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Nutrition composition of children's meals in twenty-six large US chain restaurants

Caroline G Dunn[1,*], Kelsey A Vercammen[2], Johannah M Frelier[1], Alyssa J Moran[3] and Sara N Bleich[1]

[1]Department of Health Policy and Management, Harvard T.H. Chan School of Public Health, Boston, MA, USA: [2]Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, MA, USA: [3]Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

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Abstract

Objective: To compare the nutritional quality of children's combination meals offered at large US chain restaurants characterised by three versions – default (advertised), minimum (lower-energy) and maximum (higher-energy).

Design: We identified default children's meals (*n* 92) from online restaurant menus, then constructed minimum and maximum versions using realistic additions, substitutions and/or portion size changes for existing menu items. Nutrition data were obtained from the MenuStat database. Bootstrapped linear models assessed nutrition differences between meal versions and the extent to which meal components (main dish, side dish, beverage) drove differences across versions. For each version, we examined the proportion of meals meeting the Guidelines for Responsible Food Marketing to Children.

Setting: Twenty-six fast-food and fast-casual restaurants, in 2017.

Participants: None.

Results: Nutrient values differed significantly across meal versions for energy content (default 2443 kJ (584 kcal), minimum 1674 kJ (400 kcal), maximum 3314 kJ (792 kcal)), total fat (23, 17, 33 g), saturated fat (8, 6, 11 g), Na (1046, 915, 1287 mg) and sugar (35, 14, 51 g). The substitution of lower-energy beverages resulted in the greatest reduction in energy content (default to minimum, −418 kJ (−100 kcal)) and sugar (−20 g); choosing lower-energy side dishes resulted in the greatest reduction in total fat (default to minimum, −4 g), saturated fat (−1·1 g) and Na (−69 mg). Only 3 % of meals met guidelines for all nutrients.

Conclusions: Realistic modifications to children's combination meals using existing menu options can significantly alter a meal's nutrient composition. Promoting lower-energy items as the default option, especially for beverages and side dishes, has a potential to reduce fat, saturated fat and/or sugar in children's meals.

Keywords
Children's meals
Restaurant
Combination meals
Nutrition guidelines

Children consume more energy content and have worse diet quality on days they eat at restaurants than on days they do not[1,2]. This is problematic given that more than one-third (36 %) of American children aged 2–19 years eat at fast-food restaurants on a typical day[3], and restaurant meals account for approximately 12 % of daily energy content and 35 % of added sugars and solid fats consumed by children[4,5]. A growing body of work has examined trends in the nutritional quality of foods and beverages offered on children's menus of large chain restaurants both within the United States[6–12] and internationally[13–15]. Research suggests that, despite public health recommendations and voluntary industry pledges[16], children's menu items often exceed nutrition guidelines for energy content, total fat, saturated fat, Na and sugar, with little progress towards meeting recommendations or offering a substantially larger number of healthy options[6,10–12]. In addition to unhealthy individual menu items, children's combination meals (i.e. bundled main dish, side dish and beverage at a discounted price) generally do not meet nutrition guidelines[7–9]. Furthermore, despite recent increases in the proportion of healthy side or beverage items in advertised (default) children's meals, these options still remain relatively uncommon (<20 % of meals)[12].

*Corresponding author: Email cdunn@hsph.harvard.edu

The restaurant industry may consider several approaches to provide healthier options for young customers, including reformulating existing recipes, introducing new healthier meals or including existing healthy menu items as defaults. Because it would likely require lesser resources (e.g. time, labour, money), replacing meal components with healthier default options from the existing menu may be the most desirable strategy. To ensure healthier default options, recent legislative action includes policies in California[17], Baltimore, MD[18], New York City[19], Lafayette, CO[20], Wilmington, DE[21], Louisville, KY[22] and Hawaii[23] requiring restaurants to provide healthy default beverages in children's meals. Given the strong status quo bias in restaurant ordering (i.e. customers are likely to select the default)[24,25], such legislation has a potential to improve public health without relying on individual behaviour change. However, legislative actions have almost exclusively applied to beverages, and little information is available to quantify the potential nutritional impacts of policies on other components of children's meals.

