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Consumer perspectives on food and nutrition labelling and use of food label information in Mongolia to inform food labelling policy

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Early Start
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Certification

I, Nyamragchaa Chimedtseren, declare that this thesis submitted in fulfilment of the requirements for the conferral of the Doctor of Philosophy, from the University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. This document has not been submitted for qualifications at any other academic institution.

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Nyamragchaa Chimedtseren

30 March 2021

Abstract

Background: In response to the growing burden of non-communicable diseases, countries are adopting nutrition labelling as a policy to promote healthy diets. Mongolia is experiencing nutrition transition and its health consequences. In Mongolia, there was a lack of evidence on the implementation of food labelling policy and consumer responses to food labels. These circumstances justified an investigation on policy processes of food labelling policy in Mongolia and consumer perspectives on food and nutrition labelling.

Aims: This research aimed to clarify how consumers in Mongolia perceive and use food label information, with the intent to improve food labelling policy to support consumers to make informed food choices and hence to improve their health outcomes.

Methods: The research utilized a mixed-methods design, comprising of qualitative and quantitative studies. Two consumer studies, a population-based survey (**Study I**) and a supermarket intercept survey (**Study II**), explored consumers' perceptions and use of label information. A qualitative study, employing semi-structured interviews (**Study III**) analysed the Mongolian food labelling policy to understand policy drivers, and barriers and facilitators to policy processes and their alignment to consumer needs. An audit of labels of food products (**Study IV**) available at marketplaces was conducted to assess existing food labelling practices.

Results: In **Study I**, 68% of consumers self-reported looking at food labels. However, when asked to indicate where on labels they had looked during a supermarket visit, only 54% of consumers indicated they had looked at food labels in **Study II**. Use of nutrition information on labels was minimal, and expiry dates were the most checked information. Socioeconomic status, education, gender, interest in healthy eating and perceived usefulness of food labels were associated with label use. Lack of awareness and motivation to use food labels, labels written in foreign languages and unclear label terms were the main reasons for not using food labels. **Study III** revealed that the socio-political context of the country was the main driver for the food labelling policy. Facilitators of policy processes were government commitments and technical support from international agencies, while barriers were insufficient knowledge and expertise of regulators, food producers and consumers, and inadequate infrastructure and resources. In **Study IV**, labels written in Russian and English, inconsistency in the scope and format of label information for both domestic and imported products, lack of standardised text format, especially for domestic products, and inconsistency in the contents of translated and original labels were the major issues.

Discussion and Conclusion: Despite government commitments to adopt food labelling policy, Mongolian consumers experience barriers when using food and nutrition labels, some of which may be addressed through population educational campaigns to increase nutrition literacy and interest in labels, but most of which will require changes to food labelling policy. Consumers' current use of food labels is low, especially nutrition information, due to their limited awareness. Thus, food label information currently has only a minor impact on food choices and purchases. This research provides recommendations for future actions by the government for food labelling policy and practice.

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Statement of Thesis Format

The thesis has been prepared in journal article compilation format, including one published article and three manuscripts submitted to peer-reviewed journals. The details are described as below:

1. *Chapter Four* describes **Study I** – Population-based survey exploring consumer perspectives on food and nutrition labelling at the population level (prepared for submission).
2. *Chapter Four* outlines **Study II** – Use of food and nutrition labels among urban Mongolian supermarket shoppers: Implications for food labelling policy and practice. A short communication article published in *Asia Pacific Journal of Public Health*.
3. *Chapter Five* reports on **Study III** – Food labelling policy analysis, exploring barriers to, and facilitators of, food labelling policy in Mongolia (prepared for submission to – *Health Policy and Planning*).
4. *Chapter Six* describes **Study IV** – Audit of food labels that assessed food labelling practices in Mongolia. An article on the prevalence and credibility of nutrition and health claims on food products in Mongolia was published in *International Journal of Environmental Research and Public Health*.

Each of these articles provides distinct subject material, mitigating the risks of repetition between chapters. It is believed that thesis by compilation is an appropriate format. This is in view of the fact that the findings are policy relevant and thus the robust peer-reviewed process would improve quality of the research. Additionally, through open-access publication, this research would provide a timely dissemination to inform policy entrepreneurs on related actions needed to create healthier food environments.

Publications and presentation

Listed below are the candidate's publications and presentations that are relevant to the period of candidature.

Peer-reviewed publications

Chapter Six

Nyamragchaa Chimedtseren, Bridget Kelly, Anne-Therese McMahon and Heather Yeatman. Prevalence and credibility of nutrition and health claims: Policy implications from a case study of Mongolian food labels. *International Journal of Environmental Research and Public Health* 2020; 17(20), 1-19.

Chapter Four

Nyamragchaa Chimedtseren, Bridget Kelly, Anne-Therese McMahon, Heather Yeatman and Batjargal Jamiyan. Use of food and nutrition labels among urban Mongolian supermarket shoppers: Implications for food labelling policy and practice. *Asia Pacific Journal of Public Health 2022, 34(5),* 595-597.

Manuscripts pending publication

Chapter Four

Nyamragchaa Chimedtseren, Bridget Kelly, Anne-Therese McMahon, Heather Yeatman, Bolormaa Norov and Batjargal Jamiyan. Consumers' perceptions, attitudes and use of food and nutrition labels: Findings from a Mongolian population-based survey. (prepared for submission)

Chapter Five

Nyamragchaa Chimedtseren, Bridget Kelly, Anne-Therese McMahon, Heather Yeatman and Batjargal Jamiyan. Development and implementation of food and nutrition labelling policy in Mongolia: a policy analysis. (prepared for submission)

Presentation

Nyamragchaa Chimedtseren, Heather Yeatman & Bridget Kelly 2019, "Consumer perspectives on food and nutrition labelling and use of food label information in Mongolia to inform food labelling policy", School of Health and Society HDR Presentation Day, University of Wollongong, Australia, 6 November 2019 (Poster presentation, **Appendix V**).

Statement of Contribution

The PhD research project was designed by N. Chimedtseren, the PhD candidate with guidance from B. Kelly and H. Yeatman from the University of Wollongong.

N. Chimedtseren received the Endeavour Postgraduate Scholarship from the Australian Government. B. Kelly, H. Yeatman and A.T. McMahon from the University of Wollongong, Australia and B. Jamiyan from the National Centre for Public Health of Mongolia supervised N. Chimedtseren on this research project. Specific to Chapter Four, B. Norov, was a co-author who contributed to the writing a research article on the population-based survey. As each author's contribution varied according to the relevant chapters, their details are summarised as below:

1. Chapter Two (Literature review): N. Chimedtseren, B. Kelly and H. Yeatman first designed the research question and the scope of the systematic review. A.T. McMahon contributed ideas for improvement. N. Chimedtseren performed the literature search and primary screening, followed by assessment of full-text articles to determine their eligibility. B. Kelly and A.T. McMahon conducted quality verification on selected eligible studies for data extraction. N. Chimedtseren conducted data extraction, quality appraisal and thematic analysis. A third opinion was sought from B. Kelly and A.T. McMahon to reach a consensus for any uncertainty.

2. Chapter Four (Article One - Study I – Population-based survey): N. Chimedtseren, B. Kelly, H. Yeatman and B. Jamiyan contributed ideas for data collection. N. Chimedtseren, B. Jamiyan and B. Norov performed data acquisition. N. Chimedtseren, B. Kelly, H. Yeatman, A.T. McMahon, B. Norov and B. Jamiyan interpreted the data and wrote the article. N. Chimedtseren and B. Norov performed the statistical analysis.

(Article Two - Study II – Supermarket intercept survey): N. Chimedtseren, B. Kelly, H. Yeatman and B. Jamiyan contributed ideas for data collection. N. Chimedtseren and B. Jamiyan performed data acquisition. N. Chimedtseren, B. Kelly, A.T. McMahon, H. Yeatman and B. Jamiyan interpreted the data and wrote the article. N. Chimedtseren performed the statistical analysis.

3. Chapter Five (Article Three - Study III – Food labelling policy analysis): N. Chimedtseren, B. Kelly and H. Yeatman constructed the discussion guide for the semi-structured interviews. N. Chimedtseren and B. Jamiyan performed data acquisition and consolidated the evidence. N. Chimedtseren analysed the data, with supervisions from B. Kelly, A.T. McMahon and H. Yeatman. N. Chimedtseren, B. Kelly, A.T. McMahon, H. Yeatman and B. Jamiyan wrote the article.

4. Chapter Six (Article Four - Study IV – Audit of food labels): N. Chimedtseren, B. Kelly and H. Yeatman contributed ideas for data collection. N. Chimedtseren and B. Jamiyan performed data acquisition. N. Chimedtseren, B. Kelly, H. Yeatman, A.T. McMahon and B. Jamiyan interpreted the data and wrote the article. N. Chimedtseren performed the statistical analysis.

For each publication, N. Chimedtseren first drafted the manuscript. All co-authors then read, contributed and approved the final version of the articles. It should be emphasised that N. Chimedtseren is the first author of these articles, thus justifying the role of being an independent researcher who contributed substantial intellectual inputs to conceptualise the studies, as well as performed related data acquisition and interpretation.

Signature:

Name	**Signature**	**Date**
Nyamragchaa Chimedtseren		28/03/2022
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List of Abbreviations

BMI	Body Mass Index
CAC	Codex Alimentarius Commission
CHDM	Centre for Health Development Mongolia
DF	Degree of freedom
EFIC	European Food Information Council
FDI	Foreign direct investment
FEP	Food environment policy
FIA	Food Industry Asia
FOPL	Front-of-pack labelling
GBD	Global burden of disease
GDA	Guideline Daily Amount
GDP	Gross Domestic Product
GINA	Global Database on the Implementation of Nutrition Action
GMO	Genetically Modified Organism
GST	Goods and Services Tax
HDI	Human Development Index
HSR	Health Star Rating
ICN	International Conference on Nutrition
IDRC	International Development Research Centre
IFC	International Finance Corporation
INFORMAS	International Network for Food and Obesity/NCD Research, Monitoring and Action Support
LMIC	Low and middle-income country
MASM	Mongolian Agency for Standardization and Metrology
MFPA	Mongolian Food Producers Association
MNNS	Mongolian National Nutrition Survey
MNS	Mongolian national standard
MOHM	Ministry of Health of Mongolia
NFMCA	National Federation of Mongolian Consumers Association
NSOM	National Statistical Office of Mongolia

NCD	Non-communicable disease
NCPHM	National Centre for Public Health of Mongolia
NFSNC	National Food Safety and Nutrition Council
NGO	Non-governmental organisation
NRV	Nutrient Reference Value
OR	Odds ratio
PIO	Population, Intervention, Comparison
PhD	Doctor of Philosophy
RDI	Recommended Daily Intake
SE	Standard error
SES	Socio-economic status
SD	Standard deviation
SDG	Sustainable Development Goal
SEA	South-East Asian
SFS	Sugar Fat Salt
SSIAM	State Specialised Inspection Agency of Mongolia
SMART	Specific, measurable, achievable, relevant and time-bound
SME	Small and medium enterprises
SRG	Sustainability Reporting Guide
SSB	Sugar-sweetened beverages
TLL	Traffic light labelling
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
US	United States
WCRF	World Cancer Research Fund
WHO	World Health Organization
WPRO	World Health Organization Regional Office for the Western Pacific
WTO	World Trade Organization

Chapter One

GENERAL INTRODUCTION

1.1 Preface

Chapter One introduces the context of the research. Firstly, it provides an overview of dietary risks and the burden of obesity and non-communicable diseases (NCD) at the global level, followed by an introduction of the concept of food and nutrition labelling, and an outline of global policies and national policies of selected countries as exemplary regulations. The next section provides background information on Mongolia, including the country's demographic, social, political and economic situation to provide the context of implementation of food labelling policy in Mongolia. An overview of national food labelling regulations and nutrition transition specific to the Mongolian context are described in order to further discuss the increased need for food labelling policy in Mongolia. The research aim and objectives, research questions and the significance of the research are subsequently provided. Lastly, a thesis outline, providing a summary of each chapter is provided.

1.2 General Background

1.2.1 Dietary risk factors and health

Unhealthy diets are a leading contributor to obesity and NCDs (GBD 2019 Risk Factors Collaborators 2020). NCDs are a leading cause of death globally responsible for 41 million of 55 million deaths in 2019, equivalent to 71% of all deaths globally (GBD 2019 Risk Factors Collaborators 2020).

Dietary risks refer to excessive intakes of energy, saturated and trans-fat, sodium and free sugars and low intakes of fruits, vegetables and polyunsaturated fatty acids. Dietary risk factors ranked at second (13.5% or 3.48 million) and third (14.6% or 4.47 million) in the global attributable deaths for females and males in 2019 respectively. Poor diet accounts for more than 10% of DALYs in many locations in central and Eastern Europe, central Asia and most of China (GBD 2019 Risk Factors Collaborators 2020). High systolic blood pressure, body mass index (BMI), fasting glucose and total cholesterol are risk factors that are caused by intake of foods with excess saturated and trans-fat, sodium and sugars. Diet-related risk factors increase the risk of diet-related NCDs including hypertension, cardiovascular disease, some cancers and type 2 diabetes mellitus (Meldrum et al. 2017). In low and middle-income countries (LMIC), 8 in 10 deaths (77%) occur due to NCDs. LMICs face the dual burden of nutrient deficiency and unhealthy dietary patterns due to the shift in diet, physical activity and other lifestyle changes that follow economic, demographic and epidemiological changes. The nutrition transition in these countries occur where the traditional diet is changed to increased intake of ultra-processed foods and sugar sweetened beverages due to the greater accessibility, convenience, low price and marketing.

1.2.2 Concept of food and nutrition labelling

Food labelling provides consumers with information about food products and aims to protect health by influencing consumer food choices and support fair trading (Albert 2010). Label information should be factual and non-misleading. Food labels provide a range of information, including the name of the food, ingredients list, product weight, country of origin, manufacturer or distributer information, lot identification, date marking, directions for use and storage, and nutrition information (CAC 1985).

Nutrition labels include nutrient declarations, supplementary nutrition information, such as symbols or pictorial presentations of nutrient content, ingredients list and nutrition and health claims (CAC 2013). Nutrition labelling is a policy intervention to enable a food environment that promotes healthy diets and facilitates informed healthier food choices (WHO 2013) and was recommended by the WHO for addressing obesity and NCDs (WHO 2017). According to the WHO, the primary aim of nutrition labelling is to inform consumers about nutritional properties of a food and support them in making informed healthier food choices (WHO 2013). It also encourages food manufacturers to reformulate their products to avoid unfavourable nutrient content disclosures (Kelly & Jewell 2018). Healthier food choice and healthier food consumption, resulting in improved diet quality lead to reductions in diet-related diseases (Crokett et al. 2018).

Nutrient declarations are a listing of the nutrient contents of a food and are typically presented at the back of product packaging. The amounts of nutrients are expressed in 100g/100ml and/or per serving of the product, and also given as the percentages of Recommended Daily Amount (RDA) or Nutrient Reference Values (NRV) (CAC 2013). Nutrient declarations provide an important foundation to other nutrition policies to promote healthy population diets by providing information on the nutritional content and quality of foods. For example, they provide a basis for implementing policies on marketing of foods and non-alcoholic beverages to children and fiscal policies to promote healthy diets (WHO 2016b).

Front-of-pack label (FOPL) is a presentation of nutrition information in simplified format on the front of product packaging with the intention to help consumers to understand the nutritional quality of a food and assist in interpreting nutrient declarations (Becker et al. 2015). FOPL represents an important shift from the provision of information to the understanding of that information. Different types of FOPL systems have been introduced by government agencies, food industries and other international, and non-governmental organisations in different countries (Hodgkins et al. 2012). There are two major categories of FOPLs, interpretive and non-interpretive systems. Interpretive FOPLs use interpretational aids, such as words, colours or symbols to aid consumer understanding (Kelly & Jewell 2018). Interpretive FOPLs have been identified by the WHO as a policy priority for promoting healthy diets and recommended as a "best buy" intervention for prevention and control of NCDs (WHO 2017). However, in terms of effectiveness of different types of FOPL systems, the evidence is mixed (EFIC 2015). Non-interpretive FOPLs provide a summary of nutrient information from nutrient declarations without providing an evaluation beyond the numerical values provided (Kelly & Jewell 2018). An example of non-interpretive FOPLs is the percentage GDA labelling. Interpretive FOPLs, such as health warning labels can be useful in reducing consumption of unhealthy food and drinks in countries with high burden of NCDs as they are easier to interpret by consumers in identifying unhealthy products high in sugar, salt, and saturated fat (Kanter et al. 2018; Swinburn et al. 2019).

Nutrition and health claims are a further type of nutrition labelling. Codex defines nutrition claims as "any representation which states, suggests or implies that a food has particular nutrition properties, including but not limited to the energy value and the content of protein, fat and carbohydrate, as well as the content of vitamins and minerals" (CAC 2011, p. 1). Nutrition claims are categorized as nutrient content claims and nutrient comparative claims (CAC 2011). Health claims are "any representation that states, suggests or implies that a relationship exists between a food or a constituent of that food and health" (CAC 2011, p. 1). It includes nutrient function claim, other function claim and reduction of disease risk claim (CAC 2011). It is important that health claims are not misleading consumers about health benefits of a food. To restrict nutrition and health claims on unhealthy foods, some regulations have established a criterion for making these claims that such claims are only permitted on foods in which the contents of nutrients such as fat, saturated fat, cholesterol and sodium per serving are not exceeding certain limits. Health claims should undergo scientific substantiation prior to being made on foods (CAC 1997).

1.2.3 Impacts of nutrition labelling on diet

Nutrition labelling is expected to improve diet through enabling healthier food purchase and consumption and in the long-term contribute to reduction of diet-related diseases (Crokett et al. 2018). Most of the evidence on nutrition labelling and diet-related outcomes has assessed the effect of this labelling on consumers' understanding of nutritional content of food, with less available evidence on the outcomes of food choice and purchase, and associated health outcomes (Azman & Sahak 2014; Bonsman & Wills 2012; Campos et al. 2011; Cecchini & Warin 2016; Cowburn & Stockley 2005; Croker et al. 2020; Dumoitier et al. 2019; Garde 2008; Song et al. 2021). FOPLs, particularly interpretive labels, such as the Chilean warning label, and traffic light labelling in Ecuador and the UK have been found to be associated with healthier purchasing, including significant reductions in the sugar, energy, saturated fat and sodium content of food purchases or reductions in purchasing of less healthier products (Croker et al. 2020).

Compared to the above outcomes, evidence on dietary quality as an outcome of nutrition labelling is less convincing, with scarce and mixed evidence, and more research is needed in this area (Bonsman & Wills 2012; Cecchini & Warin 2016; Croker et al. 2020; Crockett et al. 2018; Garde 2008; Hawley et al. 2012; Ikonen et al. 2019; Kiesel et al. 2011; Shangguan et al. 2019; Song et al. 2021). There are only a few literature reviews that have examined how nutrition labelling influences dietary quality. Of these, two literature reviews found inconsistent findings regarding the effectiveness of nutrition labelling, including FOPLs, on food consumption and dietary quality (Croker et al. 2020; Crokett et al. 2018). A further two literature reviews supported the potential of food label use in improving the dietary quality by finding an association between food label use and better dietary quality, related to lower dietary intakes of energy, saturated fat, fat, cholesterol and sodium, higher Healthy Eating Index (HEI) or reduced intakes of unhealthy products (Kiesel et al. 2011; Shangguan et al. 2019). For instance, Shangguan et al. (2019) found that food label use decreased energy intakes by 6.6%, total fat intake by 10.6% and intakes of unhealthy foods by 13.0%.

1.2.4 Global regulations on food and nutrition labelling

The Codex Alimentarius Commission (CAC), the joint WHO/Food and Agriculture Organization of the United Nations, develops internationally adopted food standards and guidelines with the purpose to facilitate international food trade and promote food safety and public health (Hawkes 2004). Codex guidelines guide national legislations and are used as a basis for the development of national legislation. Codex has adopted four major standards and guidelines relevant to food and nutrition labelling, namely General Standard for the Labelling of Pre-packaged Foods (Codex Stan 1-1985, last revised 2018), Guidelines on Nutrition Labelling (CAC/GL 2-1985, last revised 2013), Guidelines for Use of Nutrition and Health Claims (CAC/GL 23-1997, last revised 2013) and General Standard for the Labelling of and Claims for Pre-packaged Foods for Special Dietary Use (Codex Stan 146-1985).

General Standard for the Labelling of Pre-packaged Foods (Codex Stan 1-1985) establishes general principles for food labelling that pre-packaged food is not being described in a manner that is false, misleading or deceptive, and it is not being confused with other products. The standard outlines the information that must be provided on the label of pre-packaged food (CAC 1985).

The Guidelines on Nutrition Labelling specifies the form and content of nutrition information on a food label (CAC 2013). The guideline introduces the concept of consumer information and links nutrition labelling to public health (Albert 2010). The Guidelines on Nutrition Labelling was amended in 2011 with expansion of mandatory declarations to include saturated fat, sodium/salt and total sugars. Subsequently, in 2012, the Codex amended the guideline making nutrient declarations mandatory for all pre-packaged foods (CAC 2013; EFIC 2015). These important revisions of the guideline in the past decade reflect the efforts of the Codex to align the guideline with the WHO's Global Strategy on Diet, Physical Activity and Health (WHO 2004a) and respond to the growing burden of NCDs globally (WHO, 2018). This shift in nutrition labelling policy was also driven by increasing awareness and interest of consumers in healthy diets and about the nutritional quality of food, and interest of governments to promote healthy diets, and prevent obesity and NCDs (FAO & WHO 2014).

Guidelines for Use of Nutrition and Health Claims (CAC/GL 23-1997) provides definitions of nutrition and health claims, and specifications of different types of nutrition and health claims and conditions for making these claims. It prohibited making therapeutic claims for foods and establishes the principles and procedure of scientific substantiation for health claims (CAC 1997). Aiming to protect the health of consumers, the guideline recommends that nutrition and health claims should be consistent with, and supporting of, national nutrition policies (Albert 2010).

1.2.5 Overview of national nutrition labelling policy and regulations

Several global commitments have been made in response to the growing epidemic of diet-related NCDs, including the WHO Global NCD action Plan 2013-2020 (WHO 2013) and the Rome Declaration on Nutrition 2014 (FAO & WHO 2014). These commitments have urged countries to adopt nutrition labelling and incorporate it into national policy actions. Governments globally have committed to these actions and implemented nutrition labelling as a policy option to promote healthy diets.

According to the Second Global Nutrition Policy Review in 2016–2017, of 124 WHO member countries, 85% (74 countries) had implemented nutrient declarations and the majority of countries (70%) had implemented it on a mandatory basis. Countries in the WHO region of Americas and

European Region mostly had mandatory labelling policies, while countries from the WHO regions of Africa and South East Asia had voluntary policies for nutrient declarations. Implemented nutrition labelling policies varied across countries in terms of the nutrients declared and food products to which labels are applied, and implementation arrangements (WHO 2018a). The countries with mandatory nutrient declarations reported requiring more detailed listings of nutrients (WHO 2018a). Some countries applied mandatory nutrition labelling to all pre-packaged foods, while others mandated nutrition labelling only for selected categories of food (e.g. infant formula, cereal based food for young children, diabetic food and fortified or enriched foods) or exclusively for foods making nutrition and health claims.

The global trend has been shifting from voluntary labelling to mandatory regulation. In the last two decades, particularly since the amendment of the Codex guidelines in 2012 which recommended mandatory nutrition labelling, many countries have adopted mandatory nutrition labelling (WCRF 2021). Most recently the European Union (EU), China, Japan, Indonesia, the Philippines, Saudi Arabia, Lebanon, Vietnam, Venezuela, South Africa and Nigeria have adopted mandatory nutrition labelling (EFIC 2015; WCRF 2021). Regulatory arrangements for nutrition labelling in countries are presented below based on the updated information from the European Food Information Council (EFIC), the Global Database on the Implementation of Nutrition Action (GINA) and the NOURISHING database of World Cancer Research Fund (EFIC 2015; GINA 2021; WCRF 2021). However, information regarding food labelling policies in the majority of LMICs was not available in these global databases. As a result, the current status of food and nutrition labelling regulations in these countries remains unknown.

Countries with <u>mandatory</u> nutrition labelling: the United States (US), Canada, Mexico, Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Uruguay, Venezuela, EU Member States, Russia, Israel, Gulf Cooperation Council members, Lebanon, Nigeria, India, Hong Kong, China, Japan, South Korea, Vietnam, Malaysia, Taiwan, Thailand, the Philippines, Indonesia, South Africa, Australia and New Zealand (EFIC 2015; GINA 2021; WCRF 2021)

Countries with <u>voluntary</u> nutrition labelling: Turkey, Switzerland, Morocco, Jordan, Singapore, Brunei, Myanmar, Kenya and Mauritius (EFIC 2015; GINA 2021; WCRF 2021)

In addition to nutrient declarations, an increasing number of countries are developing and implementing FOPL systems, particularly countries in the WHO regions of the Americas, Europe and the Western Pacific (WHO 2018a). As per the WHO Second Global Nutrition Policy Review 2016–2017, of 124 member countries, FOPLs have been introduced in 44% of countries and mostly on voluntary basis (WHO 2018a; WCRF 2021). The United Kingdom (UK), Denmark, Iceland, Norway, Sweden, France, Belgium, Germany, Czech Republic, Netherlands, Poland, Croatia, Lithuania, Australia, New Zealand, Singapore, India, Malaysia, Brunei, South Korea, The Philippines, Nigeria and South Africa have introduced government endorsed FOP nutrition labels on a voluntary basis. While, Thailand, Sri-Lanka, Israel, Iran, Finland and some North and South American countries such as Mexico, Ecuador, Chile and Peru have introduced mandatory FOP labelling (EFIC 2015; WCRF 2021). The information most often included on FOPL systems was energy value, salt/sodium, total sugars, saturated fatty acids and total fat. The most common FOPLs were endorsement logos and the percentage GDA system (WHO 2018a).

1.3 Country Background

1.3.1 Geography

Mongolia is a landlocked country in Asia situated between China and Russian Federation (**Figure 1.1**). Mongolia is the 19th largest country in the world with the total land area of 1.54 million square kilometers. Meanwhile it is one of the most sparsely populated countries globally with a population of 3.3 million (Worldometer 2021). The country contains large upland steppes to the east, forested high mountains to the west and north and the Gobi desert to the south. The land itself is a plateau with an average elevation of about 1.580 meters above sea level. The climate in Mongolia is characterised by long winter with severe winter conditions, hot summer with low precipitation, and spring with constant winds. One of the remarkable features of Mongolia is its number of sunny days, which is 260 days each year (*The Encyclopedia Britannica* 2021).

Figure 1.1 Map of Mongolia, Source: http://www.mapsofworld.com/mongolia/

1.3.2 Population

The population of Mongolia in 2020 was 3.3 million with an annual population growth rate of 2.0% (CHDM & WHO 2020). The majority of the population (68.5%) live in urban areas and almost half of the population (46.7%) live in the capital city of Ulaanbaatar (CHDM & WHO

2019). The internal migration from rural areas to big cities brought negative consequences, including expanding peri-urban deprived areas without adequate infrastructure with unsafe water supply and poor sanitation, environmental pollution, poverty and unemployment, and limited access to health service (CHDM & WHO 2020). Almost half (49%) of the total Mongolian population is male. The average life expectancy is 76.2 years for women and 66.7 years for men (CHDM & WHO 2020). The literacy rate is high in Mongolia with 98.4% of the adult population are literate (UNESCO Institute for Statistics 2021). The population of the country is considerably young, with 31.9% of the population children under 15 years (CHDM & WHO 2020). However, since 1990 Mongolia has had an aging population, as a consequence of significant reductions in the fertility and death rates in relation to the country's sociopolitical and economic transition (WHO 2016a).

1.3.3 Ethnicity and traditions

The main ethnic group is Khalkh, which comprises 95% of the Mongolian population. The most prevalent religion is Buddhism. Mongolia's official language is Mongolian, which is spoken by 95% of the population as the native tongue (WPRO 2013). Mongolia has been a country of pastoral nomadism and nowadays about 25% of the population still run animal husbandry (Bertelsmann Stiftung 2020).

1.3.4 Political and economic development

Mongolia, once a socialist country, changed its political and economic systems in 1990, shifting from nearly 70 years of centrally planned economy to a free market economy. Following the resignation of the communist party and the Soviet Union's impact on its political and economic policies, Mongolia held its first multiparty elections for the Parliament in 1990, and two years later, adopted a new constitution in 1992, declaring the country's acceptance of democratic principles and commitment to a market economy (Nixson & Walters 2000). The state head is the President, and the Parliament has legislative power with 76 members who are elected for a term of four years.

Due to the dramatic drop in government revenue from a sudden withdrawal of Soviet aid, Mongolia experienced a crisis in the early period of transition, which resulted in increased poverty, unemployment, a surge in inflation and disruptions in health care and social services (Shagdar 2007). Nevertheless, Mongolian economy saw recovery after 1994 due to "shock therapy" measures, including price and trade liberalisation, privatisation, fiscal and structural reforms, and active trade and investment, and since 2004 has experienced steady economic growth (Namsrai 2017). Gross Domestic Product (GDP) grew to 10.6% in 2004 from 2.1% in 1994, and rose to 17.3% in 2011 due to a boom in the mining sector, making Mongolia the fastest growing economy in Asia (World Bank 2012). However, Mongolia's economic performance has fluctuated over the last decade, with a decline since 2014 due to the fall in the global commodity prices of the main export products, reaching 1.5% in 2016, and has risen up again up to 6.4% in 2018 (Namsrai 2017; Bertelsmann Stiftung 2020).

Mining is the dominant sector of the economy, generating a quarter of the country's GDP. Coal, copper and gold are the main export commodities, constituting around 90% of the country's exports. Trade and repair of motor vehicles comprised 16% of the share of the GDP, standing after the mining sector. Agriculture continues playing an important role in Mongolia's economy, and comprised 13% of GDP (**Figure 1.2**). In addition to these primary sectors, manufacturing is one of the significant industries (9% of the GDP), and food processing shares over half (55.1%) of the GDP of this sector (NSOM 2021).

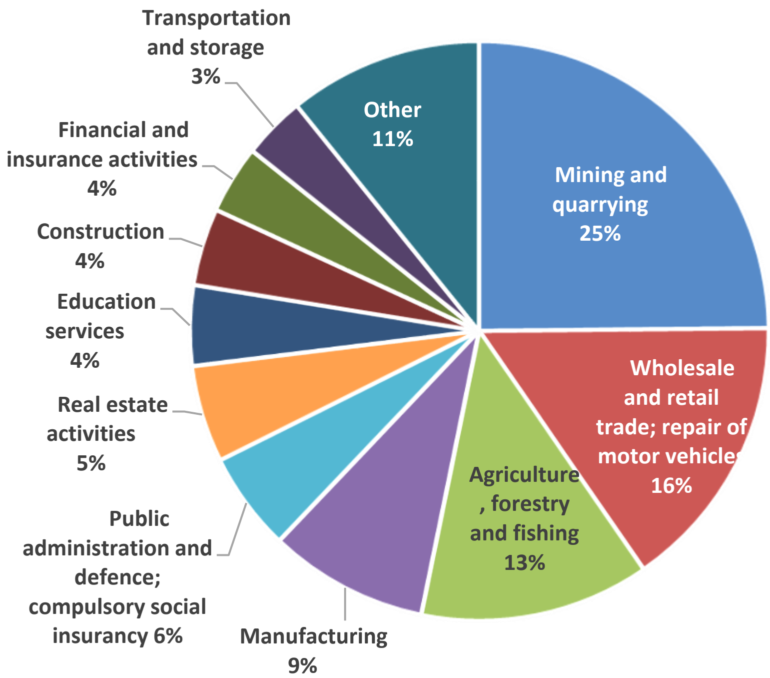

Figure 1.2 GDP by economic sectors, 2020 (Source: National Statistical Office of Mongolia)

1.3.5 Food labelling policy and regulations in Mongolia

In Mongolia, food labelling is regulated under two main food laws, namely the Food Law and the Food Safety Law, as well as the food labelling standard “Requirements for labelling of pre-packaged foods”, MNS 6648:2016 (Government of Mongolia 2012a, 2012b; MASM 2016). Food labelling has drawn little attention from the Mongolian Government until the first decade of 2000, when these laws were passed in 2012. The Food Safety Law, which was enacted in 2012, stipulates the general labelling requirements, including required label information and acceptable label languages that apply to all pre-packaged food products (Government of Mongolia 2012b). Label information should be in either Mongolian, English or Russian, and labels written in other languages should be translated into Mongolian. Information required on food labels include the product name, name and address of manufacturer, net weight and drained weight, and other numerical expressions, lot number, manufactured date, best-before or use-by date, storage condition, ingredients list, directions for use, adverse effects and precautions (allergy information), and nutrition information. In addition, it was required foods produced organically, sourced from genetically modified organisms or treated with ionizing radiation to carry appropriate international or national labels or symbols (Government of Mongolia 2012b).

In addition to the above laws, food labelling is addressed in other government policy and strategies, namely, the State Policy on Food and Agriculture (2015-2025), the National Strategy on Healthy Diet and Physical Activity (2010-2021), the National Strategy for Reducing Salt Intake (2015), the National Programme for Nutrition (2016-2025) and the Infant and Young Child Food Act (2017) (Parliament of Mongolia 2015; Government of Mongolia 2009, Government of Mongolia 2015a, Government of Mongolia 2015b, Government of Mongolia 2017). Of these policies, the National Programme for Nutrition (2016-2025) has a strong focus on food and nutrition labelling and contains several actions to implement, including adopting an endorsement logo for healthy food; amendment of the current food labelling standard and mandating declarations of nutrients, including saturated fat, sugar, salt and trans-fat; improving nutrition education of the population and promoting healthy diet, and building consumer awareness of food label use and promoting healthier food choice (Government of Mongolia 2015b). Updating of the food labelling standard was also included in the Action Plan for the National Strategy on Healthy Food and Physical Activity (Government of Mongolia 2009).

The food labelling standard came into force in 2018, as operational regulation for the Food Safety Law. It mandates all pre-packaged food products declare energy value and contents of protein, carbohydrates, fat, saturated fat, sodium and total sugars and the amount of any other nutrient for which a nutrition or health claim is made (MASM 2016). The standard is largely based on the corresponding Codex standard and guidelines with some adaptations, which are mainly exclusion of some requirements of the original guidelines as three Codex guidelines were combined into a single standard. The standard provides requirements for general food labelling, as well as for nutrition labelling, including requirements for listing and presentation of nutrient declarations, and nutrition and health claims. Unlike the earlier Mongolian food labelling standard (2007), the new standard stipulated mandatory declarations of nutrients, including for saturated fat, sodium and total sugars.

In 2017, the Ministry of Health of Mongolia also adopted a voluntary guideline on FOPL. The voluntary FOPL system combines traffic light interpretive symbols and GDA. Specifically, the label depicts the amounts of energy, saturated fat, sugar and sodium in 100g/100ml or per serving of the product, and the percentages of the recommended daily intake for an "average adult" contributed by these nutrients, along with colour codes. Red colour indicates high levels of a nutrient, amber for moderate levels and green indicates low levels (MOHM 2017).

Prior to these laws and labelling standard, the concept of food labelling was briefly introduced in the first Food Law, which was enacted in 1995. Clause 16 of this law states that product labels should contain manufactured and use-by dates, directions for storage and manufacturer's address, and if required by the product standard, trademark, ingredients list and directions for use also need to be provided (Government of Mongolia 1995). Providing nutrition information on the label was first introduced in the amended Food Law of 1999. Clause 9.2.6 of the law states that "Food should be packed and labelled with nutrition information, ingredients list, directions for use and storage, and storage duration" (Government of Mongolia 1999). The first food labelling standard, "Food labelling: General requirements" (MNS CAC 4280:1995), is dated back to 1995. Later, it was updated into the standard "General requirements for Labelling of pre-packaged food" (MNS CAC 1:2007) in 2007, and another standard for nutrition labelling "Guidelines on Nutrition Labelling" (MNS CAC GL 2:2007) was adopted in the same year. These standards were the translations of the corresponding Codex standards, namely, Codex General Standard for the Labelling of Pre-packaged food CAC 1:1985 (amended in 1991, 1999 and 2003) (CAC 1985) and Guidelines on

Nutrition Labelling CAC GL 2:1985 (1993, 2003 and 2006) (CAC 2013). The standard "General requirements for Labelling of pre-packaged food" (MNS CAC 1:2007) required mandatory application, while the "Guidelines on Nutrition Labelling" (MNS CAC GL 1:2007) was implemented on a voluntary basis (MASM 2007).

Prior to the Food Law of 1995 and the food labelling standard of 1995, there were not any overarching regulations for food labelling in Mongolia. Food labelling was only addressed in individual food product standards which were adapted from the food product standards of the former Soviet Russia, as part of the technical requirements for products. These standards required brief information on product packaging which were similar to the requirements of the 1995 law.

Table 1.1 presents a chronology of the adoption of government food and nutrition policies that are relevant to food labelling in Mongolia. It shows considerable progression of the food labelling policy in Mongolia over the last decade, which is related to increasing significance of food labelling as a strategy in responding to the growing burden of NCDs in the country.

Table 1.1 Chronology of food and nutrition policies addressing food labelling in Mongolia

Year	Policy
Prior to 1995	Individual food product standards (adapted from the standards of the Soviet Russia; brief information was provided on food packaging)
1995	Food law (providing information on food packaging was introduced)
	Standard "Food labelling: General requirements" MNS CAC 4280:1995 *(translation of the Codex standard)*
1999	Food law (providing information on nutritional quality of products on label was first introduced.)
2007	Standard "General requirements for Labelling of pre-packaged food" MNS CAC 1:2007 *(translation of the Codex standard)*
	Guidelines on Nutrition Labelling MNS CAC GL 2:2007 (translation of the Codex guidelines; voluntary nutrient declarations)
2009	National strategy on healthy diet and physical activity (2009-2021) *(Amendment of the food labelling standard was included.)*
2012	Food Law
	Food Safety Law (explicit inclusion of food and nutrition labelling)
2015	State Policy on Food and Agriculture (2015-2025) (Food labelling was highlighted as one of the strategies for improved food safety.)
	National Programme for Nutrition (2016-2025) (Several actions on food and nutrition labelling were planned, including the amendment of the current food labelling standard.)
	National Strategy for Reducing Salt Intake *(labelling of salt content)*
2016	Standard "Requirements for Labelling of pre-packaged food" MNS CAC 6648:2016 (mandatory declarations of energy and 6 nutrients; the concept of health and nutrition claims was first introduced.)
2017	Infant and Young Child Food Act (labelling of infant and young child food products)

	Guidelines on front of pack labelling, Health Minister's Order #221, 2017 (Voluntary scheme consisting of traffic light symbols and GDAs)
2018	Commencement of enforcement of the food labelling standard MNS CAC 6648:2016

The content of the Mongolian food labelling standard, MNS 6648:2016 was compared with relevant Codex standards on food and nutrition labelling, including General Standard for the Labelling of Pre-packaged Foods (CAC 1:1985), Guidelines on Nutrition Labelling (CAC/GL 2:1985), and Guidelines for Use of Nutrition and Health Claims (CAC/GL 23:1997) (**Table 1.2**). The Mongolian standard is largely similar to these Codex standards and guidelines, with some exceptions. Namely, the Mongolian standard MNS 6648:2016 does not require foods with a durability of not more than three months to include the date (day, month and year) for product expiration (best-before), as stipulated by Codex. Rather, only the month and year must be declared. While an ingredients list is required by the Mongolian regulation, there is no requirement for quantitative declaration of ingredients. Moreover, the Mongolian standard does not specify whether the same nutrients are required to be declared for imported products or not. No criteria are established in the Mongolian standard for the presentation of NRV information; it is unclear if this should be based on the NRVs provided by Codex or on the national NRVs established by the Mongolian government. Legibility requirements of the Mongolian standard are also minimal compared to Codex guidelines.

Nutrition and health claims were found to be insufficiently addressed in the Mongolian standard (Chimedtseren et al. 2020). A definition of nutrition claim was provided in the standard, however, it did not provide a definition of health claim. The standard lacked the definitions and criteria for making different types of nutrition and health claims, as well as regulations regarding the conditions for foods to make nutrition and health claims, including nutrient profiling criteria. Although the standard requires scientific substantiation for health claims, the standard did not detail the procedure for it, including which national organisation is responsible for endorsing the health claims.

Table 1.2 Comparison of Mongolian food labelling regulations and Codex guidelines

Requirement	Codex guideline	Mongolian standard
General food labelling		
General principles	Label should not be false, misleading or deceptive, and should not be referring to any other product with which the food might be confused.	Included
Mandatory labelling requirements	Regarding name of the food, list of ingredients, weight information, manufacturer information, country of origin, lot identification, date marking and storage instructions, and instructions for use	All requirements are included, except the following points on the rows below.
	Provides formats for declaration of best before date only.	Use by date and best before date are required to be declared in a same way.
	Quantitative ingredients declaration: The ingoing percentage, by weight or volume as appropriate, of each ingredient shall be given on the label.	No regulation
	In the case of foreign language labels, the mandatory information in the relabelled label shall be fully and accurately reflect that in the original label.	No regulation
Presentation of mandatory information	Clear, prominent, indelible and readily legible statements on the label	Included
Nutrition labelling		
Mandatory nutrient declaration	Energy, protein, carbohydrates, fat, saturated fat, sodium and total sugars are required to be declared.	Included
	Any other nutrient for which a nutrition or health claim is made	Included
	Any other nutrient as required by national legislation	No nutrients are specified.
	If a specific nutrient is declared voluntary, national legislation may require mandatory declaration of any other nutrient relevant for maintaining a good nutritional status.	No regulation
	Only vitamins and minerals for which recommended intakes have been established and/or which are of nutritional importance in the country should be declared.	Included, but no particular vitamins and minerals are specified to be declared.
	When vitamins and minerals are present in amounts less than 5% of the NRV or of the officially recognized guidelines of the competent authority per 100 g or 100 ml or per serving should not be declared.	Included
Presentation of nutrient content	**Energy value** should be expressed in kJ and kcal and the amounts of **protein, carbohydrates and fat** in g per 100 g/100 ml or per package if the package contains only a single portion. In addition, this information may be given per serving or per portion provided that the number of portions contained in the package is stated.	Expressed per 100g/100ml or per package if the package contains only a single portion, but not per serving.
	Protein and additional nutrients may also be expressed as percentages of the NRV where an NRV has been established.	Included, but it is not specified which NRVs (the Codex NRVs or the national

		recommended dietary intake values) shall be used.
	Vitamins and minerals should be expressed in metric units and/or as a percentage of the NRV per 100 g or per 100 ml or per package if the package contains only a single portion. In addition, this information may be given per serving or per portion provided that the number of portions contained in the package is stated.	• Expressed in metric units or as a percentage of the NRV per 100g/100ml or per package if the package contains only a single portion, but not per serving. • It is not specified whether NRVs are the Codex NRVs or nationally recommended dietary intake values.
Legibility of nutrition information	Requirements regarding format and contrast	Included
	Nutrients should be declared in a specific order developed by competent authorities and should be consistent across food products.	No regulation
	The font type, style and a minimum font size as well as the use of upper and lower case letters should be considered by competent authorities to ensure legibility of nutrition labelling.	No regulation
Supplementary nutrition information	Supplementary nutrition information on food labels should be optional and should only be given in addition to the nutrient declaration.	• Provision of FOPL on food labels was included in the standard. The standard states that "Information on the content of energy, total fat, saturated fat, sugar and salt can be placed on the front pack of a product near where the product name is placed". • But it does not specify that this information is provided in addition to the nutrient declarations.
Nutrition and health claims		
Nutrition claim	Definition of nutrition claim Definition and conditions of different types of nutrition claims	Definition of nutrition claim is briefly included. But definition and conditions of different types of nutrition claims are not provided.
	Claim regarding carbohydrate => to declare total sugars, if necessary, starch and/or other carbohydrate constituent(s)	Not included
	Claim regarding dietary fibre => to declare dietary fibre should be declared.	Included
	Claim regarding fatty acids or cholesterol => to declare saturated fatty acids, monounsaturated and polyunsaturated fatty acids, and cholesterol	Included
Health claim	Definition and components of health claim Definition and conditions of different types of health claims	Not included

	Health claims must be based on current relevant scientific substantiation of the type of claimed effect and the relationship to health as recognized by generally accepted scientific review of the data.	Included
	Any health claim must be accepted by or be acceptable to the competent authorities of the country where the product is sold.	Included, but a national organisation responsible for this procedure is not specified.
	The claimed benefit should arise from the consumption of a reasonable quantity of the food or food constituent in the context of a healthy diet.	Included
	Conditions for eligibility to use specific claim: Claims made for foods that contain nutrients or constituents in amounts that increase the risk of disease or an adverse health-related condition are prohibited.	No regulation
	If the claimed effect is attributed to a constituent of the food, there must be a validated method to quantify the food constituent that forms the basis of the claim.	No regulation
Procedure for scientific substantiation of health claims	• Conducting a systematic literature review on the scientific evidence for health claims • Criteria for the substantiation of health claims and evaluation of the evidence	No regulation
Information on the label of a food bearing health claims	• A statement of the quantity of any nutrient or other constituent of the food that is the subject of the claim • Maximum safe intake of the food or constituent where necessary. • How the food or food constituent fits within the context of the total diet. • A statement on the importance of maintaining a healthy diet	No regulation
Claims related to dietary guidelines or healthy eating	Conditions for claims related to dietary guidelines or healthy eating	No regulation

1.4 Rational and problem statement

1.4.1 Dietary and nutrition transition in LMICs

The term "nutrition transition" describes the shift from traditional diets, which primarily consist of whole foods like pulses and whole grains and are low in animal source foods, salt, and refined oils, sugars and flours, to a modern diet that is energy-dense but nutrient poor. This modern diet is characterised by increased consumption of refined carbohydrates, high intake of protein and fat, and reliance on processed foods (Bray & Popkin 1998; Drewnowski & Popkin 1997). This transition in dietary patterns, accompanied by reduced physical activity, has significantly contributed to the global rise in obesity and NCDs, particularly in LMICs (Kearney 2010). Developing countries, especially those undergoing rapid economic growth such as China, Mexico and Brazil, are particularly affected by the burden and impact of nutrition transition. These countries are experiencing a shift towards a "Western diet", and an increase in overweight and obesity rates and the prevalence of NCDs, leading to various economic, health and other consequences (Kearney 2010; Popkin et al. 2017). A study conducted by the Global Dietary Database Consortium analysed food consumption and dietary patterns in 187 countries from 1990 to 2010. The study reported that in high-income countries, there was an improvement in the consumption of both healthy and unhealthy foods and beverages. In middle-income countries, while there was an increase in the consumption of healthy items, there was also a simultaneous rise in unhealthy dietary patterns (Imamura et al. 2015).

Globalisation and trade liberalisation, climate change, economic and income growth, urbanisation, population growth and migration, politics and leadership, and sociocultural context are the interconnected drivers that contribute to changes in food systems and consequently influence shifts in diets (Micha et al. 2020; Popkin 2002). Globalisation and trade liberalisation have led to increased food trade, higher foreign direct investment (FDI) and the enlargement of transnational food companies, which in turn have changed the supply of food products. In LMICs, food import has largely increased, contributing to the increased access to processed food products. FDI into the production of processed foods and growth of multi-national retailers and supermarkets has contributed to the growth of the processed food market and are affecting dietary changes (Hawkes 2006). All these factors have increased access to processed foods by making these foods easily affordable and available. In addition, food marketing has contributed to dietary transition by encouraging people to consume energy dense, highly processed foods or discretionary foods and these promotions target young people and children (Hawkes 2006). Increased availability and access enabled through changes to food production, distribution and marketing is leading to diet changes with the increased consumption of foods with poor nutritional quality and consequent changes in nutrition.

Nutrition transition has resulted in adverse dietary changes with increased consumption of discretionary foods, and reduced intake of fruit and vegetables and fibre (Popkin 2002). Food consumption has significantly increased globally in the last decades. Calories consumed from meat, sugar and vegetable oils were largely increased between 1963 and 2003 in LMICs, while only vegetable oil consumption was increased in high-income countries. The consumption of vegetable oil has increased by threefold in LMICs and twofold in high-income, outpacing the consumption of animal fat. Sugar consumption has been markedly increased in LMICs, especially in Asia, India and to a lesser extent in Latin America, Africa and Eastern Europe and transition countries (Kearney 2010).

Changes in food systems and physical activity have an impact on health and nutritional status of the population in LMICs, leading to increased overweight and obesity, as well as diet-related diseases, including diabetes, cardiovascular diseases and some cancers (Popkin & Ng 2022). The health effects of nutrition transition are more severe in LMICs where economic and other changes happened more rapidly than in high-income countries and LMICs were unprepared to these changes (Popkin 2002). Obesity and NCDs have increased far more quickly in LMICs than high-income countries (Popkin 2002). Over 80% of cardiovascular diseases occur in LMICs (WHO 2011).

1.4.2 Dietary and nutrition transition in Mongolia

Dietary and nutrition transition has taken place in Mongolia in the last 30 years. This transition is grounded on the political and economic shift in the country from a socialist system to a democratic system and market economy, which started in early 1990s. The country has been undergoing a significant transformation in all of its developmental sectors, including the food sector. The food and agricultural sector in Mongolia has changed in terms of production, supply and consumption of food (Markowitz 2013; Spoor 1996). The dietary transition process in the country is driven by various factors, including economic growth, urbanisation and changing lifestyles, decentralisation of the food system with privatised food production and retail sectors, increased food supply enabled by trade liberalisation and increased food imports, and the introduction of supermarket chains (Bromage et al. 2020; Government of Mongolia 2015b).

1.4.2.1 Urbanisation and lifestyle changes

Mongolian people lived traditional nomadic lifestyle for centuries which involved working in labour-intensive work, such as breeding livestock and stayed physically active. Nowadays this type of lifestyle has still retained in rural areas of the country (Markowitz 2013). In the past decades, Mongolia has been experienced urbanisation and internal migration of people from rural to urban area, and currently, more than half of the Mongolian population are residing in the cities (Guinness & Guinness 2012). Rapid urbanisation has impacted the country's food system by improving marketing, distribution and transportation of food and leading to an increased access to modern foods and changes in food consumption patterns. Home cooking became less common among people, especially among those who are living in cities and demand for convenient processed foods has increased (Chimeddamba et al. 2016; Markowitz 2013).

1.4.2.2 Changes in food supply and food availability

With the shift to the market economy, existing systems of centralized food supply and food retail collapsed, and new food production and retail sectors were established. As a part of trade reforms and eliminating the state monopoly, the government eliminated all restrictions on exports and imports in the early 1990s (Shagdar 2005). Mongolia joined the World Trade Organization (WTO) in 1997 and has since expanded its participation in regional economic and trade regimes (Central Intelligence Agency 2021). Foreign trade began to expand from 1995, especially since Mongolia joined the WTO. Mongolia has engaged in trade relations with 149 countries and has been increasing its external trade over time (Bank of Mongolia 2020). As of 2020, the country exports goods to 73 countries and imports goods from 142 countries (NSOM 2021).

Statistics show that imports of animal and vegetable origin products, animal and vegetable fat and oil, and processed food products have increased each year since the early 1990s (NSOM 2021). Imports of processed food products were valued at USD 434.4 million in 2020, which comprised 8.2% of the total imports and 65.0% of the total food imports (Mongolian Statistical Information Service 2021). This compares to an import value of USD 18.6 million in 1995.

Major increases were seen in the imports of the some types of products with dietary transition significance, including granulated sugar, vegetable oil and some processed food products (margarine, biscuits and bakery products, candy, soft drinks and juice) (Mongolian Statistical Information Service 2021).

Increased importation and production of packaged processed food products has led to increased availability and affordability. As a consequence of opening up of the domestic market to imported food products, food marketplaces have been captivated by an overwhelming inflow of imported food products that are mainly packaged processed products (Oyunbayar 2007). These food products are becoming abundantly available in marketplaces in all different types and varieties, as well as having labels given in different formats and written in different languages.

The country has experienced a food retail sector boom in the last decades and the sector is continuing to expand. A number of national and foreign supermarket chains and convenience stores have been introduced since 1990s, in addition to non-chain supermarkets and grocery stores. Emergence and expansion of supermarkets has increased population exposures to processed foods. Supermarkets provide a wide variety of products, including fresh food, meat, vegetables and other foods, and sell predominantly packaged food products (USDA Foreign Agricultural Service 2018). While Mongolian people continue to purchase food in local food markets and small retail stores, people have started to prefer grocery shopping in supermarkets due to their convenience and higher standard of service provided, including higher hygiene standards and trust in the quality and safety of products sold in supermarkets (FAO 2022).

1.4.2.3 Changes in food availability and consumption

According to the household food security indicator statistics of the UN FAO, dietary energy supply and nutrients supply have steadily increased in Mongolia over the last decades (FAO 2020). Average dietary supply of calories (represents food available for consumption at the household level) has increased by 30% from 2000 to 2020, rising from 2207 kcal/person/day to 2873 kcal/person/day. Average dietary energy supply adequacy (kcal/person/day), a percentage of the average dietary energy requirement, had steadily increased over this period, reaching 125%. The per capita protein supply (per person per day) in the country increased by

10%, from 77.3 g in 2000 to 85 g in 2018. Likewise, the per capita fat supply (per person per day) increased by 23.3%, from 77.6 g in 2000 to 95.7 g in 2018 (FAO 2020).

Changing food consumption patterns have been driven by changes in food supply and production, increased food imports and changes in lifestyle. Food consumption, particularly, the consumption of rice, eggs, potatoes, vegetables, vegetable oil and animal fat, and flour and flour products has steadily increased since early 1990s. According to the Household Socioeconomic Surveys of the National Statistics Office of Mongolia, between 1989 and 2020, the monthly average per capita consumption of vegetable oil and animal fat has increased by 5 times, from 0.1 kg to 0.5 kg; eggs by 2.8 times, from 2.2 pieces to 6.1 pieces; rice by 1.9 times, from 1.0 kg to 1.9 kg; potatoes by 1.2 times, from 2.3 kg to 2.7 kg; vegetables by 1.2 times, from 1.8 kg to 2.2 kg; and flour and flour products has increased by 1.2 times, from 8.8 kg to 10.3 kg (NSOM 2021). These changes in food consumption are likely positively contributed to overall diet of the population, leading to improved food sufficiency and greater dietary diversity.

Historically Mongolian people consumed fresh and unprocessed food, and the Mongolian traditional diet consists mainly of animal origin foods, including red meats, such as mutton, beef and goat, milk and dairy products, and cereals dominated with wheat products (Facts and Details 2016; Oyunbayar 2007). Nowadays the diet had been expanded to include vegetables, bread, pasta and rice as well as a variety of processed foods (chinatravel.com d2021; Robinson 2007). Consumption of greater varieties of foods, especially of some healthy foods, such as eggs and fruit and vegetables has certainly contributed to better diets. However, on the other hand, the diet quality has been negatively impacted by the changes in food consumption with increased consumption of processed foods. A recent study on diet and nutrition status of urban and rural Mongolian adults has identified three different types of dietary patterns among Mongolian adults, including "Nomadic" "Transitional" and "Urban". Of them, the "Urban" pattern that is characterised by high consumption of vegetables, juice and sugar-sweetened beverages, vegetable oils, red meat, refined grains, and white roots and tubers, was the most prevalent diet (21% of variance of the factor components), especially in urban area, and was associated with increased risks of obesity (Bromage et al. 2020). The latest Mongolian National Nutrition Survey (5th) (MNNS-V) (2016) found high consumption of discretionary foods among the adult population, with over 90% of Mongolians aged 15-49 years reported consuming at least one type of discretionary food or beverage on the previous day of the survey and on average 5 times per day (Norov 2021). The population is facing increased exposure to unhealthy food from young age. According to the MNNS-V (2016), almost all children aged 6-11 years (99%) reported consuming discretionary foods and beverages, based on short food frequency questions. Over half of children (51.4%) reported consuming discretionary foods at least once per week, while 80.9% consumed sugar sweetened beverages at least once per week (MOHM, NCPHM & Unicef 2017).

Reflecting the increased food consumption, dietary intake of the population has significantly changed in the past two decades with remarkable increases in the intake of energy, protein, fat and carbohydrates. Compared 1992 and 2020, the energy intake has risen from 1980.8 kcal to 2784.7 kcal per person/per day, protein intake from 94.6 g to 110 g per person/per day, fat intake from 77.1 g to 92.2 g per person/per day, and carbohydrates intake from 213.4 g to 359.9 g per person/per day, respectively (NSOM 2021).

1.4.2.4 Increased burden of overweight and obesity and NCDs

Overweight and obesity has drastically increased in Mongolia in the last decades. As of 2019, half of the population aged 15-69 years was overweight and obese (MOHM 2020). Between 2011 and 2016, overweight and obesity rates nearly doubled. According to the MNNSs conducted in 2011 and 2016, the prevalence of overweight and obesity in men 15-49 years of age increased from 27.6% to 48.8% in 2016, while in women of the same age, it increased from 32.9% in 2011 to 62.7% in 2016 when measured using the same methods (MOHM, NCPHM & UNICEF 2017). Overweight and obesity is also rapidly increasing among Mongolian children and adolescents. According to the MNNS-V, 22.2% of children aged 6-11 years were overweight in 2016, which was a six-fold increase from 2010 (3.6%) (MOHM, NCPHM & UNICEF 2017).

With changing diets and lifestyle, chronic diseases have steadily grown in Mongolia over the last 30 years, and have become the leading causes of population mortality (MOHM & WHO 2020). Major NCDs, cardiovascular diseases, cancer and injury are the leading causes of deaths in Mongolia and accounted for 75.4% of population deaths in the last decade, compared to 58.0% in 1995 (CHDM & WHO 2020). The prevalence of cardiovascular diseases, the third leading cause of the population morbidity, was 1268 per 10 000 population in 2020, which was increased by 238 from the average of the last ten years. The rate for diabetes was 82.9 per 10 000 population in 2020 (CHDM & WHO 2020).

Mongolia ranks high in the world in terms of the burden from NCDs. Premature mortality from cardiovascular disease, cancer, diabetes and chronic respiratory disease was 35.3% in Mongolia in 2019, ranking 11th in the world and 7th in the Western Pacific Region of WHO (WHO 2019). In the Global Burden of Disease study 2019, out of 204 countries, Mongolia ranked 1st globally in the fraction of cardiovascular (CVD) mortality attributable to dietary risk factors (54.6%) and 4th in the age-standardized all-cause deaths attributable to dietary risks (323 deaths per 100,000) (Institute for Health Metrics and Evaluation 2019). Mongolia was also ranked 11th (425 deaths per 100,000) in the age-standardized CVD deaths attributable to metabolic risk factors (IHME 2019).

1.4.3 Why is nutrition labelling important in Mongolia?

The nutrition transition taking place in Mongolia coincides with anticipated very low levels of population awareness and use of food labels. This highlights the importance of labelling as a policy tool to support informed healthy choices and highlights the need for greater attention to its role as a key strategy to address dietary transition and obesity and NCDs. In order to deal with nutrition transition and reduce its impact on health, Mongolia needs urgently to undertake policy actions to support healthy food environment, including nutrition labelling to inform consumers about the content and healthiness of foods they purchase and based upon make food choice.

Concepts of food labelling and food labelling policy and regulations are quite new for the country due to its short exposure to a market economy. Food labelling, especially nutrition labelling has not drawn proper attention to date among relevant stakeholders, including policy makers, regulators, food industry and consumers. Instead, food safety is a priority in Mongolia and a primary concern for national food security and health (FAO 2022).

The Government of Mongolia has adopted several regulations related to food labelling in the last decade to respond to the emerged needs in relation to the changes in the food system due to the socio-political and economic transition, including to reinstate diminished food control and regulate the labelling of imported and domestic food products. However, there exist significant challenges for regulating food labels in the country due to major gaps in the existing food labelling regulations, including the lack of clear instructions and standard formats, weak regulations for health and nutrition claims, as well as labelling of imported foods, and multiple label languages (**Chapter One, Section 1.3.5**) and weak enforcement. Weak enforcement of the food labelling standard was evidenced by reports of national food inspection agencies on non-compliances of domestic and imported food products with the labelling requirements, including labels written in languages not permitted for label and missing or inaccurate label information (City Specialized Inspection Agency 2013, 2011).

As the country is in its early stage of development in the market economy, the use by government of a policy instrument such as food regulations to support public health outcomes is novel and yet under-explored. Appropriateness and effectiveness of the existing food labelling policies and regulations are still not clear as there has been no assessments of these policies previously. In Mongolia, awareness and the extent of use of food and nutrition labels by consumers and comprehension of label information is not known and evidence in this regard is lacking. Considering the political, social and economic context, use and understanding of nutrition information by Mongolian consumers is expected to be low. Due to low nutrition literacy and low awareness of nutrition labels, consumers often purchase food products without knowing their nutritional quality and are thus prone to the risks of unhealthy diets (FAO 2022).

1.5 Research aim and objectives

The aim of the research is to understand how consumers in Mongolia perceive and use food label information, with the intent to improve food labelling policy and regulation to support consumers to make informed food choices and hence to improve their health outcomes.

The objectives of the research included:

1. To explore consumers' perspectives on food and nutrition labelling, including their awareness and perception, and use of label information, challenges regarding food and nutrition label use, and ideas on what strategies would assist them to effectively use food and nutrition label information
2. To analyse existing food labelling policy and regulations to determine their alignment with consumers' needs, and barriers and facilitators of policy processes
3. To review labels of food products available at marketplaces, determine the scope of and variations in label information, describe consistency of labels with the food labelling regulations and analyse their alignment with consumers' needs
4. To develop recommendations to improve the effectiveness of food labelling policy and practices in assisting consumers to make informed food choices.

1.6 Research questions

The following four questions guided the research:

1. What are consumers' perspectives of food and nutrition labelling in Mongolia, including: their awareness and perception of labels; their use of labels; their challenges and needs regarding labelling; and what would assist them to understand and use label information?

2. To what extent does the Mongolian food labelling policy align with consumers' needs and what are the factors that lead or impede the policy processes?

3. How food labelling policy and regulations are reflected in labelling practices at the retail level and do these practices act as barriers or facilitators to consumers' use of label information?

4. What strategies should be considered to enable consumers to use food and nutrition label information to make informed food choices?

1.7 Significance of the research

This research analysed food and nutrition labelling policy and consumer perspectives on this labelling in Mongolia by utilizing a mixed methods research design. The research provided understanding of the introduction of food labelling policy in Mongolia at three levels. Firstly, the research addressed a knowledge gap in the area of awareness and use of consumers regarding food and nutrition labelling in Mongolia and is the first to explore Mongolian consumers' perspectives regarding food and nutrition labelling and their awareness and use of these labels. The study clarified challenges faced by consumers in using food labels and identified their needs in this regard. Secondly, an audit study of labels of food products was undertaken to create a database of label information of domestic and imported food products that were available in the Mongolian marketplace. This allowed an assessment of labelling practices of domestic food manufacturers and imported products against the food labelling regulation. Thirdly, in-depth analysis of policy processes involved in the development and implementation of food labelling policy in Mongolia identified the gaps in the policy processes in terms of meeting consumer needs and providing insights on the barriers to, and facilitators of, policy processes.

Based on the understanding of the issue acquired through this integrated approach, the research has facilitated informed policy discussions in Mongolia about the effectiveness of the current policy and regulations on food labelling and necessary policy reforms. Findings of the study can be used by the government to update its policy and plan future interventions in response to the nutrition transition. The study findings provide evidence indicating the need for amendments to the existing food labelling policy in Mongolia and serve as baseline data for monitoring and evaluation of the effectiveness of the current and future food labelling policies.

As Mongolia is a LMIC with the unique history of Soviet rule until recently, it provides an interesting case with global policy relevance as most other research in this field have been from high-income countries such as the US, Canada, Australia and UK, and other countries' findings cannot simply be extrapolated to LMICs. Recommendations from the study may provide insights for, and can be used by, other LMICs to advance their food labelling policies.

1.8 Thesis outline

The thesis consists of seven chapters and a brief summary is detailed below.

Chapter One provides a background on food and nutrition labelling, global and national regulations on nutrition labelling and a country background. The chapter first introduces concepts of food and nutrition labelling, and diet and obesity and NCDs. Global food and nutrition labelling regulations and a brief overview of national nutrition labelling polices is provided, followed by an introduction about Mongolia, including its food labelling policy and nutrition transition process. The chapter outlines the rationale for the research, research aim, objectives and research questions, and provides the significance of the research, and ends with an outline of the thesis.

Chapter Two presents a literature review, which explored consumer responses to food and nutrition labels, as well as development and implementation processes of food and nutrition labelling policies in LMICs. The first part of the review explored consumer awareness and consumer use of food and nutrition labels. The second part of the review explored evidences on development and implementation of food and nutrition labelling policies in LMICs and examined barriers and facilitators to the policy processes. Additionally, the review explored the food and nutrition policy and consumer perspectives on food labelling in Mongolia.

Chapter Three described the overall methodology applied in this research. Conceptual and theoretical frameworks, research design, methods used and ethical considerations are elaborated.

Chapter Four presents the findings of two consumer surveys, including a population-based survey and a supermarket intercept survey, both explored Mongolian consumers' awareness and perception, and use of food and nutrition label information. A population-based survey explored consumer awareness and perception toward, and self-reported use of food and nutrition labels in a nationally representative sample of 1394 persons. In a supermarket intercept survey, 306 shoppers were interviewed on their use of food and nutrition labels and participants' answers on label use were verified with the labels of food products purchased. Both surveys explored the use of label information in during food grocery shopping and challenges faced by consumers in using food and nutrition labels.

Chapter Five analyses the existing food labelling policy and regulations in Mongolia by clarifying their alignment with consumers' needs and exploring barriers and facilitators during the development and implementation of the policies. Seventeen semi-structured key informant interviews were conducted with key policy stakeholders. The *Health Policy Analysis Triangle Framework* and the *Advocacy Coalition Framework* enabled the understanding the policy processes by clarifying connections between policy context, process, content and actors, and identified barriers and facilitators to the policy processes.

Chapter Six provides an overview of existing food labelling practices in Mongolia based on audits of the labels of 1723 food products sold at marketplaces, determining the scope of and variations in the label information and label language. It clarifies the extent of the implementation of the food labelling regulations, and also assesses the alignment of food labels with consumers' needs and expectations. The chapter begins with a research article on nutrition and health claims carried by food products sold in retail, followed by the exploration of the scope of label information, label language and the compliance of labels to the national food labelling standard.

Chapter Seven summarises an overall discussion by discussing the key findings of the research according to the research questions, and describes the implications of the research, strengths and limitations, recommendations and conclusions.

Chapter Two

LITERATURE REVIEW: Food and nutrition labelling in low and middle-income countries: consumer responses to food and nutrition labels, and barriers and facilitators to policy development and implementation (A scoping review)

2.1 Preface

This Chapter presents a literature review, which explored consumer responses to food and nutrition labels, as well as development and implementation processes of food and nutrition labelling policies. The review focused on evidence from LMICs.

The first part of the chapter explored two outcomes related to consumer responses to food and nutrition labelling, including consumer awareness and consumer use of labels based on evidence published in peer reviewed academic literature. These outcomes represent the initial steps in the consumer response to food labelling and are important prerequisites in the application of labels. That is, one must be aware of the label and use it before it can have any impact on food choice or consumption behaviours, and subsequently, modify diet and health outcomes. The review assists to understand consumer responses to food and nutrition labels in LMICs by clarifying familiarity with, and the extent of use of, these labels by consumers and the challenges faced and factors influencing label use.

The second part of the chapter reviews evidence published in peer reviewed academic literature on the development and implementation of food and nutrition labelling policies implemented in LMICs and examined barriers and facilitators to these policy processes. The insights provided in this review can assist policy makers in LMICs in overcoming those challenges to advance food and nutrition labelling policies. The chapter ends with a brief review of food and nutrition policy and consumer perspectives on food labelling in Mongolia which was mostly based on grey literature.

A recent narrative review by Mandle et al. (Mandle et al. 2015) provides the first ever synthesis of the evidence on consumer perspectives on nutrition labelling and nutrition labelling policies in LMICs. This review focused on consumer label use and comprehension, and factors associated with, including demographic factors and attitudes toward food labelling, reasons for not using nutrition labels, and impacts of nutrition label use on food purchase and dietary intake, as well as industry response to labelling regulations and product reformulation. The review presented in this chapter extends on this earlier review by adding recent evidence on consumer awareness and use of food and nutrition labels in LMICs, including Mongolia, as well as by comparing awareness and use of food labels to nutrition labels, and exploring food and nutrition labelling policy processes in these countries. The review further served as a basis for designing a case study on food labelling policy and consumer perspectives on food and nutrition labelling in Mongolia. The review findings provided benchmarking for comparing the extent of implementation of food and nutrition labelling policy and the level of consumer awareness and use of food and nutrition labelling in Mongolia.

2.2 Introduction

Food labels provide a range of information, including the name of food, ingredients list, product weight, country of origin, manufacturer or distributer information, lot identification, date marking and directions for use and storage (CAC 1985). Nutrition labels include nutrient declarations (the listing of the nutrient contents of a food) and nutrition and health claims, as well as supplementary nutrition information (such as symbols or pictorial presentations of nutrient content) (CAC 2013). Nutrition labels help consumers to make informed decisions about the nutritional properties of foods and healthier food choices (Grunert & Wills 2007). Awareness and use of labels are the initial and important steps in the consumer response to food labelling. That is, one must be aware of the label and use it before it can have any impact on food choice or consumption behaviours, and subsequently, modify diet and health outcomes.

Nutrition labelling policy has been relatively less well implemented in most LMICs compared to high-income countries. For example, many LMICs have not fully implemented Codex Alimentarius guidelines for mandatory nutrient declarations on pre-packaged foods. According to the WHO Global Nutrition Policy Review 2016-2017, less than half of the countries in the WHO regions of Africa and South-East Asia had implemented policies on nutrient declarations and most available policies were voluntary (WHO 2018). This compares to the vast majority of countries having implemented mandatory policies for nutrition labelling in line with Codex guidelines in the WHO regions in in Europe (93%) and the Americas (86%). In this context, because the concept of food labelling is likely unfamiliar to consumers, their awareness and use of food labels was expected to be poor. Whereas, in high-income countries, consumer awareness and use of food labels has been shown to be reasonably high (Campos et al. 2011; Grunert & Wills 2007) and nutrition labelling policy that is aligned with Codex guidelines has been relatively well implemented (WHO 2018).

Although food and nutrition labelling has been adopted and implemented in some LMICs as mentioned earlier, little is known about the development and implementation of these policies, including barriers and facilitators to policy processes, and their effectiveness in assisting consumers in making informed food choices. Existing reviews of food and nutrition labelling policies are mostly focused on the policies of developed countries, while policy processes in LMICs, including countries that undergoing socio-political and economic transitions are underexplored (Brambila-Macias et al. 2011; Crokett et al. 2018; Mandle et al. 2015).

WHO and UNDP Joint programme on NCD prevention defines that governance is critical for developing and implementing national policies and plans for addressing NCDs, and strong governance supports countries to allocate adequate resources, prevent conflicts of interest and ensure accountability in policy making relevant to NCDs (WHO & UNDP 2015). Governance represents the norms, values and rules of the game through which public affairs are managed in a manner that is transparent, participatory, inclusive and responsive (UNESCO 2021). It encompasses the power to act, the capacity to act and the commitment to act, and it requires accountability, responsiveness and transparency (Gillespie 2013).

The aim of this review was to synthesise and appraise evidence on consumer responses to food labelling in LMICs, with the focus on consumer awareness and use of nutrition labels. In addition, evidence on food and nutrition labelling policies in LMICs was explored, to identify barriers and facilitators to policy processes and clarify the role of governance as a barrier or facilitator to the development and implementation of policies.

The objectives of the literature review were to:

1. Identify, synthesise and appraise evidence on consumer awareness and use of food and nutrition labels in LMICs
2. Identify, synthesise and appraise evidence on barriers and facilitators to the development and implementation of food and nutrition labelling policies in LMICs and explore the extent of policy implementation

2.3 Methods

2.3.1 Research questions

This literature review addressed three sets of research questions:

1. What is the evidence on consumer awareness and use of food and nutrition labels in LMICs, including Mongolia?
2. What is the evidence on the introduction of food and nutrition labelling policy and regulations in LMICs, with a particular emphasis on Mongolia? How were these policies developed and implemented? What were the barriers and facilitators in the development and implementation of these policies?
3. What are the knowledge gaps in consumer awareness and use of food and nutrition labels and in the development and implementation of food and nutrition labelling policy and regulations in LMICs?

2.3.2 Search strategy and eligibility criteria

The literature review followed a scoping review approach, in which evidence on consumer awareness and use of food and nutrition labels in LMICs and relevant labelling policies in these countries were systematically collected, compiled and appraised. Scoping review was chosen for its suitability for addressing the proposed topic as the area of interest is underexplored with unclear scope of existing literature, and a broader focus of scoping review was compatible with the aim of the review to identify, scope and provide an overview of available evidence in the area of interest.

The literature search included both the scientific and grey literature. First, peer reviewed literature on consumer responses to food labelling (nutrition labelling as a sub-set of food labelling) and food and nutrition labelling policies in LMICs was searched from electronic scientific databases. Additionally, grey literature on consumer responses to food labelling and food labelling policy and regulations in Mongolia was searched from the websites of relevant Mongolian government and non-governmental organisations (NGO), and relevant international organisations in Mongolia, and also through a Google search.

2.3.2.1 Peer reviewed literature

Peer reviewed literature was systematically searched from five electronic databases, including Scopus, PubMed/Medline, CINAHL, PsycINFO and Google Scholar. Eligible studies and search terms (**Table 2.1**) were guided by the Population, Intervention, Outcome (PIO) framework:

Population: Studies focusing on consumers or food labelling and nutrition labelling policies in LMICs were included.

