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Regulatory approaches to obesity prevention: a systematic overview of current laws addressing diet-related risk factors in the European Union and the United States

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Across jurisdictions, current regulatory approaches to obesity prevention are limited in reach and scope. Target groups are rarely the general population, but instead sub-populations in government-supported settings. Consumer information provision is preferred over taxation and marketing restrictions other than the regulation of health and nutrition claims. In the EU in particular, product reformulation with industry consent has also emerged as a popular small-scale measure.

While consistent and widespread use of law is lacking, governments have employed a range of regulatory measures in the name of obesity prevention, indicating that there is, in principle, political will. Results from this study may serve as a starting point for future research and policy development.

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1. Introduction

There is a broad consensus that overweight and obesity, recognized internationally as a health problem of "epidemic proportions" [1], are ultimately attributable to an energy imbalance where energy intake continuously exceeds energy expenditure. The idea of an obesogenic environment [2] identifies physical, economic, political, and sociocultural environments as key factors adversely affecting both food intake and physical activity [3].

Empirical evidence points to increased energy intake as the main cause of widespread overweight and obesity [4,5], with caloric supply and intake having risen considerably in parallel with overweight and obesity prevalence [6,7]. Snack foods, sugar-sweetened beverages, and food consumed at fast food restaurants have been identified as some of the main sources for this trend [8,9] and several studies concluded that observed average excess energy intake is sufficient to account for all or most prevalence increases in the US [10,11] and Western OECD countries [12].

Changing consumption patterns have been attributed to shifts in the food system, including "increased supply of cheap, palatable, energy-dense foods; improved distribution systems to make food much more accessible and convenient; and more persuasive and pervasive food marketing" [13]. Although some scholars dispute the central role ascribed to food price changes [14,15], the consumption of refined grains, added sugars and fats has risen substantially [16] in parallel with real price decreases [17]. Marketing practices, including new product development and increased portion sizes [9,18], may also have changed both calorie supply and demand.

The importance of the wider societal and economic environment in shaping nutrition at population level implies a role for governments to intervene through laws aimed at creating health benefits [19]. In the US, states and local jurisdictions have emerged as leaders [20] in considering and implementing laws aimed at preventing obesity and improving population-wide nutrition [21]. Yet, policy analyses at state level reveal lawmakers' preference for measures that, while politically palatable, are limited in scope and execution [22-27].

Legislative measures elsewhere include Denmark's short-lived "fat tax" [28] and Hungary's "public health product fee" [29]. In general, these have been reported mostly anecdotally [e.g. 30,31], albeit generating considerable interest from international media [e.g. 32-35]. Less headline-worthy, more incremental policy changes receive little attention, making it difficult for policy-makers in other jurisdictions to discern trends and assess potentially transferrable measures.

This paper provides a systematic overview of current regulatory approaches addressing the dietary causes of overweight and obesity in the European Union (EU) and its 28 Member States and at US federal level. The direction the world's two biggest economies [36] take on contentious policy issues such as the prevention of diet-related chronic disease necessarily has a global signaling effect, especially to fellow OECD countries with close trade links and similar socioeconomic structures. Our intention is to provide researchers and policy-makers with a starting point for future enquiries into regulatory interventions to address dietary risk factors for overweight and obesity. The information presented here may form the basis for further research into the nature and implications of these approaches, inform political discussions around feasibility and acceptability of different regulatory options, and guide future policy development.

2. Methods

2.1. Terminology

Our approach engages two separate meanings for the term "regulation": one denoting subordinate or delegated legislation issued by the executive branch of government, and the other, popular meaning of "the act or process of controlling by rule or restriction" [37]. We restricted our search to regulatory measures that (1) limit or discourage excessive caloric intake and (2) are stipulated by law. This includes semi-mandatory regulation, such as arrangements in which a legislature or government agency formally sets rules or approves rules drawn up by some combination of public and private bodies. These rules are mandatory for participants, while participation itself remains voluntary and enforcement arrangements vary. By contrast, purely self-regulatory schemes, statements of intent or desirability, and pilot programs are not within the scope of this definition.

2.2. Search Strategies

To identify relevant laws across jurisdictions, we searched appropriate government databases for primary and delegated legislation. In the absence of a database covering all 28 EU Member States, regulatory measures in the EU were identified through the Technical Regulations Information System (TRIS). TRIS collects notifications, in English, under Directive 98/34/EC: member states are required to notify all provisions related to agricultural and industrially manufactured products that could be considered barriers to the functioning of the internal market [38]. We also searched the WHO European Database on Nutrition, Obesity and Physical Activity (NOPA) as a complementary source. NOPA is a monitoring tool to which all members of the region are invited to contribute [39]. Some of the data submitted, notably policy documents and legislative and regulatory pieces, are made publicly available in their original language alongside a short summary in English. However, EU funding to maintain the database ran out in 2013 and updates for 2013 were incomplete due to staff shortages [personal communication February 2014].

All searches were conducted in English for the years 2004-2013. The earlier search limit coincides with the 2004 Global Strategy on Diet, Physical Activity and Health, which indicated an emerging international consensus on the need to tackle adverse health outcomes associated with energy-dense, nutrient-poor diets [40].

