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Research report

Policies to promote healthy portion sizes for children

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ABSTRACT

People of all ages are increasingly consuming larger portions of food. Governments worldwide are involved in the regulation of many aspects of the food supply; however, policies and programs related to serving sizes for children vary or are not clearly communicated. This paper reviews U.S. federal and state government recommendations, policies, and laws related to serving size for children and suggests directions for future policy objectives and outstanding research needed to support the enactment of laws based on the best science. Specifically, this paper reviews federal dietary recommendations and requirements for nutrition programs, packaged food labels and restaurant menus; state regulation of retail environments and child care settings; food companies' self-regulatory options; and directions for future research and policy initiatives. The paper concludes that there are many opportunities for government to revise its policies and programs to better support healthy portion sizes for children and create a more transparent information environment to assist caretakers to do the same.

Introduction

The National Institutes of Health defines portion size as the amount of food that a person chooses to eat, while a serving size is a measured amount of food or drink such as a slice of bread or one ounce of cheese (United States Department of Health & Human Services, National Institutes of Health, 2013). Therefore, people's chosen portion sizes may and often do differ from serving sizes pre-apportioned by food companies or recommended by regulators.

Although there is evidence that portion sizes are increasing internationally (Eidner, Lund, Harboe, & Clemmensen, 2013; Steenhuis, Leeuwis, & Vermeer, 2010), the United States is known for its large portions (Rozin, Kabnick, Pete, Fischler, & Shields, 2003). Research indicates that over the last several decades American adults and children are increasingly consuming larger portions, most notably in fast food restaurants and at home (Nielsen & Popkin, 2003; Piernas & Popkin, 2011). Moreover, packaged food and beverage products that are often eaten in one sitting, and thus considered an "individual serving," have dramatically increased in size (79 FR 11989, 2014). For example, twenty years ago a single portion of a soft drink was 6.5 ounces, while now many consumers consider a 20 ounce container to be one portion (United States Department of Health & Human Services, National Institutes of Health, 2013).

Studies reveal that the portion size served to people can predict consumption. Researchers have demonstrated that increasing the portion size of food items given to participants results in increased consumption by both adults and children (Fisher, Liu, Birch, & Rolls, 2007; Orlet Fisher, Rolls, & Birch, 2003; Rolls, Roe, & Meengs, 2006; Rolls, Roe, Meengs, & Wall, 2004) which may contribute to weight gain (Ello-Martin, Ledikwe, & Rolls, 2005; Rolls et al., 2006). Similarly, in studies where participants consumed larger portions of sugar-sweetened beverages alongside food, they did not decrease the amount of food consumed to compensate for the increased energy from the beverage (Flood, Roe, & Rolls, 2006; Vartanian, Schwartz, & Brownell, 2007). Evidence suggests that the calories from sugar-sweetened beverages are poorly regulated by the body, so additional portions of sugar-sweetened beverages may uniquely result in a significant increase in total energy intake (Flood et al., 2006; Johnson et al., 2009).

Although governments are fundamentally involved in the regulation of many aspects of the food supply, U.S. policies and programs related to serving sizes for children vary or are not clearly communicated. This paper reviews U.S. federal and state government recommendations, policies, and laws related to serving size for children and suggests directions for future policy objectives and outstanding research needed to support the enactment of laws based on the best science. Specifically, this manuscript reviews federal dietary recommendations and requirements for nutrition programs, food labels, and restaurant menus; state regulation of retail environments and child care settings; food companies' self-regulatory options; and directions for future research and policy initiatives. The paper concludes by finding that amidst the variety of current methods employed by the federal and state governments to promote healthy portion sizes for children, there are also

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many opportunities for the U.S. government to revise their policies and programs to better support healthy portion sizes for children and create a more transparent information environment to assist caretakers to do the same.

Federal government recommendations and requirements

Dietary guidelines for Americans

In accordance with its mission to provide nutrition education, the United States Department of Agriculture (USDA) created food and dietary guides on a voluntary basis for decades. In 1990, Congress passed the National Nutrition Monitoring and Related Research Act (National Nutrition Monitoring and Related Research Act. 7 USC §§ 5301 et seq. 1990), which required that the USDA issue dietary guidelines every five years (7 USC § 5341, 1990). The USDA issued the first official *Dietary Guidelines for Americans* in 1995 (USDA, 1995). The department also created the translational guides that have evolved over the years, starting with the Food Pyramid, then MyPyramid, and now MyPlate.

The 2015 Dietary Guidelines for Americans are in progress at the time of this writing (United States Department of Health & Human Services, 2014). The 2010 guidelines include suggestions to eat smaller portions at home and in restaurants and consume smaller portions of foods and beverages that contain solid fats or added sugars (United States Department of Agriculture, 2014a). The MyPlate website provides additional guidance on reducing portion sizes (United States Department of Agriculture, 2014d). The guidelines also suggest consulting the Nutrition Facts Panel on food packaging for more information. However, the Nutrition Facts Panel may not be an effective guide for parents to determine appropriate portion sizes. The serving size designations on food labels are not recommendations and variations in energy requirements among the population are not reflected on food labels, as discussed below.