Intervention: Studies exploring consumer behaviour towards on food and nutrition labelling or food labelling and nutrition labelling policies, as well as meeting the following inclusion and exclusion criteria were included.

Outcome: Consumer studies were included if they explored an outcome related to consumer awareness and use of food and nutrition labels.

The following inclusion and exclusion criteria were applied for eligible studies.

Inclusion criteria

- Empirical studies on labelling of retail food and beverages that focusing on consumer awareness and/or use of food and nutrition labels.
    - Studies exploring food label use, and nutrition label use alone or as a sub-set of food labelling were included. Food label use and nutrition label use were referred to looking at food/nutrition labels generally, without specifying the use of any particular non-nutrient related label information such as GMO or allergen. Self-reported label use was determined by whether or not the person looked at food label and the questions such as “Do you usually look at food labels?” or “Do you usually read food labels?” were usually asked for this purpose. Studies that objectively assessing label use, including eye-tracking studies were also included in the review.
- Empirical and non-empirical studies (reviews and commentary articles) on food labelling and nutrition labelling policies, and their development and implementation
- Articles that focused on, or included, countries belonging to low and middle-income groups of the Word Bank classification
- Articles in English or Russian

- Articles published from the inception of included databases to June 1, 2020

Exclusion criteria

- Studies on outcomes of consumer response to food label other than consumer awareness and use of food and nutrition labels (including consumer understanding, food choice and purchase, and health and dietary outcomes)
- Consumer studies or policy studies focusing on a particular non-nutrition labelling, such as GMO, allergen, organic products, natural products, country of origin and ethical and sustainability food labelling
- Studies on menu or shelf labelling
- Studies on labelling of dietary supplements and functional foods
- Studies on labelling of baby food, including infant formula and complementary foods, alcohol and tobacco products
- Studies on labelling practices of food products such as provision of mandatory information on product labels
- Studies focusing on specific population groups such as obese, with chronic disease, fitness club users or teachers etc. (however, studies focusing on students, teenagers or elderly people were included in the review)
- Non-empirical publications such as reviews, commentary articles, reports, conference papers and thesis (except reviews and commentary articles on food labelling and nutrition labelling policies)

Search terms

An initial limited search was conducted in Scopus using the terms, including "food label use", "nutrition label use", "food labelling in LMICs" and "nutrition labelling in LMICs" to get an idea on the scope of existing literature on the topic from LMICs, including review papers and identify relevant keywords used in the retrieved papers. Keywords to be used for the main search and the search strategy have been discussed with a librarian from University of Wollongong.

Table 2.1 Search terms

Scopus	(food or snack or beverage or drink or nutrition or nutrient or diet or ingredient) w/5 (label* or claim or front-of-pack or list or package) AND "low and middle income countr*" OR "countries in transition" OR "global south" OR "developing countr*" OR "emerging market*", (name of a country)
PubMed	"food label*" OR "nutrition label*" OR "snack label*" OR "drink label*" OR "beverage label*" OR "nutrient list" OR "nutrition information" OR front-of-pack OR "nutrition claim" OR "health claim" OR "ingredient list" OR "food package" AND "countries in transition" OR "global south" OR "developing countr*" OR "emerging market*" OR "low and middle income countr*", (name of a country)
CINAHL	Same as to PubMed
PsycINFO	Same as to PubMed
Google Scholar	("food OR nutrition AND labelling OR label OR claim") OR "front-of-pack" OR "nutrient declaration" OR "ingredient list" AND "countries in transition" OR "developing countries" OR "low and middle income countries"

2.3.2.2 Grey literature (for Mongolia)

Government policy and regulatory documents, national strategies and programs, national survey reports and other relevant information on food and nutrition labelling were sought from the following sources:

- Government portal site of legislative documents (www.legalinfo.mn), websites of the Government of Mongolia and main governmental and non-governmental organisations of Mongolia in charge of food, health, standardisation and food control, including Ministry of Health (MOHM), Ministry of Food and Agriculture, General Authority for Specialized Inspection, Mongolian Agency of Standardization and Metrology (MASM) and National Centre for Public Health (NCPHM), as well as consumer organisations.
- Websites of UN agencies and other international organizations in Mongolia working on food and nutrition area, including WHO, Food and Agriculture Organization (FAO), UNICEF, World Bank and the Millennium Challenge Corporation.
- A general search using Google search browser for any information related to food labelling in Mongolia.

Search terms

The terms food, nutrition, food labelling, nutrition labelling and food industry were used in combination with/without the terms policy, regulation, law, act, standard, guideline, strategy, action plan, practice, consumer, use and awareness, and Mongolia. The terms were used in both English and Mongolian language.

2.3.3 Study selection

2.3.3.1 Peer reviewed literature

The selection and reporting of eligible studies was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines (Page et al. 2021) (**Figure 2.1**). Searched records were initially screened by the Researcher for relevance by title and keywords using the inclusion and exclusion criteria. Duplicate records were also removed. All records selected in the initial screening (n=645) were then screened again by two reviewers (the Researcher and one other person) independently by their titles and abstracts. Where discrepancies existed, discussions were held between the reviewers to reach a consensus. In the next stage, full texts of selected articles were assessed for inclusion by the Researcher. Reference lists of included studies were also searched.

2.3.3.2 Peer reviewed and grey literature (for Mongolia)

A search was conducted across websites of the relevant organisations using the identified search terms, as well as in Google. All identified sources of evidence were then assessed for their relevance to food and nutrition labelling and subsequently for inclusion in the review by the Researcher.

2.3.4 Data extraction

2.3.4.1 Peer reviewed literature

For each consumer study, data on study authors, year of publication, country of study, study design, methods used, study population, sampling, study setting and participants, outcome measures and results were collected by the Researcher in a data extraction sheet in Excel. The data extraction sheet was checked by other two reviewers before commencing the data extraction. If studies assessed outcomes in addition to those considered in-scope, only data on the included outcomes were extracted. Data from studies on food labelling policy were extracted separately.

Quality appraisal of individual studies was not undertaken as critical appraisal is not mandatory for a scoping review. Instead, studies were critically reviewed and evaluated overall as a group of studies, based on the methods used and their representativeness of the population studied.

2.3.4.2 Peer reviewed and grey literature (for Mongolia)

Identified literature was organised in Excel sheet for further analysis. For each source of evidence, the name of the document, content of the document and its relevance to food and nutrition labelling, timing of the production, and stated purpose or objectives if any, were clarified.

2.4 Results

2.4.1 Study selection (peer reviewed literature)

The search identified a total of 3338 records through five databases, with 2978 remaining after duplicates removed. After screening by titles and abstracts against the inclusion and exclusion criteria, a total of 120 records were remained for full-text analysis. Finally, 52 articles on consumer responses (awareness and use of food labels), nine articles on food and nutrition labelling policy, and one article on both consumer responses and labelling policy were included in the review (**Figure 2.1**).

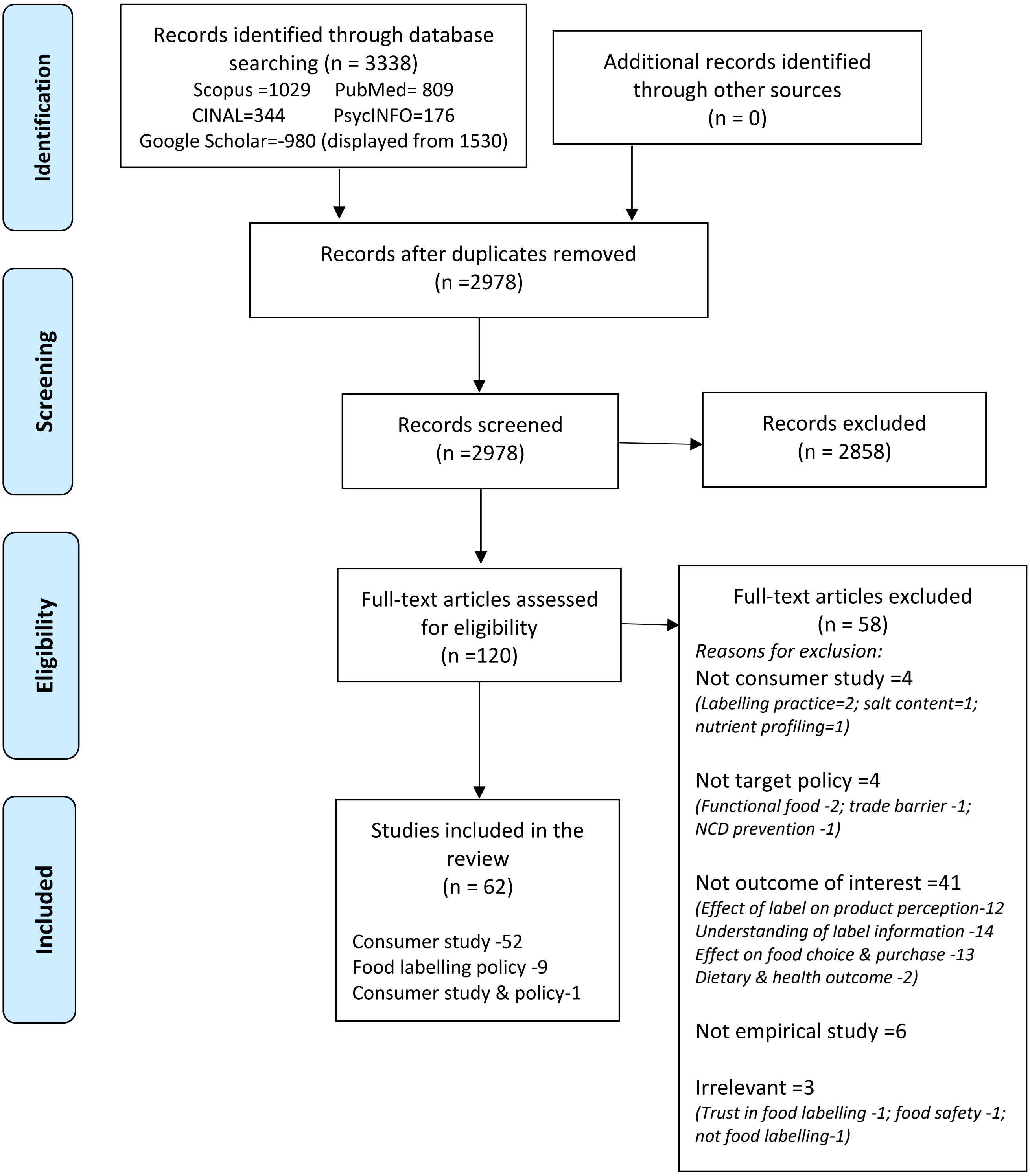

Figure 2.1 PRISMA flow diagram illustrating the study selection process

2.4.2 Characteristics of included studies (peer reviewed literature)

A total of 62 studies were included in the review, spanning 52 consumer studies, nine policy studies and one study that explored both consumer responses and labelling policy (**Appendix B, Table A2.1**). Of the 53 consumer studies, 50 studies explored food label use and 24 studies explored consumer awareness. Most of these studies were from India (10 studies) and South Africa (8 studies), and the remaining studies were from other LMICs across Asia (19 studies), Latin America (9 studies), Middle East (7 studies), Africa (6 studies) and Europe (3 studies) (**Table 2.2**).

Table 2.2 Overview of studies included in the review

Study country	All studies (n, %)	Consumer studies (n, %)			Studies on food and nutrition labelling policy (n, %)
		Total	Food/nutrition label use	Consumer awareness	
Europe					
Georgia	1 (1.6)	1	-	1	-
Romania	1 (1.6)	1	1	1	-
Slovakia	1 (1.6)	1	-	1	-
Asia					
China	5 (8.0)	4	4	3	1
India	10 (16.1)	10	10	3	-
Indonesia	1 (1.6)	-	-	-	1
Malaysia	6 (9.7)	6	6	2	-
Sri Lanka	1 (1.6)	1	1	-	-
Thailand	5 (8.0)	2	2	1	3
Multiple Countries	1 (1.6)	-	-	-	1
Middle east					
Iran	3 (4.8)	2	1	1	1
Lebanon	1 (1.6)	1	1	1	-
Turkey	3 (4.8)	3	3	2	-
Latin America					
Brazil	3 (4.8)	2	2	-	1
Ecuador	2 (3.2)	2*	2*	2*	1*
Guatemala	1 (1.6)	1	1	1	-
Mexico	3 (4.8)	2	2	-	1
Africa					
Ghana	3 (4.8)	3	3	2	-
Malawi	1 (1.6)	1	1	-	-
Nigeria	1 (1.6)	1	1	1	-
South Africa	8 (12.9)	8	8	2	-
Zimbabwe	1 (1.6)	1	1	-	-
Total	62	53	50	24	10

*Included a study that explored both consumer responses and policy.

The following sections present a part of the literature review reporting on the evidence on consumer awareness and use of food and nutrition labels in LMICs from peer reviewed academic literature.

2.4.3 Consumer responses to food and nutrition labelling in LMICs

2.4.3.1 Study design and methods

Most studies were cross-sectional studies (41 studies of 53 studies) (**Appendix B, Table A2.1**). Most of these studies (29 studies) used face-to-face or telephone interviews, 11 studies used self-administered questionnaires (Daňo & Krnáčová 2017; Festila et al. 2014; Liu et al. 2015; Lixin et al. 2020; Ma et al. 2018; Norazmir et al. 2012; Paul & Bedi 2014; Ponnudurai et al. 2019; Talagala & Arambepola 2016; Todua 2018; van der Colff et al. 2016), and one study used an observational component to determine food label use (Darkwa 2014). There were six qualitative studies utilising focus group discussions (de Morais Sato et al. 2019; Jefrydin et al. 2019; Kempen et al. 2011; Koen et al. 2018b; Nieto et al. 2020) and in-depth interviews (Rimpeekool et al. 2016), two studies used mixed methods (Freire et al. 2017; Vemula et al. 2014), three studies were intervention studies (Esfandiari et al. 2021; Chan et al. 2019; da Costa Souza et al. 2016) and one study was a modelling study analysing secondary data (Rimpeekool et al. 2017).

2.4.3.2 Study settings

Twenty-two studies were carried out in supermarkets and grocery stores among adult shoppers (**Appendix B, Table A2.1**). Some studies were conducted in schools (7 studies) (da Costa Souza et al. 2016; Jefrydin et al. 2019; Kumar & Kapoor 2017; Ma et al. 2018; Mazariegos & Barnoya 2017; Saha et al. 2013; Talagala & Arambepola 2016) and universities (6 studies) (Buyuktuncer et al. 2018; da Costa Souza et al. 2016; Madilo 2020; Norazmir et al. 2012; Rimpeekool et al. 2016; Rimpeekool et al. 2017) among students and their parents. Other studies were conducted in households (7 studies) (Ali & Kapoor 2009; Besler et al. 2012; Bhilwar et al. 2018; Chan et al. 2019; Cheah & Yip 2017; Cheong et al. 2013; Orozco et al. 2017), public places (2 studies) (Liu et al. 2015; van der Merwe et al. 2013) and unspecified settings among general public (5 studies) (Bosman et al. 2012; de Morais Sato et al. 2019; Gezmen-Karadağ & Türközü 2018; Paul & Bedi 2014; van der Colff et al. 2016). Four studies were conducted online (Daňo & Krnáčová 2017; Festila et al. 2014; Lixin et al. 2020; Todua 2018; and one study by telephone (Kempen et al. 2012).

2.4.3.3 Participant sample size

Less than half of studies (22/53) had used probability sampling and produced sample sizes representative of a country (5 studies) (Besler et al. 2012; Cheah & Yip 2017; Cheong et al. 2013; Rimpeekool et al. 2017; Todua 2018), a region (5 studies) (Danilola et al. 2019; De la Cruz-Góngora et al. 2012; de Morais Sato et al. 2019; Freire et al. 2017; Ma et al. 2018), a city or a province (6 studies) (Bosman et al. 2012; Gezmen-Karadağ & Türközü 2018; Jacobs et al. 2011; Kempen et al. 2012; Koen et al. 2018a; Vemula et al. 2014), a local area (1 study) (Bhilwar et al. 2018) or an academic institution (university or school) (5 studies) (Buyuktuncer et al. 2018; da Costa Souza et al. 2016; Lixin et al. 2020; Saha et al. 2013; Talagala & Arambepola 2016) (**Appendix B, Table A2.1**). A further half of studies (26/53) had used convenience sampling, and the samples in most of these studies were not representative of a study population. The remaining five qualitative studies (Jefrydin et al. 2019; Kempen et al. 2011; Koen et al. 2018b; Nieto et al. 2020; Rimpeekool et al. 2016) were based on convenience sampling (**Appendix B, Table A2.1**).

2.4.3.4 Awareness of food and nutrition labelling

Twenty-four studies reported on consumer awareness of food and/or nutrition labels. The majority of these studies (13/24) examined awareness of nutrition labels, a quarter of studies (6/24) examined awareness of food labels, and five studies assessed both food and nutrition label awareness.

Most studies assessed self-reported awareness of food and nutrition labels by asking respondents a general question on whether they are aware of, or familiar with, food labels (6 studies) (Aryee et al. 2019; Darkwa 2014; Gupta & Dharni 2016; Ponnudurai et al. 2019; van der Merwe et al. 2013; Todua 2018) and nutrition labels (6 studies) (Darkwa 2014; Liu et al. 2015; Ma et al. 2018; Mazariegos & Barnoya 2017; Rimpeekool et al. 2016; Song et al. 2015). Self-reported awareness of food labels was high among consumers, with most respondents (68%-98%) reporting they were aware of food labels (Aryee et al. 2019; Darkwa 2014; Gupta & Dharni 2016; Ponnudurai et al. 2019; van der Merwe et al. 2013; Todua 2018). Self-reported awareness of nutrition labels was relatively lower compared to food label awareness, with between 35% and 75% of respondents reporting they were aware of nutrition labels (Darkwa

2014; Liu et al. 2015; Ma et al. 2018; Mazariegos & Barnoya 2017; Rimpeekool et al. 2016; Song et al. 2015). In addition, three studies explored respondents' familiarity with specific terms of food labelling (Gezmen-Karadağ & Türközü 2018) and nutrition labelling such as recommended daily allowance, vitamins, energy, protein, fibre, trans-fat and nutrition and health claims (Besler et al. 2012; Singla 2010; Gezmen-Karadağ & Türközü 2018). Consumers were more familiar with the label terms, such as vitamins, energy and protein (94%-96% of respondents) (Besler et al. 2012), but were less familiar with the terms such as recommended dietary allowances (38%), trans-fat (35.5%) and fibre (64.2%) (Besler et al. 2012; Singla 2010).

Four studies evaluated food label awareness objectively by examining the ability of respondents to locate specific information on the label, identify symbols or clarify the information required on food label (Danilola et al. 2019; Daňo & Krnáčová 2017; Dharni & Gupta 2015; van der Merwe et al. 2013). High awareness of food safety information on food labels was reported in two studies (Danilola et al. 2019; van der Merwe et al. 2013), while low label awareness was reported in one study (Daňo & Krnáčová 2017). In a South African study, the majority of respondents (over 80%) could locate different types of label information (van der Merwe et al. 2013). Conversely, consumers in a study from Slovakia were unaware of the types of information, including food safety information, required on pre-packaged foods (Daňo & Krnáčová 2017).

Three studies used an objective evaluation of nutrition label awareness by asking respondents to locate label information and identify nutrition claims and endorsement logos (Hassan & Dimassi 2017; Koen et al. 2018a; van der Merwe et al. 2013) or identify the components of nutrition label (Song et al. 2015). These studies found relatively lower level of nutrition label awareness compared to the above mentioned studies measured self-reported nutrition label awareness. For instance, in a South African study rating consumers' awareness based on the tasks to locate label information and identify nutrient content claims and health endorsement logos, respondents' awareness of nutrition labels was rated as "fair or below average"(Koen et al. 2018a). In a study from China, nutrition declarations was considered as a part of nutrition label by 31% of respondents, nutrition claims and ingredients lists by 20% of respondents, and nutrient function claims by only 3% of respondents (Song et al. 2015).

In addition to the above studies, low awareness of nutrition labelling was also reported in a qualitative study from Malaysia. In this study, despite their general familiarity with nutrition labels, participants had confused nutrient declarations with other label information, such as expiry dates and ingredients list (Jefrydin et al. 2019).

Another five studies examined consumer awareness of FOPLs such as traffic light and GDA labelling systems and reported varying degrees of consumer awareness of these systems (Esfandiari et al. 2021; Festila et al. 2014; Freire et al. 2017; Orozco et al. 2017; Rimpeekool et al. 2016). High level of awareness was reported in the studies from Ecuador (consumers reported they are familiar with the traffic light label) and Romania (91% were aware of the GDA label) (Festila et al. 2014; Freire et al. 2017). Conversely, lower consumer awareness of these FOPL systems was found in other studies from Thailand, Iran and Ecuador (Esfandiari et al. 2021; Orozco et al. 2017; Rimpeekool et al. 2016). For instance, in a study from Thailand, of 34 respondents, only six person were familiar with GDA (Rimpeekool et al. 2016).

2.4.3.5 Food and nutrition label use

Of the 50 studies that explored label use, 9 studies explored use of food labels, 23 studies explored use of nutrition labels, and 18 studies examined use of both food and nutrition labels (**Appendix B, Table A2.1**). In the latter group of studies, nutrition labels were included as a sub-set of food labels. Food label and/or nutrition label use was usually measured by asking respondents a general question on whether they read, checked, looked at, noticed or paid attention to these labels, or how often they did that. Examples of the questions asked included: “Do you read food/nutrition labels at the time of purchase?” or “How often do you look at food/nutrition labels on packaged food when you go shopping?”

Most of these studies (43/50) determined the frequency of label use (i.e. how often consumers used labels). All studies relied on self-reporting by respondents, except one study conducted in Ghana, in which respondents’ label use was directly observed while they were shopping (Darkwa 2014).

Of the 43 studies that determined the frequency of food and/or nutrition label use, only eight studies provided a definition on what was meant by “food label” (1 study) (Chan et al. 2019) or “nutrition label” (7 studies) (Buyuktuncer et al. 2018; De la Cruz-Góngora et al. 2012; Gupta & Dharni 2016; Koen et al. 2018b; Kumar & Kapoor 2017; Ma et al. 2018; Talagala & Arambepola 2016), and these definitions varied across the studies. Food label was refered to “any information on the product besides the company or brand name” (Chan et al. 2019). Nutrition labelling included nutrient declarations, FOPL, nutrition claims or any nutrition information.

Nutrition label was termed in the studies as “nutrition information panel” (Buyuktuncer et al. 2018; De la Cruz-Góngora et al. 2012; Gupta & Dharni 2016; Talagala & Arambepola 2016), “nutrition information provided on the back of pack” (Ma et al. 2018), “label where the nutrition information is written” (Koen et al. 2018b), “nutrition labelling or any nutrition information referring to the content of calories, fat, carbohydrates, minerals or vitamins on the food packaging” (Kumar & Kapoor 2017; Ma et al. 2018), “traffic light colours” (Koen et al. 2018b), “nutrition claims” (Gupta & Dharni 2016; Ma et al. 2018) and “nutrient function claims” (Gupta & Dharni 2016; Ma et al. 2018).

2.4.3.5a Food label use

Frequency of food label use was measured in 25 studies (**Appendix B, Table A2.1**). Frequency of self-reported food label use ranged between 57% and 96%, indicating the majority of respondents in the studies had ever looked at or checked food labels when they grocery shopping. Between 16% and 75% of consumers reported they always or often checked food labels. In a study from Ghana, in which the respondents were observed, 65% of respondents looked at the packages of the products (food labels) before putting them in the shopping trolley or basket and 11% examined the labels very carefully by taking time (Darkwa 2014). Contrary to the findings of the above studies on high use of food labels by consumers, in a qualitative study from Brazil, participants frequently cited not reading label information (de Morais Sato et al. 2019).

2.4.3.5b Nutrition label use

Frequency of nutrition label use was measured in 29 studies (12 of them were the same set of studies described above for food label use). The frequency of self-reported nutrition label use was in the range of 11% to 89% (**Appendix B, Table A2.1**). The variation in label use across studies was likely influenced by the characteristics of the study populations, including their educational level and literacy rate. For instance, the lowest nutrition label use (11%) was found in a study that was conducted among a rural ethnic minority community in China with high illiteracy rates (Chan et al. 2019). Whereas in a study that reported the highest nutrition label use (89%), the respondents were distance-learning university students (Rimpeekool et al. 2017). In other studies, the proportion of respondents who frequently used nutrition labels was between 24%-38% (**Appendix B, Table A2.1**).

A small number of qualitative studies explored nutrition label use and found low nutrition label use among consumers (Jefrydin et al. 2019; Koen et al. 2018b; Vemula et al. 2014). Participants reported that they usually checked food labels for manufacturing and expiry dates but they hardly used nutrition information (Vemula et al. 2014). Of those who used nutrition labels, the majority used information on the front of pack, while only a few people used nutrient declarations provided on the back of pack (Koen et al. 2018b).

2.4.3.5c Information looked at on labels

People most frequently reported that they looked at expiry dates (Aryee et al. 2019; Bhilwar et al. 2018; Chan et al. 2019; de Morais Sato et al. 2019; Gezmen-Karadağ & Türközü 2018; Gupta & Dharni 2016; Hassan & Dimassi 2017; Jacobs et al. 2011; Ponnudurai et al. 2019; Saha et al. 2013; Solanki & Sheth 2015; Talagala & Arambepola 2016; Vemula et al. 2014), followed price (Ponnudurai et al. 2019; Singla 2010; Talagala & Arambepola 2016) and brand name (Gezmen-Karadağ & Türközü 2018; Talagala & Arambepola 2016; Vemula et al. 2014). Information on nutrient contents (Aryee et al. 2019; Bhilwar et al. 2018; Chan et al. 2019; de Morais Sato et al. 2019; Gezmen-Karadağ & Türközü 2018; Gupta & Dharni 2016; Jacobs et al. 2011; Koen et al. 2018a; Koen et al. 2018b; Lixin et al. 2020; Norazmir et al. 2012; Paul & Bedi 2014; Saha et al. 2013; Singla 2010; Solanki & Sheth 2015; Song et al. 2015; Talagala & Arambepola 2016; Vemula et al. 2014) and ingredients lists (Jacobs et al. 2011; Norazmir et al. 2012; Saha et al. 2013; Singla 2010; Solanki & Sheth 2015) were less frequently used. Over half to almost all people (58%-99%) looked at expiry dates across the studies (Aryee et al. 2019; Bhilwar et al. 2018; Chan et al. 2019; Gezmen-Karadağ & Türközü 2018; Gupta & Dharni 2016; Ponnudurai et al. 2019; Saha et al. 2013; Solanki & Sheth 2015; Talagala & Arambepola 2016; Vemula et al. 2014). Price and brand name (presumably in most cases the price was in a shelf tag, not on the product package) were looked at by nearly half to most of the respondents in studies (44%-85%) (Gezmen-Karadağ & Türközü 2018; Ponnudurai et al. 2019; Singla 2010; Talagala & Arambepola 2016; Vemula et al. 2014). In contrast, between 10% and 54% of consumers looked at information on nutrient content (Aryee et al. 2019; Bhilwar et al. 2018; Chan et al. 2019; Gezmen-Karadağ & Türközü 2018; Lixin et al. 2020; Saha et al. 2013; Paul & Bedi 2014; Song et al. 2015; Vemula et al. 2014) and 30% to 56% of consumers looked at ingredients lists (Saha et al. 2013; Singla 2010; Solanki & Sheth 2015; Vemula et al. 2014). Three studies (Jacobs et al. 2011; Solanki & Sheth 2015; Talagala & Arambepola 2016) reported higher use of nutrient content information (81% and 82% of respondents), while two studies (Jacobs et al.

2011; Norazmir et al. 2012) reported higher use of ingredients lists (78% and 83.3%). Directions for use (18%) (Bhilwar et al. 2018), food additives, including preservatives and colours (6%-13%) (Bhilwar et al. 2018; de Morais Sato et al. 2019; Gupta & Dharni 2016; Jacobs et al. 2011), allergen information (9%) (Saha et al. 2013), and country of origin (1%-5%) Aryee et al. 2019; Bhilwar et al. 2018) were the least frequently checked information. People also looked at vegetarian signs (Gupta & Dharni 2016; Singla 2010) and halal claims on products (Hassan & Dimassi 2017).

2.4.3.5d Reasons for using food and nutrition labels

The reasons for using food and nutrition labels are synthesised in **Table 2.3**. Most people reported using food and nutrition labels: i) to check the nutrient and calorie content of products, control calorie intake, choose healthy food, and check health attributes of products; ii) for maintaining health, preventing illnesses and weight control; iii) concern for genuineness, quality and safety of food products; iv) to check ingredients to avoid allergens and food additives or asses the constitution of products and purity of their ingredients; and v) to check label information for health reasons for people with health conditions such as food allergy, diabetes and coronary heart disease; or to check nutrition information when buying products for the first time or buying certain products. Other reasons reported to a lesser extent included: to compare nutrient content of different products or brand; to check price, discount offers or free gifts; to compare different products; to purchase food for the family; and concern for quality of food product

Table 2.3 Reasons of using food and nutrition labels

	Reasons of using labels	Number studies reported	Frequency of reports by respondents*	Studies reported**
1	To check nutrition information to assess nutrient content, control calorie intake, choose healthy food, and assess health attributes of the product	11 studies	14.8%-50%- in 5 studies Main reason- in 1 study Not mentioned - in 5 studies	14, 22, 25, 26, 27, 28, 30, 31, 37, 39, 51
2	Health concern for the effects of nutrients in maintaining health (vitamins and minerals) and growth (protein) and preventing diseases such as osteoporosis (calcium), weight concern, being on special diet	7 studies	3.7%-87.5%- in 4 studies (main reason in 1 of them) Not mentioned - in 3 studies	25, 27, 30, 31, 39, 40, 42

3	Concern for genuineness, quality and safety of food products, and to check expiry date	5 studies	28.6%-84%- in 2 studies (main reason in 1 of them) Not mentioned - in 3 studies	14, 25, 28, 30, 51
4	To check ingredients to: • avoid certain ingredients including allergens and additives such as preservatives, colourants and flavourings • assess the quality of the product in terms of constitution or purity of the ingredients	5 studies	16%-48.7%- in 2 studies Not mentioned - in 3 studies	25, 27, 28, 30, 46
5	Health reasons (food allergy, diabetes and coronary heart disease)	4 studies	9.3%- in 1 study Not mentioned - in 3 studies	14, 25, 28, 31
6	To check nutrition information when buying: • products for the first time • certain food products such as milk and milk products • to check fat content in meat products or sugar content in cold drinks and sweets	4 studies	13.8%-92.8%- in 2 studies (major reason in 1 of them) Not mentioned - in 2 studies	23, 25, 27, 30
7	To compare nutrient content of different products or brands	3 studies	22.7%-50%- in 2 studies Not mentioned - in 1 study	26, 31, 37
8	To check price, discount offers or free gifts	2 studies	42.9%- in 1 study Not mentioned - in 1 study	46, 51
9	To compare different products	1 study	18%	27
10	When purchasing food for the family	1 study	12.4%	27
11	Concern for quality of food products	1 study	Not mentioned	31

* These percentages represent only those studies that reported frequency of the reasons of using food and nutrition labels in percentages. Otherwise, in some studies it was reported qualitatively as like "… was the reason of using food labels".

See **Appendix B for the list of studies included in the review.

2.4.3.5e Reasons for not using food and nutrition labels

The reasons for not using food and nutrition labels are synthesised in **Table 2.4**. The major reasons for not using food and nutrition labels were: i) lack of knowledge and understanding of label information and how to use labels; ii) lack of time or perceived time consuming of label use; iii) lack of interest in nutrition information on the label; iv) familiarity with the product and habitual buying; v) small font size of labels; vi) taste preference over nutrition information on the label; vii) price preference over nutrition information on the label; and viii) label is not attractive, too much information; and ix) unreliable and untrusted label information. In addition, poor label format, inability to understand label language, lack of label, being hungry or craving for food and being illiterate were related to non-use of food and nutrition labels.

Table 2.4 Reasons for not using food and nutrition labels

	Reasons for not using labels	Number studies reported	Frequency of reports by respondents*	Studies reported**
1	Unable to understand or difficult to understand label information, unclear terminology, too technical information, lack of knowledge, don't know how to use label	17 studies	6.4%-65%- in 11 studies (main reason in 2 of them) Main reason in 1 study Not mentioned - in 5 studies	5, 8, 14, 15, 21, 28, 30, 31, 34, 37, 38, 39, 40, 42, 46, 47, 51
2	Lack of time or perception about label use as time consuming	14 studies	12.4%-71.9%- in 9 studies Main reason- in 1 study Not mentioned - in 4 study	5, 6, 13, 14, 15 21, 22, 30, 31, 34, 37, 39, 42, 47
3	Lack of interest in nutrition information, don't feel the need of reading label or think it is useless	10 studies	10%-31.4%- in 6 studies Not mentioned - in 4 studies	5, 6, 14, 15, 21, 22, 26, 40, 43, 47
4	Familiarity with the product, buying same product all the time	9 studies	16.4%-73.2%- in 3 studies Main reason- in 2 studies Not mentioned - in 4 study	6, 13, 22, 26, 28, 30, 31, 42, 43
5	Small font size	8 studies	8%-35.6%- in 4 studies Main reason- in 2 studies Not mentioned - in 2 studies	5, 13, 21, 28, 38, 39, 46, 47
6	Taste was more important than nutrition information on the label	6 studies	16%-75%- in 3 studies Not mentioned - in 3 studies	22, 30, 31, 37, 43, 47
7	Price was more important than nutrition information on the label, only read price tag	5 studies	24%-73.7% -in 2 studies Not mentioned - in 3 studies	6, 30, 31, 43, 47
8	Label is not attractive, too much information, information is confusing	4 studies	22.4%- in 1 study Not mentioned - in 3 studies	31, 34, 38, 39
9	Reliability of labels, trust in label information	3 studies	Main reason- in 1 study Not mentioned - in 2 studies	31, 38, 46
10	Format is hard to read, inconsistency in placement of information on the label	1 study	Not mentioned	28
	Don't understand label language	1 study	Not mentioned	28
	No label on the product	1 study	31.3%	34
	Didn't bother to read label because of hunger and cravings	1 study	Not mentioned	22
	Illiterate	1 study	35.6%	5

* These percentages represent only the studies that reported frequency of the reasons for not using food labels. Studies that reported it qualitatively were not included.
See the **Appendix B for the list of studies included in the review.

2.4.3.5f Factors affecting food label use and characteristics of label users

Fifteen studies examined the effects of sociodemographic and other factors as predictors of food and nutrition label use (**Table 2.5; Appendix B, Table A2.1**). Factors affecting food and nutrition label use included sociodemographic factors, awareness of and attitudes towards food labelling, nutrition knowledge, and health concern and health reasons.

Associations between food and nutrition label use and sociodemographic factors were examined more frequently and were reported in 14 studies (14/15). Education and gender were most frequently reported as the determinants of food and nutrition label use, and almost all studies (13/15) reported on these two factors. Females and consumers with higher educational levels were more likely to use food labels (Cheah & Yip 2017; Cheong et al. 2013; Dharni & Gupta 2015; Ma et al. 2018; Rimpeekool et al. 2016; Rimpeekool et al. 2017) and nutrition labels (Ali & Kapoor 2009; Aryee et al. 2019; Danilola et al. 2019; Gezmen-Karadağ & Türközü 2018) (**Table 2.5**). Consumers with higher education used food labels (Ahmadi et al. 2013; Ali & Kapoor 2009; Bhilwar et al. 2018; Chan et al. 2019; Chopera et al. 2014; Gupta & Dharni 2016; Hassan & Dimassi 2017; Jacobs et al. 2011; Paul & Bedi 2014; Vemula et al. 2014) and nutrition labels (Besler et al. 2012; De la Cruz-Góngora et al. 2012; Kasapila & Shawa 2011; Koen et al. 2018a; Ma et al. 2018; Mazariegos & Barnoya 2017; Solanki & Sheth 2015; Song et al. 2015) more often than those with lower levels of education. Females were frequent users of food labels (Gupta & Dharni 2016; Hassan & Dimassi 2017; Kumar & Kapoor 2017; Ponnudurai et al. 2019; Talagala & Arambepola 2016) and nutrition labels (Besler et al. 2012; De la Cruz-Góngora et al. 2012; Kasapila & Shawa 2011; Liu et al. 2015; Rimpeekool et al. 2017; Solanki & Sheth 2015) than males.

Fewer studies (10/15) reported on the associations between label use and other demographic factors, such as age, income, occupation, marital status and other factors, and findings of these studies were mixed. A significant association was found between age and nutrition label use in 3 studies, with higher likelihood of using nutrition labels related with younger (Cheah & Yip 2017; Cheong et al. 2013) or older (Rimpeekool et al. 2017) age (**Table 2.5**). Higher food label use was reported in younger (Hassan & Dimassi 2017) and older age (Rimpeekool et al. 2017) groups, while higher nutrition label use in middle (Besler et al. 2012; Solanki & Sheth 2015) and older age (Koen et al. 2018a) groups.

Income and occupation were associated with both food and nutrition label use. People with higher income (Ali & Kapoor 2009; Cheah & Yip 2017; Cheong et al. 2013) were more likely to use both food and nutrition labels, while professional workers (Rimpeekool et al. 2017) were more likely to use nutrition labels and people with occupations such as artisans and craftsmen (Danilola et al. 2019) were more likely to use food labels than their counterparts (**Table 2.5**). People of higher SES, with higher income and professionals were frequent food label (Bhilwar et al. 2018; Ponnudurai et al. 2019; Rimpeekool et al. 2017) and nutrition label (Besler et al. 2012; Koen et al. 2018a; Mazariegos & Barnoya 2017) users than their counterparts.

Marital status was associated with nutrition label use, while residential status and number of employed people in a household were associated with food label use. Married people were more likely to use nutrition labels (Cheah & Yip 2017; Cheong et al. 2013), while people living in bigger cities (Ali & Kapoor 2009) and from households with more employed family members (Gezmen-Karadağ & Türközü 2018) were more likely to use food labels than their counterparts. However, some studies reported a lack of associations between these factors and label use (Ali & Kapoor 2009; De la Cruz-Góngora et al. 2012; Lixin et al. 2020; Singla 2010) (**Table 2.5**). Married people (Hassan & Dimassi 2017), those with children (Hassan & Dimassi 2017), urban residents (Chopera et al. 2014) and people with BMI (Bhilwar et al. 2018) used food labels more frequently than their counterparts. Meanwhile, married people (Besler et al. 2012), those with children (De la Cruz-Góngora et al. 2012), people of White race (Koen et al. 2018a) and urban residents (Kasapila & Shawa 2011) were frequent nutrition label users than their counterparts.

Besides demographic factors, few studies (5/15) reported on associations between consumer awareness of and attitude towards food and nutrition label use (Ali & Kapoor 2009; Danilola et al. 2019; Dharni & Gupta 2015; Liu et al. 2015; Ma et al. 2018). Higher awareness of food safety information on labels was associated with higher use of this information (Danilola et al. 2019). Both, higher awareness of food labels and nutrition labels were associated with higher use of nutrition labels (Dharni & Gupta 2015; Liu et al. 2015). In a study from China, consumers who were familiar with nutrition labels were 3.93 times more likely to use nutrition labels, compared to those who were not familiar with these labels (Liu et al. 2015). Moreover, positive attitudes towards food and nutrition labelling were the drivers of food label (Ali & Kapoor 2009; Danilola et al. 2019) and nutrition label (Dharni & Gupta 2015; Ma et al. 2018) use. Consumers who perceived food and nutrition labels as important and useful (Ali & Kapoor 2009; Danilola et al. 2019; Dharni & Gupta 2015) and believed that nutrition labels could affect their food choices (Ma et al. 2018) were more likely to read food and nutrition labels. Higher nutrition knowledge was also associated with higher use of nutrition labels. People who were knowledgeable about healthy eating guidelines and who perceived themselves as knowledgeable about nutrition were more likely to use nutrition labels (Liu et al. 2015; Ma et al. 2018). However, in one of these studies, objective nutrition knowledge was not associated with nutrition label use (Liu et al. 2015) (**Table 2.5**).

Lastly, 3 studies (3/15) reported on the effects of respondents' health concerns and health conditions on food and nutrition label use (Bosman et al. 2012; Rimpeekool et al. 2016; Singla 2010). Consumers who were concerned about their health and the health of family members, who had an interest in diet-health relationships and who had health problems or special dietary needs were more likely to use food and nutrition labels (Bosman et al. 2012; Rimpeekool et al. 2016; Singla 2010) (**Table 2.5**). Those with chronic disease (Ma et al. 2018) and on special diets (Koen et al. 2018a) were frequent nutrition label users than their counterparts.

Table 2.5 Factors affecting food and nutrition label use

Factor	Type of label	Studies found an association*	Nature of the association	Magnitude of effect	Studies did not find an association*
Sociodemographic factors (14 studies)					
Age	Nutrition label use	9, 10	Younger age was associated with higher likelihood of using nutrition labels.	An additional year of age reduces the odds of using nutrition label by 0.013 (9); men and women of older age (OR 0.96 and 0.93) vs men and women of younger age (10)	15, 33, 34, 46 (nutrition label use) 2 (food label use)
		44	Older age was associated with higher likelihood of reading of nutrition labels.	Individuals aged 35 and older (OR 1.17) vs individuals aged 34 and younger.	
Gender	Nutrition label use	44, 9, 16	Females were more likely to read nutrition labels.	Females (OR 1.79) vs males (44); males (OR 0.72) vs females (9); being female increases label reading score by 0.204 (16).	15, 33, 34 (nutrition label use)
	Food label use	13	Females were more likely to read food labels.	Males (OR 0.56) vs females	
		19	Females had lower risk for not paying attention to food labels than females.	Males (OR 0.78) vs females	
		2	Males were more likely to read food labels than females.	Males (OR 1.69) vs females	
Education	Nutrition label use	9, 10, 35	Higher education was associated with higher likelihood of using nutrition labels.	Individuals with tertiary and secondary education (OR 7.34 and 3.84) vs individuals with primary education (9); individuals with primary (OR 4.40 men and 4.97 women) or secondary and tertiary education (OR 12.36 men and 20.15 women) vs individuals with no education (10); parents with diploma degree or above (OR 1.47) vs parents high school or lower (35).	15, 33 (nutrition label use)
		43	Being highly educated increased likelihood of attention to nutrition labels.		
	Food label use	19	Lower education was associated with higher risk of not paying attention to food labels.	Illiterate (OR 3.46) vs high school graduates (OR 1.46)	
		13, 2, 3	Higher education was associated with higher likelihood of using food labels.	Individuals with secondary and tertiary education (OR 0.25 and 0.44) vs individuals with postgraduate education (13);	

				educated consumers (OR 2.28) vs non-educated consumers (2).	
Income	Nutrition label use	9, 10	Higher income was associated with higher likelihood of using nutrition labels.	With income <RM 1000-2999, RM 3000-5999 and RM>6000 (OR 1.285; 1.490; 1.592) vs <RM 999 (9); people with higher income (OR 1.61-2.00 men and 1.58-1.77 women) vs people with lower income (10)	34, 46 (nutrition label use)
	Food label use	2	Higher income was associated with higher likelihood of using food labels.	With income >INR 10 000 (OR 1.63) vs with less income	
Occupation	Nutrition label use	44	Qualification was associated with nutrition label use.	Professionals (OR 1.17) vs workers	15 (nutrition label use) 2 (food label use)
	Food label use	13	Qualification was associated with food label use.	Unemployed, professionals and transport workers (OR 0.68; 0.38; 0.23) vs artisans and craftsmen	
Marital status	Nutrition label use	9, 10	Married people were more likely to use nutrition labels than unmarried people.	Married (OR 1.07) vs unmarried (9); married (OR 1.84 men and 1.28 women) vs unmarried (10).	15 (nutrition label use)
Having children		-	-	-	15, 46 (nutrition label use)
Ethnicity		-	-	-	34 (nutrition label use)
Household size		-	-	-	46 (nutrition label use)
Residential status	Food label use	2	Consumers lived in bigger cities were more likely to use food labels that consumers lived in smaller cities.	Consumers living in bigger cities (OR 1.49) vs consumers living in smaller cities	-
Employed household members	Food label use	19	Increase in the number of employed people in a household was associated with higher risk of not paying attention to food labels.	Fewer employed people in a household (OR 0.81) vs more employed people in a household	-
Awareness of food labelling and nutrition knowledge (4 studies)					
Awareness of food safety information	Food label use	13	Higher awareness of food safety information on the label was associated with higher likelihood of reading food safety information.	The odds of reading food safety information increased by 1.504 for a unit increase in the awareness of food safety information.	-

Awareness of food labelling	Nutrition label use	16	Higher awareness of food labels was associated with higher reading of nutrition labels.	Label reading score is increased by 0.081 for a unit increase in the awareness score of food labelling.	-
Familiarity with nutrition labels	Nutrition label use	33	Higher familiarity with nutrition labels was associated with higher likelihood of using nutrition labels.	Consumers familiar with nutrition labels (OR 3.93) vs those who is not familiar	-
Nutrition knowledge	Nutrition label use	33, 35	Higher nutrition knowledge was associated with higher likelihood of using nutrition labels.	Consumer with higher subjective nutrition knowledge (OR 1.29) vs those who with lower subjective nutrition knowledge (33); parents who are knowledgeable of Chinese Food Pagoda (OR 1.33) vs those who are not knowledgeable (35).	33 (objective nutrition knowledge and nutrition label use)
Attitude towards food labelling (4 studies)					
Perceived effect of nutrition labels on food choice	Nutrition label use	35	Perceived effect of nutrition labels on food choice was associated with higher likelihood of using nutrition labels.	Parents who believed that nutrition labels could affect their food choice (OR 1.52) vs those who did not believe so	-
Perceived importance of nutrition labels	Nutrition label use	16	Importance assigned to nutrition labelling was associated with higher reading of nutrition labels.	Label reading score is increased by 0.289 for a unit increase in the score of importance assigned to nutrition labelling.	-
Perceived importance of different label information	Food label use	2	Importance assigned to different label information was associated with higher likelihood of using food labels.	Consumers who perceived the product identification information (expiry date, price, manufacturer information), production and storage information (ethical information and storage instruction), and quality and nutrition information (warning about health risk, vegetarian, artificial ingredients, nutrient content) to be important (OR 1.63; 1.39 and 1.02) vs consumers who did not perceive these information to be important.	-
Perceived importance of food safety labels	Food label use	13	Perceived usefulness of food safety labels was associated with higher likelihood of reading food safety information.	The odds of reading food safety information increased by 1.826 for a unit increase in the response of efficacy of consumers to food safety threat.	-
Health concern and health reasons (3 studies)					
Health concern, awareness of a diet and health	Nutrition label use	46	Consumers with special dietary needs used nutrition labels more than consumers without these needs.	Nutrition label use was significantly correlated with special dietary needs (correlation coefficient 0.417).	-

link, and health reasons		43	Participants who concerned about health and diet-health diseases or experienced serious health problems used more nutrition labels.	
	Food label use	6	Health concern was associated with higher reading of food labels.	The statement “I am concerned about my health and try to choose products that give me detailed health information” were significantly associated with “I always look for health information” (w=0.79) and “I always read food labels to see what health benefits the product could offer me” (w=0.57)

*See **Appendix B** for the list of studies included in the review

2.4.4 Food and nutrition labelling policy and regulations in LMICs

This part of the literature review collected and synthesized evidence published in peer reviewed academic literature on food and nutrition labelling policy and regulations implemented in LMICs.

2.4.4.1 Description of labelling policy studies

Ten peer reviewed articles, including four policy analysis papers, four reviews and two commentary papers were included in the review. Table 2.6 summarises details of these studies. Of these studies, nine studies reported on food and nutrition labelling policies that were implemented in seven countries (Brazil, China, Ecuador, Mexico, Indonesia, Iran and Thailand) and one study covered labelling policies across multiple countries (**Table 2.6**). Policy analysis studies used one or more qualitative research methods such as interviews, focus group discussions, document analysis and observation of food labels (**Table 2.6**). Interviews and focus group discussions were conducted with different policy stakeholders, including government officials (3 studies), academia and civil society (2 studies), food industry (4 studies) and consumers (one study).

2.4.4.2 Policy type, specifications and framework

Nutrition labelling and food labelling policies described in the studies related to:

- Nutrition labelling policies
    - Nutrient declarations (5 studies)
    - FOPL policies, such as traffic light system, GDA, warning label and endorsement logo (6 studies)
    - Nutrition and health claims (1 study)
- Food labelling policies (2 studies)

Five studies reported on nutrition labelling policies (nutrient declarations) in five countries (Brazil, China, Malaysia, Indonesia and Thailand) (Chavasit et al. 2013; Coitinho et al. 2002; Hawkes 2008; Rimpeekool et al. 2015; Tee 2002). All policies were government policies, of which three policies were implemented under voluntary arrangements (China, Indonesia and Malaysia) and two policies (Brazil and Thailand) were mandatory at the time of the studies (Chavasit et al. 2013; Coitinho et al. 2002; Hawkes 2008; Rimpeekool et al. 2015; Tee 2002). Later on, China, Indonesia and Malaysia had adopted mandatory nutrition labelling (WCRF

2021). Updates on the policies were provided in Table 2.6 based on the NOURISHING framework database of the World Cancer Research Fund International (WCRF 2021). The results reported in this review are based on the policy arrangements at the time of the studies (**Table 2.6**).

Nutrients to be declared on the label varied across the policies. The Big 4 declarations (energy, protein, total fat and carbohydrates) were applied to all five countries on a mandatory or voluntary basis (Chavasit et al. 2013; Coitinho et al. 2002; Hawkes 2008; Rimpeekool et al. 2015; Tee 2002). In addition, sodium was required in Brazil and Thailand, and a listing of five more nutrients was required in Brazil and nine more nutrients in Thailand (Coitinho et al. 2002; Rimpeekool et al. 2015; Tee 2002). Sodium was required on a voluntary basis in Indonesia, while Malaysia permitted voluntary labelling of vitamins and minerals (Coitinho et al. 2002; Rimpeekool et al. 2015; Tee 2002). Reference values of nutrients were provided per serving in Brazil and Indonesia, and per 100 g/100 ml or per serving in China, Malaysia and Thailand (Coitinho et al. 2002; Rimpeekool et al. 2015; Tee 2002). Nutrient reference values were expressed as RDA in Brazil and Thailand, and as percentages of NRV in China, Indonesia and Malaysia (Coitinho et al. 2002; Rimpeekool et al. 2015; Tee 2002).

While mandatory nutrient declarations were applied to all pre-packaged foods in Brazil and Thailand, nutrient declarations were required only for food products carrying health and nutrition claims and foods for special dietary uses in China, Indonesia and Malaysia (Coitinho et al. 2002; Rimpeekool et al. 2015; Tee 2002). In Indonesia, milk and milk products were also required to have nutrient declarations (Tee 2002).

Six studies reported on five FOPL systems, including a traffic light system (implemented in Ecuador and Iran) (Edalati et al. 2020; Freire et al. 2017), the GDA system (in Thailand) (Rimpeekool et al. 2015), a warning label (in Mexico) (White & Barquera 2020) and the endorsement logo “25% Sugar, Fat, Sodium” (in Thailand) (Phulkerd et al. 2017) (**Table 2.6**). All the FOPLs have been implemented on a mandatory basis, except the voluntary endorsement logo “25% Sugar, Fat, Sodium”, implemented in Thailand (Edalati et al. 2020; Freire et al. 2017; Phulkerd et al. 2017; Rimpeekool et al. 2015; White & Barquera 2020). A traffic light system, implemented in Ecuador in 2016 was applied to all pre-packaged foods (Freire et al. 2017). The system used traffic light colour coding to indicate high, medium and low levels of fat, sodium and sugar (Freire et al. 2017). A similar labelling system, implemented in Iran included the same nutrients as the Ecuador’s traffic light system and plus trans-fat, and applied to all industrial foods (Edalati et al. 2020). Mexico has recently introduced a warning label which applies to pre-packaged foods high in fat, sodium and sugar. The label was adopted by the Mexican Congress in October 2019 and has been in effect since October 2020 (White & Barquera 2020). The label is a black octagon with a text warning to indicate high content of energy, sodium, saturated fat, trans-fat or sugar. The statement “avoid in children” accompanies the warning label if a product contains added caffeine or non-caloric sweeteners (White & Barquera 2020). In Thailand, the GDA system has been in effect since 2011 and applied only to snack foods at the time of the study (Phulkerd et al. 2017; Rimpeekool et al. 2015). The system displays the amount of saturated fat, sugar and sodium per serving, percentages of RDA for those nutrients, and number of servings (Rimpeekool et al. 2015). The “25% SFS” logo launched in Thailand in 2009 has been implemented on a voluntary basis. The logo was applied to reformulated food products, including snack foods, baked goods and Thai sweets and desserts with reduced contents of fat, sugar and sodium by 25% (Phulkerd et al. 2017). Six domestic companies had signed a Memorandum of Understanding with the Ministry of Public Health to implement the logo (Phulkerd et al. 2017).

Most of these nutrition labelling policies have been adopted within the framework of national food and nutrition policies which aimed at improving diet and nutritional status of people and promoting healthy eating (Chavasit et al. 2013; Coitinho et al. 2002; Rimpeekool et al. 2015). For instance, in Brazil, the adoption of the National Food and Nutritional Policy has contributed to the introduction of the nutrition labelling policy (Coitinho et al. 2002). In Thailand, nutrition labelling was incorporated into the national strategy for economic and social development which aimed at improving nutritional status of people and preventing diet-related NCDs (Chavasit et al. 2013; Rimpeekool et al. 2015). In Iran, the traffic light system was launched following the adoption of the national action plan for NCD prevention and control, and replaced existing nutrient declarations which were considered ineffective (Edalati et al. 2020).

Furthermore, one study reported on regulations on nutrition and health claims in some Asian countries, including Malaysia, Indonesia, Thailand and China (Tee 2002). According to the study, Indonesia had no regulations on nutrition and health claims, and the countries lacked clear regulations regarding health claims, except Thailand where health claims were not officially permitted. According to the Malaysian regulation, words that convey implied meaning of health benefits of products such as “compounded”, “medicated” or “health” were not permitted on label (Tee 2002). In China, foods with special health functions were regulated under the National Standard for Special Nutrient Food Labelling GB13432-2003, which requires food products to be approved by the Ministry of Health in order to bear such labelling (Tee 2002). At the time of this review, only the Thailand regulation had defined the provisions for nutrient content, nutrient comparative and nutrient function claims (Tee 2002). The regulations in Malaysia and China lacked definitions and criteria for making nutrition and health claims (Tee 2002). However, under the Malaysian regulation, food products making claims such as ‘enriched’, ‘fortified’ or ‘source of vitamins and minerals’ were required to meet certain criteria (Tee 2002).

Two studies reported on food labelling policies which were implemented in Indonesia and Thailand (Farida & Ayuningtyas 2019; Rimpeekool et al. 2015). Both of these policies were government mandatory regulations that applied to all pre-packaged processed foods (Farida & Ayuningtyas 2019; Rimpeekool et al. 2015). The Indonesian Government regulation 31/2018 on processed food labelling mandated a range of information on food label, including name of product, ingredients list, net weight, name and address of producer and importer, halal logo (if applicable), date and production code, expiry date, origin for some food and other information, including allergen information, warnings such as genetically modified food, directions for use, storage instructions and intended use (ChemLinked 2021) (**Table 2.6**). Similar information was required by the Thailand regulation on food labels (Ministry of Public Health 2014).

Table 2.6 Food and nutrition labelling, and FOPL labelling policies implemented in LMICs

	Study	Country	Policy (in effect since)	Policy framework	Description of the policy and food products covered	Research design	Policy stakeholders interviewed
1	Coitinho et al. 2002	Brazil	Nutrition labelling (since 2001)	Mandatory	• Mandatory declaration of energy, protein, carbohydrates, total fat, saturated fat, cholesterol, calcium, iron, sodium and dietary fiber • Amount per serving • RDA • All pre-packaged foods	Commentary article	-
2	Hawkes 2008	China	Nutrition labelling (since 2003) The National Standard for Special Nutrient Food Labelling GB13432-2003 Chinese Food Nutrition Labelling Regulation (2008)	Voluntary	• Voluntary nutrition labelling • Amount per serving or per 100g/ml • NRV • All foods, except products with nutrient claims or foods for special dietary uses (food intended for specific population, including infants and young children), fortified foods	Review article	-
			Guidance of Nutrition Labelling of Pre-packaged Food GB28050-2011 (since 2013)	Mandatory	Update [a] • Mandatory labelling of protein, fat, carbohydrates and sodium for all pre-packaged food with limited exceptions		
3	Chavasit et al. 2013	Thailand	Nutrition labelling (since 1998)	Voluntary	• Voluntary labelling of 15 nutrients • Amount per serving or per 100g/ml • Percentage of the Thai RDI • All foods, except foods with claims, foods for specific target groups and milk and milk products	Review article	-
			(since 2014)	Mandatory	• Mandatory nutrition labelling for all pre-packaged food with limited exceptions		

			GDA label (since 2011) (since 2016)	Mandatory	• Mandatory labelling of energy, saturated fat, sugar and sodium • Snacks Update [a] • Mandatory labelling for 5 categories of food, including snack, chocolate, bakery, semi-processed food and chilled or frozen meal		
4	Tee 2002	Malaysia	Nutrition labelling Regulations 388–393 of the Malaysian Food Regulations (1985) (since 2003)	Voluntary Mandatory	• Voluntary labelling of energy, fat, protein, carbohydrates, vitamin and mineral contents • All foods, except special purpose foods, including infant formula and cereal-based foods for infants and young children, and foods enriched or fortified • Amount per serving if a package contains a single portion or per 100 g/100 ml • Percentage of NRV • Lack of uniformity in nutrition label format Update [a] • Mandatory labelling of energy, protein, carbohydrates and fat on select categories of packaged foods, including bread, dairy products, canned food, fruit juices, salad dressings and soft drinks. Ready-to-drink beverages must also include total sugar.	Review article	-
			Nutrition & health claims Malaysian Guide to Nutrition labelling and Claims (2010)		• No elaborate provisions for health and nutrition claims. • The word ‘compounded’, ‘medicated’, ‘tonic’ or ‘health’ are prohibited. For foods carrying claims, ‘enriched, fortified, vitaminised, supplemented or strengthened’, ‘source of vitamins or minerals’, the amount of the nutrient in question should not be less than a reference quantity. Update [a] • Sets rules for use of specified nutrient content claims and nutrient comparative claims • List of permitted nutrient function claims • Disease risk reduction claims are prohibited.		

Indonesia	Nutrition labelling Regulation No.69 on Food labels and Advertisements (1999)	Voluntary	• Voluntary declaration of energy, fat, protein, carbohydrates and sodium • Amount per serving • Percentage of NRV • All foods, except baby foods, dietary foods, milk and milk products and other foods as specified by the Director-General, foods with claims, and fortified foods
	Regulation No.22/2019 on Nutritional Value Information on Processed Food Labels	Mandatory	Update [a] • Mandatory nutrition labelling for all pre-packaged food with limited exceptions (2019)
	Nutrition & health claims Regulation HK.03.1.23.11.11.09909 (2011) on the Control of Claims on Processed Food Labelling and advertisement		• Criteria for making nutrient content claims was defined. • In order to make nutrition and health claims, for processed food or beverage, fat and sodium should not exceed a certain level per serving (13g total fat, 4g saturated fat, 60mg cholesterol and 480mg sodium). • Limited number of nutrient function and disease risk reduction claims is permitted. • Conditions for making claims for foods intended for weight loss and diabetics, 'tonic' foods and foods to 'restore' health were stipulated.
Thailand [b]	Nutrition & health claims (since 1998)		• Nutrient content claim, comparative claim and nutrient function claims are permitted. • A claim of 'free' or 'low' is prohibited if the food is naturally 'free' or 'low' in that nutrient. • Criteria for making nutrient content claims and comparative claims was defined. • Health claims are not permitted.
China [b]	Health claims Regulation on Health Foods Labelling (1995)		• For foods with special health functions. The name of functional component and the approval code number given by the Ministry of Health are required on label.

5	Freire et al. 2016	Ecuador	Traffic light labelling (voluntary since 2014 mandatory since 2016)	Mandatory	• Traffic light colour coding with text. High (red), medium (amber) and low (green) levels of total fat, sodium and sugar • All pre-packaged foods	Interviews, focus group discussions, document analysis and audit of product labels	Food industry Consumers
6	White & Barquera 2020	Mexico	Warning label (since 2020)	Mandatory	• Warning labels in the shape of black octagons with text high in energy, sugar, sodium, saturated fat and trans-fat • The labels were accompanied by the statement "avoid in children", if a product contains added caffeine or non-caloric sweeteners. • Pre-packaged foods containing high sodium, saturated fat, trans-fat or sugar • Restrictions on advertising of products with warning labels	Commentary article	-
7	Edalati et al. 2019	Iran	Traffic light labelling (voluntary since 2014 mandatory since 2016) The National Act for Traffic Light food labelling (2015)	Mandatory	• Energy, total fat, trans-fat, sodium and sugar • All industrial foods	Interviews and document analysis	Government Academia Food industry
8	Phulkerd et al. 2017	Thailand	25% Sugar Fat Sodium policy (since 2009)	Voluntary	• "25% SFS" front-of-pack logo for reformulated food products with reduced sugar, fat and sodium contents by 25% • Three food categories: snack products, baked goods and Thai sweets and dessertsd	Interviews	Government Academia Civil society Food industry

9	Rimpeekool et al. 2015	Thailand	Food labelling (since 1979) The Notification of the Ministry of Public Health (No. 367) BE 2557 (AD 2014) Re Display of Food Labels on Containers [c] The Notification of the Ministry of Public Health (No. 383) BE 2560 (AD 2017) Re Display of Food Labels on Containers (No. 2) Nutrition labelling [d] GDA label [d]	Mandatory	Mandatory label information • name of food • food serial number • name and address of manufacturer, packer or importer • quantity of food • essential ingredients • information on food allergens • name and number of additives • natural/artificial natural/synthetic odor added/; natural flavour/artificial natural flavor added (if any) • manufacturing/expiry/best before dates • warning (if any) • advice on storage of food (if any) • method of cooking (if any) • method of usage for food intended for infants or children or certain group of people	Review article	-
10	Farida &Ayuningtyas 2019	Indonesia	Food labelling Food Law No.18 (2012) Regulation 31/2018 on processed foods labelling [e]	Mandatory	Mandatory label information • Product name • Ingredients list • Net weight or net content • Name and address of producer and importer • Halal for those required • Date and production code • Expiry date, month and year • Distribution license number for processed food • Origin of certain food • Other information	Interviews, focus group discussions and audit of product labels	Government Food industry

[a] World Cancer Research Fund countries were described. [b] Details of nutrition labelling policies in China and Thailand were provided in the above rows where other studies from these [c] Ministry of Public Health, Thailand [d] See the row 4 in this table (the study by Chavasit et al., 2013) [e] ChemLinked

2.4.4.3 Development of the policies

Of ten policy studies included in the review, nine studies (except a study by Farida & Ayuningtyas, 2019) reported on the development of food and nutrition labelling policies (Chavasit et al. 2013; Coitinho et al. 2002; Edalati et al. 2020; Freire et al. 2017; Hawkes 2008; Phulkerd et al. 2017; Rimpeekool et al. 2015; Tee 2002; White & Barquera 2020). These studies reported on drivers of policy development, engagement and participation of stakeholders in policy development, and barriers and facilitators to these processes. Barriers and facilitators to the policy development were collated and synthesized in **Table 2.7**.

2.4.4.3a Drivers of policy development

Nutrition labelling policies, including FOPL policies have been implemented by the governments in response to the need to reduce the growing burden of obesity and NCDs. Accordingly, the need to improve population health and reduce the growing burden of obesity and NCDs caused by poor diet was the key driver for these policies to emerge (Chavasit et al. 2013; Coitinho et al. 2002; Farida & Ayuningtyas 2019; Hawkes 2008; Phulkerd et al. 2017; Rimpeekool et al. 2015; White & Barquera 2020).

Governments' actions to adopt nutrition labelling policies have been influenced by the global policy recommendations and guidelines, including the guidelines of Codex Alimentarius (Hawkes 2008; Rimpeekool et al. 2015; Tee 2002), as well as by exemplar food labelling policies and practices implemented in other jurisdictions (Chavasit et al. 2013; Edalati et al. 2020; Freire et al. 2017; Tee 2002; White & Barquera 2020). Thailand has introduced a nutrition labelling policy under the country's first nutrition labelling law, which was enacted in 1998, and Thai nutrition labels were developed based on the Codex guidelines (Rimpeekool et al. 2015). Nutrition labelling regulations of Indonesia, Malaysia and China also followed the Codex guidelines (Hawkes 2008; Tee 2002). FOP traffic light labelling in Iran was influenced by the UK traffic light labelling (Edalati et al. 2020), and the Mexican warning label by the Chilean warning label (White & Barquera 2020). Moreover, Thailand's labelling policies have been influenced by the US Nutrition Labelling and Education Act (1990), which requires Thai food exports to carry nutrition labels (Rimpeekool et al. 2015).

In addition to these policy influences at the global level, advancements in nutrition science and international collaboration in the area of nutrition have contributed to the introduction of food and nutrition labelling policies in LMICs. For example, relying on the advanced nutrition science in the country, Thailand has developed a more progressive nutrition label, which reflects the specific nutritional needs of the population. Key nutrients that are associated with the major nutrition problems in the country, such as vitamin A, B1 and B2, calcium and iron, are required to be declared on food labels (Rimpeekool et al. 2015).

2.4.4.3b Engagement of stakeholders in the development of policies, and barriers and facilitators to policy development

Government was the initiator and key player in developing of all nine policies (Chavasit et al. 2013; Coitinho et al. 2002; Edalati et al. 2020; Freire et al. 2017; Hawkes 2008; Phulkerd et al. 2017; Rimpeekool et al. 2015; Tee 2002; White & Barquera 2020). Political commitment to NCD prevention and leadership roles of the governments and regulators was the most frequently cited facilitator to the policy development (4/9 studies) (Coitinho et al. 2002; Edalati et al. 2020; Rimpeekool et al. 2015; White & Barquera 2020). For instance, in 2014, the government of Iran adopted a traffic light labelling policy to fulfil its obligations towards preventing NCDs, and the government's food regulatory agency was responsible for formulating the policy (Edalati et al. 2020). Leadership and involvement of political leaders in the policy process has also greatly contributed to the successful adoption of the policy (White & Barquera 2020). The development of the warning label policy in Mexico was spearheaded by political leaders, who advocated for the initiative at the congress. This approach helped to gain support for the policy at the higher levels of decision-making, ultimately leading to its approval (White & Barquera 2020). Several other factors contributed to the development of the policies, including involving stakeholders from multiple sectors in the policy development process (2/9 studies) (Rimpeekool et al. 2015; White & Barquera 2020), conducting formative research to inform the proposed label (2/9 studies) (Rimpeekool et al. 2015; White & Barquera 2020), securing international funding (2/9 studies) (Coitinho et al. 2002; White & Barquera 2020) and partnering with food industry in the policy development (1/9 study) (Coitinho et al. 2002). Involving stakeholders from multiple sectors in the process of policy development has facilitated policy debates and enabled formative research on the proposed policies (Rimpeekool et al. 2015; White & Barquera 2020). Health sector and academia have been the key stakeholders in formulating of the policies (Coitinho et al. 2002; Edalati et al. 2020; Phulkerd et al. 2017; White & Barquera 2020), while involvement of other non-health sectors was at varying levels. Effective approaches for engaging stakeholders included organising national conferences, creating national committees or working groups to facilitate policy development, and sharing the proposed policy online for open discussion (Coitinho et al. 2002; Edalati et al. 2020; Phulkerd et al. 2017; Rimpeekool et al. 2015). Organising national conferences for stakeholders proved to be an effective strategy for increasing awareness and influencing policy makers regarding the traffic light labelling in Iran (Edalati et al.

2020). Policy debates were effective for increasing stakeholder awareness and ensuring that policies were better aligned with consumer needs. In Thailand, proposed FOPL policies, such as the GDA and traffic light labels, were extensively debated among health policy advocates, academia, civil society, consumer organisations and the food industry (Rimpeekool et al. 2015). Similarly, as a result of such debates and the efforts of academia and civil society, Mexico adopted a warning label in 2019 replacing the previous GDA label (White & Barquera 2020). In Mexico, civil society and consumer organisations played an active role in conducting formative research on the warning label (White & Barquera 2020).

Conducting formative research on the proposed policies helped to inform the policy development by incorporating consumer opinions into the policy (Coitinho et al. 2002; White & Barquera 2020). In Brazil and Mexico, formative research was conducted to evaluate consumers' ability to read, understand and use nutrition and warning labels (Coitinho et al. 2002; White & Barquera 2020). The study conducted in Mexico revealed that warning labels were easy for consumers to understand, even for those who were less advantaged, had low literacy rates and experienced greater burden of diet-related diseases (White & Barquera 2020). International funding has also facilitated the implementation of the marketing campaigns and formative research initiatives (Coitinho et al. 2002; White & Barquera 2020). Lastly, collaborating with the food industry has positively affected the policy development (Coitinho et al. 2002). In Brazil, the government's partnership with the food industry facilitated the establishment of serving sizes for packaged food products for labelling purposes. This effort helped to overcome initial resistance from the food industry towards the proposed nutrition labelling policy and established a promising groundwork for future collaboration in implementing the policy (Coitinho et al. 2002).

The development of policies was impeded by several factors, including resistance and influence from the food industry (3/9 studies) (Edalati et al. 2020; Rimpeekool et al. 2015; White & Barquera 2020), inadequate engagement and consultation with stakeholders from different sectors (1/9 study) (Edalati et al. 2020) and insufficient evidence for policy making due to a lack of formative research or consumer consultation (1/9 study) (Edalati et al. 2020). The most frequently cited barrier to policy development was food industry resistance (3/9 studies) (Edalati et al. 2020; Rimpeekool et al. 2015; White & Barquera 2020). Food industry resistance ranged from mild resistance, which was the case at the initial stage of development of the traffic light system in Iran (Edalati et al. 2020) to stronger opposition as in the case of the Mexican warning labels, which had initially stalled the adoption of the policy (White & Barquera 2020), or even has resulted in the abandonment of the policy as was the case of the traffic light labelling in Thailand (Rimpeekool et al. 2015).

In contrast to the development of the above-mentioned nutrition labelling and FOPL policies in Brazil, Mexico and Thailand, the development of the traffic light labelling system in Iran lacked a participation of non-state and non-health stakeholders, including civil society, non-governmental organisations and the media (Edalati et al. 2020). The study found that the policy was developed too quickly without thorough discussions and consultations with stakeholders, including consumers and sufficient evidence to support and justify its applicability. Moreover, due to the lack of a summary indicator for product healthiness, the system was considered by participants as weak in providing guidance to consumers (Edalati et al. 2020).

2.4.4.4 Implementation of the policies

All ten studies included in the review reported on policy implementation, describing the process of policy implementation and examining barriers and facilitators to policy implementation (**Table 2.7**). Half of these studies (n=5) investigated policies relating to FOPL (Edalati et al. 2020, Freire et al. 2017, Phulkerd et al. 2017; Rimpeekool et al. 2015, White & Barquera 2020).

2.4.4.4a Implementation process

Studies described activities undertaken during the policy implementation, including training for policy enforcers and food producers on the newly endorsed policy, and advocacy and promotion activities to raise consumers' and food producers' awareness on the proposed labelling policy. Examples of such activities included training for food inspectors, technicians and food producers on the traffic light labelling system endorsed in Iran (Edalati et al. 2020), as well as media marketing campaigns carried out nationwide by civil society organisations on the newly adopted warning labels in Mexico during 2018-2019 (White & Barquera 2020). Contrarily, lack of communication activities was reported for some policies, including the food labelling policy in Indonesia whereby the policy was poorly communicated to small and medium enterprises due to financial constraints (Farida & Ayuningtyas 2019). Some government policies, including the 25% SFS policy launched in 2009 in Thailand were implemented under a memorandum of Understanding signed between food companies and the Ministry of Health (Freire et al. 2017).

2.4.4.4b Barriers and facilitators to policy implementation

Facilitators of policy implementation included engagement of stakeholders of different sectors in policy implementation and effective policy advocacy and public education (3/10 studies) (Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020), availability of international funding and good financial management (3/10 study) (Coitinho et al. 2002; Phulkerd et al. 2017; White &

Barquera 2020), commitment and credibility of government officials (2/10 studies) (Edalati et al. 2020; Phulkerd et al. 2017), compatibility of the policy with the food company policy (1/10 study) (Phulkerd et al. 2017) and mandatory implementation of the policy (1/10 study) (Edalati et al. 2020) (**Table 2.7**). Stakeholder partnership has enabled successful policy advocacy and communication strategy was the most frequently cited facilitator to the policy implementation. Brazil, Mexico and Thailand have successfully implemented nutrition labelling and FOPL policies through collaboration between different stakeholders (Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020). In Brazil and Mexico, partnership between health authorities, civil society, health activists, commercial media and consumer groups has facilitated effective and smooth delivery of nationwide social media and marketing campaigns promoting healthy eating messages, as well as the new nutrition and warning labels. The campaigns had been organised prior to or following the adoption of the new policies and had resulted in increased awareness and understanding of, and positive attitude towards to these labels among the population (Coitinho et al. 2002; White & Barquera 2020). Extensive public awareness campaigns have been run in Thailand since 1998 through mass media, including newspaper, magazines and television to promote consumer awareness of nutrition labels (Rimpeekool et al. 2015). A promotional campaign for the GDA label has been conducted in the country since 2011, involving distribution of promotional materials to high school students and food producers, as well as supermarket marketing campaigns (Rimpeekool et al. 2015). Funding from international sources had enabled the undertaking of these campaigns (Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020). Furthermore, the commitment and credibility of government officials contributed to the successful implementation of the policies (Edalati et al. 2020; Phulkerd et al. 2017). Uptake of the policy was high under mandatory arrangements. For instance, in Iran, where the traffic light system was mandatory, 80% of domestic and imported food products carried the traffic light label (Edalati et al. 2020).