Specifically, we lack an understanding of how simple modifications, such as substitutions, additions and portion size changes to existing offerings, can influence the nutrition composition of children's combination meals; how meal components (main dish, side dish, beverage) might drive those changes; and how this knowledge could be operationalised to create children's healthier default combination meals that meet nutrition guidelines. This is a key area of inquiry given that, while parents report they are more likely to purchase fast-food for their children based on a healthy kids meal policy[26], little progress has been made towards improving the nutrition composition of foods or meals[6–11].

The primary aims of the current study were to: (i) characterise the nutrition composition of three versions of children's combination meals – default (as advertised on the menu), minimum (lower-energy) and maximum (higher-energy) – offered at large chain restaurants; (ii) examine the relative contribution of each meal component (main dish, side dish, beverage) to differences in nutrients across meal versions; and (iii) examine the proportion of children's meal versions meeting the Guidelines for Responsible Food Marketing to Children recommendations on energy content, fat, saturated fat, Na and sugar[27].

Methods

Data

Restaurants eligible for inclusion were those included in MenuStat (*n* 94 in 2017), a database containing nutrition information on menu items offered at top-grossing restaurant chains (www.menustat.org)[28,29]. Restaurants were excluded if they (i) did not offer children's combination meals (i.e. a bundled meal with 'kid', 'children' or 'child' in the description, containing a main dish, at least one side dish and a beverage; *n* 57); (ii) did not advertise a default version of the children's combination meals (e.g. only offered 'make your own' options; *n* 9); or (iii) were missing children's combination meals in MenuStat (*n* 2) (see online supplementary material; Appendix Fig. 1). The final restaurant sample included twenty-six restaurants (twenty-three fast-food, three fast-casual) (see online supplementary material; Appendix Table 1).

For each restaurant, we used online menus from the restaurant's website to construct default (as advertised), minimum (lower-energy) and maximum (higher-energy) versions of each children's combination meal (see online supplementary material; Appendix A for details on the creation of combination meals) in 2017. In summary, each default meal included a main dish, side dish and beverage; some meals included an additional side dish if those were part of the advertised meal. The minimum and maximum meal versions reflected realistic energy adjustments to the default meal, such as changing portion sizes (e.g. including a four-piece chicken instead of a six-piece one), substituting side dishes or beverages (e.g. replacing a sugary drink with a non-energetic alternative) or adding/removing toppings or dipping sauces to main dish or side dishes (e.g. adding mayonnaise to a sandwich; see online supplementary material; Appendix Tables 2 and 3). A codebook of rules described by Vercammen *et al.*[30] was created to ensure consistency in identifying default meals and developing minimum and maximum combinations across all meals and restaurants (see online supplementary material; Appendix Table 4 for an example of a default, a minimum and a maximum version of a children's meal).

At the item level (main dish, side dish, beverage and toppings/condiments), the components of each version were matched to nutrition information in the MenuStat database by restaurant and item description. Nutrition information for toppings/condiments was attributed to the meal component that they complemented (e.g. ketchup with fries was attributed to the side dish). Total nutrient values for each meal were calculated by summing across all components of the meal. If nutrition data were unavailable for an item in 2017, 2016 MenuStat values were used. If data were not available in 2016, missing values were manually entered using nutrition information from restaurant websites in 2018. After this step, complete data were available for a final sample of 276 distinct meals (ninety-two default, ninety-two minimum and ninety-two maximum versions). For a portion of the final sample (*n* 24, 9 % of total sample), nutrition data were only available for the full meal but not for the components.

Statistical analyses

Data were analysed using Stata, version 15 (StataCorp LLC)[31]. Bootstrapped linear models (using fifty replications) with fixed effects for restaurant chain and meal version (default, minimum, maximum) were used to test

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for differences in nutrients of interest (i.e. energy content, grams of fat, grams of saturated fat, milligrams of Na and grams of sugar) between the default *v.* minimum and maximum meal versions. The unit of observation in these models was the combination meal; the primary outcome was the nutrient value of interest; and the primary predictor was the meal version. Fixed effects for restaurant chain were included to account for clustering of menu items within restaurants, and bootstrapping was used to account for the non-normality of residuals[32]. The margins command was used to estimate predicted mean nutrient values for each meal version post-regression.