We derived search terms from the five nutrition-related functions of law identified by Gostin, namely: (1) enforcement of disclosure through labeling requirements, (2) regulation of food marketing, (3) taxation, (4) school and workplace policies and (5) prohibition of certain foods or food components [41]. We refined and complemented these terms using relevant Medical Subject Headings and subheadings. Finally, we adjusted our search terms to encompass those sectors and settings for government intervention suggested by Magnusson, including “primary production, manufacture, retail, catering and advertising of food” [42]. Table 1 details the final search strategy.

<table 1 here>

2.3. Eligibility Criteria

Results were assessed for relevance based on title and, where available, category/subject matter and summary/abstract. Accompanying statements of grounds submitted through TRIS were also used to establish relevance. We excluded policy areas representing distal factors without direct bearing on caloric intake such as laws relating to agricultural subsidies, state aid to food producers, and government intervention in agricultural markets, including all provisions related to trade such as tariffs, trade agreements, quotas, licenses, and refunds. These limitations in the name of study focus and feasibility notwithstanding, we note evidence that low prices of commodities such as sugar, milk, and certain crops have facilitated the trend towards excess consumption of high calorie foods and beverages [e.g. 16,43]. However, considering the deeply entrenched economic and structural interests behind agricultural subsidies and the uncertain price response to agricultural policy changes [43], levers closer to the end-consumer seem currently more promising from a policy and health impact perspective. Specific provisions to supply or subsidize commodities for large sub-populations tied to agricultural subsidies were therefore retained in recognition of their direct impact on caloric intake.

Regulatory measures relating exclusively to trans-fats or sodium/salt content were excluded, as both are independently linked to chronic disease without obesity as a necessary mediating risk factor [e.g. 44,45]. Items pertaining primarily to food safety, standardization, or quality control, rather than reduction of caloric intake, were included only where obesity-related grounds were evident from the legal text or statement of grounds.

3. Results

The majority of search results fall into just two of the five categories of Gostin's functions of law, namely consumer information through labeling requirements and school and other setting- or program-specific nutrition policies. Two further fields of legal activity are only partially represented: firstly, marketing restrictions are often semi-regulatory in nature and mostly designed to protect children. Marketing directed at the general population is mainly

regulated through limiting the health and nutrition claims allowed on foodstuffs. These regulations do not necessarily engage weight-related health concerns. Secondly, rather than prohibiting certain foods or ingredients, more limited food reformulation has been the preferred approach and, along with taxation, direct regulation of food marketing is rarely found. In addition, instead of definite patterns, the results show a wide geographical spread of activities across all categories. No jurisdiction has comprehensively targeted all areas and no clear role model becomes apparent. However, in combination with EU law applicable to all Member States and associated countries, a concentration of the most numerous and potentially most consequential activities can be observed in France, the UK, and several Scandinavian countries.

The following section reviews the most important laws identified according to the broad categories of intervention described above. Where additional references are given in brackets, the law in question is invoked only for comparative purposes. For a quick overview of actors and interventions, table 2 provides a simplified summary of the results by jurisdiction and category. Full search results are provided online. Since our search extended only to December 2013, key developments that occurred during the analysis stage of this research, in the first half of 2014, are addressed in section 5 (Methodological Limitations).

<table 2 here>

3.1. European Union

EU law provides a broad framework of dietary intake-related laws that directly contribute to and/or could more explicitly be adapted for obesity prevention. Union law-making has the potential to both constrain and enable additional obesity prevention efforts in individual Member States.

(1) Consumer Information through Nutrition Labeling

With *Regulation 1169/2011/EU on the Provision of Food Information to Consumers,* the Union introduced a mandatory standardized presentation and content format for nutrition labeling with application obligatory from December 2016. Until then, nutrition labeling remains voluntary at EU-level unless nutrition-related health claims are made (Directive 90/496/EEC, OJ L 276, 6.10.1990, p. 40). For all packaged and most unpackaged foods, operators have the choice between indicating only energy value or energy value and total fat, saturated fat, sugars, and salt in the "principal field of vision". A full nutrition declaration has to be provided in any field of vision for prepackaged foods: energy value and fat, sugar, and salt content must be expressed per 100ml or 100g and may additionally be indicated per portion or per Guideline Daily Amount (GDA) percentage. The same applies to the declaration of energy value in the principal field of vision, while the optional four nutrients may be added in one of the three forms depending on how total energy value is expressed. The Regulation also mandates that GDA expression needs to supply a reference to overall daily adult reference intake of 8400kj/2000kcal.

(2) Marketing

Marketing practices are constrained by rules imposed on the use of health and nutrition claims, complemented by requirements for clear consumer information in related fields such as food additives. The use of diet-related claims of beneficial nutritional or physiological effects is regulated by *Regulation 1924/2006/EC on Nutrition and Health Claims Made on Food*. It provides the legal basis for a Union claims register.

The recitals recognize the concern that claims may "mask the overall nutritional status of a food product, which could mislead consumers when trying to make healthy choices". As a result, the Regulation mandates the imposition of minimum conditions for the use of claims based on the overall nutritional profiles of foodstuffs or categories thereof. It also mandates that claims incorporate an accompanying statement "indicating the importance of a varied and balanced diet and a healthy lifestyle". The legislation set a deadline of January 2009 for the Commission to establish these general minimum nutritional value requirements, but this had not eventuated by the end of the study period.