Barriers to policy implementation included governance related barriers (6/10 studies) (Edalati et al. 2020; Farida & Ayuningtyas 2019; Freire et al. 2017; Hawkes 2008; Phulkerd et al. 2017; Tee 2002), challenges faced by food manufacturers (3/10 studies) (Farida & Ayuningtyas 2019; Freire et al. 2017; Tee 2002), and food industry resistance and influence (2/10 studies) (Freire et al. 2017; Phulkerd et al. 2017). Policy governance issues were the most frequently reported barrier to policy implementation (6/10 studies) (Edalati et al. 2020; Farida & Ayuningtyas 2019; Freire et al. 2017; Hawkes 2008; Phulkerd et al. 2017; Tee 2002). Policy governance was found to be hindered by a number of barriers, including: resource constraints (4/10 studies) (Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002); lack of monitoring and evaluation for policy compliance and effectiveness (4/10 studies) (Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002); lack of engagement of stakeholders from different sectors in policy implementation, particularly insufficient participation of non-state and non-health sectors (2/10 studies) (Edalati et al. 2020; Phulkerd et al. 2017); lack of comprehensive policy promotion and public education (2/10 studies) (Edalati et al. 2020; Freire et al. 2017); incompatibility of the policy with other regulations (2/10 studies) (Edalati et al. 2020; Freire et al. 2017); limited authority of government agencies to enforce policy (1/10 study) (Phulkerd et al. 2017); overlaps in implementing agencies' responsibilities (1/10 study) (Phulkerd et al. 2017); close relationship between government and food industry (1/10 study) (Phulkerd et al. 2017); lack of clarity in the policy content (1/10 study) (Phulkerd et al. 2017); and voluntary nature of the policy (1/10 study) (Phulkerd et al. 2017).

Resource constraints were the most frequently cited governance barriers to policy implementation (4/10 studies). These constraints included a lack of funding (3/10 study) (Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002), inadequate human resources (2/10 study) (Farida & Ayuningtyas 2019; Tee 2002), and insufficient knowledge and skills among regulators regarding policy implementation (3/10 studies) (Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017). For example, enforcement, monitoring and evaluation of food and nutrition labelling policies in Indonesia, Thailand and other Asian countries have been hindered due to insufficient funding and inadequate human resources (Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002). Government officials lacked the necessary knowledge and skills to effectively advocate the policies to external stakeholders and provide support to food manufacturers in implementing new food labelling standards (Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017).

Lack of monitoring and evaluation systems for policy compliance and effectiveness was the next common barrier to policy implementation (Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002). For instance, traffic light labelling and 25% SFS label policies implemented in Iran and Thailand were lacked monitoring systems and indicators to assess their effectiveness (Edalati et al. 2020; Phulkerd et al. 2017).

Other governance-related barriers included the absence of multi-stakeholder engagement, inadequate policy promotion and public education, and the incompatibility of the policy with other regulations. The absence of multi-stakeholder engagement, particularly the lack of involvement of non-state and non-health sectors in policy implementation hindered the implementation of policies (Edalati et al. 2020; Phulkerd et al. 2017). For example, in Iran, the lack of participation of non-health sectors, including civil society and mass media in policy implementation has impeded the implementation of the traffic light labelling policy by hindering the implementation of policy advocacy strategies (Edalati et al. 2020). Inadequate policy promotion and public education has resulted in low awareness among consumers about the policy, leading to low adoption of the labels by end-users (Edalati et al. 2020; Freire et al. 2017). For instance, in both Iran and Ecuador, the traffic light labelling policies were introduced without adequate comprehensive promotion activities following their adoption (Edalati et al. 2020; Freire et al. 2017).

Other less frequently reported governance-related barriers included limited authority of government agencies to enforce the policy, overlaps in the responsibilities of implementing agencies, close relationship between the government sector and the food industry, lack of clear policy content, and voluntary nature of the policy (**Table 2.7**). All these barriers were cited by one study examining the FOPL policy 25% SFS implemented in Thailand (Phulkerd et al. 2017). The study found that health agencies did not possess the regulatory authority to implement the 25% SFS policy as they were not recognised as the official regulatory agency for food labelling (Phulkerd et al. 2017). On the other hand, close ties between the government and the food industry have hindered the successful implementation of the 25% SFS labelling policy implemented in Thailand, ultimately resulting in its failure (Phulkerd et al. 2017).

The next set of barriers were related to food industry's response to food and nutrition labelling policies, including food industry resistance and influence and challenges faced by food manufacturers. As reported in three studies, limited awareness and understanding of the policy (1/10 study) (Farida & Ayuningtyas 2019), as well as laboratory incapacity (1/10 study) (Tee 2002) and technical challenges in reformulating of products (1/10 study) (Freire et al. 2017), posed difficulties to food manufacturers, especially small and medium-scale enterprises, in complying with the labelling policies. For example, small and medium-scale food enterprises in Indonesia had poor understanding about the information to include on food labels due to inadequate communication of the policy (Farida & Ayuningtyas 2019). As identified in two studies, food industry's efforts to eliminate or modify the policy hindered the implementation of the policy (Freire et al. 2017; Phulkerd et al. 2017). In Ecuador, food industry stakeholders opposed the traffic light label and attempted to remove or modify it using their economic and political power. They concerned that the label may lead to a reduction in product sales, as well as they were skeptical about the label's ability to improve diet and address obesity (Freire et al. 2017). The food industry in Thailand applied pressure on the agency responsible for enforcing the FOPL policy 25% SFS, causing obstacles in its implementation (Phulkerd et al. 2017).

Table 2.7 Barriers and facilitators to the development and implementation of food and nutrition labelling policies

Aspects of policy process	Barriers (*studies reported*)		Facilitators (*studies reported*)
	Policy development *(n=9)*		
Policy governance	-		Political commitment and leadership (*n=4*) *(Coitinho et al. 2002; Edalati et al. 2020; Rimpeekool et al. 2015; White & Barquera 2020)*
	Lack of multisector stakeholder engagement (*n=1*) *(Edalati et al. 2020)*		Engagement of multisector stakeholders (*n=2*) *(Rimpeekool et al. 2015; White & Barquera 2020)*
	Lack of formative research (*n=1*) *(Edalati et al. 2020)*		Formative research (*n=2*) *(Coitinho et al. 2002; White & Barquera 2020)*
	-		Availability of international funding (*n=2*) *(Coitinho et al. 2002; White & Barquera 2020)*
Food industry's response	Food industry resistance and influence (*n=3*) *(Edalati et al. 2020; Rimpeekool et al. 2015; White & Barquera 2020)*		Partnership with food industry (*n=1*) *(Coitinho et al. 2002)*
	Policy implementation *(n=10)*		
Policy governance	Lack of resources *(n=4)*	Lack of financial resources (*n=3*) *(Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002)*	Availability of international funding and good financial management (*n=3*) *(Coitinho et al. 2002; Phulkerd et al. 2017; White & Barquera 2020)*
		Insufficient knowledge and skills of regulators (*n=3*) *(Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017)*	-
		Lack of human resources (*n=2*) *(Farida & Ayuningtyas 2019; Tee 2002)*	-
	Lack of monitoring and evaluation (*n=4*) *(Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017; Tee 2002)*		-
	Lack of multisector stakeholder engagement (*n=2*) *(Edalati et al. 2020; Phulkerd et al. 2017)*		Engagement of multisector stakeholders (*n=3*) *(Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020)*
	Lack of policy promotion and public education (*n=2*) *(Edalati et al. 2020; Freire et al. 2017)*		Effective policy advocacy and public education (*n=3*) *(Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020)*
	Incompatibility with other regulations (*n=2*) *(Edalati et al. 2020; Freire et al. 2017)*		Compatibility with the policy of the food company (*n=1*) *(Phulkerd et al. 2017)*
	Close networks between government and food industry (*n=1*) *(Phulkerd et al. 2017)*		-
	Limited authority for policy enforcement (*n=1*) *(Phulkerd et al. 2017)*		-
	Overlaps in the responsibilities of implementing agencies (*n=1*) *(Phulkerd et al. 2017)*		-
	-		Commitment of government officials (*n=2*) (Edalati et al. 2020; Phulkerd et al. 2017)
	Lack of clear policy content (*n=1*) *(Phulkerd et al. 2017)*		-
	Voluntary implementation (*n=1*) *(Phulkerd et al. 2017)*		Mandatory implementation (*n=1*) *(Edalati et al. 2020)*

Food industry's response	Food industry resistance and influence (*n=2*) *(Freire et al. 2017; Phulkerd et al. 2017)*	-
	Poor awareness and understanding of the policy (*n=1*) *(Freire et al. 2017)*	-
	Laboratory incapacity (*n=1*) *(Tee 2002)*	-
	Technical challenges related to product reformulation (*n=1*) *(Freire et al. 2017)*	-

2.4.4.4c Uptake of the policy

There was a limited information available on penetration of the policies in the market, with only three studies reporting on the uptake of policies (Edalati et al. 2020; Freire et al. 2017). In 2018, the traffic light label was displayed on 80% of manufactured and imported food products in Iran, indicating a relatively high uptake of the system (4 years post mandatory implementation). While some food products were reformulated to meet the green labelling requirements, there were also instances of fraudulent practices to attain the green label (Edalati et al. 2020). In contrast, Ecuador experienced low introduction of the traffic light label in 2015 (one year post voluntary implementation), with a significant number of products not bearing the label (Freire et al. 2017). A study conducted in Indonesia revealed that 86%-92% of 19 products produced by small and medium enterprises did not carry the necessary information required by the food labelling regulation, including production code, expiry date, ingredients list, product weight and product name (7 years post mandatory implementation) (Farida & Ayuningtyas 2019).

2.4.4.4d Impacts on consumers' awareness and use of food and nutrition labels

The impacts of labelling policies on consumers' awareness and use of nutrition labels were discussed in two studies. A review study exploring the nutrition labelling policy in Thailand indicated that public education campaigns on nutrition labelling had resulted in increased consumer awareness and knowledge on nutrition labels, particularly regarding the traffic light label (Rimpeekool et al. 2015). Consumers and health advocates in Thailand highly supported the traffic light label and urged the government to adopt the policy. In fact, in 2011, numerous health organisations and parents signed a petition requesting the government to implement the traffic light labelling policy (Rimpeekool et al. 2015). A study conducted in Ecuador in 2015, one year following the voluntary implementation of the traffic light labelling, revealed that despite the absence of comprehensive promotion, consumers reported higher familiarity and comprehension of the label, as well as positive attitudes towards it. However, the label's effect on consumers' purchases of processed foods was limited due to existing taste and brand preferences, highlighting that the labelling alone is insufficient to address poor diets (Freire et al. 2017).

2.4.5 Mongolian food labelling policy and regulations, and consumer responses to food and nutrition labelling

2.4.5.1 Description of included literature

The search identified 45 documents, including 22 policy documents and 23 information from different sources, such as study and project reports, news releases, website information, presentations and country briefs. In addition, two peer reviewed articles published in international and local academic journals were identified. All identified literature were checked for their relevance to food and nutrition labelling, and 22 of these sources were deemed relevant and included in the review. The documents included in the review consisted of five laws, three government policies (national program, state policy and strategy), four standards and guidelines, one survey report, four media articles, three other sources (power point presentations, website information and brochures) and two peer reviewed articles.

2.4.5.2 Food and nutrition labelling policy and regulations in Mongolia

The Government of Mongolia has made significant progress in the last decade in integrating food labelling into national food policies. Several government regulations and acts pertaining to food and nutrition labelling have been adopted, including the Food Law (2012), the Food Safety Law (2012), the food labelling standard "Requirements for labelling of pre-packaged foods" (MNS 6648:2016), and a voluntary FOPL guideline (2017). Details of these regulations are provided in the Background chapter (**Chapter One**).

The new food labelling standard stipulated mandatory declarations of energy and seven nutrients for all pre-packaged foods (MASM 2016). A comparison of the content of the Mongolian standard against the Codex guidelines, including General Standard for the Labelling of Pre-packaged Foods (CODEX-STAN 1-1985), Guidelines on Nutrition Labelling (CAC/GL 2-1985), and Guidelines for Use of Nutrition and Health Claims (CAC/GL 23-1997) identified some disparities between the Mongolian and Codex regulations (**Chapter One**). Although sharing high similarities with the Codex guidelines, the Mongolian standard had certain discrepancies, such as the absence of criteria for providing NRV information, the lack of requirements for quantitative declaration of ingredients and minimal legibility for label text, inadequate regulations regarding nutrition and health claims, and the lack of standard format for best-before date, indicating its shortcomings. In addition, the National Nutrition Programme 2016-2025 included several important initiatives pertaining to food and nutrition labelling. However, the programme did not incorporate any indicators to measure the effectiveness of those activities.

Limited information was available regarding the policy formulation process of the food labelling standard, as well as inclusion of food labelling in the above mentioned food laws. Furthermore, there was no evidence found regarding the enforcement of the food labelling regulations, apart from a few of news reports by inspection agencies highlighting inadequate implementation of the food labelling standard. Frequent non-compliances with the standard were associated with missing, inaccurate or incomplete label information, such as production and expiry dates, nutrition information, ingredients list, manufacturer's name and address, and storage conditions, as well as violations related to the translation of labels of imported food products into Mongolian language (City Specialized Inspection Agency 2013; Zoljargal 2011). Poor compliance to the labelling standard was attributed to poor understanding of food producers about the labelling requirements of the food labelling standard, as well as the lack of training and communication (Saruul 2012). The availability of educational resources and communication materials for consumers on food and nutrition labelling was extremely scarce. Only one brochure was identified, which was developed to provide guidance on how to read food labels (NCPHM 2014).

2.4.5.3 Consumer response to food and nutrition labelling in Mongolia

There were identified two peer reviewed articles that briefly reflected on the attitudes Mongolian consumers towards food labelling and their use of food labels (Davaadulam et al. 2008; Demaio et al. 2013). One article was based on a survey conducted among urban residents in Mongolia, which found that 67% of residents claimed they look at product labels. Among those, 86% solely looked at expiry dates, 16% at the manufacturing country, and only 10% of consumers checked food ingredients (Davaadulam et al. 2008). The other study highlighted that a significant proportion of respondents perceived NCD prevention strategies, such as food labelling, as unimportant due to their low health literacy (Demaio et al. 2013). Furthermore, in the 2013 Mongolian STEPs survey, only 10% of participants claimed that they usually check the salt content on the label (MOHM & WHO 2015).

2.5 Discussion

2.5.1 Consumer responses to food and nutrition labelling in LMICs

This review aimed to synthesise and analyse the available evidence on the awareness and use of food and nutrition labels among consumers in LMICs. For nutrition labels to have an impact on diets and health by guiding food choices, it is essential for consumers to be aware of these labels and to use them (Grunert & Wills 2007). This is especially relevant to LMICs like Mongolia where the labelling policy is relatively new and less developed, and consumers may have limited knowledge about these labels. The findings of this review will inform the first study in Mongolia that seeks to explore consumer awareness and use of food and nutrition labels.

In this review, consumers reported a high level of awareness of food labels, but relatively lower familiarity with nutrition labels. However, fewer studies that utilised objective measurements for label awareness found lower levels of awareness for both food and nutrition labels (Danilola et al. 2019; Dharni & Gupta, 2015; Esfandiari et al. 2021; Hassan & Dimassi, 2017; Koen et al. 2018a; Freire et al. 2017; Song et al. 2015; van der Merwe et al. 2013). Respondents have demonstrated familiarity with food labels, particularly with information such as expiry dates, however were less familiar with other types of label information, such as nutrient declarations and nutrition and health claims. This suggests that consumers in LMICs are familiar with food labels, but may lack adequate knowledge about them. The level of awareness of FOPL systems varied across the studies and appeared to correspond with the implementation of such systems in their respective countries (Esfandiari et al. 2021; Festila et al. 2014; Freire et al. 2017; Orozco et al. 2017; Rimpeekool et al. 2017).

Except one study, which observed shoppers during their shopping trips (Darkwa 2014), all other studies relied on self-reported label use. The majority of these studies reported higher rates of food label use, but relatively lower use of nutrition labels. In over half of the studies (10/18), lower percentage of respondents reported using nutrition labels compared to those who reported using food labels in general. Furthermore, several qualitative studies have revealed that the use of nutrition labels by consumers is generally low, and consumers tend to check expiry dates and front-of-pack labelling rather than nutrition information provided on the back of the package (de Morais Sato et al. 2019; Jefrydin et al. 2019; Koen et al. 2018b; Vemula et al. 2014).

Food and nutrition label use is likely over-reported in the studies due to the reliance on self-reported measures. This is especially relevant for nutrition labels since respondents may confuse them with other types of label information given the lack of clear definitions of food and/or nutrition labels in most of the studies. As a result, the accuracy of determined nutrition label use may have been affected by the lack of clear definitions of nutrition labels, as well as by varying understanding of respondents under nutrition labels. For instance, a qualitative study from Malaysia included in this review (Jefrydin et al. 2019) revealed that respondents confused nutrient declarations with ingredients lists and even with expiry dates.

In the majority of studies (12/18), nutrition label use was similar to that reported in previous review studies (Campos et al. 2011; Grunert & Wills 2007; Mandle et al. 2015), with more than 40% of respondents reporting usage. In a previous review study that focused on consumers in LMICs (Mandle et al. 2015), the use of nutrition labels ranged from 40% to 70% among consumers, while other review studies conducted in high-income countries reported relatively higher use nutrition labels, ranging from 47% to 82% (Campos et al. 2011; Grunert & Wills 2007). Nevertheless, one third of studies (6/18) included in this review reported lower rates of nutrition label use, compared to those reported in the reviews mentioned above. This may indicate relatively lower use of nutrition labels among consumers in LMICs compared among those in high-income countries. Furthermore, relatively lower rates of nutrition label use observed in this review, as compared to the review by Mandle et al. (2016), can be attributed to the variation in the studies included in the reviews. While both reviews focused on LMIC consumers and had some overlap in the studies analysed, with ten consumer studies and one labelling policy study appearing in both, they differed significantly in terms of countries and timeframe of the included studies. For instance, while some studies from high-income countries such as South Korea, Chile, Morocco, Tunisia and United Arab Emirates were included in the review by Mandle et al., the current review did not cover these countries. In addition, the current review presents more recent evidence, with a majority of the studies (36 out of 53 consumer studies; and 6 out of 10 labelling policy studies) being published after 2014, whereas, the review of Mandle et al. is focused on the studies published prior to 2014.

Food and nutrition label use varied across different demographic subgroups. Those with higher levels of education and females used food labels more frequently, which was consistent to the findings of the existing reviews (Campos et al. 2011; Grunert & Wills 2007; Mandle et al. 2015).

The most commonly reported reasons for using food and nutrition labels are to check nutrient content and ingredients lists, as well as concerns about safety, quality and authenticity of products, including expiry dates. Respondents claimed using nutrition information to control calorie intake and weight, choose healthy food, maintain good health and prevent illnesses, and compare nutrient contents of different products. However, it is important to note that nutrition information as being the primary reason for people look at food label may be attributed to the fact that many of the studies included in the review solely focused on the use of nutrition labels. Therefore, when people are asked about their reasons for using food labels, they were only considering the information provided on nutrition labels. However, when respondents were asked about their reasons for looking at food labels in general, their primary concerns tend to related to safety, quality and authenticity of food products.

Expiry dates are the most frequently used label information, followed by price and brand name, while nutrition information and ingredients list are used by respondents less often. This finding is consistent with the previous reviews from both high-income and LMI countries. Interestingly, consumers showed little interest in other label information such as directions for use, food additives, allergens, country of origin and vegetarian and halal symbols. This is in contrast to the previous review on consumers in LMICs (Mandle et al. 2015), where nutrition information was less prioritised and used by consumers than any other label information, including food safety/storage information, and vegetarian and halal symbols (Mandle et al. 2015). It is likely the variations in the studies included in the reviews may account for these differences.

The main reason for not using food and nutrition labels is a lack of understanding of label information. Other significant reasons for not using food and nutrition labels included a lack of time, familiarity with products, small font size of the labels, and a general lack of interest in nutrition information. Interestingly, despite reporting high awareness of food labels, people tend to relate their non-use of food and nutrition labels to their lack of understanding and interest in them. Consumers tend to prioritise taste and price over label information, particularly nutrition information. These reasons for not using food and nutrition labels are consistent with previous reviews from both high-income and LMI countries (Cowburn & Stockley 2005; Grunert & Wills 2007; Mandle et al. 2015).

2.5.1.1 Key findings and gaps identified in the literature

The current review has updated the earlier review of Mandle et al. (2015) by adding recent evidence on consumer awareness and use of food and nutrition labels in LMICs.

Limited evidence is available on consumer awareness of food and nutrition labels from LMICs, as only a few studies have reported on the topic and the absence of review studies. The current review addresses this gap by synthesising evidence on LMIC consumers' awareness of food and nutrition labels, the topic which was not covered in the Mandle et al.'s (2015) review. High awareness of food labels and relatively lower awareness of nutrition labels reported in the studies are likely overestimated due to the reliance on self-reporting. Objective measures of label awareness utilised in the studies indicate that while consumers are generally aware of the presence of food labels on packaging, their awareness of specific types of label information is limited. Notably, consumers are less aware of nutrition labels, highlighting the need for nutrition education to improve awareness and knowledge of nutrition information on the label. Furthermore, there is insufficient data regarding consumers' understanding of the significance of these labels, the information they provide, and how to use them effectively.

The review reported higher food label use among consumers in LMICs, while nutrition label use was relatively lower, which is consistent with the findings on label awareness. However, these rates are likely overestimated owing to self-reporting. Additionally, none of these studies used objective measures of label use, such as eye-tracking methods, which are commonly used in studies from high-income countries and could provide more accurate measures of label use (Ma & Zhuang 2021). The current review revealed lower use of nutrition labels compared to previous reviews from high-income countries, as well as the review of Mandle et al. (2015). The significance of this finding lies in its revelation that consumers in LMICs may be less inclined to use nutrition labels, unlike consumers in high-income countries. This new insight diverges from the findings of the previous review of Mandle et al. (2015), which reported similar rates of nutrition label use among consumers in LMICs as compared to those in high-income countries. Qualitative studies in the current review further support these findings, indicating that consumers exercise minimal use of nutrition labels.

The findings of this review support earlier reviews, including the review of Mandle et al. (2015), regarding label user characteristics, reasons of label use or none-use, and factors that affecting food and nutrition label use. Similar to previous reviews, consumers in LMICs prioritise product safety, quality and authenticity of products over nutritional quality. They often rely on information such as expiry date, price and brand name, as well as front-of-pack labelling, rather than nutrition information. Women and people with higher levels of education tend to use food labels more frequently. Consistent with the findings of Mandle et al. (2015), the primary barrier for consumers in LMICs to using food and nutrition labels is their insufficient understanding and knowledge about these labels.

The current review includes several recent studies that have explored factors influencing the use of food labels beyond those examined in the Mandle et al.'s (2015) review, including awareness and attitudes towards food labels, as well as levels of nutrition knowledge. The findings of these studies suggest that increased awareness of food and nutrition labels, positive attitudes towards these labels, and greater nutrition knowledge are linked with higher food and nutrition label use (Danilola et al. 2019; Dharni & Gupta, 2015; Liu et al. 2015; Ma et al. 2018). However, the number of studies examining these factors remains limited.

Similar to the Mandle et al.'s (2015) review, the current review highlighted a knowledge gap regarding food label use among certain groups of consumers, including those from rural areas, lower

SES, and with lower education levels. Most studies (32/53) focused on urban consumers and individuals with higher education levels. The studies were primarily conducted in India and South Africa, with most of the remaining studies focusing on countries with upper middle-income economies. No studies were available from low-income countries and only three studies were from transition countries like Mongolia (Dano & Krakova, 2017; Festila et al. 2014; Todua 2018). Given that Mongolia is transitioning from a socialist system to a free market economy, similar to the Eastern European countries where the studies were conducted, the findings of these studies could be relevant to the Mongolian market context.

2.5.2 Food and nutrition labelling policy and regulations in LMICs

To our knowledge, this is the first review to synthesize the available evidence on the development and implementation of food and nutrition labelling policies in LMICs by synthesizing barriers and facilitators to policy processes. While there are some studies available, the current literature is limited and there are important gaps in the literature that need to be addressed in order to provide a more comprehensive understanding of the challenges and opportunities associated with developing and implementing such policies in LMICs. The findings of this review can serve as a foundation for future research and also provide policy stakeholders in LMICs with the information and insights they need to develop and implement effective food and nutrition labelling policies.

The available evidence suggests that LMICs are increasingly adopting nutrition labelling policies as part of their political commitments to promote healthy eating habits and address the growing burden of obesity and NCDs in their countries. Many countries are guided by the Codex regulations on nutrition labelling as an important benchmark for developing their labelling requirements. In addition to using the Codex guidelines as a benchmark, some countries have been influenced by the policies of major importers of their food products. Furthermore, some countries have been influenced by the labelling policies of other countries and incorporated them into their own labelling policies.

The development of nutrition labelling policies was made possible by various facilitators. Firstly, the *political commitment of governments* towards preventing NCDs played a significant role. Government officials and regulators demonstrated leadership by prioritising the need for nutrition labelling policies. It is noteworthy that all the policies explored in this context were initiated by the governments. In contrast, no policies were initiated by the food industry, such as self-regulations.

Stakeholder engagement was another important facilitator of both policy development and implementation. The involvement of multisector stakeholders in policy processes enabled the mobilisation of resources available within each sector and raised the policy ownership and accountability. A participatory approach involving academia, civil society, the media, consumer groups, and the food industry has been utilised successfully in several countries to formulate and implement nutrition labelling policies. For example, Brazil's nutrition labelling policy (Coitinho et al. 2002), Mexico's warning label policy (White & Barquera 2020), and Thailand's nutrition labelling, traffic light, and GDA labelling policies (Rimpeekool et al. 2015) all benefited from broad stakeholder consultation in their development. In these cases, engaging civil society organisations and the mass media in policy development discussions has been found to be a helpful strategy for conducting successful policy advocacy campaigns during the implementation phase. Similar findings were reported in other studies from high-income countries where a broad stakeholder consultation facilitated the development of nutrition labelling policies (Vogel et al. 2010). In contrast, the *lack of engagement of multisector stakeholders* and *consultation with consumers* served as a barrier to policy processes. For example, Iran's adoption of traffic light labelling, based on low evidence, lacked engagement with civil society and the media, which led to poor policy advocacy and consequently to low awareness of the policy among consumers (Edalati et al. 2020). However, involving the food industry in policy processes should be undertaken with caution due to conflicts of interests (Swinburn et al. 2019). In this review, a close relationship between the government and the food industry was one of the reasons for the failure of the 25% SFS labelling policy in Thailand, making it impossible the government to pressure the food industry to adopt the label (Phulkerd et al. 2017). Similarly, evidence on regulatory governance in the development and implementation stages of food policies in Australia and globally suggests that high involvement of the food industry can cause policy failures (Ngqangashe et al. 2021). In Australia, for instance, high involvement of the food industry in the governance of the Health Star Rating System has led to the policy being implemented on a voluntary basis, with insufficient regulatory power (Ngqangashe et al. 2021).

Strategies for engaging multisector stakeholders in policy development and implementation have included the formation of working groups and steering committees for policy development, organising national conferences, placing the policy online for open discussions, as well as the implementation of policy advocacy and public awareness campaigns. Policy advocacy and public awareness campaigns have been effective for informing policy stakeholders, including consumers, about new labelling policies by increasing their awareness and spurring grassroots activism (Yenerall 2017) among them. The successful engagement of civil society and the media in both policy development and promotion was evident in the cases of Brazil's nutrition labelling policy (Coitinho et al. 2012), Thailand's traffic light labelling (Rimpeekool et al. 2015) and Mexico's warning label policy (White & Barquera 2020). Examples of grassroots activism among consumers include the partnership among consumer groups in Brazil to promote healthy diets and the use of nutrition labelling by consumers (Coitinho et al. 2012), as well as signing of a petition by parents and public health advocates in Thailand in support of adopting traffic light labelling (Rimpeekool et al. 2015). Public awareness campaigns promote civil society activism (Goodwin & Jasper 2014) which applies pressure to policy makers to adopt the policy, as was in the case of Thailand's traffic light labelling and Mexico's warning label policy (Rimpeekool et al. 2015; White & Barquera 2020). In contrast, lack of policy promotion and public education can lead to poor awareness among consumers as seen in the case with traffic light labelling policies in Iran and Ecuador (Edalati et al. 2020; Freire et al. 2017). In addition, formative research seeking consumer opinions on the proposed nutrition labelling and warning label policies in Brazil and Mexico has facilitated the adoption of nutrition labels that meet consumer needs and informed communication strategies for these labels (Coitinho et al. 2012; White & Barquera 2020).

The *availability of resources*, including international funding, was identified as an important facilitator of policy development and implementation in LMICs, along with stakeholder engagement. Several studies have shown that international funding has enabled policy advocacy campaigns and formative research (Coitinho et al. 2012; Phulkerd et al. 2017; White & Barquera 2020). Additionally, *the advancement of nutrition science* nationally and *international collaboration* have positively contributed to the adoption of nutrition labelling policies, as evidenced by the case of Thailand (Rimpeekool et al. 2015). Furthermore, *compatibility of the policy with food company policies* and *the mandatory nature of the policy* were found to be other facilitators of policy implementation, as seen in the case of Iran and Thailand (Edalati et al. 2020; Phulkerd et al. 2017).

The findings on the importance of *stakeholder engagement* and *resource availability* as the key facilitators to policy development and implementation are consistent with those of Ng et al. (2022) review, which examined healthy food environment policies, including nutrition labelling policies, across countries with varying levels of development. This may indicate that these factors as common facilitators for policy processes in both high-income and low and middle-income countries. However, the ranking of *political commitments and leadership* as highly influential facilitators of policy development in the current review differs from Ng et al.'s review (2022), where it was ranked lower. Given that Ng et al.'s review (2022) included studies both from high-income and low and middle-income countries compared to all LMICs in the current review, political commitment and leadership maybe even more significant in facilitating the emergence of food and nutrition labelling policies in LMICs.

Food industry opposition was the most cited barrier to policy development of food and nutrition labelling policies in LMICs. This aligns with previous literature (Ng et al. 2022; Shill et al. 2012; Vogel et al. 2010), identifying the food industry opposition as the primary barrier to policy development for healthy food environment policies in both high-income and low and middle-income countries. The food industry has impeded the policy-making process for nutrition labelling policies by prioritising their business interests over public health concerns and attempting to influence regulatory decisions of government agencies. For example, in Thailand, food industry opposition led to the abandonment of the traffic light labelling (Rimpeekool et al. 2015), and in other cases, industry opposition has persisted even after the adoption of policies (Freire et al. 2017; Phulkerd et al. 2017).

The implementation of food and nutrition labelling policies in LMICs has faced multiple challenges, with *poor policy governance* being the most frequently cited. Of the barriers related to policy governance, *resource limitations*, including lack of funding and human resources, were the most cited barrier. These limitations have led to poor implementation of the policies by constraining their monitoring and evaluation, and enforcement. Insufficient knowledge and skills of government officials to undertake effective policy advocacy and assist food manufacturers in implementing the policies hindered the policy implementation too.

Another significant barrier to policy implementation was *the lack of monitoring and evaluation system* for policies. Effective monitoring and evaluation is critical for ensuring accountability and the effectiveness of policy. The successful implementation of policy requires a monitoring and evaluation system, which is overseen by an independent body, employs evidence-based measures, and publicly reports its findings (Gillespie et al. 2019; Ngqangashe et al. 2021; Swinburn et al. 2015). An example of successful policy implementation with effective monitoring and evaluation is the US National Sodium Reduction initiative, which is a voluntary, government-led initiative that is monitored independently of the food industry (Curtis et al. 2016).

Food industry resistance has also impeded the implementation of labelling policies. Moreover, for food industry, especially small and medium-sized entrepreneurs, complying with labelling policies is complicated by *limited technical capacity* in laboratory analyses and product reformulation. This is exacerbated by poor knowledge and understanding of the labelling policy by food manufacturers.

The barriers identified in this review, including *resource limitations*, *lack of monitoring and evaluation*, and *food industry resistance*, are consistent with the findings reported by Ng et al. (2022), which found that these barriers, particularly the *lack of monitoring and evaluation* and *resistance from the food industry*, are specific to LMICs in implementing healthy food environment policies, including food labelling policies. The findings highlight the importance of addressing these barriers in implementing food labelling policies in LMICs through a comprehensive approach that includes enhanced policy governance with effective monitoring and accountability systems, adequate resource allocation, and strategic engagement with the food industry.

The evidence provided only limited information on the implementation processes of the policies, including different strategies undertaken during the implementation of the policies and their effectiveness. Moreover, there was scarce evidence on the impacts of policies on consumer awareness and use of food and nutrition labels. Only two studies from Ecuador and Thailand reported positive outcomes resulting from public education campaigns on newly introduced nutrition and traffic light labels (Freire et al. 2017; Rimpeekool et al. 2015).

2.5.2.1 Gaps identified in the literature

There are several significant gaps in the literature on development and implementation of food and nutrition labelling policies in LMICs, which need to be addressed in future studies to better understand and improve policy processes in these countries. Overall, evidence on food and nutrition labelling policy processes in LMICs is limited, with only a few available studies. These studies are mostly from a handful of countries, and there are no studies available from low and lower-middle income countries. Additionally, only a couple of studies are available from transition or post-socialist countries, which significantly limits our understanding of policy processes in these contexts.

The majority of the studies included in the review (6 out of 10) were descriptive reviews or commentary articles that mainly provided a general overview of the policies. In contrast, there were four policy analysis studies (out of 10) that explored stakeholder opinions, conducted document analysis and observed food labels to gain a deeper understanding of policy processes. The lack of evidence based in-depth analysis limits our ability to gain a comprehensive understanding of policy processes in LMICs. Given the limited number of studies, it is difficult to generalise the findings regarding barriers and facilitators to policy processes of food and nutrition labelling policies in LMICs. Some factors have been reported by only one or two studies, making it difficult to draw any solid conclusions regarding their relative importance in this context. Moreover, the contextual factors that may have influenced the barriers and facilitators to policy processes and ultimately shaped policy outcomes were not evident in this context. This indicates the need for more in-depth exploration of the policy processes of food and nutrition labelling policies in LMICs.

Furthermore, while most policy analysis studies have focused on FOPL policies (3 out of 4), there remains a lack of in-depth exploration of general food labelling and nutrition labelling policies in LMICs. This limits our understanding of the broader context of food labelling policy processes in LMICs, including the challenges related to the adaptation of Codex guidelines into national regulations. In addition, due to the scarcity of evidence, it is impossible to compare different policy approaches, such as government-led vs self-regulatory policies or mandatory vs voluntary policies. Furthermore, there is a need for more studies to measure the effectiveness of policies by their uptake, as well as by their impacts on consumer awareness and use of food and nutrition labels.

2.5.3 Mongolian food labelling policy, and consumer responses to food and nutrition labelling

Mongolia has achieved significant progress in in the last decade in implementing food labelling policy and regulations, which is a promising step towards promoting healthy diets and preventing obesity and NCDs. The commitments of the Mongolian government to food labelling policies are linked to its efforts to adapt to the changes in the food system, such as increased food production and importation, as well as the growing significance of food labelling in relation to the country's transition to a market economy in the early 1990s.

Food and nutrition labelling has been addressed in various food laws, standards, guidelines and national programs. The main regulation for food labelling is the Mongolian food labelling standard. The Mongolian standard presents discrepancies and drawbacks when compared to the Codex guidelines, indicating inadequate formulation of the areas food and nutrition labelling covered by the standard. These shortcomings in the regulation are likely caused by the limited knowledge and expertise of government officials involved in policy development, as well as the adoption of the Codex guidelines without thorough analysis and discussion. These regulatory gaps in the policies introduce weak regulations in the areas such as nutrition and health claims, labelling of imported food products and legibility of label text. Furthermore, the National Nutrition Program 2016-2025 lacks monitoring and evaluation for the planned activities related food and nutrition labelling, which makes it difficult to assess their effectiveness and reduces the program's accountability in terms of the planned actions for food and nutrition labelling.

The process of development of the Mongolian food labelling policy and the extent of its implementation are largely unknown, as there is a lack of evidence available in both peer reviewed and grey literature. Frequent non-compliance reports indicate weak enforcement of the food labelling standard, which is likely due to poor compliance of food producers because their limited awareness and knowledge of the regulation. Furthermore, there is no information available about the development and implementation of food labelling policy, including barriers and facilitators to these processes. This has limited comparison of the Mongolian food labelling policy with those of other LMICs.

Given the limited evidence on the policy development and implementation, it remains unclear how food labelling has been integrated into the national food and nutrition policies of the country. To better understand the current situation of the Mongolian food labelling policy and identify potential areas for improvement in the policy and in its implementation, it is required to clarify important aspects such as the contextual factors that influenced the introduction of the policy, the policy development processes, including whether public consultations were held, and the policy implementation process.

Scarce available literature on consumer responses to food labelling in Mongolia suggests that the use of food labels, particularly nutrition information, is likely to be very limited among Mongolian consumers. This is largely attributed to the likely low awareness and knowledge on food and nutrition labels due to the inadequate public education in this area. Consequently, the lack of awareness and low use of food and nutrition labels by consumers could be a significant barrier to the effective implementation of the food labelling policy in Mongolia.

2.5.3.1 Gaps in the literature

The evidence regarding food and nutrition labelling policy and consumer response in Mongolia has major gaps which require further investigation. Specifically, there is a need for more research in the following areas:

- The development of the food labelling policy and how well it aligns with consumer needs
- The implementation and enforcement of the policy
- The level of awareness and use of food and nutrition labels by consumers
- The policy implications of the development and implementation of the food labelling policy and consumer response to the policy

2.5.4 Limitations

The review focused on two outcomes of consumer response: awareness and use of food and nutrition labels. As a result, studies reporting on other consumer outcomes, such as understanding and impacts of nutrition labels on food choice and purchase, and health and dietary outcomes, were excluded in this review. This exclusion may have led to the exclusion of studies assessing the effectiveness of labelling policies in relation to these consumer outcomes.

Furthermore, because of the restriction to English, Russian and Mongolian languages, papers published in other languages may have been missed.

Finally, quality appraisal of individual eligible studies was not conducted. Instead, studies were evaluated collectively, as a group based on the methods employed and the representativeness of the samples. For example, studies that determined self-reported label use were grouped separately from those that determined objective label use.

2.5.5 Conclusions

This review summarised the evidence on the development and implementation of food and nutrition labelling policies in LMICs, including Mongolia, as well as consumer awareness and use of such labels in these countries. The review also revealed significant gaps in the literature, including limited evidence regarding policy processes of food and nutrition labelling policies in LMICs, particularly from transition or low-income countries, a lack of in-depth policy analysis, and insufficient understanding of barriers and facilitators specific to policy processes in LMICs, as well as relevant contextual factors. While, the Mongolian government has attempted to integrate food labelling into national policies, there is a need for further clarification on how the food labelling policy was adopted, how people use it, and the implications of consumer response to food and nutrition labelling.

The major barrier to the development of food and nutrition labelling policies in LMICs is food industry resistance. Meanwhile, the primary challenges to policy implementation include poor policy governance, particularly a lack of monitoring and evaluation and limited resources, food industry resistance, and inadequate stakeholder engagement and consumer consultation. In contrast, successful policy development and implementation in LMICs are enabled by political commitments of governments, strong stakeholder engagement, and sufficient resource availability.

Consumers in LMICs reported high awareness and use of food labels, but relatively lower awareness and use of nutrition labels. Available evidence indicate a likely discrepancy in the use of nutrition labels among consumers in LMICs compared to those in high-income countries, with the former demonstrating comparatively lower use. In addition, there is scarce evidence providing objective measurements of consumer awareness and use of food and nutrition labels. Moreover, there is a gap in the available literature regarding the behaviour and awareness of consumers residing in lower SES areas and individuals with lower levels of education.

Chapter Three

METHODOLOGY

3.1 Preface

Chapter One provided the background and context for this research and highlighted the high prevalence of obesity and NCDs at the global level and in LMICs, including Mongolia, as a consequence of nutrition transition. It also outlined the potential importance of nutrition labelling in these countries as a strategy to address nutrition transition and prevent NCDs by promoting healthy diets. The high level of overweight and obesity and NCDs, as well as an increased availability of, access to, and consumption of processed foods in relation to the transition to a market economy justified the need for better food labelling policy in Mongolia. The literature review in *Chapter Two* identified the gap in the literature, that is, scarce evidence on the policy processes of food labelling policies and consumer responses to food and nutrition labels in LMICs, particularly a lack of evidence from low-income or transition countries, and a lack of objectively measured label use. Particularly, the Mongolian food labelling situation was largely unknown. However, it is expected that there is poor enforcement of the labelling regulations and low label use amongst consumers. The findings of the literature review supported the need for more evidence from LMICs and this PhD research sought to address these gaps in the evidence by investigating the case of Mongolian food labelling policy.

This chapter outlines the methods used to achieve the aim of this thesis to clarify Mongolian consumers' awareness and perceptions and use of label information with the intent to improve food labelling policy to support consumers to make informed food choices and hence to improve their health outcomes. This research applied a mixed methods design, comprising of four separate studies to address the four research questions outlined in *Chapter One*. **Study I** and **II** addressed the first research question and explored Mongolian consumers' responses to food and nutrition labels with a focus on their awareness and perceptions and use of food and nutrition labels and challenges faced in using label information (**Chapter Four**). **Study I**-Population-based survey explored the use of food and nutrition labels by Mongolian consumers by using a nationally representative population sample. **Study II**-Supermarket intercept survey further examined label use by interviewing shoppers in the supermarket context. **Study III**- Food labelling policy analysis investigated the development and implementation of food labelling policy and regulations in Mongolia and barriers and facilitators to these processes, as well as the extent these policy and regulations align with consumer needs that addressed the second research question (**Chapter Five**). Lastly, **Study IV**- Audit of food labels analysed labels of food products available at the Mongolian marketplaces under the third research question to assess how food labelling regulations are reflected in labelling practices and its impact on consumers' use of label information (**Chapter Six**).

This chapter first presents the conceptual framework that guided the design of the research and analysis of the data. Theoretical frameworks underpinning this conceptual framework are also introduced. This is followed by the research design and descriptions of research methods for each study, including sampling and recruitment, and processes for data collection and data analysis employed in the studies. Lastly, ethics consideration related to each study is provided.

3.2 Conceptual framework

Food choice is a complex process of value negotiations that depend on many factors, including food-internal factors (sensory and perceptual features), food-external factors (information, social environment and physical environment), personal-state factors (biological features and physiological needs, psychological factors, and habits and experiences), cognitive factors (knowledge and skills, attitude, liking and preference, anticipated consequences, and personal identity) and sociocultural factors (culture, economic variables and political elements) (Chen & Antonelli 2020). Food label use is considered as a food-external factor that influences consumers' food choice (Drichoutis et al. 2007).

In this research, an integrated conceptual framework was developed to guide the study design and analysis of data on consumer response to food and nutrition labels and development and implementation of food labelling policy in Mongolia (**Figure 3.1**). In line with the study objectives, the framework integrated both consumer and policy components of food labelling.

The consumer part of the framework, outlining consumer responses to label information, was adapted from the theoretical frameworks of Grunert and Wills (Grunert & Wills 2007) and Jacobs et al. (Jacobs et al. 2011). These frameworks defined how consumers make food choice decisions based on label information, and identified internal and external factors influencing this process. The theoretical frameworks were chosen because of their specific focus on food label use and explaining this behaviour drawing on the major consumer behaviour theories, as well as their wide use in similar studies on consumer use of food and nutrition labels (Bommer 2019; De la Cruz-Góngora et al. 2012; Gomes et al. 2020; Grunert et al. 2010; Grunert et al. 2010b; Hersey et al. 2013). Besides the above theoretical frameworks, the conceptual framework of this study was informed by previous studies reporting on the factors influencing consumer responses to food labels (Balasubramanian

& Cole 2002; Campos et al. 2011; Cowburn & Stockley 2005; Dharni & Gupta 2015; Drichoutis et al. 2005; Grunert et al. 2010b; Grunert & Wills 2007; Hung et al. 2017; Jacobs et al. 2011; Kumar & Kapoor 2017; Mandle et al. 2015; Mhurchu & Gorton 2007; Vemula et al. 2014; Vijaykumar et al. 2013).

As reflected in the conceptual framework, the consumer decision making process based on food label information consists of several steps of consumer response, starting from consumer awareness of food labels and ending in informed food choice. In the conceptual framework, consumer awareness was included as the individual step in the consumer response to food labels. Consumers' use and understanding of food label information are affected by their sociodemographic characteristics and nutrition knowledge. Nutrition knowledge motivates label use through awareness of food labels, as well as through health consciousness and attitude and perception of food labels. Having health reasons also motivates consumers to use labels. Consumers' understanding of label information is influenced by nutrition knowledge and it determines how and if the label information is used during food choices. Label use is also influenced by other factors, including factors associated with individual characteristics, such as situational and physiological factors, as well as product related factors (**Figure 3.1**). This research is focused on the initial steps in the consumer response to food labelling that are consumer awareness, attitude and use of food labels as these are considered to be important steps for food labels to influence consumer food choice and purchase and have an effect on dietary and health outcomes. Consumer response outcomes and factors influencing these outcomes that are addressed in this research are shown in green colour in the diagram of the conceptual framework (**Figure 3.1**). The consumer part of the conceptual framework guided the designing and data analysis of Study I and II, the population-based and supermarket intercept surveys (**Chapter Four**).

The conceptual framework integrated food labelling policy as an external factor affecting consumer label use. The conceptual framework used two theories of policy analysis, the *Health Policy Analysis Triangle Framework* developed by Walt and Gilson (Walt & Gilson 1994) and the *Advocacy Coalition Framework* (Jenkins-Smith & Sabatier 1994; Sabatier & Weible 2014) to analyse the development and implementation of the food labelling policy in Mongolia and identify barriers and facilitators to the policy processes (**Study III, Chapter Five**). The *Health Policy Analysis Triangle Framework* was used to understand policy processes related to food labelling policy, revealing the connections between policy processes, policy actors, policy content and policy context. The framework clarified influences of policy context on the agenda setting and policy set-up processes, and policy actors, as well as on the engagement of policy actors in policy making and implementation, and their role and power in these processes. The framework was used to guide the development of the semi-structured interview guide used in Study III and the data analyses. The framework was chosen for this research because of its broad focus, covering both policy development and implementation, and also its simplicity and ease of use. The framework has been commonly used in health policy analysis (Gilson & Raphaely 2008), including in a similar study from Iran on the adoption of traffic light labelling policy (Edalati et al. 2020). The *Advocacy Coalition Framework* informed the data analyses and it complemented the interpretation of the policy processes by explaining coalitions' actions within policy subsystems and external factors influencing the policy change. The framework explained how resources of policy subsystems affected the adoption of Mongolian food labelling policy and how policy core beliefs of the coalition of government agencies determined the focus of the policy.

Lastly, the conceptual framework contains the component of label availability, label information and label format as a factor affecting food label use. **Study IV**- Audit of food labels addressed this component and assessed labels of food products that available at marketplaces (**Chapter Six**). The theoretical frameworks underpinning the conceptual framework are described below in more detail.

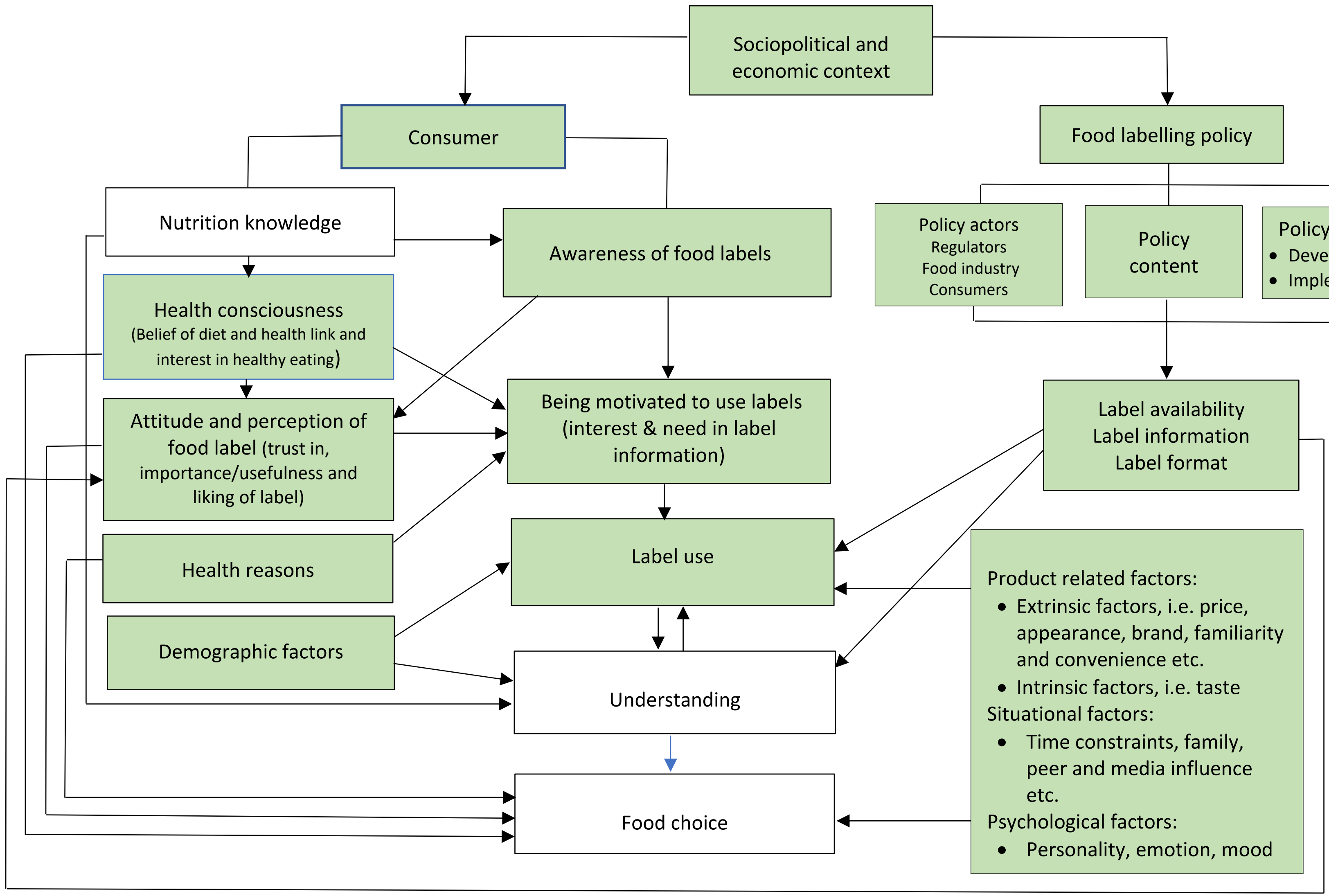

Figure 3.1 Conceptual framework adopted for this research

3.2.1 Theoretical framework of Grunert and Wills

The theoretical framework of Grunert and Wills explains consumer decision making process in food choice based on label information (Grunert & Wills 2007). The framework is driven by the theories of consumer decision making (e.g. Engel 1968) and hierarchy of effects models of communication effects (e.g. Lavidge & Steiner 1961). As defined by the framework, the consumer decision making process of using food labels in food choice consists of several stages, including search for and exposure to label information, reading or perceiving, understanding and liking the information, and using it in making food choice. As defined by Grunert and Wills (2007), for labels to have any effect on food choice, firstly consumers should be exposed to the label information. Exposure to the label happens by accident or with intention through active search by those who have an interest in it. Once the label is read or perceived and understood, inferences will be made about the meaning of the information provided, which could ultimately guide the purchase decision. Also liking of the label by consumers (the label is considered by consumers as easy to understand and useful) can affect the use of the label. Interest and understanding of label information are influenced by the level of nutrition knowledge of consumers. Finally, the label information is used in choosing of food. Search, exposure, reading or perception, understanding and use of labels are influenced by consumers' interest in, and knowledge of nutrition, consumer demographics and label format (Grunert & Wills 2007).

3.2.2 Conceptual framework of Jacobs et al.

The framework by Jacobs et al. (2011) extended the Grunert and Will's framework by adding external factors that affect label use. The external factors include food labelling regulations and the role of food manufacturers, and food label information itself, as well as internal factors that affect consumer food choice and food label use, including product attributes (price and taste etc.) and situational factors (time constraints, work status and income). By including these factors, the framework enables better understanding of consumer behaviour of food label use. Furthermore, the framework included need or motivation to use label information as an individual response step, preceding the step of information search, which includes in reading, interpreting and understanding of the information, followed by evaluation and use of the information, and informed food choice (Jacobs et al. 2011). The framework was adapted from the conceptual frameworks of Balasubramanian and Cole (2002), Drichoutis et al. (2005) and Gracia et al. (2007).

3.2.3 Health Policy Analysis Triangle

The *Health Policy Analysis Triangle Framework* is a simple analytical framework developed by Walt and Gilson (1994) for analysis for health policies. It focuses on policy content, context, process and actors. Health policy is public and private policies about health that affect the institutions, organisations, services and funding arrangements of the health system (Buse et al. 2012). Health policy research has previously been largely focused on the content of policy, neglecting actors, context and processes (Walt et al. 2008). The framework aims to overcome this drawback by enabling systematic consideration of all the different factors that might affect policy and their interrelations. It also clarifies who influences policy making (policy actors), how they exercise that influence (policy process), and under what conditions (policy context), and thus explains the attainment or failure of the policy (Buse et al. 2012; Gilson et al. 2018). Actors are influenced by the context, and context is affected by ideology, history and culture. Policy processes are affected by actors, their positions in power structures, their values and their expectations. Power is a mixture of individual wealth, personality, level of or access to knowledge or authority, and it is tied up with the organisation and structures (including networks), within which the individual actor works and lives. To understand how policies change, there is a need to analyse the context in which decisions are made. Context refers to political, economic and social factors that may affect health policy. These factors can be categorised into situational (e.g. wars, droughts, elections, incidents), structural (e.g. the political system, type of economy, demographic features or technological advance), cultural (e.g. hierarchies, ethnic minorities, linguistic differences, gender and religious factors) and international or exogenous (e.g. role of international organisations) factors. Policy processes include initiation, development or formulation, negotiation, communication, implementation and evaluation of policies (Sabatier & Jenkins-Smith 1993). The content of policy reflects these dimensions. The framework can be used both retrospectively to analyse past policy, and prospectively to help in changing existing policy (Buse et al. 2012).

3.2.4 Advocacy Coalition Framework

The *Advocacy Coalition Framework* explains that policy change is a continuous process taking place within a policy subsystem, in which advocacy coalitions are formed between actors on the basis congruency in their belief system and coordinated political strategizing (Jenkins-Smith & Sabatier 1994; Sabatier & Weible 2014). Advocacy coalitions share a distinct set of norms, beliefs and resources, and advocacy coalitions are defined by their ideas. The *Advocacy Coalition Framework* has some previous applications in public health policy studies (Pierce et al. 2020).

The *Advocacy Coalition Framework* conceptualizes a three-tiered hierarchy of belief systems, including *deep core beliefs, policy core beliefs* and *secondary beliefs* (Jenkins-Smith & Sabatier 1994). *Deep core beliefs* involve fundamental normative values of basic human philosophy, such as liberty, equality and priority of welfare of different groups. Policy core beliefs refer to the basic policy positions concerning the basic strategies for achieving core values within the subsystem. Examples of policy core values are basic value priorities, identification of groups whose welfare is of greatest concern, basic cause of problem and priority to various policy instruments. Secondary beliefs are substantively and geographically narrower than policy core beliefs and relate to administration and policy implementation issues, such as the scope of the policy, the degree of implementation and support for the policy. They are considered less difficult to change. The policy-oriented behaviour of actors is dominated by their *deep core beliefs* and *policy core beliefs*.

Sabatier argues that policy change occurs with the changes in the beliefs of coalitions, and it occurs through four primary pathways, including external and internal factors, and through policy learning and negotiated agreements (Sabatier & Weible 2007). There are two types of external factors, including relatively stable parameters and dynamic external events. External stable parameters include the basic attributes of the problem, fundamental sociocultural values and structure, and constitutional structure. Dynamic external events are changes in socioeconomic conditions, governing coalitions and regime, and changes in policy decisions from other subsystems (Sabatier & Weible 2014). Internal factors include major internal shocks that occur within a policy subsystem when crises, failures of the policies and behaviours of a dominant advocacy coalition lead to a major policy change. Internal shocks question policy core beliefs of the dominant coalition and confirm the policy core beliefs in minority coalitions. These external and internal factors affect subsystem actors through the resources and constraints, which include legal authority, public opinions, information, mobilizable troops, financial resources and skilful leadership. Less fundamental policy changes result from policy learning. Policy learning is a process whereby decision makers revise their current policy choices in the light of past mistakes or successes, and it usually affects *secondary beliefs* of actors (Sabatier & Weible 2014). Lastly, negotiated agreements are the primary pathway of policy change. Negotiations may also occur between two or more coalitions (Jenkins-Smith et al. 2014).

3.3 Ontology and epistemology

Ontology and epistemology are philosophical assumptions and principles underpinning scientific research studies. Ontology is the study of being and it concerns what constitutes reality, in other words *what is* (Cohen & Centeno 2006). Epistemology is assumptions about how we know the world, how we gain knowledge, the relationship between the knower and the known, in other words *what it means to know* (Creswell 2009). Epistemological assumptions are concerned with how knowledge can be created, acquired and communicated. Methodology is the strategy or plan of action which lies behind the choice and use of particular methods (Crotty 1998).

This study adopted a pragmatist ontological position and a pragmatist epistemology as philosophical foundations. Pragmatists focus on the nature of experience unlike other paradigms that emphasise nature of reality (Morgan 2014). Pragmatist position views that knowledge and reality are based on beliefs and habits that are socially constructed (Yefimov 2004). Pragmatists argue that actions are linked to human thoughts and depend on worldviews that are socially shared sets of beliefs, and people take actions based on the possible consequences of their action (Morgan 2014). Pragmatist epistemology offers a flexible and more reflexive approach to research design that researchers collect data by "what works" to address research question (Creswell & Clark 2017). Pragmatism provides a philosophical foundation for mixed-methods research (Morgan 2014).

3.4 Research design

The research utilized a parallel mixed methods design, comprising quantitative and qualitative methods, to achieve its objectives. Mixed methods refers to "research in which the investigator collects and analyses data, integrates findings, and draws inferences using both quantitative and qualitative approaches or methods in a single study or program of inquiry" (Tashakkori & Creswell 2007). Mixed methods are increasingly recognised as a valuable approach because of complementary interpretation of findings based on data from multiple different sources, reduced biases associated with utilising a single method and increased validity and depth of the studies (Greene et al. 1989). Mixed methods design well suited to the purpose of our research to describe, evaluate and explain (or understand) people' behaviour of label use and the status of food labelling policy in Mongolia. This research is comprised of four studies, including a population-based survey (**Study I**), a supermarket intercept survey (**Study II**), food labelling policy analysis (**Study III**), and audit of food labels (**Study IV**) that explored quantitative and qualitative methods (**Figure 3.2**).

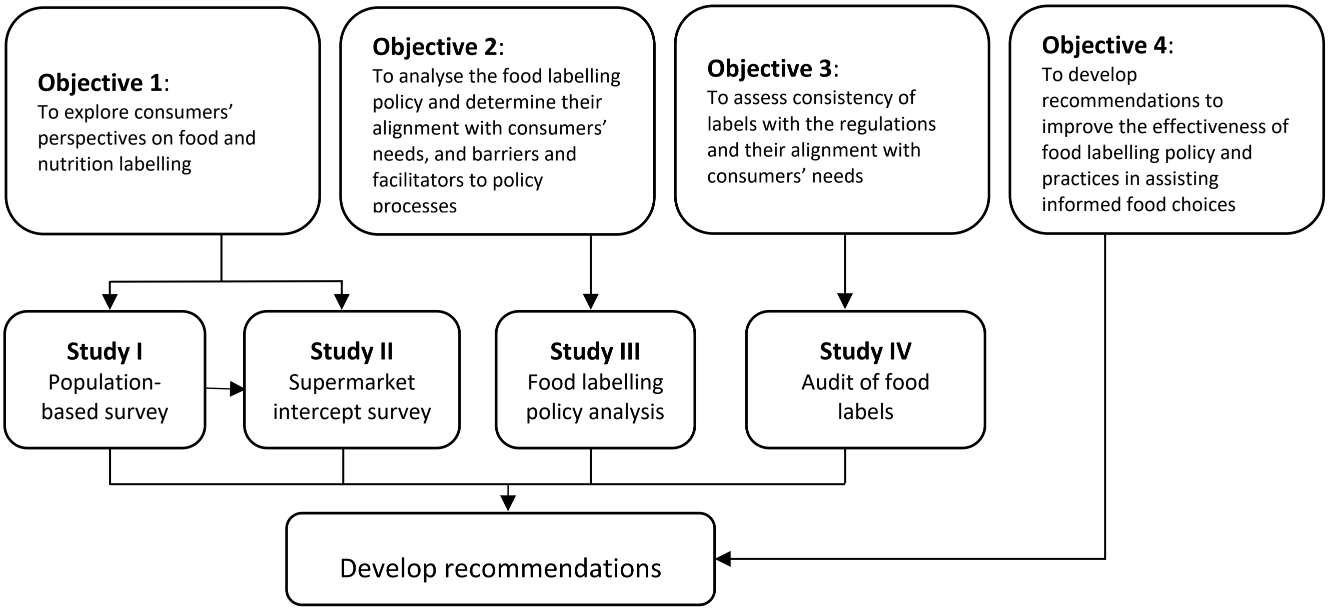

Figure 3.2 Research studies and their relevance to the research objectives

In order to improve the effectiveness of food labelling policy in assisting consumers to make informed food choices, it is important to explore the issue from several perspectives. Looking at the issue from the perspectives of both the labelling policy and its enforcement and the consumer side helps to understand how well the current policies align with consumer needs and identify possible barriers to the development and implementation of the policy. With the purpose to inform food labelling policy to better reflect consumers' needs, the research was primarily focused on exploring consumers' perspectives (awareness, perception and use) on food and nutrition labelling. The consumer study, comprising of two surveys (**Study I and II**), was conducted to achieve this objective. Two other studies, a qualitative study on food labelling policy (**Study III**) and an audit of labels of food products (**Study IV**) complimented the consumer studies by clarifying the degree of alignment of the existing food labelling policy and regulations and labels food products to the consumers' needs and expectations. The audit of food labels helped to clarify the extent of the implementation of the labelling policy in practice, as well as compliment the analysis of the policy by reflecting the gaps in the existing regulations. Findings of all four studies were triangulated in the final discussion by exploring the complementarity of the findings of the studies to understand the issue.

The following sections detail the methods applied for each study, including the study design, study population and sampling, recruitment process and research setting, data collection and analysis.

3.5 Study methods

3.5.1 Study I – Population-based survey

The population survey was undertaken at the beginning of the Researcher's PhD of as a preliminary exploration of the issue due to the lack of available evidence in Mongolia at that time. The aim of the study was to explore and develop a preliminary understanding of Mongolian consumers' perceptions and use of food and nutrition labels, while also investigating the factors that influence label use. The study provides a general overview of consumer perspectives of food labelling, which has laid a solid foundation for the rest of the PhD research. The survey was based on the Fifth Mongolian National Nutrition Survey (MNNS-V), a nationwide cross-sectional survey which was conducted in Mongolia in 2016. Integrating the study into an existing national nutrition survey facilitated collecting nationwide data in a feasible and cost-effective way, despite its limitations. Furthermore, it provided a valuable opportunity to investigate food labelling within an existing government-run national nutrition survey, thereby raising awareness of this issue the government itself. The findings of the survey were used for the development of **Study II**-Supermarket intercept survey, the methods of which will be discussed in **Section 3.5.2.**

3.5.1.1 Study design

The study utilised a cross-sectional design following the study design of the main survey, the MNNS-V. Cross-sectional design allows to collect data from a study population at one point in time, providing a snapshot of the characteristics or prevalence of certain variables at that specific moment (Ruel et al. 2016). The current study employed a cross-sectional survey design, primarily based on participants from the MNNS-V, to explore consumer perspectives on food labelling at a broader population level using a representative sample. To accomplish this, the survey questionnaire clarifying consumers' perceptions and use of food and nutrition labels was integrated into the MNNS-V questionnaire.

3.5.1.2 Study population and sample size

In our survey, almost all participants (97.4%) were aged between 15-64 years (they were also participants of the MNNS-V), and 65.6% of participants were female. The survey employed probability sampling, and the sample size to represent the Mongolian population was estimated to be 1540 individuals. This was estimated independently from the MNNS-V's sample size, which was estimated to recruit a total of 3500 individuals aged between 15-64 years (2250 women and 1250 men) residing in four regions and the capital city of Ulaanbaatar, Mongolia (MOHM, NCPHM & UNICEF 2017). The details of the sampling methodology are provided in *Chapter Four,* where **Study I**-Population-based survey was presented.

3.5.1.3 Survey instrument

A questionnaire was developed guided by the theoretical frameworks by Grunert and Wills, as well as Jacobs et al. (See 3.3 Conceptual framework), and adapted from an existing tool used in a similar study conducted in Australia (Paterson et al. 2003). Details of the development of the questionnaire (**Appendix F**) can be found in *Chapter Four,* where **Study I**-Population-based survey was presented.

The content validity (Leavy 2016) of the questionnaire was conducted by Professor H. Yeatman. Questionnaire was introduced to data collectors during the training of field workers of the MNNS-V, and instructions were given on how to administer it.

3.5.1.4 Recruitment of participants and data collection

The survey was conducted nationwide in Mongolia from September to November 2016. Details of recruitment of participants and data collection were provided *Chapter Four*, where **Study I**-Population-based survey is presented. The response rate for the survey was 90.5%, with 1394 individuals (421 males and 973 females) recruited in the survey.

The questionnaire was administered in-person by data collectors by visiting the selected households. Prior to commencing the survey, the purpose and procedure of the survey were explained**,** and written consents (**Appendix E**) were obtained from all participants.

3.5.1.5 Data analysis

Data from the questionnaires were entered into EpiData 3.1 using double data entry. Two methods of data quality assurance were employed using the EpiData data entry forms to allow for immediate detection and correction of errors. Firstly, interactive checking was incorporated into the data entry files before data keypunching. This involved setting required variables to prevent missing data, specifying data values or numerical ranges (e.g., participants' gender being entered as a value 1 or 2 only), and setting conditional skip patterns to guide the data entry process. Additionally, restricted data entry was implemented where possible to ensure that only valid responses corresponding to the questionnaire were entered. Secondly, as a validation step, all data were entered twice into separate EpiData files by different data operators. Discrepancies between the two files were identified and resolved for correction. Once the final EpiData forms for survey questionnaire were prepared, the data were exported to IBM SPSS version 25.0 for further data cleaning and quality assurance. The data cleaning process involved generating (unweighted) frequency distributions for each variable in data file. These distributions were checked for unusual values, outliers, and implausible answers to respective questions. Any seemingly incorrect values were cross-checked against original paper questionnaires. To calculate prevalence estimates for key questions, weights were generated for each respondent.

A descriptive statistical analysis was carried out for all variables related to consumer behaviour on food and nutrition labelling using IBM SPSS Statistics version 25.0 with complex survey module. The frequency estimates were calculated using a weighted analysis to account for the unequal probability of cluster selection in each strata (urban and rural). The bivariate analyses (Chi-square) were performed to determine relationships between key dependent variables and influencing independent variables. The statistical precision of all estimates was assessed using 95% confidence intervals that accounted for the complex stratified cluster sampling design. Statistical analysis support was received from the UOW Statistical Consultancy Services.

Binary logistic regression was utilised to determine the relationship between the use of food and nutrition labels (used/did not use), the binary dependent variable, and a set of independent variables. The independent variables included demographic variables (sex, age, location, education, employment and marital status) and other variables such as interest in healthy eating and perceived usefulness of food labels. The independent variables were included in the binary logistic regression model to explore which variables had a significant impact on food label use. The results from the logistic regression model were reported as odds ratios with 95% confidence intervals. For all tests, $P < 0.05$ was considered statistically significant.

3.5.2 Study II - Supermarket intercept survey

The supermarket intercept survey aimed to examine consumers' use of food and nutrition labels in a real grocery shopping context, identify factors affecting label use, and provide recommendations to improve food labelling policy and practice based on consumer needs. In this survey, we further explored the findings of the population-based survey by including additional enquiries, including the reasons behind consumers' non-use of nutrition labels.

3.5.2.1 Study design

The study employed a supermarket intercept survey design, which involved interviewing shoppers in supermarkets and using real products during the interviews. Interviews were conducted in close proximity to the time when respondents actually used the labels, either at the time of purchase or shortly after. Supermarket intercept surveys allow for the collection of fresh feedback from respondents, providing a more accurate reflection of consumers' real-life label use behaviour (Chegg 2023).

Furthermore, in this study, efforts were made to enhance the accuracy of self-reported measures for label use. To achieve this, participants' responses regarding their use of label information were verified by asking them to indicate on the product labels the specific information they claimed to have examined. This approach improved the accuracy of self-reported measures compared to simply relying on yes-or-no questions about label use. A similar method was used in a UK study (Grunert et al. 2010b) where participants were asked to indicate on the package the nutrition information they claimed to have looked at. In this study, participants were also observed to confirm whether they looked at the labels of the products purchased during their shopping trip. In the study, 27% of the respondents answered that they looked at the nutrition information on the label and indicated where they had found that information. During the observation, 21% of the respondents were observed looking at the labels of the purchased products, with most of these respondents being those who claimed to have looked at the labels. These findings support the validity of the determined nutrition label use. Furthermore, 47.4% of respondents claimed to always or regularly look at nutrition information. The researchers concluded that self-reporting resulted in an overreporting of approximately 50% in nutrition label use when compared to direct observation and subsequent interviewing with verification during the actual purchase (Grunert et al. 2010b).

3.5.2.2 Study population and sample size

The survey targeted shoppers in supermarkets located in the capital city of Ulaanbaatar, Mongolia. Convenience sampling was used for recruiting of participants and the sample size was calculated based on available resources. The interviews with shoppers were planned to be conducted in four selected supermarkets over three days, including one weekend day and two weekdays. The interviews were scheduled during morning and afternoon hours, specifically between 10 am and 12 pm, 2 pm and 4 pm, and 5 pm and 7 pm on weekdays, as well as between 10 am and 12 pm, and 2 pm and 4 pm on weekends, to capture different profiles of shoppers. The estimated number of interviews was approximately256, based on the assumption that at least two interviews would be attempted per hour per researcher. Consequently, this resulted in 12 interviews per weekday (6 hours per day) and 8 interviews per weekend day (4 hours per day) per researcher (**Table 3.1**). It was planned for two data collectors to conduct interviews over a period of two weeks.

Table 3.1 Targeted number of participants in supermarket interviews

Study area	Location of supermarkets	Interview days	Number of interviews per researcher			Total number of interviews
			during weekdays	during weekend	total	
Chingeltei district	Apartment area	Monday, Wednesday & Saturday	24	8	32	64
	Ger area	Tuesday, Friday & Sunday	24	8	32	64
Khan-Uul district	Apartment area	Monday, Wednesday & Saturday	24	8	32	64
	Ger area	Tuesday, Friday & Sunday	24	8	32	64
Total						256

3.5.2.3 Selection of supermarkets for the survey

The survey was conducted at three outlets of a large chain supermarket, My Store, as well as another small non-chain supermarket. The sampled supermarkets were small to medium in size and were chosen from areas with different SES in Ulaanbaatar city, Mongolia. The management of the selected chain and non-chain supermarkets was approached through official invitation letters (**Appendix H**) to participate in the survey, and their approval for the survey was obtained (**Appendix I**). The details of the store sampling for the survey are provided in *Chapter Four*, where **Study II**-Supermarket intercept survey is presented.

3.5.2.4 Survey Instrument

In addition to being guided by the theoretical frameworks by Grunert and Wills, as well as Jacobs et al., which were used in the conceptual framework of this research, the survey questionnaire was developed by adapting a validated tool used in a previous UK study (Grunert et al. 2010b). The questionnaire incorporated various aspects of label use, including the use of food and nutrition label information by participants (looking at label information), reasons for non-use and challenges faced in using food and nutrition labels, major considerations in food purchase (taste, price, familiarity, nutrition information on the label and others), and sociodemographic characteristics of participants (sex, age, education, employment, having children and their role in household food shopping) (**Appendix K**).

In this study, food labels refer to all information on the label, including best-before/use-by dates and nutrition-related information (nutrient declarations and ingredients list). Nutrition labels specifically refer to nutrient declarations and ingredients list. The details of the development, translation and pretesting of the questionnaire are provided in *Chapter Four*, where **Study II**-Supermarket intercept survey is presented.

3.5.2.5 Recruitment of participants and data collection

The purpose and procedure of the survey were explained to participants, and they were provided with participant information sheet containing detailed information about the project (**Appendix G**). Written consent (**Appendix J**) was obtained from all participants. Additionally, the researcher asked for permission from participants to record the details of the products they had purchased.