Next, bootstrapped linear models (using fifty replications) with fixed effects for restaurant and meal component type (main dish, side dish, beverage) were used to test the extent to which meal components contributed to differences in nutrients across meal versions. The unit of observation in these models was the meal component (i.e. main dish, beverage or side dish); the primary outcome was the difference between the default and minimum or maximum for each nutrient; and the primary predictor was an indicator for whether the meal component was a main dish, beverage or side dish. The margins command was used to estimate predicted mean differences in nutrients between the default and minimum or maximum for each meal component. Nutrition information was available for all individual meal components in 252 children's combination meals (91 % of the final sample); meals without nutrient profiles for all individual components (*n* 24; 9 % of the total sample) were excluded from the analysis.

We also estimated the proportion of each meal version that met the Guidelines for Responsible Food Marketing to Children, developed by the Center for Science in the Public Interest (CSPI)[27]. The guidelines provide nutritional criteria for food manufacturers, restaurants and organisations marketing foods to children, and state that children's meals should include no more than 35 % of energy content from fat, 10 % of energy content from saturated fat, 770 mg of Na, 35 % of total energy content from added sugar and one-third of the daily recommended energy content for the average age of children targeted for the meal. For this analysis and consistent with a previous evaluation of children's restaurant meals[8], we based our energetic standards on the recommendations for a moderately active child aged 4–8 years from the 2015–2020 Dietary Guidelines for Americans[33] of approximately 6276 kJ (1500 kcal) per day, which translates to 2092 kJ (500 kcals) per meal.

Results

Table 1 shows the predicted mean nutrient values for default, minimum and maximum combination meal versions. Nutrient values differed significantly ($P < 0{\cdot}05$ for all) between default to minimum combination meal versions, and default to maximum versions for energy content (default 2443 kJ (584 kcal); minimum 1674 kJ (400 kcal); maximum 3314 kJ (792 kcal)), total fat (23, 17, 33 g), saturated fat (8, 6, 11 g), Na (1046, 915, 1287 mg) and sugar (35, 14, 51 g).

Figure 1 depicts the mean contribution of each meal component to differences in energy content, total fat (g), saturated fat (g), Na (mg) and sugar (g) between the default *v.* minimum and default *v.* maximum meal versions (point estimates and 95 % CI included in the online supplementary material; Appendix Table 5). Beverages were the greatest driver of total energy reduction from default to minimum versions (−418 kJ (−100 kcal), 56 % of difference), followed by side dishes (−247 kJ (−59 kcal), 33 %) and main dishes (−84 kJ (−20 kcal), 11 %). Side dishes were the greatest driver of increased energy content from default to maximum versions (+536 kJ (+128 kcal), 59 %), followed by beverages (+243 kJ (+58 kcal), 27 %) and main dishes (+126 kJ (+30 kcal), 14 %). Side dishes contributed the most to changes in total fat (default to minimum: −3·5 g, 56 %; default to maximum: +7·5 g, 70 %), saturated fat (default to minimum: −1·1 g, 55 %; default to maximum: +2·3 g, 77 %) and Na (default to minimum: −69 mg, 54 %; default to maximum: +202 mg, 78 %). Finally, beverages were the largest contributor to changes in sugar (default to minimum: −20 g, 95 %; default to maximum: +16 g, 91 %).

Table 1 Mean, standard deviation and range of nutrients in default, minimum and maximum combination meals

	Combination meal versions (*n* 276 total combinations)								
	Default (*n* 92 distinct combinations)			Minimum (*n* 92 distinct combinations)			Maximum (*n* 92 distinct combinations)		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Kilojoules (kJ)	2443	887	732, 4770	1674	640	460, 3393	3314	987	1736, 5774
Calories (kcal)	584	212	175, 1140	400	153*	110, 811	792	236†	415, 1380
Total fat (g)	23	12	1·5, 50	17	9*	2, 42	33	14†	7, 74
Saturated fat (g)	8	5	0, 23	6	4*	0, 19	11	6†	2, 31
Na (mg)	1046	426	205, 2145	915	417*	190, 2135	1287	465†	480, 2615
Total sugar (g)	35	14	1, 63	14	12*	0, 59	51	20†	23, 100

*Indicates significant difference in nutrient value of minimum compared to default nutrient value in bootstrapped linear model with fixed effects for each restaurant and combination meal type ($P < 0{\cdot}05$).
†Indicates significant difference in nutrient value of maximum compared to default nutrient value in bootstrapped linear model with fixed effects for each restaurant and combination meal type ($P < 0{\cdot}05$).