Several federal programs administered by the USDA direct state agencies implementing nutrition education to rely on the dietary guidelines for nutrition education in those programs, including the Supplementary Nutrition Assistance Program (SNAP), the National School Lunch Program (NSLP), and the National School Breakfast Program (SBP), discussed in the next section.

Federal food and nutrition programs

The food and nutrition programs operated by the USDA are a prime place for federal policy to directly affect portion size for children. The reason for this is twofold. First, because many of these programs deal with the direct provision of food (often in the form of meals or snacks) or the provision of resources to purchase food, they are uniquely situated to regulate portions. Second, these programs, which are largely directed to low-income children and their families, reach a substantial number of children each year. In fiscal year 2013, nearly one in every four Americans participated in one of these programs (Oliveira, 2014), and while not all are directed explicitly at children, the five largest programs serve tens of millions of children annually: SNAP, the Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC), the NLSP and SBP, and the Child and Adult Care Food Program (CACFP).

In the wake of the recent Great Recession, these programs have become an increasingly important component of the social safety net, and accordingly have the opportunity to impact the eating habits of a substantial number of American children. However, as we describe in this section, the treatment of portion sizes for children varies notably across the different programs. Many of the current policies related to portion size are new or represent modifications to previous policies based on the latest nutrition science and the recommendations of expert panels. Accordingly, their ultimate impact on children's consumption is unknown and should be the topic of future research.

Supplemental nutrition assistance program

The SNAP program (formerly known as Food Stamps) is by far the largest of the USDA food and nutrition programs. In fiscal year 2012, 46.6 million Americans participated in the program, 45 percent of whom were children (Gray & Eslami, 2014). Participants receive a monthly benefit that can be used to purchase food (up to a maximum of $632 for a family of four) at participating retailers (United States Department of Agriculture – Food and Nutrition Service, 2013f). States offer these benefits in the form of Electronic Balance Transfer (EBT) cards, which operate like debit cards and can be scanned as such at checkout counters.

Unlike the other federal programs described below, the federal government places only broad restrictions on how SNAP benefits may be used. In short, recipients can use SNAP benefits to purchase any food or beverage item except alcohol, those labeled as dietary supplements, or "hot food" intended to be eaten immediately (United States Department of Agriculture – Food and Nutrition Service, 2010a). The definition of an allowable food is established by federal law. Although the government has considered changes to restrict eligible foods, the USDA states that a lack of consensus about what constitutes healthy or unhealthy foods and the potential administrative burden of imposing new restrictions have prevented any such changes to date (United States Department of Agriculture – Food and Nutrition Service, 2007). Thus, SNAP benefits can be used to purchase energy dense foods that are typically low in nutrient value, including cakes, candy, and sugar-sweetened beverages (United States Department of Agriculture – Food and Nutrition Service, 2013g).

Because SNAP recipients are mostly free to make their own choices about food purchases, there are no specific ways for regulations to dictate portion sizes for children. Some research has found that SNAP recipients tend to consume a large proportion of food purchased with their benefits immediately after receipt (Shapiro, 2005; Wilde & Ranney, 2000), raising concern that recipients might overeat in the early parts of the month and under-eat toward the end of the benefit period. The USDA maintains a SNAP Education (SNAP-Ed) initiative, which originated in 1981 (Landers, 2007) and now operates with state matching support in all 50 states. Although the main goals of SNAP-Ed do not relate directly to portion size, federal guidance for allowable activities specify that: "States may address other behavioral outcomes consistent with the goals and focus of SNAP-Ed and other *Dietary Guidelines of Americans* principles such as consuming smaller portions, drinking fewer sugar-sweetened beverages, and reducing sodium" (United States Department of Agriculture – Food and Nutrition Service, 2014d, p. 7).

While the scope of the SNAP program suggests the opportunity to promote healthy portion sizes for a large number of American children, the current policies attached to the program preclude any clear mechanism by which to do so. Any efforts to promote specific portion sizes in the program would require a substantial reworking of the benefit structure that would necessarily move beyond restricting the list of allowable foods. For instance, if the program eliminated eligibility for large containers of energy dense foods, such as 2- or 3-liter bottles of sugar sweetened beverages, this would ostensibly be seen as a method to promote smaller portions among children. However, the costs of such changes would need to be carefully considered. As a near-cash benefit, SNAP has come to play an increasingly counter-cyclical role, such that low income families are more likely than in previous years to depend on the program when the economy is down (Bitler & Hoynes, 2011). Because food and drink in smaller packages are often relatively more expensive than when purchased in bulk, such benefit changes could have unintended and negative consequences on the economic stability of low income

families with children who depend on SNAP. An alternative solution would be for states to include a discussion in SNAP-Ed about dividing food purchased in bulk containers into pre-apportioned single-serving portions for a child's daily consumption.