Firstly, participants were asked if they had looked at any information on the labels of products they had purchased (up to three products) and were further asked to locate that information on the label. They were also asked whether they had previously purchased these products. If a participant had not looked at the label, the reasons for not doing so were clarified. In the second part of the interviews, participants were questioned about their usual behaviour regarding food and nutrition label use, including reasons for non-use and challenges in using of food and nutrition labels. They were also asked about their decision-making process regarding food purchase, factors that guide their decisions, and whether they typically base their purchase decisions on label information. Details of the survey procedure and participant recruitment can be found in *Chapter IV*, where **Study II**-Supermarket intercept survey is presented.

3.5.2.6 Data Analysis

The data were entered into IBM SPSS Statistics version 25.0 and analysed descriptively and inferentially. Frequencies of self-reported use of food and nutrition labels were estimated. Cross-tabulations were used to compare the use of different label information across demographic characteristics. Pearson's Chi-square test was employed to compare differences in frequencies of food and nutrition label use across sociodemographic variables. Binary logistic regression was conducted to investigate associations between food label use (nutrition label use) and sociodemographic and other variables. The independent variables of age, sex, level of education, employment, SES of the area, having children, buying the product for the first time, and role in food shopping were included in the model as potential predictors for reading expiry date information and nutrition information (dependent variables). Maximum likelihood estimates and odds ratio (OR) estimates were analysed. Omnibus Tests of Model Coefficients and Hosmer-Lemeshow test were used as measures of goodness of fit of the model based on the Chi-square test. Odds ratios, 95% confidence intervals, and P values were calculated. P values <0.05 were considered significant in the final models.

3.5.3 Study III - Food labelling policy analysis

Food labelling policy analysis aimed to analyse food and nutrition labelling policy in Mongolia and determine policy drivers, and facilitators of, and barriers to, the development and implementation of the policy, and determine alignment of food labelling policy with consumers' needs and expectation. The study clarified how policy processes of food labelling policy in Mongolia are influenced by underlying contextual factors attributable to the transition and the legacy of the socialist system.

3.5.3.1 Study design

A qualitative study using a key informant interview design was used for this study. Qualitative research is a methodology that aims to explore people's subjective perspectives and experiences, generate meanings, and develop in-depth understanding of social phenomena (Leavy 2014). A qualitative approach is well suited for exploring complex phenomena and uncovering new insights and meanings, particularly when there is limited existing knowledge (Leavy 2014). This approach aligns well with exploratory nature of this study, which seeks to understand the policy processes of the Mongolian food labelling policy, which is currently not well understood.

By utilizing qualitative methods such as inductive analysis and semi-structured interviews, researchers can discover patterns, themes, and categories in the data and gain a rich understanding of the phenomena under investigation (Leavy 2014). Conducting interviews with key stakeholders can provide rich and in-depth information for policy analysis (Leech 2002). Semi-structured interviews were selected as the data collection method due to their ability to provide a general outline of the topic and guide for the interview, while allowing open-ended discussion with the flexibility to explore additional areas that may arise (Leavy 2014). Furthermore, individual interviews are preferred over group interviews when dealing with sensitive topics as they allow for exploring the opinions, experiences, understanding and motivations of individual participants on the specific topic of interest (Buse et al. 2012). In this study, individual interviews were deemed suitable for engaging participants holding top and middle-level positions in governmental, consumer, and food producers' organisations in Mongolia, and capturing insights into their experiences and perspectives regarding the food labelling policy implemented in the country.

3.5.3.2 Development of interview guide

A semi-structured interview guide was developed guided by the Health Policy Analysis Triangle Framework (Walt and Gilson, 1994), covering the areas of policy context, content, process and actors. Details of the interview guide (**Appendix N)** were provided in *Chapter Five*, where **Study III**- Food labelling policy analysis is presented.

3.5.3.3 Setting up the interviews

A qualitative study was undertaken in Ulaanbaatar, the capital city of Mongolia, between November 2017 and March 2018. Opinions and views regarding food labelling policy and regulations in Mongolia were explored via semi-structured interviews with government officials, representatives of consumer organisations and food producers. Details of sampling and recruitment of key informants were provided in *Chapter V*, where **Study III**- Food labelling policy analysis is presented.

Participants were invited by email to participate in interviews and the participant information sheet was provided (**Appendix L**). Before the interviews, all participants provided informed written consent (**Appendix M**).

3.5.3.4 Data collection

Procedures for the interview conduction were provided in *Chapter Five*, where **Study III**- Food labelling policy analysis is presented.

3.5.3.5 Data analysis and research rigour

Details of data analysis and research rigour were provided in *Chapter Five*, where **Study III**- Food labelling policy analysis is presented. In addition, the PhD researcher was familiar with the public health system and food and nutrition area in Mongolia and previously worked in a government public health research institute under the Ministry of Health, Mongolia for more than 15 years in the field of food and nutrition. This insider position of the PhD researcher enabled deeper understanding of the issue and interviewees' opinions, and along with the project research team consisting of public health experts who are outsiders to the issue, was ideal for analysing critically the policy processes of the food labelling policy in Mongolia and bringing forward recommendations to improve the effectiveness of the policy.

3.5.4 Study IV – Audit of food labels

A selective analysis of labels of food products available in the Mongolian marketplaces was conducted with the purpose to get a snapshot of existing food labelling practices with an overview of the content and scope of label information to assess the consistency of food labels with the food labelling policy and regulations, as well as their alignment with consumers' expectations and needs.

3.5.4.1 Study design

Cross-sectional, observational survey design was used for this study.

3.5.4.2 Food products covered and data collection

Food products covered in the audit were divided into 11 major categories, each consisting of sub categories or product types (**Chapter Six**). Food label information was collected by undergraduate students studying nutrition, public health and nursing in two local universities, the Mongolian University of Science and Technology (School of Industrial Technology) and the National University of Medical Sciences (Public Health School and Nursing School). Prior to the survey, the PhD researcher has contacted with lecturers of the schools regarding the survey and explained the aim and procedure of the survey. A letter of invitation to take part in the survey (**Appendix O**) was sent to the course directors at the universities explaining the aim and procedure of the survey, and approvals to involve their students in the survey were obtained (**Appendix P**). With the school approval, the PhD researcher met students of selected groups by visiting during their class hours and gave a detailed instruction regarding data collection.

In the final sample, label information of 1723 products of 11 major food categories which were available in the market places, including supermarkets, grocery shops and food markets, was collected. Further details of selection of food categories for the survey and procedure for data collection were provided in *Chapter Six*, where **Study IV**- Audit of food labels is presented.

3.5.4.3 Data analysis

Data were entered into Microsoft Excel (2016) and then converted into IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, N.Y., USA) for analysis. Descriptive analysis was carried out for the recorded information drawn from the label photos. Cross tabulations comparing frequencies of individual label information, including nutrition information across four different label language groups and product types were produced and the scope of and variations in label information were determined by the label language groups. In addition, the scope of label information was compared with the requirements of food labelling standard and non-complaint rates of label information were estimated by the label language groups.

In addition, credibility analysis of nutrition and health claims carried by food products was undertaken and details of the data analysis and the findings of this analysis were presented in the published article reproduced in *Chapter Six*. Furthermore, products with nutrition and health claims were assessed for their healthiness by comparing their nutrient content against the WHO nutrient profile model for the Western Pacific Region (WPR) (WHO 2016b). Findings of this assessment was also discussed in the published article.

3.6 Ethics considerations

The study obtained ethics approval from the Human Research Ethics Committee of the University of Wollongong on 24 October 2017 (Project identification code: 2017/394) (**Appendix C**). For the **Study I**-Population-based study, ethical approval was obtained from the Medical Research Ethics Committee (MREC) under the Ministry of Health of Mongolia on 26 August 2016 (MREC/No10) as a part of the MNNS-V (**Appendix D**).

Additionally, for the **Study II**-Supermarket intercept survey, permission to undertake interviews with shoppers in its chain supermarkets was obtained from the administration of the supermarket chain 'My store'. Approval for engaging of students in the data collection for the **Study IV** – Audit of food labels was obtained from the School of Production Technology of the Mongolian Science and Technology University (**Appendix Pa**) and the Public Health School and Nursing School of the National University of Medical Sciences (**Appendix Pb**).

Participant confidentiality was maintained during data collection, data entry, data analysis, and dissemination of survey findings. To secure anonymity and confidentiality, questionnaires and key informant interview transcripts were kept anonymous, using only ID numbers. All paper-based and digital data were stored securely, in a locked cabinet or as password protected files with only authorised researchers listed in the ethics application had an access to the data.

For **Study I, II** and **III**, study participants and key informants were fully informed about the research before the interviews, including about the aim of the study, conduct of the interviews and their length, voluntary participation and securing anonymousness and confidentiality of personal information of the participants during and after data collection, and intended use of the data with the provision of the participant information sheets. Participants of the key informant interviews were notified that interviews will be audio-recorded and will be used only for research purpose. Participation in the studies was voluntary, and written informed consents were obtained from all participants involved in all studies, prior to the interview. Permission to audio record the data collection were given verbally at the time of interview. In **Study II**, to minimise the inconvenience to participants in relation to the time required to participate in the study, interviews with shoppers were kept brief, lasting no longer than 15 minutes.

Invitation letters explaining the aim and procedure of the study and inviting the organisation to participate in the study as a study site or a collaborating organisation were sent to all participating organisations and approvals were obtained. In **Study II**, shop attendants were informed about the conduct of the study prior to the study.

Chapter Four

CONSUMERS' PERSPECITIVES ON FOOD AND NUTRITION LABELLING IN MONGOLIA

4.1 Preface

Mongolian consumers' awareness and use of food and nutrition labels are unknown and no studies have previously explored these consumers' responses to food labelling. This gap in the literature is addressed in this chapter. The chapter reports findings of two surveys: 1) a population-based survey (Study I); and 2) a supermarket intercept survey (Study II). Both studies explored consumers' awareness, perception and use of food and nutrition label information. Both surveys clarified the use of label information in making food choices, and consumers' perception of food labels, and challenges faced and needs of consumers in using food and nutrition labels. The latter study extended the information gathered in the population survey by measuring food label use more objectively in a real world context to get more accurate data on food label use and clarifying why people do not use food labels.

The chapter firstly presents the population-based survey. The population survey explored awareness and attitudes of the Mongolian population toward food and nutrition labels in a broader population sample and explored their self-reported use of food and nutrition labels. The survey had an exploratory nature to obtain, for the first time, information on consumers' perceptions and attitudes toward food labels and their use of food labels. The survey informed the supermarket intercept survey.

The second part of the Chapter relates to the supermarket intercept survey. The supermarket intercept survey determined the actual use of food labels by consumers by interviewing them in real shopping context and verified label use by focusing questions on the food products purchased. The supermarket intercept survey found that the use of food and nutrition label information was minimal among consumers and food label information used most was expiry date. SES was an important predictor for food label use and higher SES consumers used food label information more than lower SES consumers. People largely relied on taste, familiarity and perceived quality of products in making food purchase and label information currently has only a minor impact on food choices and purchase. Lack of awareness and knowledge regarding food and nutrition labels, lack of motivation and labels written in foreign languages were the challenges to using food labels. The study highlighted the need to provide labels only in Mongolian language and public education on nutrition labelling for increasing the usefulness of food and nutrition label information to inform people's food choices.

The chapter first presents the manuscript of the population-based survey, which has been prepared for re-submission to a peer reviewed journal. Then, it presents an updated version of the manuscript of the supermarket intercept survey, incorporating the comments provided by the thesis examiners. The actual published paper of the supermarket intercept survey is included in the Appendices (**Appendix A**). Authors' contribution has been detailed in the Statement of Contribution.

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>
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4.2 Consumers' perceptions, attitudes and use of food and nutrition labels: Findings from a Mongolian population-based survey. *Draft manuscript*

4.2.1 Abstract

Obesity and non-communicable diseases (NCDs) are rapidly increasing in low and middle-income countries (LMICs) due to the ongoing nutrition transition in these regions (Kearney 2010; Popkin et al. 2017). Nutrition labelling is a policy action for promoting healthy diets and addressing unhealthy diet and obesity (WHO 2003). There is scarce evidence on food and nutrition labelling from LMICs, as well as transition countries, including Mongolia. A nationwide, cross-sectional, population-based survey was conducted in Mongolia, involving 1394 participants, to explore Mongolian consumers' perceptions, attitudes, and use of food and nutrition labels. The majority of consumers (68.4%) reported looking at food labels during grocery shopping, while 36.2% of participants reported looking at nutrition labels. Most participants (90.7%) used expiry dates. Nearly half of participants had positive perceptions and attitudes towards food labels. Labels written in foreign languages (74.1%), unclear label terms and symbols (71.9%) and small font size (58.6%) were challenging for consumers. Interest in healthy eating, perceived usefulness of food labels, and higher education level of participants were positively associated with the likelihood of using food ($P<0.001$) and nutrition labels ($P<0.05$). The findings highlight barriers to the use of food labels by Mongolian consumers, some of which may be addressed through increasing nutrition literacy and interest in labels, but most of which will require changes to food labelling policy.

Keywords: consumer, food, nutrition, label, use, population, Mongolia

4.2.2 Introduction

NCDs are the leading cause of death, equivalent to 71% of all deaths globally (WHO 2021). The World Health Organization (WHO) statistics show that 77% of all NCD related deaths are in low and middle- income countries (LMICs) (WHO 2021). The nutrition transition has rapidly progressed in LMICs in the last three decades, whereby consumption of discretionary foods are displacing traditional diets and leading to a rapid increase of obesity and NCDs (Kearney 2010; Popkin et al. 2017). In the next 40 years, diet-related NCDs are expected to at least double in LMICs (Ford et al. 2017).

Food labels provide a range of information, including the name of the food, product weight, a country of origin, manufacturer or distributer information, lot identification, date marking, directions for use and storage, and nutrition information (CAC 1985). Nutrition labelling is the section on a food label that includes nutrient declarations, which are the listing of the nutrient contents of a food, nutrition and health claims, ingredients list, and supplementary nutrition information, such as symbols or pictorial presentations of nutrient content, often shown on the front of the package (CAC 2013).

By providing useful information on the nutritional value of food, nutrition labels guide healthier food choices and promote healthy diets (Koen et al. 2016; WHO 2013). The WHO recommends nutrition labelling as an important policy action to promote healthy diets and address obesity, and adopts FOPL as one of the strategies for preventing NCDs (WHO 2003; WHO 2017).

Consumer use of nutrition labels is affected by various determinants, including socio-demographic characteristics, health and weight concerns, nutrition knowledge, awareness and knowledge of food labels, and motivation to use food labels. Additionally, external factors such as taste, price and brand also influence the use of food labels (Chen & Antonelli 2020; Grunert et al. 2010b). Nutrition information is typically not considered by consumers to be a major influence on food choice and is often ranked after taste, familiarity and price (Besler et al. 2012; Grunert et al. 2010a; Vemula et al. 2014). Non-use of food labels is often linked with unclear terms and symbols, and small font size (Besler et al. 2012; Danilola et al. 2019).

Compared to their counterparts, females (Besler et al. 2012; Bryła 2020; Grunert et al. 2010a), and individuals with higher levels of education (Besler et al. 2012; Chan et al. 2019; Jacobs et al. 2011; Vemula et al. 2014; Vijaykumar et al. 2013) are more likely to use food and nutrition labels. Higher income and social advantage have also been associated with increased label use (Campos et al. 2011; Cheah & Yip 2017; Chen et al. 2012; Mhurchu & Gorton 2007). Additionally, nutrition knowledge and awareness of food labels are positively associated with label reading and better information acquisition (Balasubramanian & Cole 2002; Drichoutis et al. 2005; Hung et al. 2017; Jacobs et al. 2011; Miller & Cassady 2015). Motivation is another important factor for label use, as it drives attention to and use of label information when making food choices (Balasubramanian & Cole 2002; Hung et al. 2017; Yoon & George 2012). Positive attitudes towards food labels and higher perceived benefits of label use drive label use through motivation, and are associated with increased label use (Ali & Kapoor 2009; Danilola et al. 2019; Dharni & Gupta 2015). Conversely, negative attitudes, such as perceived difficulties in using and understanding of food labels or time constraints discourage consumers from using it (Vijaykumar et al. 2013).

There is a substantial and growing evidence base exploring consumer responses to food and nutrition labels. However, the majority of these studies have been conducted in high-income countries. Although research on food labelling is increasing in LMICs, there is still a need for more research from these countries. LMICs are experiencing a double burden of disease, resulting from both overconsumption of discretionary foods and undernutrition (Koen et al. 2016). Furthermore, there is a scarce evidence on food labelling research from transition countries, including Mongolia, which has experienced a shift from a centralised economy to a market economy (Festila et al. 2014). In these countries, where the market economy is still relatively young compared to other countries, consumers have limited experience in using processed pre-packaged foods, potentially leading to less familiarity with food labels. Examining the uptake of food label information among the Mongolian population contributes to the existing evidence base by addressing the aforementioned research gap.

Mongolia is experiencing a rapid urbanization, with a significant proportion of the population migrating from rural areas to urban centres. This transition has led to changes in lifestyle and diet as traditional nomadic lifestyles are abandoned, resulting in reduced physical activity and increased consumption of processed foods (Bromage et al. 2020). As of 2020, the majority of the population (68.5%) resides in urban centres. However, internal migration has exacerbated various challenges such as poverty, unemployment, environmental pollution, inadequate infrastructure (unsafe water supply and poor sanitation), and limited access to health services, particularly in the growing peri-urban areas (Center for Health Development Mongolia & WHO 2020).

Changing food consumption patterns have been driven by changes in food supply and production, increased food imports and changes in lifestyle. Between 2011 and 2016, overweight and obesity rates nearly doubled in Mongolia, and in 2019, half of the Mongolian population aged 15-69 years was overweight and obese (Ministry of Health Mongolia, NCPHM & UNICEF 2017; Ministry of Health Mongolia & WHO 2020).

Mongolia adopted a new food labelling standard in 2018 (Mongolian Agency for Standardization and Metrology 2016), which requires mandatory nutrient declarations for all pre-packaged foods in line with Codex Alimentarius guidelines for nutrition labelling (CAC 2013). In addition, a voluntary front of pack labelling (FOPL) system (a combination of traffic light and Guideline Daily Amounts labels, providing the amounts of energy, fat, saturated fat, sugars and salt per 100g/100ml or per serving) was introduced in 2017 (Ministry of Health Mongolia 2017). Prior to this time, food and nutrition labelling requirements included The Food Safety Law (2012) (Government of Mongolia 2012) and two standards adopted from Codex, namely “General requirements for Labelling of pre-packaged food” (MNS CAC 1:2007) and nutrition labelling “Guidelines on Nutrition Labelling” (MNS CAC GL 2:2007), where the nutrition guideline recommended the content of energy and protein, carbohydrates and fat to be declared on a voluntary basis (Mongolian Agency for Standardization and Metrology 2007). Mongolian consumers’ responses to these policies are unknown and no studies have previously explored these consumer responses to food labelling.

The aim of this study was to provide baseline information on the perceptions, attitudes, and use of food and nutrition labels among the Mongolian population, as well as identify the factors associated with label use prior to the introduction of the new Mongolian food labelling standard and the voluntary FOPL guideline. The hypothesis was that there would be low use of food and nutrition labels among the population, and that the majority of consumers would not rely on label information when making food choices.

4.2.3 Methods

A cross-sectional survey was conducted in Mongolia from September to November in 2016. The survey was integrated into the Fifth Mongolian National Nutrition Survey (MNNS-V), which was a nationwide survey covering the capital city of Ulaanbaatar and all 21 provinces in four regions. The vast majority the participants in this survey were also participants of the MNNS-V, while the remaining participants were selected from other household members present during household visits for the national nutrition survey. The MNNS-V used a stratified, three-stage, cluster sampling technique, which has been described in detail elsewhere (Ministry of Health Mongolia, NCPHM & UNICEF 2017). MNNS-V participants were randomly selected from 150 primary sampling units (khoroo or bagh), which are the smallest administrative units in Mongolia. The sampling was conducted across five strata based on the four socio-economic regions of Mongolia and the capital city of Ulaanbaatar (Ministry of Health Mongolia, NCPHM & UNICEF 2017).

The sample size for this survey was determined separately from the MNNS-V and was estimated to be 1540 individuals. This sample size was calculated by stratifying the minimum required sample size of 385 individuals, which was estimated to represent the population of Mongolia (NSOM 2020) with a 95% confidence level and an expected food label use rate of 50% (Daniel & Cross 2013). The stratification was conducted based on area of residence (urban/rural) and sex (male/female), resulting in a total of 385 individuals in each strata (385 x 2 urban/rural x 2 male/female).

To achieve the desired sample size, an attempt was made to recruit at least one male and one female from every third household visited during the MNNS-V. This involved a total of 750 households from 150 clusters, with 5 households selected from each cluster. From each household, one male and one female aged 15-49 years (the same age range used in the MNNS-V) and who were typically parents of the child aged under 5 years selected for the MNNS-V, were invited to participate in the survey and were administered the questionnaire by fieldworkers. In some cases, in a few cases other household members who were present during the visit were also invited to participate in the survey even if their age fell outside the targeted age range in order to increase the response rate. Before conducting the in-person survey, the purpose and procedure of the survey were explained to the participants, and written consent was obtained from all participants.

4.2.3.1 Survey tool development

A questionnaire was developed to assess the participants' use of food and nutrition labels. The questionnaire also intended to gather information related to the demographic characteristics of participants, including age, gender, ethnicity, residential area, education, occupation, marital status and having children under the age of 16 (**Appendix F**). For assessing the use of food labels, the question "How frequently do you refer to labels when purchasing food products?" was asked. The responses were rated on a 5-point rating scale. Additionally, the use of specific label information, such as nutrition information, was assessed using a 3-point rating scale. Consumer perceptions, attitudes, and some label questions were measured using a 5-point Likert scale. This section of the questionnaire, which examined consumer perceptions, attitudes, and label use, was adapted from a similar study conducted in Australia (Paterson et al. 2003), with some simplification of the language. Questions specific to the Mongolian context were also added, including potential challenges in using food labels and language barriers in understanding the labels of imported products. Furthermore, probing questions were included to rank the label information (expiry date, ingredients list, nutrient declarations and country of origin) based on participants' frequency of reference. The questionnaire also clarified the participants' use of label information in making food purchase decisions and the types of label information typically used to inform those decisions.

The questionnaire was originally developed in English and subsequently translated into Mongolian. The translated version was pre-tested with ten Mongolian individuals to ensure clarity of the included questions and subsequently revised. The final version of the questionnaire and the accuracy of translation was confirmed through back translation.

4.2.3.2 Ethical considerations

Ethics approval for the survey was granted by the Medical Ethics Committee under the Ministry of Health of Mongolia on July 7, 2016. Written informed consent was obtained from all participants.

4.2.3.3 Data analysis

The data were entered into EpiData 3.1 and checked for consistency using double data entry. IBM SPSS Statistics for Windows version 25.0, with the complex survey module, was used for data analysis. Descriptive statistics, including frequency distribution and cross-tabulations, were estimated. The significance of associations between dependent and independent variables was assessed using the Chi-squire test. The statistical precision of all estimates was evaluated using 95% confidence intervals (CI), which accounted for the complex stratified cluster sampling design. The analyses were weighted by selected primary sampling units, and the results presented weighted percentages and mean values, as well as unweighted counts.

Binary logistic regression was utilised to determine the relationship between the use of food and nutrition labels (used/did not use) as the binary dependent variable, and a set of independent variables including demographic variables and other variables. The independent variables were included in the binary logistic regression model to explore which variables had a significant impact on food label use. Results from the logistic regression model were reported as odds ratios (OR) with 95% CI. For all tests, a level of $P < 0.05$ was considered statistically significant.

4.2.4 Results

4.2.4.1 Sample characteristics

The response rate of the survey was 90.4% (1394 participants). **Table 4.1** provides a summary of the demographic characteristics of participants. Among the 1394 participants, 65.6% were female, and the mean age was 31 years. The majority of the participants (83.9%) belonged to the Khalkh ethnic background, which is the main ethnic group in Mongolia. In terms of education, 43.3% had secondary or vocational education, while 42.9% had tertiary or higher education. A significant proportion of participants (90.7%) were married, and 79.6% had children under the age of 16. The majority (66.6%) resided in urban areas, including the capital city or province centers, while the remaining 33.4% lived in rural areas. In terms of employment, 22.5% worked in the public sector, 44% in private sector, and 25.9% were unemployed.

4.2.4.2 Food label use

Participants were asked about how often they look at food labels when purchasing food products. The weighted analyses revealed that out of 1394 participants, 68.4% (95% CI 63.9-

72.7) reported looking at food labels to some extent. Females, urban residents, participants with a higher education level, and those who interested in healthy eating or following a specific diet tended to examine food labels more frequently compared to their counterparts (**Table 4.1**).

Table 4.1 Sociodemographic characteristics of participants and label use

Characteristics		N (%)	Looked at food labels, % (95% CI)			Chi-square Test
			Non-Users	*Label users*		
			Never/ rarely	Sometimes	Often/ always	
Total		**1394 100.0**	**31.6 (27.4-36.3)**	**22.7 (19.3-26.5)**	**45.7 (40.8-50.6)**	
Gender	Male	421 (34.4)	36.1 (29.3-43.5)	25.8 (19.7-33.1)	38.1 (30.2-46.6)	χ^2 (1) =17.4 P=0.03
	Female	973 (65.6)	29.2 (24.4-34.5)	21.0 (17.7-24.8)	49.8 (44.7-54.9)	
Age	15-29	695 (49.4)	30.7 (26.1-35.9)	21.2 (17.6-25.4)	48.0 (42.8-53.2)	χ^2 (1) =3.1 P=0.39
	>30	699 (50.6)	32.3 (27.2-37.9)	24.1 (19.1-29.9)	43.6 (36.8-50.6)	
Ethnicity	Khalkh	1074 (83.9)	31.4 (26.8-36.4)	22.4 (18.7-26.7)	46.1 (41.2-51.2)	χ^2 (1) =0.5 P=0.8
	Other	319 (16.1)	32.2 (24.4-41.1)	24.0 (19.0-39.9)	43.8 (34.3-53.8)	
Location	Urban	658 (66.6)	29.1 (23.4-35.4)	20.4 (15.9-25.9)	50.5 (43.7-57.3)	χ^2 (1) =25.5 P=0.003
	Rural	736 (33.4)	36.5 (31.9-41.5)	27.2 (23.2-31.6)	36.3 (31.4-41.4)	
Education	Incomplete secondary or lower	233 (13.9)	56.7 (47.5-65.4)	18.6 (13.3-25.5)	24.7 (17.4-33.7)	χ^2 (2) =125.3 P<0.000
	Secondary or vocational	602 (43.3)	36.0 (30.8-41.5)	25.1 (20.8-30.0)	38.9 (34.1-44.0)	
	Tertiary	559 (42.9)	19.0 (14.5-24.4)	21.6 (17.0-26.9)	58.5 (52.5-66.1)	
Marital status	Married	1261 (90.7)	31.1 (26.7-35.8)	23.2 (19.5-27.4)	45.7 (40.3-51.2)	χ^2 (1) =2.5 p=0.37
	Single	133 (9.3)	36.1 (27.9-45.3)	17.8 (12.0-25.5)	46.1 (37.6-54.9)	
Having children under 16	Yes	990 (79.6)	21.0 (17.5-25.0)	25.5 (21.5-29.9)	53.5 (47.7-59.2)	χ^2 (1) =4.591 p=0.28
	No	254 (20.4)	26.2 (19.2-34.6)	27.3 (19.8-36.4)	46.5 (37.2-56.0)	
Employment	Public servant	385 (22.5)	22.4 (16.6-29.4)	26.7 (21.4-32.9)	50.9 (43.4-58.3)	χ^2 (4) =26.1 p=0.09
	Private sector	595 (44.0)	33.5 (27.7-39.9)	24.4 (19.6-30.1)	42.1 (35.7-48.7)	
	Student	48 (4.7)	33.1 (17.8-53.1)	14.8 (6.5-30.1)	52.2 (32.3-71.4)	

	Unemployed	339 (25.9)	34.4 (27.5-42.1)	18.2 (13.9-23.4)	47.4 (40.3-54.6)	
	Retired & on medical pension	27 (2.9)	45.4 (24.6-67.8)	17.8 (6.8-38.9)	36.9 (19.5-58.5)	
Caring about eating healthy	Yes	1232	25.7 (21.7-30.3)	24.5 (20.7-28.8)	49.8 (44.8-54.8)	χ^2 (1) =165.0
	No	162	75.5 (65.3-83.4)	9.0 (5.2-15.1)	15.5 (9.7-24.0)	p<0.000
On a special diet	Yes	89	11.2 (6.2-19.4)	24.0 (15.6-35.0)	64.8 (54.6-73.8)	χ^2 (1) =9.9
	No	1155	23.1 (19.4-27.2)	26.0 (21.8-30.7)	50.9 (45.3-56.5)	p=0.04

4.2.4.3 Information looked at on food and nutrition labels

Participants who reported looking at labels when purchasing food products were asked about the specific types of label information they referred to, which included nutrient declarations, ingredients list, nutrition and health claims, expiry dates, and other information (**Table 4.2**). Among the participants, 36.2% reported often or always looking at nutrient declarations, while 46.6% stated that they never looked at this information. Most participants did not check information regarding specific nutrients such as saturated fat (78.9%), trans-fat (80.2%), fibre (68.6%), and salt (58.7%), or recommended dietary intake (RDI) (69.3%). However, the majority of participants (90.7%) indicated that they frequently checked the expiry dates. Conversely, participants reported less frequent referring to information related to food additives, allergens and genetically modified organisms (GMO).

Table 4.2 Information checked on labels (N=1244*)

Label information	Never	Sometimes	Often/Always
	% (95% CI)	% (95% CI)	% (95% CI)
Nutrient declarations	46.6 (42.2-51.1)	17.1 (14.6-20.0)	36.2 (32.1-40.6)
Fat	55.7 (50.7-60.6)	13.6 (11.1-16.4)	30.7 (26.5-35.3)
Saturated fat	78.9 (75.7-81.8)	9.6 (7.3-12.4)	11.5 (9.3-14.1)
Trans-fat	80.2 (76.8-83.3)	8.1 (6.3-10.4)	11.6 (9.5-14.1)
Protein	50.0 (45.5-54.5)	15.5 (12.5-19.0)	34.5 (30.6-38.7)
Carbohydrates	58.1 (53.1-63.0)	16.6 (13.4-20.3)	25.3 (21.7-29.3)
Calorie	48.5 (44.2-52.8)	15.8 (12.7-19.3)	35.7 (31.8-39.8)
Sugar	48.5 (44.2-52.8)	15.8 (12.7-19.3)	36.4 (32.5-40.5)
Salt	58.7 (52.9-64.2)	13.1 (10.2-16.7)	28.3 (23.7-33.2)
Fibre	68.6 (64.0-72.9)	14.0 (10.9-17.8)	17.4 (14.2-21.2)
Vitamins and minerals	43.8 (39.7-48.0)	15.9 (13.1-19.1)	40.3 (36.3-44.5)
Serving size	44.7 (39.8-49.7)	9.2 (7.4-11.5)	46.1 (41.1-51.2)
RDI	69.3 (64.8-73.6)	10.1 (8.0-12.7)	20.5 (17.6-23.8)
Ingredients list	32.5 (28.7-36.6)	11.0 (9.2-13.3)	56.5 (52.3-60.5)
Nutrition and health claims	49.9 (45.0-54.9)	18.3 (15.3-21.8)	31.7 (27.3-36.5)
Food additives	63.7 (59.3-67.9)	10.0 (7.4-13.3)	26.3 (22.9-30.1)
Allergens	72.4 (68.0-76.5)	7.4 (5.3-10.2)	20.2 (16.7-24.2)
Expiry dates	4.5 (3.1-6.7)	4.8 (3.4-6.8)	90.7 (88.2-92.7)

Country of origin	22.4 (18.9-26.4)	12.5 (10.0-15.5)	65.1 (60.7-69.3)
Directions for use/storage	21.9 (18.5-25.8)	9.1 (7.2-11.5)	68.9 (65.0-72.6)
Name of manufacturer	38.2 (33.9-42.7)	16.0 (13.3-19.2)	45.8 (41.4-50.3)
GMO information	76.7 (72.2-80.6)	7.2 (5.0-10.5)	16.1 (13.2-19.8)

* n=1244 Out of 1394 participants, 150 individuals who reported never looking at food labels were excluded from further analysis.
P<0.000

Participants were asked to rank specific label information, including nutrient declarations, expiry dates, ingredients list, and country of origin, based on the frequency with which they looked at them. As indicated in **Table 4.3**, the label information most frequently looked at by participants was the expiry dates, followed by ingredients list, nutrient declarations, and lastly, the country of origin.

Table 4.3 Rankings of label information that participants refer the most (N=1244)

Label information	The most referred	2nd referred	3rd referred	The least referred
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Expiry dates	69.8 (64.6-74.6)	14.7 (12.1-17.6)	11.3 (8.2-15.4)	4.2 (2.9-6.1)
Ingredient list	13.2 (10.6-16.4)	36.4 (33.2-39.7)	40.0 (36.5-43.7)	10.3 (8.2-12.8)
Nutrient declarations	13.6 (10.6-17.3)	25.4 (22.3-28.7)	29.4 (26.2-32.7)	31.7 (27.5-36.1)
Country of origin	3.2 (2.3-4.6)	23.8 (19.5-28.7)	19.1 (16.7-21.7)	53.9 (49.0-58.7)

4.2.4.4 Perception and attitudes toward, and use of food labels

Table 4.4 presents participants' perceptions, attitudes, and use of food labels. More than one-third of the participants expressed positive perceptions and attitudes towards food labels. For example, 48.1% of participants found label information very useful, 39.8% agreed that they were interested in food labels, and 40.6% found it easy to read the labels, while 37.8% found them easy to use. However, nearly half of participants (46.0%) acknowledged that they do not have enough time to read labels. Most participants reported difficulties in using food labels, including understanding labels written in foreign languages (74.1%), unclear terms and symbols on the labels (71.9%), and labels with a small font size (58.6%). The majority of participants (57.9%) reported that they look at labels when purchasing a product for the first time, and when examining labels, they tended to focus on only one or two items (71.9%).

Table 4.4 Perception and attitudes toward, and use of food and nutrition labels (N=1363)

	Disagree/Totally disagree	Can't tell	Agree/Totally agree
	% (95% CI)	% (95% CI)	% (95% CI)
Perceptions and attitudes			
I find information on labels is very useful	27.7 (24.4-31.3)	24.2 (20.7-28.1)	48.1 (43.9-52.2)
Very interested in food labels	39.7 (35.0-44.6)	20.5 (17.4-24.0)	39.8 (36.0-43.8)
Satisfied with the amount of information on labels	30.2 (26.3-34.5)	32.6 (28.4-37.1)	37.2 (33.6-40.9)
Don't have enough time to read labels	33.1 (30.1-36.3)	20.9 (17.8-24.3)	46.0 (42.3-49.8)
Easy to read information on labels	32.5 (28.8-36.5)	26.8 (23.4-30.6)	40.6 (37.3-44.1)
Easy to understand and use labels	33.6 (29.2-38.2)	28.6 (24.2-33.5)	37.8 (33.7-42.0)
Difficult to understand labels in foreign languages	14.3 (11.6-17.5)	11.6 (9.2-14.6)	74.1 (69.9-77.9)
Difficult to understand labels written in English	17.2 (13.9-21.0)	10.0 (7.7-12.9)	72.9 (68.7-77.4)
Difficult to understand labels written in Russian	16.6 (13.7-20.1)	10.5 (7.8-14.1)	72.8 (67.6-77.4)
Difficult to understand unclear label terms & symbols	15.4 (12.5-18.9)	12.7 (10.4-15.4)	71.9 (68.2-75.3)
Difficult to understand labels written in too small font	29.8 (25.7-33.8)	11.8 (9.2-15.0)	58.6 (53.9-63.2)
Label use			
Refer to labels when purchasing food for the first time	26.5 (22.6-30.8)	15.6 (12.8-18.9)	57.9 (53.7-62.0)
Focus on one or two items only	14.4 (11.4-18.1)	13.7 (11.1-16.8)	71.9 (68.2-78.3)
Often read the nutrient declarations	39.2 (35.0-43.6)	19.3 (16.1-22.9)	41.5 (36.9-46.2)

4.2.4.5 Factors affecting food purchase

Table 4.5 demonstrates the factors prioritised by participants when making food purchases. Food quality and safety emerged as the most significant considerations, with 57.9% and 56.0% of participants, respectively, considering them to be the most important factors. In contrast, taste, price, nutrition information, and country of origin were perceived to be of relatively lesser importance.

Table 4.5 Priority factors for purchasing food products (N=1343)

Priority factors	Mean (95% CI)	Importance in food purchase (ranked from 1 to 6)		
		Most important	Moderate	Not important
		% (95% CI)	% (95% CI)	% (95% CI)
Quality	2.5 (2.4-2.6)	57.9 (54.1-61.6)	35.0 (31.4-38.7)	7.1 (5.5-9.2)
Food safety	2.5 (2.3-2.6)	56.0 (51.6-60.2)	33.8 (30.3-37.4)	10.3 (8.5-12.4)
Taste	3.3 (3.2-3.4)	29.6 (26.0-33.6)	50.2 (46.7-53.7)	20.2 (16.6-23.9)
Price	4.0 (3.8-4.1)	27.9 (24.2-31.9)	24.4 (21.3-27.8)	47.7 (43.4-52.1)

Nutrition information	4.2 (4.0-4.3)	18.9 (15.3-23.0)	31.9 (28.4-35.6)	49.3 (44.3-54.2)
Country of origin	4.7 (4.6-4.8)	9.8 (8.1-11.9)	24.8 (21.9-28.0)	65.4 (61.7-68.8)

4.2.4.6 Use of food labels in food purchase decisions

Furthermore, participants were asked whether they consider food label information when making food purchase decisions. Of the 1348 participants, 46.7% (95% CI 42.4-51.0) stated that they never or rarely purchase food products based on label information, 29.9% (95% CI 26.8-33.2) reported sometimes purchasing food based on label information, and 23.4% (95% CI 19.3-28.0) reported often or always making food purchases based on label information.

Participants who reported often or always considering food label information in their food purchase decisions were further asked about specific information they consider (**Table 4.6**). Half of the participants (52.3%) mentioned that they primarily consider the production and expiry dates of products when making food purchases. Additionally, 17.8% of participants indicated that they refer to information regarding the nutritional quality of the food. However, in most cases, participants mentioned considering nutritional quality in general terms without specifying if they referred to nutrition information on the label. Only a few participants mentioned specifically referring to the content of certain nutrients, such as fat, sugar and cholesterol. Other label information considered included country of origin (12.4%), ingredients list (11.1%), and food safety-related information (4.4%).

Table 4.6 Label information considered by participants when making purchase decisions

Label information	n (%)
Total	388 (100%)
Production and expiry dates	203 (52.3%)
Nutritional quality	69 (17.8%)
Country of origin	48 (12.4%)
Ingredients list	43 (11.1%)
Food safety-related	17 (4.4%)
Directions for use	4 (1.0%)
Storage instructions	4 (1.0%)

4.2.4.7 Determinants of food and nutrition label use

Table 4.7 presents the results of the logistic regression analysis exploring the factors that influenced participants' use of food and nutrition labels. The model predicting food label use demonstrated a good fit, with a Cox & Snell R Square of 0.195 and Nagelkerke R Square of 0.279. Among the demographic factors assessed, only education was a significant predictor of food label use. Higher education was associated with a higher likelihood of using food labels. Additionally, we found that interest in healthy eating and perceived usefulness of label information was strongly associated with increased label use.

The next model, predicting nutrition label use, had a Cox & Snell R Square of 0.106 and Nagelkerke R Square of 0.142. Among the demographic factors, gender and education significantly predicted nutrition label use. Similar to food label use, interest in healthy eating and perceived usefulness remained the strongest predictors in determining for nutrition label use.

Table 4.7 Determinants of looking at food and nutrition labels

Dependent variable:	Food label use							
	Wald	df	P	B	SE	Odds Ratio	95% CI for Odds Ratio	
Intercept	0.44	1	0.51	1.65	0.64	5.20	1.45	18.56
Gender	0.17	1	0.68	-0.08	0.20	0.92	0.62	1.37
Age	0.63	1	0.43					
18-29				0.12	0.16	1.13	0.83	1.55
Over 30						1.00		
Location	3.03	1	0.08	0.30	0.17	1.35	0.96	1.90
Education	17.59	2	0.00					
Incomplete secondary or lower				-1.10	0.29	0.33	0.19	0.59
Secondary or vocational				-0.69	0.19	0.50	0.34	0.73
Tertiary						1.00		
Employment	2.68	4	0.61					
Public servant				0.81	0.63	2.24	0.65	7.76
Private sector				0.61	0.57	1.83	0.59	5.67
Student				0.35	0.68	1.43	0.38	5.41
Unemployed				0.39	0.56	1.47	0.49	4.45
Retired						1.00		
Marital status	0.37	1	0.54	-0.20	0.32	0.82	0.43	1.56
Interest in healthy eating	58.60	1	0.00	-2.08	0.27	0.13	0.07	0.21
Usefulness of food labels	52.08	1	0.00	-1.30	0.18	0.27	0.19	0.39

Table 4.7 continued

Dependent variable:	Nutrition label use							
	Wald	df	P	B	SE	Odds Ratio	95% CI for Odds Ratio	
Intercept	13.30	1	0.00	0.27	0.53	1.30	0.46	3.69
Gender	8.37	1	0.00	-0.53	0.18	0.59	0.41	0.85
Age	1.36	2	0.24					
18-29				-0.13	0.11	0.88	0.70	1.10
Over 30						1.00		
Location	2.37	1	0.12	0.31	0.20	1.36	0.92	2.52
Education	6.04	2	0.05					
Incomplete secondary or lower				-0.31	0.24	0.73	0.45	1.19
Secondary or vocational				-0.17	0.15	1.19	0.88	1.61
Tertiary								
Employment	0.61	4	0.96					
Public servant				0.33	0.52	1.40	0.50	3.90
Private sector				0.26	0.50	1.30	0.48	3.49
Student				0.17	0.60	1.19	0.36	3.91
Unemployed				0.26	0.46	1.29	0.52	3.18
Retired						1.00		
Marital status	0.08	1	0.78	0.06	0.23	1.07	0.68	1.68
Interest in healthy eating	19.32	1	0.00	-1.47	0.33	0.23	0.12	0.45
Usefulness of food labels	19.43	1	0.00	-0.78	0.18	0.46	0.32	0.65

4.2.5 Discussion

The study findings show that the majority of Mongolian consumers (68.4%) look at food labels, with 45.7% reporting that they always or often looked at food labels when grocery shopping. These results are in line with studies in other LMICs whereby most consumers reported reading food labels (55-90%), while about a half of consumers (25-50%) reported always reading food labels (Aryee et al. 2019; Bhilwar et al. 2018; Gezmen-Karadağ & Türközü 2018; Gupta & Dharni 2016; Jacobs et al. 2011; Ponnudurai et al. 2019; Vemula et al. 2014).

Over half of the participants (53.3%) reported that they looked at nutrition labels, which aligns with findings of international studies where 40-82% of respondents claimed to use nutrition labels (Campos et al. 2011; Grunert & Wills 2007; Mandle et al. 2015). However, the nutrition label use found in this study (53.3%) is likely overestimated. This is related to inconsistency in participants' responses, as although they indicated using various types of label information, including nutrition information, further probing revealed that participants primarily relied on expiry dates when making food choices, with nutrition information being less frequently referred. This finding is consistent with reports from other studies (Besler et al. 2012; Grunert et al. 2010b), suggesting that participants considered nutrition information to be of lower priority compared to factors such as food quality and safety, taste, and price, and were less likely to base their purchases solely on nutrition information.

The focus of participants on food safety is likely influenced by substantial local media coverage in recent years regarding violations of food labelling standards, particularly related to expired use-by dates of food products, and instances of illegal adulteration of use-by dates. This heightened awareness of food safety issues and the related public health education initiatives conducted in Mongolia (Renchindulam 2018; State Specialized Inspection Agency of Mongolia n.d.) may have contributed to prioritisation of food safety by participants when making purchase decisions.

Further analysis examining the association between the use of food and nutrition labels and participants' demographics characteristics revealed consistent findings with previous studies. Individuals with higher levels of education were more likely to use both food and nutrition labels, while females were more likely to use nutrition labels compared to their counterparts (Besler et al. 2012; Bryła 2020; Grunert & Wills 2007; Vemula et al. 2014; Vijaykumar et al. 2013). Moreover, interest in healthy eating and the perceived usefulness of label information were also identified as factors associated with the use of food and nutrition labels. These findings align with previous literature, which has consistently reported that individuals with an interest in healthy eating, awareness of health and diet associations, and positive attitudes toward food labels are more likely to use label information when making purchase decisions (Balasubramanian & Cole 2002; Hung et al. 2017; Rimpeekool et al. 2015; Singla 2010; Yoon & George 2012). Positive attitudes toward food labels, including the perceived usefulness of food and nutrition labels, have been consistently linked to higher label use (Ali & Kapoor 2009; Danilola et al. 2019; Dharni & Gupta 2015).

These findings support that promoting healthy eating and fostering positive perceptions on food labels can have a significant impact on increasing the use of food labels among consumers in Mongolia. Therefore, nutrition promotion initiatives should prioritise raising awareness about healthy eating practices and emphasizing the importance of using nutrition labels when making food choices. Public education campaigns, specifically targeting males and individuals with lower levels of education, could be particularly effective in encouraging consumers to use food labels and make healthier food choices.

Despite the positive perceptions and attitudes towards food labels among participants, significant structural barriers were identified that hindered their effective use. One of the main barriers was the difficulty related to labels written in foreign languages, unclear terms and symbols, and label formats.

The study findings highlight an important issue regarding the language barrier on food labels in Mongolia. It was revealed that the majority of participants faced difficulties in understanding labels written in foreign languages, such as English and Russian, which are endorsed as official food label languages alongside Mongolian. This particular challenge has not been explicitly reported in the existing literature, making it a novel outcome of this study. Considering that Mongolian is the sole official spoken language of the country, the extent to which Mongolian consumers can comprehend labels written in English and Russian languages remains unclear. While the current policy of allowing multiple languages on food labels may benefit food importers, it is unfavourable for consumers, acting as a barrier to the effective use of food and nutrition labels. The study emphasise the importance of having uniform labelling in the Mongolian language, especially in a country like Mongolia where a considerable proportion of processed food is imported. Therefore, it is recommended that future laws and regulations be amended to address this issue.

Similar challenges related to unclear terms and symbols on food labels have been observed in studies conducted in Europe and the United States. Consumers, especially those with lower literacy and numeracy skills, found it difficult to interpret various nutrients and numerical information provided in nutrient declarations (Cowburn & Stockley 2005; Grunert & Wills 2007). In the context of Mongolia, although participants reported some understanding of label information, but many were unfamiliar with or had difficulties in understanding terms such as RDI, trans-fat or saturated fat. The ability to comprehend and interpret label information is crucial for its impact on food choices, and which in turn is influenced by consumers' nutrition knowledge (Grunert et al. 2010a).

The burden of NCDs in Mongolia is a significant public health issue and population-wide interventions are crucial to address this challenge. Promoting healthy diets and implementing education campaigns are essential components of strategies to combat the growing burden of NCDs. In this context, interventions aimed at improving awareness, understanding, and use of nutrition label information among Mongolian consumers can play a vital role.

Government commitments to implement and upgrade the food labelling legislations are necessary to ensure that labels provide accurate and useful information to consumers. It is also important for food producers and importers to adhere to these regulations. While this study provides valuable exploratory insights into the current situation regarding food and nutrition label use among Mongolian consumers, further research is warranted. Investigating the use of food and nutrition labels using objective measurements in real-life situations would provide more accurate understanding of consumer behaviour. Additionally, studies exploring other consumer response outcomes, including understanding of, and impacts of food labels on food choices, and dietary and health outcomes are necessary in the long-term.

4.2.6 Limitations of the study

While the study provides valuable insights into the use and perception of food and nutrition labels among Mongolian consumers, the study has several limitations that need to be considered when interpreting the findings. Firstly, the sample composition was skewed towards younger age groups due to the reliance on the MNNS-V sample, which targeted individuals aged 15-49 years. This underrepresentation of older age groups limits the generalizability of the results to the entire Mongolian population.

While the sample population was representative in terms of education level (e.g. 42.9% of the study population had tertiary education compared to the national rate of 39.2%), there were discrepancies in employment status compared to the broader Mongolian adult population. The study population had a higher proportion of individuals who were unemployed or engaged in informal sector (unemployed: 25% of the study population vs 10%, the national average in 2016), which may affect their perspectives and behaviours regarding food label use.

Another limitation is the use of self-reported measures for assessing food and nutrition label use. This method is subject to social desirability bias (Podsakoff et al. 2003) that participants may overestimate their label use due to the perceived expectation of healthier behaviour. Utilising more objective measures, such as direct observations or eye-tracking methods (Bialkova et al. 2014) in future studies can provide more accurate assessment of actual behaviour of label use. Furthermore, the study did not specifically investigate participants' nutrition literacy or their understanding of label information. Future research should explore participants' nutrition literacy and comprehension of label information.

4.2.7 Conclusion

While a majority of Mongolian participants reported using food labels, the use of nutrition labels was comparatively lower. Participants primarily relied on expiry dates, and nutrition information was not given high priority in their purchase decisions. The results indicate that gender, educational level, interest in healthy eating, and positive attitudes toward food labels were associated with higher food and nutrition label use. The study highlights the need for further exploration to understand the factors that hinder effective label use by consumers.

The current food labelling policies in Mongolia, including the requirement for labels in three official languages, present certain challenges for consumers. To address these barriers, it is recommended that amendments be made to the newly passed Food labelling standard MNS 6648:2016. Furthermore, in order to effectively monitor the implementation of the food labelling standard and assess its impact, it is advisable to repeat the questionnaire used in this study in the next national nutrition survey. This will enable a comparison of the results obtained in the current study with those of the follow up analysis.

Declaration of interest: The authors report there are no competing interests to declare.

4.3 Use of food and nutrition labels among urban Mongolian supermarket shoppers: Implications for food labelling policy and practice. *Draft manuscript*

4.3.1 Abstract

Nutrition labelling guides healthier food choices and promotes healthy diets (Koen et al. 2016; WHO 2013). A supermarket intercept survey examined the use of food and nutrition labels by urban Mongolian consumers and explored factors that influence label use. A total 306 adult shoppers were interviewed in four supermarkets in Ulaanbaatar, Mongolia. Shoppers were asked to indicate what, if any, information they had looked at on the package of purchased food products. 53.6% of shoppers looked at food labels (mostly at expiry date) and very few shoppers (6.9%) looked at nutrition labels. Non-use of labels mainly related to a lack of awareness and motivation, and labels written in foreign languages. Higher levels of socioeconomic advantage were associated with greater use of product expiry date information. Findings demonstrate minimal use of food and nutrition labels among Mongolian shoppers. Regulations to provide labels only in Mongolian language, and public education on nutrition labelling, would likely increase the usefulness of label information to inform food choices.

Keywords: Food, nutrition, label, choice, use, consumer, Mongolia

4.3.2 Introduction

The purpose of food labelling is to provide consumers with information about products, as well as to support fair trading by ensuring information disclosure (Albert 2010). Nutrition labelling guides healthier food choices and promotes healthy diets, contributing to the reduction of unhealthy diet and the prevention of obesity (Koen et al. 2016; WHO 2013).The influence of labels on food purchases and consumption relates to the extent the information is available, used and understood, as well as consumers' motivations to apply this information to decisions (Grunert & Wills 2007; Jacobs et al. 2011).

Globally, there is a large number of studies on consumer responses to food and nutrition labelling, including consumer use of labels (Campos et al. 2011; Cowburn & Stockley 2005; Grunert & Wills 2007). Much of this evidence derives from high-income countries and research exploring consumer responses to food labelling in LMICs is limited (Mandle et al. 2015). Use of food and nutrition label information varies across different sociodemographic groups. Women (Besler et al. 2012; Grunert & Wills 2007), individuals with higher educational levels (Besler et al. 2012; Grunert & Wills 2007; Jacobs et al. 2011; Vemula et al. 2014), people with better nutrition knowledge (Hung et al. 2017; Jacobs et al. 2011), groups with less social disadvantage (Campos et al. 2011; Mhurchu & Gorton 2007) and highly motivated consumers (Hung et al. 2017) use food labels more frequently.

Mongolia is a country in transition, shifting from a centralised economy to a free market economy since the early 1990s (Namsrai 2017). Opening up of the economy has resulted in increased foreign trade and food imports, privatisation of the state-owned food sector and emergence of a private food industry (Namsrai 2017). With the increase of food imports and growing production of locally produced food products, availability of pre-packaged processed food in the food supply has increased.

With the progression of Mongolia's nutrition transition (CHDM & WHO 2019), there is a noticeable increase in obesity and burden of NCDs (Chimedtseren et al. 2020; MOHM & WHO 2020). Hence, the role of nutrition labelling is becoming increasingly important as a tool to assist consumers to make informed food choices. In Mongolia, a new food labelling standard was introduced in 2018, requiring mandatory nutrient declarations for all pre-packaged food products (MASM 2016). In addition, the Ministry of Health of Mongolia endorsed a FOPL system in 2017, to be implemented on a voluntary basis (MOHM 2017). However, there has been substantial local media attention on the reports of inspection agencies over recent years, highlighting violations of the food labelling standard related to food products' expired use-by dates and the illegal adulteration of this information (Renchindulam 2018; SSIAM 2016). In addition, there has been consistent food safety messages communicated to consumers on the importance of checking expiry dates on food labels, which has led to consumer use of these labels. However, there has not been the same emphasis on nutrition labelling education. To our knowledge, no studies have explored consumers' use of food label information in Mongolia. It is anticipated that, due to being exposed to the market economy for only a relatively short period of time, Mongolian consumers have limited experience regarding pre-packaged food products and food labelling (Chimedtseren et al. 2020). In order to improve the effectiveness of food labelling policy and assist people to use label information to make informed food choices, it is important to understand how Mongolian consumers perceive and use food and nutrition labels, and clarify their needs and demands in this regard. This study aimed to examine consumers' use of food and nutrition labels in a real grocery shopping context, identify factors affecting label use, and make recommendations to improve policy and practice based on consumers' needs.

4.3.3 Methods

4.3.3.1 Survey Instrument

The study employed a supermarket intercept survey design, which involved conducting interviews at the time of the purchase or shortly after. This approach enabled the collection of real-time feedback from respondents, providing a more accurate reflection of consumers' actual label use behaviour (Chegg 2023).

A questionnaire was developed by adapting a validated tool used in a previous UK study (Grunert et al. 2010b). A questionnaire incorporated participants' use of food and nutrition labels; reasons for non-use, challenges faced in using food and nutrition labels; major considerations in food purchase; and sociodemographic characteristics (**Appendix K**). In the study, “food labels” referred to all information on the label, including best-before/use-by dates and nutrition-related information (nutrient declarations and ingredients list). “Nutrition labels” specifically referred to nutrient declarations and ingredients lists. Participants were asked if they looked at any label information on the products they had purchased (up to three products) and to locate that information on the label. Requesting participants to locate the information they claimed to have checked aimed to verify their responses and enhance the accuracy of self-reported measures for label use. This approach was adapted from the aforementioned UK study and has been proven to provide more accurate measurements of self-reported use of nutrition labels (Grunert et al. 2010b). If a participant had not looked at the label, the reasons for not doing so were clarified. Participants were also questioned about their usual behaviour regarding label use.

The questionnaire was initially developed in English and then translated into Mongolian language by the first author of the study, who is a native Mongolian speaker. It was then back-translated by another person, and the two translations were compared for equivalence.

To assess the acceptance, clarity of the questions, and feasibility of the duration of the questionnaire in a supermarket context, a pre-test of the questionnaire was conducted with 20 shoppers in a similar setting. The pre-test also included open-ended questions relating to reasons for purchasing a product, reasons for non-use of food labels, and suggestions for improving food labels. Common responses from the pre-test were pre-coded and included in the questionnaire to be used the main survey, which aimed to shorten the survey time in a supermarket context. Additionally, “other” options were added to capture responses not covered by the pre-coded options. The pre-tested questionnaire was reviewed by researchers from the National Centre for Public Health of Mongolia for face validity, and public health experts of the University of Wollongong, Australia for content validity. Based on their comments, the questionnaire was refined and finalized.

4.3.3.2 Sampling

The survey was conducted at three outlets of a large chain supermarket and another small non-chain supermarket. Sampled supermarkets were small to medium in size and were chosen from areas of different SES in Ulaanbaatar city, Mongolia. The chain supermarket was one of the major retail chains in the country, with outlets widely distributed in both urban and rural areas. The non-chain supermarket was located in the outskirts of the city and was chosen to ensure representation of shoppers from a lower SES area in the sample. An approval for conducting the survey was obtained from the supermarket management. The sampled stores were selected from a list of potential store sites, taking into account SES of the area and location in residential areas. Given the lack of official delineation of SES for khoroos (the smallest administrative area) in Mongolia, determining of SES of areas was guided by infrastructure and housing conditions of the areas. Infrastructure and housing conditions are important indicators of the SES of an area in Mongolia, as they are closely connected with other indicators such as income level, poverty and unemployment rate and accessibility to social services. A ger area is an area where a traditional housing type is the main type of housing. These areas have poor infrastructure, higher unemployment and poverty rates, and less educated populations (Byambaa 2015). Approximately, 60.0% of residents in Ulaanbaatar city live in ger areas (Singh 2017). A ger area located in the western suburbs of the city was chosen as a low SES area. The high SES area was an apartment area, which was centrally located in the city and had better living conditions and wealth status. Medium SES areas, where two other supermarkets were located, had mixed housing consisting of apartments and gers. Given the middle-class population constitutes over half of the population (51.7%) in Ulaanbaatar city (Byambaa 2015), two supermarkets were selected from medium SES areas, while one supermarket was selected from each, high and low SES areas.

4.3.3.3 Procedure

The survey was conducted over three days (one weekend day and two weekdays) in each supermarket during morning and afternoon hours, to capture different profiles of shoppers. The target sample size was approximately 250, based on resources available for interviewers. Interviews were conducted by three researchers who were trained in administering the questionnaire. Researchers were positioned at the front of the store, and approached shoppers before or after the checking counter to ask them to participate. Shoppers who had purchased at least one product, and were aged 18 years or older were eligible. After completing an interview, the researcher then approached the next available shopper. In order to achieve a gender balance in the sample, a quota was set to ensure at least one-third of participants were male. With this quote, we attempted to avoid predominantly recruiting females, as they are typically the primary grocery shoppers. This approach aimed to ensure the sample is closely represented the general Mongolian population. To reach this quota, males were preferentially approached when more than one shopper was available. The purpose and procedure of the survey was explained, and written consent was obtained from all participants. Interviews lasted 15-20 minutes.

4.3.3.4 Data Analysis

Data were entered into IBM SPSS Statistics version 25.0 and analysed descriptively and inferentially. Frequencies of self-reported use of food and nutrition labels were estimated. Pearson's Chi-square test was used to compare food label use across sociodemographic variables. Binary logistic regression was conducted to investigate associations between label use and sociodemographic variables. Maximum likelihood estimates and odds ratio (OR) estimates were analysed. ORs, 95% confidence intervals (CIs), and P values were calculated. P values <0.05 were considered significant in the final models.

4.3.4 Results

A total of 306 shoppers participated in the survey. The greatest proportion of participants were female and the main grocery buyers for their households. 13% of participants were unemployed (**Table 4.8**). In terms of age distribution, the study sample was similar to the general adult population of Ulaanbaatar city (NSOM 2020) where the study was conducted.

Table 4.8 Sociodemographic characteristics of survey participants

		n	%
Total		306	100.0
Gender	Male	92	30
	Female	214	69.9
Age	18-30	99	32
	31-50	136	44.4
	51-60	34	11
	Over 60	37	12
Education	Incomplete secondary & lower	20	6
	Secondary & vocational	122	39.9
	Tertiary	164	53.6
Employment	Public servant	51	17
	Private sector	137	44.8
	Student	23	7
	Unemployed	41	13
	Retired & on medical pension	54	18

Having children under 16 years old	Yes	150	49.5
	No	153	50.5
Role in food shopping	Main role	220	71.9
	Equal role as other members	57	19
	Less role	29	9
Location of supermarket	Low SES area	71	23
	Medium SES area	157	51.3
	High SES area	78	25

4.3.4.1 Food and Nutrition Label Use

Almost two-thirds of participants (63.4%, n=194) reported they often or always looked at label information when choosing foods to purchase, with 16% (n=49) reporting they often or always looked at nutrition information on labels. The reasons given for non-use of nutrition information included a lack of awareness and knowledge of food and nutrition labels (54.6%, n=106/194), reliance on familiarity of products (31%, n=60/194), lack of motivation to use labels (30%, n=58/194), lack of understanding of nutrition labels (8%, n=15/194), labels written in foreign language (3%, n=6/194) and other reasons (8%, n=15/194). Using food labels was found challenging by most of the participants (81.6%, n=250/306). The major challenges included inability to understand foreign language labels (61.2%, n=153/250), poor legibility of labels (47.2%, n=118/250), lack of knowledge and understanding on label information (46.8%, n=117/250) and unreliable label information (11%, n=28/250).

Participants were asked if they had looked at the label of a product randomly identified from their shopping trolley/basket. Approximately half (53.6%, n=164) of participants reported that they had looked at least some information on the food label. The label use reduced substantially for the second and third products selected from their shopping trolley/basket. This was likely due to participant fatigue and disengagement (Porter et al. 2004) to avoid having to answer further questions in relation to the labels. For this reason, we excluded the second and third products from the analysis and report only on the first products. Participants were also asked to locate where on the label they looked. Expiry dates were the most commonly reported viewed label information, with over half of participants (51.3%, n=157) reporting they had checked it. Few people indicated that they had looked at nutrition information, including nutrient declarations and ingredients list (7%, n=21). Notably ingredients list (n=15) was looked at twice as frequently as nutrient declarations (n=8). Other label information, such as brand name, manufacturer, product name, directions for use, storage instructions, product weight and country of origin, were rarely looked at by respondents (7%, n=21).

Comparing the use of expiry date information by sociodemographic characteristics of participants showed that females, those with tertiary education, main grocery buyers for households and those living in areas of higher SES used this information significantly more than the other participants (**Table 4.9**). Similar trends were observed in the use of nutrition information, by sex, education and SES of areas, but were not statistically significant. However, participants reported using nutrition information significantly more frequently for first time purchases compared to recurrent purchases.

Table 4.9 Information looked at on food label by sociodemographic characteristics

		n	Nutrition information n (%)	Pearson chi square	Best before/use-by date information n (%)	Pearson chi square
Total		306	21		157	
Gender	Male	92	4 (4)	χ^2 (1) =1.30 P=0.25 n=306	39 (42)*	χ^2 (1) =4.19 P= 0.04 n=306
	Female	214	17 (8)		118 (55.1)	
Age	18-30	99	9 (9)	χ^2 (3) =1.72 P= 0.63 n=306	46 (46)	χ^2 (3) =3.91 P= 0.27 n=306
	31-50	136	7 (5)		74 (54)	
	51-60	34	3 (9)		21 (62)	
	Over 60	37	2 (5)		16 (43)	
Education	Incomplete secondary & lower	20	0 (0)	χ^2 (2) =3.53 P= 0.17 n=306	3 (15)**	χ^2 (2) =14.68 P< 0.001 n=306
	Secondary & vocational	122	6 (5)		58 (47)	
	Tertiary	164	15 (9)		96 (58)	
Employment	Public servant	51	7 (14)	χ^2 (4) =5.20 P= 0.27 n=306	32 (63)	χ^2 (4) =7.13 P= 0.13 n=306
	Private sector	137	8 (6)		74 (54)	
	Student	23	2 (9)		9 (39)	
	Unemployed	41	2 (5)		16 (39)	
	Retired & on medical pension	54	2 (4)		26 (48)	
Having children under 16	Yes	153	10 (6)	χ^2 (1) =0.05 P= 0.82 n=306	79 (52)	χ^2 (1) =0.01 P= 0.91 n=306
	No	153	11 (7)		78 (51)	
Role in food shopping	Main role	220	16 (7)	χ^2 (2) =2.52 P= 0.28 n=306	123 (55.9)*	χ^2 (2) =6.70 P= 0.04 n=306
	Equal role	57	5 (9)		22 (39)	
	Less role	29	0 (0)		12 (41)	
Location of supermarket	High SES area	78	9 (11)	χ^2 (2) =3.75 P= 0.15 n=306	53 (68)**	χ^2 (2) =24.17 P< 0.001 n=306
	Medium SES area	157	9 (6)		84 (53)	
	Low SES area	71	3 (4)		20 (28)	
Bought first time	Yes	39	6 (15)*	χ^2 (1) =5.08 P= 0.02 n=306	21 (54)	χ^2 (1) =0.12 P= 0.73 n=306
	No	267	15 (6)		136 (51)	

*P < 0.001; **P < 0.05 (Chi-square test)

Logistic regression was performed to assess the impact of sociodemographic factors on the likelihood of the participants looking at expiry date information. The model contained eight independent variables (**Table 4.10**). The full model containing all predictors was statistically significant, χ^2 (16, N=306) =46.38, p< 0.001, indicating that the model was able to distinguish between participants who used and did not use expiry date information. The model as a whole explained between 14.1% (Cox and Snell R square) and 18.8% (Nagelkerke R squared) of the variance in the use of expiry date information and correctly classified 65.0% of cases. As shown in **Table 4.10**, only one independent variable (location of supermarket) made a statistically significant contribution to the model. Location of supermarket was a strong predictor of looking at this information, recording odds ratios of 2.47 and 5.13 for medium and high SES areas, respectively, compared to the low SES area. The same regression analysis was conducted to assess the impacts of the same predictor variables on the use of nutrition labels. The model was not statistically significant.

Table 4.10 Logistic regression predicting likelihood of using expiry date information

	B	SE	Wald	df	P	Odds Ratio	95% CI for Odds Ratio	
Gender	- 0.57	0.30	3.59	1	0.06	0.56	0.31	1.02
Age								
18-30	0.64	0.80	0.65	1	0.42	1.90	0.40	9.10
31-50	0.75	0.78	0.92	1	0.34	2.12	0.46	9.85
51-60	0.82	0.60	1.89	1	0.17	2.27	0.71	7.31
Over 60			2.00	3	0.57			
Education								
Primary	-1.33	0.69	3.69	1	0.06	0.26	0.07	1.03
Secondary	-0.05	0.28	0.03	1	0.86	0.95	0.55	1.66
Tertiary			3.74	2	0.15			
Employment								
Public servant	0.30	0.69	0.19	1	0.66	1.35	0.35	5.21
Private sector	0.29	0.67	0.19	1	0.67	1.34	0.36	5.01
Student	- 0.29	0.86	0.11	1	0.74	0.75	0.14	4.03
Unemployed	- 0.13	0.74	0.03	1	0.86	0.88	0.21	3.75
Retired			2.05	4	0.73			
Having children under 16	- 0.18	0.30	0.34	1	0.56	0.84	0.46	1.52
Role in food shopping								
Main role	0.43	0.45	0.93	1	0.33	1.54	0.64	3.68
Equal role	- 0.04	0.50	0.01	1	0.93	0.96	0.36	2.54
Less role			2.25	2	0.33			
Location of supermarket								
High SES area	1.63	0.41	15.84	1	0.00	5.13	2.29	11.46
Medium SES area	0.91	0.34	7.28	1	0.01	2.47	1.28	4.78
Low SES area			15.91	2	0.00			
Bought first time	- 0.02	0.38	0.00	1	0.96	0.98	0.46	2.08
Constant	- 1.55	0.72	4.60	1	0.03	0.21		

SE-standard error df- degree of freedom CI- confidence interval
In bold is an independent variable, which was significantly associated with use of expiry date information.

4.3.4.2 Priorities Guiding Food Purchase Decisions

Taste (34.3%, n=105 of 306) and familiarity (16%, n=49 of 306) of products were the two main reasons for purchasing the product, followed by product quality (6%, n=20 of 306) and perceived health effect of the product (6%, n=19 of 306). Other product attributes and food label, including nutrition information were reported less frequently (5%, n=15 of 306, respectively) as the main reason for buying a product.

4.3.5 Discussion

This study is the first to explore Mongolian consumers' use of food and nutrition label information and factors influencing such use. When prompted using purchased products, only about half of participants reported looking at the labels of products purchased, and this almost exclusively related to expiry dates. Frequent use of this information by Mongolian consumers is likely as a result of previous food safety communications on the importance of checking expiry dates. Recent food safety incidents and use-by date tampering (Renchindulam 2018; SSIAM 2016) has, rightly so, led to consumers' food safety concerns, with this translating to relatively frequent use of these information. Prioritising of expiry date information over other label information was also common among consumers from other countries (Jacobs et al. 2011; Vemula et al. 2014). Use of expiry dates was associated with the SES of areas, a finding consistent to other studies (Besler et al. 2012; Campos et al. 2011).

The use of nutrition label information during grocery shopping is minimal among shoppers. In this study, the self-reported use of nutrition labels was only 16%, which is significantly lower compared to the range of 30.0% to 70.0% reported in other studies (Cowburn & Stockley 2005; Grunert et al. 2010b; Jacobs et al. 2011; Mandle et al. 2015; Vemula et al. 2014). Furthermore, when self-reported use was verified on the labels of purchased products, the rate dropped further to 7%. This rate is lower than both the aforementioned self-reported rate and the rate reported in a similar study conducted in the UK, where 27.0% of shoppers reported having looked at nutrition labels of recently purchased products (Grunert et al. 2010b).

A recent survey in Mongolia found that over 80.0% of food products displayed nutrient declarations and ingredients lists (Chimedtseren et al. 2020). This finding suggests that the low use of nutrition labels is likely attributed to factors other than the availability of information, such as lack of awareness, reliance on product familiarity, and various other reasons. The study found that familiarity with products reduced the use of nutrition labels. Individuals who purchased a product for the first time tended to look at nutrition labels more frequently compared to those who had previously bought the product. However, even among first-time buyers, the use of nutrition label remained significantly low, with only 6 out of 39 individuals using them. This indicates that besides familiarity, additional factors are likely contributing to the lack of label use. The most commonly reported reason for not using labels was a lack of awareness about food and nutrition labels, followed by product familiarity. These findings emphasise the importance of raising awareness among Mongolian consumers about food and nutrition labelling.

Despite the increasing dietary risks associated with the country's transition from traditional diets to increased consumption of processed pre-packaged foods, Mongolian consumers are not seeking out information on the nutritional quality of products and are not directly informed about the role and importance of this information. Instead, product taste and familiarity guided food choices and purchases, which was consistent to other studies (Besler et al. 2012; Grunert & Wills 2007; Grunert et al. 2010b; Vemula et al. 2014).

The study findings show that current food labelling regulations, despite their recent amendments, are still failing to meet consumer needs. The national food labelling standard authorises label information can be written in Russian and English, in addition to Mongolian language. As Mongolia is a net food importer, such regulations however tend to serve international food manufacturers and importers. Labels written in foreign languages are less helpful to Mongolian consumers, with few Mongolian people likely to be proficient in English and/or Russian languages. Furthermore, poor legibility of labels, technical terms used on labels and concerns about the accuracy of label information hindered label use. These problems have been frequently reported by other research (Cowburn & Stockley 2005; Jacobs et al. 2011; Mandle et al. 2015).

These findings have important implications for policy and practice in Mongolia and other countries undergoing similar transition, with regard to food labelling and public nutrition education to support effective use of food and nutrition labels by consumers to guide food choices. The current labelling regulations in Mongolia may indicate their early stages of development, however, the focus cannot only be on food safety when the country is transitioning rapidly in terms of people's diets and nutrition with its health consequences. It is critical for the country to now prioritize nutrition labelling policy to support improved nutritional quality of the food supply and promote public health. With such changes to policy and regulations, engaging with all stakeholders, including the public, is needed. Supporting people to make healthier choices through using nutrition label information is preferable and more economical than waiting to address health problems when they occur. Consumers will benefit from government actions to advance food labelling policies and improve consumer awareness of food and nutrition labelling.

4.3.6 Strength and Limitations

The study findings may not generalizable to the entire population since the survey sample is not nationally representative. However, the study enabled a valuable insight into label use among urban Mongolian consumers, including disadvantaged groups. It is important for future studies to explore food label use among rural shoppers to obtain a more comprehensive understanding. In addition, the study focused on food label use as an important aspect of consumer response to food labelling, particularly in LMICs. Therefore, future research should address the understanding of food and nutrition labels, and their impact on food choices, as well as dietary and health outcomes.

A key strength of the study is the use of verified self-reports, which provides a more objective measurement of label use. In-store interviews were conducted to verify the decision-making processes of the participants by asking targeted questions about specific products they had purchased and asking them to show the information they claimed to have looked at on the actual labels. This in-store verification method helped to determine food label use more accurately compared to relying solely on self-reports. While this approach was suitable and feasible for this study, future studies should consider using more objective measures to assess label use and understanding, such as studies using visual attention measurement or eye-tracking studies.

4.3.7 Conclusion

This study found the primary focus of Mongolian consumers remains on food safety and people use food labels mainly for checking product expiry dates and very minimally for other purposes, including referring to nutrition content of a product. Lack of awareness of people on food and nutrition labelling largely hindered their label use. The study highlights the need of prioritising nutrition labelling policy and undertaking actions to support nutrition label use by consumers. Lessons learnt from the past food safety communications suggest consumer education on healthy diets and nutrition labels as a way to encourage people to search and look at nutrition labels. The regulations need to incorporate consumer needs regarding label language and legibility of label text. One step towards increasing use of nutrition labels has been the recent implementation in Mongolia of a voluntary FOPL system. To ensure effective implementation of the system, it needs promotion to the industry and the raising of consumer awareness about the system.