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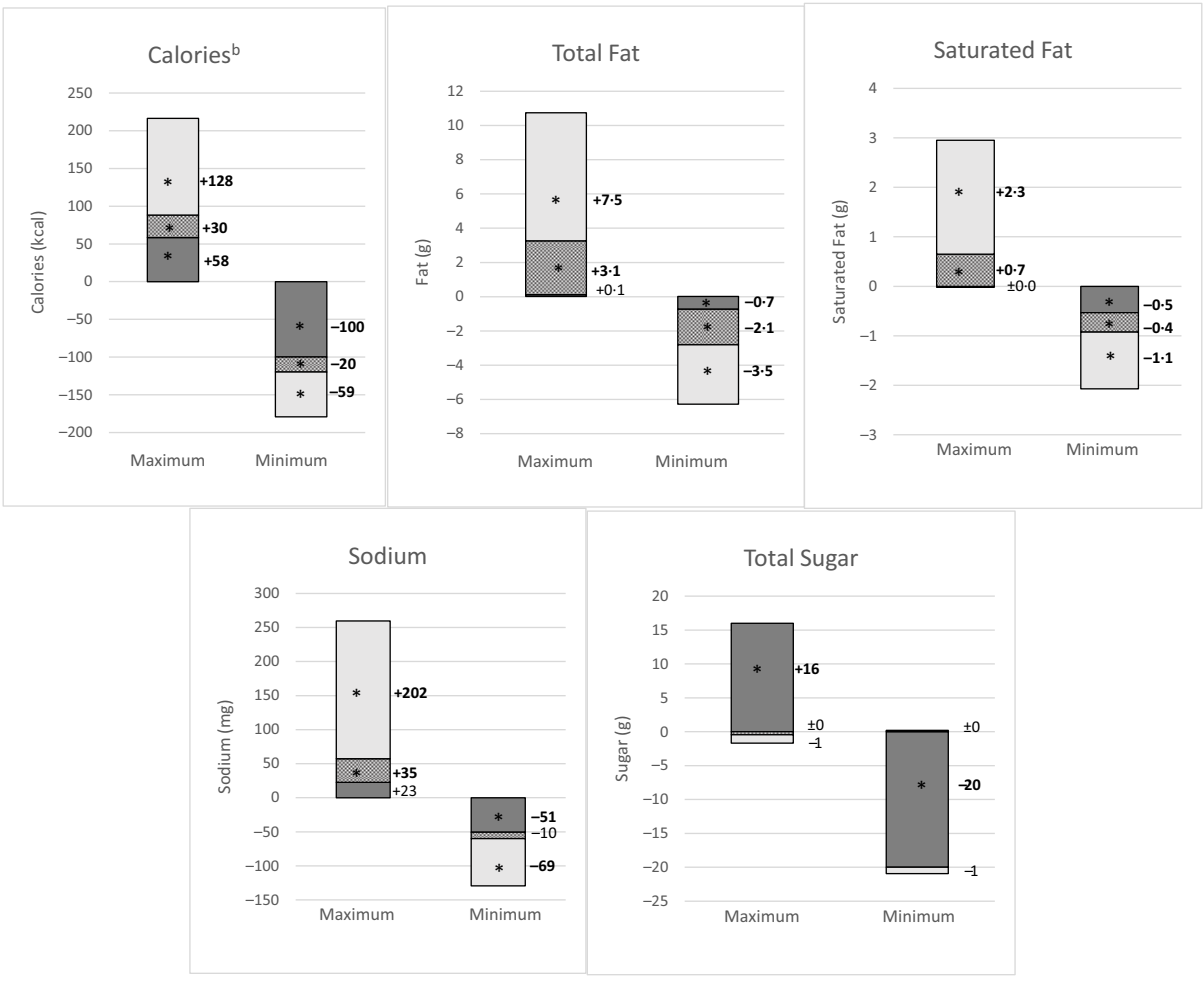

Fig. 1 Differences in predicted mean nutrient values for default *v.* maximum and minimum, by meal components (*n* 252 meals)[a] [a]Twenty-four meals (9 % of the sample: eight default, eight minimum and eight maximum) were excluded from this analysis because nutrition information was only available for the entire meal in MenuStat, precluding our ability to examine how individual meal components drove differences in nutrient values across meal versions. [b]Calories (i.e. kilocalories; 1 kcal = 4·184 kJ). ▩, beverage; ▩, entrée; □, side. *Significant difference at $P < 0·05$.