Supplemental nutrition assistance program for women, infants, and children

The WIC program provides supplemental food, nutrition education, and health referrals to pregnant, post-partum, or breastfeeding women who are low income and nutritionally at risk, along with their children up to the age of five (United States Department of Agriculture – Food and Nutrition Service, 2014e). Unlike SNAP, WIC is not an entitlement program, and yet the USDA estimates that more than half of all infants in the U.S. receive WIC benefits (United States Department of Agriculture – Food and Nutrition Service, 2013a). In 2013, the WIC program served about 2 million infants and 4.6 million children under the age of five who were low-income and nutritionally at-risk (United States Department of Agriculture – Food and Nutrition Service, 2014f). WIC participants in most states receive vouchers, checks, or EBT cards to purchase food (United States Department of Agriculture – Food and Nutrition Service, 2014e). Unlike SNAP, WIC participants must use benefits to purchase a specifically-defined bundle of food referred to as a package, which targets foods and nutrients which have historically been lacking in the diets of low income women, infants, and children (Institute of Medicine, 2005). Packages for infants consist of an allowance of infant formula, infant cereal, baby fruits and vegetables, and baby food meat. The maximum monthly allowance of these foods varies by infant age and according to whether the infant is being exclusively, partially, or not breastfed. Each month, children ages 1–4 receive a maximum of 1 gallon (3.8 L) of juice, 16 quarts (15.1 L) of milk, 36 ounces (1.0 kg) of breakfast cereal, 1 dozen eggs, $6.00 in vouchers for fruits and vegetables, two pounds (0.91 kg) of whole wheat "bread" (which includes brown rice, and other grain products), and 1 pound (0.45 kg) of legumes or 18 ounces (0.51 kg) of peanut butter (United States Department of Agriculture – Food and Nutrition Service, 2010b). States have the flexibility to set the amount of food below these maximum levels, and state WIC agencies determine the forms or brands of food that recipients may purchase (Institute of Medicine, 2005).

An aspect of WIC that may be salient to portion size for children is the program's longstanding commitment to breastfeeding (Moats & Whitacre, 2011) currently operationalized through its national "Loving Support Makes Breastfeeding Work" campaign (United States Department of Agriculture – Food and Nutrition Service, 2014g). WIC incentivizes breastfeeding by extending benefits and increasing the generosity of packages for fully breastfeeding mothers and by providing program staff with guidance on how to encourage and support breastfeeding (United States Department of Agriculture – Food and Nutrition Service, 2009; United States Department of Agriculture – Food and Nutrition Service, 2010b). Research suggests that mothers who are breastfeeding may be more responsive to satiety cues from infants (Fisher, Birch, Smiciklas-Wright, & Picciano, 2000) and that children who are bottle fed are less able to regulate milk intake later in infancy (Li, Fein, & Grummer-Strawn, 2010) and appetite in childhood (DiSantis, Collins, Fisher, & Davey, 2011).

Like SNAP, The WIC program does not explicitly regulate portion sizes for children, and doing so would require a substantial reconfiguration of the benefit structure. Rather, the composition of the WIC packages is designed to promote healthy nutrient intake and consumption consistent with the *Dietary Guidelines for Americans* for children ages 2 and older (Institute of Medicine, 2005). However, because the WIC packages are designed around maximum allowance, they suggest an effective upper limit on portions for supplemental food each month. When considered as an average daily amount, these portions are fairly small. For instance, in a 30-day month, the milk allowance translates into 4.3 ounces (127 ml) of milk daily, while the breakfast cereal allowance is 1.2 ounces (34 g) per day on average. These compare to recommended average daily intake amounts of between 16 to 24 ounces (.47 L to .71 L) of dairy and 3 to 5 ounces (85.0 g to 141.7 g) of grains for children between 2 and 4 years old (United States Department of Agriculture, 2014a). In addition, like SNAP, the WIC program promotes healthy eating through nutrition education. Accordingly, FNS provides a number of resources to state WIC agencies, including standards to promote quality nutrition services (United States Department of Agriculture – Food and Nutrition Service, 2013h) and online training for nutrition professionals (United States Department of Agriculture, 2014e) among others. Thus, the program may be most likely to promote health portion sizes for children through its continued emphasis on breastfeeding and by further use of nutrition education activities.

National school lunch program and the school breakfast program

School meals provided by the NSLP and SBP are an integral part of the food safety net for low income children. In fiscal year 2013, average monthly participation in the NSLP and SBP were 30.7 million and 13.2 million, respectively. Together the programs served over 7.3 billion meals (United States Department of Agriculture – Food and Nutrition Service, 2014b; United States Department of Agriculture – Food and Nutrition Service, 2014c), the majority of which went to children at reduced or no cost. The program is important to nutritional intake as well. One study found that those who participated in both the NSLP and SBP got about half their daily energy intake in school (Gleason & Suitor, 2001), compared to only one fifth for non-participants.

The NSLP and SBP operate similarly and are effectively federal and local partnerships (though states typically administer the programs). Participating schools receive both subsidies and commodity foods for each meal they serve and agree in turn to provide reduced-cost or free lunches to eligible children and to follow federal nutrition standards (United States Department of Agriculture – Food and Nutrition Service, 2013e; United States Department of Agriculture – Food and Nutrition Service, 2014a). The first set of comprehensive standards was implemented in 1995, following recognition that participating children consumed above-recommended levels of fat and saturated fat (Burghardt, Devaney, & Gordon, 1995). The most recent version of these standards was implemented in 2012, based on a mandate established by the Healthy and Hunger-Free Kids Act of 2010. To develop these standards, the USDA relied on a set of recommendations developed by the Institute of Medicine (IOM) (Stallings, Suitor, & Taylor, 2010) which were derived from the 2010 *Dietary Guidelines for Americans*.