4.3.8 Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Chapter Five

FOOD AND NUTRITION LABELLING POLICY IN MONGOLIA

5.1 Preface

The aim of this chapter was to analyse the existing food labelling policy and regulations in Mongolia and assess their alignment with consumers' needs and demands. The chapter analysed the development and implementation of the food labelling policy at the national level and identified the key policy drivers and barriers and enablers influencing the implementation of the policy and explored the extent of these policy and regulations aligning with consumers' needs and demands. By using the health policy analysis framework, this enabled an understanding of the effectiveness of the policy implementation by clarifying connections between policy context, process, content and actors and identified facilitators and barriers to the policy achieving its goal of supporting consumers' informed food choices. The historical socio-political context of the country and the country's transition to a new market economy was identified as the main driver of the development and implementation of the food labelling policy. The key enablers reported were government initiatives and commitments, and technical support provided by international agencies in the development of the food labelling policy. The government faced challenges in adapting Codex standards and guidelines, and key barriers to the development and implementation of the food labelling policy were insufficient knowledge and expertise of the regulators, food producers and consumers, and inadequate infrastructure and resources. This chapter concludes that nutrition labelling based on the needs of consumers should be prioritised by the government and government actions are required to ensure food labelling regulations provide clear guidance, communicate the regulations to businesses, and establish and adequately resource the effective implementation, monitoring and evaluation procedures and building capacity in food labelling for both regulators and food producers. It is also crucial to engage consumers in policy discussions and to raise their nutritional literacy through public information campaigns and appropriate programs in primary and secondary schools.

The chapter is presented based on the manuscript prepared for re-submission to a peer reviewed journal. Authors' contribution has been detailed in the Statement of Contribution.

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5.2 Development and implementation of food and nutrition labelling policy in Mongolia: a policy analysis. *Draft manuscript*

5.2.1 Abstract

Nutrition labelling policy aims to support and promote healthy diets and prevent non-communicable diseases (NCDs). Health policy analysis is useful to understand past policy failures and successes and plan for future policy implementation based on policy learning.

This research analysed the food labelling policy in Mongolia, including exploration of policy drivers and factors that influenced policy development and implementation. A qualitative study was conducted in Ulaanbaatar city, Mongolia. Semi-structured individual interviews (N=18) with government officials and representatives of consumer organisations and food producers explored food labelling policy and regulations. Walt and Gilson's health policy analysis triangle and the Advocacy Coalition Framework (ACF) informed the analysis. Food labelling regulations in Mongolia were part of broader reforms of the food control system as the government attempted to respond to the significant changes related to the transition to a market economy. Government leadership and technical support from international agencies facilitated the development of the food labelling regulations. Key obstacles identified in the development and implementation of the food labelling regulations were insufficient knowledge and expertise on the part of the authorities, food producers and consumers, and inadequate infrastructure and resources. The study findings provide helpful insights for understanding the success or failure of a food labelling policy in developing countries. This research has shown that policy relating to food labelling has so far been developed and implemented only in a limited and unsatisfactory fashion in Mongolia. Given the well-recognised health and nutritional impacts of economic transition, food labelling policy should be prioritised and based on the needs of consumers. Required food policy actions include improving consumer awareness and use of food labels through education programs, capacity building for professionals and food producers, involving the public in policy discussions, and establishing suitable monitoring and evaluation systems.

Keywords: food, nutrition, label, food policy, policy analysis, consumer

5.2.2 Introduction

Nutrition labelling is one policy option designed to support healthy diets and is recommended by the World Health Organization (WHO) as an effective intervention against NCDs (WHO 2017). The Codex Alimentarius Commission (Codex), a joint organisation of the Food and Agriculture Organization of the United Nations and the WHO, develops international food standards and guidelines with the purpose to promote public health and facilitate international trade. The Codex guideline on Nutrition Labelling (2013), a global benchmark on nutrition labelling intended to guide countries in formulating their policies and regulations, requires the mandatory declaration of the amount of energy, protein, fat, carbohydrates, saturated fat, sodium/salt, and total sugars on the back of packaging for all pre-packaged foods (CAC 2013). Global implementation of nutrient declarations has progressively increased in recent years, but this has been variously arranged as mandatory or voluntary implementation. Nutrient declaration policy is mandatory in countries in the WHO regions of the Americas and Europe, whereas most countries from the WHO regions of Africa and South-East Asia have voluntary nutrient declarations (WHO 2018a). Front-of-pack labelling (FOPL) is supplementary nutrition information presented on the front of the package with the purpose of assisting consumers to interpret the nutrient declaration. Different types of FOPL systems have been implemented in different countries, mostly on a voluntary basis (Becker et al. 2015; Hodgkins et al. 2012).

To date, food and nutrition labelling policy analyses have mostly been undertaken in high-income and upper middle-income countries (Baker et al. 2017; Boza et al. 2019; Kumar et al. 2018; Shill et al. 2012; Sisnowski et al. 2016; Vogel et al. 2010; Wood & Tenbensel 2018) with limited evidence available from low and middle-income countries (LMIC) (Kline et al. 2017; Popkin et al. 2013). Our search for academic literature on food and nutrition labelling policies in LMICs retrieved only a few studies. These studies examined processes related to the adoption of policies, including drivers for policy formulation, as well as policy implementation. In developing of food labelling policies, LMICs have largely been guided by Codex standards, and have also been influenced by labelling regulations of other countries. For example, the FOPL traffic light labelling system in Iran was based on the UK traffic light system (Edalati et al., 2020). Regulators and government organisations played a leadership role in policy development, but there was a strong influence from the food industry (Edalati et al. 2020; Farida & Ayuningtyas 2019; Phulkerd et al. 2017; White & Barquera 2020). Other facilitators to policy development were civil society and commercial media engagement in policy advocacy, public consultation, and international funding (Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020). In contrast, factors that hindered policy development included the lack of evidence to inform policy making, insufficient consumer engagement, low participation of non-health sectors, and industry resistance and influence (Edalati et al. 2020; Freire et al. 2017; Phulkerd et al. 2017; Rimpeekool et al. 2015; White & Barquera 2020). For instance, the lack of consumer involvement in the development of FOPL policy in Iran and Ecuador hindered the policy development process (Edalati et al. 2020; Freire et al. 2017). These dynamics of policy contexts differed from those in other high-income countries, where the demand for nutrition labels emerges from consumers and public health advocacy groups, and the food industry tends to oppose these poliices (Kumar et al. 2018). Poor policy governance, including the lack of monitoring and evaluation, insufficient knowledge and skills of regulators and food enterprises, the lack of funding, and industry resistance and influence, had negative effects on policy implementation in LMICs (Farida & Ayuningtyas 2019; Freire et al. 2017; Phulkerd et al. 2017). However, the policy processes of food labelling policies in LMICs are still not clearly understood due to the scarcity of evidence and the lack of in-depth analysis clarifying underlying factors that affect the policy processes specific to this context.

Mongolia is an emerging market country, which transitioned from a socialist regime to a democratic system in the early 1990s. The country has been undertaking significant reforms in all sectors, including food system and also is experiencing rapid nutrition transition (Chimeddamba et al. 2016; Rasmussen & Annor-Frempong 2015). Overweight and obesity has drastically increased in Mongolia in recent decades, with half of the population aged 15-69 years overweight and obese in 2019 (MOHM 2020). Mongolia has a high burden of NCDs. Cardiovascular diseases, cancer and injury are the leading causes of deaths in Mongolia and accounted for 75.4% of population deaths in 2019 (CHDM & WHO 2019). In Mongolia, the premature mortality rate from cardiovascular disease, cancer, diabetes and chronic respiratory disease was 35.3% in 2019, ranking 11th in the world and 7th in the Western Pacific Region of the WHO (WHO 2019).

To respond to changes in food system governance due to the shift to a market economy and to improve control for food production and importation, the Mongolian government adopted several food-related legislative acts and regulations, including the Food Safety Law (2012) and the Food Law (amended) (2012). These are the main pieces of government legislation that regulate food supply, production, service and imports (Government of Mongolia 2012a, 2012b). Food labelling is regulated under these two laws, as well as under the food labelling standard "Requirements for Labelling of Food Products", MNS 6648-2016. The Food Safety Law (2012) stipulates the general requirements for labelling of food products, including acceptable label language and the type of information required on the label (Government of Mongolia, 2012b). Prior to this, the concept of food labelling was only briefly included in the previous food laws of 1995 and 1999 (Government of Mongolia 1995, 1999). In 2008, a group of parliament members initiated the Food Safety Law, which was subsequently developed by the government in collaboration with the International Finance Corporation (IFC). The IFC, a global development organisation of the World Bank Group, specialises in supporting the private sector in developing countries (IFC 2020). The IFC project on enhancement of the food control system in Mongolia identified the need to improve the legal environment for food safety control, which was in line with the government's objective to develop a comprehensive law on food safety (United Nations Conference on Trade and Development 2013).

The national food labelling standard was adapted from Codex standards, came into force in January 2018. It mandates the declaration of energy, fat, carbohydrates, protein, saturated fat, sugar and salt, and any other nutrient for which a nutrition or health claim is made (MASM 2016). However, there are some areas that have not been adequately addressed in the standard, including nutrition and health claims, legibility of nutrition information, application of Nutrient Reference Value, quantitative declaration of ingredients, and labelling of imported products.

In addition, a separate voluntary FOPL guideline was adopted by the Health Minister's Order in 2017. The guideline specifies the use of a FOPL system that combines interpretive traffic light colour coding and guideline daily amounts. It indicates the amounts of energy, saturated fat, sugar and salt in 100g/100ml or per serve of the product, along with colour codes and percentages of the recommended daily intake (MOHM 2017). The extent of the implementation of these regulations is uncertain as no previous studies on food labelling policies have been conducted.

This study aimed to analyse food and nutrition labelling policy of a transition country, Mongolia, and determine policy drivers, and facilitators and barriers to the development and implementation of the policy. The study sought to clarify how policy processes of the food labelling policy in Mongolia are influenced by underlying contextual factors attributable to the transition and the legacy of the socialist system. Study findings will contribute to addressing the gap in research on food and nutrition labelling policies in LMICs, including the lack of in-depth policy analysis, and insufficient understanding of factors specific to policy processes, making them valuable for improving the development and implementation of such policies in LMICs.

5.2.3 Methods

5.2.3.1 Study design and sampling

A qualitative study was undertaken in Ulaanbaatar, the capital city of Mongolia, between November 2017 and March 2018. Opinions and views regarding food labelling policy and regulations in Mongolia were explored via semi-structured individual interviews with government officials, representatives of consumer organisations and food producers.

A purposive sampling strategy ensured representation from all key groups influential in food regulations and policy. The key national-level government organisations in charge of food policy, including the Ministry of Health, Ministry of Food and Agriculture, State Specialized Inspection Agency (SSIA), City Specialized Inspection Agency and Mongolian Agency for Standardization and Metrology (MASM) were targeted for the study. While focusing on government policy makers or regulators, we also wanted to include some representatives from food producers and consumer organisations. For this purpose, the National Federation of Mongolian Consumers Associations (NFMCA) and the Mongolian Food Producers Association (MFPA), two leading national non-governmental organisations, representing consumers or food producing companies, were targeted. Officials who were employed in the top and mid-level key positions in charge of food and nutrition policy in the targeted organisations were identified as potential key informants. Consequently, 13 officials who were currently employed in the above organisations and two other persons who worked in the working groups for development of food laws and the food labelling standard were listed and invited to participate in the study.

5.2.3.2 Development of interview guide

A semi-structured interview guide was developed based on the Policy analysis triangle framework (Walt & Gilson 1994) covering the areas of policy context, content, process and actors. The guide contained open-ended questions regarding: 1) existing food labelling policy and regulations in the country; 2) processes of policy development and implementation, and enablers and barriers to the processes; 3) roles of policy actors, including consumers in policy development and implementation; 4) effectiveness of the policy in assisting consumer food choices; and 5) suggestions for improving the policy. The interview guide was refined after two pilot interviews with public health professionals from the National Centre for Public Health of Mongolia (NCPHM), a governmental organisation under the Mongolian Ministry of Health, to assess its face validity in terms of content, clarity and acceptability (Holden 2010). The content validity of the interview guide was conducted by public health experts from the University of Wollongong, Australia.

5.2.3.3 Data collection

Participants were invited by email to participate in interviews. The work emails of the targeted officials were obtained from the official websites of their respective organisations. We sent an email to each participant, introducing the study and providing a participant information sheet, along with an invitation to take part. Subsequently, participants were contacted by their work phone within one week to inquire about their interest in participating. To ensure that participants felt no social pressure to participate in the study, they were reassured that their participation was completely voluntary, with no obligations. It was made clear that their decision not to participate would have no impact on their relationship with either the organisation or the researchers conducting the study. Before the interviews, all participants provided informed written consents. The study protocol and instruments were reviewed and approved by the Human Research Ethics Committee of the University of Wollongong on 24 October 2017 (Project identification code: 2017/394).

Of the 15 individuals contacted, two declined to participate due to other work commitments or a lack of knowledge in the area. Once the interviews commenced, additional participants were approached through recommendations provided by the key informants. Finally, interviews were conducted with 18 key informants representing government agencies (eight individuals), consumer organisations (two individuals), food producers (one individual) and policy formulation working groups (seven individuals). The participant numbers from each group reflected their organisational role in the development and implementation of food policy and regulations. For instance, the main government organisations, including the Ministry of Food and Agriculture, Ministry of Health, inspection agencies, and the standardization organisation, took on leading roles. Therefore, these organisations were represented predominantly in the sample.

Interviews were conducted either face to face or via video call in Mongolian language by the lead researcher (NCh), who is experienced in conducting in-depth interviews, and were audio taped. Subsequently, the recorded interviews were transcribed verbatim and translated into English by the lead researcher (NCh). Each interview lasted between 40 to 60 minutes.

5.2.3.4 Data analysis

The transcripts were uploaded to NVivo Version 12 (Plus) QSR International Pty Ltd. (2018) and analysed using thematic analysis (Miles & Huberman 1994). Thematic analysis is an approach for exploring qualitative data, enabling the identification and interpretation of patterns or themes across the data. It allows to gain insights into the research questions by examining the links between different categories, concepts, and/or themes (Leavy 2017). Before coding in NVivo, the lead researcher (NCh) carefully read transcripts several times and developed initial insights into the data. Subsequently, the researcher summarised the preliminary analytical notes. Next, open coding or inductive content coding in NVivo identified initial codes. Coding involves the task of assigning a word or phrase to specific segments of data (Saldana 2009). The codes were refined through iterative analysis and constant comparison (Fade & Swift 2011). The codes were grouped into categories based on their reference to the same concept and then organised by the domains of the theoretical framework, including policy content, context, process and actors. Sub-themes and themes were refined from the categories, and discussed and agreed within the research team (BK, AM and HY). Themes signal larger meaning behind a code or group of codes (Saldana 2014). When comparing the sub-themes and themes with the preliminary analytical notes, all the themes matched with the analytical notes, showing that all data were fit within the framework used.

5.2.3.5 Theoretical frameworks

The development of the semi-structured interview guide and the analysis of transcripts were guided by the Policy analysis triangle framework, developed by Walt and Gilson (Walt & Gilson 1994). This framework enables an understanding of how policy content and agenda setting are influenced by contexts and policy setup processes, as well as how policy actors influence policy making and implementation through their roles and power within these processes. By exploring the dynamics between policy constructs, the framework clarifies the factors that contribute to the success or failure of a policy (Buse et al. 2012; Gilson et al. 2018). It is a broad framework that covers both policy development and implementation, while it is simple and easy to use. Previous studies on nutrition labelling from developing countries, such as a study on the nutrition labelling policy in Iran, have used this framework to explore contextual factors, including health, political and international factors influencing the adoption of the traffic light labelling in the country (Edalati et al., 2020).

The Advocacy coalition framework (ACF) (1988) was employed to further analyse the aforementioned policy constructs, including context, content, process and actors, in order to understand better the policy processes of the Mongolian food labelling policy. While sharing some similarities with the Policy analysis triangle framework, the ACF provides a more detailed framework for analysing policy processes by exploring the specific components within those constructs. This includes clarifying the underlying factors that drive policy changes and examining policy actors' behavior based on their belief systems, as well as the resources and constraints that impact their behavior. The theory explains that the policy process occurs within a policy sub-system, where advocacy coalitions are formed between actors based on congruency in their belief systems and coordinated political strategizing (Sabatier & Weible 2014). Actors' policy-oriented behaviour is predominantly influenced by their "deep core beliefs" and "policy core beliefs". Policy learning, which usually affects actors' "secondary beliefs", is a process in which decision makers revise their current policy choices in light of past mistakes or successes. Exogenous stable factors (such as basic attributes of the problem, fundamental sociocultural values and structure, and rules) and dynamic factors (e.g. changes in socioeconomic conditions, changes in governing coalitions, and regime change) lead to major policy changes. These factors impact subsystem actors through the resources and constraints, including legal authority, public opinion, information, mobilizable troops, financial resources, and skillful leadership (Sabatier & Weible, 2014).

5.2.4 Results

The analysis of the policy processes of the Mongolian food labelling policy has revealed nine overarching themes and several sub-themes (**Table 5.1**).

Table 5.1 Themes and sub-themes emerged in the analysis of Mongolian food labelling policy

	Theme	Sub-theme
1	Historical socio-political transition	• Changes in food system • Diminished food control system • Diminished food safety and quality
2	Characteristics of food labelling policy	• Novel policy • Not a priority for the government
3	Agenda setting	• Needs for food control system's reforms and improved policy environment • Food safety incidents • External influencing factors • Adoption of nutrition labelling under the umbrella of the main food safety policy
4	Policy formulation and engagement of actors	• Leadership of government and public health professionals • Engagement and assistance of international organisations • Disruptions in the policy process • Higher engagement and influence of food industry • Industry opposition to the FOPL policy • Lack of engagement with consumers
5	Policy implementation and engagement of actors	• Labelling standard violations • Delay in follow up regulations • Poor infrastructure and limited resources • Lack of policy advocacy and consumer education campaigns
6	Gaps in the policy	• Not meeting consumer needs • Lack of regulations in some areas
7	Regulators	• Lack of knowledge and expertise in food labelling • Food labelling is not a priority for regulators
8	Consumers	• Low nutrition literacy and lack of awareness and experience in food labelling • Minimal use of food labels • Need for consumer nutrition education
9	Food businesses	• Lack of knowledge and experience in food labelling • Challenges with product labelling (technical challenges, issues with stocked printed labels)

The emerged themes are organised across the four domains of the Policy analysis triangle framework (context, content, process and actors) (**Figure 5.1)**. Mongolia's historical socio-political context was identified by participants as the main driver of the development and implementation of the current food labelling policy. Other themes were largely connected to this overarching context theme, and were identified as the facilitators and barriers to the policy processes. All themes fit into the domains of the framework and were interconnected, aligning with the concept of the framework that context, content, process and actors are interrelated. This indicates that the framework is relevant to the food labelling policy processes in Mongolia.

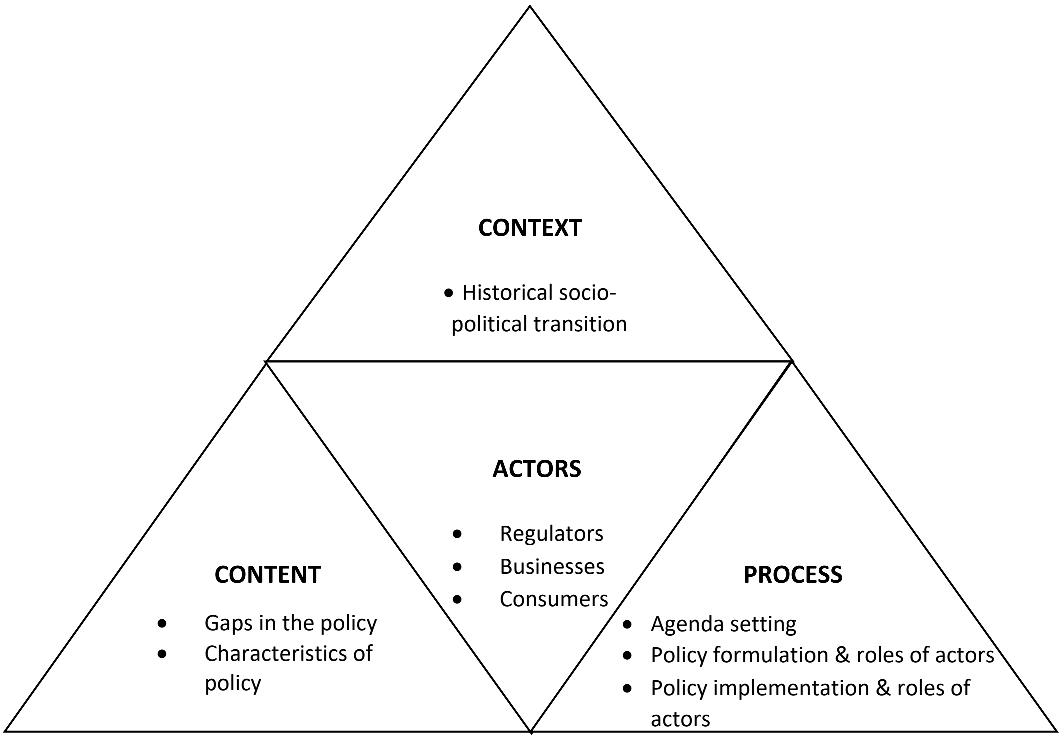

Figure 5.1 Overarching thematic findings related to the Policy analysis triangle framework (Adapted from Collins et al. 1999; Walt & Gilson 1994)

5.2.4.1 Development of food and nutrition labelling policy in Mongolia

Study participants pointed out the Food Law and the Food Safety Law as the primary legislations addressing food labelling, while the food labelling standard was identified as the main regulation for food and nutrition labelling. The legalisation of food labelling in the Food Safety Law considered by participants as a significant milestone, drawing attention to the issue. The adoption of this law and the new food labelling standard was considered a major progress by most study participants.

> "*In 2012, the Food Safety Law was enacted, comprehensively legalising the labelling of food products in Mongolia for the first time…This legalisation represented a substantial regulation*." (Regulator 1)

5.2.4.1a Historical socio-political context and emerging free market

The context in which food labelling policy is emerged in Mongolia was described by three sub-themes, including "changes in the food system", "diminished food control system" and "diminished food safety and quality". Participants highlighted that the new food policies in

Mongolia were a result of the decentralisation of the food system, which occurred during the country's transition from a socialist system to a free market economy. The changes in the food system encompassed the collapse of state-owned food industries, the emergence of the private food sector with new small and medium-sized food enterprises, retailers, and catering services, as well as trade liberalisation and an increase in food imports. Participants recognised the limitations of the current food control system in effectively regulating the increasing volume of food imports, as well as the emergence of the private food sector. One participant emphasised these changes in the economy and the political system as that:

> *"Since the enactment of the previous food Law in 1999, the economic and political environment has changed, and private businesses have entered into the food industry on a large scale. Consequently, significant difficulties have arisen in managing individual food imports." (Regulator 2)*

The sub-themes "diminished food control system" and "diminished food safety and quality" reflected the consequences of the collapse of the previous state-controlled food system in Mongolia. The new government faced challenges, including the lack of policies and infrastructure to effectively manage the evolving food system. Consequently, there were disruptions in food quality control during the early transition period, resulting in the neglect of food quality and safety issues.

Furthermore, the theme "historical sociopolitical transition" was also identified through an analysis of the data using the ACF. A sociopolitical transition experienced by Mongolia corresponded to an external event, which is identified in the ACF as a catalyst for policy changes in the country, specifically for the development of the Food Law and the Food Safety Law.

5.2.4.1b Agenda setting of food labelling policy

According to the majority of participants, food labelling was regarded as "a novel policy" that held less relevance and importance during the previous economic regime. This sub-theme was defined under the theme "characteristics of the policy". Participants agreed that this is primarily related to the limited availability of product varieties, particularly processed products, in the market at that time, as well as low awareness regarding food labelling among the general public and regulators. In contrast, many other countries have a long history of implementing food labelling regulations (Rimpeekool et al. 2015; Zilberman et al. 2018).

"In my opinion, there were no regulations governing labels before… (Member 1, Law development working group)

The sub-theme "adoption of the policy under the umbrella of the main food safety policy" refers to the integration of the food labelling policy into the new food laws. Subsequently, two sub-themes "needs for food control system reforms and improved policy environment" and "food safety incidents" explained the underlying reasons for this integration. These sub-themes are described as follows.

Participants agreed that health incidents related to food poisoning outbreaks brought the issue of food safety to the government's attention. Of particular significance was the incident in 2007, where the consumption of methanol-tainted vodka resulted in the tragic deaths of 11 people. This incident served as a turning point, prompting the government prioritise the issue and include it on the policy agenda. As claimed by participants, in response, the government acknowledged the inadequacy of the previous Food Law enacted in 1999 and initiated its amendment to establish effective food control and improve legal environment for food safety. Participants also acknowledged that the Mongolian government was influenced by internationally accepted benchmarks, such as the shared responsibility in food safety and quality (FAO 2008). This led to a shift in the government's approach from attempting to control the entire food system to adopting a shared responsibility approach for food safety and quality across all stakeholders in the food chain. With a focus on decentralisation, food producers were assigned an increased responsibility, while the government's role shifted towards creating a supportive environment and conducting risk-based audits for food control. To facilitate these changes, the government needed to restructure its agencies overseeing food safety and quality, and adapt existing food regulations to ensure appropriate governance and regulation of the food system.

In addition to the Food Law, the issue of food labelling was primarily addressed in the new Food Safety Law. This inclusion reflected the need to regulate labels of the growing volume of imported food products and improve the labelling of domestic packaged products, which were also increasing in production. Participants highlighted that concerns regarding food safety, such as providing accurate best before dates, declaring food additives on labels, and regulating labels written in foreign languages, drove the regulations related to food labelling in the law.

"The inclusion of labelling in the 2012 law was prompted by increasing volume of food imports and the intensification of international food trade." (Member 1, Law

development working group), "There have been numerous consumer complaints regarding imported foods that do not meet safety requirements, with expired dates, and contain confusing information on the labels. Hence, we addressed these concerns and incorporated them into the law [Food Safety Law]." (Regulator 2)

The government made efforts to harmonise the new regulations with international guidelines and standards. Some participants asserted that the food laws and the new food labelling standard were developed in consultation with international regulations, including the agreements of the World Trade Organization and relevant Codex standards on food and nutrition labelling. However, only a few participants agreed that the new standard was primarily developed to support informed food choices and address the increasing prevalence of obesity and lifestyle-related diseases in the country in recent decades.

"Two Codex standards, including the general standard for food labelling and the nutrition labelling standard, were merged and developed as a single standard [in Mongolia]." (Regulator 4)

5.2.4.1c Policy formulation process and roles of regulators, businesses and consumers

The theme "policy formulation" was further divided into six sub-themes (**Table 5.1**). In Mongolia, the development of all food labelling regulations was initiated and led by the government, with government officials playing a key role in the process. Participants indicated that a working group, led by the Ministry of Food and Agriculture, was responsible for amending the previous food law from 1999 and developing the new Food Law. This process took nearly five years from its commencement to its adoption in 2012. Disruptions occurred during the formulation of the laws due to the changes in the government and subsequent changes in the government officials responsible for the development of the laws, and insufficient funding.

The formulation of the Food Safety Law involved a collaborative effort between a working group led by the SSIA and the IFC. This working group included representatives from governmental agencies and non-governmental organisations. Eventually, a group of parliament members presented the draft of the law to the Parliament for further consideration. Participants emphasised the contribution of the IFC, a World Bank organisation, in facilitating the working group and providing necessary funding for the development of the law. Both the Food Law and the Food Safety Law underwent discussions at the parliament level, leading to amendments before their adoption. The development of the food labelling standard and the FOPL guideline involved a working group established by the Ministry of Health, comprising members from the NCPH and the MASM. Participants claimed that the drafts of the food laws, the standard and the guideline were provided to food producers, relevant government and non-governmental organisations, and consumer organisations to seek their opinions on the policies. While government organisations played pivotal roles, active participation from the food industry was observed through their engagement in the working group discussions. During the policy formulation process, the opinions of food producers held significant influence in shaping of the drafts of the laws and the food labelling standard. This input was influential not only in the development phase but also during the adoption of the laws at the parliamentary level. Notably, there was opposition from food producers regarding the development of the FOPL regulation, which prompted negotiations by government organisations to implement the system on a voluntary basis.

> *"In order to include a clause regarding FOPL in the new standard, the Ministry of Health and the NCPH have made strong efforts. However, food producers and, in general, everyone else strongly disliked the idea." (Regulator 5), "The Food Producers Association have over 350 member organisations across 18 aimags [provinces], and all of them have provided their comments on the standard". (Representative of Food Producers)*

In contrast, consumer participation in the development of the regulations was very low. Participants highlighted that consumer organisations were occasionally included in policy development working groups or the general public had the opportunity to provide feedback on draft policies through the websites of the Ministry of Health and the Ministry of Food and Agriculture. Some participants agreed that consumers were not involved in the development and discussions of these regulations. This indicates that existing policies were developed with minimum input from consumers, could potentially leading to existing policies are not aligned with their needs.

> *"We do not have principles of tailoring [regulations] to each consumer. Consumers were not included in the working group responsible for the labelling standard, which I oversaw. To be honest, in the discussions, only one or two non-governmental organisations and food producers were included, but not consumers. (Regulator 6)*

When analysed the data using the ACF, the food labelling policy subsystem consisted of two primary coalitions, including the government and industry coalitions. The government coalition, encompassing central government agencies responsible for health, food and agriculture, inspection, and standardization, played a key role in the policy processes of the Mongolian food labelling policy. The government coalition's deep core beliefs were about protecting public interests and population health, while their policy core beliefs focused on improving the food control system and improving food safety through the implementation of food labels. On the other hand, the industry coalition held a deep core belief of protecting commercial interests, while their policy core beliefs involved accepting the label information, including nutrient declarations, but rejecting the implementation of a mandatory FOPL system.

5.2.4.2 Policy implementation and roles of regulators, businesses and consumers

Four sub-themes were identified under the theme "policy implementation" (**Table 5.1**). Participants acknowledged that the significant challenges associated with implementing the food labelling policies. The majority of participants expressed dissatisfaction with the enforcement of the Food safety law and the previous food labelling standards, citing frequent instances of "labelling violations". They pointed out that food companies seemed to prioritise packaging materials and label design over the content of the label information itself.

> *"According to reports from inspection agencies, labelling violations are prevalent, with the non-compliance rate estimated to be between 30 and 40 percent." (Regulator 2)*

Participants highlighted the issues that hinder the effective implementation of the labelling policies, specifically emphasising "the delays in developing operational regulations" and "the lack of infrastructure and resources to support policy implementation". In the Mongolian context, participants observed significant time lags between the enactment of a law and the subsequent implementation regulations, as was the case with food labelling. For example, despite the main law being enacted six years prior, the food labelling standard only came into effect in January 2018. Such delays hindered implementation, as businesses and food inspectors lacked clear guidance on complying with the law.

Insufficient infrastructure and resources emerged as a major obstacle to implementing the food labelling policy. The lack of necessary infrastructure, including qualified inspectors hindered effective enforcement of food labelling regulations. Participants highlighted various infrastructure-related constraints for effective enforcement, such as limited authority of inspectors, inadequate penalties for non-compliance, insufficient training on food labelling for inspectors and food producers, absence of laboratories for testing the nutrients declared on labels, and a lack of monitoring and evaluation mechanisms for the policy.

Furthermore, insufficient financial and knowledge resources have impeded policy implementation. Food producers, especially small factories, encountered difficulties in complying with the new standard due to limited resources in terms of knowledge, training, and laboratory/testing capacity. It was challenging for them to bear the costs associated with stocked packaging materials, bearing old labels, and also ensuring the declaration of all required nutrients due to the lack of laboratory capacity. Government agencies also faced funding shortages for policy advocacy, consumer education campaigns, and training programs for inspectors and food producers.

> *" …in order to comply with the new standard, it is necessary to list all the ingredients and nutritional content. So the challenge is whether the laboratories have the capacity to meet these requirements. Not every factory has the resources." (Regulator 6)*

When asked questions about food labelling, participants were not inclined to answer them and often shifted the conversation towards discussing food safety issues instead. Despite their overall agreement with the importance of food labelling, participants expressed greater concern about food quality and safety issues rather than the role of food labelling. Participants were skeptical about the existing food safety and quality standards in the country and voiced a lack of trust in Mongolia's food governance. This suggests that regulators may have "insufficient knowledge about food labelling" and assign it a "low priority", considering that the majority of participants were government officials.

> *"What we are eating and using itself is problematic, let alone food labels. Consequently, there is a lack of trust among people when it comes to food labels." (Regulator 3)*

Low nutrition literacy and lack of awareness of food labels among consumers were identified by participants as the primary obstacles to the implementation of the food labelling policy. The majority of participants agreed that consumers lack of sufficient knowledge about labels and tend to only pay attention to best before dates. However, a few participants mentioned a growing interest among people in food labels, noting that some people have started to examine nutrition information on labels.

“It seems to me that consumers don't pay much attention to it [nutrition label] because the general population is poorly educated on nutrition” (Regulator 7)

Participants expressed support for a consumer-oriented approach to food labelling policy and emphasised the significance of consumer education in enabling individuals to effectively use label information.

5.2.4.3 Gaps in the food labelling policy

Participants generally held optimistic views about the newly adopted law and the standard. Given the standard had not been enforced at the time the study was conducted, they did not identify any limitations at this stage of the implementation.

There were identified some gaps in the existing food labelling policy and regulations. Two sub-themes, “not meeting consumer needs” and “lack of regulations in some areas”, emerged. Most participants supported the legalisation of three languages for food labels as they considered it assisted in regulating the labels of imported products, which previously were in multiple languages. However, one participant had opposite opinion, agreeing that labels of imported products should be solely in Mongolian.

“*Almost 70 to 80 percent of the population do not understand Russian or English, but almost 80 to 90% of processed products are imported products.” (Member 2, Law development working group)*

In addition to language requirements, there were varied opinions regarding the alignment of the food labelling standard with consumer needs. While most participants did not raise issues about the standard’s requirements, a few participants expressed concerns about the volume and complexity of information mandated on the label. They felt that the required label information is overly detailed, exceeding consumers’ nutrition literacy, thereby making it difficult for them to comprehend and use it effectively.

“*The last label standard has very weak ties to the level of education of end-users of the standard. The requirements are too high.” (Regulator 7*)

Participants also noted issues with unreliable and inconsistent label information, as well as poor legibility of label information. Some participants highlighted the lack of verification mechanisms to ensure the credibility of label information for both new and existing products.

5.2.5 Discussion

This study analysed the formulation and implementation of the food labelling policy in Mongolia for the first time and identified the barriers and facilitators to the policy processes. The Government of Mongolia has made significant progress in food labelling over the last decade, adopting several pieces of legislation as part of broader reforms addressing the consequences of the country's transition from a non-competitive market system to a new market economy. The primary objective of these regulations is to enhance food safety and quality, with the initial focus on food labelling driven by the purpose of regulating label language, declaration of food additives, and provision of expiry date information. The focus of establishing the food labelling policy in Mongolia differs from that in many other countries. Elsewhere political commitments for prevention of obesity and NCDs have been the main drivers of label changes, as those markets already have established strong food safety regulations (Edalati et al. 2020; Kumar et al. 2018; Phulkerd et al 2017; Vogel et al. 2010; White and Barquera 2020).

The leadership and commitments of the government, along with the technical and financial support provided by international agencies, were the primary facilitators in the development of the food labelling policy in Mongolia. However, the study also identified several barriers that outweighed the facilitators in the policy development and implementation. The food industry opposition was the main barrier for policy development, particularly for the adoption of the FOPL policy, which aligns with other studies conducted in LMICs (Edalati et al. 2020; Rimpeekool et al. 2015; White & Barquera 2020). Additionally, poor policy advocacy and the lack of engagement of consumers in the policy formulation were significant challenges for the Mongolian policy. In contrast, involving consumers in policy processes through formative research and holding extensive policy debates has led to successful policy outcomes in other countries, including LMICs. For example, the adoption of nutrition labelling policy in Brazil, traffic light labelling in Thailand and warning labels in Mexico (Coitinho et al. 2002; Rimpeekool et al. 2015; White & Barquera 2020). Public health and consumer advocacy groups had been successfully collaborated in policy advocacy campaigns in the development of the Australian Health Star Rating system (Kumar et al. 2018).

According to the ACF, Mongolian food labelling policy followed a path of policy change prompted by an external event - the socio-political transition in the country. This context has influenced the policy content, process and actors of the food labelling policy. In line with

Dolowitz and Marsh (2000), the adoption of the Mongolian food labelling policy can be attributed to inappropriate policy transfer in terms nutrition labelling, as the policy was integrated within the broader framework of food safety policy without careful consideration and major demands. The authors defined inappropriate policy transfer as the inclusion of a policy within a wider program that is based on a different set of values (Dolowitz & Marsh 2000). The policy core beliefs of the governing coalition, which comprises central government agencies, have shaped the food safety focus of the Mongolian food labelling policy and subsequently governed its implementation.

Mongolia has established food labelling policy and regulations that seemingly aligning with international food standards, such as Codex guidelines. However, there exists a significant implementation gap, as indicated by this study and other research around nutrition and health claims (Chimedtseren et al. 2020). The rapid transition from a controlled, socialist economy to a free market has outpaced an effective regulatory response, resulting in limited success in bringing desired changes. Neither the government, food producers nor consumers were adequately prepared to undertake new food labelling regulations in an effective manner, both in terms of structural adjustments and in their daily lives.

Dolowitz & Marsh (2000) argue that incomplete policy transfer occurs when policies are adopted without the necessary contextual and institutional conditions in place (Dolowitz & Marsh, 2000). In line with this argument, Mongolia's food labelling policy has experienced incomplete policy transfer due to a lack of infrastructure and resources, which can be attributed to the transition and the legacy of the previous system. Insufficient infrastructure and resources, including inadequate monitoring and evaluation systems, training programs, funding, and laboratory capacity, emerged as key barriers to the implementation of the Mongolian food labelling policy. Moreover, significant challenges have been identified regarding the lack of focus and insufficient knowledge and skills among both regulators and consumers. Similar challenges related to infrastructure and resources have been reported by other studies conducted in LMICs (Edalati et al. 2020; Farida & Ayuningtyas 2019; Freire et al. 2017; Phulkerd et al. 2017; Tee 2002). However, two resources specific to the Mongolian policy- time constraints and experience - can be added to the resources and constraints of policy subsystems previously defined in the ACF. These constraints reflect the country's limited time to adjust its policies to the new system, as well as the regulators' and consumers' lack of experience in food labelling, which had a negative impact on the policy change.

The study found that food regulators were primarily focused on food safety and quality issues, with food labelling, especially nutrition labelling, receiving little attention and understanding from, and of low priority to, most regulators. It was observed that when participants were specifically asked about food labelling, they frequently redirected the discussion towards food safety topics. This suggest their limited knowledge and expertise regarding food and nutrition labelling, and its significance. This lack of focus and capacity among regulators, along with their policy core beliefs centered on food safety, contributes to food and nutrition labelling being a very challenging space within food policy and practice in Mongolia. In contrast, strong policy values and beliefs of policy actors play important role for policy process (Clarke et al. 2019; Vogel et al. 2010). The low priority placed on food labelling by the Mongolian government can be partly attributed to the absence of external pressures for improved labelling, including trade influences as in the case of the development of nutrition labelling regulations in other countries (Rimpeekool et al. 2015).

Regulators believe that consumers generally do not use food label information due to low nutrition literacy, which poses a challenge for the food labelling policy in achieving its goals. Historically, the limited availability of packaged food products in Mongolia resulted in less emphasis on food labels. As a result, consumers lacked prior experience and knowledge of food marketing and food labelling, leading them to not question or seek information about product quality or legitimacy, except for checking for best before dates. Furthermore, consumer representation in policy processes was virtually absent, possibly reflecting a tradition of not seeking public opinions in decision making and a lack of an established procedures for engaging consumers in policy discussions in Mongolia during the previous system, as well as a lack of strong civil society. The adoption of the Law on Legislations in Mongolia in 2017 now requires multiple discussions with the general public for legislation intended for public compliance (Government of Mongolia 2015a). Opposition from food producers and very little consultation with consumers, regulations have failed to adequately reflect consumer needs, resulting in consumers being unable to make informed food choices and remaining nutritionally vulnerable during the economic transition. Participants believed that consumers’ lack of knowledge on food labelling led to their minimal participation in policy formulation processes and not voicing their opinions or demands for improved labelling. However, the expectation for consumers to possess sufficient awareness to advocate for better labelling is deemed unrealistic. It is ultimately the responsibility of the government to effectively communicate with consumers about the benefits of food labelling in promoting healthy choices.

The study findings suggest the need for the Mongolian government to take directive leadership in addressing the negative impacts of food system changes and promoting informed food choices. Although well intentioned, the government was ill-equipped to deal with the challenges that came from the shift to a new socio-political system that occurred 30 years ago. With the country relying heavily on imports, mainly processed foods, there is an accelerated risk of unhealthy diets, obesity and NCDs. This trend of increased supply and consumption of processed foods aligns with the nutrition transition observed in other developing countries (Kline et al., 2017). The existing regulatory system failed to anticipate these nutritional and health issues and implement pre-emptive actions to minimise their impacts. To rectify this situation, it is crucial to enhance current food policies, establishing necessary infrastructure and resources, and raising awareness and knowledge about healthy diets among the population.

To ensure the success of the food labelling policy, the government must overcome barriers related to limited knowledge, resources and infrastructure in policy development and implementation. The focus of the food labelling policy should be on nutrition labelling and prioritise the principles of free market rhetoric, emphasising consumers' ability to make informed choices (Smart 2010). Necessary actions may include government oversight of mandatory FOPL policy and providing label information in Mongolian. It is important for the government to actively educate consumers about the benefits of using food label information through consumer education campaigns, integrating nutrition education into the curriculum of primary and secondary schools, and engaging civil society organisations. Furthermore, ongoing consumer participation in the policy formulation process should be encouraged. Fortunately, the Law of Legislation (2015) has outlined a recent procedure for consumer participation in the formulation of public policies and regulations, which should be followed in future policy making processes. To enhance knowledge, infrastructure and resources, the government should seek appropriate technical and financial support from international organisations. Capacity building activities such as training programs and workshops for regulators and food producers should be conducted to improve their knowledge and understanding of food and nutrition labelling. Public forums on food labelling and establishing monitoring and evaluation mechanisms for the policy should also be considered.

5.2.6 Limitations of the study

In the study, the analysis of the food labelling policy primarily relied on the perspectives of regulators and national policy stakeholders, while food producers and consumers were represented by only a few individuals from their respective associations and organisations. As a result, the analysis predominantly focused on the perspectives of regulators, the study findings may not adequately reflect the positions of other stakeholders such as food producers and consumers towards food labelling policies. Future research is needed to thoroughly explore the perspectives of food producers and consumers regarding food labelling policies. Additionally, the key informants were primarily from national-level government agencies and non-governmental organisations, which means that the findings may not fully capture the issues and challenges encountered in policy implementation at the sub-national level. Future research should explore the implementation of food labelling policies at the local level, including rural areas. The knowledge, understanding and practices of food inspectors, food producers, importers and consumers involved in policy implementation at the grassroots level require further exploration.

5.2.7 Conclusions

The development of food labelling policy and regulations in Mongolia is driven by the need to address changes in the food control system during country's transition to a new market economy. Despite Mongolia's efforts to implement food labelling policies, significant challenges have been encountered in adapting Codex guidelines on food labelling and integrating them into national policies. Influenced by the context of the previous regime's legacy, policy processes have been hindered by limited knowledge and resources, adequate institutional structures for consumer engagement, and time constraints for restructuring the previous system and adopting new policies.

To mitigate the adverse health impacts of nutrition transition, it is crucial to prioritise nutrition labelling based on consumer needs. The government should take actions such as ensuring that food labelling regulations provide clear guidance, effectively communicate the regulations, establish and adequately resource implementation procedures, policy monitoring and evaluation processes, and building capacity in food labelling. It is important to influence regulators' policy core beliefs by improving their knowledge in nutrition labelling, as well as engaging consumers in policy discussions and improving their nutritional literacy through education campaigns and programs. The insights gained from Mongolia's experience can inform policy development and implementation in other countries undergoing similar transitions.

Chapter Six

FOOD LABELLING PRACTICE IN MONGOLIA

6.1 Preface

This chapter provides an overview of existing food labelling practices in Mongolia by reviewing the labels of food products available at market places and determining the scope of and variations in label information. This examination of the content, scope and language of label information clarified the extent of the implementation of the food labelling regulations in practice, and also assessed the alignment of food labels with consumers' needs and expectations, which were explored in *Chapter Five*.

The chapter begins presenting a published article that reported on nutrition and health claims carried by food products sold in retail. It identified nutrition and health claims on food products were largely not credible and misleading, and were often displayed on unhealthy products. Survey findings indicated a need for rigorous regulations for these claims. This research has been published in a peer-reviewed journal (**Appendix A**). Section 6.2 presents this article with minor amendments in formatting such as referencing style, figure and table numbers to conform with the University of Wollongong's thesis format.

> Citation: Chimedtseren, N., Kelly, B., McMahon, A.T., Yeatman, H 2020, "Prevalence and Credibility of Nutrition and Health Claims: Policy Implications from a Case Study of Mongolian Food Labels", *International Journal Environmental Research Public Health,* vol.17, no.20, pp.7456. doi:10.3390/ijerph17207456.

The second part of the chapter introduces the results of Study IV- Audit of food labels, of which the findings on nutrition and health claims formed one component. This audit found major problems in labels of domestic and imported products despite their overall compliance to the food labelling standard. The large majority of food labels were in one of the legal languages which are Mongolian, Russian and English, however, labels in Russian and English can be a problem for people who do not understand these languages. The content format of label information was inconsistent, especially for domestic products. The lack of standardisation for label text format is related to the lack of guidance in the national food labelling standard in this regard. Labels of imported products translated into Mongolian had relatively limited scope of label information than their original labels.

6.2 Published article: Prevalence and credibility of nutrition and health claims: Policy implications from a case study of Mongolian food labels

6.2.1 Abstract

Nutrition and health claims should be truthful and not misleading. We aimed to determine the use of nutrition and health claims in packaged foods sold in Mongolia and examine their credibility. A cross-sectional study examined the label information of 1723 products sold in marketplaces in Ulaanbaatar, Mongolia. The claim data were analysed descriptively. In the absence of national regulations, the credibility of the nutrition claims was examined by using the Codex Alimentarius guidelines, while the credibility of the health claims was assessed by using the European Union (EU) Regulations (EC) No 1924/2006. Nutritional quality of products bearing claims was determined by nutrient profiling. Approximately 10% (*n* = 175) of products carried at least one health claim and 9% (*n* = 149) carried nutrition claims. The credibility of nutrition and health claims was very low. One-third of nutrition claims (33.7%, *n* = 97) were deemed credible, by having complete and accurate information on the content of the claimed nutrient/s. Only a few claims would be permitted in the EU countries by complying with the EU regulations. Approximately half of the products with nutrition claims and 40% of products with health claims were classified as less healthy products. The majority of nutrition and health claims on food products sold in Mongolia were judged as non-credible, and many of these claims were on unhealthy products. Rigorous and clear regulations are needed to prevent negative impacts of claims on food choices and consumption, and nutrition transition in Mongolia.

Keywords: claims; food; beverage; label; nutrition; health

6.2.2 Introduction

Lifestyle-related non-communicable diseases (NCDs) are the leading cause of global deaths, responsible for 71% of the 57 million global deaths in 2016. Almost eight in every ten deaths from NCDs occur in low and middle-income countries (LMIC) (WHO 2018b). Nutrition transition can result in higher rates of obesity and NCDs and is associated with shifts in diet, physical activity and other lifestyle changes that follow economic, demographic and epidemiological changes (Popkin 1993). Changes in diet are one of the key characteristics of nutrition transition. Dietary changes include increased consumption of processed foods and shifts from traditional diets to Western pattern diets high in energy, sugars and fat (Popkin 1993). Nutrition transition is a global phenomenon but is occurring much faster in LMICs (Popkin 2002). LMICs are facing challenges in responding to nutrition transition and a faster growing burden of NCDs. These challenges relate to limited resources and time to adjust food policies to support healthy diets. Serious attempts to address the problem are limited to only a few countries (Popkin 2015).

Provision of accurate and sufficient information on the nutritional quality of food products is a key policy action for governments to support healthy diets, as recommended by the Codex Alimentarius Commission (CAC 2013). Claims are one form of nutrition labelling. Nutrition claims state, suggest or imply that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins and minerals. Health claims refer to relationships between a food or a constituent of that food and health (CAC 1997). Nutrition labelling provides information to consumers about the nutritional content of foods and assists them in making healthier choices. It may also encourage product reformulation as food manufacturers seek to avoid making undesirable disclosures (Lartey et al. 2016).

Claims on food labels should be truthful and not misleading (CAC 1997). However, food producers use claims for marketing purposes (Hawkes 2004). Claims can be misleading where they are present on foods deemed less healthy or when health claims are not scientifically substantiated (Hawkes 2004). Claims also can induce a “health halo” effect, by which they affect consumers’ perceptions of the overall healthfulness of foods. People are more likely to purchase products bearing claims and are not as restrained in their consumption (Kaur et al. 2017).

Mongolia is an LMIC where little research on food labelling has been undertaken. Prior to shifting to a market economy in the early 1990s, Mongolia was under a centralised economy and had low levels of imported food products (Shagdar 2005). Consequently, Mongolian consumers are relatively unfamiliar with food labelling specifically and processed packaged food more generally. The country is experiencing rapid nutrition transition with commensurate NCD burdens. NCDs surpassed other causes of mortality in recent decades to become the leading cause of population mortality. Cardiovascular disease and cancer accounted for 60% of population deaths in 2017, compared to 58% in 1995 (CHDM & WHO 2017). Of 15–49 years olds, 46.2% of women and 48.8% of men were overweight and obese in 2016, which represents an increase of 40% for women and 77% among men from 2010 levels (MOHM, NCPHM & UNICEF 2017).

In Mongolia, a new food labelling standard, MNS 6648:2016, which was largely based on the relevant Codex standards for food labelling (CAC 1985, CAC 1997, CAC 2013), came to enforcement in 2018. Prior to this, there was effectively no regulation relating to nutrition and health claims on food packages. The previous guideline on nutrition labelling of 2007, which was an apparent translation of the Codex guidelines on nutrition labelling (CAC 2013), lacked capability to provide proper regulation due to its poor translation (introducing errors) and voluntary nature. The new regulation of 2018 was progressive to the previous guideline as it stipulates mandatory nutrition labelling for all pre-packaged food products on the back or side of food packaging. Official label languages are Mongolian, Russian and English. Regulations relating to nutrition and health claims are still minimal in the new standard and include two main requirements: (1) the mandatory declaration of a nutrient when a nutrition or health claim is made, and; (2) the need for approval of health claims by a government-authorised organisation. A definition of a nutrition claim was provided in the food labelling standard MNS 6648:2016, together with the requirement to declare the amount of the claimed nutrient. The standard also introduced the concept of scientific substantiation of health claims. However, the standard does not specify the types of nutrition and health claims that are permitted and lacks requirements regarding criteria for making claims (MASM 2016).

Food labelling policy implementation, including for nutrition and health claims, has not been well studied in LMICs. Most evidence on the use of claims and their effects on diets are from high-income countries (Oostenbach et al. 2019; Williams et al. 2003; Williams et al. 2006). The study aimed to determine the use of nutrition and health claims on pre-packaged foods sold in Mongolia and examine the credibility of these claims. As food labelling regulations are currently in transition in this country, this study provides a critical baseline evaluation of the food labelling landscape to guide identification of areas of concern and provide a basis for assessing the progress on policy implementation. Findings will be useful to other LMICs experiencing similar trajectories in the availability and population consumption of processed pre-packaged foods in the absence of corresponding food labelling policies to guide healthier choices.

6.2.3 Materials and Methods

6.2.3.1 Data Collection and Coding

A survey of pre-packaged food product labels was conducted in Ulaanbaatar, the capital city of Mongolia, during November and December 2017. University students studying nutrition, public health and nursing were engaged in data collection after undertaking training in the data collection tool. The students collected the label information of food products from supermarkets and grocery stores located throughout the city. They were instructed to collect the product information from any supermarket or grocery store at their convenience.

Approximately 100 student data collectors sampled food products from 50 food categories belonging to 11 major groups (**Appendix R**). These food categories and subcategories were based on the food categories' classification used in the household socio-economic survey of the National Statistics Office of Mongolia (NSOM 2004), which represented the common types of food products used by Mongolian households with some modifications to include other common types of processed food products. The pre-defined food categories were pre-tested in one supermarket by crosschecking them against the products placed on the shelves in the supermarket and missing food categories were added.

The food categories were assigned to the data collectors in order to avoid duplications and each student was asked to collect label photographs of at least 20 food products across all label language groups, capturing as many different brands as possible. They took photographs of product packaging and recorded details of label information, including the product's name, category, brand, manufacturing country, label language and availability of nutrient declarations and claims. Students transferred electronic copies of the photographs to the lead author (NCh).

Photographs were coded by one person (NCh) for product name, type, manufacturing country, label language and the verbatim content of claims. If label photographs were of poor quality or did not fully capture the label, students were asked to retake photographs of the products and send them through, or the Internet was searched for images of the products.

6.2.3.2 Data Analysis

Data were entered into Microsoft Excel (2016) and converted into IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, N.Y., USA) for analysis. The proportions of food products carrying nutrition and health claims and the rate of claims per 100 products (a number of claims per 100 products) were estimated for each food category. The rates of claims were compared by claim type and label language.

By the credibility of claims, we perceived trustworthiness and reliability of claims in terms of providing reliable and scientific evidence-based information to consumers, as well as providing supporting information on the content of claimed nutrients to back up the claimed nutritional characteristics or health effects of a product. The Codex guidelines and the claims regulation of the EU were used in the credibility analysis of claims as the current national food labelling standard (2018) did not contain criteria for making nutrition and health claims. Credibility of nutrition claims was determined by their compliance with the criteria of nutrient content claims established in the Codex guidelines for Use of Nutrition and Health Claims (CAC/GL 23-1997) (CAC 1997). Nutrition claims were considered credible if the value for the claimed nutrient was present and in correct amounts on the nutrient declaration. Health claims were assessed for their consistency with the list of acceptable claims of the EU Regulations (EC) No 1924/2006 (European Parliament & Counsel on Nutrition and Health Claims 2006). The EU regulation was used because of the considerable share in the Mongolian food imports from EU countries (World Integrated Trade Solution 2018). Health claims were considered credible if they appeared in this list and were compliant with the criteria of nutrient content established for corresponding claims (**Figure 6.1**).

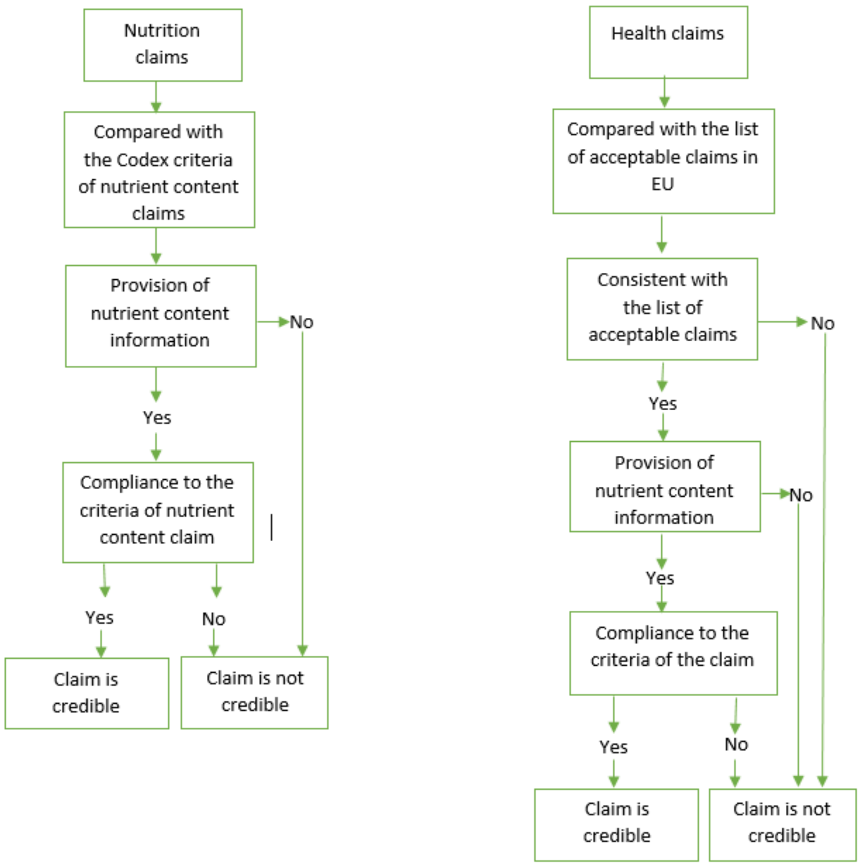

Figure 6.1 Assessment of credibility of nutrition and health claims.

Products with nutrition and health claims were assessed for their healthiness by comparing their nutrient content against the WHO nutrient profile model for the Western Pacific Region (WPR) (WHO 2016b). The purpose of the model is to restrict marketing of foods and non-alcoholic beverages to children and it is intended to differentiate between food and non-alcoholic beverages that are more likely to be part of a healthy diet from those that are less likely. The model consists a total of 18 food categories and marketing to children is prohibited for three categories (category 1—chocolate and sugar confectionary, energy bars and sweet toppings and desserts; category 2—cakes, sweet biscuits and pastries and sweet bakery products; and category 4c—energy drinks, tea and coffee). The nutrient content of the products was crosschecked against the nutrient thresholds for saturated fats, trans-fat, added sugar and sodium of the model. Products that exceeded any of the relevant thresholds were considered unhealthy.

The research was reviewed and approved by the Human Research Ethics Committee of University of Wollongong on 24 October 2017 (Project identification code: 2017/394).

6.2.3.3 Classification of Claims

Claim types were determined according to the Codex classifications (CAC 1997). In addition, therapeutic claims were included as a type of health claim (**Table 6.1**).

Table 6.1 Types of claims

Type of Claims		Definition	Example of Claim
Nutrient content claim		Claims that describe the level of a nutrient contained in a food	"Source of calcium"; "High in fibre"; "Low in fat"
Health claim		Statement about a relationship between a food or a constituent of that food and health	Examples of health claims are given below.
Type of health claim	Nutrient function claim	Claims that describe the physiological role of a nutrient in growth, development and in maintaining and supporting normal functions of the body (not related to a specific disease)	"Calcium for healthy bones and teeth. Food X is a source of calcium."
	Other function claim	Claims related to positive contribution of a food or a constituent of that food to health or improvement of a body function. In this study, claims related to substances other than nutrients were classified in this category.	"Fibre contained in the product improves peristalsis. Food X is high in fibre." "Lignans support colon function. The product contains X grams of lignans."
	Reduction of disease risk claim	Claims related to the reduced risk of developing a disease or health-related condition.	"Diets high in calcium may reduce the risk of osteoporosis. Food X is high in calcium."
	Therapeutic claim	Claims related to the beneficial effects of nutrients, substances, ingredients or products for treatment, alleviation or cure of diseases and conditions [8]. These types of claims are prohibited by Codex Alimentarius. Claims relating to the prevention of diseases are considered therapeutic claims as well.	"The product helps in liver diseases." "Regular consumption of the product prevents cardiovascular diseases."

6.2.4 Results

6.2.4.1 Characteristics of Food Products Surveyed

Label photos of 1723 food products were collected and analysed. The sample included nearly equal numbers of products labelled in Mongolian and other languages. The products belonged to 17 of 18 food categories of the WHO nutrient profile model for the WPR (**Table 6.2**). One-third of the products contained nutrient profiles in the categories (1, 2 and 4c), for which marketing to children is prohibited.

Table 6.2 Food categories covered in the survey

Food Category	Food Category Code	Products Labelled in		Total	
		Mongolian	Other Languages	n	%
Cakes, sweet biscuits and pastries, sweet bakery products	2	188	114	302	17.5
Beverages	4	118	93	211	12.2
(a) Juices	4a	(4)	(28)	(32)	(1.9)
(b) Milk drinks	4b	(30)	(6)	(36)	(2.1)
(c) Energy drinks, tea and coffee	4c	(77)	(54)	(131)	(7.6)
(d) Other sugar-sweetened beverages (juice drinks, soft drinks, flavoured water, etc.)	4d	(7)	(5)	(12)	(0.7)
Chocolate and sugar confectionary, energy bars and desserts	1	28	176	204	11.8
Processed meat, poultry, fish and similar	14	143	40	183	10.6
Processed fruit and vegetables	16	71	98	169	9.8
Fresh or dried noodles, pasta, rice and grains	12	77	40	117	6.8
Sauces, dips and dressings	18	10	91	101	5.9
Savoury snacks (chips, crisps, processed seaweed, crackers, nuts, etc.)	3	23	54	77	4.5
Yoghurt, sour milk, cream, curds	7	55	5	60	3.5
Butter, vegetable oils, other fats	10	8	47	55	3.2
Ice cream	5	26	25	51	3.0
Ready-made and convenience foods and composite dishes	9	8	42	50	2.9
Bread, bread products	11	47	2	49	2.8
Fresh and frozen meat, poultry, fish and similar	13	30	3	33	1.9
Breakfast cereals	6	6	15	21	1.2
Other products *	NA	10	9	19	1.1
Cheese	8	3	13	16	0.9
Tofu products	17	5	0	5	0.3
Total		856	867	1723	100.0

* Other products included products (bottled water, herbal tea, baking powder, infant formula and alcoholic beverages) that are not included in the food categories of the WHO nutrient profile model for the WPR; NA—not applicable.

6.2.4.2 Prevalence of Nutrition and Health Claims on Products

Overall, 9% (*n* = 149) of products carried at least one nutrition claim and 10% (*n* = 175) of products carried at least one health claim. The most prevalent claims were nutrition claims, nutrient function claims and therapeutic claims. The median numbers of nutrition and health claims were 2 claims per product, respectively (**Table 6.3**). It was common for the same product to carry more than one claim so that 50.3% of products with nutrition claims and 81% of products with health claims had more than one claim per product.

Table 6.3 Prevalence of nutrition and health claims

Type of Claims		Products with at Least one Claim		Total Number of Claims	Median Claims per Product	Rate per 100 Products *
		n	% [1]			
Nutrition claim		149	8.6	288	2.0	16.7
Health claim	Nutrient function claim	114	6.6	176	1.0	10.2
	Other function claim	93	5.4	148	1.0	8.6
	Reduction of disease risk claim	26	1.5	39	1.0	2.3
	Therapeutic claim	79	4.6	160	2.0	9.3
	Total	175	10.2	523	2.0	30.4

* Percentages and rates were estimated for the total number of products of 1723.

6.2.4.2a Prevalence of Nutrition and Health Claims by Label Language

Products labelled in Mongolian had higher rates of claims than those labelled in other languages. The prevalence of claims was between 2.2 and 21.7 times higher for products labelled in Mongolian (*n* = 856) compared to other languages (*n* = 867). Per 100 products, the different rates of claims for Mongolian labels compared with labels in other languages were: reduction of disease risk claims 4.3 (*n* = 37) versus 0.2 (*n* = 2), other function claims 15.7 (*n* = 134) versus 1.6 (*n* = 14), therapeutic claims 16.8 (*n* = 144) versus 1.8 (*n* = 16) and nutrition claims 23.0 (*n* = 197) versus 10.5 (*n* = 91), respectively.

6.2.4.2b Products Carrying Nutrition and Health Claims

Product categories with the highest percentages of products with at least one nutrition claim and with the highest rates of nutrition claims were dried curd and curd (60.0%, *n* = 9), vegetable oil (31.0%, *n* = 9) and curd drink and yoghurt (26.8%, *n* = 11). Health claims were carried most frequently on labels for dried curd and curd (53.8%, *n* = 7), buckwheat, rice and millet (52.5%, n = 21) and curd drink and yoghurt (51.2%, *n* = 21). Higher rates of health claims were found in barley, flax and wheat flour, buckwheat, rice and millet and breakfast cereal.

6.2.4.2c Types of Health Claims

For most of the nutrient function (*n* = 129 of 176 claims) and other function claims (*n* = 116 of 148 claims), health benefits were related to a whole product or its ingredients, such as “Rye contained in the product supports the digestive system” (nutrient function claim) or “Pure chocolate contained in the product improves brain function” (other function claim) (**Appendix T, Table A6.2** and **A6.3**). Therapeutic claims were the second most common claims with 160 claims found across the sample. Again, these claims were mostly based on a whole product or its ingredients (**Appendix T, Table A6.4**). Reduction of disease risk claims were the least prevalent health claims, identified 39 times across the sample (**Appendix T, Table A6.5**).

6.2.4.2d Credibility of Nutrition and Health Claims

The credibility of the claims was very low. For nutrition claims, this was mostly due to the lack of information about the claimed nutrients in the nutrient declaration or the absence of any nutrient declaration. Overall, 131 claims out of a total 288 nutrition claims (45.5%) had no information on the content of a claimed nutrient, no nutrient declaration or was a general claim. General claims were the claims regarding the high content of vitamins or minerals of a product, without referring to a specific vitamin or mineral. Example of a general claim is “The product is a source of vitamins and minerals”. Only 97 nutrition claims (33.7%) were accompanied by complete and accurate information on the claimed nutrients and their content and thus deemed as credible. For the remaining 60 nutrition claims (20.8%), nutrient content did not meet the established criteria for nutrition content claims from Codex, e.g., the criteria for a “good source of protein” claim is that the product’s protein content should not be less than 10% of the nutrient reference value (NRV) for protein (**Table 6.4).**

Even fewer health claims were credible. One-third of all health claims (*n* = 160 of 523 claims) were therapeutic claims, prohibited in the EU. Of the remaining types of health claims (*n* = 363), only 18 claims were found on the list of authorised claims of the EU. Of these, only six claims met the specific criteria of the claims for the nutrient content (**Table 6.5**). Claims regulations in the EU authorise claims for specific nutrients/substances or food/food categories, not for the food products carrying the claim (European Parliament & Counsel on Nutrition and Health Claims 2006). Most of the non-therapeutic health claims on Mongolian products (*n* = 263 of 309 claims) would be disqualified for use in the EU countries as they were based on a whole food product or its ingredients.

Claims that were in the Mongolian language were less credible than claims in other languages. Only 25.4% (*n* = 50/197 claims) of nutrition claims in Mongolian were credible versus 51.6% (*n* = 47 of 91 claims) of the claims in other languages. Nutrient information was not provided for over half of the nutrition claims (53.8%, *n* = 106) in Mongolian compared to 27.5% (*n* = 25) of the claims in other languages (**Table 6.4**). There were no health claims in the Mongolian language that met the relevant criteria in the comparison country (**Table 6.5**).

Table 6.4 Credibility of nutrition claims by label language

Type of Claim	Label Language	Total Number of Claims	Information on the Nutrient				Quantity Statement	
			Not Provided		Provided		Accurate	Inaccurate
			n	**%**	**n**	**%**	**n**	**n**
Nutrition claim	Mongolian	197	106	53.8	91	46.2	50	41
	Other	91	25	27.5	66	72.5	47	19
	Total	288	131*	45.5	157	54.5	97	60

* Nutrient information was missing due to lack of nutrient declaration (7.6% of the claims) or no values for the nutrient (for 33.3% of the claims) or was a general claim (for 4.5% of the claims).

Table 6.5 Comparison of health claims with the authorised claims in the EU.

Type of Claims		Total Number of Claims	Permitted Claims		Credible Clams
			n	%	n
Nutrient function claim		176	17	9.7%	6
Other function claim		148	1	0.7%	0
Reduction of disease risk claim		39	0	0	0
Therapeutic claim		160	0	0	0
Label language	Mongolian	453	11	2.4%	0
	Other *	70	7	10%	6
Total		523	18	3.4%	6

* “Other” included Russian, English and Korean.

6.2.4.2e. Healthiness of Products with Claims

Based on nutrient profiling, 54.2% (*n* = 140) of products with nutrition claims and 40.5% (*n* = 184) of products with health claims were less healthy products (**Table 6.6**).

Table 6.6 Application of nutrient profiling model to the products with nutrition and health claims.

Type of Claims		Label Language	Total Number of Claims	Claims Covered in Nutrient Profiling *		Ranked as Healthy		Ranked as Unhealthy	
				n	%	n	%	n	%
Nutrition claim		Mongolian	197	175	88.8	79	45.1	96	54.9
		Other	91	83	91.2	39	47.0	44	53.0
		Total	288	258	89.6	118	45.7	140	54.2
Health claim	Nutrient function claim	Mongolian	138	121	87.7	73	60.3	48	39.7
		Other	38	36	94.7	23	63.9	13	36.1
		Sub total	176	157	89.2	96	61.1	61	38.9
	Other function claim	Mongolian	134	117	87.3	67	57.3	50	42.7
		Other	14	14	100.0	7	50.0	7	50.0
		Sub total	148	131	88.5	74	56.5	57	43.5
	Reduction of disease risk claim	Mongolian	37	30	81.1	12	40.0	18	60.0
		Other	2	2	100.0	2	100.0	0	0
		Sub total	39	32	82.1	14	43.8	18	56.2
	Therapeutic claim	Mongolian	144	118	81.9	75	63.6	43	36.4
		Other	16	16	100.0	11	68.8	5	31.2
		Sub total	160	134	83.8	86	64.2	48	35.8
	Total	Mongolian	453	386	85.2	227	58.8	159	41.2
		Other	70	68	97.1	43	63.2	25	36.8
		Total	523	454	86.8	270	59.5	184	40.5

* 30 nutrition claims and 69 health claims could not be assessed against the nutrient profiling model due to lack of a nutrient declaration or missing nutrient information on the declaration.

6.2.5 Discussion

In this study, approximately 10% (*n* = 175) of all products carried health claims and 9% (*n* = 149) carried nutrition claims. The rate of health claims was similar to the findings of other studies from Australia (11%) and South Africa (10.2%) but lower than the prevalence of claims identified in Ireland (17.8%) (Kasapila & Shaarani 2013; Lalor et al. 2010; Williams et al. 2006). The rate of health claims was higher in Mongolia than previously reported on products from the EU, the US, Malaysia and Indonesia (0–7.1%) (Brecher et al. 2000; Lwin 2015). The rate of nutrition claims was much lower than the other countries' rates (Brecher et al. 2000; Lalor et al. 2010; Lwin 2015; Williams et al. 2003).

The proportion of unhealthy products with nutrition claims in our study (54.2%) was higher compared to the other studies from Australia, Canada and some EU countries where 29–42% of products carrying nutrition claims had less healthy nutrient profiles (Franco-Arellano et al. 2018; Hughes et al. 2013; Kaur et al. 2016). Likewise, products with health claims were less healthy in our study (40.5% were less healthy) compared to products with health claims in the studies from Australia (31%) and EU countries (30%) (Hughes et al. 2013; Kaur et al. 2016). In order to prevent unhealthy products to have claims, some countries implement regulations to restrict making claims on certain types of foods or to endorse claims on foods meeting certain nutrient eligibility criteria (Hawkes 2004).

This study identified that nutrition and health claims found on food and beverage products in Mongolia had very low levels of credibility. In particular, claims made on products labelled in Mongolian were less credible than claims in other languages. Most health claims were found on Mongolian language products and nearly all of them were not credible. Almost all of the 160 therapeutic health claims were on Mongolian language products. These types of claims are prohibited by Codex Alimentarius and in other countries. This contrasts to other studies, which have reported few cases of such claims on products (Kasapila & Shaarani 2013; Lwin 2015; Williams et al. 2006). A similar pattern was identified for nutrition claims, whereby only one-third of these claims (33.7%, n = 97) were deemed credible. Lack of supporting information on the content of the claimed nutrients (45.5%, n = 131 of 288 claims) largely contributed to the low credibility of nutrition claims. This finding is exceptional when compared to other studies. For example, a similar survey from Australia found only 7.2% (n = 322) of nutrition claims were not credible (Williams et al. 2003). Again, nutrition claims on Mongolian language products were half as likely to be credible than claims on products labelled in other languages.

Such variations in the credibility of claims reflect the status of food labelling regulation in Mongolia and in other countries at the time of the study. A high prevalence of therapeutic claims was also reported in a Serbian study, in which 17% of products had therapeutic claims (Davidović et al. 2015). At the time of these studies, in both Mongolia and Serbia there was no government regulation on the use of nutrition and health claims, allowing these to be freely used without any independent validation or safeguards. Soon after this survey was conducted, a new Mongolian food labelling standard, MNS 6648:2016, came into force in January 2018 (MASM 2016). However, the new standard lacks a clear definition on nutrition and health claims, specification on different types of claims and criteria for making those claims or a substantiation framework for claims, such as minimum criteria for the healthfulness of products bearing a claim. The standard states that claims be approved by an authorised government organisation prior to use, however, a procedure for that has not been developed.

The potential negative impact of claims on food choices and consumption (Kelly et al. 2009; Oostenbach et al. 2019) can be particularly significant in Mongolia. The results of this study highlight the pervasiveness of poorly regulated food claim practices. In addition, the population has relatively poor levels of nutrition literacy (Government of Mongolia & FAO 2012) and low awareness on food labelling. The added burden of non-credible claims on less healthy food products may worsen the process of nutrition transition currently underway in Mongolia. Such labelling essentially disseminates misinformation and hinders healthy choices.