Figure 2 includes the number and proportion of each type of meal meeting the CSPI Guidelines for Responsible Food Marketing to Children, using energetic recommendations for a moderately active child aged 4–8 years from the 2015–2020 Dietary Guidelines for Americans[33]. Only eleven (12 %) minimum and three (3 %) default meal versions met all guidelines. No maximum versions of the meals met all of the guidelines. Notably, the majority of meals (default 86 %; minimum 98 %; maximum 87 %) met the guidelines for sugar; fewer met the guidelines for energy content (41, 75, 12 %), total fat (48, 47, 39 %), saturated fat (41, 42, 42 %) and Na (28, 41, 12 %).

Discussion

Children's default combination meals at large US chain restaurants were generally high in energy content, total fat, saturated fat and Na, and only 3 % of advertised meals met nutrition guidelines. We also found that nutrient values differed significantly across default, minimum and maximum meal versions, which suggests that changes to children's combination meals using existing menu items could substantially alter nutrition composition. A closer look at the sources of variation indicated that considerable nutritional improvement could be realised by selecting a healthier side dish to reduce total fat, saturated fat or Na, and by substituting the default beverage to reduce energy content and sugar.

To our knowledge, three previous studies examined the extent to which children's combination meals at US chain restaurants meet nutritional recommendations[7–9]. Results from our study are most comparable to the 2013 CSPI report that also used the Guidelines for Responsible Food Marketing to Children[8] to evaluate 3494 meals from thirty-four chain restaurants. CSPI researchers also found that only 3 % of children's combination meals met nutritional guidelines. However, our findings for individual

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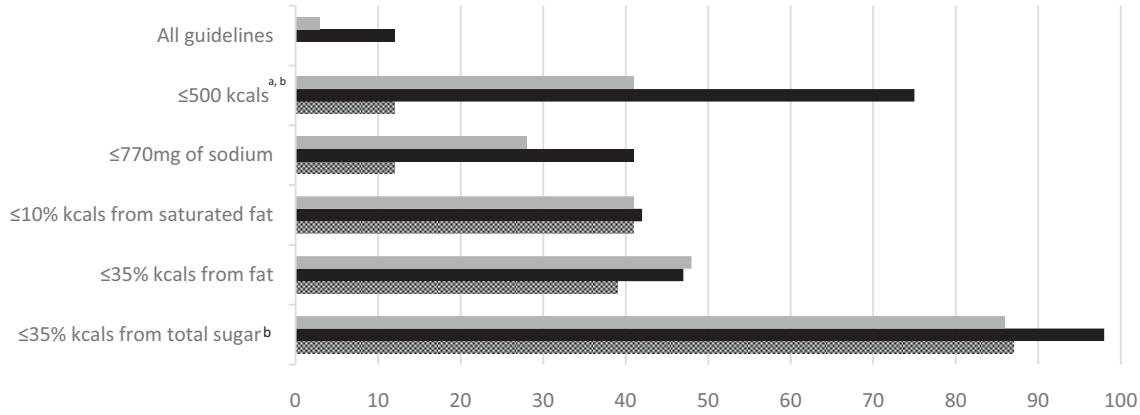

Fig. 2 Proportions of default, minimum and maximum meal versions meeting the Guidelines for Responsible Food Marketing to Children (*n* 276)
[a]Based on the Dietary Guidelines for Americans (2015); approximately one-third of the daily requirement for a moderately active 4–8-year-old child. [b]Calories (i.e. kilocalories; 1 kcal = 4·184 kJ). Although recommendations are provided for added sugar, total sugar was used because added sugars were not available from MenuStat database. ▒, default; ■, minimum; ▩, maximum.

nutrients diverge from CSPI's findings. Most notably, the CSPI report found that only 14 % of meals met the standard for energy content, while our findings indicate that 41 % of default, 75 % of minimum and 12 % of maximum meals met this standard.