The new set of nutritional standards requires a number of changes to the NSLP and SBP, most of which were meant to be implemented by the 2014–2015 school year (United States Department of Agriculture – Food and Nutrition Service, 2012c). These include new daily and weekly meal patterns that specify minimum daily serving amounts for fruits, vegetables, meat and meat alternatives, grains, and milk (United States Department of Agriculture – Food and Nutrition Service, 2012b). Notably, these requirements promote the consumption of healthy foods by separating the requirements for fruits and vegetables (previous requirements did not distinguish between the two) (United States Department of Agriculture – Food and Nutrition Service, 2012a) and requiring a minimum weekly provision of specific types of vegetables (United States Department of Agriculture – Food and Nutrition Service, 2012b). Further, whereas the earlier standards only specified minimum energy requirements, the new standards also place limits on average daily energy intake for breakfasts and lunches effectively capping serving size (United States Department of Agriculture – Food and Nutrition Service, 2012b). Finally, and consistent with

Table 1
Nutrition standards for national school lunch and school breakfast programs.

	Breakfast meal pattern			Lunch meal pattern		
	Grades K-5	Grades 6–8	Grades 9–12	Grades K-5	Grades 6–8	Grades 9–12
Meal pattern	**Amount of food per week (minimum per day)**					
Fruits in cups	5 (1)	5 (1)	5 (1)	2.5 (.5)	2.5 (.5)	5 (1)
Vegetables in cups	0	0	0	3.75 (.75)	3.75 (.75)	5 (1)
Dark green	0	0	0	0.5	0.5	0.5
Red/orange	0	0	0	0.75	0.75	1.25
Legumes	0	0	0	0.5	0.5	0.5
Starchy	0	0	0	0.5	0.5	0.5
Other	0	0	0	0.5	0.5	0.75
Additional Vegetables to reach total	0	0	0	1	1	1.5
Grains (oz equivalent)	7–10 (1)	8–10 (1)	9–10 (1)	8–9 (1)	8–10 (1)	10–12 (2)
Meats/meat alternatives (oz equivalent)	0	0	0	8–10 (1)	9–10 (1)	10–12 (2)
Fluid milk (cups)[a]	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)
Other specifications: Daily amount based on the average for a 5-day week						
Min-max calories (kcal)	350–500	400–550	450–600	550–650	600–700	750–850
Saturated fat (% of total calories)	<10	<10	<10	<10	<10	<10
Sodium (mg)	≤ 430	≤ 470	≤ 500	≤ 640	≤ 710	≤ 740
Trans fat	Nutrition label or manufacturer specifications must indicate zero grams of trans fat per serving.					

Note: 1 oz equals approximately 28.3 g; 1 cup equals approximately 236.6 ml.
[a] Fluid milk must be 1 percent milk fat or less (unflavored) or fat-free (flavored or unflavored).
Adapted from United States Department of Agriculture – Food and Nutrition Service (2012b).

2010 Dietary Guidelines, the new standards specify serving-size requirement that vary by grade in school for both meats and grains. Table 1 presents the original version of these new standards in full.

However, soon after implementation, schools reported that they were having difficulty meeting these new requirements and there was concern that districts were opting out of the programs as a result. Districts had expressed concerns regarding their ability to menu plan in the face of the new requirements, limited availability of grains and meat/meat alternatives of the correct size, and student acceptance of the new meals (United States Department of Agriculture – Food and Nutrition Service, 2013d). Noting these difficulties and others, the USDA published rules for the 2012–2013 and 2013–2014 school years exempting districts from the maximum weekly requirements for grains and meat or meat alternatives. This flexibility was made permanent in January, 2014 (United States Department of Agriculture, 2014c). Though the specific intent of the new requirements was not to regulate portion size, the permanent flexibility around maximum limits for grains and meats generates some doubt that these regulations will ultimately have any effect on portion sizes in the NSLP and SBP. Further, as of this writing, the requirements are facing intense political scrutiny. The House of Representatives is debating an agricultural spending bill that would allow school districts to opt out of the new nutritional standards (Nixon, 2014), prompting threats of a veto from the White House (Jalonick, 2014) and a sharply-worded editorial by the First Lady (Obama, 2014), who had championed the new standards as part of her Let's Move! initiative.

Because they involve the direct provision of meals to children, the NSLP and SBP are perhaps the federal programs in the best position to affect portion sizes for children. However, the political backlash and the administrative challenge attached to the recent revision to nutritional requirement make the viability of major changes to the program uncertain. Above and beyond the clear scientific guidance related to portion size in these programs (Stallings et al., 2010) an important challenge for the USDA will be to reconcile the needs and resources of local school districts and the political will for such reforms as they seek to promote healthy portions for children.

