PREVENTING CHRONIC DISEASE
PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY

Policy, Systems, and Environmental Approaches in Chronic Disease Research and Practice

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PCD's vision is to serve as an influential journal in the dissemination of proven and promising peer-reviewed public health findings, innovations, and practices with editorial content respected for its integrity and relevance to chronic disease prevention.

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GUEST EDITORIAL

Data for Decision Makers: Finding Policy, Systems, and Environmental Solutions for Public Health Problems

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Introduction

Public health decision makers are tasked with developing solutions to a variety of health problems. Policy, systems, and environmental (PSE) approaches are part of the portfolio of options they can use (1,2). PSE approaches work at a macro level and aim to improve health by changing factors such as rules or laws (policy), organizational procedures or protocols (systems), or physical, social, and economic environments (1).

PSE approaches are important for several reasons (1,2). First, because they operate at the macro level, PSE approaches can affect large numbers of people (1,2). For example, US Department of Agriculture (USDA) policies about what can be served in school lunches affect all children in schools who receive federal funding for their lunch programs. Second, they can limit people's ability to engage in an unhealthy behavior or make it easier for people to choose healthy options; this influence is at a larger scale than individual behavior-change interventions (2). For example, workplace smoke-free policies that preclude workers from smoking for large parts of the day reduce tobacco use (3) and built environment interventions that improve routes such as sidewalks to everyday destinations make it easier for people to be physically active (4). Third, PSE approaches potentially have longer term sustainability (1), in part because they can become institutionalized or more permanent. For example, once sidewalks exist, they are harder to eliminate than a physical activity program in a local community center. Finally, PSE strategies have the potential to improve heath equity by addressing root causes of health disparities (1). These root causes can include economic stability, educational access and quality, health care access and quality, neighborhood and built environments, and social and community contexts (5,6). Addressing these root causes has the potential to address multiple health outcomes (6).

Decision makers are influenced by many factors when deciding on a PSE strategy, including needed partnerships, political or leadership will, community acceptance, and feasibility (7). However, information is also important for decision making; evidence from various sources, including local data, also influences decision makers (7). Brownson and colleagues identified 3 potential points where information could have influence: policy process, policy content, and policy outcome (8). Health scientists, including data scientists, epidemiologists, researchers, and evaluators have an important role in providing this information by answering questions such as:

- What health problems need PSE solutions?
- What PSE solutions should be considered?
- What is the uptake of PSE solutions?
- What is needed to successfully implement PSE solutions in the real world?

In this commentary, we explore how research, surveillance, and evaluation can be used to answer these key questions by using examples from this special *Preventing Chronic Disease* collection: Policy, Systems, and Environmental Approaches in Chronic Disease Research and Practice. We will also propose 4 additional opportunities for health scientists to advance implementing PSE solutions.

What Public Health Problems Need PSE Solutions?

PSE solutions can be used to address most public health problems. However, because they can affect large numbers of people, they

can be particularly considered for solving problems that also affect large numbers of people, for example, a health condition or risk factor with high population-wide prevalence. The article by Rippin et al illustrates how data can be used to identify such a problem (9). The authors used data collected from the standardized and nationally representative World Health Organization (WHO) Steps Survey to document the prevalence of fruit and vegetable consumption across 9 countries in the WHO European Region. The authors reported a high prevalence of inadequate fruit and vegetable consumption across all countries, ranging from 60% to 88%. Although consumption generally increased with education, it remained relatively low across most educational groups. The extensive and elevated prevalence of this risk factor for multiple chronic diseases suggests that countries and groups helping these countries should consider PSE solutions to address the problem. Examples could include interventions that improve the availability or affordability of fruits and vegetables (10).

In addition to identifying existing problems that might benefit from PSE solutions, research can also be used to identify new potential targets for PSE interventions. For example, Voyer et al used data from the 2020 Behavioral Risk Factor Surveillance System to characterize potential risk factors for subjective cognitive decline (SCD) (11). The authors highlighted a positive association between 2 or more adverse childhood experiences (ACES) and SCD, identifying ACES as a potentially modifiable risk factor for SCD. If a causal relationship is established, PSE interventions that address ACES, such as improving family economic security (12), are a potential tool for preventing cognitive decline.

What PSE Solutions Should Be Considered?

Once decision makers identify areas for PSE interventions, they need to know what evidence-based PSE strategies are available. Groups such as the Community (13) or the US (14) Preventive Services Task Forces use rigorous methods to recommend evidence-based PSE solutions for communities or clinical settings that address public health problems. Often many PSE options can be considered for a single health problem. For example, Voyer et al (11), in their article on SCD, provide a table with examples of PSE interventions that could be used to address modifiable risk factors for SCD including built environment interventions for physical inactivity.

