Discretionary calorie intake a priority for obesity prevention: results of rapid participatory approaches in low-income US communities

Deborah A. Cohen1, Roland Sturm1, Marielena Lara1, Marylou Gilbert1, Scott Gee2

1RAND Corporation, Santa Monica, 1776 Main St, Santa Monica, CA 90407, USA
2Kaiser Permanente, 1950 Franklin Street, 13th floor, Northern California, Oakland, CA 94612, USA
Address correspondence to Deborah A. Cohen, E-mail: dcohen@rand.org

ABSTRACT

Background Since resources are limited, selecting the most promising targets for obesity interventions is critical. We examined the relative associations of physical activity, fruit and vegetable consumption and ‘junk food’ consumption with BMI and the prevalence of relevant policies in school, work, food outlets and health-care settings.

Methods We conducted intercept surveys in three low-income, high-minority California communities to assess fruit, vegetable, candy, cookie, salty snacks and sugar-sweetened beverage consumption and self-reported height, weight and physical activity. We also assessed relevant policies in selected worksites, schools and health-care settings through key informant interviews.

Results Data were collected from 1826 respondents, 21 schools, 40 worksites, 14 health-care settings and 29 food outlets. The average intake of salty snacks, candy, cookies and sugar-sweetened beverages was estimated at 2226 kJ (532 kcal) daily, 88% higher than the US Department of Agriculture/Department of Health and Human Services guidelines recommend. Energy from these sources was more strongly related to BMI than reported physical activity, fruit or vegetable consumption. Policies to promote healthy eating and physical activity were limited in worksites. Fruits and vegetables were less salient than junk food in community food outlets.

Conclusion Targeting consumption of salty snacks, candy cookies and sugar-sweetened beverages appeared more promising than alternative approaches.

Keywords community interventions, discretionary food, nutrition, obesity

Introduction

Many communities are eager to take steps to halt the obesity epidemic. The causes of population weight gain are multi-factorial and reversing the obesity epidemic calls for changes in individual behavior, social norms, physical environments, public policy and organizational practice. There are countless potential interventions, for example: fix sidewalks, make streets safer, increase physical activity opportunities, add more sports clubs and after school programs, build walking trails, increase the availability of fruits and vegetables, have merchants place fruits and vegetables in the front of the store, and change the options in vending machines. The scope can be overwhelming for communities. Diluted efforts and messages may contribute to the limited effect of recent community-level interventions. How could community-based organizations prioritize among all possible strategies?
Rapid assessment methodologies were developed more than two decades ago and have been widely implemented in several fields. Their goal is to quickly identify targets for interventions that have a high probability of being adopted and sustained at the local level. Aside from identifying promising targets, rapid assessments could also provide the information necessary to strengthen the saliency and provide political support for change. Rapid assessments typically include community participation and are pragmatic, streamlined and applied.

In order to inform community-led efforts in three communities in Northern California, we used rapid assessment approaches to find out how a healthy diet and physical activity are supported or inhibited as well as the role of discretionary foods, high in sugar and fat, but low in essential nutrients. To prevent further increases in obesity our goal was to identify the most salient targets for community interventions. Before we started the rapid assessment, several very different targets were already under debate. One approach was to increase fruit and vegetable consumption, a laudable goal because Americans eat fewer servings of fruits and vegetables than recommended. Increasing fruit and vegetable consumption has the potential to control obesity, but only if these items were to replace the energy dense snacks and high-calorie beverages that have been implicated in weight gain.

Another approach would more aggressively focus on reducing the consumption of discretionary foods directly. Yet a third one is to encourage physical activity, which the food industry supports, since if people burn more energy, they need to eat more food to maintain weight. Hill estimates that increasing energy expenditure by 418 kJ (100 kcal)/day would be sufficient to prevent obesity, as long as food consumption does not also increase.

Understanding the role of discretionary foods and their relationship to fruit and vegetable consumption, physical activity, and dieting is important to developing effective interventions. A new concept that was developed for the latest U.S. Dietary Guidelines is ‘discretionary calories’. The guidelines calculate the amount of energy available after people have satisfied the guidelines to meet essential nutrients through the consumption of fruits, vegetables, grains, meats or legumes and dairy product equivalents. For the average person who needs a daily 8,370 kJ (2000 kcal) diet, the US Department of Agriculture/Department of Health and Human Services (USDA/DHHS) guidance recommends that energy from discretionary foods should not exceed 1117 kJ (267 kcal) to achieve energy balance while satisfying adequate nutrient intake. Discretionary foods include cookies, candy, salty snacks and sodas that are high in energy, but low in nutrients.