The impact of this may be observed in a 2013 decision (Commission Regulation 1018/2013/EC) in response to Member State concerns over sending a "conflicting and confusing message to consumers, particularly in light of national dietary advice to reduce sugars consumption". The claim “carbohydrates contribute to the maintenance of normal brain function” was allowed only under restricted conditions, including a limitation of eligibility to products that also meet the “low sugars” or “no added sugars” claims. Similarily, Commission Regulation 1047/2012/EC changed the conditions for the claims “reduced saturated fat” and “reduced sugars” in order to prevent reformulation running counter to regulators’ intentions. Industry had previously responded to the regulation by replacing saturated fats with trans-fats and sugar with fat. The regulator reacted by mandating that the sum of saturated fats and trans-fats be 30% below, and trans-fat content similar to, comparable products to qualify for “reduced saturated fat” status. Similarly, the calorie value of “reduced sugars” products is now required to be equal or below that of comparable products. Consumer understanding of overall nutritional value is also a concern for legislation regulating other aspects of food composition: *Regulation1925/2006/EC on the Addition of Vitamins and Minerals to Foods*, for instance, expresses concern that consumers not be misled about the “nutritional merit of a food”. The legislation provides for the exclusion of certain foods in addition to requiring compulsory nutritional labeling under an exemption from the still applicable voluntary scheme.

(3) Food reformulation

Regulation 1333/2008/EC on Food Additives represents an example of regulatory action making small inroads into calorie reduction: it is the legislative basis for a suite of Commission regulations approving food additives with explicit references to obesity-related grounds such as “the need for new products which are energy-reduced to be placed on the market” or otherwise enabling and facilitating the manufacture of products with lower caloric value (e.g. Commission Regulations 913/2013/EU, No 723/2013/EU, No 1049/2012/EU).

In an instance of directly imposed reformulation, *Directive 2012/12/EU relating to Fruit Juices* prohibits the use of added sugar in fruit juices and bans the claim ‘with no added sugars’. It may be

replaced with the interim message "from 28 April 2015 no fruit juices contain added sugars". Rather than forcing manufacturers to reduce sugar content, the "new directive incorporates the current industry practice" [46].

(4) Setting-specific nutritional standards

The European Union's regulation of the nutritional content of its food programs, which include a long-running School Milk Scheme, a School Fruit Scheme and an EU food distribution program, is uneven.

The two school programs have their current legal basis in Regulation 1308/2013/EU, known as the *Single Common Market Organisation (CMO) Regulation*. Its predecessor, the 2007 Single CMO Regulation, made no mention of non-economic motivations for the supply of school milk, but new implementing rules set in 2008 (Commission Regulation 657/2008/EC) invoke the "fight against obesity". They also cite "existing health and nutritional tendencies" as the reason for including a wider range of milk-based products, including flavored milk with up to 7% added sugar, a limit not previously specified. The rules applying prior to the overhaul had been last revised in 2007 to end reimbursement rates favoring full-fat over reduced-fat milk (Commission Regulation 1544/2007/EC). By contrast, Council Regulation 13/2009/EC which added the School Fruit Scheme indicated a nutritionally more stringent approach by excluding from EU co-financing "unhealthy products", defined in the implementing rules as any products containing added sugar, fat, salt, or sweeteners. The new Single CMO Regulation frames both school programs in language combining the economic motivations of the Common Agricultural Policy (CAP) in "stabilising markets" with promoting "healthy eating habits".

In contrast to the emergence of explicit health concerns in the school programs, the re-orientation of the EU food distribution towards nutritional content has been more subtle. The scheme was initially exclusively based on surplus food from intervention stocks (Council Regulation 3730/87/ECC, OJ L 352, 15.12.1987, p. 1.) but was separated out of the CAP and transformed into a primarily market purchase-based program with *Regulation 121/2012/EU regarding Distribution of Food Products to*

the most Deprived Persons in the Union. This allows greater flexibility in regulating nutritional content of national food programs, with Member States mandated to "choose the food products on the basis of objective criteria including nutritional values".

(5) Regulatory measures targeting the management of obesity

In addition to primary preventive regulatory measures, several measures could be considered geared towards secondary and tertiary prevention, i.e. reduction or stabilization of overweight or non-medical treatment of obesity. *Regulation 609/2013/EU* incorporates changes introduced by the Claims Regulation which allows claims referring to a "reduction of hunger" or an "increase of the sense of satiety", but maintains the original prohibition of references to the rate or amount of weight loss. Since it came into force, numerous applications related to weight loss have been rejected under its provisions (e.g. Commission Regulations 432/2011/EU, 383/2010/EU, 984/2009/EC).

3.2. EU Member States

Member States and additional European Free Trade Association (EFTA) members have considered, implemented, and at times revoked an array of regulatory approaches. In the areas of nutrition information and food reformulation in particular, the supremacy of Union law restricts the maneuvering space for Member States, but additional policies with regulatory character have nevertheless been developed.