What Is the Uptake of PSE Solutions?

Once decision makers identify and recommend a PSE strategy, they need to learn about its use. They need to know whether the recommended PSE strategy is adopted and, if so, by what groups, with what speed, and how well it is executed.

Tracking the implementation of PSE strategies can occur nationally to inform the decisions of multiple partners. Articles by Webber et al (15) and Onufrak et al (16) illustrate this by using data from the Community-Based Survey of Supports for Healthy Eating and Active Living (CBS-HEAL), a nationally representative survey of US municipalities. They documented the proportion of communities implementing recommended policies and practices that support physical activity, diet, and breastfeeding. They also documented changes in these policies between 2014 and 2021 and whether changes varied by community characteristics. For example, Webber et al found that the most common physical activity policy was maintenance for green spaces and equipment (86%) and that Complete Streets policies increased more between 2014 and 2021 for communities with larger versus smaller population sizes (15). Onufrak et al found that policies that support farmers markets were common (60%) and that the largest change in nutrition policies was for breastfeeding breaktime for government employees (an increase of 27 percentage points) (16). Data from surveillance such as CBS-HEAL can be used by funders of communities (eg, Centers for Disease Control and Prevention or US Department of Transportation) to determine whether the PSE strategies they promote are being implemented and identify where additional resources or technical assistance is needed to maximize impact.

Tracking can also occur at a program level to inform the decisions of the program funders. The article by Velarde et al demonstrates the uptake and impact of PSE interventions as part of the USDA-funded SNAP-Ed program (Supplemental Nutrition Assistance Program Education) (17). The authors used a standardized measurement tool to examine the impact over 4 years of an intervention in New Mexico to help schools implement at least 1 PSE strategy for nutrition and physical activity. They found significant improvements in school nutrition but not physical activity policies and environments. In this real-world setting, PSE interventions varied among the 11 elementary schools assessed, illustrating the evaluation challenge of balancing findings from community-driven interventions with obtaining generalizable findings.

What Is Needed to Successfully Implement PSE Solutions in the Real World?

When PSE interventions are slow to be adopted or do not work as intended, they cannot have their intended impact. Decision makers need to understand why so they can provide supports for success.

The article by Wood et al illustrates how this information can be obtained (18). The authors conducted a comprehensive mixed-methods evaluation to identify facilitators and barriers to adopting a food service guidelines policy in Los Angeles County. They specifically examined how nutrition standards and practices were integrated into food service contracts in county government departments over a 10-year period, from 2011 through 2021. Facilitators identified included understanding the contracting process in the departments affected, building relationships with affected departments, designing guidelines and standards that could meet everyone's needs, and providing tools and technical assistance to those implementing policies. Barriers included the complexity of the contracting environment and lack of resources and technical expertise on nutrition in the departments needed to effectively implement the policy. These lessons are likely not specific to implementing food service guidelines and underscore the need for strategic planning when starting PSE strategies.

Potential Future Actions

The articles in this collection illustrate some ways health scientists can provide information that decision makers need to recommend PSE solutions for major public health problems. We propose 4 future actions health scientists could take to advance the implementation of PSE solutions.

Recognize the value of community engagement and incorporate it into the work. Community engagement is defined as the "the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people" (19). Community engagement gives voice to community members, particularly those not often heard, to actively create and influence solutions to problems affecting them (20). This engagement can help ensure that PSE strategies are responsive to the needs of the community, supported by the community, and culturally appropriate.

Many expert groups document and recognize the importance of community engagement in developing public health interventions and research (5,19–22). Proposed benefits of community engagement include improved trust, a better understanding of causes of a problem, improved community capacity to implement solutions, more practical and feasible solutions, and acceptance of the final solution (23). Community engagement can occur as part of planning, the interpretation of findings or data, or evaluation.

Health scientists, using their experience in data collection, can help decision makers obtain this input from community members. They can also incorporate community engagement in their own research and evaluation of PSE strategies using established tools and frameworks (20,21,24).

Improve measurement of PSE indicators. To assess the presence and use of PSE interventions, accurate information is needed. However, obtaining this information can be challenging, particularly when gathering this information across many groups, as is done in surveillance. For example, information on policies is often found in detailed government documents that might be time-consuming to find or hard to interpret. To improve timeliness, large surveys often use self-reported data. However, the validity may not be known. Studies that document the validity of different methods of capturing PSE interventions would ensure decisions are made from accurate assessments. The advance of artificial intelligence can potentially streamline finding policies and interpreting them to facilitate assessment.