The study has several limitations. First, the survey sample does not represent all pre-packaged food products available at the marketplaces in Mongolia. However, using a prior developed list of product categories and an attempt to ensure the representation of domestic and imported products and different brands, the sample captured all common types of pre-packaged products in the marketplace. Second, due to the convenience sampling, calculation of percentages and statistical tests was not possible in some cases due to a small number of claims per comparison group.

6.2.6 Conclusions

Mongolia is experiencing rapid nutrition transition, similar to many developing nations. Nutrition labelling policy is increasingly important as marketplaces and population diets are being dominated by processed packaged foods. Major issues in the use of nutrition and health claims in Mongolia were identified, whereby most claims were not credible and not based on scientific evidence and many were found on unhealthy products due to the unregulated and voluntary use of nutrition and health claims by food producers. New food labelling regulation has been introduced in Mongolia since data were collected, however specifications on the use of nutrition and health claims remain weak. Given Mongolian consumers’ relative poor nutrition literacy, it is likely that they are at greater risk of the negative effects of misleading claims on their food choices and consumption. Regulations for food claims are in their early stages of development in Mongolia and more rigorous regulations providing clear guidance about the types of permitted claims and conditions under which claims can be made are needed. The current regulations regarding nutrition and health claims are needed to be upgraded in consultation with the Codex guidelines for use of nutrition and health claims as well as claims regulations of other countries. Awareness of consumers and food producers on nutrition and health claims is needed to be improved.

6.2.7 Author Contributions

Conceptualization, N.C., B.K. and H.Y.; methodology, N.C., B.K. and H.Y.; formal analysis, N.C.; investigation, N.C.; data curation, N.C.; writing—original draft preparation, N.C.; writing—review and editing, N.C., B.K., A.-T.M. and H.Y.; supervision, B.K., A.-T.M. and H.Y.; project administration, N.C. All authors have read and agreed to the published version of the manuscript.

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6.2.10 Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

6.3 Audit of food label information

Food products covered in this audit were the same products that were analysed in the study on nutrition and health claims presented in the first part of this Chapter. The labels were examined for compliance with the Mongolian food labelling standard in terms of the provision of the required information and its provision in authorised languages. The availability of label information to consumers assessed based on the provision of information on the label, while the accessibility was evaluated the provision of information in legally authorised languages, as well as by legibility of label information.

To assess the compliance with the regulation, labels were compared with the requirements of the previous food labelling standard “General requirements for Labelling of pre-packaged food” (MNS CAC 1:2007) and the nutrition labelling standard “Guidelines on Nutrition Labelling” (MNS CAC GL 2:2007), which were in effect in Mongolia at the time of the study. These regulations were adopted from the Codex guidelines and required to display a range of information on food labels, including voluntary nutrition information (energy, protein, fat and carbohydrates) (MASM 2007).

6.3.1 Product origin and types of food products

Table 6.7 provides an overview of the sampled food products by product types, their origin (domestic or imported), and label language. A total of 1723 food products spanning 11 major categories were collected for analysis. The final analysis included between 1672 and 1722 products (representing different label types) after excluding products with incomplete information for the label components of interest. The excluded products had poor quality or or incomplete label photos captured by data collectors or label information written in a language that the researcher could not interpret.

Each product type category in the final sample contained 50 to 374 food products. The 11 major food categories were further divided into 58 sub-categories. For example, the milk and dairy category was subdivided into types such as milk, yoghurt, curd and dried curds, cream and sour cream, imported cheese, and others. The sample of 1723 food products captured a wide range of common pre-packaged food products available in the marketplace. The sample included nearly equal proportions of domestic (47.4%) and imported (52.6%) products. Domestic products primarily consisted of core food items, such as meat products and milk and dairy products, which are staple foods for Mongolians. Imported products maly comprised discretionary food items, including candy and sweets, snacks, ready-to-eat meals, vegetable oil and fat, seasonings, and processed vegetables and fruits.

Table 6.7 Characteristics of food products by food types, product origin and primary label language

Product type	**Total**	Imported products	Domestic products	Milk & dairy	Meat products	Cereals	Processed vegetables & fruit	Candy & sweets	Snacks	Ready to eat meals	Juice & soft drinks	Vegetable oil & fat	Seasonings	Other
							n, %							
Product origin														
Domestic	817 47.4	-	-	80 80.0	171 81.8	273 79.1	59 36.2	62 16.6	36 29.0	10 20.0	85 62.5	4 7.7	6 5.8	31 47.0
Imported	906 52.6	-	-	20 20.0	38 18.2	72 20.9	104 63.8	312 83.4	88 71.0	40 80.0	51 37.5	48 92.3	98 94.2	35 53.0
Primary label language														
Mongolian	856 49.7	53 5.8	803 98.3	77 77.0	167 79.9	298 86.4	66 40.5	66 17.6	37 29.8	11 22.0	87 64.0	6 11.5	11 10.6	30 45.5
Russian	381 22.1	373 41.2	8 1.0	15 15.0	26 12.4	27 7.8	23 14.1	138 36.9	32 25.8	17 34.0	12 8.8	37 71.2	38 36.5	16 24.2
English	220 12.8	217 24.0	3 0.4	3 3.0	3 1.4	8 2.3	37 22.7	58 15.5	25 20.2	14 28.0	25 18.4	8 15.4	23 22.1	16 24.2
German	88 5.1	88 9.7	0	1 1.0	3 1.4	5 1.4	9 5.5	42 11.2	16 12.9	0	2 1.5	0	8 7.7	2 3.0
Korean	38 2.2	35 3.9	3 0.4	4 4.0	7 3.3	1 0.3	4 2.5	2 0.5	0	3 6.0	2 1.5	1 1.9	13 12.5	1 1.5
Polish	36 2.1	36 4.0	0	0	0	0	11 6.7	12 3.2	9 7.3	0	0	0	4 3.8	0
Turkish	19 1.1	19 2.1	0	0	0	0	6 3.7	10 2.7	0	0	3 2.2	0	0	0
Other languages	61 3.5	61 6.7	0	0	3 1.4	3 0.9	5 3.1	38 10.2	4 3.2	0	4 2.9	0	3 2.9	1 1.5
Asian languages	24 1.4	24 2.6	0	0	0	3 0.9	2 1.2	8 2.1	1 0.8	5 10.0	1 0.7	0	4 3.8	0
Total	1723 100.0	906 100.0	817 100.0	100 5.8	209 12.1	345 20.0	163 9.5	374 21.7	124 7.2	50 2.9	136 7.9	52 3.0	104 6.0	66 3.8

6.3.2 Label language

In **Table 6.8**, food products were grouped based on the language used in their labels, comparing between labels in legal languages and labels in other languages. The majority of food labels (84.6%) were written in Mongolian, Russian and English, which are the authorised official languages for label information under the Food Safety Law (2012). Nearly half of the total sample (49.7%) was written in Mongolian (**Table 6.8**). Most domestic products had labels written in Mongolian, with a few in foreign languages like Russian, English and Korean.

Russian, English and German were the most common primary label languages for imported products. A small percentage (5.8%) of imported products had labels primarily written in Mongolian.

For some products (15.4%, n=266), labels were written in non-legal languages, requiring translation. However, the majority of these labels (72.9%, n=194 of 266) were compliant with the standard, either already translated into Mongolian, or including label information in English or Russian in addition to the non-legal primary language. This increased the proportion of products with labels in legal languages to 95.8%.

Translations were typically provided in two forms: labels primarily written in a non-legal language plus one of the legal languages, or a sticker attached to the original label with the translation into Mongolian or in one of the other two legal languages. Among the products requiring translation (n=266), over half (53%) were translated into English (42.5%) or English and Russian (10.5%), and 14.8% were translated into Mongolian (11.7%) or Mongolian plus English or Russian (3.1%). One third of the labels displaying translated information (84 of 271 labels, 31%) had the translation on stickers. Out of the 84 labels with stickers, 48 (57.1%) were in Mongolian, 27 (32.1%) were in English, and 9 (10.7%) were in Mongolian along with English or Russian. Some labels had both translations on the label and a sticker.

The overall non-compliance rate for label language (having label information in languages other than English, Russian, or Mongolian) was 4.2% (n=72 of 1723). Over half of the products imported from Germany (64.8%, n=57 of 88) were non-compliant, and one in every five products imported from Korea (21.1%, n=8 of 38) had non-translated labels.

Table 6.8. Description of food labels by label languages

Primary label language	Products (n, %)	Translation languages (n, %)							Non-compliant (n, %)
		Total translated	Mongolian	Russian	English	English & Russian	English & Mongolian	Mongolian, English & Russian	
Legal languages									
Mongolian	856 49.7								
Russian	381 22.1	61(22)	56 (18) * 14.7				5 (4) 1.3		
English	220 12.8	16(1)	16 (1) 7.3						
Sub total	1457 84.6	77(23)	72 (19) 4.9				5 (4) 0.3		
Other languages									
German	88	31(13)	5 (5)		25 (8)			1	57

	5.1	35.2	5.7		28.4			1.1	64.8
Korean	38 2.2	30(28) 78.9	16 (16) 42.1		13 (11) 34.2		1 (1) 2.6		8 21.1
Polish	36 2.1	33(6) 91.7			29 (6) 80.6	4 11.1			3 8.3
Turkish	19 1.1	19(3) 100.0			7 36.8	9 47.4	1 (1) 5.3	2 (2) 10.5	
Other languages (not Asian)	61 3.5	48(5) 78.7	4 (3) 6.6	14 23.0	21 34.4	15 (1) 24.6		3 (1) 4.9	4 6.6
Other languages (Asian)	24 1.4	24(7) 100.0	6(5) 25		18(2) 75.0				
Sub total	266 15.4	194 (61) 72.9	31 (29) 11.7	14 5.3	113(27) 42.5	28 10.5	2 (2) 0.8	6 (3) 2.3	72 27.1
Total	1723 100.0	271 (84) 15.7	103 (48) 6.0	14 0.8	113 (27) 6.6	28 1.6	7 (6) 0.4	6 (3) 0.3	72 4.2

*Products having a sticker with translation are given in brackets. The numbers before the brackets stand for the products with the labels translated including the products having stickers with the translation.

6.3.3 Provision and scope of label information

In order to assess the availability and accessibility of label information, a comparison was made between the provided label information and the requirements outlined in the national standard. This comparison was conducted across different label language groups, as well as by domestic versus imported products. Non-compliance rates were estimated for each type of label information, including overall nutrient declarations, declarations of specific nutrients (such as energy, protein, carbohydrates and fat), and the ingredients list.

6.3.3.1 The availability and accessibility of nutrition information – by language

Table 6.9 shows that 90.9%-91.8% of products had nutrient declarations and ingredients lists, and for the majority of labels, this information was provided in legal languages (86.9%-87.5%). This information was missing for 8.2%-9.1% of products, and for 4.0%-4.3% of products, it was provided in non-legal languages. Consequently, around 12.2%-13.4% of all products (1 in 10 products) had inaccessible information for due to its absence or being in a foreign language.

More than half of the products had nutrient declarations (52%, n=812 of 1553) and ingredients lists (52.1%, n=824 of 1581) written solely in Mongolian or in combination with other languages. For 24.7%-25.7% of products, nutrient declarations (25.7%, n=399 of 1553) and ingredients lists (24.7%, n=390 of 1581) were provided in English along with other languages, while for 17.6%-18.5% of products (17.6%, n=274 of 1553 nutrient declarations; 18.5%, n=293 of 1581 ingredients lists), they were in Russian along with other languages.

A small percentage (8.3%-10.4%) of products had nutrition and health claims (nutrition claims-8.3%, n=140 of 1695; health claims-10.4%, n=175 of 1685). Almost all of these claims were in legal languages. Among the claims, approximately70.7%-87.4% (n=99 of 140 for nutrition claims; n=153 of 175 for health claims) were in Mongolian.

Table 6.9 Scope of nutrition label information compared by label language

Label language	Nutrient declaration	Ingredient list	Nutrition claim	Health claim
Single legal language				
English (ENG)	119 7.7%	104 6.6%	26 17.4%	9 5.1%
Mongolian (MGL)	568 36.6%	605 38.4%	65 43.6%	115 65.7%
Russian (RUS)	84 5.4%	89 5.6%	14 9.4%	13 7.4%
Multiple languages (Legal language & other)				
MGL & other (including ENG & RUS)	244 15.7%	219 13.8%	34 22.8%	38 21.7%
ENG & other (including RUS & excluding MGL)	280 18.0%	286 18.1%	3 2.0%	-
RUS & other (excluding ENG & MGL)	190 12.2%	204 12.9%	4 2.7%	-
Legal languages (total)	1485 95.6%* 86.9%**	1507 95.3%* 87.5%**	146 98.0%* 8.6%**	175 100%* 10.4%**
Non-legal languages (other than MLG, RUS & ENG)	68 4.4%* 4.0%**	74 4.7%* 4.3%**	3 2.0%* 0.2%**	0
Labels with nutrient declarations /ingredients list/nutrition & health claims	1553 100%* 90.9%**	1581 100%* 91.8%**	149 100%* 8.8%**	175 100%* 10.4%**
Labels without nutrient declarations /ingredients list/nutrition & health claims	156 9.1%**	141 8.2%**	1546 91.2%**	1510 89.6%**
Total	1709 100%**	1722 100%**	1695 100%**	1685 100%**
Labels with unclear provision of the information#	-	-	25	34
Labels with missing information##	14	1	3	4
All labels	1723	1723	1723	1723

*Percentages estimated for labels with nutrient declarations /ingredients list/nutrition claims/health claims
**Percentages estimated for all labels
When the label is written in a foreign language, unclear provision of information is defined as the situation where it is not clear whether the information is provided or not.
Missing information is defined when the specific area of packaging containing that information was not captured due to incomplete photography of the product packaging from all sides.

6.3.3.2 The availability and accessibility of nutrition information – by domestic versus imported products

The provision of nutrition information, including nutrient declarations, ingredients lists, nutrition claims and health claims, was compared by domestic and imported products (**Table 6.10**). Both imported and domestic products showed high rates of the provision of nutrient declarations and ingredients lists (93.7%-94.3% for imported products and 87.8%-89.0% for domestic products). However, domestic products lacked nutrient declarations and ingredients lists nearly twice as often as compared to imported products (11.0-12.2% vs. 5.6-6.3%). Among the food categories, vegetable oil and fat, snacks, milk and dairy, juice and soft drinks, and cereals had the highest provision of nutrient declarations. On the other hand, the "other product" category and seasonings had the lowest presence of nutrient declarations. Only half of domestically produced ready-to-eat meals and "other products", and one third of domestic seasonings, included nutrient declarations, which was half the rate of imported products in the same categories.

Ingredients lists were most frequently provided for processed vegetables and fruit, snacks, and ready-to-eat meals compared to other food categories. However, products in the "other products" category had the lowest provision of ingredients lists (65.2%), and notably, only 33.3%-45.2% of domestically produced "other products" and seasonings included ingredients lists.

The presence of nutrition and health claims varied across different food categories. Milk and dairy, vegetable oil and fat, snacks, cereals, and products in the "other products" category had a higher frequency of nutrition and health claims, with 11.7%-20.0% of these products featuring nutrition claims and 16.5%-32.0% having health claims. Compared to imported products, domestic products had twice the frequency of nutrition claims (10.9% vs 5.8%) and three times the frequency of health claims (15.6% vs 5.5%).

Approximately a quarter of domestic snacks (27.8%) and milk and dairy products (22.5%), and one in ten domestic "other products" (13.3%) and processed vegetables and fruit (10.2%) had nutrition claims, which were two to four times higher than similar imported products. The presence of health claims on labels was also high among domestic products, with approximately 38.8%-44.4% of domestic milk and dairy products and snacks, and 14.1%-16.9% of juice and soft drinks, candy and sweets, and processed vegetables and fruit carrying health claims. These rates were 4-9 times higher than for similar imported products.

Table 6.10 The availability of nutrition label information compared by product type vs product origin

Product type	Nutrient declaration (n, %)			Ingredient list (n, %)			Nutrition claim (n, %)			Health claim (n, %)		
	Imported	Domestic	Total	Imported	Domestic	Total	Imported	Domestic	Total	Imported	Domestic	Total
Milk & dairy	20 100.0	77 96.3	97 97.0	20 100.0	75 93.8	95 95.0	2 10.0	18 22.5	20 20.0	1 5.0	31 38.8	32 32.0
Meat & meat products	36 100.0	147 86.0	183 88.4	37 100.0	149 87.1	186 89.4	2 5.9	14 8.2	16 7.8	0	8 4.7	8 3.9
Cereals	71 98.6	256 93.8	327 94.8	38 52.8	246 90.1	284 82.3	13 19.1	25 9.2	38 11.1	22 32.4	34 12.5	56 16.5
Processed veggies & fruit	100 97.1	47 81.0	147 91.3	104 100.0	59 100.0	163 100.0	12 12.1	6 10.2	18 11.4	4 4.0	10 16.9	14 8.9
Candy & sweets	295 94.9	44 72.1	339 91.1	308 98.7	54 87.1	362 96.8	4 1.3	5 8.1	9 2.4	5 1.6	9 14.5	14 3.8
Snacks	88 100.0	36 100.0	124 100.0	87 98.9	36 100.0	123 99.2	9 10.7	10 27.8	19 15.8	5 6.1	16 44.4	21 17.8
Ready to eat meals	38 97.4	5 50.0	43 87.8	40 100.0	10 100.0	50 100.0	0	0	0	0	0	0
Juice & soft drinks	51 100.0	77 95.1	128 97.0	51 100.0	78 91.8	129 94.9	5 10.2	6 7.1	11 8.2	0	12 14.1	12 9.0
Vegetable oil & fat	48 100.0	3 100.0	51 100.0	46 95.8	4 100.0	50 96.1	9 19.1	0	9 17.6	3 6.4	0	3 5.9
Seasonings	73 74.5	2 33.3	75 72.1	94 95.9	2 33.3	96 92.3	4 4.2	0	4 3.9	0	0	0
Others	23 67.6	16 53.3	39 60.9	29 82.9	14 45.2	43 65.2	1 2.9	4 13.3	5 7.8	8 23.5	7 23.3	15 23.4
Labels with nutrient declaration/ingredient list/nutrition & health claims	843 93.7	710 87.8	1553 90.9	854 94.3	727 89.0	1581 91.8	61 6.9	88 10.8	149 8.8	48 5.5	127 15.6	175 10.4
Labels without nutrient declaration/ingredient list/nutrition & health claims	57 6.3	99 12.2	156 9.1	51 5.6	90 11.0	141 8.2	818 93.1	728 89.2	1546 91.2	822 94.5	688 84.4	1510 89.6
Total	900 52.7*	809 47.3*	1709	905 52.6*	817 47.4*	1722	879 51.9*	816 48.1*	1695	870 51.6*	815 48.4*	1685
Labels with unclear provision of the information**		-			-			25			34	
Labels with missing information#		14			1			3			4	
All labels		1723			1723			1723			1723	

*Percentage estimated for product origin

**When the label is written in a foreign language, unclear provision of information is defined as the situation where it is not clear whether the information is provided or not.

Missing information is defined when the specific area of packaging containing that information was not captured due to incomplete photography of the product packaging from all sides.

6.3.3.2a Nutrient declarations

Nutrient declarations included information on energy and the three major nutrients: protein, carbohydrates, and fat, along with additional nutrients such as saturated fat, fibre, vitamins and minerals. The amounts of nutrients were expressed per 100 g/100 ml of the product and/or per serving, if serving size and number of servings in the package are provided. Some nutrient declarations also included the percentage of daily value, indicating the contribution of the nutrients to the RDI for that particular nutrient.

The content of nutrient declarations was assessed and compared across different label language groups (**Appendix U, Table A6.1)**. Nutrient declarations were present on 90.4% (n=1305 of 1444) of labels written in legal languages. Among labels primarily written in other non-legal languages, 93.6% (n=248 of 265) included nutrient declarations. The most commonly declared nutrients were energy, protein, total fat, and total carbohydrates, which appeared on 82.6%-89.3% of the products. Other nutrients were declared in approximately one third of the products (28.4%-37.9%), including sodium, total sugars, saturated fat, and some other nutrients. However, the declaration of additional nutrients was less common on labels in legal languages compared to labels primarily written in other languages. Notably, the declaration of total sugars, saturated fat, and sodium was nearly three to four times less likely for products with labels in legal languages (20.0-30.6% of the products) compared to those with labels in non-legal languages (75.1-81.2% of the products). These nutrients were least likely to be declared on products labelled in Mongolian (for 7.8-24.5% of the products) and Russian (for 18.0-24.9% of the products), which typically followed the Codex standards recommending the declaration of the “Big 4” (energy, protein, carbohydrates and fat).

The majority of nutrient information was provided per 100 g/100 ml of the product (83.7% of the total products; n=1426 of 1703), while only 20.7% of the products indicated nutrients per serving (n=353 of 1703). Products with labels in non-legal languages were more likely to declare nutrients per serving (27.7% of products, n=73 of 264) compared to those with labels in legal languages (19.5% of products, n=280 of 1439). Notably, over half of the labels written in English (65.3%, n=143 of 219), Korean (52.6%, n=20 of 38), and some Asian languages (52.2%, n=12 of 23) provided the nutrient amounts per serving, which was higher than other language groups. In contrast, products with labels written in Mongolian were least likely to provide the nutrient amounts per serving.

The inclusion of percentage of daily value was twice as common on products with non-legal language labels compared to products with legal language labels. This information was most frequently found on labels in German (56.8%, n=50 of 88) and Korean (63.2%, n=24 of 38), and least frequently on labels in Russian (11.4%, n=43 of 378), Mongolian (17.2%, n=145 of 842), and some other non-Asian languages (16.4%, n=10 of 61).

Serving size and serving per package were provided for 14.8-19.8% of the total products (n=254; 340 of 1716). Serving size information was predominantly included in the nutrient declarations, although for some products, it was placed elsewhere on the package. Again, this information was shown more frequently for products with non-legal language labels than for products with legal language labels. It is noteworthy that labels written in English, Korean, and certain Asian languages (47.8%-64.5% for serving size; 44.1%-56.4% for servings per package) had serving size information presented more frequently. On the other hand, products with Mongolian and Russian labels had the least frequency of presenting this information (8.0%and 15.3% for serving size; 2.9% and 11.3% for servings per package).

Furthermore, in addition to nutrient declarations, the study examined the availability of other nutrition information, such as ingredients lists, FOPL information, and nutrition and health claims within primary label language groups. The results showed that ingredients lists were present on the majority of products with a non-legal primary language label (99.2%) and on majority significant portion of products with legal language labels (90.4%). However, the availability of ingredients lists was notably lower for products with Mongolian labels (87.3%) compared to other language groups (94.5%-100%).

Regarding FOPL information, it was found that products with non-legal primary language labels were nearly three times more likely to feature FOPLs compared to products with legal language labels (19.2% vs. 7.6%). Notably, products with labels written in German displayed the highest number of FOPLs, with 42% of the products having such labelling. In contrast, nutrition and health claims were most prevalent among products with Mongolian labels (11.0%-16.2% of these products), surpassing the rates found in any other label language group by at least twofold (**Table 6.11**).

Table 6.11 Provision of other nutrition information by primary label language

Primary label language	Total	Labels with (%, n) Ingredient list	Total	Labels with (%, n) FOPL	Total	Labels with (%, n) Nutrition claim	Total	Labels with (%, n) Health claim
Legal languages								
Mongolian	856	87.3% 747	856	5.4% 46	855	10.8% 92	854	16.2% 138
Russian	380	95.3% 362	381	11.3% 43	380	6.3% 24	380	6.8% 26
English	220	94.5% 208	220	10.0% 22	220	10.5% 23	220	4.5% 10
Sub total	1456	90.4% 1317	1457	7.6% 111	1455	9.6% 139	1454	12.0% 174
Other languages								
German	88	97.7% 86	88	42.0% 37	76	5.3% 4	67	0
Korean	38	100.0% 38	38	10.5% 4	27	3.7% 1	27	3.7% 1
Polish	36	100.0% 36	36	13.9% 5	36	0	36	0
Turkish	19	100.0% 19	19	5.3% 1	18	5.6% 1	18	0
Other languages (not Asian)	61	100.0% 61	61	4.9% 3	61	4.9% 3	61	0
Other languages (Asian)	24	100.0% 24	24	4.2% 1	22	4.5% 1	22	0
Sub total	266	99.2% 264	266	19.2% 51	240	4.2% 10	231	0.4% 1
Total*	1722	91.8% 1581	1723	9.4% 162	1695	8.8% 149	1685	10.4% 175

*After excluding labels with missing or unclear provision of the information

6.3.3.2b The availability and accessibility of other label information

In addition to nutrition information, the food labelling standard requires the declaration of other information on the label, such as the product name, directions for use and storage, as well as production on and best-before dates. **Table 6.12** provides an overview of the provision of this additional label information across different label language groups.

With the exception of “directions for use”, the majority of products (ranging from 94.0% (n=1572 of 1672) to 98.5% (n=1694 of 1720) included all the required information, and predominantly in legal languages (ranging from 86.9% (n=1353 of 1559) to 95.1% (n=1636 of 1720)). However, almost half of the products (48.6%, n=815 of 1677) lacked directions for use.

Similarly to the patterns observed with nutrition information, Mongolian was the most prevalent language for this category of information, followed by English and Russian.

Table 6.12 Overview of the provision of other label information, compared by label language

Label language	Product type	Directions for use	Storage instructions	Production & best before dates
Single legal language				
English (ENG)	176 10.4%	59 6.8%	93 5.9%	116 8.1%
Mongolian (MLG)	681 40.2%	424 49.1%	685 43.6%	517 35.9%
Russian (RUS)	100 5.9%	69 8.0%	91 5.8%	94 6.5%
Multiple languages (Legal primary language & other)				
MGL & other (including ENG & RUS)	204 12.0%	146 16.9%	218 13.9%	163 11.3%
ENG & other (including RUS)	276 16.3%	74 8.6%	251 16.0%	263 18.3%
RUS & other	199 11.7%	71 8.2%	206 13.1%	200 13.9%
Legal languages (total)	1636 96.6%* 95.1%**	843 97.8%* 50.3%**	1544 98.2%* 92.3%**	1353 94.0%* 86.9%**
Non-legal languages (other than MLG, RUS & ENG)	58 3.4%* 3.4%**	19 2.2%* 1.1%**	28 1.8%* 1.7%**	87 6.0%* 5.6%**
Labels with product type declaration/directions for use/storage condition/ production & best before dates	1694 100%* 98.5%**	862 100%* 51.4%**	1572 100%* 94.0%**	1440 100%* 92.4%**
Labels without product type declaration/directions for use/storage condition/ production & best before dates	26 1.5%**	815 48.6%**	100 6.0%**	119 7.6%**
Total	1720 100%**	1677 100%**	1672 100%**	1559 100%**
Labels have a date but no text (e.g does not state if best before or use by date)	-	-	-	162
Labels with unclear provision of the information[##]		45	49	
Labels with missing information[#]	3	1	2	2
All labels	1723	1723	1723	1723

*Percentages estimated for labels with product type declaration/use instruction/storage condition/production & best before dates.

** Percentages estimated for all labels

[#] When the label is written in a foreign language, unclear provision of information is defined as the situation where it is not clear whether the information is provided or not.

[##] Missing information is defined when the specific area of packaging containing that information was not captured due to incomplete photography of the product packaging from all sides.

A comparison of other label information, such as product name, directions for use, storage instruction, and the production and best-before dates, across primary label language groups revealed that directions for use were less prevalent on products with labels in Polish (27.8%), German (24.5%), other not Asian languages (20%), and Turkish (15.8%) when compared to other language groups. Labels in these languages primarily appeared on products that generally do not require directions for use, such as candy, sweets, snacks, processed vegetable and fruits, juices and fruit drinks. Furthermore, the provision of the production on and best-before dates was slightly lower for domestic products in comparison to products from other label language groups (**Table 6.13**).

Table 6.13 Provision of other label information by primary label language

Primary label language	Total	Labels with (%, n)	Total	Labels with (%, n)	Total	Labels with (%, n)	Total	Labels with (%, n)
		Product type		Directions for use		Storage instruction		Production & best-before date
Legal languages								
Mongolian	854	97.1% 829	855	57.9% 495	855	95.8% 819	696	88.9% 619
Russian	381	100% 381	381	48.3% 184	380	97.9% 372	380	96.3% 366
English	220	99.5% 219	220	47.3% 104	220	81.4% 179	218	92.7% 202
Sub total	1455	98.2% 1429	1456	53.8% 783	1455	94.2% 1370	1294	91.7% 1187
Other languages								
German	88	100% 88	53	24.5% 13	47	83.0% 39	88	93.2% 82
Korean	37	100% 37	29	72.4% 21	30	100% 30	38	94.7% 36
Polish	36	100% 36	36	27.8% 10	36	94.4% 34	36	100% 36
Turkish	19	100% 19	19	15.8% 3	19	89.5% 17	19	100% 19
Other languages (not Asian)	61	100% 61	60	20.0% 12	61	98.4% 60	61	93.4% 57
Other languages (Asian)	24	100% 24	24	83.3% 20	24	91.7% 22	23	100% 23
Sub total	265	100% 265	221	35.7% 79	217	93.1% 202	265	95.5% 253

Total*	1720	98.5% 1694	1677	51.4% 862	1672	94.0% 1572	1559	92.4% 1440

*After excluding labels with missing or unclear provision of the information

6.3.3.3 Translation on stickers versus label translation

The translation of label information into legal languages was presented in two different formats: translated information written on a sticker attached to the product packaging or translated label information (primarily in Mongolian) provided as a part of the label. In some cases, translation was provided in both sticker and label translation.

While translated labels generally covered the required label information, compliance varied depending on the type of information. Among the label information, seven types of information (product name, ingredients list, nutrient declarations, storage instruction, production & best-before dates, weight, and product name) demonstrated good compliance with the regulations, ranging from 70.5% to85.8%. However, there were six types of label information that exhibited relatively lower compliance rates (ranging from 29.5% to 40.2%), including importer name, manufacturer name, manufacturing country, directions for use, other information, and allergy information. Of particular concern were the lack of reporting on directions for use (40.2%) and allergy information (30.6%) (**Appendix U, Table A6.1**).

The scope of translated information varied between stickers and label translations. Stickers generally provided more limited information compared to label translations (**Figure 6.2** and **Table 6.14**). In some instances, stickers were directly attached on the original label, thereby obscuring certain information. Allergy information (40.3% vs 8.2%), nutrition claims (3.6% vs 1.2%) and health claims (4.1% vs 0%), and other information (43.9% vs 18.8%) were two to five times more frequently found in label translations compared to sticker information. However, product name, importer and manufacturer name, and directions for use were more frequently found on stickers than in label translations.

The scope of translated label information also varied depending on the language of translation. For instance, labels with Mongolian translation (either stickers or label translation) had the highest frequency of importer and manufacturer names, as well as directions for use, compared to labels with English or Russian translation. However, some other label information, such as nutrient declarations, ingredients lists, production and best-before dates, allergy information, storage instructions, and weight, were less frequently provided on labels with Mongolian translation compared to labels translated into English or Russian. Ingredients lists (58.2% vs. 98.8%) were presented 1.7 times less often, and allergy information (16.4% vs. 57.0%) was 3.5 times less frequent on labels with Mongolian translation compared those translated into English or Russian. Similarly, stickers with Mongolian translation had nutrient declarations (68.4% vs. 92.9%) and allergy information (7.0% vs. 10.7%) 1.4-1.5 times less frequently than stickers with English translation (**Figure 6.2** and **Table 6.14**).

Table 6.14 Imported food products-either with sticker or label translation

Label information	Label translation*					Sticker with translation**			Total
	into Mongolian	into English	into Russian	into ENG & RUS ENG &MGL ENG, RUS &MGL	Sub total	into Mongolian	into English	Sub total	
Total products with translation	55	86	13	42	196	57	28	85	281***
Product name	43 78.2%	61 70.9%	11 84.6%	37 88.1%	152 77.6%	44 77.2%	28 100%	72 84.7%	224 79.7%
Ingredients list	32 58.2%	85 98.8%	13 100%	40 95.2%	170 86.7%	41 71.9%	27 96.4%	68 80.0%	238 84.7%
Nutrient declarations	42 76.4%	82 95.3%	13 100%	39 92.9%	176 89.8%	39 68.4%	26 92.9%	65 76.5%	241 85.8%
Importer name	27 49.1%	0	0	4 9.5%	31 15.8%	45 78.9%	13 46.4%	58 68.2%	89 31.7%
Storage instruction	42 76.4%	78 90.7%	13 100%	40 95.2%	173 88.3%	34 59.6%	18 64.3%	52 61.2%	225 80.1%
Production & best-before dates	44 80.0%	83 96.5%	12 92.3%	38 90.5%	177 90.3%	29 50.9%	20 71.4%	49 57.6%	226 80.4%
Weight	33 60.0%	82 95.3%	8 61.5%	30 71.4%	153 78.1%	23 40.4%	22 78.6%	45 52.9%	198 70.5%
Directions for use	34 61.8%	25 29.1%	1 7.6%	10 23.8%	70 35.7%	39 68.4%	4 14.3%	43 50.6%	113 40.2%
Product type specification	37 67.3%	84 97.7%	13 100%	42 100%	176 89.8%	29 50.9%	13 46.4%	42 49.4%	210 74.7%
Manufacturer name	36 65.5%	1 1.2%	0	9 21.4%	46 23.5%	28 49.1%	9 32.1%	37 43.5%	83 29.5%
Other information#	25 45.5%	23 26.7%	9 69.2%	29 69.0%	86 43.9%	16 28.1%	0	16 18.8%	102 36.3%
Manufacturing country	28 50.9%	2 2.3%	0	2 4.8%	32 16.3%	3 5.3%	12 42.9%	15 17.6%	47 16.7%
Allergy information	9 16.4%	49 57.0%	8 61.5%	13 31.0%	79 40.3%	4 7.0%	3 10.7%	7 8.2%	86 30.6%
Nutrition claim	5 9.1%	1 1.2%	0	1 2.4%	7 3.6%	1 1.8%	0	1 1.2%	8 2.8%
Health claim	8 14.5%	0	0	0	8 4.1%	0	0	0	8 2.8%

Serving size	1 1.8%	1 1.2%	0	2 4.8%	4 2.0%	0	0	0	4 1.4%

***** Ten of these products with label translations also had a sticker. These columns only report on label translation.

******Ten of these products with stickers also had some label translations. These columns report only on the sticker information. As products with both a sticker and label translation are listed in both columns for sticker with translation and label translation, the numbers in the column of 'Sticker with translation' are a little more than the actual product numbers.

*** * *** The actual number of products was 271, with 10 them having both a sticker and label translation. Therefore, the total number of products is 281.

[#] Other information included standard information, as well as logos and statements, such as natural/original/real/pure product, no colours, artificial sweeteners & preservatives, GMO free, organic/eco/bio food or clean product, rich in/source of/contain vitamins or minerals or nutritious, healthy food or healthy, functional food or probiotic, gluten free, fortified/added vitamins or minerals, no added/white sugar, no food additives, UTZ, taste of natural fruit, contain biological active substances/antioxidants/health product etc.

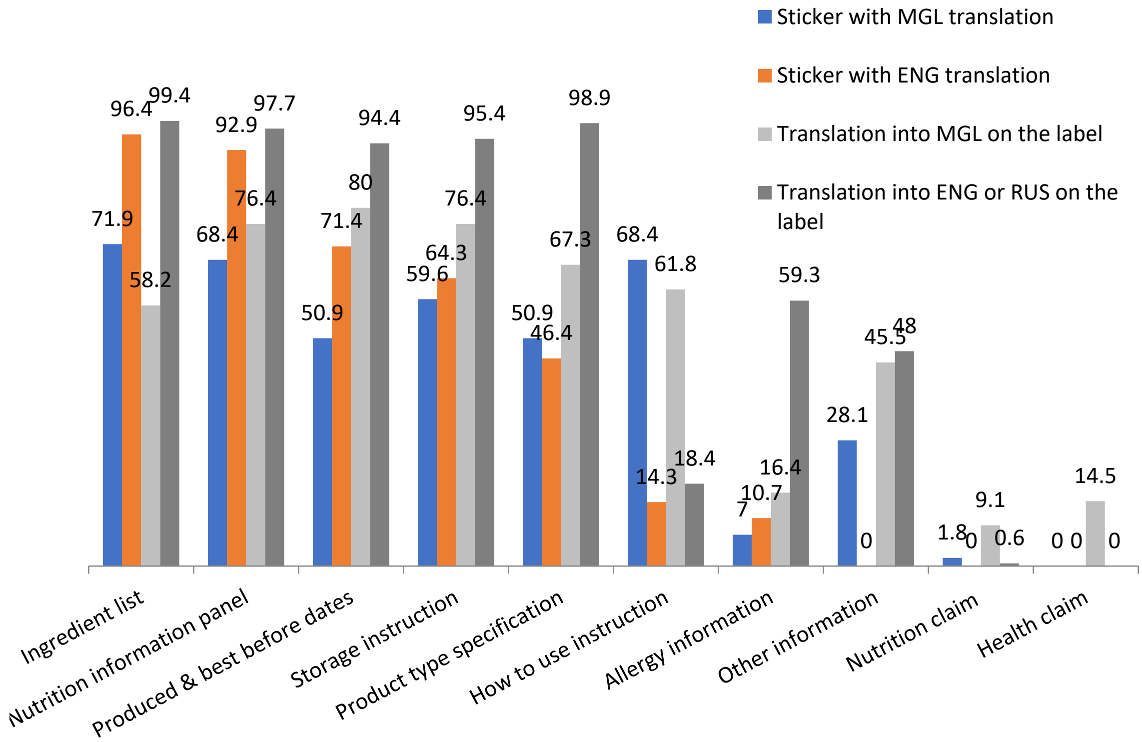

Figure 6.2 The content of translated information compared by the language of translation and the form of translation (stickers vs. label translation)

6.4 Discussion

This review focused on assessing the information presented on labels of pre-packaged food products available at marketplaces in Mongolia. The objective was to provide an overview on the labelling status of food products in Mongolia.

The findings of the audit revealed a high level of compliance of labels of pre-packaged foods in Mongolia with the food labelling standards, with over 90% of products' compliant, with the labelling legislation in terms of the provision of required information. This demonstrates high adherence of the food industry to the labelling regulations despite the relatively new food labelling regulations in Mongolia. Label information was mostly provided in one of the legal languages: Mongolian, English or Russian. However, for small proportions of imported products, specifically some types of candies and sweets, snacks and seasonings imported from Germany and South Korea, labels were not translated into legal languages. These findings highlight the need for strengthening monitoring and enforcement activities in the future, with a specific focus on these products to ensure that products comply with regulations by meeting the requirements for label language. A similar study from Indonesia that audited the product labels of small and medium-scale food enterprises reported relatively lower compliance rates. In this study, ingredients lists were presented on 57.2%-83.3% of products, while production dates were found on only 15%-25% and expiry dates on 57.2%-83.3% of products (Farida & Ayuningtyas 2019). In terms of nutrition information, 91% of products had nutrient declarations, 9% nutrition claims, and 10% had health claims. The prevalence of nutrient declarations on food labels in Mongolia was comparable to the rates in some European countries (85%) and China (87%), but higher than the rates in some LMICs, including Turkey (24%), Malawi (40.4%), India (52%), Serbia (62.7%), and Thailand (79.2%) (Davidović et al. 2015; Dunford et al. 2015; Genannt Bonsmann et al. 2010; Huang et al. 2016; Kasapila & Shaarani 2013; Pongutta et al. 2018). The EU project “Food Labelling to Advance Better Education for Life” (FLABEL) reported that, on average, 85% of products in EU countries had back-of-pack labelling, ranging from 70% in Slovenia to 82% in the UK, while Turkey had the lowest rate of 24% (Genannt Bonsmann et al. 2010).

Legalising English and Russian as the languages for label information may likely introduce a major barrier to consumers in accessing label information. The reason for this is that only half of the products in this audit had labels written in Mongolian, and it is unclear to what extent the labels in English or Russian are understood by consumers, which comprised the other half of the audited products. Despite the lack of official statistics regarding the proficiency of Mongolians in Russian and English languages, it is likely that most people are not able to read and understand these labels, given the majority the population speaks Mongolian, and Russian or English are not commonly spoken. This regulation reflects a period when labelling regulations were developed 10-15 years ago to respond to the changes in the food system occurring in Mongolia during the early transition period in the 1990s. Legalising Russian for label language likely reflects the country's historical ties with the former Soviet Union. However, these regulations are not in line with current consumer needs. Since the development of the labelling regulations, there have been radical changes in the political and economic situation of the country and in population demographics, with the emergence of a new generation with different interests and abilities, including their foreign language proficiency. Label language related issues have not been explicitly reported in the literature. Two previous studies from Turkey and Romania suggested providing label information in consumers' native language can enhance their understanding of label information (Besler et al. 2012; Festila et al. 2014).

There was a lack of standardised formatting for the display of label information in terms of content and legibility. The content of label information and the format of presentation were inconsistent across imported and domestic products, as well as between different countries from where the products were imported. These inconsistencies were related to the primary label language, the form of translation, and translated language.

The scope and presentation of label information varied based on the primary label language, following the label formats of the products' countries of origin. Nutrition information varied significantly across products in terms of the types of nutrients declared, the units used to express the nutrients (per 100g/ml or per serving size, or both), inclusion of percentages of daily value in the nutrient declarations, and the format of nutrient declarations, a listing or a table. In some cases, nutrient declarations were provided in multiple formats with different nutrient ranges and units, such as per serving or per 100g/ml. Such inconsistent labels can confuse consumers, particularly those who have limited knowledgeable of labels, and may hinder their use.

Compared to labels in other languages, labels primarily written in Mongolian and domestic products had a relatively limited scope of information, especially in terms of nutrition information. This includes the provision of nutrient declarations, RDI, ingredients list, serving size, FOPL, and declaration of total sugars, saturated fat, and sodium. Non-compliance rates for the provision of nutrition and other label information were higher for products with labels primarily written in Mongolian compared to those with labels written in other languages. Approximately half of the products (43.6%-51.4%) included label information, such as nutrient declarations, ingredients list, product name, storage instructions, and expiry dates, in Mongolian, either in the original label or as a translation. Therefore, despite high compliance with legal languages, the actual accessibility of label information in the Mongolian language was low.

The limited provision of important nutrients, such as total sugars, sodium and saturated fat, on domestic products could diminish the relevance of this information for consumers purchasing these products. On the other hand, nutrition and health claims were more frequently found on products with labels written in Mongolian compared to products with labels in other languages or imported products. This is likely due to the lack of regulation regarding making the claims.

The scope of label information varied depending on the form of translation (sticker vs label translation) and the language of translation. Stickers generally contained less information compared to label translations, particularly in terms of nutrient declarations, ingredients lists, and storage instructions, which were provided less frequently on stickers. Mongolian translations, in general, had less provision of information compared to English, and to a lesser extent, Russian translations. Stickers with Mongolian translations often only presented the importer and manufacturer names and directions for use. Consequently, translated labels, especially those with Mongolian translations and presented on stickers, lacked sufficient information and could serve a barrier to label use by consumers. The absence of allergy information on labels with Mongolian translation (only 11.7% of labels contained this information) is particularly concerning due to the potential health risk it poses to consumers.

Lastly, labels of both domestic and imported products were less likely to meet consumer needs in terms of legibility. There was no standard for the legibility of label text, including font size and text contrast. Legibility of labels was particularly poor for imported products, as their labels were sometimes written in multiple languages, resulting in crowded labels and small text was difficult to read. Poor legibility can discourage people from reading and using labels.

Chapter Seven

OVERALL DISCUSSION AND CONCLUSION

7.1 Preface

This research is the first to examine policies, practices, and consumer perspectives on food and nutrition labelling in Mongolia. The study aimed to understand how consumers in Mongolia perceive and use food label information, with the intention of improving food labelling policies and regulations to enable informed food choices and hence improve health outcomes. Four studies were conducted to assess the current food labelling policies and practices in Mongolia, as well as the perspectives of Mongolian consumers on food and nutrition labelling. The findings of these studies will be valuable in enhancing current food labelling policies and regulations to better support consumers in making informed food choices.

This chapter summarises and discusses the key findings from the research in relation to the four research questions of the project. The research's contributions to the existing evidence base and its implications for theory, policy and practice are also discussed. Finally, the strengths and limitations of the research are reviewed, and recommendations for future activities are provided, along with the conclusion.

7.2 Gaps in existing knowledge addressed by the study

The research addressed the gap in the literature on food and nutrition labelling policies and consumer response outcomes in LMICs and Mongolia, as identified in *Chapter Two*. There was limited evidence available regarding the development and implementation of food and nutrition labelling policies, and consumer awareness and use of such labelling in these countries. Especially, there was a scarcity of information regarding the development and implementation of the Mongolian food labelling policy and the corresponding consumer responses within the country. Previous studies largely described self-reported label use, which is prone to over reporting rather than objective label use. Factors influencing label use are often understudied, with limited research beyond demographic factors. Additionally, and the label use behaviour of disadvantaged groups, including individuals from lower SES and with lower educational levels, is understudied. There is also a scarcity of comprehensive policy analyses that examine the factors that hinder or facilitate policy processes. While there have been some in-depth policy analyses on FOPL policies, there remains a significant gap in exploring policy processes related to general food labelling and nutrition labelling policies.

Thus, this study was novel as it was the first to explore food labelling policy and consumer responses to food and nutrition labels in Mongolia. Limited research had been conducted on consumers' food label behaviours in LMICs, with only two studies originating from Eastern European countries. However, no prior studies had examined food labelling policy in transition and post-socialist countries.

The study employed an approach that improved the reliability of self-reported measures of label use. By utilising this approach, the study contributed to addressing the scarcity of evidence on objective label use, which, in turn, contributed to enhancing the validity of the evidence, particularly within the context of LMICs. By investigating several research questions, the study aimed to address the aforementioned gaps in the evidence on food labelling policy and consumer behaviour. In the subsequent sections, we present the key findings of this study in relation to each research question.

7.3 Key findings

7.3.1 Consumer perspectives on food and nutrition labelling: Studies I and II – Population-based and supermarket intercept surveys (Chapter Four)

The studies addressed the first research question of the thesis:

> RQ 1. What are consumers' perspectives of food and nutrition labelling in Mongolia, including: their awareness and perception of labels; their use of labels; their challenges and needs regarding labelling; and what would assist them to understand and use label information?

The majority of previous research on consumer responses to food and nutrition labelling has predominantly focused on high-income countries, while consumer responses to food labelling in LMICs are underexplored. The evidence from emerging and transition countries is particularly scarce (Festila et al. 2014). The different socio-economic and cultural settings in emerging markets limit the generalizability of previous theories and findings to these countries (Burgess & Steenkamp 2013).

The studies were novel as they were the first to explore consumers' perspectives on food and nutrition labelling in Mongolia (**Chapter Four**). Recent shifts in food and dietary patterns, such as the increased consumption of pre-packaged processed foods, highlight the significance of food labelling in guiding individuals towards healthier choices. However, food labelling is a relatively new concept in Mongolia, as people, have had limited exposure to both diverse food types and label information (**Chapter One**). The study draws upon the existing literature on consumer behaviour in LMICs, as discussed in *Chapter Two,* and employs a conceptual framework outlined in *Chapter Three*.

The studies focused on and provided insights into the initial stages of consumer responses to food labelling, including consumer awareness, perception, and use of food labels. Additionally, these studies explored other factors associated with these outcomes, considering their relevance and significance during the early stages of food labelling policy development in Mongolia. Given the early stage of development of this field of research, examining further outcomes such as understanding of food labels and dietary and health outcomes was considered premature at this stage.

The population-based survey was conducted prior to the supermarket intercept survey in order to explore the population's use and perception of food and nutrition labels. The survey aimed to understand the challenges individuals face in using food labels, the factors that influence label use, and the role of food labels in making food choices. Subsequently, the supermarket intercept survey was carried out to further examine the use of food labels use by people, and reasons for not using labels. The survey involved interviewing people in the real shopping context and measuring label use based on improved self-reports using the labels of the products purchased.

In the population-based survey, a majority of Mongolian consumers (68%) reported looking at food labels, with one third (36%) reporting frequent use of nutrition labels during grocery shopping. However, in the supermarket intercept survey conducted among urban shoppers from different SES areas, only 54% of the participants looked at labels of the products they purchased, and merely 7% paid attention to nutrition labels. This significant discrepancy between the two surveys suggests that people may overestimate their use of labels in self-reported responses, while in reality, very few individuals actually look at nutrition labels. The low rate of nutrition label use (7%) determined in the supermarket survey is in contrast to the self-reported rates (ranging 11%-89%) found in other studies from LMICs (**Chapter Two**). This finding aligns with a similar study by Grunert et al. (2010), where self-reported use of nutrition label was 50% higher than the rate determined through observations and interviews of participants asking to identify where on the label they claimed to have looked for that information (Grunert et al. 2010). These findings suggest that the method used in the supermarket survey, in which self-reports were verified on the labels of purchased products, provides a more accurate reflection of actual label use compared to the population survey. However, there could be other factors influencing the lower label use observed in the supermarket survey, such as product familiarity and situational circumstances. In our study, as reported by respondents, the primary reason for non-use of nutrition labels was a lack of awareness and knowledge of food and nutrition labelling, reported by 55% of those who do not typically look at nutrition labels. The second most common reason was the familiarity of food products, reported by 31% of those who do not usually examine nutrition labels. Consumers refer most to expiry date information, which was consistent with the consumers' behaviour in other LMIC countries (**Chapter Two**).

These findings suggest that despite the growing dietary risks linked to the rise in the consumption of processed pre-packaged foods, Mongolian consumers are not actively seeking information about nutritional quality of products. This may indicate a lack of awareness among consumers regarding the role and significance of such information, and highlight the importance and urgency of raising consumers' awareness of food and nutrition labels as an initial step towards generating interest and motivation to use label information. While understanding of label information remains an issue, building awareness of labels serves as a crucial precursor to improving label comprehension. Instead of label information, product taste, familiarity, and product quality and safety guided consumers' food choices and purchases, which was consistent to other studies (Besler et al. 2012; Grunert et al. 2010; Grunert & Wills 2007; Vemula et al. 2014).

The supermarket intercept survey revealed that label language is a significant barrier to label use. In Mongolia, the majority of the population only speaks their mother tongue and are not proficient in other languages. Therefore, labels written in foreign languages posed a challenge for people who do not speak or understand these languages, especially considering the high reliance of the country on food imports. The study suggests the need to review labelling policies for imported foods, specifically regarding the approval of label languages. This challenge regarding foreign language labels is a novel outcome of this study, which has not been explicitly reported in the existing literature.

7.3.2 Food and nutrition labelling policy in Mongolia: Study III – Policy analysis of the Mongolian food labelling policy (Chapter Five)

Study III – Policy analysis of the Mongolian food labelling policy (**Chapter Five**) addressed the second research question of the thesis, which is:

> RQ 2. To what extent does the Mongolian food labelling policy align with consumers' needs and what are the factors that lead or impede the policy processes?

Public policies are frequently not evaluated, and evaluations are rarely reported in LMICs (Sisnowski et al. 2017). Gilson and Raphaely argue that health policy analysis in LMICs often focuses on describing "what happened" rather than exploring "what explains what happened", emphasising the limited use of conceptual frameworks and relevant theories in policy analysis (Gilson & Raphaely 2008). There is limited evidence available from developing countries regarding policy analysis of nutrition labelling policies (Kline et al. 2017; Popkin et al. 2013).

This study presents the first analysis of the Mongolian food labelling policy, exploring the factors that hinder and facilitate policy development and implementation while assessing their effectiveness in meeting consumer needs. The study employed the *Health Policy Analysis Triangle Framework* by Walt and Gilson and the *Advocacy Coalition Framework (ACF)* to guide the development of the interview guide and data analysis. Semi-structured interviews were conducted with stakeholders. The following sections discuss the key findings of the study in relation to the findings of the literature review (**Chapter Two**) and the broader literature.

The study found that the adoption of the Mongolian food labelling policy was influenced by its historical socio-political context and the need to restore the diminished food control system during the transition to a market economy. Unlike other countries, where obesity and NCDs were the main drivers for label change (Barquera et al. 2013; Edalati et al. 2020; Kumar et al. 2018; Phulkerd et al. 2017; Vogel et al. 2010), the Mongolian labelling policy was primarily driven by concerns related food safety, such as the provision of best-before dates and the declaration of food additives on the labels. The regulation of labels on imported food products written in foreign languages also played a significant role. Nutrition labelling was not prioritised by the government or regulators, and its adoption occurred within the broader framework of food safety policies.

Government commitment and leadership, as well as technical and financial support from international agencies, were identified as facilitators for the development of the food labelling policy in Mongolia. Food industry exert some opposition, while consumer participation was low, resulting in the policy not reflecting their perspectives. This contrasts with Western food systems where consumers exert pressure on the government for improved food label information. The lack of public interest and stakeholder engagement weakened the effectiveness of the Mongolian policy, in contrast to successful participatory approaches observed in other LMICs like Brazil (Coitinho et al. 2002), Mexico (White & Barquera 2020) and Thailand (Rimpeekool et al. 2015).

The implementation of the labelling policy faced challenges, including delays in the policy formulation processes, insufficient infrastructure, and limited resources. These barriers encompassed aspects related to monitoring and evaluation, training, laboratory capacity, stakeholder knowledge and skills, and funding. These findings align with the previous literature on barriers to food and nutrition labelling policies in LMICs (**Chapter Two**).

While the Mongolian policy and regulations appear to align with the Codex standards on the surface, their practical implementation has been limited due to the historical context influencing stakeholders' positions and the availability of infrastructure and resources. The policy core beliefs prioritising food safety have led to a lack of emphasis on nutrition labelling. This lack of focus and capacity hindered the development and implementation of effective food labelling policy.

The study findings highlight the need for directive leadership from the Mongolian government to mitigate the negative impacts of the transition and empower consumers to make informed food choices. Recommendations include reviewing and updating the food labelling policy by shifting the focus to nutrition labelling and basing them on consumers' needs, intensifying the implementation of the FOPL guideline, providing label information only in the Mongolian language, promoting consumers' participation in the policy processes, and improving consumer awareness on food labelling.

The lessons learnt from this study can be valuable for other countries undergoing similar transitions. The factors, including a lack of historical exposure and experience of consumers to food labelling, their poor food and nutrition literacy, a lack of community engagement in policy processes, a lack of expertise among policy makers and government officials on food and nutrition labelling, and limited time for effective regulatory response, make food labelling a challenging space for intervention in transition countries like Mongolia.

7.3.3 Food labelling practice in Mongolia: Study IV – Audit of food labels (Chapter Six)

The study addressed the third research question of the thesis:

> RQ 3. "How food labelling policy and regulations are reflected in labelling practices at the retail level and do these practices act as barriers or facilitators to consumers' use of label information?".

The format, content and position of nutrition labels affect consumers' perception and use of food labels (Rayner et al. 2013). Consumers are more likely to read labels if the information is concise and easy to process. Therefore, label information should be accurate, complete, standardised and easy to read and understand (Henderikx 2017).

Study IV – Audit of food labels (**Chapter Six**) assessed labels of food products sold in Mongolian marketplaces. The study aimed to assess the uptake of food labelling policy and identify barriers and facilitators to consumers' use and understanding of labels, focusing on label availability and accessibility. The assessment evaluated the overall compliance of food product labels with the national food labelling standard, including the provision of required label information and label language. The study identified several barriers and facilitators that influenced consumers' use and understanding of labels, providing insights to stakeholders such as the government, food regulators, manufacturers and policy makers. The findings serve as a baseline reference to inform improvements in the current labelling policy and guide future initiatives for improving labelling practices and evaluating progress in this area.

The audit of food labels in Mongolia showed a high level of compliance of labels with the labelling legislation in terms of the provision of label information on pre-packaged foods. Most products (over 90%) displayed the required label information such as product name, storage instructions, production and expiry dates, ingredients list, and directions for use. Nutrient declarations, although voluntary at the time, were present on 91% of products. The prevalence of nutrient declarations on food labels in Mongolia was comparable to the rates in some European countries (85%) and China (87%), and higher than the rates in other LMICs (24-79%) (Davidović et al. 2015; Dunford et al. 2015; Genannt Bonsmann et al. 2010; Huang et al. 2016; Kasapila & Shaarani 2013; Pongutta et al. 2018). Furthermore, 96% of labels were written at least one of the three legal languages (Mongolian, English and Russian), with 55% in Mongolian and 45% in English or Russian. These data indicate that food companies and importers in

Mongolia are following regulatory requirements and providing necessary information within the country's regulations. It is also not in line with the Codex recommendation that label language should be acceptable to the consumer for whom it is intended (CAC 1985). Some countries require labels of imported food products to be in the official language of the country as part of the labelling requirements for imported food products. For example, Indonesian food labelling regulation requires labels of imported products to be written in Indonesian language (Bahasa) (United States Department of Agriculture 2020).

However, the study identified significant issues related to the availability and accessibility of label information. Legalising English and Russian as label languages creates a barrier to consumers in accessing label information. This is particularly problematic since products with such labels were likely to be imported discretionary foods. The issue of label language found in this study was not explicitly reported in previous literature, although two studies, from Turkey and Romania, suggested the provision of label information in mother tongue of consumers rather than English (Besler et al. 2012; Festila et al. 2014). The study also found inconsistencies in the scope and format of label information, depending on the primary label language and other factors. Labels primarily written in Mongolian, Russian and some former Soviet Union provided limited nutrient information, while labels in English and languages of some EU countries offered a broader range of nutrients. Domestic products and imported products from Russia and former Soviet Union countries lacked critical nutrient information. Domestic products carried health and nutrition claims more frequently than imported products, but these claims were misleading, with very low credibility and presented on unhealthy products. It is imperative to address this situation due to the negative impact of these claims on consumer food choices and health (Oostenbach et al. 2019). Labels translated into Mongolian language had limited provision of different types of label information compared to labels with English and Russian translations. Additionally, a lack of standardised label formats, including font size and text contrast, created inconsistency in label text between domestic and imported products.

The study findings highlight the need for improvement of food labelling practices in Mongolia. It suggests legalising labels in the consumers' mother tongue, addressing inconsistencies in the label scope and format, establishing legibility standards, enhancing the provision of label information, particularly nutrition information on domestic products, and developing standards for translated labels. The study also emphasises the importance of introducing regulations for claims. Overall, the study contributes valuable knowledge about label information, provision and credibility of health and nutrition claims, and impact of those claims on consumer choices and consumption in Mongolia.

7.3.4 Linking the findings of consumer, policy and food label audit studies

The findings of the consumer studies, food labelling policy analysis and labelling practices study were interconnected and complemented each other, leading to a better understanding of the introduction of food labelling policy in Mongolia. The discussions that follow aim to support the understanding of the individual study findings by examining their connections with one another and placing them within the broader context of global evidence.

Nearly half of the products examined in the study had labels written in English and Russian **(Study IV, Chapter Six**). These labels presented challenges and were inaccessible to the majority of consumers (**Study I** and **II, Chapter Four**). The existing regulation permits the use of Mongolian, English, and Russian languages for label information. Considering the significant number of products with labels in these languages in the Mongolian market, this regulation serves as a significant barrier to effective label use and needs to be revised.

The audit of food labels revealed inconsistencies in terms of the scope of information and presentation format. This inconsistency in label format was attributed to the lack of regulations regarding standardised format for labelling of imported products. The study also found domestic products provided a narrower range of nutrient information compared to imported products, which aligns with the requirements of the food labelling standard in effect during the study period in 2017. Interestingly, neither consumers nor regulators raised concerns about the inconsistent label information. This suggests a lack of expectations or pressure from consumers and government officials regarding the provision of consistent and easily accessible label information. Consumers expressed dissatisfaction with the legibility of labels, which aligns with the findings of the label audit. This again reflects the absence of specific guidelines in the food labelling standard regarding the legibility of label information, particularly of nutrition information. Clear and comprehensive regulations regarding the necessary label information and format for both domestic and imported products contribute to standardised and consistent labels in other countries like Australia. In Australia and New Zealand, food regulations mandate that all food sold in Australia and New Zealand, including imported foods, must comply with the specified requirements, ensuring the provision of necessary information (Food Standards Australia New Zealand 2021). In contrast, the Mongolian regulation does not clearly indicate whether the requirement for label information applies equally to domestic and imported products. This regulatory gap may explain the inconsistency in label information found on imported products sold in the Mongolian marketplaces. The Mongolian food labelling standard does not provide specific guidelines for labelling of imported food products, except for the requirement of translation for labels in languages other than the three legal languages. Additionally, there is a lack of external pressure, such as foreign trade requirement, to enforce better labelling practices in Mongolia.

Consumers' limited use of labels, including using label information for comparing different products, may explain their lack of awareness. Regulators' focus on food safety rather than food and nutrition labelling could also reflect their lack of knowledge. In contrast, pressure from consumer groups, public health professionals, and civil society organisations has driven the adoption of improved labelling policies and practices in other countries (Rimpeekool et al. 2015).

The study suggests that the issues with food labels in Mongolia primarily result from gaps in the regulations rather than failures in the enforcement. The regulatory gaps have led to poor labelling practices, which is in turn affected consumers' ability to use label information effectively. Mongolia, being an importer of discretionary foods, often faces challenges with labels that are either poorly translated or lacking in essential nutrition information. These inconsistencies in label information pose difficulties for consumers when using food labels. Furthermore, consumers' limited awareness of food and nutrition labels puts them at a disadvantage, making them more vulnerable to the negative impacts of their food environments. The study also highlights the presence of misleading claims on food labels, which cannot be verified due to the lack of other nutrition information on the packaging.

7.4 Strength and limitations

The study adopted a comprehensive mixed methods design to explore consumer responses to food and nutrition labelling in relation to the policy processes of food labelling policy, informed by an integrated conceptual framework. It was the first to undertake such a theory informed integrated analysis of food labelling policy and consumer responses in Mongolia. This approach facilitated a deeper understanding of the introduction of the food labelling policy and consumer uptake of this policy. Another strength of the study is its examination of food labelling from multiple perspectives, including those of consumers, policymakers, and practitioners. This approach provided a better understanding of the policy processes around food labelling and its alignment with consumer needs. Moreover, by triangulating the findings across different studies, the credibility of the research was enhanced. Furthermore, the study used a more objective measurement of label use. In the supermarket interviews, participants were asked to indicate the specific information they referred to on actual food labels. This methods in-store verification helped to determine food label use more accurately than relying solely on self-reported label use.

The study has several limitations. Firstly, the supermarket intercept survey explored a convenience sample of urban shoppers, which restricts the generalizability of the study findings to the entire population. Nonetheless, the study did manage to provide a general overview of label use among urban Mongolian consumers, including disadvantaged population groups. Future studies should aim to explore food label use by rural shoppers, as their label use behaviour may differ from their urban counterparts. In addition, while the study focused on food label use, further research needed to examine other consumer response outcomes, such as understanding of label information and the impact of food labels on food choices. Regarding the population-based survey, the study relied on participants of the MNNS-V, specifically women of childbearing age (15 to 49 years) and men within the same age group. This resulted in underrepresentation of older age groups in the study.

In the food labelling policy analysis, perspectives on the policy mainly originated from regulators and national policy stakeholders, with less representation from food producers and consumers. Consequently, the analysis predominantly focused on the viewpoints of regulators, potentially overlooking the insights of other policy stakeholders, including perspectives of food producers and consumers. Future research should explore their perspectives more comprehensively to deepen the understanding of food labelling policies. Moreover, the study’s key informants consisted of individuals from national-level government agencies and non-governmental organisations. Thus, the study findings may not fully capture the issues and problems encountered in the implementation of the policy at the sub-national level. Further exploration is warranted to investigate the knowledge, understanding and practices of food inspectors, food producers, importers and consumers, involved in the implementation of the policy at the grassroots level.

Lastly, in the audit of food labels, the sample of food products did not represent all packaged food products available at the Mongolian marketplaces. Nevertheless, by using a pre-developed list of product categories and attempting to ensure representation of domestic and imported products, as well as different brands, the sample adequately covered the common types of packaged products found in the marketplace.

7.5 Implications of the research

This section presents the implications of the research towards theory, policy and practice.

7.5.1 Implications for theory application

The research used an integrated conceptual framework to explore implementation of food and nutrition labelling policies in Mongolia, considering consumer perspectives, policy aspects and practical implications. The conceptual framework drew on four theoretical frameworks, including the theoretical framework of Grunert and Wills, the conceptual framework of Jacobs et al., the *Health Policy Analysis Triangle Framework* of Walt and Gilson, and the ACF. This combined conceptual framework was utilised to understand consumer responses to food labels and the factors that influence these responses, including food labelling policies. The study confirmed the applicability of these frameworks in understanding consumer responses to food labels and the policy processes related to food labelling policies in LMICs. The *Health Policy Analysis Triangle Framework* proved to be relevant to the food labelling policy processes in Mongolia as it facilitated the exploration of interactions among policy processes, content, actors and context, while also highlighting the influence of socio-political context on these components. Consumer responses to food labels aligned with and were well explained by the conceptual framework of this study, which drew from the theoretical frameworks of Grunert and Wills, as well as Jacobs et al. Moreover, the ACF revealed that the policy core beliefs of regulators centered around achieving improved food safety, which needs to be changed in order to adopt and implement successful nutrition labelling policy. The study identified certain resource-related factors that are specific to the Mongolian policy and linked to the country's transitional context, such as a lack of experience and time constraints. These constraints reflect insufficient time for the country to adjust its policies to the new system, as well as a lack of experience and expertise in food labelling. These factors were not addressed in the ACF, hence, they can be added to the list of resources and constraints for the policy subsystems that have been previously addressed by the framework. Including these factors will strengthen the applicability of the framework in analysing food labelling policies in transitional contexts and LMICs.

7.5.2 Implications for policy

The findings of the study provide valuable insights for improving the food labelling policy of Mongolia. They present an opportunity for the government to take proactive action in implementing a policy that supports consumers in making healthy food choices by providing useful information on food labels and assisting consumers in using this information. The study revealed that the government's food labelling policy primarily focuses on food safety, while neglecting the goal of promoting healthier diets. Therefore, it is crucial for the government to prioritise nutrition labelling to address the increasing consumption of processed food and the ongoing nutrition transition in the country. Fortunately, the government is currently well-positioned to upgrade the food labelling policies, as the policies are still in the early stages of implementation. Taking early action would benefit both the government and consumers. However, the study also identified significant gaps in the current policy, undermining its effectiveness and requiring urgent actions. Areas that need improvement in food labelling regulations include regulations regarding label language, labelling of imported food products, nutrition and health claims, provision of consistent label information, label format, and legibility of label information.

Moreover, the study emphasised the importance of raising awareness among the population regarding healthy eating and nutrition labelling. Awareness raising interventions should highlight the health benefits of nutrition labels and encourage their use. Currently, the food labelling policy in Mongolia lacks information and communication components, as well as capacity building initiatives, which diminish its significance. Drawing lessons from previous food safety communication efforts, which resulted in the frequent use of expiry dates by Mongolian consumers, consumer education on healthy diets and nutrition labels would encourage people to actively search and use nutrition label information.

7.5.3 Implications for practice

The research has significant implications for practice. To our knowledge, this study was the first to explore the introduction of food labelling policy in Mongolia from the perspectives of consumers, policy and practice, utilising an integrated conceptual framework. This novel approach provides valuable insights to public health nutrition research in Mongolia, and the study findings can serve as baseline data for future policies and actions to measure their progress. The policy analysis and consumer survey methods employed in this study can serve as a guide for future research on food and nutrition labelling, as well as studies exploring different public health policies.

The first step is to disseminate the study findings to policy entrepreneurs and decision-makers, bringing attention to the identified barriers in policy processes of the food labelling policy and seeking solutions to support consumers in using food labels. The research findings will be shared through publications sent to relevant government organisations, including the Ministry of Health, Ministry of Food and Agriculture, State Specialised Inspection Agency, and Mongolian Agency of Standardization and Metrology. In addition, the findings will be disseminated through presentations at various forums and conferences, as well as through media advocacy such as newspaper articles and social media platforms.

The study highlights the importance of awareness raising communications and capacity building efforts for consumers, regulators and food manufacturers regarding food and nutrition labelling, with a focus on long-term health perspectives. These strategies should involve stakeholders from multiple sectors, including consumer organisations, NGOs and mass media. Furthermore, the study findings hold relevance for other countries undergoing similar transitions or those in low and middle-income settings.

7.6 Recommendations

The food labelling policy landscape in Mongolia has undergone significant changes over last decade. The Mongolian government has implemented several policies and related to food labelling, representing a step forward in achieving the desired outcomes of supporting consumers in making informed and healthier food choices. However, future work is still required. Based on the study findings, the following recommendations have been developed to increase the effectiveness of the food labelling policy in Mongolia. These recommendations specifically address **RQ4**.

Recommendation 1: Addressing the gaps in food labelling legislation

The government should prioritise nutrition labelling policy by shifting the current focus on food safety, and support consumers in making healthier food choices. Upgrading the current regulations is necessary to address the challenges related to the common use of misleading and unsubstantiated claims, multiple label languages, and unregulated labels of imported products, as well as to improve food labels to better meet consumer needs. To begin with, regulations for the labelling of imported food products need to be established. These regulations should outline the required label information, label format, label language, and relevant procedures. It is important to ensure that label information is provided solely in the Mongolian language. Additionally, regulations for nutrition and health claims should provide clear specifications on the use of such claims. This includes guidance on the types of permitted claims, conditions under which claims can be made, and procedures for substantiating health claims. Furthermore, the regulations need to provide clear guidance on labelling format and legibility requirements.

Recommendation 2: Supporting consumers to use nutrition labels

The government of Mongolia should pursue strategies to support consumers in using nutrition labels. Mongolian consumers currently have low nutrition literacy and lack of awareness of food and nutrition labels, resulting in limited use of nutrition information on food labels. Evidence from other countries, particularly in Latin America, has shown promise with the implementation of simple and user-friendly FOPL systems. Evaluations of these labels have demonstrated their effectiveness in improving consumer understanding (Pérez-Escamilla et al. 2021). Interpretive FOPLs, which are easier to comprehend by consumers of varying levels of literacy, is recommended by Codex when consumers have low nutrition literacy and motivation (CAC 2013). Therefore, FOPLs can be beneficial for Mongolian consumers in terms of providing them with information about the nutritional content of food products.

It is worth noting that since the start of this PhD project, the Mongolian government has introduced a voluntary FOPL guideline in 2017. Future studies should focus on assessing consumer understanding and use this signposting system, monitoring the progress and limitations in its implementation, and identifying any regulatory gaps that may exist.

Recommendation 3: Prioritising public education on nutrition labelling

The study identified a significant barrier to consumer use of food and nutrition labels in Mongolia: consumers are not adequately prepared to use these labels due to a lack of awareness and knowledge, particularly regarding nutrition labels. To promote the use of labels that have been introduced by the newly adopted Mongolian food labelling standard, there is a need to implement public education initiatives that ensure the uptake of these labels. The study findings indicated that people are aware of and knowledgeable about expiry date information, actively using it and recognising its importance. This highlights the potential effectiveness of public education when executed correctly and when people are motivated to seek and use the provided information. However, the same level of awareness and use is not observed yet for nutrition labelling. For any FOPL initiatives to be effective, their adoption should be accompanied by comprehensive public education campaigns (Graham et al. 2015; Hawley et al. 2012). Consequently, the Mongolian government should prioritise public education efforts to improve nutrition knowledge and empower consumers to use nutrition labels effectively, including the newly adopted FOPL system.

Recommendation 4: Raising consumer awareness of food and nutrition labelling through social marketing campaigns

The government should prioritise the provision of consumer education campaigns to raise public interest and awareness of food and nutrition labelling. These campaigns should be designed to engage consumers, taking into consideration factors such as their level of education, age, gender, SES, and interest in nutrition. Importantly, social marketing campaigns should be tailored to different consumer groups, ensuring that the messaging aligns with their specific characteristics and needs. Evidence on the impact of education campaigns on FOPL systems has shown positive outcomes, including increased awareness and use of the system among consumers (Jones et al. 2019). For example, an education campaign conducted during the implementation of the Health Star Rating (HSR) system in Australia resulted in increased awareness, trust, understanding and use of the HSR among consumers exposed to the campaign (Jones et al. 2019).

Recommendation 5: Building capacity in knowledge, infrastructure and resources in the development and implementation of food and nutrition labelling policy

In ensure the effective implementation of the food labelling policy, the government needs to address the existing gaps in knowledge, expertise, resources and infrastructure. It is crucial for the government to take actions in communicating the content of the regulations to businesses, establishing and adequately resourcing implementation procedures, as well as monitoring and evaluation of the policy effectiveness. Additionally, building capacity in food labelling is essential for government officials, regulators and food producers.

Government actions should focus on influencing the policy core beliefs of policy makers and regulators by enhancing their content knowledge and competency in nutrition labelling. This can be achieved through various capacity building measures, including policy advocacy efforts, ongoing training programs, and workshops. These initiatives aim to strengthen the understanding and application of food and nutrition labelling regulations. Moreover, the government should explore opportunities to enhance knowledge, infrastructure and resource capacities by seeking appropriate technical and financial support from international organisations, such as the WHO.

Recommendation 6: Facilitating engagement of stakeholders in policy processes of food labelling policy and ensuring consumer engagement

The government should actively engage with civil society organisations, including NGOs, consumer organisations, and food producers' associations, to foster shared responsibility for consumer education activities. Collaborating with these organisations can facilitate effective communication and coordination in implementing educational initiatives for consumers.

Furthermore, the government should promote ongoing consumer participation in the food labelling policy formulation process. By actively involving consumers, their opinions and needs can be considered, leading to policies that better meet their expectations. This engagement will not only empower consumers but also enhance the effectiveness of the policies by aligning them with consumer preferences and requirements.

7.7 Conclusion

The study provides valuable insights that contribute to a better understanding of the state of food labelling policy in Mongolia. It examines various aspects of the policy, including its development, implementation, and barriers and facilitators to the development and implementation. Additionally, the study explores the current landscape of food labelling in the marketplace, consumer response to labelling, and the implications of food labelling in Mongolia.