(1) Consumer Information through Nutrition Labeling

The EU Food Information to Consumers Regulation, described in section 3.1.1, continues to restrict additional nutrition labeling at Member State level to voluntary participation schemes. Six countries, Denmark, Iceland, the Netherlands, Norway, Sweden, and the UK, notified semi-mandatory schemes in which the respective jurisdictions set labeling format and conditions of use.

The most widely adopted is a Nordic nutrition labeling scheme which uses a keyhole symbol to identify healthier choices. Eligibility is determined by a system of cut-off points for maximum fat, sugar, and salt and minimum dietary fiber. Adjustments to the scheme in the last ten years have seen it

jointly adopted by Sweden (2008/444/S), Denmark (2008/440/DK), and EFTA members Norway (2008/9024/N) and Iceland (2012/9008/IS). Denmark has since notified the extension of the labeling system to the certification of catering establishments and for use on recipes (2011/314/DK).

The Netherlands approved a new industry-owned and administered food choice logo and the accompanying nutritional criteria for its use. The logo consists of a green tick mark reading "healthier choice within this product group" for basic foodstuffs and a blue tick mark reading "conscious choice within this product group" for foodstuffs defined as non-basic (2012/414/NL).

The most comprehensive semi-mandatory nutrition labeling system in force was notified in 2006 when the UK was still weighing the respective advantages of different "Voluntary Front of Pack Signpost Nutrition Labelling Systems" (2006/38/UK). Eventually launched in 2013 [47], it provides for the green, amber, and red coding of nutrient values which are subject to separate per 100ml/g criteria for total fat, saturated fats, sugars, and salt in foodstuffs and beverages. The red categories additionally specify overriding per portion cut-off

points.

(2) Marketing

Few statutory regulations address marketing practices for unhealthy food, but Norway recently notified a proposed ban on the marketing of such foods to children (2013/9005/N) with the express purpose "to promote health by preventing obesity and diet-related diseases in the population". The criteria intended to determine whether marketing is directed at children employ the term "may particularly appeal to children", indicating that marketing does not have to exclusively target children to come within scope. Crucially, the proposal establishes a clear definition of what constitutes "energy-dense, salty, sweet or nutrient-poor foods": for instance, fast food may not exceed 225kcal/950kJ of energy or 4g of saturated per 100g of ready-to-eat product. Additional laws with direct reference to the marketing of unhealthy food and beverages were filed in the NOPA database: from Belgium comes a Decree of the Flemish Government to add specific provisions on advertising and sponsorship aimed at children and young people to the code for advertising and sponsorship on

radio and television and from Iceland the 2011 Media Law. The Icelandic law stipulates that "in commercial communications and teleshopping it shall be prohibited to […] encourage minors to consume foods and beverages containing nutrients and substances with a nutritional and physiological effect, excessive intakes of which in the overall diet are not recommended, in particular fat, trans-fatty acids, salt/sodium and sugars". However, neither regulation contains a full definition of these categories.

At the intersection of labeling and marketing sits France's requirement for health messages to accompany advertising of items "containing added sugar, salt or synthetic sweeteners or manufactured foodstuffs" (2004/329/F). The messages, with separate messages for infant and toddler foods and marketing directed at children, advise healthy eating and exercise, for example, "Stay healthy: avoid eating too much fat, sugar and salt" (2006/480/F). Non-compliant advertisers are taxed 1.5% of their annual marketing budget, benefiting the National Institute for Prevention and Health Education.

(3) Setting-specific nutritional standards

Four countries, the UK, Poland, France, and Hungary, have notified laws to TRIS regulating the school food environment.

The UK introduced mandatory nutrition standards for school food in England (2007/226/UK), Scotland (2008/32/UK) and Wales (2013/76/UK): all three prescribe rules for the composition and nutritional content of school lunches, including total daily energy value as well as minimum and maximum values for key nutrients. Requirements for foods provided outside school lunches are also specified.

Poland (2012/637/PL, 2013/509/PL) banned the distribution, sale, and on-premises marketing of certain high-sugar foods and beverages in educational institutions.

In France, three regulations establish general frameworks on the nutritional quality of school food (2010/758/F 2010/697/F) and food served in universities, prisons and childcare, healthcare, social and socio-medical establishments (2011/564/F). All three regulate meal component content and frequency

with the goal of reducing sugar and fat. The 2004 Health Law that introduced the legal basis for mandatory health promoting messages to accompany advertising for unhealthy foods and beverages also stipulated a ban on vending machines carrying the same categories of items in French schools from September 2005.

Meanwhile, Hungary (2005/475/HU) mandates that institution directors obtain the endorsement of the school health service prior to allowing vending machines or food retailing on their premises.

Another three laws addressing the school food environment were submitted to NOPA: According to WHO's content analysis of the legal texts in their original language, Romania's Ministerial Order No. 1563 approves a list of foods that are banned from preschools and schools. Slovenia's 2013 Law on School Nutrition prohibits vending machines in primary schools and Estonia's Regulation on Health Protection Requirements for Catering Facilities specifies that school lunches are to cover 30-35% of daily energy and nutrient needs in schools and 85-90% in kindergartens.