Because implementation of PSE strategies often takes time, another avenue for research is identifying measures that align to different stages of the implementation process. Such information would allow funders to capture early measures of success and implementors to identify early stages for intervention. For example, Wood et al identified 4 phases of the food service guidelines contracting process where these types of measures could be incorporated (18).

Provide additional information and tools that strengthen the real-world implementation of PSE strategies. Decision makers need information on how to implement PSE strategies in real-world settings, and health scientists can do additional work to provide this information. The field of implementation science provides frameworks to guide this work (25). Tools and supports that effectively translate findings from this work could also help decision makers and practitioners apply it practically. For example, in addition to identifying barriers and facilitators to implementation, researchers can determine the necessary components of quality PSE interventions (8). By knowing what components of research-tested interventions must be kept versus what components can be adapted to community context, decision makers and implementors can design effective strategies from the beginning. Researchers can also develop tools that help others assess the quality of policies. Examples of these tools include those developed to measure the quality of policies for Complete Streets (26) and food service guidelines (27). Health scientists are also encouraged to share findings even when the PSE strategy was less effective than intended; lack of statistical significance does not mean findings are not useful.

Determine whether PSE interventions have unintended outcomes and why. PSE approaches are often chosen because they can benefit many people. However, unintentional consequences can occur

in which not everyone benefits. For example, strategies to make communities more walkable can potentially increase property values, forcing lower-income community members to move and not benefit from the improvements (28).

Health scientists can design evaluations that assess the effect of policies in different types of communities or population groups, particularly those that are historically disadvantaged. In addition to documenting whether intended outcomes are equitably achieved, they can also consider whether unintended consequences occurred — for whom and why. Examples of unintended consequences that could be assessed include adverse economic effects, increased disparities in access to resources such as quality education or health care, or deleterious changes in other health outcomes.

Conclusion

PSE strategies are an important tool with the potential to provide substantial and sustainable improvements to public health problems. However, decision makers need actionable information to select the most appropriate PSE interventions and to determine when and how to best implement them. Health scientists have an important role in providing that information.

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References

1. Community Commons. An introduction to policy, systems and environmental (PSE) changes. Accessed May 16, 2024. https://www.communitycommons.org/collections/An-Introduction-to-Policy-Systems-and-Environmental-PSE-Change
2. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health.* 2010;100(4):590–595. doi:10.2105/AJPH.2009.185652
3. Hopkins DP, Razi S, Leeks KD, Priya Kalra G, Chattopadhyay SK, Soler RE; Task Force on Community Preventive Services. Smokefree policies to reduce tobacco use. A systematic review. *Am J Prev Med.* 2010;38(2Suppl):S275–S289. doi:10.1016/j.amepre.2009.10.029
4. The Community Guide. Physical activity: built environment approaches combining transportation system interventions with land use and environmental design. Accessed May 16, 2024. https://www.thecommunityguide.org/findings/physical-activity-built-environment-approaches.html
5. National Academies of Sciences, Engineering, and Medicine. *Communities in action: pathways to health equity.* Washington (DC): The National Academies Press; 2017.
6. US Department of Health and Human Services. Healthy People 2030: social determinants of health. Accessed May 16, 2024. https://health.gov/healthypeople/priority-areas/social-determinants-health
7. Lilly K, Kean B, Hallett J, Robinson S, Selvey LA. Factors of the policy process influencing Health in All Policies in local government: a scoping review. *Front Public Health.* 2023;11:1010335. doi:10.3389/fpubh.2023.1010335
8. Brownson RC, Chriqui JF, Stamatakis KA. Understanding evidence-based public health policy. *Am J Public Health.* 2009;99(9):1576–1583. doi:10.2105/AJPH.2008.156224
9. Rippin HL, Maximova K, Loyola E, Breda J, Wickramasinghe K, Ferreira-Borges C, et al. Suboptimal intake of fruits and vegetables in nine selected countries of the World Health Organization European region. *Prev Chronic Dis.* 2023;20:230159. doi:10.5888/pcd20.230159
10. Crawford P, Dunning L, Kappagoda M, O'Connor J. The role of law and policy in achieving the Healthy People 2020 Nutrition and Weight Status goals of increased fruit and vegetable intake in the United States. Washington (DC): US Department of Health and Human Services, Office of Disease Prevention and Health Promotion; 2018.
11. Voyer H, Aytur S, Tanda N. Linking adverse childhood experiences and other risk factors to subjective cognitive decline in an aging population.Prev Chronic Dis. 2023;20:230182.