Lastly, schools which participate in the NSLP and SBP must also meet other requirements. For example, since the 2006–2007 school year, federal law has required that school districts develop wellness plans (Mello, Pomeranz, & Moran, 2008). These plans may specify nutrition guidelines and involve the community in setting goals for nutrition education, physical activity, and student wellness promotion. Notably, as of the 2014–2015 school year, these same schools must now also comply with the USDA's Smart Snacks in School nutrition standards, which governs the sale of competitive foods sold outside of the NSLP and SBP through a la carte offerings, in the school store, and vending machines during the school day. This policy sets nutrition standards and energy limits (e.g., 200 kcal for snacks) and restricts portion sizes for certain beverages (e.g., an 8 ounce [237 mL] maximum for fruit juice in elementary schools) (United States Department of Agriculture, 2014f). Prior to these guidelines, the federal government had very loose standards for competitive foods but 39 U.S. states had implemented some type of nutritionally-based restriction. Because nearly 95% of public and private schools in the United States participate in the NSLP (Ralston, Newman, Clauson, Guthrie, & Buzby, 2008), these additional federal requirements will have important implications for the nutrition content of foods and the portion sizes of beverage offered to school-aged children nationally, especially in states that did not previously regulate competitive foods or did so in a relaxed manner.

Child and adult care food program

The Federal Government administers the CACFP to child care centers, day care homes, afterschool care programs, emergency shelters, and adult day care centers by providing reimbursement for snacks and meals that meet federal nutrition and portion requirements. Although both children and adults are eligible, children under the age of 12 comprise the vast share of participants; on average 3.3 million children received meals and snacks each day compared to 120,000 adults (United States Department of Agriculture – Food and Nutrition Service, 2013b). As with the school meals programs, the Healthy and Hunger Free Kids Act of 2010 mandated that that the USDA develop a new set of standards for CACFP meal patterns consistent with the *Dietary Guidelines for Americas* and aided by an IOM report on the CACFP that had been requested by the USDA (Murphy, Yaktine, Suitor, & Moats, 2011).

Although the USDA released a proposed rule revising meal patterns for the CACFP, a final rule has not yet been issued. Nonetheless, it is likely that the IOM recommendations will form the nucleus of whatever changes are made to the program, and these are described here. Though the CACFP is similar to the NSLP and SBP in that the federal government reimburses providers, the program

Table 2
IOM recommended daily meal patterns for breakfast and lunch/supper for the CACFP.

Food group (measure)	Age group		
	1 year	2–4 years	5–13 years
Breakfast			
Fruit or non-starchy vegetables (cup)	0.25	0.5	0.5
Grain/bread (oz equivalent)	0.5	1	1.5
AND			
Lean meat or meat alternate (oz equivalent)[a]	0.5	1	1
OR			
Grain/bread (oz equivalent)	1	2	2.5
AND			
Lean meat or meat alternate (oz equivalent)[a]	0	0	0
Fluid milk (cup)	0.5	0.5	0.75
Lunch/supper			
Fruit (cup)	0.25	0.5	0.5
Vegetable (cup)	0.25	0.5	1
Grain/bread (oz equivalent)	0.5	1	2
Lean meat or meat alternate (oz equivalent)[a]	0.5	1	2
Fluid milk (cup)	0.5	0.5	1

Note: 1 oz equals approximately 28.3 g; 1 cup equals approximately 236.6 ml.
[a] IOM recommendations suggest that meat be served three days per week at breakfast for all ages and that an extra 0.5 oz of grain/bread for 1 year-olds or 1 oz of bread/grain for all other ages be substituted on non-meat days.
Adapted from Murphy et al. (2011).

differs from its school-based counterparts in a number of ways that have led to different proposed meal patterns. For one, many CACFP meals and snacks are provided for small groups in residential homes, meaning that the IOM recommendations are not based on nutrient-based planning but only on food-based menu planning, which is easier to execute (Murphy et al., 2011).

Table 2 summarizes the recommended requirements for reimbursable CACFP breakfasts and lunches/suppers; there are separate recommendations for infants under the age of 1, and for reimbursable snacks (see tables 7-1 and 7-4, respectively in (Murphy et al., 2011). The recommended IOM meal patterns differ from current requirements in a few notable ways. For example, the recommended serving size patterns allow for lean meat or meat alternatives at breakfast, reduce the size of some servings (1/2 oz meat for lunch/supper for 1 year-old children compared to 1 oz currently), and change the age groupings from 1–2, 3–5, and 6–12 years-old to 1, 2–4, and 5–13 years-old (Murphy et al., 2011; United States Department of Agriculture – Food and Nutrition Service, 2013c).

Federal labeling requirements

Food packaging

Congress passed the Nutrition Labeling and Education Act in 1990 (NLEA), requiring the Food and Drug Administration (FDA) to regulate the labels on packaged foods. Among other mandates, the NLEA required that the agency base serving size information on amounts customarily consumed. In 1993, the FDA enacted regulations creating the Nutrition Facts Panel which bases serving size information on Reference Amounts Customarily Consumed (RACCs). The FDA established two sets of RACCs, one for children less than 4 years of age, and one for persons 4 years and older (9 CFR 317.312). However, the regulations specifically state that the RACCS for infants and toddlers "are to be used only when the product is specially formulated or processed for use by an infant or by a child under 4 years of age" (9 CFR 317.312). Thus, the FDA's inspection website lists food products, such as teething biscuits and infant cereal, and product categories, such as those labeled "baby food," "toddler," or "graduate," that meet this definition (United States Department of Health and Human Services – U.S. Food and Drug Administration, 2014b).

