A Reformulation and Assessment of the Global AgeWatch Index: Inclusion of a Gender-based Domain

by

Oladele Ademola Atoyebi

MPH, Staffordshire University, 2013

MBBS, LAUTECH, 2007

Thesis Submitted in Partial Fulfilment of the

Requirements for the Degree of

Master of Arts

in the

Department of Gerontology

Faculty of Arts and Social Sciences

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SIMON FRASER UNIVERSITY

Spring 2018

Approval

Name:	**Oladele Ademola Atoyebi**
Degree:	**Master of Arts**
Title:	**A Reformulation and Assessment of the Global AgeWatch Index: Inclusion of a Gender-based Domain**
Examining Committee:	**Chair: Sharon Koehn** Clinical Research Professor

Andrew Wister
Senior Supervisor
Professor

Barbara Mitchell
Supervisor
Professor

Andrew Sixsmith
Supervisor
Professor

Zheng Wu
External Examiner
Professor
Department of Sociology
University of Victoria

Date Defended/Approved: February 27th, 2018

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Abstract

The Global AgeWatch Index (GAWI) is a measure that ranks countries according to the wellbeing of their older adults. The GAWI was constructed using four domains of wellbeing excluding a gender inequality domain. This research aimed to include the domain of gender equality in the GAWI and produce a reformulated index (rGAWI) so that the resulting ranking of countries based on the new indices can be compared with that observed for the original GAWI. This cross-sectional study utilized publicly available data on female labour force participation, total fertility rate and age at first marriage to create a new domain of gender inequality. The new domain was added to the original four GAWI domains to generate the rGAWI. The inclusion of the gender inequality domain into GAWI resulted in changes in the rankings of 87.5% of the countries and countries with lower gender inequality scores had poor reformulated indices of wellbeing.

Keywords: Global Aging; Gender Inequality; Aging Index; Wellbeing; Global AgeWatch Index; Older Adults

Dedication

To the elders who strive, and those who care for them.

Acknowledgements

This thesis was made possible with the support of my senior supervisor, Dr. Andrew Wister. I am grateful to him for his patience and interest in guiding me through to the end of this research.

I appreciate Dr. Barbara Mitchell, my thesis committee member for her help, comments and contributions to the construction of the gender inequality domain of the reformulated index.

I also thank Dr. Andrew Sixsmith, my thesis committee member, for his support and helpful feedback.

I am grateful to Roslyn McKoen, Graduate Program Assistant, for her guidance, thoughtfulness and kindness.

Thank you to Anne Marie Barrett, Manager, Academic and Administrative Services for her support and encouragement.

I acknowledge and appreciate the financial and academic contributions of the Department of Gerontology, Simon Fraser University through the Graduate Scholarship and Fellowship awards that supported me during this research
.
I acknowledge the kindness of Dr. Gloria Gutman CM OBC, the donor of the Gloria Gutman Conference Travel Award that encouraged my presentation of the research findings at the 46th CAG conference in Winnipeg.

Thank you to LaDonna, Riley, Bonita, Glaucia and Patrick for their friendship and support.

I thank Hadassah and Hallela, for reinforcing me to work on this research.

And I really thank my wife, Elizabeth for always being there to support my ambitions.

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List of Acronyms

AFM	Age at First Marriage
FLFP	Female Labour Force Participation
GAWI	Global AgeWatch Index
rGAWI	Reformulated Global AgeWatch Index
GDP	Gross Domestic Product
GNI	Gross National Income
HIC	High Income Country
LMIC	Lower and Middle-Income Country
TFR	Total Fertility Rate
QOL	Quality of Life
WHO	World Health Organization

Chapter 1.

Introduction

The population of the world is aging and by 2050, the proportion of the world's population over age of 60 years will be 22% (WHO, 2015). In part, this has occurred due to a decline in fertility rates that shift the age structure over time. Also, the life expectancy of humans at birth has been increasing globally (United Nations, 2013) and virtually all countries have recorded an improvement in the reduction of mortality over the last four decades (Fang and Millar 2009; Canning, 2010). These patterns have increased the degree of population aging globally, but in different proportions for individual countries. While population aging as a relative factor continues to be significantly higher in more developed countries and High- Income Countries (HICs), the absolute number of older persons has exploded in low- and middle- income countries (LMICs) due to their large populations overall, and about 65% of all persons aged 60 years and above lived in less developed countries in 2010 (He et al., 2015). Most LMICs will double their population of older adults in a compressed time span of 20–25 years (Phillips et al., 2010). Moreover, the social and economic conditions under which these trends are occurring are different across countries. This phenomenon creates considerable variability in the experiences and outcomes of aging globally. In an effort to better understand the heterogeneity in the aging experience, it is useful to examine countries globally, moving beyond simple dichotomies (e.g. HICs/LMICs).

Older adults are exposed to unique sets of social, health and economic factors that affect their well-being and quality of life (QOL). Factors such as life expectancy, disability free life expectancy, socioeconomic characteristics, and social inclusion all play a role in determining the quality of life of older people. Moreover, the wellbeing of older people varies in different countries because people are differentially exposed to unique socioeconomic factors that affect the process of aging. It is therefore important to comparatively examine the dimensions that lead to wellbeing and QOL in these different contexts, such as health status, social support, socio-economic status, and social welfare. It is also important to understand these patterns to design policies and plan health care services appropriately.

Modernization has contributed to the processes of demographic transition; a change in pattern of mortality, fertility, and growth rates as countries progress through different stages of their development (Dyson, 2013). The transition affects different domains of life including the population structure, economy, environment, household organization and disease patterns. The rate at which countries develop and transition through the stages of demographic transition differs. In addition to the demographic changes observed globally, the epidemiologic transition that is characterized by changing patterns of population age distributions, morbidity, mortality, fertility, life expectancy, and causes of death has also contributed to the modification of disease patterns (McKeown, 2009). For example, mortality from communicable diseases is declining in majority of countries while chronic non-communicable illnesses that are associated with longevity are on the rise.

Changes in demographic and epidemiological patterns continue to contribute to unique patterns of aging across different countries. To address these issues, researchers have begun to develop several indices that can be used for such cross-national comparisons of aging processes. Developing accurate health and social indices for countries may inform future research, policies, and action (UNDP, 2015). For instance, global quantitative measures could aid in the classification of countries based on existing risks associated with key domains that affect older people's wellbeing that may prove to be highly valuable for creating interventions or policies that target policy areas, such as affordable health care and pension plans.

The Global AgeWatch Index (GAWI) is a measure that ranks countries according to the wellbeing of their older adults. While the GAWI has been constructed using different domains of wellbeing, no indicator of gender inequality has been included. This research will include indicators of gender inequality to reformulate the GAWI to determine the effects of this reformulated index on the wellbeing of older adults among the 96 countries for which there is comparable data. The following sections will describe indices of wellbeing and the purpose of the current study. The research questions will be presented at the end of this chapter.

1.1. Country-level Indices of Wellbeing

Several index measures have been recently designed by researchers and policy makers over the years to assess the social, health and economic wellbeing of individuals (youths, general populations, and older adults) across diverse populations. The John A. Hartford Aging Society Index was developed by researchers from Columbia University's Mailman School of Public Health and University of Southern California Schaeffer Center for Health Policy & Economics, with the support of The John A. Hartford Foundation (Columbia University, 2017). The John A. Hartford Aging Society Index measures health and wellbeing of aging populations; is composed of five domains of social and economic indicators that reflect the status and wellbeing of older persons in a country; and can be followed over time and used to compare nations. The domains of the John A. Hartford Aging Society Index are productivity and engagement, well-being, equity, cohesion, and security. The rationale behind the index is that it offers a shift from sole focus on the characteristics of individuals and their immediate environments to one that includes a strategy for the entire society to successfully adapt to an aging population. However, the index was generated for only 30 countries, excluding the other 155 countries in the world due to lack of comparable data.

In addition, the Global Youth Wellbeing Index was developed by the International Youth Foundation to measure the effectiveness of existing youth programs. The Global Youth Wellbeing Index has seven domains (gender equality, economic opportunity, education, health, safety and security, citizen participation, and information and communication technology) and 35 indicators (Sharma, 2017). The 2017 Global Youth Wellbeing Index includes details on each country to assist policy makers, corporate investors, foundations, multilateral institutions, and donor countries to identify where previous youth-focused investments have been effective and where new resources are urgently required. The index identifies sectors where investments are presently required to ensure the current generation of youth can thrive in a world with increasing challenges.

Furthermore, the Gallup Global Well-Being Rankings developed by The Gallup-Healthways (2014) provides an overview of global citizens' well-being based on a survey of people in 145 countries and areas. The Global Well-Being Index focuses on the feelings and experiences of people about their daily lives and measures well-being across five elements: purpose, social, financial, community and physical. Response of people

sampled are categorized as thriving, struggling, or suffering and countries are ranked based on the percentage of the population that is thriving in three or more elements of well-being.

The Canadian Index of Wellbeing (CIW) is a composite index developed by researchers at the University of Waterloo. The CIW (n.d) is comprised of eight domains that assess stability and change in the wellbeing of Canadians over time. The domains are community vitality, democratic engagement, education, environment, healthy populations, leisure, and culture, living standards, and time use. Also, the Centre for the Study of Living Standards, a Canadian non-profit organization that seeks to contribute to a better understanding of trends in productivity, living standards and economic and social well-being through research developed the Index of Economic Well-being, which was has four domains: Effective per capita consumption flows, net wealth stocks, equality in income distribution, and economic security (CSLS, 2017). This index measures the economic wellbeing for the Canadian provinces and 14 Organisation for Economic Co-operation and Development (OECD) countries using 24 individual indicators with in the four domains. As it focuses on economic wellbeing, this index excludes other domains of wellbeing such as health and the environment. Other countries outside the OECD are also excluded.

Two other index measures of wellbeing are the Human Development Index, created by the United Nations Development Programme (UNDP) (2015) and the Global AgeWatch Index (GAWI), designed by HelpAge International (2014) in the United Kingdom (UK). However, while the Human Development Index focuses on the dimensions and factors such as mean years of schooling and gross national income (GNI) per capita that affects the general population, it is not useful to estimate these factors for older adults.

Alternatively, the GAWI ranks and describes 96 countries in the world in terms of the social and economic wellbeing of their older population. The GAWI has four domains that have been identified to measure the wellbeing of older persons, including: income security, health status, capability (education and employment), and enabling environment (HelpAge International, 2014). Each domain has several components that make up the sub-index. Income security was measured using poverty rate in old age, pension coverage, living standards using GNI per capita as a proxy and the relative welfare of older people as indicators. Health status was assessed using life expectancy at 60, healthy life

expectancy at 60 and psychological wellbeing as indicators. The indicators used to measure capability in the Global AgeWatch Index are employment levels and education status of older people while enabling environment was measured with access to public transport, physical safety, social connections, and civic freedom (HelpAge International, 2015). The GAWI ranks 96 countries based on value obtained from the aggregation of the four domains. Switzerland, Norway, and Sweden are at the top of the index with rank values of 90.1, 89.3, and 84.4 respectively. Canada is ranked fifth with a rank value of 84.0. Mozambique, Malawi, and Afghanistan are the last three countries at the bottom of the index with rank values of 4.5, 4.1, and 3.6 respectively.

Given that the GAWI was developed to assess well-being among older adults and can be widely applied to a majority of both more developed and less developed countries, this thesis focuses on this index. This work assesses its usefulness as an indicator of social and economic wellbeing of older people and examines a method for making improvements in this index.

1.2. Rationale

The rationale for creating an index to measure the wellbeing of older persons is that they constitute unique groups in societies. Policy makers need to be guided by appropriate measures of health and wellbeing to prioritize interventions and programs for seniors. Measuring aging indices at specific time intervals can also assist in assessing the impact of interventions on the lives of older people on a comparative national scale. In addition, appropriate assessment of wellbeing is important for estimating effectiveness of development programs across countries towards the achievement of the sustainable development goals (SDGs). The SDGs are goals that have been set by the United Nations General Assembly in 2015 to ensure economic, social, and environmental equality as well as to protect the human rights of all persons regardless of country, gender or age group (United Nations, 2015).

Aging indices are usually computed with all relevant domains that have been shown to be significant in determining the health and wellbeing of older persons (Jackson et al., 2010, HelpAge International, 2014). Relevant domains that have been used for developing indices of wellbeing include health status, economic status, education, and safety. The domains are usually constructed with measurable indicators such as life

expectancy at birth, years of schooling, pension income and relative welfare. However, there is a gap in this literature that assesses the domains of the GAWI, in particular, whether it omits a gender-based domain.

1.3. Study Purpose

Indicators of gender inequality such as literacy gap, percentage of women compared to men in paid employment, low paid occupations, income gap, part-time work, mental stress of work-family conflict, work interruptions for family caregiving, and the burden that may result from family caregiving have been shown to influence health outcomes and wellbeing in the society (Cool, 2010; He et al., 2016; Turcotte, 2011; Vincent, 2013; Vlassoff, 2007). Often, these gendered forms of inequality are cumulative over the life courses of women resulting in lower wellbeing in later life because of economic security (lower incomes, lower pensions benefits, etc.). Moreover, cummulative discrimination, marginalization, isolation, and other factors can affect wellbeing and are not captured in the current GAWI domains (HelpAge International, 2014; O'Rand, 2016). Therefore, the purpose of this research is to develop and incorporate a domain of gender equality in the GAWI. Thus, the resulting ranking of countries based on the new indices can be compared with that observed for the original GAWI.

Based on existing evidence that female gender inequality measures influence the social and economic wellbeing of individuals and populations, it is important to assess how these measures affect the GAWI. It will be contended that inclusion of available measures of female roles related to female labour force, fertility rate, and age at first marriage comprise a domain that captures some of this gendered inequality.

1.4. Research Questions

The research questions that this thesis intends to answer are:

i.   To what extent does the inclusion of a gender inequality domain (comprised of female labour force participation, total fertility rate and age at first marriage) affect the GAWI?

ii.   How does the creation of a gender inequality domain change the ranking of countries on the GAWI, and

iii.   Does the revised measure produce ranking that have face validity (compared against available social gerontological and demographic literature)?

Chapter 2.

Theoretical and Conceptual Frameworks

This study is guided by the social determinants of health model while using feminist gerontological theory (Arber & Ginn, 1991; Hooyman et al., 2002; Ray, 1996) and the cumulative advantage/disadvantage (CAD) theory (Ferraro & Shippee, 2009) to elucidate the importance of gender equality on the social and economic wellbeing of older adults in different nations.

2.1. The social determinants of health

The social determinants of health model describes the way social, economic, environmental, and political factors affect the health of individuals in a specified population. Dahlgren and Whitehead (2007, p.11) depicted the model as a construct of factors surrounding a core of personal unmodifiable traits such as age, sex and constitutional factors (figure 1). Individual lifestyle factors, social and community networks, education, work environment, living conditions, unemployment, general socioeconomic, cultural, and environmental conditions, cover the next layer around this core.

The GAWI is based on the premise that social determinants of health and wellbeing play a significant role in how seniors experience the aging process. The four domains of income security, health status, capability and enabling environment are factors that are shaped by the social and economic status of seniors living in a country, and therefore affect their wellbeing.
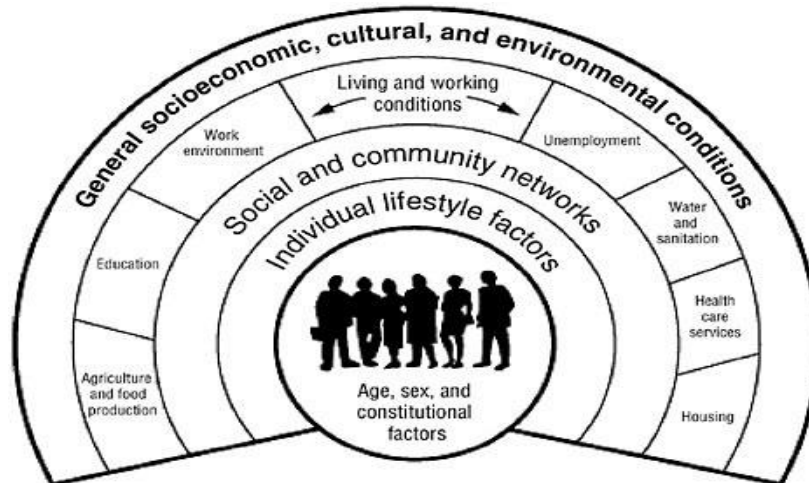
Figure 1.   Social determinants of health (Dahlgren and Whitehead, 2007, p.11)

For instance, the sex of an individual has been theorized to affect their health (Kalache et al., 2005). This may be because of different hormones and organs that are peculiar to men and women. These hormones may have an effect specific to organs in the human body. Oestrogen secretion in females might play a role in the development of breast cancer in later life while testosterone secretion in males might affect their chances of developing prostatic cancer (Risbridger et al., 2010). An interaction may occur between gender-specific hormonal and genetic factors, as well as restrictions in accessing care in such a manner that overall heath is affected. For example, an uneducated and unemployed pregnant woman who lives in a village, far from any healthcare services, has a higher risk of being a victim of maternal mortality. Gender inequality is prevalent in many countries and it exists in form of biases in opportunities, remuneration, feeding pattern, resources, entitlements, and values (Marmot et al., 2008). These biases negatively impact the wellbeing of women

The knowledge, attitude, and practices of individuals over the life course are likely to affect their health. Personal behavioural or societal values adopted by individuals may contribute to their health in old age. The access to resources and basic amenities that support a high quality of life also influences the health of older adults. For example, lack of access to basic amenities associated with poverty often leads to severe deprivation of basic human needs such as nutritious food, safe drinking water, shelter, healthcare and sanitation facilities.

Constitutional, socioeconomic, communal, and environmental factors have been linked to the status of health of an individual or community. Age, gender, education, work,

and income can influence the health of older persons. In addition, the effects of the socioeconomic factors can be modified, augmented, reduced or unchanged by other social factors. The opportunities and risks that people face is determined by their location. Socio-economic characteristics often depend on the standard of living associated with a country or region within a country. People living in poverty are more likely to be plagued with poor physical, mental and social health when compared with the wealthy. The association between poverty and poor health status has long been shown by researchers from various environments. This association exists in all regions of the world as a relative phenomenon that is dependent on the educational level or social class of the different people in a community.

The places, community networks and housing that people inhabit also affect their health. People in countries with urban housing with clean water, electricity, sanitation, social cohesion, and safety resources are more likely to be healthy in comparison with those in resource poor countries. For example, 10% of the population of Uganda live in urban areas while about 100% of people in Belgium are urban residents (Marmot, 2008). This may be relatable to the average life expectancy of 60.4 years in Uganda for both sexes compared to a life expectancy of 81.4 years in Belgium (UN DESA, 2017). Access to basic amenities, social protection and high standard of living is more likely in HICs than LMICs. Higher mortality rates have been recorded among populations with undesirable level of access to sanitation and health services. While residents of LMICs are often have poor access to health care, it is likely that other social determinants such as education, cultural and environmental conditions contribute to mortality rates in cooperation with economic factors.

A safe and supportive work environment that is free of bias and discrimination fosters personal development, self-esteem, and financial security. Stable employment conditions are associate with physical, social, and psychological wellbeing (Benach and Muntaner, 2007). Indecent working conditions are unfavourable to the wellbeing of workers and increase the level of stress. HICs have employment policies that support improved working conditions (Marmot, 2008). Such policies ensure workers are treated fairly and lower their exposure to occupational hazards as well as work-related stress.

Furthermore, the risks of diseases are strengthened in older persons who experience malnutrition because they poor and unable to afford an adequate diet (Krondl

et al., 2008). The risks are also likely to be higher if they are uneducated and are unaware of disease prevention and health promotion strategies. They may be unable to access the appropriate information that can aid their health or help when they are ill. Such older persons may have a higher tendency to report a low level of health.

Health inequities exist between and within countries; are unjust and preventable. To eliminate health inequities, the socioeconomic gaps between different categories of people should be bridged. The conceptual framework for this research directs our attention to how the health statuses of older adults might differ depending upon their constitutional and socioeconomic circumstances. This model of the social determinants of health is therefore an appropriate guide for assessing the effects of gender inequality on the wellbeing of older adult.

2.2. Feminist gerontological theory

Feminists acknowledge that gender oppression cannot be definitely separated from other forms of discrimination by race, class, and age due to the intersection of multiple social and economic constructs (Hooyman et al., 2002). However, the issues around gendered inequalities in the labour force are stacked against women. It is crucial to draw from the life experiences of women due to the deprivation and prejudice that shape their life experience and affect their wellbeing in old age. Generally, feminist gerontologists such as Ruth Ray, Virginia Richardson, and Christine Saulnier focus on intersections of relations of gender inequality with age (Calassanti, 2010; Garner, 2014). Central to feminism is the notion that women are systematically subordinated and stereotyped in such a way as to relegate their rights to self- determination. Feminist theory defines the forces that support inequality, oppression, and injustice, while promoting the pursuit of equality and justice (Arber & Ginn, 1991; Hooyman et al., 2002; Ray, 1996). This approach also helps to understand the role of gender inequality in shaping the quality of life of women that in turn affects the general wellbeing of the older adults in a population.

There is no isolated "woman" or "man" that is being considered in the context of inequality, and the systemic discrimination of women involves an intersectionality of sex, race, ethnicity, class, sexuality, nationality and other socioeconomic factors. The tendency of women to be exposed to lower income, low level of education, burden of caregiving, lower labour force participation, discrimination, stigma, violence, and harmful cultural

practices in comparison to men contribute to gender inequality and as well affect the health and wellbeing of the aging population (Mikkonen and Raphael, 2010).

Furthermore, feminist theory can explain how women have traditionally been cast in the role of homemaker, burdened with the responsibility of providing care for family members without the option of negotiating their role. While homemaking may not necessarily be an issue because it can be viewed as a historically and geographically specific middle-class construct, the problem is a disproportionate allocation of heavy domestic work to women. The domestic work is unpaid and undervalued; and when women engage in paid work, they earn less than men.

Rigid family structures ensure women are socialized to be traditionally responsible for various gendered roles such as caregiving, procreation and home making rather than allowing them to be engaged in education and paid employment (Mackinnon, 2009). Wives, sisters, and daughters often have to provide care by default or are directly chosen by other members of the family to do so especially in developing countries (Gerstel and Gallagher, 2001). In some countries, women tend to be apportioned the role of household management while men are expected to follow a career path, become the primary breadwinner, and secure a source of income for the family (Allen et al., 1999; Ruppanner, 2008). From a feminist perspective, the role of homemaker, except when taken up solely by choice, prevents equality by creating a rigid stereotype of caregiving as the traditional role of women (Mackinnon, 2009). Women have traditionally been cast in the role of caregiving without adequate consideration for their opinions and welfare. Depending on ethnicity and cultural values, women are often in rigid family structures where they are presumed to be responsible for the provision of emotional support for all members of the family even when they must also fulfil the demands of paid job.

The distribution of men and women into social and economic roles is the root of broader gender role inequality. This distribution predicts that rewards accrue when people align with the presumed characteristics apportioned to their identity (Porter, 2010). It is likely that this identity is more differentiated in certain countries than others. In countries where gender inequality is prevalent, evaluation results when characteristics misalign with gendered role demands and it is difficult for women to raise an opinion. Gendered social and economic role allocation results in inequities (e.g., in terms of power and privilege) and these disparities are particularly pronounced in certain countries.

Gerontologists have emphasized the importance of viewing the effect of sociodemographic differences on the society with a gender lens. Gender is conceptualized as a dynamic relation between men and women by which they acquire resources and determine their responsibilities (Calasanti, 2010). In the context of old age experiences, the differences between men and women and the separation of gendered roles often affect individual social, financial and health statuses. The overall orientation of people as they age depend noticeably on societal expectations based on their gender. In addition, the distribution of roles between men and women depend on generally accepted norms in the society.

Gender disparities in health are modified along the life course based on trajectories of events to which individuals are exposed. Such events are experienced while performing occupational and household tasks and are engrained in societal norms. People live by cultural values that exist in their environment regardless of the harm such a stance may pose to the wellbeing of women. Moreover, the precursors and risk factors for physical and mental illnesses are often not easy to pinpoint and are usually complex. For example, men and women working in the same establishment and in similar roles may have different occupational health issues. The gender differences are not restricted to the workplace but also exist in the lifestyles of men and women throughout the life course. Compared to men, women have greater psychological distress due to the way they combine employment with other responsibilities (Moen and Chermack, 2005). In addition, employed women are more likely than men to feel overwhelmed by the amount of work that they do despite the likelihood of women to work for more hours and perform many tasks at the same time.

Each society has inherent expectations from men and women according to their gender. Paid job roles, informal caregiving, authority, and dominance are invested in people are often pointers to inequities. In communities, the inequalities in access to social and material resources that pitches the advantage towards males are often sustained by the population who feel naturally obliged to keep the norm even at their own expense (Calasanti, 2010). In a patriarchal setting, a woman's femininity may be regarded as too delicate to work in a capacity that is generally associated with men. Relegating females to positions deemed suitable for the 'weaker' sex in such societies reduces the ability of women to earn a similar living wage and acquire comparable pension. Therefore, gender gaps in remuneration are primarily due to the apparent segregation of women into low

paying jobs with little chance of promotion. The ratio of female-to-male income for full-time workers is about 0.72 in 2010, indicating the gender gap in earnings (Proctor, 2016). The ability of women to build a career and rise along the ranks of employment is further jeopardized by the expectation of society that they raise children, take care of the home, and provide informal care to ageing parents and in-laws (Gerstel and Clawson, 2014).