Our findings are similar to those of Batada *et al.*[9], who reported that among 1662 possible children's combination meals at twenty-two US chain restaurants, 1 % of meals met a set of nutritional standards based on the 2010 Dietary Guidelines for Americans[34]. Contrary to our findings, Sliwa *et al.*[7] found that 32 % of 1363 children's meals from ten quick-service restaurants met nutrition standards. However, the guidelines used by both Batada *et al.*[9] and Sliwa *et al.*[7] were specified for a moderately active child aged 9–13, with higher thresholds for energy content, fat (measured as per cent energy content from fat) and saturated fat (measured as per cent energy content from saturated fat). Discrepancies between these two studies are likely due to the inclusion of additional nutrition standards (e.g. micronutrients) by Batada *et al.*[9]. Of note, had we selected a higher energetic threshold (such as the 2720 kJ (650 kcal) per meal maximum for children in kindergarten to grade 5 participating in the National School Lunch Program[35]), more combination meals would have met the guidelines for energy content. This means that our estimate of the proportion of meals meeting the energetic guideline is conservative.

In addition to differences in the standards used to assess nutritional quality, there are several reasons why our findings may diverge from previous studies. Differences may be due to the timeframe the data were collected (2012[8,9] and 2014[7] *v.* our data collected in 2017), or to differences in the restaurants sampled (*n* 26 in our study, *n* 34 in the CSPI report[8], *n* 22 in Batada, *et al.*[9], and *n* 10 fast-food services in Sliwa *et al.*[7]). Methodological differences in constructing meal versions may also account for divergent findings. Specifically, previous studies examined all possible children's meal combinations, while our approach included constructing and assessing three distinct versions (default, minimum and maximum).

The construction of three meal versions using a detailed set of rules for reasonable alterations allowed us to examine how changes such as substitutions or portion size modifications account for variations in nutrition composition. Therefore, results provide specific examples of how realistic modifications to meal components can improve the default option and provide an estimate of the magnitude of those differences. The menu labelling provision of the Affordable Care Act, which was implemented in May 2018, requires that restaurants (among other retail establishments) with twenty or more locations disclose energetic information on the menu. For 'variable items' like combination meals, energy content may be listed as ranges (e.g. 1966–2469 kJ (470–590 kcals)), but guidance on how to construct ranges is vague, and restaurants are not required to disclose the compositions of meals they used to create the ranges[36]. Therefore, it is not immediately apparent where a default meal would fall in the posted range, and restaurants are not required to post information on other nutrients of public health concern (e.g. Na, saturated fat), which, as we showed, can vary greatly with changes to the default. It is also unclear how meaningful energy ranges are when customers are making decisions about what to order[37]. Because a tendency towards the status quo in restaurant ordering has been documented[24,25] and evidence on the impact of energetic menu labelling remains inconclusive[37], changing healthy default options has the potential to improve diets without requiring individual behaviour change for the one-third of children who consume restaurant food daily[3].

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While the federal guidance has suggested reformulation of existing items or the introduction of new items to meet health goals[33], our findings highlight that simple changes to default meals using existing menu options can substantially improve the nutrition of children's meals. This approach would likely require lesser resources and, thus, may be favourable to the restaurant industry, but previous work has documented that restaurants participating in voluntary industry initiatives (e.g. the Kids LiveWell initiative from the National Restaurant Association, which was not active at the time of data collection and analysis; oral communication, March 2019) continue to serve meals and food items outside of industry-suggested standards[6,7,9].