(4) Food reformulation

Food reformulation, aimed at reducing added sugar and to a lesser extent reducing fat, has been a major focus of notified activities, but the scope has been limited. For instance, between 2007 and 2013, four exemptions from EU law were filed to allow lower than standardized sugar content in jams and jellies, some with the explicit goal to prevent "obesity by promoting healthy eating" (2008/107/D) and "as part of the fight against obesity" (2008/218/F). However, it is made very clear that the adjustment was following industry wishes: Germany explains that the regulation follows established manufacturing practice, France refers to "market trends" and the UK claims "to provide manufacturers with freedom and flexibility and to avoid stifling innovation" (2013/649/UK).

Under the title "Urgent measures to promote the country's development through a higher level of health protection" (2012/559/I), Italy notified a mandatory increase in the percentage of fruit juice contained in certain beverages from 12% to 20%. The accompanying notification invokes a "broader strategy, aimed at reducing inappropriate behaviour and promoting healthy eating, together with legislation aimed at providing incentives for the industry to produce food products with reduced fat

and sugar content, regulate commercial promotion aimed at young children and ensure healthy food", none of which have been the subject of a notification from Italy in the time period under review.

Citing "current consumer trends, leaning towards the purchase of products that adhere to scientific nutritional recommendations", Spain submitted two Royal Decrees on revised quality standards for a variety of bakery products, confectionery and sweets (2009/589/E, 2010/187/E) that allow reformulation towards reduced sugar and fat content.

The Netherlands also submitted a proposal to set the maximum fat content of lean minced meat "in such a way that a contribution is made towards preventing excess weight and reducing the intake of saturated fats" (2007/34/NL).

(5) Taxation

Only three countries notified far-reaching legislation intended to change food purchasing behaviors in the general population. France established an indexed tax of €7.16 per hectoliter on sugary drinks and drinks containing artificial sweeteners (2011/597/F) to "increase the price of sugary drinks, the uncontrolled consumption of which encourages weight gain, in order to encourage consumers to drink them less".

Hungary's "public health product fee" (2011/340/HU) expressly aims to reduce "the domestic consumption of products involving health risks", while "creating a new budgetary resource for the financing of public health services". The legislation established categories of pre-packaged foods and beverages taxable if they exceed certain added sugar, caffeine, or salt thresholds. The original tax rates were subsequently increased, certain product categories broadened and new ones added (2011/599/HU, 2013/622/HU).

Denmark imposed, and subsequently abolished, an excise tax based on saturated fat content (2011/19/DK) and permanently shelved a similar proposal based on sugar content (2011/651/DK). In parallel to the reasoning in Hungary, the twofold objective of the laws was to "benefit the health of the population and to acquire funding for targeted public expenditure". It was intended that the sugar

tax would increase existing chocolate and ice cream duties by 25% and 50%, respectively. The fat tax imposed a levy per kilogram of saturated fat on a range of foodstuffs, including meat, dairy, oils and fats, if they exceeded the saturated fat threshold.

3.3. United States

A major US focus has been federally assisted nutrition programs. Changes to the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and schemes targeting child nutrition dominate American regulatory obesity prevention efforts. In the time period under review, no law mandating food reformulation appears to have been enacted. Similarly, the search did not find any new federal provisions restricting food marketing practices or taxing unhealthy foods and beverages. This may indicate an absence of such laws or a lack of updates of laws possibly enacted prior to the search period. However, a suite of new rules has been proposed in 2014, i.e. outside the search limit, that would overhaul nutrition labeling and continue to implement statutory provisions of previously enacted congressional legislation regarding nutrition standards in federally assisted programs. These items feature briefly in the discussion section.

(1) Consumer Information through Nutrition Labeling

Provisions in the 2010 *Patient Protection and Affordable Care Act* make nutrition labeling mandatory country-wide for standard menu items offered in chain restaurants with 20 or more locations. On menus and menu boards, total calorie value per item must be indicated and a statement regarding recommended average daily caloric intake must be prominently displayed. Per item calorie value disclosure also applies to operators owning more than 20 vending machines and to restaurant items not displayed on a menu or menu board.

(2) Marketing

Similar to the EU, US marketing practices are addressed by regulation of health and nutrition claims, primarily in relation to specific product categories such as meat (e.g. Final Rules 75FR82147, 70FR33803).

(3) Nutrition Standards

The *2010 Healthy, Hunger-Free Kids Act* includes *Title II Reducing Childhood Obesity and improving the diets of children,* mandating changes to school food and food assistance programs. The act provides an update of meal patterns and nutrition standards for the long running, federally legislated school lunch and school breakfast programs based on National Academy of Sciences recommendations. This mandate has been carried out by Final Rule 77FR4088 which sets calorie ranges and saturated fat and sodium limits. In addition to these nutrient requirements, new meal patterns are also prescribed and include fruit, grains, meat or meat substitutes, and milk as mandatory food components. Food type specifications also differ from previous standards in that five different sub-groups of vegetables need to be served and all grains have to be 51% whole grain. Final Rule 77FR4088 also changes previous provisions (*2004 Child Nutrition and WIC Reauthorization Act)* with regard to beverages accompanying school meals from allowing a variety of milk to only fat-free milk or unflavored low-fat milk.