The gendered nature of work and personal obligations influences the ability of women to meet the demands and resources at various stages of their lives. The demands of family and work on women are huge and may make them report their work as more stressful, less rewarding with lesser income and time for leisure. These gender disparities in opinion about work experience reflects the inequalities and differential social pressures in the workplace and are shaped my multifactorial institutional forces (Moen and Chermack, 2005).

Furthermore, gender inequalities persist in many communities because they are taken for granted and go unchallenged. People often overlook subtle sexist attitudes that are naturally implanted as a component of society. For example, new mothers usually leave their jobs to nurse their babies and are expected to continue nursing for up to two-three years regardless of their desire to resume their careers or arrangement for a baby-sitter. In essence, there is a systemic discrimination against women that increases their risk of financial insecurity as they grow older. The poverty rates of old women (11.9%) is about twice that of old men (6.7%); a reflection of the median income of older men and women (Calasanti, 2010). Higher poverty rates are worsened by high prevalence of chronic illnesses and the stress of caregiving among women in old age. Despite the personal pressures, older women are likely to continue their gendered roles in the family and society out of instinct to maintain their mother status. Societal norms and practices in some countries continue to separate men and women into the breadwinner and homemaker categories respectively and research continue to explore the how gender inequality, societal roles, relationships, and health are interwoven to produce life-changing personal and communal effects later in life (Moen and Roehling, 2005).

2.3. The cumulative advantage/disadvantage (CAD) theory

The concept of cumulative advantage/disadvantage (CAD) underlies a life course perspective as a mechanism for creating inequities in old age (Ferraro & Shippee, 2009).

Cumulative advantage/ disadvantage is a process in which inequality is accumulated due to constraints, whereby individuals in certain strata of the society are deprived of some benefits relative to others (O'Rand, 2016). The CAD theory predicts that the overall effects of past events increases over time in stratified systems. For example, there is a disparity in the timing and level of educational achievements between men and women and this disparity is a significant determinant of inequality in old age. A female child that is deprived of formal education due to her parent's low socioeconomic status or cultural beliefs has a greater tendency to develop into a poor unemployed woman with a low quality of life compared to her educated counterparts. In addition, individuals living in low income countries may have a lower quality of life compared with those in high income countries due to poor access to quality healthcare, education, basic amenities, and welfare resources. These may be exacerbated for women. Hence, social systems in different countries generate inequality across the life course. For women, the correlates of gender inequality accumulate over time. In addition, gender inequality is multidimensional and is shaped by individual resilience, changes in available resources and human agency. National policies that encourage gender equality across all strata of the society will enable women to contribute to the wellbeing of families and the society.

The CAD describes the interdependent trajectories of inequality with age, across the domains of life such as gender, socioeconomic status, race, family, education, and health (O'Rand, 2016). CAD is a complex interindividual divergence in socioeconomic and demographic characteristics over time along the life course (Dannefer, 2003). The divergence is exhibited by cohorts of the population and is dependent on the factors to which they are exposed. As any cohort of the population ages, they are exposed to a range of factors that affect their physical, mental, and social wellbeing.

The opportunities and challenges a person has over the life course are associated with their lifestyle, behaviour, and social perceptions. The life time events strongly influence the aging process through a complex interaction of physical, psychological, social, and environmental factors. Different socioeconomic statuses, differential exposure to risk factors as well as the varying onsets and courses of chronic illnesses within aging cohorts result in different patterns of inequality. Furthermore, stratification of people into cohorts based on wealth, inheritance, community, occupation, and others along the life course creates a divergence in health status like social stratification. For example, educated people are more likely to have good physical, mental and social health

compared to the uneducated, and educational attainment decreases age-specific rates of morbidity, disability, and mortality among adults (O'Rand, 2016). Lack of education seems to foster a predisposition to ill-health; a situation that can be worsened by the presence of other risk factors. As discussed earlier, the occurrence of and exposure to risk factors may depend on the health-related programs and policies of individual countries.

2.4. Combining the social determinants of health, cumulative disadvantage, and feminist lens

The social determinants of health framework can be synthesised with the cumulative disadvantage model and feminist gerontological theory. Social determinants like gender, individual lifestyle factors, education, income, community networks, and living conditions, interact together in different contexts of advantage or disadvantage over the life course. The intersectionality of these factors determines the level of inequality between men and women.

Perpetual sexism and discrimination against girls and women in some countries limit their chances for education, competitive careers, and wellbeing in comparison to other countries. The disadvantages of discrimination against women are huge where the gender bias is unresolved and persistent for a long time, over the life course. Lower levels of education will result in higher levels of impairment among women than among men; a phenomenon termed the resource substitution hypothesis (Ross and Mirowsky, 2010). Resources can substitute each other although the substitute may not be as effective. Hence, when women are less educated than men, they acquire alternate resources which may not be as beneficial. On the other hand, the advantage that men have is often reinforced by similarly good opportunities.

Where males are prioritized over females in terms of educational and occupational opportunities, men continue to develop their skills and get ahead in employment and/or career. Women who have been subjected to deprivation over the life course would have less social security in old age and at the point of retirement. Thus, persistent gender inequality affects the wellbeing of young as well as older women.

Furthermore, cohorts of older adults from different countries have a diverse background. They are different in terms of ethnicity, culture, environment, and life course-

experiences. Ethnic values, cultural practices and environmental exposures offer different health experiences. For example, a cohort of women in Chad might have been exposed to harmful traditional practices such as female genital mutilation, subjugation of women, and exemption from formal education., while a similar cohort in Switzerland were not exposed to harmful practices. The cumulative experiences of the different cohorts of women in the different countries over the life course would affect their life-time opportunities and wellbeing later in life. These experiences are in turn shaped by the accumulation of risk, available resources, and human agency.

2.5. Summary

Gender inequality in labour force participation can alter the effects of social factors on the wellbeing of a nation's older citizens. The interplay of gender inequality with the domains of income security, health status, capability (employment and education), and enabling environment on wellbeing of older persons is depicted in figure 2.
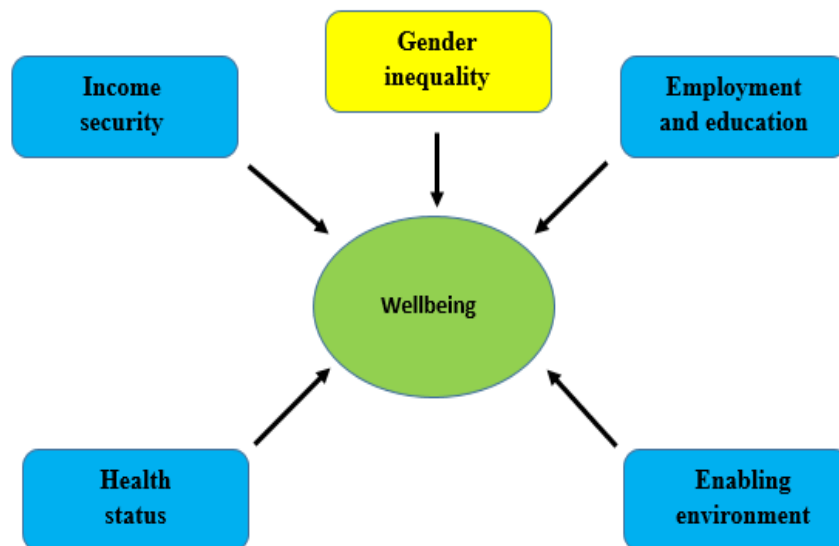
Figure 2.   Interplay of gender inequality on wellbeing of older persons

From a feminist perspective, power relations place women at a disadvantage compared to men. Societal arrangements that discriminates against girls and women over the life course may lead to marginalization, poor health, and wellbeing in old age (Calasanti, 2004). Trajectories of discrimination against women might also be in the form of lack of social networks, poor access to medical care, and significant emotional strain. Girls and

women are not given as much opportunity as men to express their opinions and potentials. They are also often less educated and underrepresented in the labour force, further reducing their chances of earning an income comparable to their male counterparts. Even when they are equally qualified, institutionalized discrimination ensures women work fewer hours or are paid less. They also tend to have a smaller pension contribution and coverage (He et al., 2016). In addition, the underrepresentation of women in the labour force reduces the total number of citizens available to generate a national income and the population of women who would contribute to national development as well as the pension pool. All these would create a deprivation in terms of the available resources for the nation, particularly for the population of older persons. The quality of life and health of older adults thus vary by their location in a network of inequalities (Calasanti, 2004). Countries with higher fertility rates would also have higher dependency ratios that usually imply greater pressure on the productive population as well as the existence of an imbalance in productivity and consumption. Fewer number of persons are available to contribute to a nation's productivity and this can limit the improvement in social and economic conditions for the population.

Therefore, gender differences in the accumulation of risks for illness along the life course are assumed to influence how women will fare in health compared to men. In addition, cumulated negative social influences on women also determines how healthy the society will be, including the population of older people. The theoretical basis for this research provides a comprehensive way of examining the different dimensions of wellbeing.

Chapter 3.

Literature Review

3.1. The GAWI

This chapter begins with an overview of the GAWI, including a description of all domains and indicators. It follows with the detailing of the objectives, methodology, weighting for indicators, data interpretation, research support, and gaps of the GAWI. This chapter will also discuss other available gender-based indices, as well as the importance of female labour force participation, fertility rates, and age at first marriage on wellbeing in later life. A summary of research objectives is provided at the end.

3.1.1. GAWI overview

The Global AgeWatch Index (GAWI), generated by HelpAge International, is the first composite index that uses a framework of recent comparative and quantitative data available internationally to measure the economic and social wellbeing of older people in various countries (HelpAge International, 2014). GAWI is based on different indicators of wellbeing of older adults; it was produced to facilitate international comparative research on the wellbeing of older people; and intended to be an important research framework for policy makers and practitioners to help identify data and knowledge gaps on issues of ageing.

The GAWI was produced as part of HelpAge International's Global AgeWatch Program; aimed at analyzing data on ageing to facilitate research, exposing gaps in elder care policy, and enhancing capacity building of policymakers on ageing. The second and latest edition of the GAWI was released in 2015 after making several improvements on the initial GAWI created in 2013. The index has 13 indicators for which data were obtained from international databases such as the World Health Organization (WHO), the International Labour Organization (ILO), the World Bank, Barro and Lee, and Gallup (HelpAge International, 2015).

The GAWI has been described as "a work in progress" with HelpAge International aiming to improve its content and methodology over time as more relevant data become

available and feedback is obtained from all stakeholders. For example, the unavailability of age-disaggregated data on older adults for all countries is a gap that can be filled by governments and researchers. The theoretical framework of the GAWI is based on scientific evidence from existing literature supporting the association between several indicators and the wellbeing of older adults. Multiple indicators are required for estimating wellbeing because it is multi-dimensional.

The indicators, all outcome indicators provide a view of the current generation of older people. In addition, the data for the indicators are publicly available international databases. The indicators used in calculation the GAWI have been categorized into four main domains: (1) Income security (2) Health status (3) Employment and education and (4) Enabling environment.

The income security domain has four indicators: Pension income coverage, poverty rate in old age, relative welfare of older people, and GDP per capita. Data on pension income coverage, poverty rate in old age and relative welfare of older people were based on direct indicators of personal wellbeing of older adults in the different countries and were obtained from the World Bank and the Organization for Economic Co-operation and Development (OECD). GDP per capita is a proxy measure for the standard of living of people in a nation and data on GDP for the countries were sourced from the World Bank.

Furthermore, life expectancy at 60, healthy life expectancy at 60, and relative psychological wellbeing are the three indicators constituting the GAWI domain of health status. Data on life expectancy at 60 were sourced from the WHO Global Health Observatory Data Repository, healthy life expectancy at 60 from the 2010 Global Burden of Disease Study of the Institute for Health Metrics and Evaluation, while data for relative psychological wellbeing were obtained from results of the Gallup WorldView.

The capability domain has two indicators of employment and education. The domain was constituted using information on employment rate and educational attainment of older adults. The employment rate among older adults is measured as the percentage of the population aged 55-64 that are employed; a proxy for the economic empowerment of older people and measures their access to the labour market, wages and pension. Data on employment rate was obtained from the International Labour Organization.

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Furthermore, education attainment is measured as the proportion of the population aged 60-plus with secondary or higher education; a proxy for lifetime accumulation of skills and competencies in older adults. The data on education was obtained from Barro-Lee educational attainment dataset(ref).

The fourth domain of the GAWI is that of enabling environments that was measured using indicators of enabling features prioritized by older people in the environments they live in. The indicators of the enabling environment domain are social connections, physical safety, civic freedom, as well as access to public transport, and the data on them was obtained from Gallup Analytics. A description of the indicators constituting the enabling environment domain is given in table 1.

Table 1:   The indicators of the enabling environment domain

Indicator	Description
Social connections	Percentage of people aged 50-plus who responded "yes" to the survey question: "If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?"
Physical safety	Percentage of people aged 50-plus who responded "yes" to the survey question: "Do you feel safe walking alone at night in the city or area where you live?"
Civic freedom	Percentage of people aged 50-plus who provided a positive response to the survey question: "In this country, are you satisfied or dissatisfied with your freedom to choose what you do with your life?"
Access to public transport	Percentage of people aged 50-plus who provided a positive response to the survey question: "In the city or area where you live, are you satisfied or dissatisfied with the public transportation systems?"

3.1.2. GAWI Objectives

The main objectives of the GAWI are:

1. "To improve the quality of life and wellbeing" of older people. By comparing country rankings, policy makers may identify effective strategies that will improve the socioeconomic situation of older adults in various countries.

2. "To highlight successes and shortcomings of strategic responses to population ageing challenges."

The relative positions of various countries on the GAWI table of rankings may indicate how well they are able to implement policies that support population aging.

3. "To stimulate demand for and supply of sufficient age- and sex-disaggregated data as necessary to study policy-relevant topics on ageing".

3.1.3. GAWI Methodology

The methodology used in the aggregation of indicators initially into domains and eventually into the aging index involves:

a. Expressing all indicators as positive values such that the higher the value, the higher the ranking of the country and the higher the level of wellbeing of its older people.

b. Normalizing all indicators such that each indicator value fall between 0 and 100, using the following formula:

$$\text{Normalized indicator} = \frac{(\text{actual value} - \text{minimum value})}{(\text{maximum value} - \text{minimum value})}$$

Normalization involved only the 96 countries included in the GAWI. The lowest and highest values used in the normalization calculations are adjusted slightly to avoid zero values.

3. The application of Weights to the indicators based on their relevant importance (details below). The indicators were then aggregated into a domain by calculating the geometric mean.

4. Normalizing the domain scores by using the formula:

Normalized domain value = (actual value – minimum value)

$$\overline{\hspace{5cm}}$$

(maximum value – minimum value).

This approach of normalizing the domains reduces the influence of scale differences on the final index score.

5. Aggregating the normalized domain values in step 4 above to determine the index score for each country. The aggregation of domain scores, with equal weighting was also done by calculating the geometric mean of the individual normalized domain scores for all 96 countries.

3.1.4. Choice of weights for GAWI indicators

Weights were applied to the indicators of the GAWI according to their perceived relative importance to the wellbeing of older adults in their specific domains (HelpAge International, 2014). Weighting also depended on the quality of data available for the indicator. While weights were applied to indicators in the calculation of domain values, the domains were considered equal and no weighting was applied in aggregating the domains for a final index calculation. The weights applied to the indicators in each domain are described in table 2.

Table 2.   Weights for GAWI indicators

Domain	Indicator	Weight	Weight percentage	Rationale for weight
Income security	Poverty rate in old age	Half unit	20	capture the same perspective
	Relative welfare of older people	Half unit	20	
	Pension income coverage	Full unit	40	
	GDP per capita	Half unit	20	Compromise indicator meant to reflect standard of living
Health status	Psychological wellbeing	Half unit	20	Available data incomplete
	Life expectancy at 60	Full unit	40	
	Health-adjusted life expectancy at 60	Full unit	40	
Education and employment	Employment			
	Education			
Enabling environment	Social connections	Full unit	25	
	Physical safety	Full unit	25	
	Civic freedom	Full unit	25	
	Access to public transport	Full unit	25	

3.1.5. Interpreting the data

The GAWI rankings (figure 3) show how countries are positioned relative to each other in terms of the wellbeing of older adults. The calculated index values for the countries indicate the level of wellbeing of older people living in them. A difference of 10 or more

points in index values between countries is deemed significant statistically (HelpAge International, 2015).

1. Switzerland	21. Chile	41. Vietnam	61. Croatia	81. Ghana
2. Norway	22. Czech Republic	42. Mauritius	62. Dominican Republic	82. Honduras
3. Sweden	23. Estonia	43. Armenia	63. Lithuania	83. Lao PDR
4. Germany	24. Belgium	44. Ecuador	64. Belarus	84. Morocco
5. Canada	25. Spain	45. Romania	65. Russia	85. Jordan
6. Netherlands	26. Slovenia	46. Sri Lanka	66. Serbia	86. Nigeria
7. Iceland	27. Uruguay	47. Malta	67. Bangladesh	87. Iraq
8. Japan	28. Costa Rica	48. Peru	68. Montenegro	88. Uganda
9. USA	29. Georgia	49. Bulgaria	69. Paraguay	89. Rwanda
10. United Kingdom	30. Cyprus	50. Philippines	70. Nepal	90. Zambia
11. Denmark	31. Argentina	51. Kyrgyzstan	71. India	91. Tanzania
12. New Zealand	32. Poland	52. China	72. Mongolia	92. Pakistan
13. Austria	33. Mexico	53. Albania	73. Ukraine	93. West Bank & Gaza
14. Finland	34. Thailand	54. El Salvador	74. Indonesia	94. Mozambique
15. Ireland	35. Latvia	55. Bolivia	75. Turkey	95. Malawi
16. France	36. Colombia	56. Brazil	76. Venezuela	96. Afghanistan
17. Australia	37. Italy	57. Nicaragua	77. Moldova	
18. Israel	38. Portugal	58. Tajikistan	78. South Africa	
19. Luxembourg	39. Hungary	59. Guatemala	79. Greece	
20. Panama	40. Slovakia	60. South Korea	80. Cambodia	

Figure 3.   **GAWI country rankings (HelpAge International, 2015, p4)**
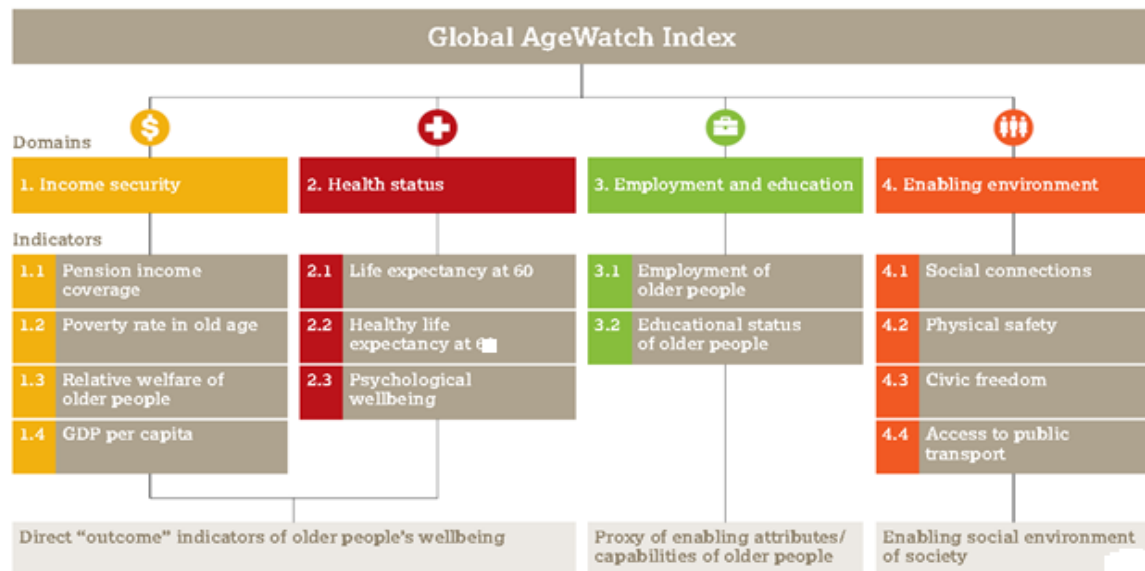
Figure 4.   **Indicators and domains of the GAWI (HelpAge International, 2015, p7)**

The GAWI assesses health and socioeconomic domains that are indicators of the wellbeing or quality of life of older persons in a country. However, it does not include direct or indirect indicators of gender inequality in a country, other than overall economic indicators such as GDP that might be affected by female roles in that society. However, factors that reflect the role of women have been shown to influence aging. For instance, according to He et al. (2016), assessment of data on China and India, countries with the largest populations in the world, shows that women are significantly lagging when compared with their male counterparts in terms of employment, pension coverage, as well as self-reported health. Similar disparities in labour force participation, health status and social welfare has been observed for several other countries of the world (Navarro & Shi, 2001). Women also face institutionalized and societal discrimination, marginalization, and higher poverty rates especially in LMICs (Mikkonen & Raphael, 2010). It is therefore important to consider gender segregation of data and analyses that focuses on health of seniors or the general population; because gender inequality in a country is not fully captured by GAWI indicators, such as GDP, pension coverage, poverty, welfare, and overall labour force participation. Gender inequality also has a significant effect in reducing the pension coverage of women in comparison to men. Women in a setting where gender inequality thrives are more vulnerable to deprivation, marginalization, and prejudice, which further limit their ability to express their potentials in the society. Thus, these issues associated with gender inequality require a critical consideration for appropriate policy-making and interventions.

3.1.6. Research support for GAWI domains

The design of the GAWI depends on indicators that are organized into four domains. The indicators for each domain of the GAWI are scored, weighted, and used to calculate a domain score. The weights assigned to different indicators in each domain were based on the authors' perception of relative importance of the indicators in the domain as well as data quality. The domain scores were subsequently aggregated to derive the overall index for individual countries. This final index is the geometric mean of the four domain scores, weighted equally.

There has been limited research using GAWI since it is a recent measure. HelpAge International (2015) uses the index to provide information on inequalities in health, education, and income levels of older adults in different countries, so policy makers can

work towards bridging the gap and meet the sustainable development goals of the United Nations. The ranking of countries in the index revealed that inequality in income, health and education of seniors is high comparing top-ranked and bottom-ranked countries. This inequality reflects high-income levels, health status, life expectancies and educational levels in the top-ranked countries when compared with the ones at the bottom. For example, Japan is ranked eighth on the index and its life expectancy at the age of 60 years is 26 years. In comparison, Afghanistan is ranked 96th on the index and has a life expectancy at 60 years of 16 years (WHO, 2016).

Moreover, this inequality is worsening. According to HelpAge International (2015), the average life expectancy in the 10 top-ranked countries was 5.7 years more than that of the bottom ranked countries in 1990, while this has increased to 7.3 years by 2012. Apart from life expectancy, the gap between the top-ranked and bottom-ranked nations is widening in terms of education and income. It is noteworthy that there is significant discrimination of women in some third world countries ranked at the bottom in form of restrictions from participating in the labour market, access to pension, lower earnings and savings thus increasing their risks of poverty compared to men.

In addition to aiding the comparisons of wellbeing of older adults among countries, the index is also aimed at creating a tool for measuring the success attained based on the objectives of the SDGs to ensure a universal approach that ensures the wellbeing of people of all ages including older persons. This wellbeing of older persons is considered a result of life exposures and experiences. Nations with adequate policies and practice that protect their citizens throughout their life span as well as support programs for all age groups have good indices for older persons (Yourman et al., 2012).

Several physical, social, and economic factors such as income, life expectancy, social connections, education, psychological wellbeing and relative welfare have been linked with health status and general wellbeing of individuals in old age (Kronenfeld, 2013). These factors have informed the classification of GAWI indicators into the domains of income security, health status, capability, and enabling environment. The domains are further discussed below.

Income security

Research has shown that income adequacy, level of education and having a job or the kind of occupation affects the health and socioeconomic status of a person as they age (Meyer et al., 2014). The higher the level of income, the better the status and quality of life of older persons; because they can afford healthy meals, preventive measures, and the comfort of a healthy living environment. They are also able to afford appropriate and prompt treatment for any ailment they might suffer from especially in countries where social health insurance is ineffective or where out of pocket expenditure is the major source of health care financing.

In addition, significant positive correlations have been shown to exist between health expenditure as a percentage of the gross domestic product (HGDP) and longevity among older persons (Kim, 2014). Adequate spending on health by a country would result in available healthcare services and a reduction in health inequities. Older adults in countries where health expenditure aims to increase accessibility to healthcare are likely to have an improved access and utilization of services, fewer complications of chronic diseases and lower risks of early demise. Although longevity does not necessarily translate into good health status, this association does indicate that higher health expenditure tends to keep people alive for a longer period.

Health status

Health has been consistently associated with general wellbeing (Tallini, 2011). The health status domain of GAWI has three indicators: life expectancy at 60, healthy life expectancy at 60, and psychological wellbeing. These indicators also correlate with wellbeing in some ways. Deaton (2008) argued that longer life expectancy might be the best single indicator of population health that gives people more opportunity to be more productive and fulfilled.

Research has also suggested that people who have optimal health are able to cultivate positive emotions. Positive emotions are an important determinant of mental health that influences subjective wellbeing (Fredrickson, 2000). In addition, biological and physiological processes sleep as sleep patterns and immune responses that are associated with mental health can partly determine wellbeing (Ryff, 2004).