Significant barriers regarding knowledge, infrastructure and resources were identified by the study in the implementation of food labelling policy in Mongolia. Consumer awareness and use of food labelling, especially nutrition labels is poor. Low awareness of food and nutrition labelling poses a significant obstacle to effective label use, especially when it comes to using nutrition information on the labels.

The current food labelling regulations in Mongolia are still in the early stages of development, with a primary focus on food safety. Policy processes are hindered by the lack of knowledge, infrastructure and resources among stakeholders, which can be attributed to the transitional context of the country. There are gaps in the regulations, such as multiple label languages, inadequate regulations for the labelling of imported food products, nutrition and health claims, label format, and label legibility. These gaps prevent food labels from meeting consumer needs and impede their effective use. Insufficiently regulated labels, coupled with low consumer awareness and limited knowledge and expertise among regulators, hinder the ability of food labels to promote healthy diets and enable informed food choices among consumers in Mongolia.

The study emphasises the need for the Mongolian government to take directive leadership in prioritising nutrition labelling policy. This includes intensifying the implementation of the FOPL guideline to mitigate the negative impacts of the nutrition transition and empower people to make informed food choices. The aforementioned gaps in the regulations need to be addressed.

To overcome the barriers related to knowledge, infrastructure and resources, the government should implement strategies and ensure consumer participation in policy processes. Prioritising public awareness campaigns and education on food and nutrition labels is essential. The lessons learnt from this study can also benefit other countries undergoing similar socio-economic and nutrition transitions in formulating and implementing food labelling policies. Furthermore, there is a need for further theory-informed research in this field to enhance the effectiveness of government policies in meeting the health needs of the population and promoting overall well-being.

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Appendices

Appendix A - Published papers

International Journal of *Environmental Research and Public Health*

MDPI

Article

Prevalence and Credibility of Nutrition and Health Claims: Policy Implications from a Case Study of Mongolian Food Labels

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Abstract: Nutrition and health claims should be truthful and not misleading. We aimed to determine the use of nutrition and health claims in packaged foods sold in Mongolia and examine their credibility. A cross-sectional study examined the label information of 1723 products sold in marketplaces in Ulaanbaatar, Mongolia. The claim data were analysed descriptively. In the absence of national regulations, the credibility of the nutrition claims was examined by using the Codex Alimentarius guidelines, while the credibility of the health claims was assessed by using the European Union (EU) Regulations (EC) No 1924/2006. Nutritional quality of products bearing claims was determined by nutrient profiling. Approximately 10% (n = 175) of products carried at least one health claim and 9% (n = 149) carried nutrition claims. The credibility of nutrition and health claims was very low. One-third of nutrition claims (33.7%, n = 97) were deemed credible, by having complete and accurate information on the content of the claimed nutrient/s. Only a few claims would be permitted in the EU countries by complying with the EU regulations. Approximately half of the products with nutrition claims and 40% of products with health claims were classified as less healthy products. The majority of nutrition and health claims on food products sold in Mongolia were judged as non-credible, and many of these claims were on unhealthy products. Rigorous and clear regulations are needed to prevent negative impacts of claims on food choices and consumption, and nutrition transition in Mongolia.

Keywords: claims; food; beverage; label; nutrition; health

1. Introduction

Lifestyle-related non-communicable diseases (NCDs) are the leading cause of global deaths, responsible for 71% of the 57 million global deaths in 2016. Almost eight in every ten deaths from NCDs occur in low- and middle-income countries (LMIC) [1]. Nutrition transition can result in higher rates of obesity and NCDs and is associated with shifts in diet, physical activity and other lifestyle changes that follow economic, demographic and epidemiological changes [2]. Changes in diet are one of the key characteristics of nutrition transition. Dietary changes include increased consumption of processed foods and shifts from traditional diets to Western pattern diets high in energy, sugars and fat [2]. Nutrition transition is a global phenomenon but is occurring much faster in LMICs [3]. LMICs are facing challenges in responding to nutrition transition and a faster growing burden of

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NCDs. These challenges relate to limited resources and time to adjust food policies to support healthy diets. Serious attempts to address the problem are limited to only a few countries [4].

Provision of accurate and sufficient information on the nutritional quality of food products is a key policy action for governments to support healthy diets, as recommended by the Codex Alimentarius Commission [5]. Claims are one form of nutrition labelling. Nutrition claims state, suggest or imply that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins and minerals. Health claims refer to relationships between a food or a constituent of that food and health [6]. Nutrition labelling provides information to consumers about the nutritional content of foods and assists them in making healthier choices. It may also encourage product reformulation as food manufacturers seek to avoid making undesirable disclosures [7].

Claims on food labels should be truthful and not misleading [6]. However, food producers use claims for marketing purposes [8]. Claims can be misleading where they are present on foods deemed less healthy or when health claims are not scientifically substantiated [8]. Claims also can induce a "health halo" effect, by which they affect consumers' perceptions of the overall healthfulness of foods. People are more likely to purchase products bearing claims and are not as restrained in their consumption [9].

Mongolia is an LMIC where little research on food labelling has been undertaken. Prior to shifting to a market economy in the early 1990s, Mongolia was under a centralised economy and had low levels of imported food products [10]. Consequently, Mongolian consumers are relatively unfamiliar with food labelling specifically and processed packaged food more generally. The country is experiencing rapid nutrition transition with commensurate NCD burdens. NCDs surpassed other causes of mortality in recent decades to become the leading cause of population mortality. Cardiovascular disease and cancer accounted for 60% of population deaths in 2017, compared to 58% in 1995 [11]. Of 15–49 years olds, 46.2% of women and 48.8% of men were overweight and obese in 2016, which represents an increase of 40% for women and 77% among men from 2010 levels [12].

In Mongolia, a new food labelling standard, MNS 6648:2016, which was largely based on the relevant Codex standards for food labelling [5,6,13], came to enforcement in 2018. Prior to this, there was effectively no regulation relating to nutrition and health claims on food packages. The previous guideline on nutrition labelling of 2007, which was an apparent translation of the Codex guidelines on nutrition labelling [5], lacked capability to provide proper regulation due to its poor translation (introducing errors) and voluntary nature. The new regulation of 2018 was progressive to the previous guideline as it stipulates mandatory nutrition labelling for all pre-packaged food products on the back or side of food packaging. Official label languages are Mongolian, Russian and English. Regulations relating to nutrition and health claims are still minimal in the new standard and include two main requirements: (1) the mandatory declaration of a nutrient when a nutrition or health claim is made, and; (2) the need for approval of health claims by a government-authorised organization. A definition of a nutrition claim was provided in the food labelling standard MNS 6648:2016, together with the requirement to declare the amount of the claimed nutrient. The standard also introduced the concept of scientific substantiation of health claims. However, the standard does not specify the types of nutrition and health claims that are permitted and lacks requirements regarding criteria for making claims [14].

Food labelling policy implementation, including for nutrition and health claims, has not been well studied in developing countries. Most evidence on the use of claims and their effects on diets are from developed countries [15–17]. The study aimed to determine the use of nutrition and health claims on packaged foods sold in Mongolia and examine the credibility of these claims. As food labelling regulations are currently in transition in this country, this study provides a critical baseline evaluation of the food labelling landscape to guide identification of areas of concern and provide a basis for assessing progress on policy implementation. Findings will be useful to other developing countries experiencing similar trajectories in the availability and population consumption of processed packaged foods in the absence of corresponding food labelling policies to guide healthier choices.

2. Materials and Methods

2.1. Data Collection and Coding

A survey of packaged food product labels was conducted in Ulaanbaatar, the capital city of Mongolia, during November and December 2017. University students studying nutrition, public health and nursing were engaged in data collection after undertaking training in the data collection tool. The students collected the label information of food products from supermarkets and grocery stores located throughout the city. They were instructed to collect the product information from any supermarket or grocery store at their convenience.

Approximately 100 student data collectors sampled food products from 50 food categories belonging to 11 major groups (Table A1). These food categories and subcategories were based on the food categories' classification used in the household socio-economic survey of the National Statistics Office of Mongolia [18], which represented the common types of food products used by Mongolian households with some modifications to include other common types of processed food products. The pre-defined food categories were pre-tested in one supermarket by crosschecking them against the products placed on the shelves in the supermarket and missing food categories were added.

The food categories were assigned to the data collectors in order to avoid duplications and each student was asked to collect label photographs of at least 20 food products across all label language groups, capturing as many different brands as possible. They took photographs of product packaging and recorded details of label information, including the product's name, category, brand, manufacturing country, label language and availability of nutrient declarations and claims. Students transferred electronic copies of the photographs to the lead author (NCh).

Photographs were coded by one person (NCh) for product name, type, manufacturing country, label language and the verbatim content of claims. If label photographs were of poor quality or did not fully capture the label, students were asked to retake photographs of the products and send them through, or the Internet was searched for images of the products.

2.2. Data Analysis

Data were entered into Microsoft Excel (2016) and converted into IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA) for analysis. The proportions of food products carrying nutrition and health claims and the rate of claims per 100 products (a number of claims per 100 products) were estimated for each food category. The rates of claims were compared by claim type and label language.

By the credibility of claims, we perceived trustworthiness and reliability of claims in terms of providing reliable and scientific evidence-based information to consumers, as well as providing supporting information on the content of claimed nutrients to back up the claimed nutritional characteristics or health effects of a product. The Codex guidelines and the claims regulation of the EU were used in the credibility analysis of claims as the current national food labelling standard (2018) did not contain criteria for making nutrition and health claims. Credibility of nutrition claims was determined by their compliance with the criteria of nutrient content claims established in the Codex guidelines for Use of Nutrition and Health Claims (CAC/GL 23-1997) [6]. Nutrition claims were considered credible if the value for the claimed nutrient was present and in correct amounts on the nutrient declaration. Health claims were assessed for their consistency with the list of acceptable claims of the EU Regulations (EC) No 1924/2006 [19]. The EU regulation was used because of the considerable share in the Mongolian food imports from EU countries [20]. Health claims were considered credible if they appeared in this list and were compliant with the criteria of nutrient content established for corresponding claims (Figure 1).

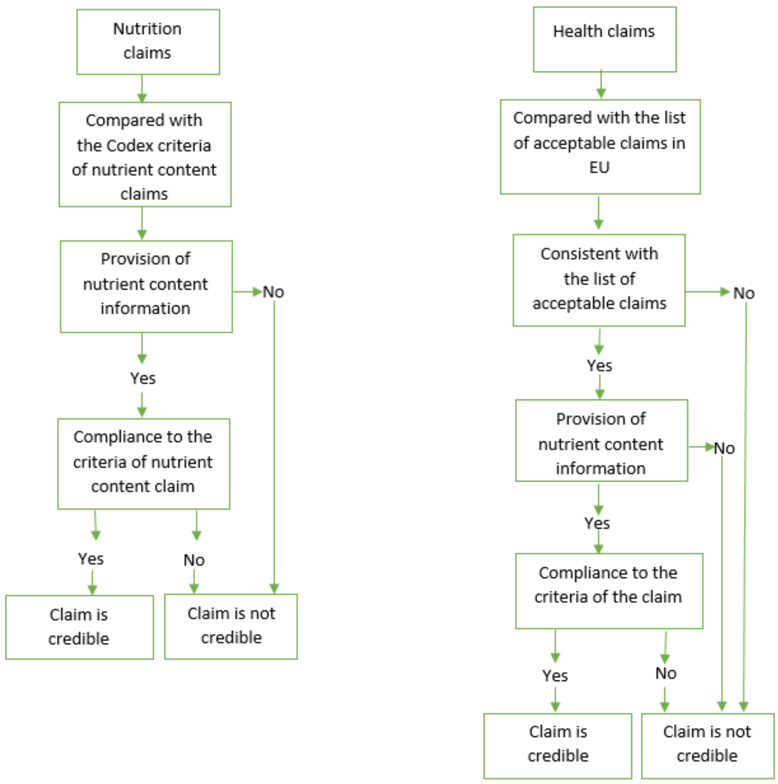

Figure 1. Assessment of credibility of nutrition and health claims.

Products with nutrition and health claims were assessed for their healthiness by comparing their nutrient content against the WHO nutrient profile model for the Western Pacific Region (WPR) [21]. The purpose of the model is to restrict marketing of foods and non-alcoholic beverages to children and it is intended to differentiate between food and non-alcoholic beverages that are more likely to be part of a healthy diet from those that are less likely. The model consists a total of 18 food categories and marketing to children is prohibited for three categories (category 1—chocolate and sugar confectionary, energy bars and sweet toppings and desserts; category 2—cakes, sweet biscuits and pastries and sweet bakery products; and category 4c—energy drinks, tea and coffee). The nutrient content of the products was crosschecked against the nutrient thresholds for saturated fats, trans fatty acids, added sugar and sodium of the model. Products that exceeded any of the relevant thresholds were considered unhealthy.

The research was reviewed and approved by the Human Research Ethics Committee of University of Wollongong on 24 October 2017 (Project identification code: 2017/394).

Classification of Claims

Claim types were determined according to the Codex classifications [6]. In addition, therapeutic claims were included as a type of health claim (Table 1).

Table 1. Types of claims.

Type of Claims		Definition	Example of Claim
Nutrient content claim		Claims that describe the level of a nutrient contained in a food	"Source of calcium"; "High in fibre"; "Low in fat"
Health claim		Statement about a relationship between a food or a constituent of that food and health	Examples of health claims are given below.
Type of health claim	Nutrient function claim	Claims that describe the physiological role of a nutrient in growth, development and in maintaining and supporting normal functions of the body (not related to a specific disease)	"Calcium for healthy bones and teeth. Food X is a source of calcium."
	Other function claim	Claims related to positive contribution of a food or a constituent of that food to health or improvement of a body function. In this study, claims related to substances other than nutrients were classified in this category.	"Fibre contained in the product improves peristalsis. Food X is high in fibre." "Lignans support colon function. The product contains X grams of lignans."
	Reduction of disease risk claim	Claims related to the reduced risk of developing a disease or health-related condition.	"Diets high in calcium may reduce the risk of osteoporosis. Food X is high in calcium."
	Therapeutic claim	Claims related to the beneficial effects of nutrients, substances, ingredients or products for treatment, alleviation or cure of diseases and conditions [8]. These types of claims are prohibited by Codex Alimentarius. Claims relating to the prevention of diseases are considered therapeutic claims as well.	"The product helps in liver diseases." "Regular consumption of the product prevents cardiovascular diseases."

3. Results

3.1. Characteristics of Food Products Surveyed

Label photos of 1723 food products were collected and analysed. The sample included nearly equal numbers of products labelled in Mongolian and other languages. The products belonged to 17 of 18 food categories of the WHO nutrient profile model for the WPR (Table 2). One-third of the products contained nutrient profiles in the categories (1, 2 and 4c), for which marketing to children is prohibited.

Table 2. Food categories covered in the survey.

Food Category	Food Category Code	Products Labelled in		Total	
		Mongolian	Other Languages	n	%
Cakes, sweet biscuits and pastries, sweet bakery products	2	188	114	302	17.5
Beverages	4	118	93	211	12.2
(a) Juices	4a	(4)	(28)	(32)	(1.9)
(b) Milk drinks	4b	(30)	(6)	(36)	(2.1)
(c) Energy drinks, tea and coffee	4c	(77)	(54)	(131)	(7.6)
(d) Other sugar-sweetened beverages (juice drinks, soft drinks, flavoured water, etc.)	4d	(7)	(5)	(12)	(0.7)
Chocolate and sugar confectionary, energy bars and desserts	1	28	176	204	11.8
Processed meat, poultry, fish and similar	14	143	40	183	10.6
Processed fruit and vegetables	16	71	98	169	9.8
Fresh or dried noodles, pasta, rice and grains	12	77	40	117	6.8
Sauces, dips and dressings	18	10	91	101	5.9
Savoury snacks (chips, crisps, processed seaweed, crackers, nuts, etc.)	3	23	54	77	4.5
Yoghurt, sour milk, cream, curds	7	55	5	60	3.5
Butter, vegetable oils, other fats	10	8	47	55	3.2
Ice cream	5	26	25	51	3.0
Ready-made and convenience foods and composite dishes	9	8	42	50	2.9
Bread, bread products	11	47	2	49	2.8
Fresh and frozen meat, poultry, fish and similar	13	30	3	33	1.9
Breakfast cereals	6	6	15	21	1.2
Other products [1]	NA	10	9	19	1.1
Cheese	8	3	13	16	0.9
Tofu products	17	5	0	5	0.3
Total		856	867	1723	100.0

[1] Other products included products (bottled water, herbal tea, baking powder, infant formula and alcoholic beverages) that are not included in the food categories of the WHO nutrient profile model for the WPR; NA—not applicable.

3.2. *Prevalence of Nutrition and Health Claims on Products*

Overall, 9% (n = 149) of products carried at least one nutrition claim and 10% (n = 175) of products carried at least one health claim. The most prevalent claims were nutrition claims, nutrient function claims and therapeutic claims. The median numbers of nutrition and health claims were 2 claims per product, respectively (Table 3). It was common for the same product to carry more than one claim so that 50.3% of products with nutrition claims and 81% of products with health claims had more than one claim per product.

Table 3. Prevalence of nutrition and health claims.

Type of Claims		Products with at Least one Claim		Total Number of Claims	Median Claims per Product	Rate per 100 Products [1]
		n	% [1]			
Nutrition claim		149	8.6	288	2.0	16.7
Health claim	Nutrient function claim	114	6.6	176	1.0	10.2
	Other function claim	93	5.4	148	1.0	8.6
	Reduction of disease risk claim	26	1.5	39	1.0	2.3
	Therapeutic claim	79	4.6	160	2.0	9.3
	Total	175	10.2	523	2.0	30.4

[1] Percentages and rates were estimated for the total number of products of 1723.

3.2.1. Prevalence of Nutrition and Health Claims by Label Language

Products labelled in Mongolian had higher rates of claims than those labelled in other languages. The prevalence of claims was between 2.2 and 21.7 times higher for products labelled in Mongolian (n = 856) compared to other languages (n = 867). Per 100 products, the different rates of claims for Mongolian labels compared with labels in other languages were: reduction of disease risk claims 4.3 (n = 37) versus 0.2 (n = 2), other function claims 15.7 (n = 134) versus 1.6 (n = 14), therapeutic claims 16.8 (n = 144) versus 1.8 (n = 16) and nutrition claims 23.0 (n = 197) versus 10.5 (n = 91), respectively.

3.2.2. Products Carrying Nutrition and Health Claims

Product categories with the highest percentages of products with at least one nutrition claim and with the highest rates of nutrition claims were dried curd and curd (60.0%, n = 9), vegetable oil (31.0%, n = 9) and curd drink and yoghurt (26.8%, n = 11). Health claims were carried most frequently on labels for dried curd and curd (53.8%, n = 7), buckwheat, rice and millet (52.5%, n = 21) and curd drink and yoghurt (51.2%, n = 21). Higher rates of health claims were found in barley, flax and wheat flour, buckwheat, rice and millet and breakfast cereal.

3.3. Types of Health Claims

For most of the nutrient function (n = 129 of 176 claims) and other function claims (n = 116 of 148 claims), health benefits were related to a whole product or its ingredients, such as "Rye contained in the product supports the digestive system" (nutrient function claim) or "Pure chocolate contained in the product improves brain function" (other function claim) (Tables A2 and A3). Therapeutic claims were the second most common claims with 160 claims found across the sample. Again, these claims were mostly based on a whole product or its ingredients (Table A4). Reduction of disease risk claims were the least prevalent health claims, identified 39 times across the sample (Table A5).

3.4. Credibility of Nutrition and Health Claims

The credibility of the claims was very low. For nutrition claims, this was mostly due to the lack of information about the claimed nutrients in the nutrient declaration or the absence of any nutrient declaration. Overall, 131 claims out of a total 288 nutrition claims (45.5%) had no information on the content of a claimed nutrient, no nutrient declaration or was a general claim. General claims were the claims regarding the high content of vitamins or minerals of a product, without referring to a specific vitamin or mineral. Example of a general claim is "The product is a source of vitamins and minerals". Only 97 nutrition claims (33.7%) were accompanied by complete and accurate information on the claimed nutrients and their content and thus deemed as credible. For the remaining 60 nutrition claims (20.8%), nutrient content did not meet the established criteria for nutrition content claims from Codex, e.g., the criteria for a "good source of protein" claim is that the product's protein content should not be less than 10% of the nutrient reference value (NRV) for protein (Table 4).

Even fewer health claims were credible. One-third of all health claims (n = 160 of 523 claims) were therapeutic claims, prohibited in the EU. Of the remaining types of health claims (n = 363), only 18 claims were found on the list of authorised claims of the EU. Of these, only six claims met the specific criteria of the claims for the nutrient content (Table 5). Claims regulations in the EU authorise claims for specific nutrients/substances or food/food categories, not for the food products carrying the claim [19]. Most of the non-therapeutic health claims on Mongolian products (n = 263 of 309 claims) would be disqualified for use in the EU countries as they were based on a whole food product or its ingredients.

Claims that were in the Mongolian language were less credible than claims in other languages. Only 25.4% (n = 50/197 claims) of nutrition claims in Mongolian were credible versus 51.6% (n = 47 of 91 claims) of the claims in other languages. Nutrient information was not provided for over half of the nutrition claims (53.8%, n = 106) in Mongolian compared to 27.5% (n = 25) of the claims in other languages (Table 4). There were no health claims in the Mongolian language that met the relevant criteria in the comparison country (Table 5).

Table 4. Credibility of nutrition claims by label language.

Type of Claim	Label Language	Total Number of Claims	Information on the Nutrient				Quantity Statement	
			Not Provided		Provided		Accurate	Inaccurate
			n	%	n	%	n	n
Nutrition claim	Mongolian	197	106	53.8	91	46.2	50	41
	Other	91	25	27.5	66	72.5	47	19
	Total	288	131 [1]	45.5	157	54.5	97	60

[1] Nutrient information was missing due to lack of nutrient declaration (7.6% of the claims) or no values for the nutrient (for 33.3% of the claims) or was a general claim (for 4.5% of the claims).

Table 5. Comparison of health claims with the authorised claims in the EU.

Type of Claims		Total Number of Claims	Permitted Claims		Credible Clams
			n	%	n
Nutrient function claim		176	17	9.7%	6
Other function claim		148	1	0.7%	0
Reduction of disease risk claim		39	0	0	0
Therapeutic claim		160	0	0	0
Label language	Mongolian	453	11	2.4%	0
	Other [1]	70	7	10%	6
Total		523	18	3.4%	6

[1] "Other" included Russian, English and Korean.

3.5. Healthiness of Products with Claims

Based on nutrient profiling, 54.2% (n = 140) of products with nutrition claims and 40.5% (n = 184) of products with health claims were less healthy products (Table 6).

Table 6. Application of nutrient profiling model to the products with nutrition and health claims.

Type of Claims		Label Language	Total Number of Claims	Claims Covered in Nutrient Profiling [1]		Ranked as			
						Healthy		Unhealthy	
				n	%	*n*	%	*n*	%
Nutrition claim		Mongolian	197	175	88.8	79	45.1	96	54.9
		Other	91	83	91.2	39	47.0	44	53.0
		Total	288	258	89.6	118	45.7	140	54.2
Health claim	Nutrient function claim	Mongolian	138	121	87.7	73	60.3	48	39.7
		Other	38	36	94.7	23	63.9	13	36.1
		Sub total	176	157	89.2	96	61.1	61	38.9
	Other function claim	Mongolian	134	117	87.3	67	57.3	50	42.7
		Other	14	14	100.0	7	50.0	7	50.0
		Sub total	148	131	88.5	74	56.5	57	43.5
	Reduction of disease risk claim	Mongolian	37	30	81.1	12	40.0	18	60.0
		Other	2	2	100.0	2	100.0	0	0
		Sub total	39	32	82.1	14	43.8	18	56.2
	Therapeutic claim	Mongolian	144	118	81.9	75	63.6	43	36.4
		Other	16	16	100.0	11	68.8	5	31.2
		Sub total	160	134	83.8	86	64.2	48	35.8
	Total	Mongolian	453	386	85.2	227	58.8	159	41.2
		Other	70	68	97.1	43	63.2	25	36.8
		Total	523	454	86.8	270	59.5	184	40.5

[1] 30 nutrition claims and 69 health claims could not be assessed against the nutrient profiling model due to lack of a nutrient declaration or missing nutrient information on the declaration.

4. Discussion

In this study, approximately 10% (n = 175) of all products carried health claims and 9% (n = 149) carried nutrition claims. The rate of health claims was similar to the findings of other studies from Australia (11%) and South Africa (10.2%) but lower than the prevalence of claims identified in Ireland (17.8%) [17,22,23]. The rate of health claims was higher in Mongolia than previously reported on products from the EU, the USA, Malaysia and Indonesia (0–7.1%) [24,25]. The rate of nutrition claims was much lower than the other countries' rates [16,23–25].

The proportion of unhealthy products with nutrition claims in our study (54.2%) was higher compared to the other studies from Australia, Canada and some EU countries where 29–42% of products carrying nutrition claims had less healthy nutrient profiles [26–28]. Likewise, products with health claims were less healthy in our study (40.5% were less healthy) compared to products with health claims in the studies from Australia (31%) and EU countries (30%) [27,28]. In order to prevent unhealthy products to have claims, some countries implement regulations to restrict making claims on certain types of foods or to endorse claims on foods meeting certain nutrient eligibility criteria [8].

This study identified that nutrition and health claims found on food and beverage products in Mongolia had very low levels of credibility. In particular, claims made on products labelled in Mongolian were less credible than claims in other languages. Most health claims were found on Mongolian language products and nearly all of them were not credible. Almost all of the 160 therapeutic health claims were on Mongolian language products. These types of claims are prohibited by Codex Alimentarius and in other countries. This contrasts to other studies, which have reported few cases of such claims on products [17,22,24]. A similar pattern was identified for nutrition claims, whereby only one-third of these claims (33.7%, n = 97) were deemed credible. Lack of supporting information on the content of the claimed nutrients (45.5%, n = 131 of 288 claims) largely contributed to the low credibility of nutrition claims. This finding is exceptional when compared to other studies. For example, a similar survey from Australia found only 7.2% (n = 322) of nutrition claims were not credible [16]. Again, nutrition claims on Mongolian language products were half as likely to be credible than claims on products labelled in other languages.

Such variations in the credibility of claims reflect the status of food labelling regulation in Mongolia and in other countries at the time of the study. A high prevalence of therapeutic claims was also reported in a Serbian study, in which 17% of products had therapeutic claims [29]. At the time of these studies, in both Mongolia and Serbia there was no government regulation on the use of nutrition and health claims, allowing these to be freely used without any independent validation or safeguards. Soon after this survey was conducted, a new Mongolian food labelling standard, MNS 6648:2016, came into force in January 2018 [14]. However, the new standard lacks a clear definition on nutrition and health claims, specification on different types of claims and criteria for making those claims or a substantiation framework for claims, such as minimum criteria for the healthfulness of products bearing a claim. The standard states that claims be approved by an authorised government organisation prior to use, however, a procedure for that has not been developed.

The potential negative impact of claims on food choices and consumption [15,30] can be particularly significant in Mongolia. The results of this study highlight the pervasiveness of poorly regulated food claim practices. In addition, the population has relatively poor levels of nutrition literacy [31] and low awareness on food labelling. The added burden of non-credible claims on less healthy food products may worsen the process of nutrition transition currently underway in Mongolia. Such labelling essentially disseminates misinformation and hinders healthy choices.

The study has several limitations. First, the survey sample does not represent all packaged food products available at the marketplaces in Mongolia. However, using a prior developed list of product categories and an attempt to ensure the representation of domestic and imported products and different brands, the sample captured all common types of packaged products in the marketplace. Second, due to the convenience sampling, calculation of percentages and statistical tests was not possible in some cases due to a small number of claims per comparison group.

5. Conclusions

Mongolia is experiencing rapid nutrition transition, similar to many developing nations. Nutrition labelling policy is increasingly important as marketplaces and population diets are being dominated by processed packaged foods. Major issues in the use of nutrition and health claims in Mongolia were identified, whereby most claims were not credible and not based on scientific evidence and many were found on unhealthy products due to the unregulated and voluntary use of nutrition and health claims by food producers. New food labelling regulation has been introduced in Mongolia since data were collected, however specifications on the use of nutrition and health claims remain weak. Given Mongolian consumers' relative poor nutrition literacy, it is likely that they are at greater risk of the negative effects of misleading claims on their food choices and consumption. Regulations for food claims are in their early stages of development in Mongolia and more rigorous regulations providing clear guidance about the types of permitted claims and conditions under which claims can be made are needed. The current regulations regarding nutrition and health claims are needed to be upgraded in consultation with the Codex guidelines for use of nutrition and health claims as well as claims regulations of other countries. Awareness of consumers and food producers on nutrition and health claims is needed to be improved.

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Appendix A

Table A1. Product groups and categories covered in the study.

		Product Groups and Categories	Number of Products
	1	**Milk and dairy products**	
1	1.1	Milk (natural or with added flavour)	31
2	1.2	Yogurt (natural or with added fruit)	32
3	1.3	Curds, dried curds	17
4	1.4	Skim, cream	5
5	1.5	Cheese imported	13
6	1.6	Other (curd drink, mare milk, ghee, evaporated milk, etc.)	14
	2	**Meat products**	
7	2.1	Sausage and frankfurter	56
8	2.2	Canned and vacuum packaged meat	20
9	2.3	Canned fish	31
10	2.4	Frozen dumpling and wonton	38
11	2.5	Other processed meat (minced meat, patties, meatballs, ham, liver paste, beef jerky, frozen chicken, frozen fish, seafood, sliced meat, chicken, etc.)	53
	3	**Cereals**	
12	3.1	Flour	24
13	3.2	Rice, other grain	26
14	3.3	Pasta, noodles	48
15	3.4	Bread, bread crumbs	49
16	3.5	Cookies, pastry	177
17	3.6	Breakfast cereal, oatmeal	22
	4	**Processed veg and fruit**	
18	4.1	Canned vegetables	45
19	4.2	Vacuumed vegetable salads	22
20	4.3	Fruit and vegetable purée and sauce	16
21	4.4	Fruit compote	25
22	4.5	Jam	44
23	4.6	Other (laver, kimchi, etc.)	11
	5	**Sweets**	
24	5.1	Biscuits, wafers	102
25	5.2	Chocolate	56
26	5.3	Candies (packaged caramels, soft candy, butterscotch, jelly candy, draje and marmalade, etc.)	52
27	5.4	Ice cream	73
28	5.5	Honey	37
29	5.7	Other (choco pie, assorted chocolate, chocolate biscuit, chocolate spread, sugar, etc.)	54
	6	**Snacks**	
30	6.1	Chips	44

31	6.2	Crackers, extruded snacks	24
32	6.3	Nuts (packed)	34
33	6.4	Dried fruits (packed)	22
	7	**Ready to eat meals**	
34	7.1	Meals (packaged meals, burger, sandwiches, pizza, bun, etc.)	12
35	7.2	Instant soups, instant noodles	37
	8	**Beverages**	
36	8.1	Soft drinks	37
37	8.2	Fruit drinks, 100% fruit juice	64
38	8.3	Bottle tea, energy drink, flavoured water	29
39	8.4	Bottle water, carbonated water, mineral water	6
	9	**Edible oils and fat**	
40	9.1	Butter, margarine	11
41	9.2	Vegetable oil	29
42	9.3	Mayonnaise	12
	10	**Seasonings**	
43	10.1	Ketchup, tomato pasta	23
44	10.2	Salad dressings, sauce, vinegar	41
45	10.3	Other spices and condiments	40
	11	**Other**	
46	11.1	Tea, coffee, coffee cream	29
47	11.2	Egg	16
48	11.3	Infant formula, weaning food	11
49	11.4	Tofu	6
50	11.5	Alcohol, beer	3
			1723

Table A2. Nutrient function claims by attributable health benefits.

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Nutrition Claim (n)		
		Total	The Claim Based on	
			Nutrients	Ingredients or Whole Food
Prevents obesity; helps in weight control and maintaining normal weight; suitable for dieting; suppresses appetite	fibre, unsaturated fat, low fat, protein, vitamin D	33	12	21
Improves appetite; supports digestive system; helps in stomach discomfort; supports growth of bifidobacteria	vitamin B1, B12, fibre, high in protein, magnesium, galactooligosaccharide	27	8	19
Stabilizes/supports heart function, cardiovascular system and blood circulation; stabilizes blood pressure; favorable effects on blood vessels	vitamin B1, omega 7	26	2	24
Facilitates excretion of toxic substances; cleansing the organism; has de-toxic effect	fibre, protein unsaturated fat	22	4	18
Supports bone development and maintains normal growth	calcium, iron, protein, carbohydrate, fat	17	6	11
Relieves fatigue	vitamin PP, E, folic acid, zinc, iron, manganese	10	2	8
Supports nervous system and brain development	vitamin B1, iodine	9	4	5
Supports immunity	selenium, vitamin C	8	2	6
Protects against flu and cold	vitamin PP, E, folic acid, zinc, iron, manganese, phosphorus	6	2	4
Supports blood cell formation	vitamin PP, E, folic acid, zinc, iron, manganese	5	1	4
Participates in/supports metabolism	vitamin B2	3	1	2
Supports liver and gallbladder function	NA	2	0	2
Supports respiratory function	NA	2	0	2
Maintains normal sight	vitamin B2	2	1	1
Supports kidney function	NA	1	0	1
Supports endocrine system	NA	1	1	0
Supports muscle development	NA	1	1	0
Healthy skin	NA	1	0	1
Total		176 (100.0)	47(26.7)	129 (73.3)

NA—not applicable.

Table A3. Other function claims by attributable health benefits.

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Substances Linked to the Claim	Other Function Claim (n)		
			Total	The Claim Based on	
				Nutrients/Substances	Ingredients or Whole Food
Improves colon function; helps in constipation; improves stomach function; normalize useful gut flora	fibre, protein, magnesium, inulin	probiotic bacteria bifidobacteria	35	11	24
Improves intestine peristalsis	fibre, unsaturated fat vitamin B, folic acid, calcium, iron	lignans	29	3	26
Improves immunity	nucleotides	NA	21	4	17
Improves/boosts metabolism	NA	probiotic bacteria	11	4	7
Improves mental capacity and memory; improves brain function	vitamin B1, B, iron	NA	8	3	5
improves heart function, cardiovascular system; decreases blood pressure	NA	NA	8	0	8
Builds strong bones and accelerates growth	NA	NA	7	0	7
Builds strong teeth and gums	NA	NA	6	0	6
Slows down aging	omega 7, unsaturated fat	NA	6	2	4
Releases edema	NA	NA	5	0	5
Facilitates excretion of toxic substances; cleansing the organism; has de-toxic effect	NA	lactic acid bacteria	3	3	0
Improves liver and gallbladder function	NA	NA	2	0	2
Increases breast milk production	vitamin E, F	NA	2	1	1
Reduces cough	NA	NA	1	0	1
Improves kidney function	NA	NA	2	0	2
Improves respiratory function	NA	NA	1	0	1
Improves eye sight; improves night sight	vitamin PP, E, folic acid, zinc, iron, manganese	NA	1	1	0
Total			148 (100.0)	32 (21.6)	116 (78.4)

NA—not applicable.

Table A4. Therapeutic claims by attributable health benefits.

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Substances Linked to the Claim	Therapeutic Claim (n)		
			Total	The Claim Based on	
				Nutrients/Substances	Ingredients or Whole Food
Prevents cancer	essential amino acids fibre, protein	flavonoids	15	1	14
Prevents osteoporosis	NA	NA	9	0	9
Prevents CVD, heart diseases and stroke	unsaturated fat, fibre low in saturated fat and cholesterol	Luteolin flavonoids	9	3	6
Prevents digestive system, gastritis, increased stomach acidity, and stomach and colon ulcers	fibre, protein	NA	6	1	5
Prevents high blood pressure	NA	lignans	4	2	2
Prevents diabetes	fibre	lignans	3	1	2
Prevents iron deficiency and anemia	NA	NA	3	0	3
Prevents iodine deficiency and goiter	NA	NA	3	0	3
Prevents paralysis, epilepsies and seizure	NA	NA	3	0	3
Prevents diseases	NA	NA	2	0	2
Prevents urinal diseases and kidney diseases	NA	NA	2	0	2
Prevents arthritis	NA	NA	2	0	2
Prevent allergy	NA	NA	2	0	2
Prevents kidney and bile stones	NA	NA	1	0	1
Prevents tooth diseases	NA	NA	1	0	1
Prevents vitamin and mineral deficiencies	NA	NA	1	0	1
Helps in diabetes; suitable for diabetics	fibre, protein, vitamin D magnesium	NA	15	5	10
Heals digestive system, gastritis, increased stomach acidity, and stomach and colon ulcers	omega 7, high in protein	NA	11	1	10
Helps in CVD and heart diseases	essential amino acids	NA	9	2	7
Reduces liver fat and bile condensation; heals liver and gallbladder diseases	NA	NA	6	0	6
Helps in kidney and bile stones	NA	NA	5	0	5
Heals bronchitis, pneumonia, tuberculosis and respiratory diseases	NA	NA	5	0	5
Helps in/suppresses the progression of cancer	NA	luteolin	5	1	4
Heals high blood pressure	fibre, unsaturated fat	NA	5	2	3
Helps in urinal diseases and kidney diseases	NA	NA	4	0	4
Heals atherosclerosis	fibre, unsaturated fat	NA	4	1	3
Heals skin diseases	NA	NA	3	0	3
Helps in iron deficiency and anemia	NA	NA	3	0	3
Heals arthritis	NA	NA	3	0	3
Accelerates healing of chronic hepatitis	vitamin PP	NA	2	1	1
Heals osteoporosis	NA	NA	2	0	2
Heals sore mouth	NA	NA	2	0	2
Helps in poor vision and eye diseases	NA	NA	2	0	2
Heals sore, wounds and burns; has anti-inflammatory effect	vitamin PP, fibre protein	NA	2	1	1
Heals bone fracture and injury	NA	NA	1	0	1
Alleviates pancreases	NA	NA	1	0	1
Helps in tympanitis	NA	NA	1	0	1
Effective against dementia	NA	NA	1	0	1
Has remedy effects	NA	NA	1	0	1
Heals vitamin and mineral deficiencies	NA	NA	1	0	1
Total			160 (100.0)	22 (13.8)	138 (86.2)

NA—not applicable.

Table A5. Reduction of disease risk claims by attributable health benefits.

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Substances Linked to the Claim	Reduction of Disease Risk Claim (*n*)		
			Total	The Claim Based on	
				Nutrients/Substances	Ingredients or Whole Food
Reduces/maintains blood cholesterol level	fibre, omega 7	NA	13	2	11
Reduces/ maintains blood sugar level	omega 7, fibre, protein	NA	9	2	7
Reduces risk of CVD, heart diseases and stroke	unsaturated fat, fibre low in saturated fat and cholesterol	Luteolin flavonoids	8	6	2
Reduces risk of cancer	NA	bifidobacteria	3	2	1
Reduces risk of Alzheimer's and Parkinson's diseases	NA	NA	1	1	0
Reduces risk of osteoporosis	calcium	NA	1	1	0
Reduces risk of high blood pressure	NA	lignans	1	1	0
Reduces risk of diabetes	NA	lignans	3	1	2
Total			39 (100.0)	16 (41.0)	23 (59.0)

NA—not applicable.

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Appendix B – Table A2.1.Consumer awareness and use of food and nutrition labelling in LMICs

	Author, Year	Country	Study design	Sampling, sample size, study settings	Type of label	Measures of label use & awareness/tools or methods	Frequency of label use	Awareness	Information looked at on label (% of participants looked at)	Reasons for not using label	Factors affecting label use
1	Ahmadi et al. 2013	Iran	Cross-sectional	n=380 Convenience sampling, Supermarket, women	Nutrition label	self-reported use /questionnaire, face-to face interview	61.3% frequently used				
2	Ali & Kapoor 2009	India	Cross-sectional	n=631 Convenience sampling, Households	Food label	self-reported use /questionnaire	45.3% frequently used				Food label use: *Sociodemographic factors* • gender • education • income • residential status *Attitude towards food labelling* • perceived importance of different label information
3	Arye et al. 2019	Ghana	Cross-sectional	n=384 Convenience sampling, Supermarket	Food label (awareness only) Nutrition label (use only)	self-reported use & awareness/questionnaire, face-to face interview	95.8% used (51.9% frequently checked)	98.4% were aware of food labels	Expiry date-79.4%, nutrition information-43.5%, country of origin-1%		Food label use: *Sociodemographic factors* • education
4	Besler et al. 2012	Turkey	Cross-sectional	n=1536 Probability sampling, 26 regions to represent the country, stratified by sex, age and SES, Households	Food label (use only) Nutrition label	self-reported use & awareness/questionnaire, face-to face interview	Food label- 64.1% (78.3%- first purchase; 70.4%- familiar brands) Nutrition label- 72.3% (27.9%- frequently checked)	Awareness of nutrition label terms: 96% were aware of vitamins, 95.4% of energy, 94.2% of protein, 35.5% of trans-fat and 64.2% of fiber.			
5	Bhilwar et al. 2018	India	Cross-sectional	n=368 Probability sampling, to represent an area in the city, Households	Food label Nutrition label	self-reported use /questionnaire, face-to face interview	Food label- 64.1% (44.8% frequently used) Nutrition label- 25%		Manufacturing date-58.9%, expiry date-41.5%, nutrition information-25%, directions for use-18.3%, food additives-13.8%, country of origin-4.7%	Illiterate-35.6% Small font size-35.6% Lack of time-30.3% Lack of interest-27.7% Lack of knowledge & understanding-6.4%	

6	Bosman et al. 2012	South Africa	Cross-sectional	n=1997 Probability stratified sampling to represent metropolitan population	Health claims	self-reported use/questionnaire, face-to face interview	Opinion on and use of health information on labels Opinion on the food and health link			Lack of time Lack of interest Product familiarity Preference for taste & price	Food label use: *Health concern & health reasons* • health concern, awareness of a diet and health link, and health reasons
7	Buyuktuncer et al. 2018	Turkey	Cross-sectional	n=958 Probability sampling, University, Students	Food label Nutrition label	self-reported use /questionnaire, face-to face interview	Food label- 54.7% always used Nutrition label- 38.2% always used				
8	Chan et al. 2019	China	Serial cross-sectional interventio n study	n=35 Convenience sampling, Households, ethnic minority	Food label Nutrition label	self-reported use & awareness/question naire, face-to face interview	Food label- 60% (37.1%- always read) Nutrition label- 11.4%		Expiry date-95.2%, nutrition information-19%	Lack of knowledge & understanding-42.9%	
9	Cheah & Yip 2017	Malaysia	Cross-sectional	n=34305 Probability sampling, The national nutrition survey, Households	Nutrition label	self-reported use /questionnaire, face-to face interview	24.2% used when buy unfamiliar food				Nutrition label use: *Sociodemographic factors* • age • gender • education • income • marital status
10	Cheong et al. 2013	Malaysia	Cross-sectional	n=4898 Probability sampling, The national health and morbidity survey, Households, elderly residents	Nutrition label	self-reported use /questionnaire, face-to face interview	61.9% of elderly men and 36.6% of elderly women used				Nutrition label use: *Sociodemographic factors* • age • education • income • marital status
11	van der Colff et al. 2016	South Africa	Cross-sectional	n=279 Convenience sampling, Individuals	Food label	self-reported use /self-administered questionnaire	79% read				
12	da Costa Souza et al. 2016	Brazil	Quasi-experimen tal study	n=702 Probability sampling, School & university, students	Nutrition label	self-reported use /questionnaire, face-to face interview	55.8%-72% -used pre- and post-intervention				

13	Danilola et al. 2019	Nigeria	Cross-sectional	n=220 Probability sampling, 2 shopping malls from 5 malls to represent one region, Supermarket	Food label	• Self-reported use /questionnaire, face-to face interview • Objective awareness	41.7% frequently used food safety information on the label	• 61.8% had high awareness and high use of label information whereas 38.2% had high level of awareness but low use of the information. • High awareness was reflective of the literacy rate. • Awareness of food label has influenced the frequency of reading food safety information on label.		Lack of time Product familiarity Small font size (all were the main reason)	Food label use: *Sociodemographic factors* • gender • education • occupation *Awareness of food labelling* • awareness of food safety information *Attitude towards food labelling* • perceived importance of food safety labels
14	Darkwa 2014	Ghana	Cross-sectional	n=100 Convenience sampling, Supermarket	Food label Nutrition label	• Self-reported use & awareness/self-administered questionnaire • Observed label use/observation	75% read food labels (observed) 37% frequently read food labels (self-reported) 37% read nutrition labels (self-reported)	80% were aware of food labels. 75% were aware of nutrition facts.		Lack of knowledge & understanding-8% Lack of time-65% Lack of interest-8%	
15	De la Cruz-Gongora et al. 2012	Mexico	Cross-sectional	n=731 Probability stratified sampling to represent 3 regions, 6 stores, Supermarket	Nutrition label	self-reported use /questionnaire	79% read NIP (Of those who read, 30% frequently used; 11% read for the first purchase)			Lack of knowledge & understanding Lack of time Lack of interest	
16	Dharni & Gupta 2015	India	Cross-sectional	n=150 Convenience sampling, Supermarket	Food label Nutrition label	• Self-reported label use (average importance given to 14 label components at the time of purchase) • Objective awareness /questionnaire on awareness of food label, label information and labelling regulations		• Awareness was positively associated with education but negatively with income. • Path analysis: Label reading and level of awareness directly affected understanding. Label reading was driven by awareness and importance given to nutrition information at the time of purchase.			Nutrition label use: *Sociodemographic factors* • gender *Awareness of food labelling* • awareness of food safety information *Attitude towards food labelling* • Perceived importance of nutrition labels

17	Esfandiari et al. 2021	Iran	Interventio n	n= 676 Random (convenience) sampling, Shopping center	Traffic light label	Objective awareness/question naire self-administered at pre- and post intervention		Significant increase of awareness of TL labelling and its symbolic colours and the corresponding level of NCD risks after education (Rate of correct answers has increased from 1%-3.4% to 69.8%-89.9%).			
18	Festila et al. 2014	Romania	Cross-sectional	n=428 Convenience sampling, individuals	Food label (use only) FOPLs (awareness only)	self-reported use & awareness /online survey, questionnaire self-administered	71.1% read	• 91.4% had seen the GDA label, when only 14.3% the Unilever's 'My Choice' logo. • The aware respondents showed higher understanding compared to the unaware respondents.			
19	Gezmen-Karadağ & Türközü 2018	Turkey	Cross-sectional	n=1200 Probability sampling to represent 10 cities, Individuals	Food label Nutrition label Nutrition & health claims (awareness only)	self-reported use & awareness/question naire	Food label- 59.6% (15.8%- always read) Nutrition label- <10%-always read	• 56.8% knew about nutrition claims, 51.7% knew about health claims. • Females had more knowledge on nutrition claims compared to males ($p < 0.05$). • 81.7% had heard about the additive terms, 81.7% about GMO, and 65.4% about saturated fat. But the majority had not heard about the types of additives.	Expiry date-58%, brand-49%, manufacturing date-45%, nutrition information-<10%		Food label use: *Sociodemographic factors* • gender • education • employment of household members
20	Gupta & Dharni 2016	India	Cross-sectional	n=150 Convenience sampling, Supermarket	Food label Nutrition label	self-reported use & awareness/question naire	Food label- 77.3% paid attention recently.	83.3% were aware of food labels, but didn't notice its components in depth.	Expiry date (score=4.8), vegetarian sign (4.4), nutrition information & food additives (1.8-2.3)		
21	Hassan & Dimassi 2017	Lebanon	Cross-sectional	n=748 Convenience sampling, Supermarket	Food label Nutrition label	• Self-reported use /questionnaire • Objective awareness/question naire on the information required on food labels	29.3% always read	Low awareness of food labels: Average score for knowledge of food labels was 63.1%. Older, obese, having kids, with chronic illness or allergies, following a specific diet and residing in big cities scored significantly higher.	Name of product-93.8%, expiry & best before date-67.1%-87.3%, manufacturing date-69%, halal claims-49.1%	Lack of time-34.9% Lack of interest-15.1% Lack of knowledge & understanding-9.8% Small font size-8%	

22	Jefrydin et al. 2019	Malaysia	Qualitative study	5 FGDs, 34 students from 5 randomly selected public schools in 4 districts	Nutrition label	focus group discussion	24.2% always read	Majority of participants were familiar with nutrition labels. Misperception of nutrition labels: Despite being well-informed about nutrition labels, they were not able to differentiate nutrition labels with other label information such as expiry date or ingredients list.		Lack of time Lack of interest Product familiarity Preference for taste & price Other reason (hunger)	
23	Kasapila & Shawa 2011	Malawi	Cross-sectional	n=206 Convenience sampling, Grocery store	Nutrition label	self-reported use /questionnaire	29.1% read				
24	Kempen et al. 2012	South Africa	Cross-sectional	n=357 Probability stratified sampling to represent one province	Food label Nutrition label Nutrition & health claims (awareness only)	self-reported use /questionnaire, telephone survey	71.8% read (31.9% frequently read)				
25	Kempen et al. 2011	South Africa	Qualitative study	9 FGD, 55 participants in 3 major supermarkets	Food label Nutrition label	focus group discussion					
26	Koen et al. 2018a	South Africa	Cross-sectional	n=960 Probability stratified sampling to represent one city, 16 grocery stores	Nutrition label	• Self-reported use /questionnaire • Objective awareness/ rated awareness based on the tasks to locate information and identify nutrient content claims and endorsement logos	36% frequently used	The awareness of nutrition labels of respondents was rated as fair or below average.	Calories, fat, protein, vitamins and minerals (from nutrition label)	Product familiarity-34.3% Lack of interest-31.4%	
27	Chopera et al. 2014	Zimbabwe	Cross-sectional	n=320 Convenience sampling, 3 malls in urban areas and grocery stores in rural areas, Supermarket	Food label	self-reported use /questionnaire, face-to face interview	77.2% read				

28	de Morais Sato 2019	Brazil	Qualitative study	12 FGDs, Probability sampling, 96 participants from 4 of the 5 regions in the country	Nutrition label Warning label	focus group discussion	Not reading of food labels were frequently cited.		Food additives-most participants, expiry date-the second most looked info, from nutrition label- sodium, sugar, fat, calories, gluten & lactose	Product familiarity-main reason Lack of knowledge & understanding-second reason Small font size-second reason Other reason (foreign label language, poor label format)	
29	Freire et al. 2017	Ecuador	Mixed methods	• 21 FGDs, Probability stratified sampling, 178 consumers from 5 provinces, Supermarket • KII with 9 key informants representing large, medium and small scale processed food companies • Review of regulations and labels of processed foods	Traffic light label	• Self-reported use • Objective awareness: ability to identify the label; knowledge on the correspondence of label colours to the levels of salt, sugar and fat in products; and importance of the label for prevention of chronic diseases /focus group discussion, key informant interviews		Consumers were familiar with the label and were able to identify it. They were aware of the concept of the TL label and its significance for prevention of chronic diseases.			
30	Jacobs et al. 2010	South Africa	Cross-sectional	n=174 Probability stratified sampling, 3 supermarket chains to represent 2 cities	Food label	self-reported use /questionnaire, face-to face interview	66.7% read (24.7% always read)		Expiry date-94.4%-97.7%, ingredients-59.1%-83.3%, nutrition information-31.9%-81.4%, food additives-48.7%	Preference for taste & price-75%, 73.7% Product familiarity-73.2% Lack of time-71.9% Lack of knowledge & understanding-63.2%	

31	Koen et al. 2018b	South Africa	Qualitative study	9 FGDs, 67 participants in 16 grocery stores of 4 major retailers, Supermarket	Nutrition label	focus group discussion	Only few participants read NIP.		Information on the front of pack-most of participants, nutrient declarations-a few participants	Lack of knowledge & understanding Lack of time Product familiarity Preference for taste & price Unattractive, overloaded labels Distrust in label	
32	Kumar & Kapoor 2016	India	Cross-sectional	n= 300 Convenience sampling, Schools	Food label Nutrition label	self-reported use /questionnaire	75% frequently used food labels				
33	Liu et al. 2015	China	Cross-sectional	n= 660 Convenience sampling, public places and schools, adults	Nutrition label	self-reported use & awareness/self-administered questionnaire	28.5% frequently used	• Familiarity with nutrition labels (visual): 71.6% have noticed nutrition labels before. Familiarity with nutrition labels indicates that they are aware of it but probably not knowing much about it. • Those who were familiar with nutrition labels were more likely to use nutrition labels and also were more likely to understand, both subjectively and objectively, nutrition labels.			Nutrition label use: *Awareness of food labelling* • Familiarity with nutrition labels • Nutrition knowledge
34	Lixin et al. 2020	2020	Cross-sectional	n=147 Probability sampling, University, medical students	Nutrition label	self-reported use/online survey, questionnaire self-administered	59.9% used		Sugar-43.5%	Lack of time-59.9% Unattractive, overloaded labels-22.4% Lack of knowledge & understanding-17% Other reason (no label)-31.4%	
35	Ma et al. 2018	China	Cross-sectional	n=1770 Probability sampling, 2 schools representing a region, Schools, students & their parents	Nutrition label	self-reported use & awareness/self-administered questionnaire	19.3% knew and used	19.3% knew and used 16.1% knew but didn't use 64.6% didn't know and didn't use			Nutrition label use: *Sociodemographic factors* • education *Awareness of food labelling* • nutrition knowledge *Attitude towards food labelling* • perceived effect nutrition labels on food choice

36	Madilo et al. 2019	Ghana	Cross-sectional	n=1478 Convenience sampling with gender strata, 14 universities in 10 regions	Food label	self-reported use /questionnaire, face-to face interview	91.7% read food labels (31.3% read frequently)				
37	Mazariegos & Barnoya 2017	Guatemala	Cross-sectional	n=316 Random (convenience) sampling, caregivers of prekindergarten and kindergarten children	Nutrition label	self-reported use & awareness/questionnaire, face-to face interview	29.4% frequently used	Higher-income caregivers were more likely to be aware of nutrition labels (88%), compared to those with lower income (51%, p<0.05),		Lack of knowledge & understanding-65% (main reason) Lack of time-51% (main reason) Preference for taste & price-35%	
38	Nieto et al. 2020	Mexico	Qualitative study	12 FGDs, 78 participants, stratified by sex, age groups and the size of the city in 5 provinces, Supermarket	Nutrition label GDA Claims	focus group discussion				Lack of knowledge & understanding-main reason Small font size Unattractive, overloaded labels Distrust in label	
39	Norazmir et al. 2012	Malaysia	Cross-sectional	n=295 Convenience sampling, University, students	Nutrition label	self-reported use /questionnaire, self-administered	46.4% used		Ingredients-78.3%, percentage daily value-56.5%	Lack of knowledge & understanding-32.4% (main reason) Unattractive, overloaded labels-23.8% Lack of time-18.6% Small font size-11%	
40	Orozco et al. 2017	Ecuador	Cross-sectional	n=394 Convenience sampling, Households, women	Nutrition label TL label	self-reported use & awareness /questionnaire, face-to face interview	11.1%-39.9%- used traffic light label	• 84.3% of indigenous women and 46% of mestizas women were unaware of the TL system. • Education and area of residence were related with awareness of nutrition labels.		Lack of knowledge & understanding-32.7%-50% (main reason) Lack of interest-13%-16%	
41	Paul & Bedi 2014	India	Cross-sectional	n=250 non-probability, purposive sampling, not specific settings	Food label Nutrition label	self-reported use /questionnaire, self-administered	30-40% frequently used food labels 58% read nutrition labels		Fat & calories->50%, cholesterol-48%		

42	Ponnudurai et al. 2019	Malaysia	Cross-sectional	n=247 Convenience sampling, Supermarket	Food label	self-reported use & awareness /self-administered questionnaire	71.5% read (30.6%-always read)	76.6% were aware of food labels.	Expiry date-89.8%, price-44.2%	Lack of knowledge & understanding-17.9% Product familiarity-16.4% Lack of time-12.4%	
43	Rimpeekool et al. 2016	Thailand	Qualitative study	n=34 Purposive sampling: participants from theThai Cohort Study, a national cohort of university students, as well as non-university educated rural shoppers	Nutrition label GDA label	self-reported use & awareness /in-depth interview	55.9% used (29.4% competent users & 29.4% confused users)	Most participants (n=25/34) were aware of nutrition labels. However, only 6 participants have seen GDA, only one person knew the Thai term for GDA, and none were familiar with the English term GDA.		Lack of interest Product familiarity Preference for taste & price	Nutrition label use: *Sociodemographic factors* • education *Health concern & health reasons* • health concern, awareness of a diet and health link, and health reasons
44	Rimpeekool et al. 2017	Thailand	Secondary data analysis	n=42750 distant learning university students of the Thai cohort study	Nutrition label	self-reported use/analysis of secondary data	89% read (seen nutrition labels on products)				Nutrition label use: *Sociodemographic factors* • age • gender • education
45	Saha et al. 2013	India	Cross-sectional	n=297 Probability cluster sampling, Schools, students	Food label Nutrition label	self-reported use /questionnaire, face-to face interview	88% read food labels (29.1% read frequently) 20% read nutrition labels		Manufacturing date-79%, expiry or best before date 65%-74%, ingredients-50%, nutrition information-20%, allergen information-9%		
46	Singla 2010	India	Cross-sectional	n=100 Non-probability purposive sampling, Supermarket	Food label (use only) Nutrition label	self-reported use & awareness/questionnaire	82% read food labels for the first time (31% after first time) 11% read nutrition labels	62% didn't know about the term recommended dietary allowances (RDA).	Price-32.9%, ingredients-28%, vegetarian logo-15.9%, nutrition information-11%	Lack of knowledge & understanding-37% (main reason) Small font size Distrust in label	Nutrition label use: *Health concern & health reasons* • health concern, awareness of a diet and health link, and health reasons
47	Solanki & Sheth 2015	India	experimental cross-sectional study	n=200 Convenience sampling, Supermarket	Food label Nutrition label	self-reported use /experiment with the labels of two products	57% read food labels of the given products 82% of those who looked at labels read nutrition information		Expiry date-95%, nutrition information-82%, ingredients-56%	Lack of time-31% Preference for taste & price-16%, 24% Lack of knowledge & understanding-11% Lack of interest-10% Small font size-8%	

48	Song et al. 2015	China	Cross-sectional	n=1152 Convenience sampling, Supermarket	Nutrition label	• Self-reported use /questionnaire, face-to face interview • Self-reported awareness • Objective awareness: ability to identify the components of nutrition labels	87.9% read (28.7% always used)	Self-reported awareness: • 37.8% claimed they know nutrition facts 'well' and 34.9% 'somewhat'. Objective awareness: • 31% considered nutrient facts table; 20% nutrition claims and ingredient lists; and 3% nutrient function claims as parts of nutrition label.	Protein-51.5%, vitamins-49.8%, fat-29.4%		
49	Talagala & Arambepola 2016	Sri-Lanka	Cross-sectional	n=542 Probability cluster sampling, Schools, students	Food label Nutrition label	self-reported use /self-administered questionnaire	74.5% frequently used food labels. 81% frequently paid attention on nutrition labels.		Expiry date-99%, price-85%, nutrition declarations-81%, brand-75%		
50	van der Merwe et al. 2013	South Africa	Cross-sectional	n=229 Convenience purposive sampling, public places	Food label Nutrition label (awareness only)	• Self-reported use/questionnaire, face-to face interview • Self-reported awareness • Objective awareness: ability to locate information on label and identify symbols and nutrition claims	73% read 70% read in the first purchase	• 85% rated themselves as being somewhat informed, and 68% well informed about labels. • Majority (over 80%) could 'locate label information' and 'identify symbols' and 'specific nutrient content claims'. • Education, age and language spoken were associated with label knowledge. • Subjective nutrition knowledge was positively associated with informedness about food labels.			
51	Vemula et al. 2014	India	Mixed methods	21 FGDs, n=1863, Probability snowballing sampling, Supermarket	Food label Nutrition label	• Self-reported use /questionnaire, face-to face interview • Focus group discussion	90% read food labels (40% frequently used food labels) 33% checked nutrition labels		Brand-85%, manufacturing & expiry dates-81%, nutrition information-33% FGD: usually checked expiry date, but hardly nutrition information	Lack of knowledge & understanding-main reason	

52	Dano & Krnacova 2017	Slovakia	Cross-sectional	n=139 Convenience sampling, Individuals	Food label	Objective awareness/online questionnaire		Insufficient knowledge regarding mandatory information on food packaging, information about food ingredients and the meaning of quality and origin marks.			
53	Todua 2018	Georgia	Cross-sectional	n=1122 Probability stratified sampling to represent the population	Food label	self-reported awareness/questionnaire, face-to face interview		• 83% reported basic knowledge on food labelling. • Interest is a significant determinant of awareness of food labelling (F=8.041, p=0.005). • Awareness (F=7.683, p=0.000) was significantly associated with buying decision of consumers.			

Appendix B –Table A2.2 List of policy studies included in the literature review

NO	AUTHOR	YEAR	TITLE
1	Coitinho, D. et al.	2002	What Brazil is doing to promote healthy diets and active lifestyles
3	Edalati, S. et al.	2020	Development and implementation of nutrition labelling in Iran: A retrospective policy analysis
4	Farida, I. & Ayuningtyas, D.	2019	Obstacles of Food Label Policy Implementation on Food Micro, Small and Medium Enterprises (MSME) in Jakarta and Semarang
5	Hawkes, C.	2008	Agro-food industry growth and obesity in China: what role for regulating food advertising and promotion and nutrition labelling?
6	Freire, W.B. et al.	2017	A qualitative study of consumer perceptions and use of traffic light food labelling in Ecuador
7	Chavasit, V. et al.	2013	Thailand conquered under-nutrition very successfully but has not slowed obesity
9	Phulkerd, S. et al.	2017	Barriers and potential facilitators to the implementation of government policies on front-of-pack food labeling and restriction of unhealthy food advertising in Thailand
10	White, M. & Barquera, S.	2020	Mexico Adopts Food Warning Labels, Why Now?
12	Tee, E-Siong	2002	Nutrition labelling and claims: Concerns and challenges; experiences from the Asia Pacific Region
14	Rimpeekool, W.	2015	Food and nutrition labelling in Thailand: a long march from subsistence producers to international traders

Appendix C - UOW Ethics approval

HREC Approval of Application 2017/394

irma-support@uow.edu.au <irma-support@uow.edu.au>
Tue 10/24/2017 10:48 AM

To: bkelly@uow.edu.au <bkelly@uow.edu.au>

Cc: Nyamragchaa Chimedtseren <nc974@uowmail.edu.au>; hyeatman@uow.edu.au <hyeatman@uow.edu.au>; rso-ethics@uow.edu.au <rso-ethics@uow.edu.au>

Dear Dr Kelly Gillott,

I am pleased to advise that the application detailed below has been **approved**.

Ethics Number:	2017/394
Approval Date:	24/10/2017
Expiry Date:	23/10/2018
Project Title:	Food labelling in Mongolia: Consumer perspectives
Researcher/s:	Kelly Gillott Bridget; Chimedtseren Nyamragchaa; Yeatman Heather
Documents Approved:	Ethics Application V1 - 12/10/2017 Response to review 12/10/2017 & 19/10/2017 Letter to Mongolian Science and Technology University V3 Letter to the supermarket administration V3 PIS in-retail intercept survey V3 PIS Key informant interview V3 CF in-retail intercept survey V3 CF Key informant interview V3 Interview guide of key informant interview Version 1

Sites:

Site	**Principal Investigator for Site**
Supermarket chain 'My store' in Ulaanbaatar, Mongolia	Ms. Chimedtseren
Mongolian governmental organisations: . Ministry of Health . Ministry of Food, Agriculture & Light Industry . General Agency for Specialised Inspection . National Centre for Standardisation & Metrology	Ms. Chimedtseren
Mongolian NGOs: . Authority for Fair Competition & Consumer Protection . Mongolian Association of Food Producers	Ms. Chimedtseren

Households in 21 provinces and the capital city of Ulaanbaatar, Mongolia	Ms. Chimedtseren

The HREC has reviewed the research proposal for compliance with the *National Statement on Ethical Conduct in Human Research* and approval of this project is conditional upon your continuing compliance with this document. Compliance is monitored through progress reports; the HREC may also undertake physical monitoring of research.

Approval is granted for a twelve month period; extension of this approval will be considered on receipt of a progress report **prior to the expiry date**. Extension of approval requires:

- The submission of an annual progress report and a final report on completion of your project.
- Approval by the HREC of any proposed changes to the protocol or investigators.
- Immediate report of serious or unexpected adverse effects on participants.
- Immediate report of unforeseen events that might affect the continued acceptability of the project.

If you have any queries regarding the HREC review process or your ongoing approval please contact the Ethics Unit on 4221 3386 or email rso-ethics@uow.edu.au.

Yours sincerely,

Emma Barkus

Dr Emma Barkus,
Acting Chair, UOW & ISLHD Social Sciences Human Research Ethics Committee

The University of Wollongong and Illawarra and Shoalhaven Local Health District Social Sciences HREC is constituted and functions in accordance with the NHMRC National Statement on Ethical Conduct in Human Research.

Appendix D - Ethics approval for the MNNS-V survey

ЭРҮҮЛ МЭНДИЙН ЯАМ

АНАГААХ УХААНЫ ЁС ЗҮЙН ХЯНАЛТЫН ХОРООНЫ ТОГТООЛ

2016 оны 08 дугаар сарын 26 -ний өдөр   № 10

210648 Улаанбаатар хот
Сүхбаатар дүүрэг,
Олимпийн гудамж-2
Засгийн газрын VIII байр,
Эрүүл мэнд, спортын яам
Утас: 261556, Факс:323541
Цахим хаяг:
ganzorig@moh.gov.mn

Анагаах ухааны ёс зүйн хяналтын хорооны 2016 оны 07 дугаар сарын 07-ний өдрийн 04 дүгээр хурлын протоколыг үндэслэн ТОГТООХ нь:

1. "Монголын хүн амын хоол тэжээлийн байдал үндэсний 5 дугаар судалгаа" сэдэвт судалгааг Ж.Батжаргал, Н.Болормаа, Б.Энхтунгалаг (Нийгмийн эрүүл мэндийн хүрээлэн) нар нь 2016-2017 онд багтаан хэрэгжүүлэхийг зөвшөөрсүгэй.

2. Дотоодын лабораторийн өнөөгийн хүчин чадлыг харгалзан, судалгааны арга зүйн дагуу судалгааны сорьцийг Герман Улсын аминдэм, эрдсийн "VITMiNLab" лавлагаа лабораторид илгээн шинжлүүлж, шинжлэх ухааны нотолгоо гаргахыг зөвшөөрсүгэй.

3. Судалгааны явцын тайланг жил бүр, төгсгөлийн тайланг судалгаа дууссан хугацаанаас хойш 2 сарын дотор багтаан Анагаах ухааны ёс зүйн хяналтын хороонд ирүүлэхийг төслийн удирдагчид үүрэг болгосугай.

ДАРГ [redacted] ОЙЖАМЦ

Appendix E - Population-based survey- Participant information sheet and consent form for the MNNS-V survey

СУДАЛГААНЫ МЭДЭЭЛЭЛ,
ТАНИУЛСАН ЗӨВШӨӨРЛИЙН ХУУДАС
(Сонгогдсон өрхийн 15-49 насны эрэгтэй, өрхийн тэргүүн)

Та "**Хүн амын хоол тэжээлийн байдал**" үндэсний V судалгаанд санамсаргүй байдлаар сонгогдсон тул би тантай ярилцаж, уг судалгааны талаар мэдээлэл өгөх хүсэлтэй байна. Энэхүү судалгааг Эрүүл мэнд, спортын яамны харъяа Нийгмийн эрүүл мэндийн хүрээлэнгийн Хоол судлалын төвийн мэргэжлийн судлаачид зохион байгуулж байна. Намайг ....гэдэг. Манай ажлын утас 458645, Миний гар утас ....

Судалгааны нэр "Хүн амын хоол тэжээлийн байдал" үндэсний V судалгаа

Судалгааны зорилго: Энэхүү судалгаа нь Монгол улсын хүн амын хоол тэжээлийн өнөөгийн байдалд үнэлгээ өгөх зорилготой юм.

Судалгааны мэдээлэл цуглуулах арга
Судалгаанд Монгол Улсын эдийн засгийн 4 бүс, Улаанбаатар хотоос тус бүр 450 өрхийг санамсаргүй байдлаар сонгож, тухайн өрхийн 5 хүртэлх насны хүүхэд, 15-49 насны хүмүүсийг хамруулах болно.

Манай судлаачид өрхийн хүнсний хэрэглээ, аж байдлын түвшин, бага насны хүүхэд, эмэгтэйчүүдийн хооллолт, аминдэм, эрдсийн бэлдмэлийн хэрэглээ, хүүхдийн эрүүл мэнд, өвчлөл, хүнсний бүтээгдэхүүний шошгийн талаар суулт асууж, ярилцах болно. Мөн танай өрхийн хэрэглэж байгаа давснаас дээж авч, иодоор баяжуулсан эсэхийг хурдавчилсан шалгуур ашиглан тодорхойлно. Түүнчлэн таны 5 хүртэлх насны хүүхэд (эсвэл ач/зээ), 15-49 насны хүмүүсийн биеийн жин, өндрийг хэмжиж, хуруун өндөгнөөс цусны дээж авч гемоглобины хэмжээг шууд тодорхойлон цус багадалттай эсэхийг хэлж өгнө. Үүний зэрэгцээ төмөр, А, Д аминдэмийн дуталтай эсэхийг илрүүлэх зорилгоор хураагуур судаснаас цусны дээж авна. Хоногт хоол хүнсээр авч буй давсны хэмжээг тодорхойлохын тулд танай өрхийн 15–49 насны хүмүүсээс шээсний дээж авч, шинжилгээ хийнэ.

Судалгаа Танай өрхөд ямар ашигтай вэ?
Та бүхэн үнэ төлбөргүйгээр бие махбодын хэмжилт, шинжилгээ хийлгэнэ. Бие махбодын хэмжилт, эмнэзүйн үзлэг, цусны шинжилгээний үр дүнгийн талаарх мэдээллийг тус төвийн эрдэм шинжилгээний ажилтнууд танд танилцуулах бөгөөд холбогдох зөвлөгөө өгнө. Та 5 хүртэлх насны хүүхдээ судалгаанд оролцуулбал, нарийн мэргэжлийн хүүхдийн эмч таны хүүхдийн биеийн жин, өндрийг хэмжиж, түүний бие махбодын өсөлт хөгжилт, хооллолтын байдлыг үнэлэхийн зэрэгцээ, Д аминдэм дутал буюу рахитын шинжийг илрүүлэх эмнэлзүйн үзлэг хийж, шаардлагатай зөвлөгөө өгнө. Мөн танай өрхийн 15-49 насны хүмүүс судалгаанд оролцсоноор биеийн жин, өндрөө хэмжүүлж, захын цусан дахь гемоглобины түвшинг тодорхойлох шинжилгээнд хамрагдах болно. Энэ нь тэдэнд биеийн жингээ хэвийн эсвэл хэвийн бус, цус багадалттай эсэхээ мэдэх, МУ-ын нийт хүн ам, ялангуяа хүүхэд, эмэгтэйчүүдийн хоол тэжээлийн байдал, эрүүл мэндийг дэмжих бодлого, үйл ажиллагааны төлөвлөлт, хэрэгжилтэд өөрийн хувь нэмрээ оруулах боломж олгоно.

Танай өрхийн гишүүд судалгаанд хэрхэн оролцох вэ?
Таны болон танай өрхийн бусад хүмүүст судалгаанд оролцох эсэхээ шийдэх хугацаа олгоно. Та энэ хугацаанд тодруулахыг хүссэн зүйлээ манай судлаачаас асуух боломжтой бөгөөд танай өрхийн бусад гишүүн, бага насны хүүхдээ судалгаанд оролцуулахаад шийдвэл, зөвшөөрлийн хуудас дээр гарын үсэг зурж, баталгаажуулсны эцэст судалгаанд оролцоно.

Та, танай өрхийн гишүүд ямар эрхтэй вэ?
Таны өгсөн мэдээллийн нууцыг бид чанд хадгалах бөгөөд хэн нэгэн хүнд ямар нэг байдлаар мэдээлэхгүй. Бид таны өгсөн мэдээллийг зөвхөн судалгааны ажлын зорилгоор ашиглана. Судалгааны аримт бичигт таны нэр, хаяг болон ажил мэргэжлийн талаар тодорхой мэдээлэл дурьдахгүй бөгөөд зөвхөн тусгай тоогоор илэрхийлсэн код таны мэдээллийг төлөөлөх болно. Цусны шинжилгээнд бага хэмжээний цус авах ба энэ үед бага зэргийн өвдөлт мэдрэгдэнэ. Цусны шинжилгээнд дээж авахдаа халдвараас сэргийлэх зорилгоор нэг даагийн хэрэглээний ариун зүү, хуруу шил ашиглах бөгөөд шинжилгээ авахын өмнө таниар зүүний бүтүүмжлэл, хэрэглэх хугацааг шалгуулна. Танаас болон танай өрхийн гишүүдээс авсан цусны дээжийг зөвхөн судалгаа шинжилгээний зорилгоор ашиглана. Та, танай өрхийн бусад гишүүд дараах эрхтэй.

- Асуулга судалгааны явцад өөрийн хүсээгүй асуултад хариулахгүй байх,
- Судалгаанд оролцохгүй байх, эсвэл судалгаагаар хийгдэх зарим үзлэг, шинжилгээнээс татгалзах,
- Судалгаанд оролцох зөвшөөрлөө судалгааны аль ч үед цуцлах,

Судалгаанд оролцохоос татгалзсанаар Танд болон танай өрхийн гишүүдэд эмнэлгийн тусламж, үйлчилгээ авахад ямар нэгэн саад бэрхшээл, дарамт, шахалт үзүүлэхгүй.