Further the 2010 Act requires that all additional foods sold in schools ("competitive foods") meet Dietary Guideline-consistent standards to be established through regulatory action. Interim Final Rule 78FR39067 implements this provision: it sets nutrient requirements, including absolute calorie limits as well as relative maximums for total fat, saturated fat, and sugar. In addition, all foods must fall into one of three categories, namely be a "whole grain-rich" product, contain a defined amount of fruit and/or vegetables, have fruit, vegetables, dairy or protein as its first ingredient; or until 2016 may qualify by virtue of high calcium, potassium, vitamin D, or dietary fiber content. Beverages other than milk are restricted to drinking water or non-sweetened juice, with the exception of high schools where beverages meeting certain definitions of "calorie-free" are allowed. Age-dependent maximum portion sizes are specified for all beverages except water.

In addition to the above, the *2008 Food, Conservation and Energy Act* or Farm Bill, made permanent a new school-based Fresh Fruit and Vegetable Program that had previously been trialed.

Child nutrition outside the school setting is addressed in the framework of the Child and Adult Care Food Program (CACFP) and the WIC. The *2010 Healthy, Hunger-Free Kids Act* makes changes to both programs: meals and snacks served in care homes and institutions under the CACFP must be Dietary Guideline-complaint and "promote the health of the population served by the program […] as indicated by the most recent relevant nutrition science" (Subtitle B, Sec. 221, 2(g)B(i)). Nutrition requirements are to be reviewed at least every ten years. Similar to the school programs, milk needs to meet Dietary Guideline-consistent and drinking water must be provided. In addition to the mandatory nutrition standards that have yet to be established by regulatory action, the legislation calls for guidance to be issued to "states and institutions […] to encourage […] foods that are recommended for increased serving consumption" (Subtitle B, Sec. 221, 3(B)(u)(3)(B)(i) such as fruits and vegetables, whole grain products and low-fat meat and dairy products.

Meanwhile, the supplemental foods provided to eligible mothers and young children through the WIC program are also required to be reviewed at least every ten years. The *2004 Child Nutrition and WIC Reauthorization Act* required that the foods made available under the scheme be updated after a review by the Institute of Medicine. Interim Rule 72FR68966, applicable from 2009, implements this mandate.

The nutritional status of another vulnerable group, older persons, is targeted by Final Rule 71FR74618 which implements previous statutory provisions to make permanent the Senior Farmers' Market Nutrition Program, modeled after a similar program under WIC.

At the general population level, the Supplemental Nutrition Assistance Program (SNAP), formerly known as food stamps, has its current legal basis in the *2008 Food and Nutrition Act* and was re-authorized most recently during the search period by the 2008 Farm Bill. It exhibits the same range of purposes as the EU's most recent food assistance program, claiming "to strengthen the agricultural economy; to help to achieve a fuller and more effective use of food abundances; [and] to provide for improved levels of nutrition among low-income households". SNAP does not appear to consider

nutritional value since “any food or food product for home consumption except alcoholic beverages, tobacco, and hot foods or hot food products ready for immediate consumption” is covered.

4. Discussion

The current regulatory approaches most prevalent in the EU and US are generally limited in reach and scope. Target groups are often not the general population, but sub-populations in settings where the government can claim responsibility for the health of these populations during the time they spend under its care. Regulatory changes addressed to the food manufacturing industry were mainly confined to one product type, frequently incorporating already-existing practice or industry requests. Although health concerns are often invoked, they do not appear to take precedence over industry interests and broad claims of a contribution to obesity prevention sit oddly with the very limited scope of reformulation. An overarching concern for the economic bottom line may also be inferred from the fact that, rather than targeting consumption levels or patterns, reformulation may operate unbeknown to consumers unless industry qualifies for and considers advantageous the use of health or nutrition claims. Nonetheless, the frequency of limited reformulation efforts in the EU and the language used in accompanying policy statements reflect government attraction to these comparatively non-contentious approaches and possibly increasing industry acquiescence in an attempt to prevent more sweeping legislation, such as taxation. It is unlikely decision-makers would be attracted to more far-reaching, population-wide measures without clear evidence of success, but with Denmark’s fat tax discontinued after just one year and Hungary’s “public health product fee” only introduced in 2011, there has been little time for incremental health effects to accumulate and become practically significant.

Overall, the patterns described above appear consistent with trends gauged from more in depth studies at US state level where subject matter and associated political palatability seem instrumental in predicting the introduction and adoption of legislation. A study examining enactment of US state legislation addressing childhood obesity found that bills on school nutrition were the most frequently proposed measure, while other specific nutrition-related topic areas such as soda and snack taxes and menu and nutrition labeling were introduced less often and not enacted once in the period under

review [22]. A follow-up study observed a positive association of relatively uncontroversial and inconsequential content (such as walking/biking trails, model school policies and studies or task forces) with bill adoption [23]. It also demonstrated a positive association between enactment and variables hinting at political palatability such as multiple sponsors or bipartisanship, and a negative association with variables indicating significant policy change such as new laws and laws generating revenue, which are similarly the types of laws least frequently observed in the EU and at US federal level. Likewise, a study of population-wide obesity legislation by setting found that most proposed legislation related to schools, with initiatives applying community-wide proposed and enacted much less often [26].