12. Fortson BL, Klevens J, Merrick MT, Gilbert LK, Alexander SP. Preventing child abuse and neglect: a technical package for policy, norm, and programmatic activities. Atlanta (GA): National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; 2016.
13. The Community Guide. Community Preventive Services Task Force findings. Accessed May 16, 2024. https://www.thecommunityguide.org/pages/task-force-findings.html
14. US Preventive Services Task Force. Recommendation topics. Accessed May 16, 2024. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation-topics
15. Webber BJ, Whitfield GP, Moore LV, Stowe E, Omura JD, Pejavara A, et al. Physical activity–friendly policies and community design features in the US, 2014 and 2021. *Prev Chronic Dis.* 2023;20:220397. doi:10.5888/pcd20.220397
16. Onufrak SJ, Moore LV, Pierce SL, MacGowan CA, Galuska DA. Changes in policy supports for healthy food retailers, farmers markets, and breastfeeding among US municipalities, 2014–2021: National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL). *Prev Chronic Dis.* 2023;20:230018. doi:10.5888/pcd20.230018
17. Velarde C, Landrau-Cribbs E, Soleimani M, Cruz TH. Measuring policy, systems, and environmental changes at elementary schools involved in SNAP-Ed New Mexico programming, 2018–2022. *Prev Chronic Dis.* 2024;21:230221. doi:10.5888/pcd21.230221
18. Wood M, Robles B, Beltran J, Kuo T. Integrating healthy nutrition standards and practices into food service contracting in a large US county government. *Prev Chronic Dis.* 2024;21:230220. doi:10.5888/pcd21.230220
19. Committee on Community Engagement. Principles of community engagement (1st edition). Atlanta (GA): Centers for Disease Control and Prevention; 1997.
20. National Academy of Medicine. A conceptual model for assessing community engagement. Accessed May 16, 2024. https://nam.edu/programs/value-science-driven-health-care/achieving-health-equity-and-systems-transformation-through-community-engagement-a-conceptual-model/
21. Clinical and Translational Science Awards Consortium Community Engagement Key Function Committee Task Force on the Principles of Community Engagement. Principles of community engagement. Publication no. 11-7782. Bethesda (MD): National Institutes of Health; 2011.
22. Community Commons. Community engagement. Accessed May 16, 2024. https://www.communitycommons.org/entities/159a67e6-bd83-40e2-ba4c-326257a3f8cc
23. Penn State College of Agricultural Sciences. Why community engagement matters. Accessed May 16, 2024. https://aese.psu.edu/research/centers/cecd/engagement-toolbox/engagement/why-community-engagement-matters
24. Community Commons. Community Planning Toolkit: community engagement. Accessed May 16, 2024. https://www.communitycommons.org/entities/c99aece3-4159-4fd1-a504-2155d69f3605
25. National Institutes of Health; Fogarty International Center. Toolkit part 1: implementation science methodologies and frameworks. Accessed May 16, 2024. https://www.fic.nih.gov/About/center-global-health-studies/neuroscience-implementation-toolkit/Pages/methodologies-frameworks.aspx
26. Thakkar A. How strong is your Complete Streets policy? Use our Policy Evaluation tool to find out. Smart Growth America. Developed January 25, 2024. Accessed May 16, 2024. https://smartgrowthamerica.org/how-strong-is-your-complete-streets-policy-use-our-policy-evaluation-tool-to-find-out/
27. Zaganjor H, Bishop Kendrick K, Onufrak S, Ralston Aoki J, Whitsel LP, Kimmons J. Food service guideline policies on local government-controlled properties. *Am J Health Promot.* 2019;33(8):1166–1173. doi:10.1177/0890117119865146
28. Cole HVS, Mehdipanah R, Gullón P, Triguero-Mas M. Breaking down and building up: gentrification, its drivers, and urban health inequality. *Curr Environ Health Rep.* 2021;8(2):157–166. doi:10.1007/s40572-021-00309-5

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RESEARCH BRIEF

Suboptimal Intake of Fruits and Vegetables in Nine Selected Countries of the World Health Organization European Region

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Summary

What is already known on this topic?

Low rates of fruit and vegetable intake are associated with increased risk of noncommunicable diseases (NCDs). Although the disease burden due to inadequate fruit and vegetable consumption appears highest in Eastern Europe and Central Asia among countries in the World Health Organization (WHO) European Region, little systematic evidence exists.

What is added by this report?

Higher NCD death rates in Eastern Europe and Central Asia may be partly explained by differences in diet quality, particularly low rates of fruit and vegetable intake. Most populations in our study did not meet the WHO-recommended daily intake of at least 5 servings (400 g).

What are the implications for public health practice?