Our goal was to use multi-faceted rapid assessment approaches to find out how a healthy diet and physical activity are supported or inhibited as well as the role of discretionary foods in three communities in Northern California.

Methods

The data come from a project to improve healthy eating and active living in three low-income, high-minority communities. Three community-based organizations formed collaboratives with members from multiple organizations concerned about obesity. In all three sites, staff were trained to recruit subjects over 18 years and conducted anonymous intercept interviews (stopping people on the streets) in targeted neighborhoods, in English or Spanish, lasting 5–10 min. In the spring of 2007, people were surveyed in several venues, retail outlets, health-care clinics, worksites and their homes. Locations were based upon where future interventions to promote healthy eating and active living would be implemented. Respondents had to either live, work or receive medical care in the target area (total n = 1826; Site 1 n = 547; Site 2 n = 959, Site 3 n = 320). All methods were approved by the RAND Human Subjects Protection Committee.

For fruit/vegetable consumption, the brief survey instrument included the same items as the Center for Disease Control’s Behavioral Risk Factor Surveillance Study (BRFSS). We asked whether the respondent is ‘eating fewer calories to lose weight or to keep from gaining weight’, another BRFSS question. The survey also asked about consumption of four types of snack foods: salty snacks, cookies, candy and sugar-sweetened beverages, all four of which we abbreviate as SCCSs. One way to minimize the bias is to have short recalls, so the dietary questions asked about the past 24 h only.

The 2005 US Dietary Guidelines provides a quantitative target: ‘discretionary calories’ addressing both energy balance and the need for essential nutrients and depends upon age, physical activity levels and diet quality. People who exceed recommended discretionary calories will either have an energy imbalance and/or be at risk for malnutrition. Adjusting for age, gender, physical activity and BMI, we calculated each respondents’ recommended daily discretionary calories. While some of the items contain ingredients that are not automatically considered discretionary, for example the nuts in a candy bar, we counted all the energy as an indicator of diet quality.

A serving of salty snacks was defined as a ‘handful’ (about 28 gm), a serving of cookies as about 3 average
cookies (28 gm), a serving of candy as equivalent to a medium-sized Snickers bar (about 42 gm) and a serving of a sugared-sweetened beverage (including sodas) as a 355 ml (12 oz) can. We imputed energy intake assuming that a serving of salty snacks averages approximately 586 kJ (140 kcal), a serving of cookies 586 kJ (140 kcal), a serving of candy 837 kJ (200 kcal) and a 355 ml (12 oz.) can of sugared-sweetened drinks 628 kJ (150 kcal) based upon the USDA National Nutrient database and product nutrient labels.  

For physical activity, people reported the frequency of moderate and vigorous physical activity (MVPA) as well as the minutes per session using these items based on the International Physical Activity Questionnaire. Moderate activity was defined as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate and vigorous activity was defined as running, aerobics, heavy yard work or anything else that causes large increases in breathing or heart rate. In contrast to the diet items, the physical activity questions about a ‘usual’ week. However, validation studies suggest that these kinds of questions can distinguish between broad categories of sedentary and active individuals. By multiplying the number of days per week and the minutes per day we estimated weekly minutes of MVPA. We categorized minutes of MVPA into three categories, sedentary, if total weekly minutes were less than 150, moderately active, if weekly minutes were greater than 150 and less than 300 and active, if they exceeded 300 min/week. Additional variables included sex, age, race/ethnicity and we asked respondents to self-report their height and weight, which were used to calculate the body mass index (BMI). The surveys did not contain items about individual income or education.

The community organizations also conducted assessments of healthy eating and active living policies and practices in 21 schools, 40 worksites and 14 health-care settings. Members of the community collaborative interviewed knowledgeable staff at each institution using an interview guideline prepared by a working group with members from all three sites. Two of the three communities observed a guideline prepared by a working group with members from all three sites. Two of the three communities observed a guideline prepared by a working group with members from all three sites.