Capability (education and employment)

There is an association between a higher level of education and a higher status of health (de Souza Braga et al., 2015). People who are well educated usually understand what they need to do or where they need to go to prevent an illness or to obtain adequate treatment options during an illness.

Furthermore, having a job also seem to help in maintaining one's physical, mental, and social health. The association between work and health seem to be a mutual one with being employed helping to maintain a good health status and being of sound health improving the chances of one being able to secure and maintain a job. Being employed gives a sense of satisfaction as one can earn a living, contribute to the society and engage in social interaction with co-workers as well as people outside work.

Enabling environment

Besides the impact of unemployment, environmental or work-related hazards may lead to severe or debilitating injuries that may affect the health and quality of life of a person as they age (Kim, 2014). The enabling environment is thus important for an optimal level of health and socioeconomic conditions. Older persons particularly face environmental and climate change-related health risks, but this is often overlooked in mitigation and planning for disaster management (Hutton, 2008). Seniors have functional limitations that make them particularly susceptible to the effects of heat waves, diminished air quality, drought, flooding, earthquakes, and extreme weather events (Frumkin, et al., 2012; Horton et al., 2010).

Other environmental factors such as poor housing conditions, overcrowding and lack of access to improved water supply or improved sanitation are directly associated with the risk of infectious diseases like pneumonia, tuberculosis, cholera filariasis and trachoma, as well as contributing to the physical and mental debilitation of chronic diseases through noise, air, land, and water pollution (Blas & Kurup, 2010). In addition, other hazards such as the dangers and instability created by civil unrest and wars also impact on the health of older persons more. These hazards as well as other social factors like migration, urbanization and changing social structures that may affect the wellbeing of older adults (Safa, 2012) are not represented in the GAWI.

Thus, the indicators used in GAWI seem incomplete and restricted as other important variables that have been proven to be associated with health status and wellbeing of older persons have been excluded. While most of these other variables are beyond the scope of this thesis, we will address two crude indicators of gender inequality – female labour force participation and total fertility rate. In a world where discrimination and gender differences create a significant impact on the health of women and their families, the index needs to be presented with consideration for the effects of gender inequality. This would help identify specific disadvantages affecting populations with gender bias that can be targeted with appropriate policy.

3.1.7. Gaps in the GAWI

HelpAge International (2015) identifies significant gaps in GAWI. These gaps include paucity of sex-disaggregated data for most of the indicators used in calculating the GAWI; and lack of data on certain indicators for some countries restricting the analysis to 96 countries. Furthermore, data for the GAWI indicators were sourced from international databases to ensure uniformity, comparability and some standardization. However, there is usually a lag period between the time of collection of data individual countries and when they are updated in international databases. For example, indicators of the health domain in the 2015 GAWI were not updated because more recent data were not available in international database at the time of the Index production. Therefore, older data were used in the 2015 ranking. National sources of data are usually more recent.

While the index data is publicly available, HelpAge International (2015) has clearly made the methodology, results, country rankings and limitations publicly accessible. This open approach ensures researchers can interpret and make relevant contributions towards an improved index that more accurately measure the wellbeing of older adults across countries.

3.2. Other available gender-based indices

Although the GAWI is not segregated by gender, there is a precedence for inclusion of the gender domain in other indices. This section describes the indices that have a gender component incorporated in their development. A gender component referred as the Gender Development Index (GDI) was included in the Human

Development Report in 1995 (Klasen & Schuler, 2011). GDI was incorporated into the HDI as a measure of gender equality and considers how the wealth, education and wellbeing of a nation is distributed between the different gender groups in the society. The indicators used in developing the GDI include income (estimated earned income), education (adult literacy rate and the combined primary to tertiary gross enrolment ratio) and life expectancy. However, the GDI is an integral part of the HDI and cannot be used on its own. The reliability of the GDI in measuring gender inequality has also been questioned due to paucity of internationally uniform data. Gender-segregated data on the indicators are often not available for all countries. In addition, the calculation of the GDI depends on estimating the life expectancy of women to be five years lesser than that of men. It is assumed that women would live five years longer than men. The criticism is that GDI should be designed to attain the same life expectancy for men and women if it is to promote gender equality. The income indicator in the GDI has also been debated to be weak because it does not include the value of informal care work chores often performed by women such as housekeeping, childcare, cooking, and caregiving (Klasen & Schuler, 2011). Also, the income indicator is over-dependent on Gross Domestic Product (GDP) and Gross National Product (GNP). While the GDP and GNP are good indicators of national income, they do not reflect the true gender differences in individual income. The GDI has also been criticized particularly for its complexity. The modelling and analyses employed in developing the GII involved complex, non-linear analysis that are difficult to interpret (Klasen & Schüler, 2011). In addition, it is difficult to extend the methodology used for the GII to other closely related statistical processes that are important for policy development.

As an alternative to the GDI, another gender component referred to as the Gender Inequality Index (GII) was incorporated into the Human Development Report in 2010 as a composite index for 190 countries (UNDP, 2015). The GII was constructed with empowerment, reproductive health, and labour market participation as indicators. Empowerment was assessed with measures that reflect a country's approach to gender equality and inclusion, including the proportion of seats held by women in national parliaments, percentage of women in managerial or professional occupations and the female share of earned income. In addition, gender empowerment as defined in the GII is limited to an outcome measure and does not include the household or domestic dimension (Cueva Beteta, 2006). To be a more accurate measure, empowerment should include all

of domestic, individual and political dimensions and should be treated as a process rather than an outcome.

Another gender-based index that has been used in monitoring gender inequality is the Duncan Segregation Index designed by Duncan and Duncan (1955) to assess whether there is a higher population of a group relative to another. The index is based on the principle of dissimilarity or segregation. It has been applied to measure whether there is a significantly higher population of one gender relative to the other in a particular occupation (Blau, Brummund, & Liu, 2013). The index determines the percentage of employed men (or women) who would have to change jobs for the job distribution of men and women to be equal. The value ranges from 0 – 100. Hence, the Duncan Segregation Index value is equal to zero when the proportion of women in an occupation is equal to the proportion of women in the entire labour force. It will be equal to 100% if the occupation is completely segregated.

Furthermore, the Global Gender Gap Index (GGI) is a framework developed by the World Economic Forum in 2006 (World Economic Forum, 2016). The GGI uses quantitative and qualitative data from the Executive Opinion Survey of the WEF to measure and track the extent of gender-based disparities across all countries (Hausmann, Tyson, & Zahidi, 2009). The indicators of the GGI include:

• Economic participation: including levels of male and female unemployment, economic activity, and remuneration for equal work.

• Economic opportunity: assessed with the duration of parental leave, availability of government-provided childcare, number of women in managerial positions, and wage inequalities between men and women.

• Political empowerment: measured using the number of female ministers, women holding senior legislative and managerial positions, years a female has been head of state, and the share of seats held by a woman in parliament.

• Educational attainment: including enrolment rates for primary, secondary, and tertiary education, average years of schooling and literacy rates.

• Health and wellbeing: assessed using adolescent fertility rate, percentage of births attended by skilled health staff, infant and maternal mortality rates, and effectiveness of governments' efforts to reduce poverty and inequality.

The deficiency of the GGI includes limited relevant data for the indicators in many countries and complex data requirements.

Apart from global and international gender-based indices, other measures have been developed or employed regionally or in individual countries to monitor gender inequality. In Canada, the Gender-Based Analysis Plus (GBA+) has been used to assess how people of different biological sex or sociocultural gender differences experience government programs and policies. It is aimed at ensuring that all persons regardless of gender identity benefit equally from government initiatives. This objective is based on existing evidence that points to gender inequality in education, health, and employment. The evidence includes differences in the income of men and women in Canada (87:100), as well as the gap in adequate women representation in top job positions (21.6%) (Statistics Canada, 2017).

In addition, the Africa Gender and Development Index (AGDI) was designed to measure progress towards gender equality in Africa (Economic Commission for Africa, 2011). It has been piloted in 12 African countries to help monitor the implementation of conventions that have been ratified to promote gender equality. The AGDI combines two tools: The Gender Status Index (GSI) and the African Women's Progress Scoreboard (AWPS). The GSI is a quantitative measure made up of 42 indicators that have been categorized into three equally weighted blocs: social power (capabilities), economic power (opportunities) and political power (agency).

The social power bloc of the GSI has two components: Education (measured by levels of school enrolment and dropout, and literacy levels of girls and women) and health (measured by levels of child health, new HIV infection and time spent out of work through illness). The economic power bloc consists of three components: Income (measured by women's income from agriculture, work, and cash transfers), time use or employment (measured by time spent in economic activities and in employment), and access to resources (measured by access to means of production and management positions). The political power bloc consists of two components: Representation in key decision-making

positions in the public sector and representation in key decision-making positions in civil society. The AWPS is a qualitative measure of the level of implementation of key women's rights and equality at the national, regional and international levels. The AGDI is designed for Africa and is not applicable to other continents.

All the gender-based indices described in this section have been developed for the general population. None of these measures is specific for assessing the gender-differences in the wellbeing of older adults, which is an important research gap that is worth filling. Considering the paucity on data for several indicators of wellbeing, a gender-inclusive index that is adequate for assessing the wellbeing of older people should be constructed from uniform measures that are available for all countries. While the GAWI is specific for older adults, its domains are restricted to income, health, capability (education and employment), and enabling environment.

Yet, recent research findings have pointed to the need to expand the index based on relationships between other population indicators such as infant mortality rates, maternal mortality, mental wellbeing, female labour force participation, elderly dependency ratio, health expenditure, access to improved drinking water source, improved sanitation facilities, air pollution, climate change and the wellbeing of the population including seniors (Falkingham & Namazie, 2002; Corvalan et al., 2005). While most of these data are not available for most countries, especially LMICs, a few of them show promise data on female labour force participation, total fertility rates and age at first marriage can be obtained for all 96 countries used in the GAWI.

3.3. The importance of female labour force participation on wellbeing in later life

The disparity between males and females in terms of opportunity for work, income, and social and economic wellbeing has been a focus of considerable research. Education, income, and labour force participation of men exceeds that of women significantly, especially in developing regions of the world (Cascio et al., 2015; Hill & King, 1995). Labour force participation is defined as all people who supply labour to produce goods and services during a specified period (World Bank, 2016a). This participation is one of the indicators that has been shown to affect the social and economic status of the population of any country.

Trajectories of low female labour force participation may include the mental or physical stress of family caregiving, a feeling of deprivation, marginalization, low pension coverage, and higher poverty rates. These factors may influence the health, social and economic status of a population over time especially as they age (Bloom et al., 2009). In addition, the model of the social determinants of health identifies how sociodemographic and economic factors shape individual lives in the different contexts of education, family, and work (Mayer & Tuma 1990). This can be used to describe the relationship between gender inequality in labour force participation, and the wellbeing of older adults in a population.

Gender has been shown to play a role in the nature or course of one's work career. Male and female workers have different schedule and duration of employment. The differences often result in a systemic bias against women in paid employment. Gender bias in employment creates barriers that hinder women from acquiring further skills necessary for improvement and job promotion (Moen & Chermack, 2005). Women tend to have fewer resources and opportunities required to promote high quality of life and wellbeing for themselves as well as older adults in their community.

In addition, educational and vocational resources that are accessible and made available to women are different from those of men. Systemic prejudices and biases stemming for the participation of women in multiple roles result in an advantage to men in terms of career advancement. Determining the different career pathways for men and women is important in understanding well-being in old age (Moen & Chermack, 2005). The susceptibility of women to stress because of multiple roles also threaten their mental health. Women are often times overworked and are not offered the opportunity to make choices and control their lives. In situations where paid employment is combined with informal caregiving roles, too many factors work against the ability to make desired choices. Without the ability to make choices and control one's career path, quality of life may be compromised.

Career trajectories have various effects on identity and achievement. These trajectories are influenced by gender roles. Along the life-course, female labour force participation is associated with women's health. Women who are employed in decent jobs with high pay grades have been shown to have a higher level of health and wellbeing. In a similar research, men who were laborers have a substantial risk of death than those who

are employed in professionals and managerial positions (Williams, 2008). Furthermore, the risk of dying is low for people employed who moved from manual jobs to professional or managerial positions. Men who worked in a series of unrelated jobs had a higher risk of early death than those with more stable jobs.

When men leave a position at their jobs, it is often through retirement. Men have a more stable schedule, allowing them to consistently work in the same profession for several years, often securing promotions along the line. However, women usually experience discontinuity in their career due to time taken off work because of childbirth and other family and caregiving roles (Moen & Chermack, 2005). As a result, women are more likely to have less years of full-time work experience as men. Women are likely to retire late if they have financial constraints or due to cost implications of caregiving. Conversely, women may retire early to create more time for taking care of family members.

Walters et al. (2002) carried out an analysis of the 1994 Canadian National Population Health Survey and found that, while women did not necessarily experience poorer health than men, there were minor differences in health patterns attributable to paid work. Another multivariate analysis of data from the Canadian National Population Health Survey by Denton et al. (2004) showed that gender differences in labour force participation are associated with the wellbeing of the population. In support of this, other researchers found some evidence women who are in paid employment are less vulnerable to poor health (Cai, 2010). Cai and Kalb (2006) also reported that labour force participation has a significant effect on improving the health of females over the life course. The cumulative advantage of females who can work has far-reaching implications (O'Rand, 2016). They can take care of themselves and their families while contributing immensely to the development of the national economy.

Furthermore, Lahelma et al. (2002) also found that women that are employed in paid work have better health. O'Rand (2016) argues that such advantages/disadvantages accumulate over the life course, significantly influencing their wellbeing and quality of life in old age. In addition, the health and wellbeing of women and their financial status may impact other members of their household. As the household grows and its members age, there may be significant interactions between labour force participation of women in the household and the wellbeing of older adults in the household. These interactions are manifested because participation is likely to bridge inequality gaps and thus improve the

general income and wellbeing of all the members of the household (Vissandjee et al., 2004).

Furthermore, an initial examination of existing data shows an association between a wide gender gap in labour force participation and the ranking of countries on the GAWI. For instance, the labour force participation of females 65 years and above is estimated in 2012 to be about 8.8% (17.1% for males) in Canada but up to 11.0% (42.0% for males) in Pakistan (He et al., 2016), while Canada ranked 5th on the GAWI and Pakistan 92nd (HelpAge International, 2015). Although Pakistan had a higher proportion of women in the labour force than Canada, the gender gap for employment is 31% for Pakistan and 8.3% for Canada. In addition, the labour force participation of Canadian women increased from 15.8% to 28.6% while that of Canadian men increased from 30.5% to 39.4% between 1997 and 2010 (Carrière & Galarneau, 2011). Canada thus have a narrower gender gap for employment and a better ranking on the GAWI. Therefore, working may translate into improved social, health and economic status, and greater wellbeing.

In sum, gender gaps in education, health, access to services and employment places women in a disadvantaged position compared with men. This gender gap predisposes women to accumulate deficits in chances for optimal quality of life over their life course. They may become more vulnerable and less resilient. Due to the important roles such as caregiving that women perform in many families, the cumulative disadvantage may also have a macro-effect on the wellbeing of the older population in the society.

The precursors of the gender inequality include fewer opportunities for economic gain, community status and workplace leadership. The inequality also initiates an accumulation of stress across different domains of life (Ferraro & Shippee, 2009) that affects the quality of life and wellbeing. This cumulative disadvantage is more conspicuous in some countries compared to others, and therefore surfaces as a crucial factor to be considered in a gender domain applied to a well-being index for older adults. These effects are in addition to the measures included in the GAWI. Therefore, this thesis will include this factor in a gender domain as an important determinant of the wellbeing of older adults.

3.4. The importance women's age at first marriage on wellbeing in later life

The age at which women first enter marriage determines the age of first pregnancy and childbirth to appreciable extents. Getting married often signifies the point at which commitment to family roles begin. These family roles such as home making, caregiving and child raising are usually carried out by women while men often progress in their respective employment and/or careers. Making a commitment to homemaker family roles often comes with various responsibilities that compete for one's time and the autonomy to make own decisions without considering a spouse is lost. In addition, the "marriage gradient" (Bernard, 1982) often exists because women tend to marry men who are older than themselves or who may have a superior socioeconomic status. This gradient further deepens inequities over the life course because women are likely to give up their jobs later in life to provide care to older-aged husbands.

In societies in which family roles are shared between spouses, the woman is relieved of the pressures and roles associated with raising a family. In patriarchal societies, men are often more dominating and may leave their spouses to be solely responsible for homemaking. For younger women and girls going into marriage early, the situation is magnified. Research has shown that child brides are often dependent on their spouses. They also have the tendency to drop out of school and have difficulty building a career (Mikhail, 2002). In addition, the higher the age at first marriage, the more likely it is for a woman to delay childbearing. Delaying the birth of a family's first child also strengthens their economic stability (Sonfield et al., 2011). Maintaining stable finances in a family in turn has positive effects on the physical and mental wellbeing of older adults (Diener & Biswas-Diener, 2002).

Therefore, it is important to consider the effects of female labour force participation, fertility rates and age at first marriage on the wellbeing of the older population. The GAWI provides an adequate template for measuring the wellbeing of older adults against female labour force participation, fertility rates and age at first marriage across countries.

3.5. The importance of fertility rates on wellbeing in later life

Other factors that have been associated with wellbeing of women are access to contraception, low fertility rates and wealth (UN 2013). Fertility is a crude but useful indicator of gender-specific roles of women in a society that may affect aging. Poor access to contraception by women of child bearing age has been found to be a social determinant of the health of women (Blas and Kurup, 2010). Indeed, women who can make decisions about their family size and have access to contraception are able to participate more in many roles outside of the home. This can result in higher participation in a range of activities that may enhance health and wellbeing, such as involvement in educational programs, improving their skills and knowledge to further pursue a career and compete for senior positions in their profession (Bloom et al., 2009). They are also able to bridge gender gaps in pension programs and overcome institutional marginalization (Duflo, 2012). In addition, lower fertility rates might allow families to accumulate more physical assets and allow older adults in households to have access to infrastructure that they would have otherwise had (Canning & Schultz, 2012).

Access to contraception and family planning is not the same in all countries and can determine how healthy, educated, or employable a woman will eventually be as one does not have many choices in planning their family if the options of contraception are withdrawn. Thus, different fertility rates across countries can influence many social roles of women that can in turn affect the wellbeing of older adults across nations.

In some countries, women have access to contraceptives and the freewill to delay pregnancy if they so desire. Having the freedom to delay pregnancy beyond the teenage years and early adulthood affirms a sense of control over self. In other countries with restrictions on access to contraceptives, it is often difficult to control or delay pregnancy (Peipert et al., 2012). Women's low access and utilization of contraception often results in a high incidence of unwanted pregnancies with the associated poor physical, mental and social health.

Multiple parity has significant health, social and economic implications. Medical complications could arise because of grandmultiparity, the birth of five or more children by a woman (Mgaya et al., 2013). The health effects of grandmultiparity include

malpresentation of the fetus, postpartum haemorrhage, and low birth weight, all contributing to poor maternal and child outcomes (Simonsen et al., 2013). Furthermore, some of the social implications include of high parity include overcrowding, exhaustion of available learning and social amenities, increased environmental pressure. Economic effects of multiparity are linked to the sharing of meagre family financial resources by many children, often resulting in poverty, hunger, poor education, and reduced chances of economic liberation.

Cultural practices and beliefs, such as male patriarchy in some countries also push more women into getting pregnant whether they want to or not. Such pregnancies would deprive the women and their families of optimal physical, mental, and social wellbeing. In addition, forcing women to procreate exemplifies another dimension of gender inequality in which they are unable to make a decision about their body and family composition. This also indicates the discrimination and deprivation that women experience over the life course (Duflo, 2012). High fertility rate has a negative effect on the life expectancy of persons in such countries (Bunch, 1997). It is also probable that fertility rates would influence the wellbeing of the older population in ways other than reducing labour force participation of women.

Certain cultures in some countries encourage women to give birth to a high number of children. Examples of such culture exist in societies where children are regarded as symbols of social status or where gender preference is encouraged with male children considered more valuable than females (Almond & Edlund, 2008; Gupta, 1987). Girls may not be allowed to attend schools and or follow lucrative career paths, and this may have a cascading negative effect into middle and old age. We therefore will consider fertility rates of countries as an additional indicator of gender inequality.

3.6. Summary of literature and goals of research

The GAWI is an essential measure for comparing the wellbeing of older people across countries. However, the index has some limitations including the exclusion of other domains that are vital in the assessment of wellbeing in the context of ageing. The overall objective of this research is to determine the effects of gender inequality on the wellbeing

of older adults using a reformulated GAWI. To fulfil this objective, an additional domain of gender inequality will be developed based on the female labour force participation, fertility rates and age at first marriage across the countries represented in the GAWI. The new domain will be added to the original four domains of GAWI (income security, health status, capability and enabling environment), and a new reformulated Global AgeWatch Index (rGAWI) will be developed. The rankings of countries on the GAWI and rGAWI will be compared to assess the effects of including the new domain.

Chapter 4.

Methodology

The chapter lays out the design, relevant data, measurements, calculations, analyses, and weighting involved in the formulation of the gender inequality domain and in the reformulation of the GAWI. The limitations of this study are also outlined.

4.1. Design

This cross-sectional study utilizes the principle of composite indexes based on an analytical framework of publicly available and comparable quantitative data. Secondary data on female labour force participation, total fertility rate and age at first marriage are combined into a new domain representing gender inequality that is subsequently used to reformulate the GAWI (rGAWI). The gender inequality domain is added to the original four GAWI domains of income security, health status, capability and enabling environment to generate a reformulated composite index. The new rGAWI index will be used to rank countries and the rankings were compared for the original and newly constructed indices. The rankings of the countries on the GAWI will be compared with that of the rGAWI to determine how the inclusion of the gender inequality domain affects the ageing index, an indication of the wellbeing of older adults in different countries. The gender inequality domain scores of different countries will also be critically assessed in relation to the new index (rGAWI) and rankings. In addition, the difference between the original and reformulated index values for each country will be assessed and compared.

4.2. Additional data

Data for the original four GAWI domains of income security, health status, capability and enabling environment were sourced from the latest index presented by HelpAge International (2015). The data used for calculating the original GAWI were originally collected between 2010 and 2014 by international agencies. Data on female labour force participation and total fertility were derived from the 2010-2014 World Bank database (World Bank, 2016a; World Bank, 2016b) and age at first marriage data were obtained from the United Nations Department of Economic and Social Affairs (UN DESA,

2000), which are an international and reliable data sources. These databases were selected because a preliminary assessment revealed that they tend to yield adequate and updated data for all countries in the world. However, the data collection and analysis will be restricted to the 96 countries included in the original GAWI so that comparative analyses can be made. Where a country had missing data for any of the variables of interest in the World Bank or UN DESA datasets, individual country data bank or the World Health Organization (WHO) Global Health Observatory were searched to fill such gaps to ensure adequacy for completeness and comparability of uniform data among countries.