Manufacturers use RACCs to calculate serving sizes and other information disclosed on their packages (United States Department of Health and Human Services – U.S. Food and Drug Administration, 2014b). FDA regulations define "serving" and "serving size" as an amount of food customarily consumed per eating occasion (9 CFR 317.309, 2012). Thus, it is important to highlight here that the serving size on food labels is *not* a recommendation but rather a reflection of Americans' eating habits.

The FDA based all the RACCs on surveys of food consumption conducted in 1977–1978 and 1987–1988. Thus, in 2014, the FDA announced that it will update the Nutrition Facts Panel to revise serving size information to reflect current consumption patterns, among other reforms (United States Department of Health and Human Services – U.S. Food and Drug Administration, 2014c). Because consumers of all ages currently eat larger portions of food than listed as a serving size on the facts panel, the FDA explained that it "is updating the reference values used by manufacturers to set serving sizes to make them more realistic, reflecting what people really eat and drink" (United States Department of Health and Human Services – U.S. Food and Drug Administration, 2014a). The proposed revised Nutrition Facts Panel for the general population will be based on a 2000 Kcal diet, which is considered the average energy need for an adult. As stated, children's energy requirements often differ, but these will not be reflected on the updated Nutrition Facts Panel.

The FDA is proposing to change the RACCs for foods for children less than four years from 60 grams to 110 grams in the following categories: dinners, desserts, fruits, vegetables and soups (79 FR 11989, 2014). The FDA is also seeking to address "single portions" that are consumed in one sitting but that contain multiple servings according to the 1993 labeling requirements. For example, consumers will generally drink twelve ounce cans, sixteen ounce bottles, or twenty ounce bottles of beverages in one sitting. Acknowledging these varied consumption behaviors, the label update will increase the serving sizes listed for many foods and beverages.

Because research indicates that people rely on external cues to determine appropriate serving size, more research is needed to determine if and how these new label changes will impact consumption. Moreover, it is unclear whether the public believes that serving size information on food packaging is based on government recommendations for appropriate consumption patterns, rather than reflecting actual consumption, and how this relates to children's food needs. Research is needed to determine consumer understanding of serving size information for adults and children and whether consumption may increase as a result of the revised Nutrition Facts Panel.

Notwithstanding the outcome of this research, the FDA can only act within the parameters set forth by Congress in the NLEA, which requires that serving sizes listed on the facts panel reflect the "amount customarily consumed" (21 USC 343(q)(1)(A)(i)). Thus, even if research reveals that the FDA should base serving size disclosures on something other than the RACC, the agency cannot veer from the authority granted to it under the Food Drug and Cosmetic Act (FDCA). Thus, Congress would need to revise the FDCA to permit the agency to update the regulations based on the most robust science.

Food labels are generally geared toward adults and adult eating patterns. Parents might be unaware of the appropriate portion size that should be served to their children over three years old. More research is warranted to explore whether additional serving size measurements should be considered for children older than three years. It would be challenging for food labels to reflect the wide range of calorie requirements in the population. However, Congress could consider other requirements; for example, that food labels designate an average serving size for children less than 8 or 12 years old alongside the average adult serving size. Additional research into consumer comprehension, behavior, and preference is necessary to help inform such future labeling requirements.

Menu labeling

Several U.S. states and localities passed laws requiring calorie information to be placed on menus of chain restaurants. In 2010, Congress amended the NLEA to require the disclosure of calorie content on vending machines owned by larger operators where inspection of the Nutrition Facts Panel is not possible, and on menus, menu boards, and self-service displays of food and beverages in restaurants that are part of a chain with twenty or more outlets nationally (21 USC 343(q)(5)(H)). Vending machines generally contain products intended to be consumed in one sitting but there is no standardized serving size measurement for restaurant food (Cohen & Story, 2014).

In addition to the energy disclosure requirement, federal law requires that restaurants covered by the law must make information available upon request that lists many items specified on the Nutrition Facts Panel: the total number of calories, total fat, saturated fat, cholesterol, sodium, total carbohydrates, complex carbohydrates, sugars, dietary fiber, and protein contained in each serving size or other unit of measure (21 USC 343 (q)(5)(H)(ii)(III)). Congress did not require that restaurants disclose serving size information or the total number of servings in the product (21 USC 343 (q)(1)(A), (B)). Congress did permit the Secretary of Health and Human Services to allow the FDA to propose regulations to require any additional "nutrient" to be disclosed for the purpose of providing information to assist consumers in maintaining healthy dietary practices (21 USC 343 (q)(5)(H)(ii) (IV)(vi)). Serving size information is not a nutrient so the FDA cannot require this disclosure.

If research reveals that serving size information would be helpful to customers, Congress would need to amend the NLEA to permit or direct the FDA to require the disclosure of this information, either on menu boards or in the additional information available upon request. As the law is written, this serving size information would likely be linked to the Nutrition Facts Panel so the outstanding questions noted above about consumer perceptions would be relevant here as well. Moreover, this information would likely be based on the 2000 Kcal diet and thus would similarly not be directed at children's needs. Congress could require information for both adults and children to assist caretakers to make the best choices for children.