Results

Sample characteristics

The three communities targeted served between 39,800 and 58,000 individuals; between 12.3 and 19.3% of households were classified as having incomes below the federal poverty level. Altogether 1826 individuals from the three communities provided responses to the rapid intercept surveys with complete information. Of this group 41.4% were Hispanic, 32.1% were African-American, 16.1% were White and 9.1% were Asian. Their average age was 39.4 years and 59.9% of respondents were female (Table 1). Compared with the local population as measured in the US census, our sample had a higher proportion of African-Americans and Hispanic respondents. However, the intervention planned is intended to reach minorities more than non-minority groups.

Healthy eating and active living behaviors

The average reported consumption of fruits and vegetables is 4.2 or 16% less than 5-a-day; 38.7% of respondents reported eating at least five servings of fruits and vegetables in the past day. Across the three sites, 54.4% reported obtaining at least 150 min/week of moderate to vigorous physical activity and 46% reported they were eating less to control their weight. The average servings consumed in the last 24 h was 0.85 servings of salty snacks, 0.83 servings of cookies, 0.64 servings of candy and 1.2 servings (12 oz equivalents) of sugar-sweetened beverages. This converts to an average 1 day intake of 2226 kJ (532 kcal) (95% CI: 2088, 2360), a level of consumption that is on average 1.88 times (95% CI: 1.74, 2.01) higher than the Dietary Guidelines recommend from discretionary sources (Table 1). This average discrepancy is more than 5 times larger than the discrepancy in fruit/vegetable consumption (88% too
Moreover, the average SCCS consumption among the 45% of dieters who exceeded the discretionary calories recommendations was 3059 kJ (731 kcal). Figure 1 breaks down SCCS energy into the measured components stratified by site and by key socio-demographic variables. Site 1 had the highest consumption and the main components were candy and sugar-sweetened beverages, consumed even more than in other sites. Women consumed fewer sugar-sweetened beverages than men ($P < 0.01$).

Figure 1 also shows the large differences in SCCS consumption, depending on whether or not individuals reported eating less to lose/maintain weight ($P < 0.001$ for each component and the total). The total energy in the ‘eat less’ group averaged 1619 kJ (387 kcal) (95 percent CI: 1456, 1778) or 1.4 times the recommended energy from discretionary foods (95% CI: 1.3, 1.6). Respondents who did not try to eat less consumed an average of 2745 (656 kcal) of energy from SCCSs (95 percent CI: 2536, 2950), or 2.3 times the recommended amount (95% CI: 2.1, 2.5) with 61% exceeding recommended discretionary calorie intake (95% CI: 57, 64).

Table 2 attempts to disentangle the effects of individual characteristics. There are two dependent variables, total energy from SCCS (Model 1) and reported BMI (Model 2). Model 1 indicates that trying to eat less, eating more fruit and more exercise were associated with reduced SCCS consumption. Yet there is little substitution of fruit for energy from SCCS: an additional serving of fruit reduces energy from SCCSs by 130 kJ (31 kcal), which is less than such a serving would add (e.g. a medium apple is 310 kJ (72 kcal)). Physical activity was associated with a small reduction in SCCSs—only 17 kJ (4 kcal).
In terms of socio-demographics, age was associated with lower energy consumed from SCCS, but had no effect on excess SCCS energy, while the opposite was true for females, in that they consumed more excess SCCS energy than men, likely due to their smaller size and lower energy needs. We found no significant difference in consumption of SCCS energy between Hispanics and non-Hispanic Whites, but African-American and Asian differed significantly from Hispanics.

Model 2 shows the multivariate analysis of BMI and the coefficients represent units of BMI in kg/m². Individuals who try to lose/maintain weight by eating less have the highest BMI, equivalent to 4.4 kg (9.6 lbs) more for a person 1.65 m (5’5”) tall. Energy from SCCSs is the most significant predictor of BMI. Consumption of the average number of SCCSs per day was associated with a BMI increase of 0.5 kg/m² or 1.4 kg for a 1.65 m person. Fruit consumption alone was also associated with reductions in BMI (1.1 kg less for a 1.65 m person), but vegetables were not. In contrast to the results in Table 2, physical activity, gender or African-American race were not associated with BMI. Once the SCCS variables were included, these variables provided no additional explanatory power for BMI. In a sensitivity analysis, we used obesity status in a logistic regression model and the qualitative results were unaffected.