Specific description of measures (HelpAge International, 2014, p22-25)

Table 3.   Indicators of the income security domain

Indicator	Purpose	Definition	Data source
Pension income coverage	Measures the existence and coverage of the pension system in a country	It is defined as the ratio of beneficiaries of pension programmes to the number of people aged 65-plus.	World Bank, OECD and Pension Watch
Poverty rate in old age	Measures the poverty of older people, using the relative poverty definition.	Percentage of people aged 60-plus living in households where the equivalised income/consumption is below the poverty line threshold of 50% of the national equivalised median income/consumption (equivalising factor is the square root of household size)	World Bank, OECD and Eurostat
Relative welfare of older people	Measures the income/consumption situation of older people in relation to the rest of the population.	Average income/consumption of people aged 60-plus as a share of average income/consumption for the rest of society.	World Bank, OECD and Eurostat
GDP per capita	A proxy for the standard of living of people in a country that aims to provide a comparison across countries	A measure of the total output of a country that takes the gross domestic product (GDP) and divides it by the number of people in the country (converted to international dollars using purchasing power parity rates (PPP).	World Bank

Table 4.   Indicators of the Health status domain

Indicator	Purpose	Definition	Data source
Life expectancy at 60	Measures how many years a person aged 60 can expect to live	The average number of years that a person aged 60 can expect to live, if they pass through life exposed to the sex- and age-specific death rates prevailing at the time they are aged 60, for a specific year, in a given country.	WHO
Healthy life expectancy at 60	Measures how many years a person of 60 can expect to live in good physical health.	The average number of years that a person aged 60 can expect to live in "full health" by taking into account years lived in less than full health due to disease and/or injury.	The Institute for Health Metrics and Evaluation's Global Burden of Disease Study 2010
Relative psychological wellbeing	Measures self-assessed mental wellbeing	Share of people over 50 who answered "yes" to the question: "Do you feel your life has an important purpose or meaning?" Expressed as the percentage of people aged 50+ who answered "yes" to this question divided by the percentage of people aged 35-49 who answered "yes".	Gallup

Table 5.   Indicators of the capability domain

Indicator	Purpose	Definition	Data source
Labour market engagement of older people (employment rate)	Measures older people's access to the labour market and therefore their ability to supplement pension income with wages, and their access to work-related support networks (proxy for the economic empowerment of older people)	Percentage of the population aged 55-64 that are employed	ILO and UN
Educational attainment of older people	Key competencies in the form of knowledge, skills and attitudes improve quality of life in older age. Education is a proxy of lifetime accumulation of skills and competencies that shows the social and human capital potential inherent among older people.	Percentage of the population aged 60+ with secondary or higher education.	Barro and Lee

Table 6.   Indicators of the enabling environment domain

Indicator	Purpose	Definition	Data source
Social connections	Measures the perceived support available from relatives or friends	Percentage of people aged 50+ who responded "yes" to the survey question: "If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?"	Gallup
Physical safety	Measures how safe people feel in their neighbourhood	Percentage of people aged 50+ who responded "yes" to the survey question: "Do you feel safe walking alone at night in the city or area where you live?"	Gallup
Civic freedom	Measures how much control older people feel they have over their life	Percentage of people aged 50+ who provided a positive response to the survey question: "In this country, are you satisfied or dissatisfied with your freedom to choose what you do with your life?"	Gallup
Access to public transport	Measures access to and quality of public transport, considered as vital to mobility of older adults and their ability to access services	Percentage of people aged 50+ who provided a positive response to the survey question: "In the city or area where you live, are you satisfied or dissatisfied with the public transportation systems?"	Gallup

Table 7. Country ranking on the GAWI and domain scores

Country	Index value	Global rank	Domain score			
			Income security	Health status	Capability	Enabling environment
Switzerland	90.1	1	77.3	81.3	75.0	83.7
Norway	89.3	2	89.4	73.5	76.3	80.1
Sweden	84.4	3	83.5	75.2	65.6	79.4
Germany	84.3	4	80.9	75.6	68.4	78.6
Canada	84.0	5	82.9	80.3	61.2	78.9
Netherlands	83.0	6	85.9	74.8	59.6	79.6
Iceland	81.8	7	86.6	78.2	54.5	78.8
Japan	80.8	8	75.1	83.9	62.7	75.0
United States of America	79.3	9	76.3	70.1	65.7	76.8
United Kingdom	79.2	10	81.5	69.3	53.6	81.8
Denmark	78.6	11	80.9	68.1	59.9	77.7
New Zealand	76.0	12	78.4	77.8	57.8	71.5
Austria	74.4	13	84.3	72.7	37.6	82.7
Finland	72.7	14	80.3	70.8	44.8	76.1
Ireland	72.0	15	79.9	73.1	40.6	77.0
France	71.2	16	88.4	78.3	35.8	74.2
Australia	71.0	17	53.5	79.8	62.5	72.5
Israel	70.1	18	67.8	69.8	59.2	69.6
Luxembourg	69.5	19	89.7	76.6	31.0	76.1
Panama	67.7	20	72.4	68.7	56.4	66.4
Chile	66.3	21	70.8	74.4	49.5	66.0
Czech Republic	65.6	22	81.8	56.1	56.4	65.8
Estonia	64.9	23	70.7	50.0	64.8	68.1
Belgium	63.4	24	73.1	68.7	32.9	73.4
Spain	61.7	25	73.4	80.5	24.0	74.7
Slovenia	60.6	26	77.7	63.2	23.9	79.2
Uruguay	59.8	27	83.2	63.3	37.9	63.5
Costa Rica	59.6	28	64.6	73.8	29.2	71.6
Georgia	58.8	29	66.4	46.2	53.9	67.1
Cyprus	58.2	30	71.7	70.7	34.8	63.8
Argentina	57.6	31	79.0	59.4	40.8	61.7
Poland	57.4	32	77.6	55.3	31.1	69.2
Mexico	56.3	33	73.4	64.5	28.7	66.7
Thailand	56.0	34	59.3	59.1	25.8	78.2
Latvia	55.2	35	74.5	44.1	57.0	60.1
Colombia	54.3	36	48.3	72.8	33.0	67.5
Italy	53.5	37	78.2	78.7	28.2	58.5

Country	Index value	Global rank	Domain score			
			Income security	Health status	Capability	Enabling environment
Portugal	52.9	38	82.1	70.7	19.5	65.4
Hungary	52.2	39	73.2	47.4	35.8	63.1
Slovakia	52.1	40	78.7	51.4	45.6	56.8
Viet Nam	51.8	41	48.1	63.9	27.3	71.3
Mauritius	51.8	42	82.9	45.0	24.6	69.2
Armenia	51.1	43	75.1	34.0	62.1	58.9
Ecuador	50.9	44	62.5	69.2	25.1	63.4
Romania	50.8	45	78.4	44.9	34.1	62.0
Sri Lanka	49.8	46	36.2	50.0	40.1	72.9
Malta	49.8	47	63.5	72.1	18.9	66.4
Peru	49.7	48	50.5	68.1	44.3	56.9
Bulgaria	49.7	49	67.9	40.0	47.5	59.8
Philippines	48.8	50	44.2	31.9	43.5	77.3
Kyrgyzstan	48.8	51	64.8	28.9	42.3	69.6
China	48.7	52	39.2	46.5	37.8	71.8
Albania	47.0	53	68.8	45.7	49.0	54.7
El Salvador	46.9	54	38.1	66.3	29.8	65.3
Bolivia	46.2	55	62.8	46.4	39.9	57.1
Brazil	46.2	56	81.5	57.4	29.9	54.6
Nicaragua	46.0	57	38.3	57.0	26.0	70.6
Tajikistan	45.1	58	60.2	31.1	41.5	63.1
Guatemala	44.7	59	42.4	57.0	21.1	70.2
Republic of Korea	44.0	60	24.7	58.2	47.6	64.1
Croatia	44.0	61	50.5	55.3	30.0	58.9
Dominican Republic	43.7	62	30.1	61.0	29.9	67.3
Lithuania	43.2	63	63.8	44.2	50.0	52.6
Belarus	42.1	64	65.1	28.6	27.0	67.1
Russian Federation	41.8	65	76.2	27.1	48.4	55.5
Serbia	41.7	66	65.8	45.3	21.2	60.2
Bangladesh	41.1	67	47.2	37.7	24.2	67.5
Montenegro	39.7	68	56.3	49.1	20.6	58.9
Paraguay	38.9	69	35.9	54.4	30.6	57.5
Nepal	38.2	70	53.0	31.2	24.9	63.2
India	37.9	71	45.9	27.0	30.1	65.3
Mongolia	37.4	72	75.8	20.5	27.9	62.9
Ukraine	37.0	73	70.9	27.3	34.8	54.8
Indonesia	36.6	74	19.9	37.8	28.8	79.0
Turkey	36.3	75	73.6	52.5	7.0	67.6
Venezuela	35.9	76	50.6	69.1	31.6	49.5

Country	Index value	Global rank	Domain score			
			Income security	Health status	Capability	Enabling environment
Republic of Moldova	35.1	77	53.4	25.8	32.0	57.7
South Africa	35.0	78	79.5	25.9	25.9	55.0
Greece	34.5	79	76.8	70.7	16.9	49.6
Cambodia	34.4	80	16.9	53.3	24.0	72.2
Ghana	34.2	81	19.6	31.9	49.3	63.7
Honduras	34.1	82	21.4	56.2	25.0	62.0
Lao People's Dem. Republic	29.4	83	19.7	29.7	19.0	75.5
Morocco	29.3	84	52.2	37.5	14.6	53.9
Jordan	28.6	85	59.4	43.6	4.4	70.6
Nigeria	25.3	86	17.7	25.9	32.3	58.3
Iraq	23.2	87	59.1	32.8	11.9	49.6
Uganda	23.1	88	15.0	22.1	34.4	58.9
Rwanda	22.7	89	12.0	30.0	13.8	78.2
Zambia	22.3	90	18.8	24.7	26.2	54.8
Tanzania	15.9	91	9.3	39.8	13.8	54.5
Pakistan	12.7	92	6.4	31.8	25.8	56.0
West Bank and Gaza	12.3	93	24.7	36.6	1.8	62.3
Mozambique	4.5	94	22.8	18.9	4.5	45.1
Malawi	4.1	95	5.6	18.8	19.0	48.4
Afghanistan	3.6	96	23.3	7.1	12.1	47.0

4.3. Measurement

Domains and indicators: The exact domains, indicators, and indices in the original GAWI were retained for this analysis. Standard demographic measurements were used for the female labour force participation and total fertility rates in different countries. Female labour force participation rate is measured as the percentage of female population aged 15-64 that is economically active in each of the countries involved (World Bank, 2016a). The total fertility rate was measured as the "average number of children that a hypothetical cohort of women would have at the end of their reproductive period if they were subject during their whole lives to the fertility rates of a given period and if they were not subject to mortality" (WHO, 2015). Age at first marriage was measured as the average age at which a woman would first get married.

The data were manually entered into the computer, double-checked, and cleaned for errors such as incomplete or duplicate entries. Missing values were substituted by similar data from the World Health Organization (WHO) Global Health Observatory or the individual country's data bank. In addition to the domains of income security, health status, capability (education and employment), and enabling environment originally existing in the GAWI, a new domain of gender inequality was generated. The female labour force participation, total fertility rate and age at first marriage were aggregated to create the gender inequality domain (GID). The aggregation of the indicators of the GGID was based on computations from multivariate analyses.

Table 8.   Indicators of the gender inequality domain

Indicator	Purpose	Definition	Data source
Female labour force participation rates	Measures the inclusion of women in the labour force	The percentage of female population aged 15-64 that is economically active in each of the countries	World Bank
Total fertility rate	Assesses the choices women have in making their own decision concerning child birth (timing and number of births)	Average number of children that a hypothetical cohort of women would have at the end of their reproductive period if they were subject during their whole lives to the fertility rates of a given period and if they were not subject to mortality	World Bank
Age at first marriage	Measures how early in life a woman gets married.	The average age at which a woman would first get married	UN DESA

4.4. Analysis

The analysis used in this research are modelled after the GAWI methodology (HelpAge International, 2014). The indicators on the gender inequality domain were expressed as positive values, normalized and weighted (see below). The weighted values

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are aggregated using the geometric mean. A similar procedure was utilized in aggregating the five domains of income security, health status, capability, enabling environment and gender inequality to calculate the rGAWI index values. The steps followed in analyzing the data are explained in the following sub-sections.

4.4.1. Expressing all indicators as positive values

Following the model used in calculating the GAWI, the indicators on the gender inequality domain were expressed as positive values such that the higher the value, the higher the ranking of the country. Specifically, the values of the fertility rate indicator were reversed using inverse transformation and expressed in terms of 'low fertility rates'.

4.4.2. Normalization

The values of the indicators of the original GAWI were normalized before included in the calculation of domain scores. This is to produce measures with equal variances so that they are standardized when combined. In order to express an indicator in "normalized" terms, minimum and maximum values are used to ensure that the indicator falls between 0 and 100. The formula used for normalizing the indicator is:

Normalized indicator = ((actual value – minimum value) / (maximum value – minimum value)) * 100

The choice of the minimum and maximum values is made based on the 96 countries covered in the GAWI. For instance, the least life expectancy at 60 for the 96 countries is 16 years (in Cambodia, Nigeria and Rwanda), while the maximum is 26 years (in Japan). To normalize the "life expectancy at 60" indicator, 16 is used for the minimum value and 26 for the maximum. To avoid zero values, the minimum and maximum values used in the calculation of normalized values are slightly adjusted; and HelpAge International (2014) set the minimum and maximum values for life expectancy at 60 at 15 years and 27 years respectively.

Since the values of the indicators of the original GAWI were normalized, the values for female labour force participation, fertility rates and age at first marriage are also normalized so that the indicators to fall between 0 and 100.

Using Canada as an example, the normalization calculation for the female labour force participation is shown below:

Actual value= female labour force participation in Canada = 74.7

Minimum value for female labour force participation is in Iraq (table 7) = 15.8

Maximum value for female labour force participation is in Tanzania = 89.9

. To avoid zero values, the minimum and maximum values used in the normalization calculations are also slightly adjusted to 14.8 and 90.9 respectively

Therefore, the normalized female labour force participation indicator value for Canada

= ((actual value – minimum value) / (maximum value – minimum value)) X 100

= ((74.7 – 14.8) / (90.9 – 14.8)) X 100

= (59.9/76.1) X 100

= 0.787 X 100

= 78.7

Similar calculations are done for the other gender inequality domain indicators. Table 9 shows the normalized values for the gender inequality domain indicators for all the 96 countries.

Table 9.   Normalized values for the gender inequality domain indicators

Country	Female labour force participation rate	Total fertility rate	Age at first marriage	Normalized female labour force participation rate	Normalized total fertility rate	Normalized age at first marriage
Switzerland	78.2	0.65	22.40	83.31	69.30	35.00
Norway	76.0	0.54	28.40	80.42	56.34	72.50
Sweden	78.9	0.53	31.80	84.23	55.65	93.75
Germany	72.0	0.69	29.00	75.16	75.23	76.25
Canada	74.7	0.63	26.20	78.71	67.34	58.75
Netherlands	74.4	0.56	26.10	78.32	59.25	58.13
Iceland	82.3	0.50	31.70	88.70	51.21	93.13
Japan	65.4	0.71	26.90	66.49	77.62	63.13
United States of America	66.2	0.53	26.00	67.54	56.00	57.50
United Kingdom	70.5	0.53	26.40	73.19	55.31	60.00
Denmark	75.7	0.58	25.00	80.03	61.21	51.25
New Zealand	72.8	0.49	26.10	76.22	50.63	58.13
Austria	70.6	0.68	26.80	73.32	74.09	62.50
Finland	73.7	0.57	29.60	77.40	60.41	80.00
Ireland	62.8	0.50	28.70	63.07	52.11	74.38
France	66.8	0.48	27.70	68.33	49.49	68.13
Australia	70.7	0.56	27.00	73.46	59.64	63.75
Israel	66.7	0.37	24.30	68.20	36.52	46.88
Luxembourg	62.1	0.62	26.00	62.16	66.40	57.50
Panama	53.4	0.43	21.90	50.72	42.84	31.88
Chile	55.6	0.55	23.40	53.61	57.77	41.25
Czech Republic	65.6	0.69	23.00	66.75	75.23	38.75
Estonia	72.2	0.63	22.10	75.43	67.34	33.13
Belgium	62.4	0.56	26.20	62.55	59.25	58.75
Spain	68.5	0.67	26.10	70.57	72.43	58.13
Slovenia	67.4	0.75	24.80	69.12	81.48	50.00
Uruguay	67.6	0.55	23.00	69.38	57.77	38.75
Costa Rica	51.2	0.53	22.20	47.83	54.98	33.75
Georgia	61.2	0.57	22.30	60.97	60.02	34.38
Cyprus	66.5	0.68	23.10	67.94	74.09	39.38
Argentina	55.4	0.45	23.30	53.35	45.59	40.63
Poland	60.5	0.75	23.00	60.05	82.15	38.75
Mexico	48.3	0.44	22.40	44.02	44.64	35.00
Thailand	71.0	0.66	23.50	73.85	71.36	41.88

Country	Female labour force participation rate	Total fertility rate	Age at first marriage	Normalized female labour force participation rate	Normalized total fertility rate	Normalized age at first marriage
Latvia	73.0	0.67	22.00	76.48	71.89	32.50
Colombia	60.0	0.49	22.40	59.40	50.63	35.00
Italy	54.0	0.70	26.10	51.51	75.82	58.13
Portugal	70.2	0.66	23.90	72.80	70.83	44.38
Hungary	58.6	0.70	23.80	57.56	75.82	43.75
Slovakia	62.7	0.72	22.60	62.94	78.24	36.25
Viet Nam	79.2	0.55	23.20	84.63	57.40	40.00
Mauritius	49.3	0.57	23.80	45.34	60.02	43.75
Armenia	58.8	0.61	22.40	57.82	65.03	35.00
Ecuador	58.2	0.40	21.80	57.03	39.38	31.25
Romania	57.3	0.75	22.40	55.85	82.15	35.00
Sri Lanka	39.0	0.48	25.30	31.80	48.94	53.13
Malta	47.9	0.65	22.20	43.50	69.80	33.75
Peru	69.6	0.46	23.10	72.01	46.83	39.38
Bulgaria	64.2	0.69	21.10	64.91	74.66	26.88
Philippines	52.8	0.32	23.80	49.93	30.56	43.75
Kyrgyzstan	59.9	0.38	21.40	59.26	36.86	28.75
China	70.4	0.63	22.10	73.06	66.87	33.13
Albania	51.7	0.67	22.90	48.49	71.89	38.13
El Salvador	51.4	0.52	22.30	48.09	54.65	34.38
Bolivia	66.5	0.37	22.70	67.94	35.70	36.88
Brazil	65.1	0.56	22.70	66.10	59.64	36.88
Nicaragua	50.2	0.52	19.80	46.52	53.67	18.75
Tajikistan	61.9	0.37	20.70	61.89	36.02	24.38
Guatemala	51.5	0.34	21.30	48.23	33.11	28.13
Republic of Korea	55.6	0.80	26.10	53.61	87.95	58.13
Croatia	58.6	0.68	23.80	57.56	74.09	43.75
Dominican Republic	55.9	0.43	22.50	54.01	43.28	35.63
Lithuania	71.8	0.63	22.20	74.90	67.34	33.75
Belarus	62.4	0.68	21.70	62.55	73.53	30.63
Russian Federation	68.8	0.62	21.60	70.96	66.40	30.00
Serbia	53.9	0.70	24.00	51.38	75.82	45.00
Bangladesh	60.6	0.42	18.10	60.18	41.77	8.13
Montenegro	52.3	0.60	26.70	49.28	63.28	61.88
Paraguay	58.9	0.52	21.50	57.95	54.65	29.38

Country	Female labour force participation rate	Total fertility rate	Age at first marriage	Normalized female labour force participation rate	Normalized total fertility rate	Normalized age at first marriage
Nepal	83.1	0.45	18.80	89.75	45.35	12.50
India	28.6	0.40	19.30	18.13	40.15	15.63
Mongolia	60.1	0.46	22.10	59.53	47.09	33.13
Ukraine	62.8	0.65	21.00	63.07	70.31	26.25
Indonesia	53.5	0.47	21.60	50.85	47.60	30.00
Turkey	32.2	0.49	22.00	22.86	50.34	32.50
Venezuela	55.1	0.43	22.10	52.96	43.50	33.13
Moldova	44.4	0.64	20.90	38.90	68.80	25.63
South Africa	49.2	0.43	27.10	45.20	43.28	64.38
Greece	58.7	0.70	24.50	57.69	76.41	48.13
Cambodia	82.1	0.38	21.00	88.44	37.91	26.25
Ghana	69.0	0.25	20.50	71.22	21.24	23.13
Honduras	45.0	0.36	20.40	39.68	34.91	22.50
Lao	80.0	0.35	21.20	85.68	34.29	27.50
Morocco	27.3	0.47	26.30	16.43	48.13	59.38
Jordan	16.7	0.32	24.50	2.50	29.57	48.13
Nigeria	48.6	0.19	20.30	44.42	14.78	21.88
Iraq	15.8	0.24	21.70	1.31	20.81	30.63
Uganda	76.5	0.17	18.20	81.08	12.02	8.75
Rwanda	87.9	0.22	22.70	96.06	18.16	36.88
Zambia	73.3	0.17	20.30	76.87	12.63	21.88
Tanzania	89.9	0.20	20.50	98.69	16.20	23.13
Pakistan	25.9	0.36	21.60	14.59	35.38	30.00
West Bank and Gaza	16.4	0.36	21.70	2.10	35.22	30.63
Mozambique	85.9	0.19	18.00	93.43	14.69	7.50
Malawi	84.3	0.18	18.60	91.33	13.08	11.25
Afghanistan	16.4	0.19	17.80	2.10	14.17	6.25

4.4.3. Weighting

Weights are assigned to the normalized indicators in the gender inequality domain based on differential effects based on a multivariate analysis with the original GAWI composite measure (see below).

Table 10.   Correlation matrix for the gender inequality domain indicators

		Female labour force participation rate	Total fertility rate	Age at first marriage
Female labour force participation rate	r		.121	.163
	R^2		0.015	0.027
Total fertility rate	r	.121		.433**
	R^2	0.015		0.187
Age at first marriage	r	.163	.433**	
	R^2	0.027	0.187	
**. Correlation is significant at the $p<0.01$ level				

To rule out collinearity, a correlation matrix (table 10) is constructed for the gender inequality domain indicators. The correlation matrix shows there are no significant correlations between the indicators of the gender inequality domain except for the correlation between total fertility rate and age at first marriage. However, only 18.7% of the variance in total fertility rate is predicted by age at first marriage.

Weighting is done by carrying out regression analysis (table 11) with the indicators of the gender inequality domain as independent variables on the original index score of GAWI as the dependent variable. The standardized coefficients (Beta) are compared for the indicators and used as the relative weight in the domain.

Table 11.   Regression model for the gender inequality domain indicators

Gender inequality domain indicators	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
Female labour force participation rate	0.228	0.061	0.239	3.737	<0.001
Total fertility rate	0.319	0.073	0.308	4.393	<0.001
Age at first marriage	0.588	0.078	0.530	7.516	<0.001
Total			1.077		
Dependent Variable: GAWI Index value					

Table 12. **Analysis of variance for the gender inequality domain regression model**

ANOVA						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	23356.936	3	7785.645	53.092	<0.001
	Residual	13491.208	92	146.644		
	Total	36848.144	95			
Dependent Variable: GAWI Index value						
Predictors: FLFP, TFR and AFM						

Calculations for the weighting:

Weight for female labour force participation= 0.239/1.077 =0.22

Weight for total fertility rate = 0.308/1.077 = 0.29

Weight for age at first marriage = 0.530/1.077 = 0.49

Therefore, the weight percentages for female labour force participation, total fertility rate and age at first marriage are 22%, 29% and 49% respectively. The weighted indicator scores are shown in table 13.

4.4.4. Calculating the score for the gender inequality domain

The domain score for the gender inequality domain was determined by calculating the geometric mean of the gender inequality indicators. This was done as follows:

Geometric mean = 3√(female labour force participation score X total fertility rate score X age at first marriage score)

The gender inequality domain score for each country is expressed in table 13.

Table 13. **Weighted scores of the gender inequality indicators**

Country	Weighted female labour force participation	Weighted total fertility rates	Weighted age at first marriage	Gender inequality domain score
Switzerland	18.33	20.10	17.15	18.49
Norway	17.69	16.34	35.53	21.74
Sweden	18.53	16.14	45.94	23.95
Germany	16.54	21.82	37.36	23.80
Canada	17.32	19.53	28.79	21.35
Netherlands	17.23	17.18	28.48	20.35
Iceland	19.51	14.85	45.63	23.65
Japan	14.63	22.51	30.93	21.68
United States of America	14.86	16.24	28.18	18.94
United Kingdom	16.10	16.04	29.40	19.66
Denmark	17.61	17.75	25.11	19.87
New Zealand	16.77	14.68	28.48	19.14
Austria	16.13	21.49	30.63	21.98
Finland	17.03	17.52	39.20	22.70
Ireland	13.88	15.11	36.44	19.70
France	15.03	14.35	33.38	19.31
Australia	16.16	17.29	31.24	20.59
Israel	15.00	10.59	22.97	15.40
Luxembourg	13.67	19.26	28.18	19.50
Panama	11.16	12.42	15.62	12.94
Chile	11.80	16.75	20.21	15.87
Czech Republic	14.69	21.82	18.99	18.26
Estonia	16.59	19.53	16.23	17.39

Country	Weighted female labour force participation	Weighted total fertility rates	Weighted age at first marriage	Gender inequality domain score
Belgium	13.76	17.18	28.79	18.95
Spain	15.52	21.00	28.48	21.02
Slovenia	15.21	23.63	24.50	20.65
Uruguay	15.26	16.75	18.99	16.93
Costa Rica	10.52	15.94	16.54	14.05
Georgia	13.41	17.41	16.84	15.78
Cyprus	14.95	21.49	19.29	18.37
Argentina	11.74	13.22	19.91	14.56
Poland	13.21	23.82	18.99	18.15
Mexico	9.68	12.95	17.15	12.91
Thailand	16.25	20.69	20.52	19.04
Latvia	16.83	20.85	15.93	17.74
Colombia	13.07	14.68	17.15	14.87
Italy	11.33	21.99	28.48	19.22
Portugal	16.02	20.54	21.74	19.27
Hungary	12.66	21.99	21.44	18.14
Slovakia	13.85	22.69	17.76	17.74
Viet Nam	18.62	16.65	19.60	18.25
Mauritius	9.97	17.41	21.44	15.50
Armenia	12.72	18.86	17.15	16.02
Ecuador	12.55	11.42	15.31	12.99
Romania	12.29	23.82	17.15	17.12
Sri Lanka	7.00	14.19	26.03	13.72
Malta	9.57	20.24	16.54	14.74
Peru	15.84	13.58	19.29	16.07
Bulgaria	14.28	21.65	13.17	15.97

Country	Weighted female labour force participation	Weighted total fertility rates	Weighted age at first marriage	Gender inequality domain score
Philippines	10.99	8.86	21.44	12.78
Kyrgyzstan	13.04	10.69	14.09	12.52
China	16.07	19.39	16.23	17.17
Albania	10.67	20.85	18.68	16.08
El Salvador	10.58	15.85	16.84	14.14
Bolivia	14.95	10.35	18.07	14.09
Brazil	14.54	17.29	18.07	16.56
Nicaragua	10.23	15.56	9.19	11.35
Tajikistan	13.62	10.45	11.94	11.93
Guatemala	10.61	9.60	13.78	11.20
Republic of Korea	11.80	25.51	28.48	20.46
Croatia	12.66	21.49	21.44	18.00
Dominican Republic	11.88	12.55	17.46	13.76
Lithuania	16.48	19.53	16.54	17.46
Belarus	13.76	21.32	15.01	16.39
Russian Federation	15.61	19.26	14.70	16.41
Serbia	11.30	21.99	22.05	17.63
Bangladesh	13.24	12.11	3.98	8.61
Montenegro	10.84	18.35	30.32	18.20
Paraguay	12.75	15.85	14.39	14.27
Nepal	19.75	13.15	6.13	11.67
India	3.99	11.64	7.66	7.08
Mongolia	13.10	13.66	16.23	14.26
Ukraine	13.88	20.39	12.86	15.38

Country	Weighted female labour force participation	Weighted total fertility rates	Weighted age at first marriage	Gender inequality domain score
Indonesia	11.19	13.81	14.70	13.14
Turkey	5.03	14.60	15.93	10.54
Venezuela	11.65	12.61	16.23	13.36
Moldova	8.56	19.95	12.56	12.89
South Africa	9.94	12.55	31.54	15.79
Greece	12.69	22.16	23.58	18.79
Cambodia	19.46	10.99	12.86	14.01
Ghana	15.67	6.16	11.33	10.30
Honduras	8.73	10.12	11.03	9.91
Lao	18.85	9.94	13.48	13.62
Morocco	3.61	13.96	29.09	11.36
Jordan	0.55	8.58	23.58	4.81
Nigeria	9.77	4.29	10.72	7.66
Iraq	0.29	6.03	15.01	2.97
Uganda	17.84	3.49	4.29	6.44
Rwanda	21.13	5.27	18.07	12.62
Zambia	16.91	3.66	10.72	8.72
Tanzania	21.71	4.70	11.33	10.50
Pakistan	3.21	10.26	14.70	7.85
West Bank and Gaza	0.46	10.21	15.01	4.14
Mozambique	20.55	4.26	3.68	6.85
Malawi	20.09	3.79	5.51	7.49
Afghanistan	0.46	4.11	3.06	1.80

4.4.5. Aggregating the scores of the five domains to calculate rGAWI

The five domains of income security, health status, capability, enabling environment and gender inequality are aggregated to determine the rGAWI score.