If voluntary action is either ineffective or discontinued, legislative options may be needed to create meaningful changes. The current legislation focusing on improving default beverage options[17–23] could substantially improve the nutritional profile of meals offered on children's menus by reducing sugar and energy content. However, no legislation has focused on requiring a healthy side dish as the default, which could significantly reduce energy content, fat, saturated fat and Na – all of which are overconsumed by children[33]. The substitution of healthy default beverages in place of sugary drinks may be preferable by the industry because it may require lesser resources than adjustments made to sides. Restaurants might comply with healthy default beverage laws by simply offering tap water as the default beverage, which requires no change to beverage contracts or supply chains, while the inclusion of fresh fruits or vegetables as side items may necessitate additional employee training, changes to procurement, increased food preparation time and increased storage capacity[38,39]. Moreover, restaurant executives may have concerns about low consumer demand for healthier items and subsequent decreases in revenue[39], which may reduce voluntary compliance with such initiatives. Because children are viewed as vulnerable populations, policies regarding the inclusion or availability of children's menu items may be met with less opposition than those targeting adult customers. However, any legislative action taken to alter options at restaurants is likely to be met with industry opposition and should be accompanied by clear guidance on acceptable items and meal combinations (e.g. agreement on nutrient limits or ranges; clear definitions of 'healthy') to facilitate compliance among industry leaders.

These findings should be interpreted with respect to several limitations. First, data were limited to twenty-six US chain restaurants with nutrition information available in the MenuStat database, and were confined by children's combination meals listed on restaurant websites. This may limit the generalisability of results by not accounting for regional or seasonal combination meals and local or state policies that influence meal compositions (e.g. healthy beverage ordinances)[17–23], or include independent, small chain or local establishments. Second, this analysis focused on creating meal versions that maximised and minimised energy content, but did not account for alterations that could maximise or minimise other nutrients such as Na or sugar. Third, the CSPI guidelines for fat and sugar are based on the overall energetic content of meals (i.e. per cent of energy content from fat and sugar), meaning higher-energy meals may have a greater likelihood of meeting recommendations while actually having higher absolute values of fat and sugar. For example, a 4184-kJ (1000-calorie) meal with 1423 kJ (340 calories) from sugar (34 %) would meet the sugar guideline of including <35 % energy content from sugar, while a 2092-kJ (500-calorie) meal with only 795 kJ (190 calories) from sugar (38 %) would not. Next, our analysis did not include purchase or consumption data, which limited our ability to infer population health impacts of our findings. Finally, the CSPI guidelines include a standard for added sugar – a nutrient of greater public health interest than total sugar. However, data on added sugar is not available in MenuStat; therefore, we reported findings on total sugar and may have underestimated the proportion of meals meeting this recommendation.

The current study also has several strengths, notably examining children's combination meals across twenty-six large restaurant chains and the use of high-quality, publicly available nutrition data. Additionally, detailed rules for reasonable alterations to children's meals to create minimum and maximum versions allowed for an in-depth analysis of how modifications may impact the nutritional profile of combination meals and facilitate an estimate for the effect of swapping current default items for healthier menu options.

This research suggests important areas for future inquiry. In particular, better data are needed to understand how often children order combination meal versions and the types of customisations they make. Further, more empirical evaluations (e.g. from natural experiments) are needed to assess the effects of changes to the default children's combination meals on purchasing and consumption. For example, adjustments to children's menus may have unintended consequences if young consumers react to healthy changes by ordering items from the adult menu, or may be less effective if children already do so. Some evidence suggests that parents are more likely to purchase fast-food if they believe it is healthier; thus, creating and publicising healthier meals could have an unintended consequence of increasing overall fast-food consumption[26]. Future research should assess the cost-effectiveness of implementing changes to children's menus from the perspectives of restaurants (who may incur higher food preparation and menu printing costs), consumers (who may face a burden if healthier offerings are more expensive) and the government (who would be responsible for monitoring and enforcement if menu changes are the result of a legislative process). Fast-food consumption remains high among minority, low-income

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populations[3] that are more likely to be overweight[40]; as such, future research should evaluate whether voluntary or legislative actions to improve children's meals also address health equity.

Conclusion

Children's default combination meals at large US chain restaurants are high in energy content, total fat, saturated fat and Na, and few default meals meet comprehensive nutrition guidelines. Realistic modifications – such as substituting default side dishes and beverages – could significantly alter the nutrition composition. Promoting existing healthier items as the default option, especially side dishes and beverages, holds promise for improving the nutrition composition of children's meals. However, more research is needed to determine the impact of these changes on children's meal orders and dietary intake.

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Supplementary material

For supplementary material accompanying this article visit https://doi.org/10.1017/S1368980019004907

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