The reluctance of policy-makers to intervene on economically significant matters underlines the importance of new regulatory possibilities at subsidiary levels. Yet, the European Food Information to Consumers Regulation may serve as an example of higher order law limiting national obesity prevention efforts. During the legislative process, concrete opportunities to complement the display of nutritional data with more explicit promotion of healthy nutrition were foregone: several amendments explicitly allowing additional mandatory nutrition labeling at Member State level, including color schemes such as traffic light labeling, were defeated in the European Parliament [48]. As a result, unless action is taken at Union level, semi-mandatory labeling regulation, combining voluntary participation with government-set or -approved mandatory rules, will remain the most stringent standard possible across the EU. Moreover, the European Parliament also passed rigid criteria to be met by voluntary participation schemes at Member State-level. Unlike Nordic and Dutch labeling which positively highlights overall nutritional value and is presented as a broad nationally based nutrition claim in accordance with the Claims Regulation, the UK scheme positively and negatively judges nutrient content, a differentiation that is not foreseen by the Claims Regulation. The newest technical guidance issued in June 2013 explains that the colors in that scheme do not represent claims, but a form of additional expression under the Food Information to Consumers Regulation [47]. Since then, the scheme has been the subject of at least two critical parliamentary questions in the European Parliament [49,50] and several protest notes by Italy to the Council of the European Union [51]

questioning the scheme's compliance with the regulation, particularly the provisions that additional schemes be "objective and non-discriminatory; and their application does not create obstacles to the free movement of goods". While the Commission maintains that the scheme appears to be within the scope of the regulation [52-54], the current dispute foreshadows the clash between public health concerns and vested economic interests that is likely to define the Commission review of potential harmonization of additional labeling in 2017 and any Member State action in the meantime.

5. Methodological Limitations

Although we designed our search strategies to maximize comprehensiveness, the overview in this article is not exhaustive. The purposely broad search terms take into account the challenge of locating mandatory provisions that are not explicitly acknowledged as related to obesity prevention, yet this breadth resulted in several thousand hits per database which could only be scanned for relevance rather than examining full text. Minor provisions embedded in major or omnibus-style pieces of legislation or regulation might therefore be underreported.

In addition, systematic searches at EU Member State-level present their own set of difficulties in the absence of a common legal database. Despite being rooted in a legal obligation, TRIS contains only measures that countries deem relevant for submission and NOPA contributions are entirely voluntary: one such relevant intervention that has not been notified, but was identified from the literature [31], is Finland's recent excise duties on sweets and ice cream and increased soft drink tax rate [55,56]. More generally, consistent notification to TRIS in areas such as school food regulation and regulation of marketing to children may be lacking: school nutrition policies only concern a small market segment and most advertising regulations have co-regulatory character at best rather than representing full statutory regulation required for inclusion in this study. Conversely, these two areas have attracted the interest of supranational institutions as relatively uncontroversial, provided they are directed at the protection of minors. Two recent in-depth reports by the European Commission [57] and WHO-Euro [58] are available to complement the necessarily limited findings presented in this study: the EU report shows that, while mandatory interventions have indeed been under-notified, half of all national

school food polices do not set any mandatory standards. Similarly, the WHO report confirms our findings that statutory regulation of food and beverage advertising, even to children, is a rare occurrence in Europe. WHO concludes that "the majority of the EU countries rely on general advertising regulations, which do not specifically address the promotion of HFSS food and beverage products to children, and on self-regulatory mechanisms which may or may not include specific controls to limit the promotion of such products to children", with additional statutory provisions specific to nutrition found only in Ireland. [58] Even approaches that scale back the degree of government coercion further than the at least semi-mandatory regulations covered in this paper are rare, despite appearing more politically feasible. A unique case falling somewhere between semi-mandatory and entirely self-regulated is the UK's linking of the industry-written and enforced, non-statutory BCAP code [§32.5, 59] to statutory instruments, overseen by communications regulator Ofcom. These institute a ban on the advertisement in or adjacent to programming directed at children of foods and beverages deemed unhealthy based on a score-based nutrient profiling scheme [60,61].

Considering that TRIS submissions occur at advanced draft stages, it is also impossible to follow up on implementation details and possible subsequent repeal unless these are also notified. For instance, the cancellation of Denmark's fat tax has been widely reported [e.g. 33,34] and it appears that Norway chose to trial an industry-led, self-regulatory regime on food advertising for children for at least the next two years despite notifying its draft law to the EU in 2013 [62].

Our search method also could not take into account regulatory developments that have not yet reached approval stage, or that were discarded or defeated during the legislative or administrative decision-making process. In the first quarter of 2014, US executive agencies initiated a suite of regulations that are much more far-reaching than previous initiatives at federal level. Among these are the revision of the Nutrition and Supplement Facts Labels and the overhaul of one-sitting serving sizes, published as proposed rules in March 2014 (79FR11879, 79FR11989). Also on the official regulatory agenda (79FR895) are a proposed rule regarding meal pattern revisions for the Child and Adult Care Food Program and the finalization of regulatory provisions updating the nutritional content of WIC food packages and implementing the Affordable Care Act menu labeling requirements.