Normalizing the domain scores

The scores on the domains of the original GAWI as well as the calculated score for the gender inequality domain are normalized in a similar way as described in section 4.4.2. The formula used is:

Normalized domain score = ((actual value – minimum value) / (maximum value – minimum value)) * 100

The normalized values for the domains are shown in table 14.

Table 14.   The normalized domain values

Country	Normalized income security	Normalized health status	Normalized capability	Normalized enabling environment	Normalized gender inequality
Switzerland	84.49	95.40	97.03	97.63	73.23
Norway	98.46	85.58	98.75	88.65	86.69
Sweden	91.62	87.74	84.68	86.89	95.86
Germany	88.65	88.18	88.43	85.08	95.23
Canada	90.89	94.13	78.96	85.62	85.10
Netherlands	94.39	87.17	76.90	87.35	80.97
Iceland	95.19	91.50	70.20	85.45	94.61
Japan	81.83	98.72	80.94	76.13	86.45
United States of America	83.27	81.17	84.80	80.50	75.13
United Kingdom	89.27	80.15	68.98	92.88	78.08
Denmark	88.64	78.73	77.24	82.73	78.98
New Zealand	85.70	90.93	74.46	67.58	75.94
Austria	92.57	84.48	48.13	95.03	87.69
Finland	87.94	82.08	57.49	78.89	90.68
Ireland	87.51	85.08	52.06	81.08	78.25
France	97.35	91.68	45.71	74.09	76.65
Australia	56.79	93.47	80.63	69.88	81.95
Israel	73.40	80.83	76.37	62.89	60.44
Luxembourg	98.89	89.48	39.42	78.81	77.45

Country	Normalized income security	Normalized health status	Normalized capability	Normalized enabling environment	Normalized gender inequality
Panama	78.69	79.42	72.65	54.84	50.26
Chile	76.91	86.64	63.69	53.99	62.38
Czech Republic	89.62	63.44	72.64	53.49	72.28
Estonia	76.78	55.71	83.67	59.17	68.70
Belgium	79.52	79.43	41.98	72.11	75.16
Spain	79.87	94.36	30.27	75.37	83.72
Slovenia	84.91	72.52	30.13	86.38	82.19
Uruguay	91.26	72.58	48.49	47.86	66.80
Costa Rica	69.66	85.89	37.08	67.65	54.87
Georgia	71.73	50.90	69.42	56.63	62.05
Cyprus	77.94	81.96	44.48	48.60	72.74
Argentina	86.41	67.59	52.35	43.29	56.99
Poland	84.79	62.43	39.64	61.82	71.83
Mexico	79.88	74.17	36.43	55.59	50.13
Thailand	63.52	67.25	32.67	83.97	75.51
Latvia	81.23	48.20	73.47	39.44	70.16
Colombia	50.79	84.69	42.11	57.57	58.27
Italy	85.51	92.11	35.80	35.56	76.26
Portugal	89.96	81.97	24.48	52.39	76.47
Hungary	79.63	52.47	45.79	46.92	71.80
Slovakia	86.01	57.51	58.61	31.31	70.14
Viet Nam	50.57	73.40	34.70	67.05	72.24
Mauritius	90.92	49.41	31.13	61.78	60.86
Armenia	81.90	35.41	80.08	36.35	63.04
Ecuador	67.30	80.13	31.74	47.49	50.49
Romania	85.74	49.21	43.54	44.19	67.59
Sri Lanka	36.65	55.75	51.33	70.82	53.51
Malta	68.45	83.77	23.65	54.90	57.73
Peru	53.30	78.74	56.84	31.62	63.24
Bulgaria	73.50	43.03	61.05	38.72	62.81
Philippines	45.95	32.80	55.86	81.81	49.60
Kyrgyzstan	69.98	28.94	54.21	62.80	48.54
China	40.18	51.30	48.33	68.13	67.77
Albania	74.54	50.31	63.03	26.00	63.25
El Salvador	38.94	76.45	37.85	52.32	55.22
Bolivia	67.56	51.13	51.16	32.04	55.02
Brazil	89.31	65.15	38.00	25.83	65.27
Nicaragua	39.14	64.58	33.00	65.19	43.70

Country	Normalized income security	Normalized health status	Normalized capability	Normalized enabling environment	Normalized gender inequality
Tajikistan	64.53	31.75	53.16	46.70	46.10
Guatemala	43.85	64.63	26.59	64.28	43.05
Republic of Korea	23.36	66.13	61.13	49.16	81.42
Croatia	53.31	62.41	38.14	36.41	71.22
Dominican Republic	29.59	69.65	38.10	57.09	53.65
Lithuania	68.71	48.35	64.34	21.02	68.98
Belarus	70.23	28.51	34.20	56.77	64.56
Russian Federation	83.13	26.60	62.26	28.16	64.64
Serbia	71.11	49.77	26.67	39.65	69.69
Bangladesh	49.52	40.09	30.63	57.65	32.34
Montenegro	60.05	54.57	25.89	36.46	72.06
Paraguay	36.31	61.31	38.97	33.06	55.79
Nepal	56.18	31.80	31.54	46.94	45.02
India	47.98	26.58	38.36	52.33	26.02
Mongolia	82.65	18.28	35.37	46.41	55.75
Ukraine	77.00	26.87	44.45	26.25	60.38
Indonesia	17.78	40.23	36.58	86.01	51.11
Turkey	80.18	58.88	8.15	57.90	40.31
Venezuela	53.37	79.95	40.23	13.40	52.01
Moldova	56.73	24.95	40.80	33.38	50.08
South Africa	87.02	25.13	32.86	26.92	62.07
Greece	83.86	82.04	21.08	13.55	74.48
Cambodia	14.28	59.90	30.27	69.32	54.71
Ghana	17.46	32.75	63.46	48.32	39.35
Honduras	19.47	63.54	31.67	43.99	37.74
Lao	17.53	29.97	23.76	77.24	53.08
Morocco	55.33	39.86	18.05	24.25	43.74
Jordan	63.61	47.60	4.65	65.34	16.59
Nigeria	15.22	25.13	41.18	34.91	28.39
Iraq	63.25	33.92	14.51	13.48	8.98
Uganda	12.13	20.30	43.86	36.46	23.34
Rwanda	8.55	30.33	16.96	83.96	48.96
Zambia	16.44	23.66	33.15	26.29	32.81
Tanzania	5.40	42.76	17.01	25.61	40.15
Pakistan	2.09	32.59	32.72	29.42	29.20
West Bank and Gaza	23.38	38.75	1.36	44.82	13.83

Country	Normalized income security	Normalized health status	Normalized capability	Normalized enabling environment	Normalized gender inequality
Mozambique	21.11	16.25	4.84	2.56	25.06
Malawi	1.15	16.18	23.80	10.58	27.70
Afghanistan	21.71	1.27	14.75	7.26	4.14

Weighting domains

A correlation matrix computed for the five domains (table 15) reveals significant correlations. Due to a significant collinearity between the domains, a regression model is not computed for the purpose of weighting. Hence, equal weights are applied to the domains in order to calculate the rGAWI scores.

The mean, standard deviation (s.d), and range for each of the domains are presented in table 16 to compare the domain effects. The degree to which the gender inequality domain differentiates countries is also expressed.

Table 15.   Correlation matrix for the domains of rGAWI

Domain	coefficient	Normalized Income security	Normalized health status	Normalized capability	Normalized enabling environment	Normalized gender inequality
Normalized Income security	r		0.544**	0.463**	0.317**	0.683**
	R^2		0.296	0.214	0.100	0.466
Normalized health status	r	0.544**		0.420**	0.547**	0.703**
	R^2	0.296		0.176	0.299	0.494
Normalized capability	r	0.463**	0.420**		0.405**	0.602**
	R^2	0.214	0.176		0.164	0.362
Normalized enabling environment	r	0.317**	0.547**	0.405**		0.529**
	R^2	0.100	0.299	0.164		0.280
Normalized gender inequality	r	0.683**	0.703**	0.602**	0.529**	
	R^2	0.466	0.494	0.362	0.280	

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Table 16.   **The mean, s.d. and range for each domain**

Statistics	Income security	Health status	Capability	Enabling environment	Gender inequality
mean	63.3328	59.5884	46.4383	53.9733	59.9636
s.d	27.06421	24.23786	21.88137	22.78565	19.79012
Minimum	1.15	1.27	1.36	2.56	4.14
Maximum	98.89	98.72	98.75	97.63	95.86
range	97.74	97.45	97.39	95.07	91.73

Calculation of rGAWI

The newly created gender inequality domain is aggregated with the pre-existing GAWI domains of income security, health status, capability (education and employment), and enabling environment to calculate a new aging index for the 96 countries. The rGAWI scores are determined by calculating the geometric mean of the normalized domain scores.

Geometric mean = 5√(Income security score X Health status score X Capability score X Enabling environment score X Gender inequality score)

Table 17.   **Normalized domain scores and rGAWI**

Country	Income security	Health status	Capability	Enabling environment	Gender inequality	rGAWI
Switzerland	84.49	95.40	97.03	97.63	73.23	89.03
Norway	98.46	85.58	98.75	88.65	86.69	91.45
Sweden	91.62	87.74	84.68	86.89	95.86	89.27
Germany	88.65	88.18	88.43	85.08	95.23	89.05
Canada	90.89	94.13	78.96	85.62	85.10	86.78
Netherlands	94.39	87.17	76.90	87.35	80.97	85.15
Iceland	95.19	91.50	70.20	85.45	94.61	86.86
Japan	81.83	98.72	80.94	76.13	86.45	84.48
United States of America	83.27	81.17	84.80	80.50	75.13	80.91
United Kingdom	89.27	80.15	68.98	92.88	78.08	81.43
Denmark	88.64	78.73	77.24	82.73	78.98	81.16
New Zealand	85.70	90.93	74.46	67.58	75.94	78.48
Austria	92.57	84.48	48.13	95.03	87.69	79.30

Country	Income security	Health status	Capability	Enabling environment	Gender inequality	rGAWI
Finland	87.94	82.08	57.49	78.89	90.68	78.43
Ireland	87.51	85.08	52.06	81.08	78.25	75.54
France	97.35	91.68	45.71	74.09	76.65	74.64
Australia	56.79	93.47	80.63	69.88	81.95	75.49
Israel	73.40	80.83	76.37	62.89	60.44	70.34
Luxembourg	98.89	89.48	39.42	78.81	77.45	73.39
Panama	78.69	79.42	72.65	54.84	50.26	65.99
Chile	76.91	86.64	63.69	53.99	62.38	67.77
Czech Republic	89.62	63.44	72.64	53.49	72.28	69.29
Estonia	76.78	55.71	83.67	59.17	68.70	68.01
Belgium	79.52	79.43	41.98	72.11	75.16	67.84
Spain	79.87	94.36	30.27	75.37	83.72	67.87
Slovenia	84.91	72.52	30.13	86.38	82.19	66.67
Uruguay	91.26	72.58	48.49	47.86	66.80	63.43
Costa Rica	69.66	85.89	37.08	67.65	54.87	60.69
Georgia	71.73	50.90	69.42	56.63	62.05	61.65
Cyprus	77.94	81.96	44.48	48.60	72.74	63.15
Argentina	86.41	67.59	52.35	43.29	56.99	59.64
Poland	84.79	62.43	39.64	61.82	71.83	62.21
Mexico	79.88	74.17	36.43	55.59	50.13	57.00
Thailand	63.52	67.25	32.67	83.97	75.51	61.57
Latvia	81.23	48.20	73.47	39.44	70.16	60.28
Colombia	50.79	84.69	42.11	57.57	58.27	57.11
Italy	85.51	92.11	35.80	35.56	76.26	59.80
Portugal	89.96	81.97	24.48	52.39	76.47	59.14
Hungary	79.63	52.47	45.79	46.92	71.80	57.79
Slovakia	86.01	57.51	58.61	31.31	70.14	57.65
Viet Nam	50.57	73.40	34.70	67.05	72.24	57.41
Mauritius	90.92	49.41	31.13	61.78	60.86	55.49
Armenia	81.90	35.41	80.08	36.35	63.04	55.62
Ecuador	67.30	80.13	31.74	47.49	50.49	52.80
Romania	85.74	49.21	43.54	44.19	67.59	55.96
Sri Lanka	36.65	55.75	51.33	70.82	53.51	52.46
Malta	68.45	83.77	23.65	54.90	57.73	53.29
Peru	53.30	78.74	56.84	31.62	63.24	54.41
Bulgaria	73.50	43.03	61.05	38.72	62.81	54.24
Philippines	45.95	32.80	55.86	81.81	49.60	50.90
Kyrgyzstan	69.98	28.94	54.21	62.80	48.54	50.69
China	40.18	51.30	48.33	68.13	67.77	54.02
Albania	74.54	50.31	63.03	26.00	63.25	52.23

Country	Income security	Health status	Capability	Enabling environment	Gender inequality	rGAWI
El Salvador	38.94	76.45	37.85	52.32	55.22	50.41
Bolivia	67.56	51.13	51.16	32.04	55.02	49.97
Brazil	89.31	65.15	38.00	25.83	65.27	51.80
Nicaragua	39.14	64.58	33.00	65.19	43.70	47.33
Tajikistan	64.53	31.75	53.16	46.70	46.10	47.21
Guatemala	43.85	64.63	26.59	64.28	43.05	46.12
Republic of Korea	23.36	66.13	61.13	49.16	81.42	51.94
Croatia	53.31	62.41	38.14	36.41	71.22	50.52
Dominican Republic	29.59	69.65	38.10	57.09	53.65	47.45
Lithuania	68.71	48.35	64.34	21.02	68.98	49.92
Belarus	70.23	28.51	34.20	56.77	64.56	47.85
Russian Federation	83.13	26.60	62.26	28.16	64.64	47.84
Serbia	71.11	49.77	26.67	39.65	69.69	48.23
Bangladesh	49.52	40.09	30.63	57.65	32.34	40.82
Montenegro	60.05	54.57	25.89	36.46	72.06	46.73
Paraguay	36.31	61.31	38.97	33.06	55.79	43.73
Nepal	56.18	31.80	31.54	46.94	45.02	41.23
India	47.98	26.58	38.36	52.33	26.02	36.70
Mongolia	82.65	18.28	35.37	46.41	55.75	42.48
Ukraine	77.00	26.87	44.45	26.25	60.38	42.93
Indonesia	17.78	40.23	36.58	86.01	51.11	40.94
Turkey	80.18	58.88	8.15	57.90	40.31	38.97
Venezuela	53.37	79.95	40.23	13.40	52.01	41.27
Moldova	56.73	24.95	40.80	33.38	50.08	39.53
South Africa	87.02	25.13	32.86	26.92	62.07	41.29
Greece	83.86	82.04	21.08	13.55	74.48	42.96
Cambodia	14.28	59.90	30.27	69.32	54.71	39.67
Ghana	17.46	32.75	63.46	48.32	39.35	36.96
Honduras	19.47	63.54	31.67	43.99	37.74	36.53
Lao	17.53	29.97	23.76	77.24	53.08	34.82
Morocco	55.33	39.86	18.05	24.25	43.74	33.51
Jordan	63.61	47.60	4.65	65.34	16.59	27.33
Nigeria	15.22	25.13	41.18	34.91	28.39	27.46
Iraq	63.25	33.92	14.51	13.48	8.98	20.67
Uganda	12.13	20.30	43.86	36.46	23.34	24.70
Rwanda	8.55	30.33	16.96	83.96	48.96	28.28
Zambia	16.44	23.66	33.15	26.29	32.81	25.66
Tanzania	5.40	42.76	17.01	25.61	40.15	20.95

Country	Income security	Health status	Capability	Enabling environment	Gender inequality	rGAWI
Pakistan	2.09	32.59	32.72	29.42	29.20	18.06
West Bank and Gaza	23.38	38.75	1.36	44.82	13.83	15.01
Mozambique	21.11	16.25	4.84	2.56	25.06	10.13
Malawi	1.15	16.18	23.80	10.58	27.70	10.54
Afghanistan	21.71	1.27	14.75	7.26	4.14	6.57

The new index calculated in this research is regarded as the reformulated Global AgeWatch Index (rGAWI). The countries are ranked based on the rGAWI (table 17). The ranking of countries on the rGAWI can then be compared with the original GAWI rankings. Differences between the original and revised models are attributable to additional gender inequality beyond that which is captured in the original GAWI modelling.

4.5. Ethical approval

Ethical approval was not required for this research because the data involved are public and there are no human subjects.

4.6. Limitations

The data on female labour force participation and total fertility rates obtained from the World Bank were from several specific country surveys. The precision of individual surveys from the different countries may be difficult to ascertain in the context of this research. In addition, some other factors that are important for accessing the wellbeing of older adults were not included in rGAWI as discussed above and the data was not segregated by gender. Further limitations of this study are discussed in the following chapter.

Chapter 5.

Results

5.1. The gender inequality domain

The addition of the gender inequality domain indicators changed the ranking of the countries on the GAWI. Countries with higher gender inequality domain scores are ranked higher on the rGAWI. In addition, the relative scores of the gender inequality measures affects the gender inequality domain scores and this relation is further explained in this section. Regression analysis indicates that the age at first marriage indicator has the largest effect on the wellbeing of older adults out of all the gender inequality domain measures (table 18).

Table 18.   Country ranking by gender inequality domain scores

S/N	Country	GAWU score	Global rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in score	Change in rank
1	Sweden	84.4	3	95.86	89.27	2	4.84	1
2	Germany	84.3	4	95.23	89.05	3	4.75	1
3	Iceland	81.8	7	94.61	86.86	5	5.02	2
4	Finland	72.7	14	90.68	78.43	14	5.75	-
5	Austria	74.4	13	87.69	79.30	12	4.92	1
6	Norway	89.3	2	86.69	91.45	1	2.17	1
7	Japan	80.8	8	86.45	84.48	8	3.69	-
8	Canada	84.0	5	85.10	86.78	6	2.82	-1
9	Spain	61.7	25	83.72	67.87	22	6.16	3
10	Slovenia	60.6	26	82.19	66.67	25	6.02	1
11	Australia	71.0	17	81.95	75.49	16	4.52	1
12	Republic of Korea	44.0	60	81.42	51.94	52	7.93	8
13	Netherlands	83.0	6	80.97	85.15	7	2.14	-1
14	Denmark	78.6	11	78.98	81.16	10	2.56	1
15	Ireland	72.0	15	78.25	75.54	15	3.59	-
16	United Kingdom	79.2	10	78.08	81.43	9	2.23	1

S/N	Country	GAWU score	Global rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in score	Change in rank
17	Luxembourg	69.5	19	77.45	73.39	18	3.86	1
18	France	71.2	16	76.65	74.64	17	3.43	-1
19	Portugal	52.9	38	76.47	59.14	36	6.25	2
20	Italy	53.5	37	76.26	59.80	34	6.28	3
21	New Zealand	76.0	12	75.94	78.48	13	2.46	-1
22	Thailand	56.0	34	75.51	61.57	31	5.55	3
23	Belgium	63.4	24	75.16	67.84	23	4.44	1
24	United States of America	79.3	9	75.13	80.91	11	1.64	-2
25	Greece	34.5	79	74.48	42.96	69	8.49	10
26	Switzerland	90.1	1	73.23	89.03	4	-1.07	-3
27	Cyprus	58.2	30	72.74	63.15	28	4.91	2
28	Czech Republic	65.6	22	72.28	69.29	20	3.66	2
29	Viet Nam	51.8	41	72.24	57.41	39	5.62	2
30	Montenegro	39.7	68	72.06	46.73	66	7.04	2
31	Poland	57.4	32	71.83	62.21	29	4.80	3
32	Hungary	52.2	39	71.80	57.79	37	5.61	2
33	Croatia	44.0	61	71.22	50.52	56	6.55	5
34	Latvia	55.2	35	70.16	60.28	33	5.03	2
35	Slovakia	52.1	40	70.14	57.65	38	5.57	2
36	Serbia	41.7	66	69.69	48.23	60	6.53	6
37	Lithuania	43.2	63	68.98	49.92	59	6.71	4
38	Estonia	64.9	23	68.70	68.01	21	3.06	2
39	China	48.7	52	67.77	54.02	47	5.33	5
40	Romania	50.8	45	67.59	55.96	42	5.13	3
41	Uruguay	59.8	27	66.80	63.43	27	3.60	-
42	Brazil	46.2	56	65.27	51.80	53	5.64	3
43	Russia	41.8	65	64.64	47.84	62	6.08	3
44	Belarus	42.1	64	64.56	47.85	61	5.70	3
45	Albania	47.0	53	63.25	52.23	51	5.22	2
46	Peru	49.7	48	63.24	54.41	45	4.71	3
47	Armenia	51.1	43	63.04	55.62	43	4.47	-
48	Bulgaria	49.7	49	62.81	54.24	46	4.56	3
49	Chile	66.3	21	62.38	67.77	24	1.50	-3
50	South Africa	35.0	78	62.07	41.29	72	6.33	6
51	Georgia	58.8	29	62.05	61.65	30	2.81	-1

S/N	Country	GAWU score	Global rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in score	Change in rank
52	Mauritius	51.8	42	60.86	55.49	44	3.73	-2
53	Israel	70.1	18	60.44	70.34	19	0.26	-1
54	Ukraine	37.0	73	60.38	42.93	70	5.93	3
55	Colombia	54.3	36	58.27	57.11	40	2.82	-4
56	Malta	49.8	47	57.73	53.29	48	3.50	-1
57	Argentina	57.6	31	56.99	59.64	35	2.09	-4
58	Paraguay	38.9	69	55.79	43.73	68	4.86	1
59	Mongolia	37.4	72	55.75	42.48	71	5.09	1
60	El Salvador	46.9	54	55.22	50.41	57	3.50	-3
61	Bolivia	46.2	55	55.02	49.97	58	3.75	-3
62	Costa Rica	59.6	28	54.87	60.69	32	1.08	-4
63	Cambodia	34.4	80	54.71	39.67	77	5.22	3
64	Dominican Republic	43.7	62	53.65	47.45	63	3.71	-1
65	Sri Lanka	49.8	46	53.51	52.46	50	2.65	-4
66	Lao	29.4	83	53.08	34.82	83	5.39	-
67	Venezuela	35.9	76	52.01	41.27	73	5.36	3
68	Indonesia	36.6	74	51.11	40.94	75	4.35	-1
69	Ecuador	50.9	44	50.49	52.80	49	1.91	-5
70	Panama	67.7	20	50.26	65.99	26	-1.68	-6
71	Mexico	56.3	33	50.13	57.00	41	0.74	-8
72	Moldova	35.1	77	50.08	39.53	78	4.47	-1
73	Philippines	48.8	50	49.60	50.90	54	2.06	-4
74	Rwanda	22.7	89	48.96	28.28	85	5.57	4
75	Kyrgyzstan	48.8	51	48.54	50.69	55	1.91	-4
76	Tajikistan	45.1	58	46.10	47.21	65	2.12	-7
77	Nepal	38.2	70	45.02	41.23	74	3.04	-4
78	Morocco	29.3	84	43.74	33.51	84	4.24	-
79	Nicaragua	46.0	57	43.70	47.33	64	1.32	-7
80	Guatemala	44.7	59	43.05	46.12	67	1.44	-8
81	Turkey	36.3	75	40.31	38.97	79	2.66	-4
82	Tanzania	15.9	91	40.15	20.95	90	5.10	1
83	Ghana	34.2	81	39.35	36.96	80	2.76	1
84	Honduras	34.1	82	37.74	36.53	82	2.40	-
85	Zambia	22.3	90	32.81	25.66	88	3.37	2
86	Bangladesh	41.1	67	32.34	40.82	76	-0.29	-9

S/N	Country	GAWU score	Global rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in score	Change in rank
87	Pakistan	12.7	92	29.20	18.06	92	5.33	-
88	Nigeria	25.3	86	28.39	27.46	86	2.15	-
89	Malawi	4.1	95	27.70	10.54	94	6.42	1
90	India	37.9	71	26.02	36.70	81	-1.16	-10
91	Mozambique	4.5	94	25.06	10.13	95	5.67	-1
92	Uganda	23.1	88	23.34	24.70	89	1.57	-1
93	Jordan	28.6	85	16.59	27.33	87	-1.25	-2
94	West Bank and Gaza	12.3	93	13.83	15.01	93	2.71	-
95	Iraq	23.2	87	8.98	20.67	91	-2.54	-4
96	Afghanistan	3.6	96	4.14	6.57	96	2.93	-

5.1.1. Female labour force participation

The highest female labour force participation indicator score (table 19) expressed by a country on the rGAWI is 98.69 (Tanzania) and the lowest is 1.31 (Iraq). A high score of female labour force participation may be an important factor in moving Tanzania from 91st on the GAWI to 90th position on the rGAWI. The same trend is observed for Rwanda, which gained 4 ranking places and moved from the 89th position to the 85th.