The federal menu label law preempts, or trumps, non-identical state and local laws that apply to chain restaurants with twenty or more establishments nationally. Therefore, states cannot enact menu labeling laws that would require serving size to be listed unless the law applies to food retail establishments with fewer than twenty locations. However, these establishments have the option to opt-into the federal menu labeling law, which would then trump the divergent requirements in the state law. States could still attempt to require such disclosures and the outcome would either be that the restaurants would disclose the serving size information as required, or they would opt-into the federal law and abide by those requirements.

Finally, a state may petition the FDA to request an exemption from the federal law. Such a proposal must address a particular need for information unmet by federal law and cannot require restaurants to violate federal requirements or unduly burden interstate commerce (21 CFR 100.1). A state might seek an exemption to require the additional information available to consumers include the number of standard servings per the Dietary Guidelines that make up the portion served for each menu item for both adults and children. For example, a 64 ounce soda would have to list that it has 8 servings per the USDA guidelines.

The federal menu labeling also has the potential to influence the creation of smaller portion sizes of menu items. Several studies assessed changes to the calories and nutrient component of food after the enactment of menu labeling laws (Bruemmer, Krieger, Saelens, & Chan, 2012; Dumanovsky et al., 2011). One study that specifically looked at children's menus found that fast-food restaurants significantly decrease the mean energy of 40 kcal in children's foods after enactment of the federal law (Wu & Sturm, 2014). No study has investigated whether portion sizes changed after menu labeling, although anecdotal reports indicate smaller portions not specifically targeted to children, may have been introduced after the enactment of a local law.

State laws related to portion sizes

Regulating retail establishments

State governments possess the authority to enact laws and regulations to protect, preserve and promote the health, safety, and the general welfare of their population (*Jacobson v. Massachusetts*, 197 U.S. 11 (1905). This legal concept is called the "police power" and it affords the government the discretion to determine the method to regulate the food supply to protect public health. All states delegate the police power to their political subdivisions, cities, counties and towns, to varying degrees. Except as restricted by the United States Constitution, states may use the police power to benefit population interests as long as they do not do so in an arbitrary or unreasonable manner (*Schmidinger v. Chicago*, 226 U.S. 578 (1913). Common examples of laws created pursuant to the police power include ordinances related to sanitation, safety, and zoning, and this could be used to address large portion sizes.

In several cases from the early part of the twentieth century, the Supreme Court upheld against legal challenge states' and cities' ability to enact laws with "respect to the weight, measurement, quality or ingredients of an article of general consumption," as a valid and "common exercise of the police power" (*Hutchinson Ice Cream Co. v. Iowa*, 242 U.S. 153 (1916). These laws were generally enacted to prevent frauds or protect the public from impure ingredients (*Hutchinson Ice Cream Co. v. Iowa*, 242 U.S. 153 (1916); *Schmidinger v. Chicago*, 226 U.S. 578 (1913). In one 1916 case, a North Dakota statute required lard to be sold in specifically sized containers despite the fact that businesses wanted to offer smaller sizes than permitted by the law (*Armour & co. v. North Dakota*, 240 U.S. 510 (1916). The Supreme Court upheld the law as a valid exercise of the state's police power to regulate honest weights and measures. State governments today may seek to restrict large portion sizes to address chronic disease that results from overconsumption- a different but equally valid rationale under the police power.

A modern example of a serving size regulation was enacted by New York City in 2012. New York City's Board of Health adopted an ordinance prohibiting the sale of sugar-sweetened beverages in containers larger than sixteen ounces in the city's food retail establishments (e.g., restaurants). Local retailers and the beverage industry, among others, sued the city to prevent enforcement of the measure. In June 2014, the state's highest court held that the Board of Health overstepped is regulatory authority and impermissibly acted in a legislative capacity by engaging in policymaking rather than standard rule-making permitted by a city agency (*In the Matter of New York Statewide Coalition of Hispanic Chambers of Commerce v. The New York City Department of Health & Mental Hygiene*, 2014). This is a separation of powers issue and only applies within New York State. The New York City Council or New York State legislature could still enact a serving size restriction, as could all state legislatures across the country. Regulating portion sizes in a similar manner would be in accordance with a state's police power. State and local governments can experiment with similar provisions, such as requiring the default portions in restaurants' children's meals to be the smallest portion available. The idea of healthy defaults is often discussed in terms of requiring or urging fast food restaurants to make the default selection in children's meals nutritionally healthy (Yale Rudd Center for Food Policy & Obesity, 2013), but urging or

requiring the portion size to be small is another method to address children's food consumption in such establishments.

State child care policy

Although the CACFP reaches a large number of low-income children, millions of other children are in non-parental care arrangements not covered by the CACFP. Because much of the responsibility for child care policy has been devolved, states bear the primary responsibility for setting policy for child care placements. Though child care settings figure prominently in the IOM's recommendations for fighting child obesity (Institute of Medicine, 2011), child care settings have been referred to as an "untapped setting" in obesity prevention efforts (Kaphingst & Story, 2009). Indeed, while the IOM recommends that state regulatory agencies mandate that all child care settings adopt the CACFP meal standards, a 2009 review of state licensing requirements revealed wide variability in nutrition policies within and among states (Kaphingst & Story, 2009). For instance, the review found that 29 states mandated that meals and snacks served in child care centers be consistent with CACFP standards or other similar meal pattern requirements, while only 24 and 20 made the same requirement for large- and small-family child care homes, respectively. Only two states required that meals and snacks served in child care centers be consistent with the *Dietary Guidelines for Americans*, and no states made a similar requirement for small-family homes.