Finally, as mentioned in the introduction, the geographical and jurisdictional scope of this paper is necessarily limited. For instance, the number of municipalities and similar administrative units across Europe and the United States is simply too large and their governments too diverse linguistically and legally to allow for systematic examination. Nonetheless, various levels of government from municipalities to sovereign states, individually or cooperatively, are currently involved in obesity prevention. A number of local governments such a New York City under Mayor Michael Bloomberg and a few Californian municipalities have emerged as trailblazers in enacting innovative laws aimed at reducing calorie intake. New York policies include the first instance of menu labeling in chain restaurants, an attempted portion size cap on soda sold in a range of food service establishments, and the successful introduction of nutrition standards for city procurement [63-65]. Berkeley voters made headlines when they approved the first 1-cent-an-ounce tax on soft drinks in the US in November 2014 [e.g. 66] and zoning laws, often within the remit of local government, have been employed, among others, to keep fast food chains at least 500 feet from schools in Detroit and to ban chain restaurants from certain areas in several Californian municipalities [67]. At the same time, industry has successfully subverted other initiatives such as San Francisco's attempt to ban toy incentives from kid's meals has been circumvented by McDonald's charging a separate ten cents passed on to the company charity [68].

6. Conclusion

This overview of current laws and regulations indicates that a range of strategies to reduce caloric intake at the population level have been considered and implemented. At the aggregate level, most broad areas of intervention proposed in the academic literature have been tackled in at least one jurisdiction. However, few countries have built a comprehensive obesity prevention regime of multiple, complementary measures spanning different sectors and settings. The ultimate goal from a public health perspective, the reduction of average caloric intake and a resulting decrease of obesity prevalence, will require patience on the part of policy-makers and action in the face of incomplete knowledge of implementation results. Nonetheless, knowing what measures have been undertaken elsewhere allows researchers and policy-makers to study potential exemplars with a view to emulating

successful policies and improving or combining existing approaches to increase overall effectiveness in preventing obesity.

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Table

Table 1: Databases and Search Strategies

Jurisdiction	Database	Search strategy
European Union	EUR-Lex	((TI~ ((obes* OR overweight OR nutrition* OR sugar* OR fat* OR label*OR calori* OR food* OR lunch OR breakfast OR snack* OR drink* OR beverage* OR vending) OR ((nutrition* OR sugar* OR fat* OR label*OR calori* OR food* OR lunch OR breakfast OR snack* OR drink* OR beverage*) AND tax))) OR (TE~ ((obes* OR overweight OR nutrition* OR sugar* OR fat* OR label* OR calori* OR food* OR lunch OR breakfast OR snack* OR drink* OR beverage*OR vending) OR ((nutrition* OR sugar* OR fat* OR label* OR calori* OR food* OR lunch OR breakfast OR snack* OR drink* OR beverage*) AND tax)))) AND Date_of_document >= 01/01/2004 <= 31/12/2013 AND DTS_SUBDOM = LEGISLATION, Search language: English
European Union Member States	Technical Regulations Information System (TRIS)	Single keyword searches for the years 2004-2013, conducted separately for title and text, by year where results exceeded the maximum number of hits.
	WHO European Database on Nutrition, Obesity and physical activity (NOPA)	Search combining country (28 current EU MS + Iceland, Norway, Switzerland), topic (nutrition-related and obesity-related), and years (2004-2013)
United States		
Congressional legislation	THOMAS (Library of Congress)	Advanced bill text search by word(s)/phrase; include variants applied: obesity+overweight+nutrition+sugar+fat+label+labeling+calorie+food+diet+lunch+breakfast+snack+drink+beverage+vending Limitations: 108th Congress (2004 only) to 113th Congress (2013 only), enrolled bills only
Federal regulation	Federal Register (US Government Printing Office)	Advanced search, restricted to 'rules and regulations' and "presidential documents' for executive orders overweight OR nutrition OR sugar OR fat OR label OR labeling OR calorie OR food OR diet OR lunch OR breakfast OR snack OR drink OR beverage OR vending

Table

Table 2: Jurisdictional activities by interventional category (2004-2013, based on search results)

Jurisdiction	Nutrition labeling		Food marketing		Food standards		Product reformulation	Taxation
	Informative	Interpretative	Advertising	Health claims	Institutions	Programs		
European Union	✔			✔		✔	✔	
Austria								
Belgium			✔					
Bulgaria								
Czech Republic								
Croatia								
Cyprus								
Denmark		✔*						(✔)
Estonia					✔			
Finland								
France			✔		✔		✔	✔
Germany							✔	
Greece				✔				
Hungary					✔			✔
Iceland		✔*	✔	✔				
Ireland								
Italy							✔	
Latvia				✔				
Lithuania								
Luxembourg								
Malta								
Netherlands		✔*					✔	
Norway		✔*	✔*					
Poland					✔			
Portugal								
Romania					✔			
Slovakia								
Slovenia					✔			
Spain							✔	
Sweden		✔*						

Switzerland								
United Kingdom		✔*			✔			
United States	✔			✔	✔	✔		

Brackets indicate repealed laws and asterisks denote semi-mandatory regulations. Note that all EU laws apply in EU and EEA Member States in addition to any individual country-level laws. This table summarizes the search results and therefore does not include missing data discussed in section 5 (Methodological Limitations).

e-component

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