Table 19.   Country ranking by female labour force participation scores

S/N	Country	GAWI score	GAWI rank	Female labour force participation score	rGAWI Score	rGAWI rank	Change in score	Change in rank
1	Tanzania	15.9	91	98.69	20.95	90	5.1	1
2	Rwanda	22.7	89	96.06	28.28	85	5.57	4
3	Mozambique	4.5	94	93.43	10.13	95	5.67	-1
4	Malawi	4.1	95	91.33	10.54	94	6.42	1
5	Nepal	38.2	70	89.75	41.23	74	3.04	-4
6	Iceland	81.8	7	88.70	86.86	5	5.02	2
7	Cambodia	34.4	80	88.44	39.67	77	5.22	3
8	Lao	29.4	83	85.68	34.82	83	5.39	-
9	Viet Nam	51.8	41	84.63	57.41	39	5.62	2

S/N	Country	GAWI score	GAWI rank	Female labour force participation score	rGAWI Score	rGAWI rank	Change in score	Change in rank
10	Sweden	84.4	3	84.23	89.27	2	4.84	1
11	Switzerland	90.1	1	83.31	89.03	4	-1.07	-3
12	Uganda	23.1	88	81.08	24.70	89	1.57	-1
13	Norway	89.3	2	80.42	91.45	1	2.17	1
14	Denmark	78.6	11	80.03	81.16	10	2.56	1
15	Canada	84.0	5	78.71	86.78	6	2.82	-1
16	Netherlands	83.0	6	78.32	85.15	7	2.14	-1
17	Finland	72.7	14	77.40	78.43	14	5.75	-
18	Zambia	22.3	90	76.87	25.66	88	3.37	2
19	Latvia	55.2	35	76.48	60.28	33	5.03	2
20	New Zealand	76.0	12	76.22	78.48	13	2.46	-1
21	Estonia	64.9	23	75.43	68.01	21	3.06	2
22	Germany	84.3	4	75.16	89.05	3	4.75	1
23	Lithuania	43.2	63	74.90	49.92	59	6.71	4
24	Thailand	56.0	34	73.85	61.57	31	5.55	3
25	Australia	71.0	17	73.46	75.49	16	4.52	1
26	Austria	74.4	13	73.32	79.30	12	4.92	1
27	United Kingdom	79.2	10	73.19	81.43	9	2.23	1
28	China	48.7	52	73.06	54.02	47	5.33	5
29	Portugal	52.9	38	72.80	59.14	36	6.25	2
30	Peru	49.7	48	72.01	54.41	45	4.71	3
31	Ghana	34.2	81	71.22	36.96	80	2.76	1
32	Russia	41.8	65	70.96	47.84	62	6.08	3
33	Spain	61.7	25	70.57	67.87	22	6.16	3
34	Uruguay	59.8	27	69.38	63.43	27	3.6	-
35	Slovenia	60.6	26	69.12	66.67	25	6.02	1
36	France	71.2	16	68.33	74.64	17	3.43	-1
37	Israel	70.1	18	68.20	70.34	19	0.26	-1
38	Cyprus	58.2	30	67.94	63.15	28	4.91	2
39	Bolivia	46.2	55	67.94	49.97	58	3.75	-3
40	United States of America	79.3	9	67.54	80.91	11	1.64	-2
41	Czech Republic	65.6	22	66.75	69.29	20	3.66	2
42	Japan	80.8	8	66.49	84.48	8	3.69	-
43	Brazil	46.2	56	66.10	51.80	53	5.64	3

S/N	Country	GAWI score	GAWI rank	Female labour force participation score	rGAWI Score	rGAWI rank	Change in score	Change in rank
44	Bulgaria	49.7	49	64.91	54.24	46	4.56	3
45	Ireland	72.0	15	63.07	75.54	15	3.59	-
46	Ukraine	37.0	73	63.07	42.93	70	5.93	3
47	Slovakia	52.1	40	62.94	57.65	38	5.57	2
48	Belgium	63.4	24	62.55	67.84	23	4.44	1
49	Belarus	42.1	64	62.55	47.85	61	5.7	3
50	Luxembourg	69.5	19	62.16	73.39	18	3.86	1
51	Tajikistan	45.1	58	61.89	47.21	65	2.12	-7
52	Georgia	58.8	29	60.97	61.65	30	2.81	-1
53	Bangladesh	41.1	67	60.18	40.82	76	-0.29	-9
54	Poland	57.4	32	60.05	62.21	29	4.8	3
55	Mongolia	37.4	72	59.53	42.48	71	5.09	1
56	Colombia	54.3	36	59.40	57.11	40	2.82	-4
57	Kyrgyzstan	48.8	51	59.26	50.69	55	1.91	-4
58	Paraguay	38.9	69	57.95	43.73	68	4.86	1
59	Armenia	51.1	43	57.82	55.62	43	4.47	-
60	Greece	34.5	79	57.69	42.96	69	8.49	10
61	Hungary	52.2	39	57.56	57.79	37	5.61	2
62	Croatia	44.0	61	57.56	50.52	56	6.55	5
63	Ecuador	50.9	44	57.03	52.80	49	1.91	-5
64	Romania	50.8	45	55.85	55.96	42	5.13	3
65	Dominican Republic	43.7	62	54.01	47.45	63	3.71	-1
66	Republic of Korea	44.0	60	53.61	51.94	52	7.93	8
67	Chile	66.3	21	53.61	67.77	24	1.5	-3
68	Argentina	57.6	31	53.35	59.64	35	2.09	-4
69	Venezuela	35.9	76	52.96	41.27	73	5.36	3
70	Italy	53.5	37	51.51	59.80	34	6.28	3
71	Serbia	41.7	66	51.38	48.23	60	6.53	6
72	Indonesia	36.6	74	50.85	40.94	75	4.35	-1
73	Panama	67.7	20	50.72	65.99	26	-1.68	-6
74	Philippines	48.8	50	49.93	50.90	54	2.06	-4
75	Montenegro	39.7	68	49.28	46.73	66	7.04	2
76	Albania	47.0	53	48.49	52.23	51	5.22	2
77	Guatemala	44.7	59	48.23	46.12	67	1.44	-8
78	El Salvador	46.9	54	48.09	50.41	57	3.5	-3

S/N	Country	GAWI score	GAWI rank	Female labour force participation score	rGAWI Score	rGAWI rank	Change in score	Change in rank
79	Costa Rica	59.6	28	47.83	60.69	32	1.08	-4
80	Nicaragua	46.0	57	46.52	47.33	64	1.32	-7
81	Mauritius	51.8	42	45.34	55.49	44	3.73	-2
82	South Africa	35.0	78	45.20	41.29	72	6.33	6
83	Nigeria	25.3	86	44.42	27.46	86	2.15	-
84	Mexico	56.3	33	44.02	57.00	41	0.74	-8
85	Malta	49.8	47	43.50	53.29	48	3.5	-1
86	Honduras	34.1	82	39.68	36.53	82	2.4	-
87	Moldova	35.1	77	38.90	39.53	78	4.47	-1
88	Sri Lanka	49.8	46	31.80	52.46	50	2.65	-4
89	Turkey	36.3	75	22.86	38.97	79	2.66	-4
90	India	37.9	71	18.13	36.70	81	-1.16	-10
91	Morocco	29.3	84	16.43	33.51	84	4.24	-
92	Pakistan	12.7	92	14.59	18.06	92	5.33	-
93	Jordan	28.6	85	2.50	27.33	87	-1.25	-2
94	West Bank and Gaza	12.3	93	2.10	15.01	93	2.71	-
95	Afghanistan	3.6	96	2.10	6.57	96	2.93	-
96	Iraq	23.2	87	1.31	20.67	91	-2.54	-4

5.1.2. Total fertility rate

The total fertility rate also influences the changes in ranking observed. When the countries on the rGAWI are ranked by their total fertility rate scores (table 20), the first 23 countries except for Japan rose from their ranked GAWI positions. In addition, the highest increases in rankings is observed for some of the countries with the highest total fertility rate scores (Republic of Korea, Greece, and Serbia)

Table 20.   Country ranking by total fertility rate scores

S/N	Country	GAWI score	GAWI rank	Total fertility rate score	rGAWI score	rGAWI rank	Change in score	Change in rank
1	Republic of Korea	44.0	60	87.95	51.94	52	7.93	8
2	Poland	57.4	32	82.15	62.21	29	4.8	3
3	Romania	50.8	45	82.15	55.96	42	5.13	3
4	Slovenia	60.6	26	81.48	66.67	25	6.02	1
5	Slovakia	52.1	40	78.24	57.65	38	5.57	2
6	Japan	80.8	8	77.62	84.48	8	3.69	-
7	Greece	34.5	79	76.41	42.96	69	8.49	10
8	Hungary	52.2	39	75.82	57.79	37	5.61	2
9	Italy	53.5	37	75.82	59.80	34	6.28	3
10	Serbia	41.7	66	75.82	48.23	60	6.53	6
11	Germany	84.3	4	75.23	89.05	3	4.75	1
12	Czech Republic	65.6	22	75.23	69.29	20	3.66	2
13	Bulgaria	49.7	49	74.66	54.24	46	4.56	3
14	Austria	74.4	13	74.09	79.30	12	4.92	1
15	Cyprus	58.2	30	74.09	63.15	28	4.91	2
16	Croatia	44.0	61	74.09	50.52	56	6.55	5
17	Belarus	42.1	64	73.53	47.85	61	5.7	3
18	Spain	61.7	25	72.43	67.87	22	6.16	3
19	Latvia	55.2	35	71.89	60.28	33	5.03	2
20	Albania	47.0	53	71.89	52.23	51	5.22	2
21	Thailand	56.0	34	71.36	61.57	31	5.55	3
22	Portugal	52.9	38	70.83	59.14	36	6.25	2
23	Ukraine	37.0	73	70.31	42.93	70	5.93	3
24	Malta	49.8	47	69.80	53.29	48	3.5	-1
25	Switzerland	90.1	1	69.30	89.03	4	-1.07	-3
26	Moldova	35.1	77	68.80	39.53	78	4.47	-1
27	Canada	84.0	5	67.34	86.78	6	2.82	-1
28	Estonia	64.9	23	67.34	68.01	21	3.06	2
29	Lithuania	43.2	63	67.34	49.92	59	6.71	4
30	China	48.7	52	66.87	54.02	47	5.33	5
31	Russia	41.8	65	66.40	47.84	62	6.08	3
32	Luxembourg	69.5	19	66.40	73.39	18	3.86	1
33	Armenia	51.1	43	65.03	55.62	43	4.47	-
34	Montenegro	39.7	68	63.28	46.73	66	7.04	2
35	Denmark	78.6	11	61.21	81.16	10	2.56	1

S/N	Country	GAWI score	GAWI rank	Total fertility rate score	rGAWI score	rGAWI rank	Change in score	Change in rank
36	Finland	72.7	14	60.41	78.43	14	5.75	-
37	Georgia	58.8	29	60.02	61.65	30	2.81	-1
38	Mauritius	51.8	42	60.02	55.49	44	3.73	-2
39	Australia	71.0	17	59.64	75.49	16	4.52	1
40	Brazil	46.2	56	59.64	51.80	53	5.64	3
41	Netherlands	83.0	6	59.25	85.15	7	2.14	-1
42	Belgium	63.4	24	59.25	67.84	23	4.44	1
43	Uruguay	59.8	27	57.77	63.43	27	3.6	-
44	Chile	66.3	21	57.77	67.77	24	1.5	-3
45	Viet Nam	51.8	41	57.40	57.41	39	5.62	2
46	Norway	89.3	2	56.34	91.45	1	2.17	1
47	United States of America	79.3	9	56.00	80.91	11	1.64	-2
48	Sweden	84.4	3	55.65	89.27	2	4.84	1
49	United Kingdom	79.2	10	55.31	81.43	9	2.23	1
50	Costa Rica	59.6	28	54.98	60.69	32	1.08	-4
51	Paraguay	38.9	69	54.65	43.73	68	4.86	1
52	El Salvador	46.9	54	54.65	50.41	57	3.5	-3
53	Nicaragua	46.0	57	53.67	47.33	64	1.32	-7
54	Ireland	72.0	15	52.11	75.54	15	3.59	-
55	Iceland	81.8	7	51.21	86.86	5	5.02	2
56	New Zealand	76.0	12	50.63	78.48	13	2.46	-1
57	Colombia	54.3	36	50.63	57.11	40	2.82	-4
58	Turkey	36.3	75	50.34	38.97	79	2.66	-4
59	France	71.2	16	49.49	74.64	17	3.43	-1
60	Sri Lanka	49.8	46	48.94	52.46	50	2.65	-4
61	Morocco	29.3	84	48.13	33.51	84	4.24	-
62	Indonesia	36.6	74	47.60	40.94	75	4.35	-1
63	Mongolia	37.4	72	47.09	42.48	71	5.09	1
64	Peru	49.7	48	46.83	54.41	45	4.71	3
65	Argentina	57.6	31	45.59	59.64	35	2.09	-4
66	Nepal	38.2	70	45.35	41.23	74	3.04	-4
67	Mexico	56.3	33	44.64	57.00	41	0.74	-8
68	Venezuela	35.9	76	43.50	41.27	73	5.36	3
69	Dominican Republic	43.7	62	43.28	47.45	63	3.71	-1

S/N	Country	GAWI score	GAWI rank	Total fertility rate score	rGAWI score	rGAWI rank	Change in score	Change in rank
70	South Africa	35.0	78	43.28	41.29	72	6.33	6
71	Panama	67.7	20	42.84	65.99	26	-1.68	-6
72	Bangladesh	41.1	67	41.77	40.82	76	-0.29	-9
73	India	37.9	71	40.15	36.70	81	-1.16	-10
74	Ecuador	50.9	44	39.38	52.80	49	1.91	-5
75	Cambodia	34.4	80	37.91	39.67	77	5.22	3
76	Kyrgyzstan	48.8	51	36.86	50.69	55	1.91	-4
77	Israel	70.1	18	36.52	70.34	19	0.26	-1
78	Tajikistan	45.1	58	36.02	47.21	65	2.12	-7
79	Bolivia	46.2	55	35.70	49.97	58	3.75	-3
80	Pakistan	12.7	92	35.38	18.06	92	5.33	-
81	West Bank and Gaza	12.3	93	35.22	15.01	93	2.71	-
82	Honduras	34.1	82	34.91	36.53	82	2.4	-
83	Lao	29.4	83	34.29	34.82	83	5.39	-
84	Guatemala	44.7	59	33.11	46.12	67	1.44	-8
85	Philippines	48.8	50	30.56	50.90	54	2.06	-4
86	Jordan	28.6	85	29.57	27.33	87	-1.25	-2
87	Ghana	34.2	81	21.24	36.96	80	2.76	1
88	Iraq	23.2	87	20.81	20.67	91	-2.54	-4
89	Rwanda	22.7	89	18.16	28.28	85	5.57	4
90	Tanzania	15.9	91	16.20	20.95	90	5.1	1
91	Nigeria	25.3	86	14.78	27.46	86	2.15	-
92	Mozambique	4.5	94	14.69	10.13	95	5.67	-1
93	Afghanistan	3.6	96	14.17	6.57	96	2.93	-
94	Malawi	4.1	95	13.08	10.54	94	6.42	1
95	Zambia	22.3	90	12.63	25.66	88	3.37	2
96	Uganda	23.1	88	12.02	24.70	89	1.57	-1

5.1.3. Age at first marriage

The highest age at first marriage indicator score of a country on the rGAWI (table 21) is 93.75, observed in Sweden. Sweden moved from the third position on GAWI to the second on rGAWI. The lowest score for age at first marriage is 6.25 (Afghanistan) and

most of the countries at the bottom of the age at first marriage ranking table dropped in overall GAWI rankings. In addition, the most drops in ranking were expressed by some countries found near the bottom of the age at first marriage ranking table (Guatemala, Tajikistan, Nicaragua, India and Nepal).

Table 21.   Country ranking by age at first marriage scores

S/N	Country	GAWI score	GAWI rank	Age at first marriage score	rGAWI score	rGAWI rank	Change in score	Change in rank
1	Sweden	84.4	3	93.75	89.27	2	4.84	1
2	Iceland	81.8	7	93.13	86.86	5	5.02	2
3	Finland	72.7	14	80.00	78.43	14	5.75	-
4	Germany	84.3	4	76.25	89.05	3	4.75	1
5	Ireland	72.0	15	74.38	75.54	15	3.59	-
6	Norway	89.3	2	72.50	91.45	1	2.17	1
7	France	71.2	16	68.13	74.64	17	3.43	-1
8	South Africa	35.0	78	64.38	41.29	72	6.33	6
9	Australia	71.0	17	63.75	75.49	16	4.52	1
10	Japan	80.8	8	63.13	84.48	8	3.69	-
11	Austria	74.4	13	62.50	79.30	12	4.92	1
12	Montenegro	39.7	68	61.88	46.73	66	7.04	2
13	United Kingdom	79.2	10	60.00	81.43	9	2.23	1
14	Morocco	29.3	84	59.38	33.51	84	4.24	-
15	Canada	84.0	5	58.75	86.78	6	2.82	-1
16	Belgium	63.4	24	58.75	67.84	23	4.44	1
17	Republic of Korea	44.0	60	58.13	51.94	52	7.93	8
18	Italy	53.5	37	58.13	59.80	34	6.28	3
19	Spain	61.7	25	58.13	67.87	22	6.16	3
20	Netherlands	83.0	6	58.13	85.15	7	2.14	-1
21	New Zealand	76.0	12	58.13	78.48	13	2.46	-1
22	Luxembourg	69.5	19	57.50	73.39	18	3.86	1
23	United States of America	79.3	9	57.50	80.91	11	1.64	-2
24	Sri Lanka	49.8	46	53.13	52.46	50	2.65	-4
25	Denmark	78.6	11	51.25	81.16	10	2.56	1
26	Slovenia	60.6	26	50.00	66.67	25	6.02	1
27	Greece	34.5	79	48.13	42.96	69	8.49	10
28	Jordan	28.6	85	48.13	27.33	87	-1.25	-2
29	Israel	70.1	18	46.88	70.34	19	0.26	-1
30	Serbia	41.7	66	45.00	48.23	60	6.53	6

S/N	Country	GAWI score	GAWI rank	Age at first marriage score	rGAWI score	rGAWI rank	Change in score	Change in rank
31	Portugal	52.9	38	44.38	59.14	36	6.25	2
32	Hungary	52.2	39	43.75	57.79	37	5.61	2
33	Croatia	44.0	61	43.75	50.52	56	6.55	5
34	Mauritius	51.8	42	43.75	55.49	44	3.73	-2
35	Philippines	48.8	50	43.75	50.90	54	2.06	-4
36	Thailand	56.0	34	41.88	61.57	31	5.55	3
37	Chile	66.3	21	41.25	67.77	24	1.5	-3
38	Argentina	57.6	31	40.63	59.64	35	2.09	-4
39	Viet Nam	51.8	41	40.00	57.41	39	5.62	2
40	Cyprus	58.2	30	39.38	63.15	28	4.91	2
41	Peru	49.7	48	39.38	54.41	45	4.71	3
42	Poland	57.4	32	38.75	62.21	29	4.8	3
43	Czech Republic	65.6	22	38.75	69.29	20	3.66	2
44	Uruguay	59.8	27	38.75	63.43	27	3.6	-
45	Albania	47.0	53	38.13	52.23	51	5.22	2
46	Brazil	46.2	56	36.88	51.80	53	5.64	3
47	Bolivia	46.2	55	36.88	49.97	58	3.75	-3
48	Rwanda	22.7	89	36.88	28.28	85	5.57	4
49	Slovakia	52.1	40	36.25	57.65	38	5.57	2
50	Dominican Republic	43.7	62	35.63	47.45	63	3.71	-1
51	Romania	50.8	45	35.00	55.96	42	5.13	3
52	Switzerland	90.1	1	35.00	89.03	4	-1.07	-3
53	Armenia	51.1	43	35.00	55.62	43	4.47	-
54	Colombia	54.3	36	35.00	57.11	40	2.82	-4
55	Mexico	56.3	33	35.00	57.00	41	0.74	-8
56	Georgia	58.8	29	34.38	61.65	30	2.81	-1
57	El Salvador	46.9	54	34.38	50.41	57	3.5	-3
58	Malta	49.8	47	33.75	53.29	48	3.5	-1
59	Lithuania	43.2	63	33.75	49.92	59	6.71	4
60	Costa Rica	59.6	28	33.75	60.69	32	1.08	-4
61	Estonia	64.9	23	33.13	68.01	21	3.06	2
62	China	48.7	52	33.13	54.02	47	5.33	5
63	Mongolia	37.4	72	33.13	42.48	71	5.09	1
64	Venezuela	35.9	76	33.13	41.27	73	5.36	3
65	Latvia	55.2	35	32.50	60.28	33	5.03	2
66	Turkey	36.3	75	32.50	38.97	79	2.66	-4
67	Panama	67.7	20	31.88	65.99	26	-1.68	-6

S/N	Country	GAWI score	GAWI rank	Age at first marriage score	rGAWI score	rGAWI rank	Change in score	Change in rank
68	Ecuador	50.9	44	31.25	52.80	49	1.91	-5
69	Belarus	42.1	64	30.63	47.85	61	5.7	3
70	West Bank and Gaza	12.3	93	30.63	15.01	93	2.71	-
71	Iraq	23.2	87	30.63	20.67	91	-2.54	-4
72	Russia	41.8	65	30.00	47.84	62	6.08	3
73	Indonesia	36.6	74	30.00	40.94	75	4.35	-1
74	Pakistan	12.7	92	30.00	18.06	92	5.33	-
75	Paraguay	38.9	69	29.38	43.73	68	4.86	1
76	Kyrgyzstan	48.8	51	28.75	50.69	55	1.91	-4
77	Guatemala	44.7	59	28.13	46.12	67	1.44	-8
78	Lao	29.4	83	27.50	34.82	83	5.39	-
79	Bulgaria	49.7	49	26.88	54.24	46	4.56	3
80	Ukraine	37.0	73	26.25	42.93	70	5.93	3
81	Cambodia	34.4	80	26.25	39.67	77	5.22	3
82	Moldova	35.1	77	25.63	39.53	78	4.47	-1
83	Tajikistan	45.1	58	24.38	47.21	65	2.12	-7
84	Ghana	34.2	81	23.13	36.96	80	2.76	1
85	Tanzania	15.9	91	23.13	20.95	90	5.1	1
86	Honduras	34.1	82	22.50	36.53	82	2.4	-
87	Nigeria	25.3	86	21.88	27.46	86	2.15	-
88	Zambia	22.3	90	21.88	25.66	88	3.37	2
89	Nicaragua	46.0	57	18.75	47.33	64	1.32	-7
90	India	37.9	71	15.63	36.70	81	-1.16	-10
91	Nepal	38.2	70	12.50	41.23	74	3.04	-4
92	Malawi	4.1	95	11.25	10.54	94	6.42	1
93	Uganda	23.1	88	8.75	24.70	89	1.57	-1
94	Bangladesh	41.1	67	8.13	40.82	76	-0.29	-9
95	Mozambique	4.5	94	7.50	10.13	95	5.67	-1
96	Afghanistan	3.6	96	6.25	6.57	96	2.93	-

5.2. Change score model for comparing country rankings on GAWI and rGAWI

A standard method for comparing change in index scores and rankings on GAWI and rGAWI was constructed in a preliminary analysis of data on female labour force participation, fertility rate and age at first marriage. This model is meant to give a summary

of observed changes and also guide a detailed discussion of results. Table 22 shows a comparison of the gender inequality domain, GAWI and rGAWI calculations for 11 countries. The countries are randomly and systematically selected with a sample interval of 10 to give a fair representation of all 96 countries with equal coverage of the range of rankings. The first country was randomly picked by balloting. In addition, the first (Norway) and last (Afghanistan) countries on the rGAWI are included in the model. Canada is also included, being the country of current research.