Table 3 shows findings from the community assessments of worksites, schools, health-care settings and local food outlets. With the exception of the near elimination of beverage and snack vending machines available to students in schools, most settings had a limited number of practices that would reduce SCCS consumption. Half of the worksites and more than half of the health-care settings sold sugar-sweetened beverages and snacks in vending machines. The prominence of discretionary foods high in energy was further noted by more than half the worksites and health-care settings serving cookies, cakes and pastries at meetings. Furthermore, candy, chips and pastries dominated the local food outlets, and although one-third did not sell fresh fruits and vegetables, nearly all residents had access to fruits and vegetables within a 1 mile radius of their homes.

Physical activity programs were below state guidelines in the majority of the schools surveyed (only 38% met guidelines) and most worksites and health-care settings did not offer any structured physical activity programs during the...
workday. A few sites did have fitness centers and only a small percentage of worksites and health-care settings offered incentives to employees to use active or mass transit to get to work. The majority of health-care settings appeared to be providing services related to obesity, but only a minority had policies that would help employees to avoid SCCSs or to engage in physical activity at work.

**Discussion**

**Main finding of this study**

The main finding of this study was that the consumption of large amounts of SCCS was more closely tied to BMI than fruit and vegetable consumption or physical activity and, therefore, could justifiably be deemed the most important target in these communities’ obesity prevention campaigns. The high amounts of SCCSs consumed was unexpected, considering that consumption of these types of food is typically underreported (although we tried to minimize this bias with 24-h recall) and because we did not assess many other discretionary foods, such as cakes and pastries, ethnic sweets such as churros and pan dulce, and frozen treats. For more than one-fourth of the population the level of SCCS consumption in a given day is the energy equivalent of a full lunch or dinner that consists solely of candy, soda, cookies and chips.

The finding that fruits are associated with a lower BMI suggest that the substitution of fruits for higher calorie snacks is occurring, although the amount is relatively small, accounting for only 130 kJ (30 kcal)/serving of fruit, which is fewer calories than a typical fruit contains. In the USA, fruits are typically consumed as desserts or snacks in-between meals.
In the majority of community settings observed, foods high in discretionary calories were promoted in a routine way, either in cafeterias, in business meetings or consistently made available in vending machines. Schools were the only settings in which there were explicit policies to discourage consumption of cookies, soda, candy and chips.

**What is already known on this topic**

According to USDA/DHHS guidelines, to lose weight people should forego all discretionary calories, and only consume the minimum amount of food with the necessary nutrients to maintain their health. The recommendation that everyone increase physical activity expenditure by an average of 418 kJ (100 kcal) a day (about a 20 min walk) will not compensate for some of the large intakes of energy from discretionary foods observed. A person weighing 68 kg (150 lbs.) who consumes 2400 kJ (500 kcal) excess a day would need to walk briskly for about 5 times the recommended amount to burn that amount of energy, or for 1 1/2 h. Physical activity is important to health, although in this population more physical activity was not significantly associated with reductions in BMI, probably because people who exercise also ate more, which has been found elsewhere.17

**What this study adds**

While physical activity and the consumption of fruits and vegetable were not optimal in any of the communities, identifying factors that are likely to play a more significant role in obesity is helpful in determining where efforts will likely yield greater impact. When facing other demands or when under stress, people tend to select high sugar/fat snack foods automatically and preferentially.18 People need help to resist sugar- and fat-laden snack foods and beverages for which humans have inborn preferences and which interfere with appetite regulation.19–21 Although improvements in fruit and vegetable consumption and physical activity are necessary for optimal health, consumption of SCCS emerged from this rapid assessment as a much more promising target for obesity control.

**Limitations of this study**

While a limitation of the survey is that it may not be representative of the total community, those responding to the survey do represent the people whom the community collaboratives want to reach with healthy living campaigns. Another limitation is that the modeling we did is based upon self-reports of consumption, physical activity, height and weight that are likely imprecise, and therefore may not accurately reflect the true relationships. However, these reports are typically biased in a direction that would make our estimates conservative, since most people underestimate the snacks they consume.22 Yet, the overall finding of the excessive consumption of non-nutritious foods such as SCCSs is consistent with other dietary analyses,23 and trends indicating increases in the sales of sugar and oils over the past two decades.24

The collaboratives identified a host of interventions to promote eating more nutritious foods and increasing physical activity, and each intervention could probably be argued is reasonable and necessary. Nevertheless, unless the excessive consumption of SCCS is curtailed, other interventions are likely to have a limited impact on obesity control.

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