Absent consistent state policies regarding portion size in child care, subsidies offered through the federal Child Care Development Fund (CCDF) offer another mechanism by which child care policy might affect portion size for children. CCDF subsidies are available to offset the cost of child care for low income families engaged in work or other similar activities. The program is administered at the state-level within broad guidelines regarding eligibility and funding set at the federal level. Thus, states have great leeway in designing programs, and though many attempt to funnel children into subsidized slots in child care centers, which are most heavily regulated, some allow subsidy recipients to use non-licensed care, which is not subject to any regulations (Child Care Bureau, 2011). In light of the structure of the program, federal policy makers could add to the minimal guidelines passed down to states and require that all CCDF subsidies be used at care placements that are compliant with CACFP standards. States could independently make a similar requirement of all subsidized placements or could take the more intermediate step of requiring that all placements be used in licensed care settings that are subject to state nutrition regulations (Kaphingst & Story, 2009).

Self-regulation

Food manufacturers market their products to children in the media and on packages. Products that are clearly geared toward children sometimes come in pre-apportioned sizes. However, research indicates that packaged snack foods are divided into sizes 2.5 times larger than is appropriate for young children (Bish, Regis, & Gottesman, 2005). Manufacturers could correct this so that the pre-apportioned sizes are smaller than those for adults. This might also be helpful when children are serving themselves. There may be environmental concerns associated with the increased use of packaging materials required for individually sized portions that should be explored. Additionally, while manufacturers could not amend the serving size information on Nutrition Facts Panels to align with children's energy needs, they could include portion suggestions in their marketing campaigns. For example, advertisements could state that a tub of yogurt labeled as having two servings per the NLEA, is actually large enough to feed four children.

Food service establishments could also experiment with self-regulatory portion controls. For example, many restaurants have "healthy menu" items; they could experiment with including smaller portion size as part of rubric of healthy eating. Fast food restaurants might also voluntarily agree to use standardized definitions of serving sizes across chains. Studies show that the serving size label can influence size perception and consumption (Aydinoğlu & Krishna, 2011). Creating a standard definition is especially relevant for beverages, which come in different named sizes ranging from "small" to "extra large," but which vary across establishments. Retailers could voluntarily use the term relating to the agreed upon definition for an established number of ounces so that every "kiddie cup," for example, is the same across chains.

Outstanding policy issues and opportunities

Many portion size recommendations are based on energy density or content. However, focusing on energy alone might undermine the importance of the nutritional quality of food products, especially for growing children. The quality of the food consumed can impact health incomes, adiposity, and satiety (Ludwig & Friedman, 2014). Although overconsumption of food is considered to be a contributor to obesity in much of the literature, Ludwig and Friedman's 2014 study indicates that, "overeating may be secondary to diet-induced metabolic dysfunction in the development of some forms of obesity. If so, treatment focused on dietary quality, rather than advice to eat less, could help address this sequence of events at the source and produce better long-term weight loss" (Ludwig & Friedman, 2014). Shifting the focus on the quality of food rather than solely energy intake may assist all parents to make healthier decisions for their children.

More research is needed to determine if there are better or more accurate methods to impart portion size information and recommendations to caretakers. Food labels present a challenging but important opportunity for educating the population because they are the location where consumers come into direct contact with nutrition information. Studies can help government tailor future labeling standards to reflect the latest science and overcome the difficulty of tailoring recommendations to children of different ages.

Because of their wide reach, the USDA's school-based food and nutrition programs present an important opportunity for government policies to more actively promote healthy portion sizes for children. Though generally children from low-income households receive free or reduced-price meals, any child at a participating school may purchase a breakfast or lunch (Ralston et al., 2008). Because all meals are subject to the same nutritional and portion controls, the NSLP and SBP have the potential to reach a substantial portion of school-aged children in the U.S. Increasing participation in these programs might thus be a viable way to promote healthy portion sizes despite challenges in the implementation of the recent nutrition standards. Moreover, the revised mandates for school districts to maintain stronger wellness policies and comply with the Smart Snacks in Schools standards create additional opportunities for the federal government to influence healthy eating and portion sizes. Further, school districts are only required to abide by the minimum requirements specified by the USDA. Thus, there is substantial room for state and local districts to implement stricter standards regarding portion size in schools. Without altering its own requirements, the federal government could provide financial incentives to districts that adopt stricter regulations regarding portion size. Though their impact on portion size for children has yet to be seen, these federal regulations, which allow for additional state and local policymaking, might provide a general model for future revisions to other USDA programs and policies.

Conclusion

The concept and importance of portion sizes is evolving and government has attempted to update programs to reflect emerging science. Government has a great deal of power to directly change the food environment as a regulator, purchaser, and purveyor of food. The government also has great influence over the information environment through dietary recommendations and labeling requirements. Several policy options remain available to the federal, state and local governments to positively impact portion sizes and encourage healthier food consumption by children. Moreover, food companies can engage in self-regulatory efforts to assist parents making portion size decisions for their children. More research is warranted to advance all such future efforts and support children's nutritional needs.

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