The countries represented in this sample model are Norway, Canada, United Kingdom, Israel, Poland, Viet Nam, Ecuador, Lithuania, Greece, Turkey and Afghanistan. This was done to demonstrate how the rankings of the 96 countries on GAWI and rGAWI can eventually be compared. The results of the preliminary analysis and how comparisons are made between GAWI and rGAWI are described.

Table 22.　　Model for comparing the ranking of countries based on the GAWI and rGAWI

Country	GAWI Rank	Female labour force participation	Total Fertility rate	Age at 1st marriage	Gender inequality domain score	rGAWI score	rGAWI rank	Change in index score	Change in rank
Norway	2	80.42	56.34	72.50	86.69	91.45	1	2.17	1
Canada	5	78.71	67.34	58.75	85.10	86.78	6	2.82	- 1
United Kingdom	10	73.19	55.31	60.00	78.08	81.43	9	2.23	1
Israel	18	68.20	36.52	46.88	60.44	70.34	19	0.26	-1
Poland	32	60.05	82.15	38.75	71.83	62.21	29	4.80	3
Viet Nam	41	84.63	57.40	40.00	72.24	57.41	39	5.62	2
Ecuador	44	57.03	39.38	31.25	50.49	52.80	49	1.91	-5
Lithuania	63	74.90	67.34	33.75	68.98	49.92	59	6.71	4
Greece	79	57.69	76.41	48.13	74.48	42.96	69	8.49	10
Turkey	75	22.86	50.34	32.50	40.31	38.97	79	2.66	- 4
Afghanistan	96	2.10	14.17	6.25	4.14	6.57	96	2.93	0

Table 22 above shows the comparison of GAWI and rGAWI for the 11 systematically selected countries. After including the gender inequality domain in the analysis, Norway had added 2.17 index scores, a unit increase in rank and moved from the second to the first position. Canada had a 2.82 increase in index score but dropped one place on the rankings. United Kingdom had added 2.23 index scores, a unit increase in rank. Israel had a 0.26 increase in index score but dropped one place on the rankings. Poland had added 4.80 index scores and a 3-unit increase in rank position. Viet Nam had added 5.62 index scores with a 2- unit increase in rank position. Ecuador had a 1.91 increase in index score but dropped 5-places on the rankings. Lithuania had added 6.71 index scores and 4- unit rise in position. Greece had added 8.49 index scores and rises 10 places in the rankings. Turkey had a 2.66 increase in index score but dropped 4-places on the rankings. Afghanistan had added 2.93 index scores and remained at the 96th position. Similar analyses and comparisons are carried out in this research for all the 96 countries on the

GAWI. The effects of the addition of the gender inequality domain in terms of changes observed in the rankings of countries are further discussed subsequently.

5.3. Index changes for all countries

Table 23.   Comparative ranking of all countries based on the GAWI and rGAWI

Country	GAWI score	GAWI Rank	Gender inequality domain indicator score			rGAWI score	rGAWI rank	Change in index score	Change in rank
			Female labour force partic	Total Fertility rate	Age at 1st marriage				
Norway	89.3	2	80.42	56.34	72.50	91.45	1	2.17	1
Sweden	84.4	3	84.23	55.65	93.75	89.27	2	4.84	1
Germany	84.3	4	75.16	75.23	76.25	89.05	3	4.75	1
Switzerland	90.1	1	83.31	69.30	35.00	89.03	4	-1.07	-3
Iceland	81.8	7	88.70	51.21	93.13	86.86	5	5.02	2
Canada	84.0	5	78.71	67.34	58.75	86.78	6	2.82	-1
Netherlands	83.0	6	78.32	59.25	58.13	85.15	7	2.14	-1
Japan	80.8	8	66.49	77.62	63.13	84.48	8	3.69	0
United Kingdom	79.2	10	73.19	55.31	60.00	81.43	9	2.23	1
Denmark	78.6	11	80.03	61.21	51.25	81.16	10	2.56	1
United States of America	79.3	9	67.54	56.00	57.50	80.91	11	1.64	-2
Austria	74.4	13	73.32	74.09	62.50	79.30	12	4.92	1
New Zealand	76.0	12	76.22	50.63	58.13	78.48	13	2.46	-1
Finland	72.7	14	77.40	60.41	80.00	78.43	14	5.75	0
Ireland	72.0	15	63.07	52.11	74.38	75.54	15	3.59	0
Australia	71.0	17	73.46	59.64	63.75	75.49	16	4.52	1
France	71.2	16	68.33	49.49	68.13	74.64	17	3.43	-1
Luxembourg	69.5	19	62.16	66.40	57.50	73.39	18	3.86	1
Israel	70.1	18	68.20	36.52	46.88	70.34	19	0.26	-1
Czech Republic	65.6	22	66.75	75.23	38.75	69.29	20	3.66	2
Estonia	64.9	23	75.43	67.34	33.13	68.01	21	3.06	2
Spain	61.7	25	70.57	72.43	58.13	67.87	22	6.16	3
Belgium	63.4	24	62.55	59.25	58.75	67.84	23	4.44	1
Chile	66.3	21	53.61	57.77	41.25	67.77	24	1.50	-3
Slovenia	60.6	26	69.12	81.48	50.00	66.67	25	6.02	1
Panama	67.7	20	50.72	42.84	31.88	65.99	26	-1.68	-6

Country	GAWI score	GAWI Rank	Gender inequality domain indicator score			rGAWI score	rGAWI rank	Change in index score	Change in rank
			Female labour force partic	Total Fertility rate	Age at 1st marriage				
Uruguay	59.8	27	69.38	57.77	38.75	63.43	27	3.60	0
Cyprus	58.2	30	67.94	74.09	39.38	63.15	28	4.91	2
Poland	57.4	32	60.05	82.15	38.75	62.21	29	4.80	3
Georgia	58.8	29	60.97	60.02	34.38	61.65	30	2.81	-1
Thailand	56.0	34	73.85	71.36	41.88	61.57	31	5.55	3
Costa Rica	59.6	28	47.83	54.98	33.75	60.69	32	1.08	-4
Latvia	55.2	35	76.48	71.89	32.50	60.28	33	5.03	2
Italy	53.5	37	51.51	75.82	58.13	59.80	34	6.28	3
Argentina	57.6	31	53.35	45.59	40.63	59.64	35	2.09	-4
Portugal	52.9	38	72.80	70.83	44.38	59.14	36	6.25	2
Hungary	52.2	39	57.56	75.82	43.75	57.79	37	5.61	2
Slovakia	52.1	40	62.94	78.24	36.25	57.65	38	5.57	2
Viet Nam	51.8	41	84.63	57.40	40.00	57.41	39	5.62	2
Colombia	54.3	36	59.40	50.63	35.00	57.11	40	2.82	-4
Mexico	56.3	33	44.02	44.64	35.00	57.00	41	0.74	-8
Romania	50.8	45	55.85	82.15	35.00	55.96	42	5.13	3
Armenia	51.1	43	57.82	65.03	35.00	55.62	43	4.47	0
Mauritius	51.8	42	45.34	60.02	43.75	55.49	44	3.73	-2
Peru	49.7	48	72.01	46.83	39.38	54.41	45	4.71	3
Bulgaria	49.7	49	64.91	74.66	26.88	54.24	46	4.56	3
China	48.7	52	73.06	66.87	33.13	54.02	47	5.33	5
Malta	49.8	47	43.50	69.80	33.75	53.29	48	3.50	-1
Ecuador	50.9	44	57.03	39.38	31.25	52.80	49	1.91	-5
Sri Lanka	49.8	46	31.80	48.94	53.13	52.46	50	2.65	-4
Albania	47.0	53	48.49	71.89	38.13	52.23	51	5.22	2
Republic of Korea	44.0	60	53.61	87.95	58.13	51.94	52	7.93	8
Brazil	46.2	56	66.10	59.64	36.88	51.80	53	5.64	3
Philippines	48.8	50	49.93	30.56	43.75	50.90	54	2.06	-4
Kyrgyzstan	48.8	51	59.26	36.86	28.75	50.69	55	1.91	-4
Croatia	44.0	61	57.56	74.09	43.75	50.52	56	6.55	5
El Salvador	46.9	54	48.09	54.65	34.38	50.41	57	3.50	-3
Bolivia	46.2	55	67.94	35.70	36.88	49.97	58	3.75	-3
Lithuania	43.2	63	74.90	67.34	33.75	49.92	59	6.71	4
Serbia	41.7	66	51.38	75.82	45.00	48.23	60	6.53	6
Belarus	42.1	64	62.55	73.53	30.63	47.85	61	5.70	3
Russia	41.8	65	70.96	66.40	30.00	47.84	62	6.08	3

Country	GAWI score	GAWI Rank	Gender inequality domain indicator score			rGAWI score	rGAWI rank	Change in index score	Change in rank
			Female labour force partic	Total Fertility rate	Age at 1st marriage				
Dominican Republic	43.7	62	54.01	43.28	35.63	47.45	63	3.71	-1
Nicaragua	46.0	57	46.52	53.67	18.75	47.33	64	1.32	-7
Tajikistan	45.1	58	61.89	36.02	24.38	47.21	65	2.12	-7
Montenegro	39.7	68	49.28	63.28	61.88	46.73	66	7.04	2
Guatemala	44.7	59	48.23	33.11	28.13	46.12	67	1.44	-8
Paraguay	38.9	69	57.95	54.65	29.38	43.73	68	4.86	1
Greece	34.5	79	57.69	76.41	48.13	42.96	69	8.49	10
Ukraine	37.0	73	63.07	70.31	26.25	42.93	70	5.93	3
Mongolia	37.4	72	59.53	47.09	33.13	42.48	71	5.09	1
South Africa	35.0	78	45.20	43.28	64.38	41.29	72	6.33	6
Venezuela	35.9	76	52.96	43.50	33.13	41.27	73	5.36	3
Nepal	38.2	70	89.75	45.35	12.50	41.23	74	3.04	-4
Indonesia	36.6	74	50.85	47.60	30.00	40.94	75	4.35	-1
Bangladesh	41.1	67	60.18	41.77	8.13	40.82	76	-0.29	-9
Cambodia	34.4	80	88.44	37.91	26.25	39.67	77	5.22	3
Moldova	35.1	77	38.90	68.80	25.63	39.53	78	4.47	-1
Turkey	36.3	75	22.86	50.34	32.50	38.97	79	2.66	-4
Ghana	34.2	81	71.22	21.24	23.13	36.96	80	2.76	1
India	37.9	71	18.13	40.15	15.63	36.70	81	-1.16	-10
Honduras	34.1	82	39.68	34.91	22.50	36.53	82	2.40	0
Lao	29.4	83	85.68	34.29	27.50	34.82	83	5.39	0
Morocco	29.3	84	16.43	48.13	59.38	33.51	84	4.24	0
Rwanda	22.7	89	96.06	18.16	36.88	28.28	85	5.57	4
Nigeria	25.3	86	44.42	14.78	21.88	27.46	86	2.15	0
Jordan	28.6	85	2.50	29.57	48.13	27.33	87	-1.25	-2
Zambia	22.3	90	76.87	12.63	21.88	25.66	88	3.37	2
Uganda	23.1	88	81.08	12.02	8.75	24.70	89	1.57	-1
Tanzania	15.9	91	98.69	16.20	23.13	20.95	90	5.10	1
Iraq	23.2	87	1.31	20.81	30.63	20.67	91	-2.54	-4
Pakistan	12.7	92	14.59	35.38	30.00	18.06	92	5.33	0
West Bank and Gaza	12.3	93	2.10	35.22	30.63	15.01	93	2.71	0
Malawi	4.1	95	91.33	13.08	11.25	10.54	94	6.42	1
Mozambique	4.5	94	93.43	14.69	7.50	10.13	95	5.67	-1
Afghanistan	3.6	96	2.10	14.17	6.25	6.57	96	2.93	0

The new ranking of the countries on the rGAWI resulted in the displacement of most countries from their initial position on the GAWI (Table 23). After the computation of the rGAWI, Norway ranks first with an index score of 91.45 and Afghanistan is the last on the table with an index score of 6.57. The GID scores of the first and last countries on the rGAWI are 86.69 and 4.14 respectively. Of the 96 countries included in this analysis, the ranking of 84 countries changed on the rGAWI while that of 12 countries remained the same as it was on the GAWI. For the 84 countries with a change in ranking, 36 countries ranked lower while 48 ranked higher on the rGAWI compared to the original GAWI. Switzerland, Canada, Netherlands, United States of America, New Zealand, France, Israel, Chile, Panama, Georgia, Costa Rica, Argentina, Colombia, Mexico, Mauritius, Malta, Ecuador, Sri Lanka, Philippines, Kyrgyzstan, El Salvador, Bolivia, Dominican Republic, Nicaragua, Tajikistan, Guatemala, Nepal, Indonesia, Bangladesh, Moldova, Turkey, India, Jordan, Uganda, Iraq and Mozambique ranked lower on the rGAWI than they did on the GAWI (Table 24).

Conversely, Norway, Sweden, Germany, Iceland, United Kingdom, Denmark, Austria, Australia, Luxembourg, Czech Republic, Estonia, Spain, Belgium, Slovenia, Cyprus, Poland, Thailand, Latvia, Italy, Portugal, Hungary, Slovakia, Viet Nam, Romania, Peru, Bulgaria, China, Albania, Republic of Korea, Brazil, Croatia, Lithuania, Serbia, Belarus, Russia, Montenegro, Paraguay, Greece, Ukraine, Mongolia, South Africa, Venezuela, Cambodia, Ghana, Rwanda, Zambia, Tanzania and Malawi ranked higher (Table 25). Japan, Finland, Ireland, Uruguay, Armenia, Honduras, Lao People's Dem. Republic, Morocco, Nigeria, Pakistan, West Bank and Gaza, and Afghanistan retained their rankings (Table 26).

The distribution of the different countries by the indicators of the GID shows that Tanzania has the highest score for female labour force participation (98.69) and Iraq has the lowest (1.31) (Table 19). Also, Korea has the best score for fertility rate (87.95) while Uganda has the poorest (12.02) (Table 20). For age at first marriage, Sweden has the best score (93.75) while Afghanistan has the poorest (6.25) (Table 21).

Most countries had consistent scores across the three indicators of the GID. Exceptions include Estonia, which has scores of 75.43 and 67.34 on the female labour force participation and total fertility rate indicators respectively but has a score of 33.13 for age at first marriage. A similar trend is expressed by Uruguay, that has scores of 69.38

and 57.77 on the female labour force participation and total fertility rate indicators respectively but has a score of 38.75 for age at first marriage.

Table 24. **Countries that ranked lower on rGAWI vs GAWI**

S/N	Country	GAWI Rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in index score	Change in rank
1	Switzerland	1	73.23	89.03	4	-1.07	-3
2	Canada	5	85.10	86.78	6	2.82	-1
3	Netherlands	6	80.97	85.15	7	2.14	-1
4	United States of America	9	75.13	80.91	11	1.64	-2
5	New Zealand	12	75.94	78.48	13	2.46	-1
6	France	16	76.65	74.64	17	3.43	-1
7	Israel	18	60.44	70.34	19	0.26	-1
8	Chile	21	62.38	67.77	24	1.50	-3
9	Panama	20	50.26	65.99	26	-1.68	-6
10	Georgia	29	62.05	61.65	30	2.81	-1
11	Costa Rica	28	54.87	60.69	32	1.08	-4
12	Argentina	31	56.99	59.64	35	2.09	-4
13	Colombia	36	58.27	57.11	40	2.82	-4
14	Mexico	33	50.13	57.00	41	0.74	-8
15	Mauritius	42	60.86	55.49	44	3.73	-2
16	Malta	47	57.73	53.29	48	3.50	-1
17	Ecuador	44	50.49	52.80	49	1.91	-5
18	Sri Lanka	46	53.51	52.46	50	2.65	-4
19	Philippines	50	49.60	50.90	54	2.06	-4
20	Kyrgyzstan	51	48.54	50.69	55	1.91	-4
21	El Salvador	54	55.22	50.41	57	3.50	-3
22	Bolivia	55	55.02	49.97	58	3.75	-3
23	Dominican Republic	62	53.65	47.45	63	3.71	-1
24	Nicaragua	57	43.70	47.33	64	1.32	-7
25	Tajikistan	58	46.10	47.21	65	2.12	-7
26	Guatemala	59	43.05	46.12	67	1.44	-8
27	Nepal	70	45.02	41.23	74	3.04	-4
28	Indonesia	74	51.11	40.94	75	4.35	-1
29	Bangladesh	67	32.34	40.82	76	-0.29	-9
30	Moldova	77	50.08	39.53	78	4.47	-1
31	Turkey	75	40.31	38.97	79	2.66	-4
32	India	71	26.02	36.70	81	-1.16	-10
33	Jordan	85	16.59	27.33	87	-1.25	-2
34	Uganda	88	23.34	24.70	89	1.57	-1
35	Iraq	87	8.98	20.67	91	-2.54	-4
36	Mozambique	94	25.06	10.13	95	5.67	-1

Table 25.   Table Countries that ranked higher on rGAWI vs GAWI

S/N	Country	GAWI Rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in index score	Change in rank
1	Norway	2	86.69	91.45	1	2.17	1
2	Sweden	3	95.86	89.27	2	4.84	1
3	Germany	4	95.23	89.05	3	4.75	1
4	Iceland	7	94.61	86.86	5	5.02	2
5	United Kingdom	10	78.08	81.43	9	2.23	1
6	Denmark	11	78.98	81.16	10	2.56	1
7	Austria	13	87.69	79.30	12	4.92	1
8	Australia	17	81.95	75.49	16	4.52	1
9	Luxembourg	19	77.45	73.39	18	3.86	1
10	Czech Republic	22	72.28	69.29	20	3.66	2
11	Estonia	23	68.70	68.01	21	3.06	2
12	Spain	25	83.72	67.87	22	6.16	3
13	Belgium	24	75.16	67.84	23	4.44	1
14	Slovenia	26	82.19	66.67	25	6.02	1
15	Cyprus	30	72.74	63.15	28	4.91	2
16	Poland	32	71.83	62.21	29	4.80	3
17	Thailand	34	75.51	61.57	31	5.55	3
18	Latvia	35	70.16	60.28	33	5.03	2
19	Italy	37	76.26	59.80	34	6.28	3
20	Portugal	38	76.47	59.14	36	6.25	2
21	Hungary	39	71.80	57.79	37	5.61	2
22	Slovakia	40	70.14	57.65	38	5.57	2
23	Viet Nam	41	72.24	57.41	39	5.62	2
24	Romania	45	67.59	55.96	42	5.13	3
25	Peru	48	63.24	54.41	45	4.71	3
26	Bulgaria	49	62.81	54.24	46	4.56	3
27	China	52	67.77	54.02	47	5.33	5
28	Albania	53	63.25	52.23	51	5.22	2
29	Republic of Korea	60	81.42	51.94	52	7.93	8
30	Brazil	56	65.27	51.80	53	5.64	3
31	Croatia	61	71.22	50.52	56	6.55	5
32	Lithuania	63	68.98	49.92	59	6.71	4
33	Serbia	66	69.69	48.23	60	6.53	6
34	Belarus	64	64.56	47.85	61	5.70	3
35	Russia	65	64.64	47.84	62	6.08	3
36	Montenegro	68	72.06	46.73	66	7.04	2
37	Paraguay	69	55.79	43.73	68	4.86	1

S/N	Country	GAWI Rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in index score	Change in rank
38	Greece	79	74.48	42.96	69	8.49	10
39	Ukraine	73	60.38	42.93	70	5.93	3
40	Mongolia	72	55.75	42.48	71	5.09	1
41	South Africa	78	62.07	41.29	72	6.33	6
42	Venezuela	76	52.01	41.27	73	5.36	3
43	Cambodia	80	54.71	39.67	77	5.22	3
44	Ghana	81	39.35	36.96	80	2.76	1
45	Rwanda	89	48.96	28.28	85	5.57	4
46	Zambia	90	32.81	25.66	88	3.37	2
47	Tanzania	91	40.15	20.95	90	5.10	1
48	Malawi	95	27.70	10.54	94	6.42	1

Table 26.   Countries that ranked same on rGAWI and GAWI

S/N	Country	GAWI Rank	Gender inequality domain score	rGAWI score	rGAWI rank	Change in index score	Change in rank
1	Japan	8	86.45	84.48	8	3.69	0
2	Finland	14	90.68	78.43	14	5.75	0
3	Ireland	15	78.25	75.54	15	3.59	0
4	Uruguay	27	66.80	63.43	27	3.60	0
5	Armenia	43	63.04	55.62	43	4.47	0
6	Honduras	82	37.74	36.53	82	2.40	0
7	Lao	83	53.08	34.82	83	5.39	0
8	Morocco	84	43.74	33.51	84	4.24	0
9	Nigeria	86	28.39	27.46	86	2.15	0
10	Pakistan	92	29.20	18.06	92	5.33	0
11	West Bank and Gaza	93	13.83	15.01	93	2.71	0
12	Afghanistan	96	4.14	6.57	96	2.93	0

The effects of the GID indicators on the new rankings on rGAWI can be read from table 23. The most marked drop in ranking affected India, which dropped 10 places from the 71st position on GAWI to 81st on the rGAWI. India has a score of 26.02 on the GID which is due to poor scores for the female labour force participation (18.13) and age at first marriage indicators (15.63). Similarly, Bangladesh which dropped 9 ranking positions

from the 67th position on GAWI to 76th on the rGAWI. Bangladesh has a score of 32.34 on the GID which is due to a poor score for the age at first marriage indicator (8.13).

However, the highest increase in ranking was recorded for Greece, which rose from 79 on the GAWI to 69 on the rGAWI (table 23). Greece has a score of 74.48 on the GID and this is mostly due to a high score of 76.41 for the total fertility rate indicator. The next highest climb in ranking was exhibited by Republic of Korea, that rose from 60th position on the GAWI to 52nd on the rGAWI. Republic of Korea has a score of 81.42 on the GID and an index score of 51.94.

The higher the score on the GID, the more likely it is that a country moved up the table. Countries that dropped in ranking are those with a low GID score. In addition, countries with low GID scores are retained at the bottom of the overall rGAWI ranking. The least ranked nations include Iraq, Pakistan, the West Bank, Malawi, Mozambique and Afghanistan.

Chapter 6.

Discussion

This last chapter provides a discussion of results, comparing the rankings of the countries on GAWI and rGAWI. A validation of the reformulated index is done and an outline of the policy implications of this research is also presented. Furthermore, the chapter explains the limitations of the current research as well as directions for future research and ends with a concluding section.

6.1. Country rankings on GAWI and rGAWI

The aim of this research is to determine the effects of gender inequality on the wellbeing of older adults by determining the extent to which the inclusion of a gender inequality domain affects the GAWI and the ranking of countries on the index. The inclusion of the GID into GAWI results in changes in the rankings of 87.5% of the 96 countries included in this analysis. The impact of the GID score on the final ranking can be explained using some countries as examples. For instance, Luxembourg ranked 20th on GAWI and has a GID score of 77.45. Comparatively, Panama ranked 21st on the GAWI and has a GID score of 65.99. The lower GID score of Panama could explain the significant drop in rank of the country from 20 on the GAWI to 26 on the rGAWI. Also, South Africa has a GID score of 62.07 and rose in rank from 78 to 72 while the republic of Moldova, ranked 77th in GAWI has a GID score of 50.08 and dropped to 78th position in the reformulated index.

Furthermore, there seems to be a pattern of change in the new ranking of countries on the rGAWI in terms of their socioeconomic statuses. Specifically, 25% of the countries that dropped in ranking on the rGAWI are HICs while 75% are LMICs. Also, 48% of countries that rose in ranking on the rGAWI are HICs while 52% are LMICs. For countries that retained their ranking, 33% are HICs and 67% are LMICs. This implies that more HICs had better scores on the GID and were less likely to drop in ranking compared to LMICs. Also, indicators of gender inequality such as gender imbalance in education and employment have widely been linked to lower GDP (Jayachandran, 2015). This link between gendered socioeconomic differences and GDP further supports the

intersectionality of the social determinants of health and the gender bias that has been described by feminist gerontologists (Garner, 2014; Hooyman et al., 2002; Ray, 1996). While HICs have policies that support gender equality, the same can not be said about the majority of LMICs (Kochhar & Kochhar, 2016). HICs such as Norway, Germany and Canada have female- friendly and equal gender stance when designing programs to improve the wellbeing of their citizens.

The HICs that dropped in ranking did so within 1 to 2 ranks while LMICs dropped significantly. For instance, while Switzerland, Canada, Netherlands, and the USA all dropped 1-2 places on the rGAWI compared to the GAWI, Panama, a LMIC, dropped from the 20th position on the GAWI to the 26th on the rGAWI. Dropping 1-2 ranking positions may be more tolerable and within an acceptable margin of error compared to dropping 6 positions. In addition, the average changes in index scores and rankings between the GAWI and rGAWI for HICs and LMICs are different. HICs have an average change in index score of 4.09 compared to 3.61 for LMICs. Furthermore, HICs have an average change in ranking of +1.13 compared to -0.74 for LMICs.

Women in some Latin American countries, Africa and Middle East have been found to have low participation in the labour force (Abramo and Valenzuela, 2005; Fargues, 2005). Even when they are in paid employment, they are more likely to work part time. A study carried out to determine the rates of women's labour force participation in Latin America showed that less than 50% of Latin American women with some kind of employment work a full week compared to about 66% of their male counterparts (Abramo & Valenzuela, 2005). This has been attributed to the tendency of the women to combine domestic duties with paid work, and also to their poorer chances of finding good-quality jobs. The detriment of unemployment lasts for a long time and has deleterious effects on wellbeing in old age (O'Rand, 2016).