Хэрэв та судалгаатай холбоотой асуудлаар нэмэлт лавлагаа авахыг хүсвэл надтай, эсвэл НЭМХ-гийн холбогдох албан тушаалтан, уг судалгааны удирдагч болон зохицуулагчидтай шууд холбогдох боломжтой.
Холбогдох утас:

НЭМХ-гийн захирал, бичиг хэрэг – 45 86 45,
Хоол судлалын төвийн дарга, судалгааны удирдагч Ж. Батжаргал – 99137920,
Судалгааны зохицуулагчид Н. Болормаа – 99235574, Б. Энхтунгалаг – 99256225.

ЗӨВШӨӨРӨЛ

Би "Хүн амын хоол тэжээлийн байдал" үндэсний V судалгааны талаарх мэдээллийг бүрэн авч, уншиж танилцав.

15-49 насны эрэгтэй ..../ ..../

Танилцуулсан судлаач ..../../

Та судалгаанд оролцох бидний урилгыг хүлээн авч, судалгаанд оролцохыг зөвшөөрч эсвэл татгалзаж (зур) байгаа бол гарын үсгээ зурж, баталгаажуулна уу.

15-49 насны эрэгтэйн судалгаанд оролцохыг

Зөвшөөрсөн оролцогч ..../../

Татгалзсан оролцогч ..../.../

Appendix F - Questionnaire of Population-based survey

1. How do you describe the level of your responsibility for food/grocery shopping in your household?

    1. Play the main role
    2. Engage equally as the other members
    3. Engage less than the other members
    4. Not responsible for any of the food/grocery shopping

2. How much attention do you pay to keeping a healthy diet? (please select one)

    1. Pay very little or no attention 2. Pay some attention 3. Pay high attention

3. When you purchase a food product, do you look at the label information on the package?

    1. Never 2. Rarely 3. Sometimes 4. Often 5. Always

4. Why do you look for the labelling information? Does it relate to the following reasons?

Because any of the following health conditions does apply to you or any members of your household			
Heart disease	1. yes 2. no	Asthma	1. yes 2. no
Diabetes	1. yes 2. no	Liver, pancreas and gall bladder disease	1. yes 2. no
High blood pressure	1. yes 2. no	Digestive concerns such as coeliac disease, irritable bowel syndrome	1. yes 2. no
High cholesterol	1. yes 2. no 3. don't know	Food allergies	1. yes 2. no
Because any of the following conditions does apply to you or any members of your household			
Pregnancy or breast feeding	1. yes 2. no	Religious/ethical beliefs that influence dietary choices	1. yes 2. no
On a specific diet	1. yes 2. no	Having children under 16 years old	1. yes 2. no
Vegetarian/vegan	1. yes 2. no	Watching my health/others' health generally	1. yes 2. no
Training for sports	1. yes 2. no	Watching my weight/others' weight generally	1. yes 2. no

5. Do you usually look for this specific information on the label?

Nutrition Information Panel	1. yes 2. no 3. sometimes	***Ingredient List***	1. yes 2. no 3. sometimes
Fat	1. yes 2. no 3. sometimes	Additives (e.g. colours and preservatives)	1. yes 2. no 3. sometimes
Saturated fat	1. yes 2. no 3. sometimes	Information about allergens	1. yes 2. no 3. sometimes
Trans-fat	1. yes 2. no 3. sometimes	***Other Elements***	1. yes 2. no 3. sometimes
Protein	1. yes 2. no 3. sometimes	The best before/sell by date	1. yes 2. no 3. sometimes
Carbohydrates	1. yes 2. no 3. sometimes	Country of origin	1. yes 2. no 3. sometimes
Calories	1. yes 2. no 3. sometimes	Cooking/Storage instructions	1. yes 2. no 3. sometimes

Sugar	1. yes 2. no 3. sometimes	Name of manufacturer	1. yes 2. no 3. sometimes
Salt (sodium)	1. yes 2. no 3. sometimes	Whether the product is of Genetically Modified/non-Genetically Modified origin	1. yes 2. no 3. sometimes
Fibre	1. yes 2. no 3. sometimes	Claims about the nutrient content and health benefit of a food, such as 'low fat' or 'high in fibre', 'no sugar' or 'calcium is good for healthy bones'	1. yes 2. no 3. sometimes
Vitamins and/or minerals	1. yes 2. no 3. sometimes	Other (specify …………………………)	1. yes 2. no 3. sometimes
Serving size	1. yes 2. no 3. sometimes		
%RDI (% recommended dietary intake)	1. yes 2. no 3. sometimes		

6. Please rank the following in order of which information you refer to most. (1 = information most frequently referred to; & 4 = information least frequently referred to)
Nutrition Information Panel……… Ingredient List........The best before/sell by date........ Country of origin.......

7. With regard to food labels, on a scale of 1 to 5, where 1 is "strongly disagree", 2 is "disagree", 3 is "neutral", 4 is "agree" and 5 is "strongly agree", please tell me how strongly you agree or disagree with each statement.

I find information on food labels really useful or important	**1 2 3 4 5**
I don't have enough time to read food labels when I'm shopping	**1 2 3 4 5**
I'm satisfied with the amount of information provided on food labels	**1 2 3 4 5**
I find that information on food labels is easy to read /**Here it refers only for reading. A question referring to understanding follows./**	**1 2 3 4 5**
I only refer to a food label when buying products for the first time	**1 2 3 4 5**
It's easy to understand and use the information on food labels	**1 2 3 4 5**
It's difficult to understand the information on food labels because it is written in a foreign language	**1 2 3 4 5**
It's difficult to understand the information on food labels because it has unclear terms, symbols and numbers.	**1 2 3 4 5**

It's difficult to read the information on food labels because it is written very small format.	**1 2 3 4 5**
When I read the labels on food products, I focus on one or two key things, such as the levels of fat or if there are preservatives or best before date.	**1 2 3 4 5**
I often refer to nutrition facts information (**calorie, fat, protein, carbohydrates, sugar and salt, etc**.)	**1 2 3 4 5**
I'm very interested in food label information	**1 2 3 4 5**
It's difficult to understand the information on food labels written in English.	**1 2 3 4 5**
It's difficult to understand the information on food labels written in Russian.	

8. What of the following considerations is your top priority in choosing food? (please rank each with a scale of 1 to 6, where 1 is "highest priority" and 6 is "lowest priority")
Price ..... Quality..... Taste..... Safety (best before date, additive content, etc.)..... Country of origin..... Nutrition information (fat or sugar content, etc.).....

9. Do you usually make a purchase decision based on the information provided on food labels?
1. Never 2. Rarely 3. Sometimes 4. Often 5. Always
if you have answered 'often' or 'always', please state what information you use
……
10. Of the following two food products A and B, which one is healthier?

1. Product A is healthier than product B 2. They are the same
3. Product B is healthier than product A 4. Can't tell.

Product A		**Product B**	
Nutrition Information		Nutrition Information	
	In 100 g		In 100 g
Fat	15,0 г	Fat	24,0 g
Saturated fat	5,0 г	Saturated fat	5,8 g
Sugar	2,8 г	Sugar	2,8 g
Sodium	2,0 г	Sodium	2,0 g
Calorie	362 kcal	Calorie	436 кcal

Appendix G - Supermarket intercept survey- Participant information sheet

UNIVERSITY
OF WOLLONGONG
AUSTRALIA

PARTICIPANT INFORMATION SHEET FOR PARTICIPANTS OF IN-RETAIL INTERCEPT SURVEY

TITLE OF THE RESEARCH: *Food labelling in Mongolia: Consumer perspectives*

PURPOSE OF THE RESEARCH

This study is conducted by researchers of the University of Wollongong, Australia and National Centre of Public Health, Mongolia. The study is being led by Nyamragchaa Chimedtseren under supervision of Dr Kelly, Professor Yeatman and Dr Jamiyan. Nyamragchaa is a PhD student of the University of Wollongong and also a researcher at the National Centre for Public Health, Mongolia.

This study is examining how consumers use food labels and how this may influence their food purchase decisions. We would like to invite you to participate in our study. The study aims to interview shoppers about how they choose the food to buy and what influences their purchase decisions, their perspectives on food labelling and to clarify on how much they use food labels and how food labels are important for them in making food choices and their purchase decisions, challenges they have regarding food label use and what are their needs and demands in this regard.

- In the interview, we will ask you about your ways of using food labels, including: How often you read food labels and whether you make purchase decisions based on food label information?
- Any difficulties that you face in using food labels
- What you would like to change or improve about food labels?

By doing this study, we want to find out ways to improve the current food labelling policy and regulations and food labels to make them better support consumers in making informed food choices. You are being invited to take part in this survey because we are interviewing shoppers in this supermarket on random basis and you are randomly selected in the survey.

VOLUNTARY PARTICIPATION, CONFIDENTIALITY AND PRIVACY

Your involvement in the study is voluntary. It is your choice whether to participate or not. You may withdraw your participation from the study at any point during the interview. However, as the interviews are anonymous, you will not be able to withdraw your data at a later time. Declining to participate in the study will not affect your shopping in this supermarket or somewhere else or your relationship with the University of Wollongong or National Centre for Public Health or the researcher.

The questionnaire is anonymous and your name will not be asked in the questionnaire. Only an identification number will represent your information in the questionnaire and further analysis and reporting stages.

Your participation in this study will be confidential. The information you provided including your personal information including age, education and income will not be shared or given to anyone outside of the research team. The information that we collect for this research project will be used only for research purposes. The information we collect will be incorporated into Nyamragchaa Chimedtseren' PhD thesis. The research team also plans to publish an article in an academic journal based on the interviews.

Any collected data will be stored securely by the research team in a locked filing cabinet or in password-protected files for electronic information.

We will store the data from this project for a minimum of five years after the publication of our results. If you would like to access your information at any point during the project, including after publication, you may contact the researchers.

POSSIBLE RISKS, INCONVENIENCES AND DISCOMFORTS

As this research is considered to be 'low risk', there are minimal ethical considerations. To minimise the time required to participate in the survey, interviews will be kept brief and will be completed in 15 minutes.

WHAT WE WOULD LIKE YOU TO DO

1. If you accept to participate in the survey, we will ask you to give your consent for the study by signing a consent form.
2. We would like you to take part in the survey by answering a questionnaire regarding your experiences of using food labels. The interview will last less than 15 minutes.
3. We would like to take photos and record details of products that you purchased.

FUNDING AND BENEFITS OF THE RESEARCH

The research is funded by the HDR student research funding scheme of the University of Wollongong and the research data will be owned by the University of Wollongong. There will no direct benefit to you, but your participation likely to help us find out more about how to improve the current policy and regulations and seek ways to support consumers to make informed food choices and thus consumers are prevented from the risks of unhealthy diet and obesity.

REIMBURSEMENTS

You will not be provided any incentive to take part in the study. However, we will give you 2000 MNT for your time.

ETHICS REVIEW AND COMPLAINTS

This study has been reviewed by the Human Research Ethics Committee (Social Science, Humanities and Behavioural Science) of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UoW Ethics Officer on (02) 4221 3386 or email rso-ethics@uow.edu.au.

If you wish to ask any questions, you can ask them now or later by contacting to any of the following researchers of the research team.

The contact details for the research team are:

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Dr Batjargal JamiyanHead of School of
Head of Department of Food and Nutrition
Research, National Centre of Public Health

Thank you for your interest in this study.

Participant Information Sheet V5 05062018

Appendix H - Supermarket intercept survey- Letter to supermarket administration

University of Wollongong

Date

Nyamragchaa Chimedtseren
School of Health and Society
Faculty of Social Sciences
University of Wollongong
Australia
NSW 2522

To: Administration of the supermarket chain 'Minii delguur'

Re: Conducting in-retail intercept survey on the use of food labels by shoppers

Dear Sir/Madam,

My name is Nyamragchaa Chimedtseren and I am a PhD student at the School of Health and Society, University of Wollongong.

This is a formal letter to kindly ask you to collaborate in the research study involving interviews of shoppers who are shopping in grocery stores of your supermarket chain.

The aim of the study is to explore consumers' perspectives on food labelling; the use of food label information by consumers and its impact on their purchases; and consumers' needs and demands in this regard.

Interviews of shoppers will be conducted by trained researchers of the National Centre of Public Health, Mongolia and will be held during 3 days in each supermarket, during specified morning and afternoon hours. We are planning to organize the survey across 4 supermarkets located in different areas.

The upmost attention will be paid in organising the survey in a manner that will minimize any disturbance to the business routine and during the survey and only two researchers will be present in the supermarket to do interviews. They will stand at a place in the store that is convenient to the store management (e.g. at the exit).

We would like to ask you to collaborate in our survey and provide your permission to conduct interviews in the chain stores and provide a necessary support by organising the stores as the survey sites.

By doing this study, we want to find out ways to improve the current food labelling policy and regulations of our country so that to make them to better support consumers in making informed food choices. Your collaboration and support in the survey are highly appreciated.

In addition, the survey will follow necessary ethical requirements and the specific names and locations of the chain stores covered in the study will be confidential and will not be mentioned in any of the research publications.

Letter to supermarket administration V1 28082017

Appendix I - Supermarket intercept survey- Letter of approval from supermarket administration

a) Letter from the administration of My Store supermarket chain

МИНИЙ франчайзинг

"МИНИЙ ФРАНЧАЙЗИНГ" ХХК

2017-10-25 № 3/31

танай Wollongong -ны

Зөвшөөрөл олгох тухай

Нийгмийн Эрүүл Мэндийн Үндэсний Төвийн Хоол Судлалын Алба болон Wollongong-ны Их Сургуулийн докторант Ч.Нямрагчаа нарт

"Миний дэлгүүр" хүнсний сүлжээ дэлгүүрийн худалдан авагчдын дунд хүнсний шошгийн хэрэглээний судалгаа явуулах зөвшөөрөл олгох тухай

Wollongong-ны Их Сургуулийн докторант Ч.Нямрагчаа болон Нийгмийн Эрүүл Мэндийн Үндэсний Төвийн Хоол Судлалын Албанаас манай компанид ирүүлсэн 2017 оны 10 сарын 23-ны өдрийн албан захидалтай танилцаад хариу хүргүүлж байна.

Бид "Миний дэлгүүр" хүнсний сүлжээний салбар дэлгүүрүүдэд хэрэглэгчийн хүнсний шошгийн судалгаа хийх хүсэлтийг хүлээн авч судалгааны талаарх мэдээлэлтэй танилцсаны үндсэн дээр уг судалгааг өөрийн салбар сүлжээ дэлгүүрүүдэд явуулах зөвшөөрөл олгохоор шийдвэрлэснийг мэдэгдэж байна.

Уг судалгааг УБ хотод байршилтай сонгогдсон 4 салбар сүлжээ дэлгүүрүүдэд 2018 оны 3 сард (нийт 12 өдөр), туршилт судалгааг 2017 оны 11 сард (нийт 2 өдөр) багтаан албан бичигт дурьдсан аргачлалын дагуу хийх зөвшөөрлийг олгож байна.

Бид судалгаа явуулах сүлжээ дэлгүүрүүдэд судалгаа явагдах хугацаа, судалгааны явцад хийгдэх үйл ажиллагааны талаар холбогдох мэдээллийг урьдчилан мэдэгдэж судалгааг ая болох саадгүй явуулах нөхцөл боломжоор хангах эрх хэмжээ авна.

Та бүхний судалгааны ажилд амжилт хүсье.

/Н.Отгонбат/

b) Letter from the administration of My Store supermarket chain (English translation)

MINII FRANCHAISING Co.LtD

Ulaanbaatar, Bayanzurkh district
Khoroolol # 13, Narnii road, Minii hypermarket
Tel: 976-75756061 Fax: 976-75756062
http: www.minii-suljee.mn

To: DEPARTMENT OF FOOD AND NUTRITION RESEARCH OF NATIONAL CENTRE OF PUBLIC HEALTH AND CH.NYAMRAGCHAA, PhD STUDENT OF UNIVERSITY OF WOLLONGONG

Date: 25.10.2017 #3/31

Re: Providing approval for the survey

We are introduced with the letter received from Ch.Nyamragchaa, PhD student of University of Wollongong and Department of Food and Nutrition Research dated on 23 November and providing a reply herewith.

This is to acknowledge that we are accepting the request for conducting the consumer survey on food labeling in chain stores of the supermarket chain 'Minii' and to inform that we are providing approval for the survey to be conducted in our stores.

We are accepting that the survey will be conducted in 4 selected chain stores located in Ulaanbaatar in March 2018 (during 12 days) and the pilot study in November 2017 (during 2 days).

In order to facilitate the survey, we will inform the stores in advance regarding timing of the survey and activities to be carried out.

Wish all the best for your survey.

Sincerely,

N.Otgonbat

Acting Director

Appendix J - Supermarket intercept survey - Participant consent form

UNIVERSITY OF WOLLONGONG AUSTRALIA

CONSENT FORM FOR PARTICIPANTS OF IN-RETAIL INTERCEPT SURVEY

RESEARCH TITLE: *Food labelling in Mongolia: Consumer perspectives*

RESEARCHERS: Mrs Nyamragchaa Chimedtseren, Dr Bridget Kelly Gillot, Professor Heather Yeatman & Dr Batjargal Jamiyan

I have been given information about the research project ***"Food labelling in Mongolia: Consumer perspectives"***. I have had the opportunity to discuss the project with the researcher of a research team and to ask any questions.

I understand that my participation in this research is voluntary and I am free to withdraw from the research at any time prior to the end of the interview. My non-participation or withdrawal of consent will not affect my relationship with the University of Wollongong or the National Centre for Public Health or the research team.

I understand that the data collected from my participation will be used in Nyamragchaa Chimedtseren's PhD thesis and may be used in academic journal publications and presentations.

I understand that if I have any enquiries about the research I can contact Mrs Nyamragchaa Chimedtseren via nc974@uowmail.edu.au or Dr Batjargal Jamiyan on 976-455600. I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on (02) 4221 3386 or email rso-ethics@uow.edu.au.

I consent voluntarily to be a participant in this study and consent to:

Participating in an interview for approximately 15 minutes	**Yes** ☐	**No** ☐
Photo of the food products that I purchased is taken	**Yes** ☐	**No** ☐

Name of the participant (please print)

....

Signature Date (day/month/year)

..../....../......

Name of the researcher taking the consent (please print)

....

Signature Date (day/month/year)

..../.. ..../......

Consent form V5 05062018

Appendix K - Questionnaire of Supermarket intercept survey

Opening commentary- Hello, my name is ………….. I am a researcher of Public Health Institute. We are conducting a survey about how people choose food products to buy when they are shopping in supermarkets. I would like to invite you to take part in this survey and to talk to me about your experience in this regard. The interview will take about **15** minutes. Participation in the survey is on voluntary basis and you can choose not participate in it, as well as all the information we obtain will remain strictly confidential and anonymous. You can make your decision after introducing with this survey information sheet (The sheet will be handed to the participant).		
General information		
District ______________________ Khoroo_____________________________ Supermarket name: _________________ Location: ________________________________ Date of interview (year/month/day): 2018/_____/______ Day of week: __________________Time of interview: _____am/pm Code of interviewer: _______		
N	Question	Answer
Demographics		
1	In what age range are you?	18-30 years old -1 31-40 years old -2 41-50 years old -3 51-60 years old -4 >61 years old -5
2	Gender	Male – 1 Female - 2
3	What is your education?	No education - 1 Incomplete primary - 2 Primary - 3 Incomplete secondary - 4 Secondary - 5 College/vocational training - 6 University - 7 Postgraduate - 8
4	What is your employment status?	Government worker – 1 NGO worker – 2 Employed in private sector – 3 Student – 4 Herdsman – 5 Unemployed – 6 Pensioner – 7 On medical care – 8
5	Do you have at least one child under 16 years old?	Yes – 1 No – 2
Food label use		
6	What is your level of responsibility for food/grocery shopping in your household?	Play the main role - 1 Engage equally - 2 Engage less than half of the time - 3
Now I would like to talk about the products that you selected to purchase. Can we please talk about this product first (the researcher will select one random product)? Can I please record some details of this product first?		
7	Product name:	

8	Product category	Milk & dairy products -1 Meat & meat products -2 Cereal -3 Processed vegetables & fruit -4 Candies & sweets -5 Snacks -6 Ready to eat meals -7 Beverages -8 Oil & fat -9 Seasonings -10 Other - 11	
9	Product type: (*Refer to Table 1 and write down the name of product type, e.g. imported cheese*)		
10	Have you had bought this product before?	Yes, I had bought it before – 1 No, I bought it for the first time – 2	
11	11.1 What is the main reason you selected this product? (circle one)	11.2 Are there any other reasons? (circle as many as apply)	
	Tastes good – 1 Domestic product – 2 Product appearance & freshness – 3 Product is not expired – 4 Brand/manufacturer – 5 Accustomed product - 6 Produced country – 7 Ingredients – 8 Nutritional quality - 9 Product quality – 10 Product safety – 11 Health concern/health effects – 12 Product price - 13 Other – 14 Specify:…………………………………………..	Tastes good – 1 Domestic product – 2 Product appearance & freshness – 3 Product is not expired – 4 Brand/manufacturer – 5 Accustomed product - 6 Produced country – 7 Ingredients – 8 Nutritional quality - 9 Product quality – 10 Product safety – 11 Health concern/health effects – 12 Product price - 13 Other – 14 Specify: …………………………………………………………………	
12	Did you look at the label information for this product when you were choosing it?	Yes -1	12.1 Which label information did you look at? Can you please show me where you saw this on the label? 1.____________________: ______ 2.____________________: ______ 3.____________________: ______ 4.____________________: ______ 5.____________________: ______ 6.____________________: ______ Correctly located on the label - 1 Incorrectly/couldn't locate - 2
		No -2	12.2 Why didn't you look at the label information? Purchased the product before-1 Don't care about label information-2 Other -3 Specify: ……………………………………………
13		Never – 1	

<table>
<tr><td></td><td>How often do you look at the label information when you purchase …………. (the name of a category of the chosen product, i.e. dairy products)?</td><td>Rarely – 2
Sometimes – 3
Often – 4
Always – 5</td><td>13.1 What specific label information do you usually look at most for this particular category of products?

Best before/expire dates -1
Manufacturer/brand -2
Produced country – 3
Ingredients – 4
Nutritional information – 5
Weight -6
Health effect – 7
Cooking/storage instructions – 8
Allergens – 9
Food additives - 10
Other – 11
Specify: ……………………………………………..</td></tr>
<tr><td colspan="4">What other products did you buy? Can we please talk a bit more about a few of them? (the researcher will choose again two more products (1 core and 1 non-core product) from the shopper's bucket and record the details and ask the same questions)</td></tr>
<tr><td colspan="4">Product 2</td></tr>
<tr><td>14</td><td>Product name:</td><td colspan="2"></td></tr>
<tr><td>15</td><td>Product category</td><td colspan="2">Milk & dairy products -1
Meat & meat products -2
Cereal -3
Processed vegetables & fruit -4
Candies & sweets -5
Snacks -6
Ready to eat meals -7
Beverages -8
Oil & fat -9
Seasonings -10
Other - 11</td></tr>
<tr><td>16</td><td>Product type: (Refer to Table 1)</td><td colspan="2"></td></tr>
<tr><td>17</td><td>Have you had bought this product before?</td><td colspan="2">Yes – 1
No - 2</td></tr>
<tr><td rowspan="2">18</td><td rowspan="2">Did you look at the label information of this product when you were choosing it?</td><td>Yes -1</td><td>18.1 Which label information did you look at? Can you please show me where you saw this on the label?
1.____________________: ______
2.____________________: ______
3.____________________: ______
4.____________________: ______
5.____________________: ______
6.____________________: ______

Correctly located on the label - 1
Incorrectly/couldn't locate - 2</td></tr>
<tr><td>No -2</td><td>18.2 Why didn't you look at the label information?

Purchased the product before -1
Don't care about label information -2
Other -3
Specify: ……………………………………………….</td></tr>
<tr><td>19</td><td></td><td>Never – 1</td><td></td></tr>
</table>

	How often do you look at the label information when you purchase (…………………………….) this category of food products?	Rarely – 2 Sometimes – 3 Often – 4 Always – 5	19.1 What specific label information do you usually look at most for this particular category of products? Best before/expire dates -1 Manufacturer/brand -2 Produced country – 3 Ingredients – 4 Nutritional information – 5 Weight -6 Health effect – 7 Cooking/storage instructions – 8 Allergens – 9 Food additives - 10 Other – 11 Specify: ………………………………………………..
Product 3			
20	Product name:		
21	Product category	Milk & dairy products -1 Meat & meat products -2 Cereal -3 Processed vegetables & fruit -4 Candies & sweets -5 Snacks -6 Ready to eat meals -7 Beverages -8 Oil & fat -9 Seasonings -10 Other - 11	
22	Product type: (*Refer to Table 1)*		
23	Have you had bought this product before?	Yes – 1 No - 2	
24	Did you look at the label information of this product when you were choosing it?	Yes -1	24.1 Which label information did you look at? Can you please show me where you saw this on the label? 1.____________________: ______ 2.____________________: ______ 3.____________________: ______ 4.____________________: ______ 5.____________________: ______ 6.____________________: ______ Correctly located on the label - 1 Incorrectly/couldn't locate - 2
		No -2	24.2 Why didn't you look at the label information? Purchased the product before -1 Don't care about label information -2 Other -3 Specify: ……………………………………………….
25		Never – 1	

	How often do you look at the label information when you purchase (……………………………) this category of food products?	Rarely – 2 Sometimes – 3 Often – 4 Always – 5	25.1 What specific label information do you usually look at most for this particular category of products? Best before/expire dates -1 Manufacturer/brand -2 Produced country – 3 Ingredients – 4 Nutritional information – 5 Weight -6 Health effect – 7 Cooking/storage instructions – 8 Allergens – 9 Food additives - 10 Other – 11 Specify: ………………………………………………..

We have talked about these 3 particular products. Now I would like to talk about how much, in general, you use food labels when purchasing food products?			
26	In general, do you usually read label information when you choose foods to buy?	Never – 1	
		Rarely – 2 Sometimes – 3 Often – 4 Always – 5	26.1 What information on label do you usually read? Best before/expire date -1 Manufacturer/brand -2 Produced country – 3 Ingredients – 4 Nutrition information – 5 Weight -6 Health effect – 7 Cooking/storage instructions–8 Allergens – 9 Food additives - 10 Other – 11 Specify: ……………………………………………………………….
27	Do you usually read nutrition information (pointing out on the nutrition information on the label) on label?	Never – 1 Rarely – 2	27.1 What are the reasons? Don't know/unaware about label information – 1 Don't know/unaware about nutrition label – 2 Just rely on familiar product/manufacturer – 3 Not interested/don't pay attention on it - 4 Don't need it/don't consider it useful/ – 5 Can't make use of it as don't understand - 6 Can't read as it is in foreign language – 7 Other - 8 Specify:……………………………………………………………….
		Sometimes – 3 Often – 4 Always – 5	27.2 What nutrition information do you read? Energy - 1 Carbohydrate - 5 Fat - 2 Sugar – 6 Saturated fat - 3 Salt - 7 Trans-fat - 4 Vitamin &minerals– 8 Other –9 ………………………………………………

28	Do you have any difficulties and challenges in using food labels?	Yes -1	28.1 What difficulties do you have? Difficult to understand foreign language labels – 1 Unreliable label information – 2 Lack of awareness on label information – 3 Difficulty in understanding of label information – 4 Difficult to read labels due to small font, obscured or hidden – 5 Other - 6 Specify:…………………………………………………………………..
		No -2	
29	Which of the following, if any, are **a** priority for you when purchasing food products? (choose a max of 5)	Expiry date – 1 Price – 2 Produced country – 3 Manufacturer/Brand – 4 Quality – 5 Product appearance & freshness – 6 Taste – 7 Health effect – 8 Nutrition information – 9 Product safety – 10 Other – 11 Specify: ……………………………………………………………….	
30	What could be done to help you to make use of information on food labels?	Awareness raising on labels and nutrition through mass media – 1 Awareness raising campaigns – 2 Labels written in Mongolian – 3 Other – 4 Specify:……………………………………………………………………………………..	
31	What would you like to improve or change about food labels? Is there any other information that you would like to have on food labels?	Written in Mongolian – 1 Legible to read (big font & distinct) – 2 Clear produced & expire dates – 3 Easy to interpret (illustrations, in front of package, short & clear) – 4 Indication of nutrients levels (low or high fat etc.) – 5 Information on health effects - 6 Aisle information for unpackaged products, inc. origin & expire date – 7 Manufacturer & distributer contact information -8 Other - 9 Specify:……………………………………………………………………………………..	
Just so we can ensure that we have a good cross-section of participants, may I ask about your household income?			
32	What is your household monthly average income?	>1,000,001 MNT 801,000-1,000,000 MNT 581,000-800,000 MNT 361,000-580,000 MNT <360,000 MNT	

Thank you very much for your participation.

Appendix L - Key informant interview - Participant information sheet

University of Wollongong

PARTICIPANT INFORMATION SHEET FOR PARTICIPANTS OF KEY INFORMANT INTERVIEW

TITLE OF THE RESEARCH: *Food labelling in Mongolia: Consumer perspectives*

PURPOSE OF THE RESEARCH

This is an invitation to participate in a study conducted by researchers of the University of Wollongong, Australia and National Centre for Public Health, Mongolia. The study is being conducted by Nyamragchaa Chimedtseren, under supervision of Dr Kelly and Professor Yeatman.

This study aims to interview governmental officials, civil servants and representatives of food producers and consumer organisations, working in key governmental and non-governmental organisations to find out about the current food labelling policy and regulations and its implementation and to what extent the existing policy and regulations align with consumers' needs and demands.

We wish to speak with key officials who are engaged in the development and implementation of food and nutrition policies, to seek their views and opinions on food labelling policy and regulations.

WHAT WE WOULD LIKE YOU TO DO

As part of this research, we would like you to take part in a single one-to-one interview. Interviews will be conducted in person in a private room. Interviews will be audio taped, with your consent, and will last approximately 30-45 minutes. The interview will include questions regarding the following:

1. Your understanding of food labelling policy and regulations;
2. Your opinion on the implementation of the policy and regulations and barriers encountered in the implementation;
3. Your opinion on the effectiveness of these policy and regulations in supporting consumers in making informed food choices and the extent to which they meet consumers' needs and demands;
4. The process of setting of the food labelling policy and regulations and the extent of consumers' engagement in the process; and
5. What, if any, improvements you believe could be made to the current policy and regulations.

POSSIBLE RISKS, INCONVENIENCES AND DISCOMFORTS

As this research is considered to be 'low risk', there are minimal ethical considerations. To minimise the inconvenience related to time and travel, interviews will be held in places convenient for you on a suitable day and time to you.

VOLUNTARY PARTICIPATION, CONFIDENTIALITY AND PRIVACY

Your involvement in the study is voluntary. You may withdraw your participation from the study at any point prior to our results being published, and withdraw any data that you have provided. Declining to participate in the study will not affect your relationship with the University of Wollongong or National Centre for Public Health. You are also able to request a copy of your interview transcript.

Your participation in this study will be confidential. The information you provided will not be shared or given to anyone outside of the research team. The information that we collect from this research project will be used only for the research purposes stated in this information sheet. Any information about you including your name, position and contact information will not be mentioned in the research publications or in the thesis, instead, only an identification number given to your will represent your information.

Any interview recordings, transcripts or other data will be stored securely by the research team in a locked filing cabinet or in password-protected files for electronic information.

We will store the data from this project for a minimum of five years after the publication of our results. If you would like to access your information at any point during the project, including after publication, you may contact the researchers.

FUNDING AND BENEFITS OF THE RESEARCH

The research is funded by the HDR student research funding scheme of the University of Wollongong. This research will be part of the PhD studies of Nyamragchaa Chimedtseren. The information we collect from your interview will incorporated into Nyamragchaa Chimedtseren' PhD thesis. The research team also plans to publish a paper in an academic journal based on the interviews.

This research serves as an important case study to explore the gaps in the current policy and regulations and seek ways to support consumers to make informed food choices thus to be prevented from the risks of unhealthy diet and obesity. We hope that the data collected in this study will be used as a basis for the improvement of food labelling policies and regulations.

REIMBURSEMENTS

You will not be provided any incentive to take part in the study. However, we will give you 10000 MNT for your time.

ETHICS REVIEW AND COMPLAINTS

This study has been reviewed by the Human Research Ethics Committee (Social Science, Humanities and Behavioural Science) of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UoW Ethics Officer on (02) 4221 3386 or email rso-ethics@uow.edu.au.

If you wish to ask any questions, you can contact to any of the following researchers of the research team.

The contact details for the research team are:

Mrs Nyamragchaa Chimedtseren
PhD Candidate, School of Health and Society
University of Wollongong
nc974@uowmail.edu.au

Dr Bridget Kelly Gillot
Lecturer of School of Health and Society
University of Wollongong
bkelly@uow.edu.au
+61 2 4221 3893

Professor Heather Yeatman
University of Wollongong
hyeatman@uow.edu.au
+61 2 4221 4038

Head of School of Health and Society

Thank you for your interest in this study.

Appendix M - Key informant interview – Participant consent form

University of Wollongong

CONSENT FORM FOR PARTICIPANTS OF KEY INFORMANT INTERVIEW

RESEARCH TITLE: *Food labelling in Mongolia: Consumer perspectives*

RESEARCHERS: Mrs Nyamragchaa Chimedtseren, Dr Bridget Kelly Gillot & Professor Heather Yeatman

I have been given information about the research project ***"Food labelling in Mongolia: Consumer perspectives"***. I have had the opportunity to discuss the project with the researcher of a research team and to ask any questions.

I understand that my participation in this research is voluntary and I am free to withdraw from the research at any time prior to the publication of the results of the study. My non-participation or withdrawal of consent will not affect my relationship with the University of Wollongong or the National Centre for Public Health or the research team.

I understand that the data collected from my participation will be used in Nyamragchaa Chimedtseren's PhD thesis and may be used in several academic journal publications and presentations.

I understand that if I have any enquiries about the research I can contact Mrs Nyamragchaa Chimedtseren via nc974@uowmail.edu.au. I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, Office of Research, University of Wollongong on (02) 4221 3386 or email rso-ethics@uow.edu.au.

I consent voluntarily to be a participant in this study and consent to:

Participating in an interview for approximately 45 minutes	**Yes** ☐	**No** ☐
My interview being audio recorded	**Yes** ☐	**No** ☐
I would like a copy of my interview transcript	**Yes** ☐	**No** ☐

Name of the participant (please print) Date

..../....../......

Signature

....

Name of the researcher taking the consent (please print) Date

..../....../......

Signature

....

Consent form V1 28082017

Appendix N - Key informant interview guide

Opening commentary- I would like to hear your thoughts on food labelling policy and regulations in Mongolia. I am interested in how this policy was developed and what have influenced the introduction of this policy and what was the participation consumers in the development and implementation of the policy. Also I would like to know your opinions regarding the effectiveness of the policy itself and its implementation. There are no right and wrong answers.

Question 1: In relation to policy/ies (XX) for which your section has responsibility, can you please describe the role of this policy in food labelling regulation / policy matters?
Question 2: Can you please describe for me how this policy was developed and what were the key drivers for developing such a regulation / policy?
Prompts:

- Can you please tell me more about the key people involved? Or key policy objectives that you were trying to achieve?
- Can you please tell me about key external factors / activities that influenced the development of this policy (e.g. new Codex regulation, key trade partnership agreement, etc.)

Question 3: In some countries, governments have been influenced by consumers or the public health communities to design food label information in particular ways. Can you please tell me about how the needs of consumers or of public health have influenced the food labelling regulation / policy processes or decisions?
Prompt:

- Can you please tell me the ways that consumers were consulted on the policy during its development? If not, why not?

Question 4: In your opinion, how effective the implementation of this policy in practice? What are the barriers in its effective implementation?
Prompts:

- What are the weaknesses and gaps in the policy?
- Obstacles faced in its implementation?
  - Implementation by food industries in practice?
  - Monitoring and evaluation?
  - Barriers from consumer side?

Question 5: How do you think that consumers make of use food label information in practice? In your opinion, how helpful is the food labelling policy in assisting consumers to use food labels?
Prompts:

- Using food labels by consumers to assess food safety, comparing products or judging about nutritional quality of a product

Question 6: What actions should be undertaken in order to enable consumers make informed food choices by using food labels?
Prompts:

- Policy changes?
- Consumer education?
- Improving of labelling practices?

Appendix O - Letter to Mongolian University of Science & Technology and Mongolian University of Medical Sciences for approval to engage students

a) Letter to Mongolian University of Science & Technology

University of Wollongong

2017.10.01

Nyamragchaa Chimedtseren
School of Health and Society
Faculty of Social Sciences
University of Wollongong
Australia
NSW 2522

To: Head of the Biotechnology and Nutrition Branch of the School of Industrial Technology of the Mongolian Science and Technology University

Re: Requesting collaboration in a food label survey

Dear Professor S. Delgermaa,

My name is Nyamragchaa Chimedtseren and I am a PhD student at the School of Health and Society, University of Wollongong.

This is a formal letter to ask you to collaborate in a survey that reviews the labels of food products available at marketplaces in Mongolia.

The aim of the study is to review the content and scope of label information and their consistency with the food labelling policy and regulation, as well as with consumer needs and demands.

We are planning to use a crowdsourcing method for data collection, therefore, would like to involve undergraduate students studying nutrition science in your school in the collection of food label information. Detailed instructions on the procedure will be given by the researcher.

In this regard, we would like to kindly ask you to help us by organising the necessary arrangements for the involvement of your students in our survey which includes identifying classes when the researcher can meet the students and give the instructions and helping to collect back the forms filled by the students.

By doing this survey, we want to find out ways to improve the current food labelling policy and regulations of our country, with the aim to better support consumers in making informed food choices. Your collaboration and support in the survey are highly appreciated and it will contribute to the promotion of healthy diets and improvement of health of the population.

Thank you for your collaboration and support in this study.

Yours sincerely,

Nyamragchaa Chimedtseren
PhD student and a researcher of the research team
University of Wollongong
E-mail: nc974@uowmail.edu.au
Phone: +61 4 9022 2552

Letter to Mongolian Science and Technology University V1 28082017

b) Letter to Mongolian University of Science & Technology (Mongolian translation)

University of Wollongong

2017.10.01

Чимэдцэрэн овогтой Нямрагчаа
Эрүүл мэнд, нийгмийн сургууль
Нийгмийн шинжлэх ухааны Тэнхим
Wollongong-ны Их сургууль, Австрали улс
NSW 2522

ШИНЖЛЭХ УХААН ТЕХНОЛОГИЙН ИХ СУРГУУЛИЙН ҮЙЛДВЭРЛЭЛ ТЕХНОЛОГИЙН СУРГУУЛИЙН ШИМ СУДЛАЛ БИОТЕХНОЛОГИЙН САЛБАРЫН УДИРДЛАГАД

Хүнсний шошгийн мэдээлэл цуглуулах судалгаа явуулахад дэмжлэг хүсэх тухай

Хүндэт Профессор С.Дэлгэрмаа танаа,

Намайг Чимэдцэрэнгийн Нямрагчаа гэдэг. Би Австрали улсын Wollongong-ны Их Сургуулийн докторын сургалтанд 2016 оноос элсэн суралцаж байгаа ба хүнсний шошгийн талаарх хэрэглэгчдийн мэдлэг хандлага, шошго хэрэглэх даддын чиглэлээр судалгааны ажил хийж байгаа юм.

Би энэхүү судалгааны ажлын хүрээнд манай улсад хүнсний худалдаанд байгаа хүнсний бүтээгдэхүүний шошгололтын байдал, шошгийн мэдээлэлд үнэлгээ хийх судалгааны ажлыг хийхээр төлөвлөөд байгаа ба та бүхнийг бидний судалгаанд дэмжлэг үзүүлэхийг хүсэж энэхүү албан захидлыг хүргүүлж байна.

Энэхүү судалгааны ажил нь хүнсний худалдаанд байгаа бүтээгдэхүүний шошгийн мэдээллийн агуулга, хамрах хүрээ, хүнсний шошгололтын талаарх хууль, стандартын шаардлагад хэрхэн нийцэж байгаа болон шошгийн мэдээлэл нь хэрэглэгчдийн хэрэгцээ шаардлагад хэрхэн нийцэж байгааг тодруулах зорилготой.

Шошгийн мэдээллийг цуглуулахдаа crowdsourcing буюу олон хүнээр зэрэг мэдээлэл цуглуулах аргыг хэрэглэхээр төлөвлөж байгаа ба шошгийн мэдээлэл цуглуулахад танай сургуулийн шим судлалын чиглэлээр бакалаврын сургалтанд суралцаж буй оюутнуудыг оролцуулах хүсэлтэй байна. Хүнсний шошгийн мэдээлэл нь шим тэжээлийн чиглэлээр суралцах хичээлийн агуулгатай уялдах боломжтой бөгөөд оюутнуудад шошгийн мэдээлэлд үндэслэн хүнсний шим тэжээллэг байдалд үнэлгээ дүгнэлт өгөх, эрүүл ба эрүүл бус хүнсний талаарх мэдлэгээ бататгах сургалтын ач холбогдолтой бөгөөд энэ зорилгоор хичээлийн дадлага ажлын хүрээнд зохион байгуулах боломжтой гэж үзсэний үндсэн дээр эдгээр оюутнуудыг сонгосон болно.

Иймд та бүхнийг бидний судалгааны ажилд хамтран ажиллаж өөрийн оюутнуудыг хамруулахыг зөвшөөрч шаардлагатай зохицуулалтыг хийж өгнө үү хэмээн хүсэж байна. Үүнд: бидэнд тухайн оюутнуудтай уулзах боломжтой хичээл лекцийн цагийг тодруулах өгч, оюутнуудын бөглөсан судалгааны хуудсыг эргүүлэх цуглуулж авах ажлыг зохион байгуулах ажил багтана. Эдгээр боломжит цагт судлаач нь оюутнуудтай уулзаж мэдээлэл хэрхэн цуглуулах талаар нарийвчилсан мэдээллийг өгнө.

Судалгаанд бүрэн сайн дурын үндсэн дээр оролцох бөгөөд судалгаа хийх зөвшөөрөл олгох эсэх нь та бүхний сонголт байна. Хэрэв та бүхэн судалгаанд оролцохоос татгалзвал энэ нь Wollongong-ны Их Сургууль болон судалгаа явуулж буй судлаач нартай харилцах таны харилцаанд сөргөөр нөлөөлөхгүй болно.

Уг судалгааг хийснээр бид хүнсний шошгололтын талаар засгийн газраас хэрэгжүүлж байгаа бодлого, журам зааврыг шинэчлэн сайжруулах арга замыг тодруулж улмаар хэрэглэгчдэд шошгийн мэдээлэлд үндэслэн хүнсээ сонгох боломж олгож дэмжлэг үзүүлэхийг зорьж байгаа болно. Иймд уг зорилгыг биелүүлэхэд та бүхний хамтын дэмжлэг туслалцаа, хамтын ажиллагаа үнэтэй хувь нэмэр оруулна.

Та бүхнийг бидний ажлыг дэмжиж судалгаа явуулах зөвшөөрөл олгоно гэдэгт найдаж байна. Энэхүү судалгааны талаар асууж тодруулах зүйлс болон өөрсдийн шийдвэрийн талаар доорх е-майл хаяг болон утсаар надтай болон эсвэл судалгааны удирдагч НЭМҮТ-ийн Хоол Судлалын Албаны дарга Ж.Батжаргалтай холбогдоно уу.

Хүндэтгэсэн,

Чимэдцэрэн овогтой Нямрагчаа
Эрүүл мэнд, нийгмийн сургууль
Wollongong-ны Их Сургууль
E-mail хаяг: nc974@uowmail.edu.au

Жамъян овогтой Батжаргал
Нийгмийн Эрүүл Мэндийн Үндэсний Төв
Хоол Судлалын Албаны дарга
Е-майл хаяг: batjar_j@hotmail.com
Утас: 976-455600

c) Letter to Mongolian University of Medical Sciences (Mongolian translation)

University of Wollongong

2017.10.01

Чимэдцэрэн овогтой Нямрагчаа
Эрүүл мэнд, нийгмийн сургууль
Нийгмийн шинжлэх ухааны Тэнхим
Wollongong-ны Их сургууль, Австрали улс
NSW 2522

АНАГААХЫН ШИНЖЛЭХ УХААНЫ ИХ СУРГУУЛИЙН НИЙГМИЙН ЭРҮҮЛ МЭНДИЙН СУРГУУЛЬ, СУВИЛАХУЙН СУРГУУЛИЙН УДИРДЛАГАД

Хүнсний шошгийн мэдээлэл цуглуулах судалгаа явуулахад дэмжлэг хүсэх тухай

Хүндэт Профессор …….. танаа,

Намайг Чимэдцэрэнгийн Нямрагчаа гэдэг. Би Австрали улсын Wollongong-ны Их Сургуулийн докторын сургалтанд 2016 оноос элсэн суралцаж байгаа ба хүнсний шошгийн талаарх хэрэглэгчдийн мэдлэг хандлага, шошго хэрэглэх дадлын чиглэлээр судалгааны ажил хийж байгаа юм.

Би энэхүү судалгааны ажлын хүрээнд манай улсад хүнсний худалдаанд байгаа хүнсний бүтээгдэхүүний шошгололтын байдал, шошгийн мэдээлэлд үнэлгээ хийх судалгааны ажлыг хийхээр төлөвлөөд байгаа ба та бүхнийг бидний судалгаанд дэмжлэг үзүүлэхийг хүсэж энэхүү албан захидлыг хүргүүлж байна.

Энэхүү судалгааны ажил нь хүнсний худалдаанд байгаа бүтээгдэхүүний шошгийн мэдээллийн агуулга, хамрах хүрээ, хүнсний шошгололтын талаарх хууль, стандартын шаардлагад хэрхэн нийцэж байгаа болон шошгийн мэдээлэл нь хэрэглэгчдийн хэрэгцээ шаардлагад хэрхэн нийцэж байгааг тодруулах зорилготой.

Шошгийн мэдээллийг цуглуулахдаа crowdsourcing буюу олон хүнээр зэрэг мэдээлэл цуглуулах аргыг хэрэглэхээр төлөвлөж байгаа ба шошгийн мэдээлэл цуглуулахад танай сургуулийн шим судлалын чиглэлээр бакалаврын сургалтанд суралцаж буй оюутнуудыг оролцуулах хүсэлтэй байна. Хүнсний шошгийн мэдээлэл нь шим тэжээлийн чиглэлээр суралцах хичээлийн агуулгатай уялдах боломжтой бөгөөд оюутнуудад шошгийн мэдээлэлд үндэслэн хүнсний шим тэжээллэг байдалд үнэлгээ дүгнэлт өгөх, эрүүл ба эрүүл бус хүнсний талаарх мэдлэгээ бататгах сургалтын ач холбогдолтой бөгөөд энэ зорилгоор хичээлийн дадлага ажлын хүрээнд зохион байгуулах боломжтой гэж үзсэний үндсэн дээр эдгээр оюутнуудыг сонгосон болно.

Иймд та бүхнийг бидний судалгааны ажилд хамтран ажиллаж өөрийн оюутнуудыг хамруулахыг зөвшөөрч шаардлагатай зохицуулалтыг хийж өгнө үү хэмээн хүсэж байна. Үүнд: бидэнд тухайн оюутнуудтай уулзах боломжтой хичээл лекцийн цагийг тодруулах өгч, оюутнуудын бөглөсан судалгааны хуудсыг эргүүлэх цуглуулж авах ажлыг зохион байгуулах ажил багтана. Эдгээр боломжит цагт судлаач нь оюутнуудтай уулзаж мэдээлэл хэрхэн цуглуулах талаар нарийвчилсан мэдээллийг өгнө.

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Уг судалгааг хийснээр бид хүнсний шошгололтын талаар засгийн газраас хэрэгжүүлж байгаа бодлого, журам зааврыг шинэчлэн сайжруулах арга замыг тодруулж улмаар хэрэглэгчдэд шошгийн мэдээлэлд үндэслэн хүнсээ сонгох боломж олгож дэмжлэг үзүүлэхийг зорьж байгаа болно. Иймд уг зорилгыг биелүүлэхэд та бүхний хамтын дэмжлэг туслалцаа, хамтын ажиллагаа үнэтэй хувь нэмэр оруулна.

Та бүхнийг бидний ажлыг дэмжиж судалгаа явуулах зөвшөөрөл олгоно гэдэгт найдаж байна. Энэхүү судалгааны талаар асууж тодруулах зүйлс болон өөрсдийн шийдвэрийн талаар доорх е-майл хаяг болон утсаар надтай болон эсвэл судалгааны удирдагч НЭМҮТ-ийн Хоол Судлалын Албаны дарга Ж.Батжаргалтай холбогдоно уу.

Хүндэтгэсэн,

Чимэдцэрэн овогтой Нямрагчаа
Эрүүл мэнд, нийгмийн сургууль
Wollongong-ны Их Сургууль
E-mail хаяг: nc974@uowmail.edu.au

Жамъян овогтой Батжаргал
Нийгмийн Эрүүл Мэндийн Үндэсний Төв
Хоол Судлалын Албаны дарга
E-майл хаяг: batjar_j@hotmail.com
Утас: 976-455600

Appendix P - Letters of Approval from Mongolian University of Science & Technology and Mongolian University of Medical Sciences

a) Approval by Mongolian University of Science & Technology School of Production Technology

ШИНЖЛЭХ УХААН, ТЕХНОЛОГИЙН
ИХ СУРГУУЛЬ
ҮЙЛДВЭРЛЭЛИЙН ТЕХНОЛОГИЙН СУРГУУЛЬ

14191, Улаанбаатар хот, Сүхбаатар дүүрэг,
8-р хороо, ШУТИС-ийн I байр, Ш/х-46/590
Утас: (976-11) 31-19-07, Факс: (976-11) 31-19-07
Цахим хаяг: sit@must.edu.mn
Вэб: www.sitech.edu.mn

2017.11.08 № 501

танай ______ -ны № ______ -т

НИЙГМИЙН ЭРҮҮЛ МЭНДИЙН ҮНДЭСНИЙ
ТӨВИЙН ХООЛ СУДЛАЛЫН АЛБА БОЛОН
WOLLONGONG-НЫ ИХ СУРГУУЛИЙН
ДОКТОРАНТ Ч.НЯМРАГЧАА НАРТ

Хүнсний шошгийн судалгаанд
оюутнуудыг оролцуулах зөвшөөрөл
олгох тухай

Тус сургуульд 2017 оны 10 сарын 23-ны өдөр Wollongong-ны Их Сургуулийн докторант Ч.Нямрагчаа болон Нийгмийн Эрүүл Мэндийн Үндэсний Төвийн Хоол Судлалын Албанаас ирүүлсэн албан захидалтай танилцан хариуг хүргүүлж байна.

Бид хүнсний шошгийн талаарх энэхүү судалгааны ажлыг дэмжиж байгаа бөгөөд манай сургуулийн оюутнуудыг уг судалгаанд оролцуулахыг зөвшөөрч байгааг мэдэгдэж байна.

Уг судалгаанд IV ангийн оюутнуудыг оролцуулах бөгөөд судалгаанд шаардлагатай зохицуулалтын арга хэмжээ авах болно.

ЗАХИРАЛ К.ТУЯАЦЭЦЭГ

b) Approval by Mongolian University of Science & Technology School of Production Technology (English translation)

UNIVERSITY OF SCIENCE AND TECHNOLOGY
PRODUCTION TECHNOLOGY UNIVERSITY

14191 Ulaanbaatar, Sukhbaatar district
Khoroo # 8, Building 1, Post box 46590
Tel: 976-11-311907 Fax: 976-11-311907
Email: sit@must.edu.mn
Website: www.sitech.edu.mn

To: DEPARTMENT OF FOOD AND NUTRITION RESEARCH OF NATIONAL CENTRE OF PUBLIC HEALTH AND CH.NYAMRAGCHAA, PhD STUDENT OF UNIVERSITY OF WOLLONGONG

Date: 08.11.2017 #501

Re: Providing approval for involving of students in the food label survey

Herewith, we are providing a response to the official letter of Ch.Nyamragchaa, PhD student of University of Wollongong and Department of Food and Nutrition Research dated on 23 November.

We are informing that we are supporting this research and providing consent to involve students of our university in the research.

4rd year students will be participated in this survey and necessary arrangements will be made.

DIRECTOR J.TUYATSETSEG

c) Approval by Mongolian University of Medical Science (in Mongolian)

АШУҮИС | СУВИЛАХУЙН СУРГУУЛЬ

Улаанбаатар хот, Баянгол дүүрэг, 5-р хороо,
Ард Аюушийн гудамж,
Улаанбаатар-26 салбар, 188-р шуудангийн хайрцаг,
И-мейл: nursing@mnums.edu.mn, Веб: nursing.mnums.edu.mn
Утас: 70007533, Факс: 976-70007533

2017. 11. 13 № 01/97

таны ______________-ны № ______________-т

UNIVERSITY OF WOLLONGONG

Хариу хүргүүлэх тухай

Чимэдцэрэн овогтой Нямрагчаа нь Австрали улсын Wollongong-ны Их Сургуулийн докторантод суралцдаг.

Судалгааны ажлыг нь Сувилахуйн сургууль дэмжиж байгаагаа илэрхийлж байна.

ЗАХИРАЛ Н. НАРАНБААТАР

Appendix Q - Food label recording sheet for audit of food labels

ID number of the product		**1**	**2**	**3**	**4**
Product name					
Brand name					
Product category*					
Product type**					
Domestic/Imported product (1-imported, 2- domestic)					
Label language					
Translated label attached (1- yes, 2- no)					
Where the product was captured (name of the supermarket chain or the place)					
Small package (1 -yes, 2- no)					
Weight (unit)					
Manufactured country					
Company distributed/imported					
Cooking instructions (1 -yes, 2- no)					
Storage instructions (1 -yes, 2- no)					
Use by dates (1 -yes, 2- no)					
Nutrition Information Panel (1 -yes, 2- no)					
Please tick each, if it is provided. (V)	Calorie (kcal/kJ)				
	Protein				
	Carbohydrates				
	Sugar				
	Fat				
	Sat fat				
	Sodium (g/mg)				
	Other nutrients: (e.g. vitamins, minerals, cholesterol)	Specify……….. ………………… …………………… ..	Specify……….. ………………… …………………… …	Specify……….. ………………… …………………… …	Specify… ………….. ………….. ………….. ……….
Serving size (1 -yes, 2- no) (piece/g/ml/OZ)					
Servings per package (1 -yes, 2- no)					
Quantity of nutrients per serving size (1 -yes, 2- no)					
Quantity of nutrients per 100g/100ml (1 -yes, 2- no)					
Percentage of daily intake per serving (1 -yes, 2- no)					
Ingredient list (1 -yes, 2- no)					
Nutrition claim (1 -yes, 2- no)		Specify………… …………………… .	Specify………… ……………………	Specify………… ……………………	Specify… ………….. ………….. …

Health claim (1 -yes, 2- no)	Specify………… ……….	Specify………… ……….	Specify………… ……….	Specify… …………… ….
FOPL (1 -yes, 2- no)	Specify………… ……….	Specify………… ……….	Specify………… ……….	Specify… …………… ….
Other information (1 -yes, 2- no) ('GMO', 'organic product', 'no artificial colours' etc.)	Specify………… ……….	Specify………… ……….	Specify………… ……….	Specify… …………… ….
Number of photos of the label attached				

Product category* - 1) meat products, 2) milk & dairy products, 3) cereals, 4) processed vegetables and fruit, 5) sweets, 6) snacks, 7) ready meals, 8) beverages, 9) edible oils and fat, and 10) seasonings.

Product type**- Subcategories of food products within main food categories as given in Table…

Appendix R - Categories of food products included in audit of food labels

1	***Milk & dairy products***	***5***	***Sweets***
1.1	Milk (natural or with added flavour)	5.1	Biscuits & wafers
1.2	Yogurt (natural or with added fruit)	5.2	Chocolate
1.3	Curds & dried curds	5.3	Candies (packaged caramels, soft candies, butterscotch, jelly, draje and marmalade etc.)
1.4	Skim & cream	5.4	Chocolate spread
1.5	Cheese imported	5.5	Honey
1.6	Other (curd drink, mare milk, ghee, condensed milk etc.)	5.7	Other (product with chocolate, chocopie, kontic etc.)
2	***Meat products***	5.6	Ice cream
2.1	Sausage & frankfurter	5.8	Sugar cube
2.2	Canned & vacuum packaged meat	***6***	***Snacks***
2.3	Canned fish	6.1	Chips
2.4	Frozen dumpling and wonton	6.2	Crackers & extruded snacks
2.5	Other processed meat (ground meat, patties, meatballs, ham, liver paste etc.)	6.3	Nuts
3	***Cereals***	6.4	Dried fruits
3.1	Flour	***7***	***Ready to eat meals***
3.2	Rice & other grain	7.1	Ready meals (packaged meals, burger, sandwiches, pizza etc.)
3.3	Pasta, noodle, jelly noodle	7.2	Instant soups & instant noodles
3.4	Bread	7.3	Korean packaged meals
3.5	Cookies & bakery	***8***	***Beverages***
3.6	Breakfast cereals	8.1	Soft drinks (carbonated)
4	***Processed veg & fruit***	8.2	Fruit drinks
4.1	Canned vegetables	8.3	Bottled tea, energy drinks, sweetened water
4.2	Vacuum packaged vegetable salads	8.4	Bottled water, sparkling water, mineral water
4.3	Fruit & vegetable purée	***9***	***Edible oils & fat***
4.4	Canned fruit in sugar syrup	9.1	Butter & margarine
4.5	Jam	9.2	Vegetable oil
4.6	Other (seaweed, laver, kimchi etc.)	9.3	Mayonnaise
11	***Other***	***10***	***Seasonings***
11.1	Tea, coffee	10.1	Ketchup, vinegar
11.2	Instant tea	10.2	Salad dressings & sauce
11.3	Egg	10.3	Other (seasonings, Korean seasonings)
11.4	Baby food	10.4	Salt
11.5	Vodka, beer		
11.6	Tofu		
11.7	Coffee cream		
11.8	Bread crumbs		
11.9	Food supplement		
11.10	Chewing gum		

Appendix S - Template for policy document analysis

Name of policy document	Type of policy document	When the policy came into force	Purpose/ aim/ objectives	Timeframe	Scope / content	Who has responsibility for	
						Implementation	Monitoring & evaluation

Appendix T – Table A6.1. Product groups and categories covered in the study

Table A6.1 Product groups and categories covered in the study

		Product Groups and Categories	Number of Products
	1	**Milk and dairy products**	
1	1.1	Milk (natural or with added flavour)	31
2	1.2	Yogurt (natural or with added fruit)	32
3	1.3	Curds, dried curds	17
4	1.4	Skim, cream	5
5	1.5	Cheese imported	13
6	1.6	Other (curd drink, mare milk, ghee, evaporated milk, etc.)	14
	2	**Meat products**	
7	2.1	Sausage and frankfurter	56
8	2.2	Canned and vacuum packaged meat	20
9	2.3	Canned fish	31
10	2.4	Frozen dumpling and wonton	38
11	2.5	Other processed meat (minced meat, patties, meatballs, ham, liver paste, beef jerky, frozen chicken, frozen fish, seafood, sliced meat, chicken, etc.)	53
	3	**Cereals**	
12	3.1	Flour	24
13	3.2	Rice, other grain	26
14	3.3	Pasta, noodles	48
15	3.4	Bread, bread crumbs	49
16	3.5	Cookies, pastry	177
17	3.6	Breakfast cereal, oatmeal	22
	4	**Processed veg and fruit**	
18	4.1	Canned vegetables	45
19	4.2	Vacuumed vegetable salads	22
20	4.3	Fruit and vegetable purée and sauce	16
21	4.4	Fruit compote	25
22	4.5	Jam	44
23	4.6	Other (laver, kimchi, etc.)	11
	5	**Sweets**	
24	5.1	Biscuits, wafers	102
25	5.2	Chocolate	56
26	5.3	Candies (packaged caramels, soft candy, butterscotch, jelly candy, draje and marmalade, etc.)	52
27	5.4	Ice cream	73
28	5.5	Honey	37
29	5.7	Other (choco pie, assorted chocolate, chocolate biscuit, chocolate spread, sugar, etc.)	54
	6	**Snacks**	
30	6.1	Chips	44
31	6.2	Crackers, extruded snacks	24
32	6.3	Nuts (packed)	34

33	6.4	Dried fruits (packed)	22
	7	**Ready to eat meals**	
34	7.1	Meals (packaged meals, burger, sandwiches, pizza, bun, etc.)	12
35	7.2	Instant soups, instant noodles	37
	8	**Beverages**	
36	8.1	Soft drinks	37
37	8.2	Fruit drinks, 100% fruit juice	64
38	8.3	Bottle tea, energy drink, flavoured water	29
39	8.4	Bottle water, carbonated water, mineral water	6
	9	**Edible oils and fat**	
40	9.1	Butter, margarine	11
41	9.2	Vegetable oil	*29*
42	9.3	Mayonnaise	12
	10	**Seasonings**	
43	10.1	Ketchup, tomato pasta	23
44	10.2	Salad dressings, sauce, vinegar	41
45	10.3	Other spices and condiments	40
	11	**Other**	
46	11.1	Tea, coffee, coffee cream	29
47	11.2	Egg	16
48	11.3	Infant formula, weaning food	11
49	11.4	Tofu	6
50	11.5	Alcohol, beer	3
			1723

Appendix T – Table A6.2. Nutrient function claims by attributable health benefits

Table A6.2 Nutrient function claims by attributable health benefits

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Nutrition Claim (*n*)		
		Total	The Claim Based on	
			Nutrients	Ingredients or Whole Food
Prevents obesity; helps in weight control and maintaining normal weight; suitable for dieting; suppresses appetite	fibre, unsaturated fat, low fat, protein, vitamin D	33	12	21
Improves appetite; supports digestive system; helps in stomach discomfort; supports growth of bifidobacteria	vitamin B1, B12, fibre, high in protein, magnesium, galactooligosaccharide	27	8	19
Stabilizes/supports heart function, cardiovascular system and blood circulation; stabilizes blood pressure; favourable effects on blood vessels	vitamin B1, omega 7	26	2	24
Facilitates excretion of toxic substances; cleansing the organism; has de-toxic effect	fibre, protein unsaturated fat	22	4	18
Supports bone development and maintains normal growth	calcium, iron, protein, carbohydrate, fat	17	6	11
Relieves fatigue	vitamin PP, E, folic acid, zinc, iron, manganese	10	2	8
Supports nervous system and brain development	vitamin B1, iodine	9	4	5
Supports immunity	selenium, vitamin C	8	2	6
Protects against flu and cold	vitamin PP, E, folic acid, zinc, iron, manganese, phosphorus	6	2	4
Supports blood cell formation	vitamin PP, E, folic acid, zinc, iron, manganese	5	1	4
Participates in/supports metabolism	vitamin B2	3	1	2
Supports liver and gallbladder function	NA	2	0	2
Supports respiratory function	NA	2	0	2
Maintains normal sight	vitamin B2	2	1	1
Supports kidney function	NA	1	0	1
Supports endocrine system	NA	1	1	0
Supports muscle development	NA	1	1	0
Healthy skin	NA	1	0	1
Total		176 (100.0)	47(26.7)	129 (73.3)

NA—not applicable.

Appendix T - Table A6.3. Other function claims by attributable health benefits

Table A6.3 Other function claims by attributable health benefits

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Substances Linked to the Claim	Other Function Claim (*n*)		
			Total	The Claim Based on	
				Nutrients/Substances	Ingredients or Whole Food
Improves colon function; helps in constipation; improves stomach function; normalize useful gut flora	fibre, protein, magnesium, inulin	probiotic bacteria bifidobacteria	35	11	24
Improves intestine peristalsis	fibre, unsaturated fat vitamin B, folic acid, calcium, iron	lignans	29	3	26
Improves immunity	nucleotides	NA	21	4	17
Improves/boosts metabolism	NA	probiotic bacteria	11	4	7
Improves mental capacity and memory; improves brain function	vitamin B1, B, iron	NA	8	3	5
improves heart function, cardiovascular system; decreases blood pressure	NA	NA	8	0	8
Builds strong bones and accelerates growth	NA	NA	7	0	7
Builds strong teeth and gums	NA	NA	6	0	6
Slows down aging	omega 7, unsaturated fat	NA	6	2	4
Releases edema	NA	NA	5	0	5
Facilitates excretion of toxic substances; cleansing the organism; has de-toxic effect	NA	lactic acid bacteria	3	3	0
Improves liver and gallbladder function	NA	NA	2	0	2
Increases breast milk production	vitamin E, F	NA	2	1	1
Reduces cough	NA	NA	1	0	1
Improves kidney function	NA	NA	2	0	2
Improves respiratory function	NA	NA	1	0	1

Improves eye sight; improves night sight	vitamin PP, E, folic acid, zinc, iron, manganese	NA	1	1	0
Total			148 (100.0)	32 (21.6)	116 (78.4)

NA—not applicable.

Appendix T - Table A6.4. Therapeutic claims by attributable health benefits

Table A6.4 Other function claims by attributable health benefits

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Substances Linked to the Claim	Therapeutic Claim (n)		
			Total	The Claim Based on	
				Nutrients/Substances	Ingredients or Whole Food
Prevents cancer	essential amino acids fibre, protein	flavonoids	15	1	14
Prevents osteoporosis	NA	NA	9	0	9
Prevents CVD, heart diseases and stroke	unsaturated fat, fibre low in saturated fat and cholesterol	Luteolin flavonoids	9	3	6
Prevents digestive system, gastritis, increased stomach acidity, and stomach and colon ulcers	fibre, protein	NA	6	1	5
Prevents high blood pressure	NA	lignans	4	2	2
Prevents diabetes	fibre	lignans	3	1	2
Prevents iron deficiency and anemia	NA	NA	3	0	3
Prevents iodine deficiency and goiter	NA	NA	3	0	3
Prevents paralysis, epilepsies and seizure	NA	NA	3	0	3
Prevents diseases	NA	NA	2	0	2
Prevents urinal diseases and kidney diseases	NA	NA	2	0	2
Prevents arthritis	NA	NA	2	0	2
Prevent allergy	NA	NA	2	0	2
Prevents kidney and bile stones	NA	NA	1	0	1
Prevents tooth diseases	NA	NA	1	0	1

Prevents vitamin and mineral deficiencies	NA	NA	1	0	1
Helps in diabetes; suitable for diabetics	fibre, protein, vitamin D magnesium	NA	15	5	10
Heals digestive system, gastritis, increased stomach acidity, and stomach and colon ulcers	omega 7, high in protein	NA	11	1	10
Helps in CVD and heart diseases	essential amino acids	NA	9	2	7
Reduces liver fat and bile condensation; heals liver and gallbladder diseases	NA	NA	6	0	6
Helps in kidney and bile stones	NA	NA	5	0	5
Heals bronchitis, pneumonia, tuberculosis and respiratory diseases	NA	NA	5	0	5
Helps in/suppresses the progression of cancer	NA	luteolin	5	1	4
Heals high blood pressure	fibre, unsaturated fat	NA	5	2	3
Helps in urinal diseases and kidney diseases	NA	NA	4	0	4
Heals atherosclerosis	fibre, unsaturated fat	NA	4	1	3
Heals skin diseases	NA	NA	3	0	3
Helps in iron deficiency and anemia	NA	NA	3	0	3
Heals arthritis	NA	NA	3	0	3
Accelerates healing of chronic hepatitis	vitamin PP	NA	2	1	1
Heals osteoporosis	NA	NA	2	0	2
Heals sore mouth	NA	NA	2	0	2
Helps in poor vision and eye diseases	NA	NA	2	0	2
Heals sore, wounds and burns; has anti-inflammatory effect	vitamin PP, fibre protein	NA	2	1	1
Heals bone fracture and injury	NA	NA	1	0	1
Alleviates pancreases	NA	NA	1	0	1
Helps in tympanitis	NA	NA	1	0	1
Effective against dementia	NA	NA	1	0	1
Has remedy effects	NA	NA	1	0	1
Heals vitamin and mineral deficiencies	NA	NA	1	0	1
Total			160 (100.0)	22 (13.8)	138 (86.2)

NA—not applicable.

Appendix T - Table A6.5. Reduction of disease risk claims by attributable health benefits

Table A6.5 Other function claims by attributable health benefits

Health Benefit the Claim Refers to	Nutrients Linked to the Claim	Substances Linked to the Claim	Reduction of Disease Risk Claim (*n*)		
			Total	The Claim Based on	
				Nutrients/Substances	Ingredients or Whole Food
Reduces/maintains blood cholesterol level	fibre, omega 7	NA	13	2	11
Reduces/ maintains blood sugar level	omega 7, fibre, protein	NA	9	2	7
Reduces risk of CVD, heart diseases and stroke	unsaturated fat, fibre low in saturated fat and cholesterol	Luteolin flavonoids	8	6	2
Reduces risk of cancer	NA	bifidobacteria	3	2	1
Reduces risk of Alzheimer's and Parkinson's diseases	NA	NA	1	1	0
Reduces risk of osteoporosis	calcium	NA	1	1	0
Reduces risk of high blood pressure	NA	lignans	1	1	0
Reduces risk of diabetes	NA	lignans	3	1	2
Total			39 (100.0)	16 (41.0)	23 (59.0)

NA—not applicable.

Appendix U – Table A6.1. Nutrient declarations compared by primary label language

Table A6.1 Nutrient declarations compared by primary label language

Primary label language	Total	Labels with (%, n) nutrient declaration	Total	Labels with (%, n) Calories	Total	Labels with (%, n) Protein	Total carbohydrates	Total fat	Total sugars	Saturated fat	Sodium	Other nutrients
Legal languages												
Mongolian	847	87.6% 742	845	85.4% 722	841	84.8% 713	75.5% 635	83.1% 699	18.7% 157	7.8% 66	24.5% 206	24.1% 203
Russian	378	95.0% 359	378	94.7% 358	378	84.9% 321	87.6% 331	87.6% 331	24.9% 94	18.0% 68	18.3% 69	23.8% 90
English	219	93.2% 204	219	92.2% 202	218	92.2% 201	91.7% 200	91.7% 200	74.3% 162	70.2% 153	75.7% 165	62.4% 136
Sub total	1444	90.4% 1305	1442	88.9% 1282	1437	85.9% 1235	81.1% 1166	85.6% 1230	28.7% 413	20.0% 287	30.6% 440	29.9% 429
Other languages												
German	88	90.9% 80	88	90.9% 80	88	90.9% 80	90.9% 80	90.9% 80	90.9% 80	90.9% 80	90.9% 80	46.6% 41
Korean	38	92.1% 35	38	92.1% 35	38	92.1% 35	92.1% 35	92.1% 35	81.6% 31	89.5% 34	89.5% 34	65.8% 25
Polish	36	100.0% 36	36	100.0% 36	36	97.2% 35	97.2% 35	97.2% 35	94.4% 34	91.7% 33	88.9% 32	55.6% 20
Turkish	18	100.0% 18	18	88.9% 16	17	70.6% 12	76.5% 13	88.2% 15	94.1% 16	64.7% 11	70.6% 12	52.9% 9
Other languages (not Asian)	61	95.1% 58	61	95.1% 58	61	90.2% 55	95.1% 58	88.5% 54	60.7% 37	55.7% 34	57.4% 35	24.6% 15
Other languages (Asian)	24	87.5% 21	24	75.0% 18	21	76.2% 16	76.2% 16	76.2% 16	66.7% 14	19.0% 4	47.6% 10	47.6% 10
Sub total	265	93.6%	265	91.7%	261	89.3%	90.8%	90.0%	81.2%	75.1%	77.8%	46.0%

		248		243		233	237	235	212	196	203	120
Total*	1709	90.9% 1553	1707	89.3% 1525	1698	86.4% 1468	82.6% 1403	86.3% 1465	36.8% 625	28.4% 483	37.9% 643	32.3% 549

*After excluding labels with missing or unclear information

Table A6.1 continued

Primary label language	Total	Labels with (%, n)			Total	Labels with (%, n)	
		Nutrients per serving	Nutrients per 100g/mg	Percentage of daily value		Serving size	Servings per package
Legal languages							
Mongolian	842	9.4% 79	85.0% 716	17.2% 145	855	8.0% 68	2.9% 25
Russian	378	15.3% 58	94.4% 357	11.4% 43	380	15.3% 58	11.3% 43
English	219	65.3% 143	61.6% 135	47.5% 104	220	64.5% 142	56.4% 124
Sub total	1439	19.5% 280	83.9% 1208	20.3% 292	1455	18.4% 268	13.2% 192
Other languages							
German	88	21.6% 19	90.9% 80	56.8% 50	88	21.6% 19	18.2% 16
Korean	38	52.6% 20	47.4% 18	63.2% 24	34	50.0% 17	44.1% 15
Polish	36	22.2% 8	97.2% 35	27.8% 10	36	22.2% 8	22.2% 8
Turkish	18	33.3% 6	83.3% 15	27.8% 5	19	31.6% 6	15.8% 3
Other languages (not Asian)	61	13.1% 8	95.1% 58	16.4% 10	61	18.0% 11	14.8% 9

Other languages (Asian)	23	52.2% 12	52.2% 12	34.8% 8	23	47.8% 11	47.8% 11
Sub total	264	27.7% 73	82.6% 218	40.5% 107	261	27.6% 72	23.8% 62
Total*	1703	20.7% 353	83.7% 1426	23.4% 399	1716	19.8% 340	14.8% 254

Appendix V - Presentation on Mongolian consumers' perspectives on food and nutrition labelling and use of food label information