Also, while relying on the Malthusian argument, another explanation can be made to link uncontrolled population growth and poor access to reproductive health services to increased demand for scarce resources, poverty, hunger, and mortality (Canning and Schultz, 2012). Population increase that is solely due to high fertility has been shown to have adverse social and economic consequences (Sinding, 2009). This research has also revealed that not all countries that retained their ranking after the inclusion of the GID have a good score on all three indicators of gender inequality. For example, Estonia, Uruguay,

Switzerland, Latvia, and China have low scores on the age at first marriage indicator while they scored high on the female labour force participation and total fertility rate indicators. These countries may need effective policies to discourage early marriage in order to sustain a good score on the GID and improve the wellbeing of their residents. Out of the five countries listed above, Latvia and China made considerable progress in ensuring high female labour force participation and low fertility rates, therefore rising in the rGAWI. In the case of China, the one child policy that had been in place from 1980 up until 2015 could have been responsible for its good total fertility rate indicator score (Feng, Gu, & Cai, 2016; World Bank, 2016b).

Furthermore, Estonia and Uruguay maintained the same position on the rGAWI while Switzerland dropped from first to third. It is important to note that the lower age at first marriage used in this analysis is 22.4 years which was recorded in 1994. About the same period, the ages at first marriage in Norway and Sweden, the two countries that rose above Switzerland in the rGAWI were 28.4 and 31.8 years respectively. This difference in the ages at first marriage in Norway, Sweden, and Switzerland is responsible for the change in rankings observed among them. Although the age of 22.4 years is significantlly above the marriageable age in Switzerland (The Federal Council, 2017), the results of this research indicates it is a low average age to be married and can impact wellbeing significantly.

Iraq had the poorest score for female labour force participation and this has been reflected in different research findings (Fargues, 2005). The poor representation of women in the Iraqi labour force is linked to the war that has ravaged the country in recent times. Implementation of policies is likely to be disrupted by civil unrest and social systems would be less effective. Due to the manner by which social systems affect health (Dahlgren & Whitehead, 2007), the wellbeing of the population is likely to be undermined when civic systems are disrupted, and older adults are often severely affected (Aldrich & Benson, 2008).

In addition, there are indications that women in Iraq and some other Middle Eastern countries were locked in gendered home-making roles before the war, that made it difficult for them to participate effectively in the labour force (Karshenas & Moghadam, 2001). Similarly, Afghanistan has a poor score for the female labour force participation indicator (2.1). Although Afghanistan's score is slightly higher than Iraq's, any gain is offset by

Afghanistan's poor score for age at first marriage, that is the lowest of all 96 countries in this analysis.

The analysis resulted in some countries having a high score on one indicator of gender inequality and low scores on other indicators. For instance, Tanzania has a high female labour force participation indicator score of 98.69 (table 9) compared to low total fertility rate (16.20) and age at 1st marriage (23.13) scores. Research has shown that the participation of Tanzanian women in the labour force is increasing with men and women reaching about equal proportions in service jobs (Fischer, 2014). In addition, Tanzania has an overall change in rank of +1 after the reformulation of GAWI (table 21), an indication that the high female labour force participation score is offset by the low sores of the other two indicators of gender inequality.

Marriage at a mature age as opposed to child or teen marriage as well as low fertility rates reduces the probability for a woman to have a high-risk birth. Such high-risk births have been observed in women of maternal age less than 18 years and women at high parities (Canning & Schultz, 2012). Therefore, countries with a high prevalence of child marriages such as Afghanistan, Mozambique, and Uganda (UN DESA, 2000) and those with high fertility rates such as Uganda, Zambia and Malawi (World Bank, 2016b) are more likely to have more maternal complications and poor birth spacing, which further impair the ability of mothers and their children to have optimal health, nutrition, investments and education. All these further affect the ability of the mothers to contribute to the society and affects the macrosocial dynamics of ageing (O'Rand, 2016). In addition, the development, educational outcomes and income of their children are compromised further worsening the impact on society.

Furthermore, it is important to clarify the overall effect of this research on the GAWI. The maximum difference noticed was a drop of 10 places expressed by India. No country moved from the top to the bottom of the table and vice versa. This is an indication that the new domain is sensitive while also relatively congruent with the original four domains in GAWI. Countries that have high scores on the income security, health status, capability (education and employment) and enabling environment domains are likely to also have a high GID score. Exceptions to this are countries that are obviously lacking in supporting gender equality based on previous research and existing scientific reports. A reverse trend exists for countries with low scores on the original four GAWI domains.

Hence, this research shows that gender equality has face validity in being or is a valid covariate in determining the wellbeing of older adults.

6.2. Validation of the rGAWI

Table 27 shows the top 5 countries that improved rank and the top 5 that decreased rank after the inclusion of the gender inequality domain. Greece, Republic of Korea, Serbia, South Africa and China had the most increases in rank of all the 96 countries in the rGAWI while Tajikistan, Mexico, Guatemala, Bangladesh and India had the highest drops in rank.

Table 27.   Highest and lowest change in ranks by countries

Country	Female labour force participation	Total Fertility Rate	Age at First Marriage	Gender inequality domain score	Change in score	Change in rank
Greece	57.69	76.41	48.13	74.48	8.49	10
Republic of Korea	53.61	87.95	58.13	81.42	7.93	8
Serbia	51.38	75.82	45.00	69.69	6.53	6
South Africa	45.20	43.28	64.38	62.07	6.33	6
China	73.06	66.87	33.13	67.77	5.33	5
Tajikistan	61.89	36.02	24.38	46.10	2.12	-7
Mexico	44.02	44.64	35.00	50.13	0.74	-8
Guatemala	48.23	33.11	28.13	43.05	1.44	-8
Bangladesh	60.18	41.77	8.13	32.34	-0.29	-9
India	18.13	40.15	15.63	26.02	-1.16	-10

The measures of gender inequality used in this research are systematically related and can be used as a substitute measure for each other (Ajrouch, Yount, Sibai, & Roman, 2016). This gives a form of concurrent criterion-related validity. The gender inequality domain scores are relatively high for the top five countries and generally low for the bottom five. The convergence exhibited by the three gender domain measures reflects the same underlying phenomenon and construct. The top five countries on table 27 have higher changes in scores that infer a significant improvement in wellbeing and translates to higher country rankings. Conversely, the five countries at the bottom have low changes in rGAWI scores. The positions of the highly and lowly ranked countries are compared with existing literature in the following paragraphs.

Social clubs for older adults are common in Greece (Thøgersen-Ntoumani et al., 2011), likely increasing the opportunity for social participation and reducing loneliness. Active social activity participation rates have been found to be 42.0 % among older adults in Greece compared to 29.4 % in France, 28.1 % in Sweden, 5.9 % in Spain, and 31.6 % in Denmark to 8.1 (Vozikaki et al., 2017). In addition, lifelong learning programs among older adults, known to improve community wellbeing and are also actively organized in Greece (Merriam & Kee, 2014). Moreover, research has indicated that older women are more likely to establish multi-household relationships and be involved in the community and in which they live than older men (Russell, 2007). Even when older men attend programs at senior's centres, they are likely to be accompanied and supported by spouses, daughters or other female caregivers. It is likely that the participation in social activities help improve the quality of life of older people.

 In the Republic of Korea, which also gained 8 positions in rGAWI ranking, there has been recent changes in social pension programs targeted at improving the well-being of older adults. The Korean government recently doubled the benefit level of its social pension, a process which has been associated with increased gross income, poverty reduction and an in increase in purchasing power among older adults (Lee, Ku, & Shon, 2017). Increasing social pension might have been easier for Korean government because Korea has the lowest total fertility rate and very few children. Thus, it is possible to adequately take care of the nation's children and still have enough funds to effect policy changes that focus on the wellbeing of older adults. In addition, the encouragement of older adults to consistently participate in social activities like religious groups, leisure, cultural, sports, school clubs as well as family reunions and voluntary work has reduced isolation and improved quality of life (Choi et al., 2017).

Over the last 30 years, there has been an improvement in aged care in Serbia including better medical education, intersectoral collaboration, and structural reforms of the social and health care system (Ševo et al., 2009). The number of assisted living facilities in Serbia has also increased and measures are being put in place to improve the quality of life of older adults.

South Africa has a change in ranking, moving six places up the rGAWI ranking table. This gain is supported by literature, which shows the impact of South Africa's old age grant on a range of health outcomes for older people (Lloyd-Sherlock & Agrawal, 2014). More recent emphasis on social pensions is associated with higher rates of health

service utilization. In addition, people in receiving pensions more financially secure and better able to fulfil their social roles and live a better life with higher food security (Case & Menendez, 2007).

Traditional family arrangements in Chinese culture involves older adults living in multi-generational households where they have better psychological well-being. Older people living in multi-generational households tend to receive greater physical care and financial remittances from their working adult in addition to building stronger emotional cohesion with members of the family (Silverstein, Cong, & Li, 2006). The support offered to older adults by a familialistic society to foster strong physical and mental wellbeing generally buttresses the arguments based on the social determinants of health model (Dahlgren & Whitehead, 2007). Intergenerational care in an extended family setting could have been made more feasible by China's one-child policy that placed less stress on the mothers, giving them more time and resources to contribute to the care of aging parents and parents-in law. Countries with high fertility rates and low age at first marriage would likely produce poorer female members of the family with reduced capacity to contribute to meaningful intergenerational care.

Unlike the first five countries in table 27, the bottom five dropped in ranking after reformulating the GAWI with a gender inequality domain. Gerontological literature shows that older adults continue to have poor wellbeing indicators in Tajikistan, Mexico, Guatemala, Bangladesh, and India. Research carried out in Tajikistan shows that the number of people who use direct out-of-pocket payments to purchase prescribed medications and access health services doubled between 2005 and 2011 (Schwarz, Wyss, Gulyamova, & Sharipov, 2013). This shift to out-of-pocket expenditure rather than insurance coverage for health care financing is catastrophic, inefficient and increases the risk of poverty among families and communities (Evans & Etienne, 2010). The cumulative disadvantage of catastrophic health expenditure over time would deprive the community of other basic needs of life and likely hamper their wellbeing (O'Rand, 2016).

Unlike Serbia that has increased the number of assisted care facilities (Ševo et al., 2009), the number of nursing and elderly home beds in Tajikistan decreased over a 20-year period from 25 per 100 000 population in 1990 to 22 in 2009 (Khodjamurodov, Sodiqova, Akkazieva, & Rechel, 2016). In addition, the prevalence of malnutrition and diseases caused by micronutrient deficiencies has increased due to poor food quality,

inadequate food intake, and lack of balanced diets. Water systems have deteriorated and less than half of residents in rural areas have access to improved water sources.

The poverty rate in Mexico increases from 20% to 30% among older people and those living in rural communities are particularly vulnerable due to lack of income and formal pension coverage. Even among those with social coverage, financial status for a high proportion of older adults decline significantly after their retirement and continually worsen with age (Aguila et al., 2012). Unlike the rest of the Latin American countries, poverty rate decreases until around the age of 40, and then substantially increases in Mexico (Gasparini et al., 2010). The vulnerability of older Mexicans due to poverty increases their susceptibility to health issues and a decline in quality of life (Aguila et al., 2012).

In Guatemala, older adults generally have lower access to health insurance (Gasparini et al., 2010). Moreover, poor self-rated health is reported by more women than men with gender gaps in chronic diseases. The prevalence of obesity and different forms of disability are also higher among older women compared to men, probably associable to the exposure of research cohort to a nutrition supplementation trial as younger parents in the 1960s and 1970s (Yount, Hoddinott, & Stein, 2010). In recent years, health expenditure and outcomes has not improved in Guatemala due to poorly targeted public spending, widespread poverty, poor environmental conditions, limited availability quality health service, and poor knowledge of the benefits of modern medicine (Gragnolati & Marini, 2003).

Older adults in Bangladesh lack access to a formal social security system as a result of limited and insufficient old-age pension scheme estimated to be approximately US$2 per month; they often rely on personal means, families and friends for financial support and care (Nilsson, Rana, & Kabir, 2006). Overall, the prevalence of disabilities has been found to be higher in Bangadeshi women, older adults, and those with low socio-economic status (Islam, Bhowmik, Islam, Renzaho, & Hiller, 2016). The high prevalence of disabilities among women have been linked to the physical violence and domestic abuse inflicted by their partners, relatives or neighbours. Up to 84% of women in Bangladesh were estimated to have suffered physical and psychological problems due to emotional, physical, verbal or sexual violence from their partners (Hasan, Muhaddes,

Camellia, Selim, & Rashid, 2014). The long-term abuse and prejudice against women over the life course intersects with persistent poverty and social deprivation to produce an unhealthy society, where older women have been significantly disadvantaged; further aligning with the thoughts of feminist gerontologists (Arber & Ginn, 1991; Hooyman et al., 2002; Ray, 1996). In addition, the situation in Bangladesh is escalated by forced migration. A significant population of young adults and middle-aged individuals that could contribute to the workforce and strengthen the pension system in Bangladeshi leave the country due to environmental degradation and impoverishment (Poncelet, Gemenne, Martiniello, & Bousetta, 2010). Forced migration lead to the erosion of traditional support and leave the older adults socially vulnerable.

Research in India shows a prominent level of social isolation and neglect that may lead to poor wellbeing among older adults. About 68% of participants in a study on health and social problems of the elderly reported that people neglect older adults, and half of the respondents felt neglected by their relatives (Lena et al., 2009). In similar studies, over 40% of participants had complained about loneliness (Prakash, Choudhary, & Singh, 2004). Furthermore, the focus of India's health program and policies have been on control of communicable diseases and maternal and child health. This is despite the increasing population of older adults and their health care needs. In addition, there is a poor awareness of availability of geriatric services among older people and a sizeable proportion of them feel significantly stressed (Ingle & Nath, 2008). As a further reflection of the impact of gender inequality on wellbeing in aging, the proportion of women (12%) who are financially independent is significantly lower than men (50%). Thus, in comparison to men, women earn lower income and have poorer quality jobs that negatively affects their health (Roy & Chaudhuri, 2008). The disparities in the social determinants of health between men and women can be explained by the feminist gerontological theory as a trajectory of systemic discrimination against women.

6.3. Policy implications

The aim of this is research is to determine the effects of gender-based indicators on the wellbeing of older adults. This was done by adding a gender domain to the GAWI. The results revealed that countries with poor scores on indicators of gender inequality tend to have poor overall reformulated indices of wellbeing for older adults. Specifically, older adults in countries with poor female labour force participation, high fertility rate, and

low age at first marriage are likely to have less than optimal wellbeing. In addition, countries with deficient performance on more than one of the three indicators of gender inequality assessed in this research have worse reformulated index scores than those with a poor score on only one indicator. These findings seem to be supported by previous gerontological research on the effects of events along the life-course on the quality of life in old age. Moreover, countries that have poor policies for controlling gender inequality are likely to have poor ageing policies and care plan for their older population.

The findings of this research have relevance in motivating researchers to further determine the specific manner by which gender inequality affects the wellbeing of older adults. Future research can be focused on individual countries, provinces or regions with poor gender inequality indices such as female labour force participation rates, total fertility rates, and age at first marriage. Direct associations between the indicators of gender inequality and wellbeing of older people can be assessed using comparative analysis of primary or secondary data. For example, association between female labour force participation and quality of life of older adults in a specific country or region may be determined using specific data collected for this purpose rather than proxies. The results may further inform the decision of policy makers in designing strategies for reducing high fertility rates and improving the participation of women in the labour force. The onus lies on countries with prevalent underage marriages to work towards increasing female education and proscribing child marriages.

It is recommended that countries and communities continue to empower women by allowing them to have more representation in the labour force. The participation of women in paid employment has significant positive effect on the improvement of the wellbeing of older adults in the family and community. Policies that support funded child care services, paternity leave or respite in the case of care provided for an older relative should be preferred. Such policies offer breaks in strenuous caregiving and employed caregivers who are often women can further contribute to the labour force.

Furthermore, the effects of family planning programmes on reducing fertility rates and improving socioeconomic status of women, families and communities have been shown through different evaluation program research in LMICs. Such programs implemented in rural Bangladesh and Ghana have resulted in improved access to basic amenities and general wellbeing (Schultz, 2009). Although the outcome of trial programs

described by Schultz was not specific for older adults, the macroeconomic and social benefits of reducing total fertility rates in communities would extend to and affect the wellbeing of seniors. Access to family planning can benefit the economy through reduction in fertility as well as improvements in reproductive and general health while low fertility rates are correlated with lows dependency rates. Countries with low fertility rates are likely to have more resources available to take care of older adults. Governments, health authorities and non-governmental organizations should support policies to improve the delivery of family planning services. Women should be given easy access to education, family planning services and freedom to take decisions about own body would translate to optimal fertility rates. Governments should fund reproductive health services and ensure girls and women have unrestricted access to sexual health programmes. In addition, child/underage marriages should be abolished. Every country should be committed to empowering women by allowing them to have more financial independence and political representation in every sphere of the society.

Underage marriage is associated with a high tendency of spousal abuse and women are often more affected than men. Child marriage has negative health and social outcomes that are detrimental to a woman's educational and career potentials, more so that underage marriages usually happen in the context of power imbalance and abuse. Underage wives are often unable to make full contributions to the labour force, are often denied access to family planning, and are likely to be multiparous. The gender inequality that arises from underage marriage affects the society and may have deleterious effects on the wellbeing of older adults. The right to voluntarily enter into marriage, and to have control on one's body should be upheld in all countries according to the Universal Declaration of Human Rights. Women should be protected and allowed the right to choose when and who they marry. All countries, especially those with low average age at first marriage for women should ensure that women enter into marriage based on their choice. Policies should be made to protect women and ensure that they are mature enough to take well-informed decisions pertaining to marriage before they get married.

Female leaders and decision makers often implement policies that protect the interests of girls and women (Beaman et al., 2009). Increasing the political representation of women promises to be an effective pathway to closing the global gender gap. It is recommended that all countries adopt a mandated quota system that gives women more opportunity to participate in leadership. This mandated exposure of society to female

leadership may increase the affinity of people for women leaders and reduce bias against women. Women should be given due recognition for their duties as family caregivers and homemakers. The cost of informal caregiving should be widely publicized to emphasize the importance of women to the global economy. In addition, countries across the world can introduce legislation that promote equality between men and women and proscribe gender- based discrimination. In addition, government parastatals as well as private and multinational agencies should ensure that men and women are given equal chances for career development. Remuneration, career development activities and opportunities should not be apportioned based on gender differences.

6.4. Limitations and future research directions

This research was limited in using the same weight for the gender inequality domain and the original four domains of the GAWI. In addition, there is an overlap of the gender inequality domain with the other domains used in reformulating the GAWI; and the overlap was not accounted for in the calculations (this was also not done in the original calculation of GAWI). For instance, poor health status and low income are often found in the setting of high total fertility rate and low age at first marriage. Future research could delineate the domains and apply appropriate weight to each of them. Weightings could be based on objective measures of the relative effects of each domain on the wellbeing of older adults. It is also beneficial to examine different weighting systems that can be used to calculate appropriate weights for the different domains, rather than aggregating them in equal proportions.

Furthermore, there are some shortcomings in the way that indicators of gender inequality are applied in this research. Female labour force participation was measured based on the assumption that all paid work contributes to the wellbeing of women. However, there are communities in which women are forced to work under duress with little or no remuneration. Such women work under very harsh conditions that negatively impact their health and wellbeing. The female labour force participation also does not account for the informal caregiving, domestic chores, and child rearing that women perform. Future research could account for these variations in the duties that women perform. In addition, age at first marriage does not include women in common law relationships. Although, cohabitation is a common trend in many countries, and could therefore bias these results, it is distinct from marriage, especially in low income countries.

Women in common law relationships are likely to be mature and responsible for their own decisions compared to under-aged girls that are forced into early marriages in some low-income countries. If cohabitation were included into a 'partnered' status, these issues would have to be addressed.

There are other indicators of gender inequality that could be added to the new domain to further enhance its completeness, once they become available for enough countries for comparative analyses. Factors such as sexual abuse, domestic violence, gendered income disparity, glass ceiling effects, and family caregiving affects men and women unequally. These factors are potential indicators that could be included in the gender inequality domain but do not presently have complete and universal data. Moreover, the association between each indicator of gender inequality and wellbeing could be examined separately. Isolating indicators would help determine and address their individual impact on wellbeing. The cancelling effects of high-scoring indicators on low-scoring ones to produce a minimal change in a domain score could be avoided. However, this analysis was beyond the scope of this thesis.

This research did not account for some other variables that could impact the quality of life of older adults. The precision of these findings could be improved by including more indicators of wellbeing in older adults such as overcrowding, access to improved water supply, disasters and migration in the index. It would be interesting and highly contributory to explore the impact of immigration on the interaction between the five domains of the rGAWI and wellbeing of the elderly. Immigrants often retain certain aspects of their culture or religion in the receiving country. This transfer of cultural and religious practices may have a cumulative and significant effect on the quality of life of a section of the population, including older adults. This is more so in countries that have a large immigrant community. For instance, immigrants from third world countries where discrimination against women is acceptable may subtly or directly express such prejudice against women in their new country even if it is against the law or acceptable etiquette.

Moreover, this research did not take into consideration, the direct effects of environmental factors such as climate change. Although the physical safety indicator in the original GAWI domain of enabling environment assessed the general feeling of safety among older adults, the differential impacts of the environment on persons living in various parts of the world was not analyzed. Changing weather patterns over a period influences

the occurrence and frequency of floods, forest fires, heat waves and other disasters. These adverse events are vital environmental factors and are often traceable to human activity and in turn lead to displacement, physical injuries, and psychosocial impairments. The impairments often last for an extended period as cumulative drawback (O'Rand, 2016). Older adults are affected more significantly because of possible pre-existing frailty as well as the absence of specific mitigation or evacuation plans that target the elderly.

In addition, the rGAWI still cover 96 countries. More countries can be included in the analysis and computation of an index that address the wellbeing of older adults. Not withstanding the paucity of data on relevant indicators for some countries, more data mining and collaborations with national and international agencies might help researchers obtain more data for future analysis. Including more countries in the ageing index would increase the knowledge of interactions between domains of wellbeing and offer an opportunity to make further comparisons and recommendations. Data can also be obtained for sub-regions within countries that are sometimes not homogeneous in terms of social, demographic, and economic characteristics. Regional analysis of regional data may help explore the effects of diversity that exists within borders.

Also, a multi-methods approach, involving quantitative as well as qualitative data could further improve this study. Contributions from residents of different countries and sub-regions can be included through interviews and focus groups. Qualitative data could reveal gendered perceptions of different contexts and make it easier to understand some of the rank changes observed among countries. Dialogue should address how wellbeing is assessed in different countries because it is a relative measure that has several meanings, contributing factors and trajectories. Future research can also build on the theories that guide the current study because they have been effective lenses through which the link between gender inequality and wellbeing of older adults is evidently outlined. The indicators in each domain are dynamic and the continuous changes in different measures may be explained further with a life-course approach.

6.5. Conclusion

The addition of the GID to the GAWI, validated using multivariate analyses and available social gerontological and demographic literature resulted in remarkable changes in the ranking of most the 96 countries involved. The changes in the ranking of these

countries indicate that gender inequality does affect the wellbeing of older adults as presented in the GAWI. The reformulated measure also produced a ranking that seem to have face validity when compared with available social gerontological and demographic literature. Countries with poor policies for protecting women against prejudice and discrimination have low scores for the measures of female labour force participation, total fertility rate and age at first marriage and tend to score low on the gender inequality domain. Low scores on the domain of gender inequality are linked to low scores and rankings on the GAWI. Including the gender inequality domain in the GAWI seems to improve its accuracy in assigning value to the wellbeing of older adults in different countries. It is more likely that the changes observed in the reformulation of GAWI are not just random but reliable and valid.

Feminist gerontology has exposed the knowledge gaps of gender differences in socioeconomic influencers and wellbeing of older adults, and seeks a more critical evaluation of the factors determining such differences. The identification of the nature of power dynamics that create inequities between men and women can drive policy changes and power redistribution. It is recommended that countries and communities continue to empower women early in their life courses by allowing them to have more representation in the labour force. Policies that support funded child care services or respite in the case of care provided for an older relative should be preferred. Such policies offer breaks in strenuous caregiving and employed caregivers who are often women can further contribute to the labour force. The participation of women in paid employment has significant positive effect on the improvement of the wellbeing of older adults in the family and community.

Furthermore, access to female education, family planning services and freedom to take decisions about own body would translate to optimal fertility rates. In addition, child/underage marriages should be abolished. Every country should be committed to empowering women by allowing them to have more financial independence and political representation in every sphere of the society. Bridging the gender gap in representation is an impactful policy change on the wellbeing of women and older adults.

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Appendix A.

Indicators and domains of the rGAWI

1. Income security	2. Health status	3. Employment and education	4. Enabling environment	5. Gender inequality
1.1 Pension income coverage	2.1 Life expectancy at 60	3.1 Employment of older people	4.1 Social connections	5.1 Female labour force participation
1.2 Poverty rate in old age	2.2 Healthy life expectancy at 60	3.2 Educational status of older people	4.2 Physical safety	5.2 Total fertility rate
1.3 Relative welfare of older people	2.3 Psychological wellbeing		4.3 Civic freedom	5.3 Age at first marriage
1.4 GDP per capita			4.4 Access to public transport	