Evidence-based policies are needed to increase fruit and vegetable consumption and reduce the burden of and disparities in NCDs. Our findings can inform further research and policy development.

Abstract

The objective of this study was to characterize fruit and vegetable consumption in 9 selected countries of the World Health Organization (WHO) European Region. We analyzed data on fruit and vegetable intake and participant sociodemographic characteristics for 30,455 adults in 9 Eastern European and Central Asian countries via standardized STEPS survey methodology. Fruit and vegetable consumption across all countries was suboptimal, with a high percentage of populations not meeting the WHO-recommended intake of at least 5 servings (400 g) per day. Strengthened implementation of evidence-based policies to increase intake of fruit and vegetables is needed to reduce the burden of and disparities in NCDs.

Objective

Noncommunicable diseases (NCDs) account for 74% of deaths globally (1). Of all World Health Organization (WHO) regions, the European Region has the highest rates of NCD-related illness and death; almost 90% of deaths in this region are related to NCDs (2). Overweight and obesity affect more than 59% of adults in the European Region (2,3). Surveillance and monitoring are key to preventing and controlling NCDs (1). The WHO STEPwise approach to Surveillance (STEPS) is a standardized tool for collecting, analyzing, and disseminating data on NCD risk factors to guide and inform NCD policy makers on prevention policies (4).

WHO recommends daily consumption of at least 400 g (equivalent to 5 servings) of fruit and vegetables (5). Low consumption rates are associated with increased NCD risk (6). Increasing fruit and vegetable intake would, therefore, help achieve healthier diets and improve NCD outcomes (7,8).

Although the disease burden due to inadequate fruit and vegetable consumption appears highest in Eastern Europe and Central Asia among countries in the WHO European Region, little systematic evidence is available (9). Using STEPS data, we assessed fruit and

vegetable consumption in 9 Eastern European and Central Asian countries. This evidence will help provide information for evidence-based policies to increase fruit and vegetable intake and reduce the effect of NCDs.

Methods

The WHO STEPS surveyed 37,311 adults in Armenia, Azerbaijan, Belarus, Georgia, Kyrgyzstan, the Republic of Moldova, Tajikistan, Turkey, and Uzbekistan. The survey used a multistage clustered sampling design to collect population-based, cross-sectional, nationally representative household survey data from 2013 through 2018. Sampling procedures are detailed elsewhere (10,11). Informed consent was obtained by using country-specific language forms; ethical approval was obtained in each country before survey administration.

Face-to-face interviews and a standardized questionnaire assessed sociodemographic characteristics and NCD risk factors (11). Participants reported their age, sex, education level, marital status, and work status. Participants used visual aids to record the number of days per typical week and number of servings on each of those days that they consumed fruits and vegetables, from which the daily number of 80g servings was derived. Participants reported (yes/no) whether they received advice from a health care professional in the previous 3 years to eat at least 5 daily servings of fruits or vegetables. Trained interviewers measured height and weight at the participant's home after the interview.

To enable comparisons across countries, we restricted our sample to adults aged 25 to 65 years. We considered participants who reported consuming 20 or more daily servings of fruit or vegetables to be outliers and excluded them from analyses. Our analytic sample size consisted of 30,455 participants. To estimate a nationally representative prevalence of fruit and vegetable consumption for each country, we calculated percentages derived in R version 3.5.0 *survey* package (R Foundation for Statistical Computing), which used survey design weights developed by WHO to account for multistage cluster design and nonresponse while considering the population age and sex distribution. We assessed differences in these percentages by using weighted multinomial mixed-effects regression adjusted for age, sex, marital status, and weight status (underweight, normal weight, overweight, obese), in *lme4* and *broom* packages in R version 3.5.0 (R Foundation for Statistical Computing). Analyses were stratified by country to facilitate comparisons and acknowledge country-specific contexts and cultural factors related to food intake. Significance was set at $P < .05$.

Results

The average age of the study population was 42 years, and most participants were married or cohabiting (Table 1). In all countries, most participants had completed high school. Employment rates ranged from 37% to 80%. More than half were overweight or obese in all countries. The proportion of people not meeting the WHO recommendation to consume at least 5 daily servings of fruit or vegetables ranged from 60% in Tajikistan and 62% in Georgia to 88% in Turkey (Table 2). The average number of servings of fruit or vegetables per day was below the 5 recommended servings in all countries, except Tajikistan (5.1 servings/day).

Fruit and vegetable intake varied substantially by education, particularly in Armenia, Azerbaijan, Belarus, Kyrgyzstan, Republic of Moldova, and Tajikistan. Broadly, participants with more than a high school education consumed more servings of fruit and vegetables daily (Figure).

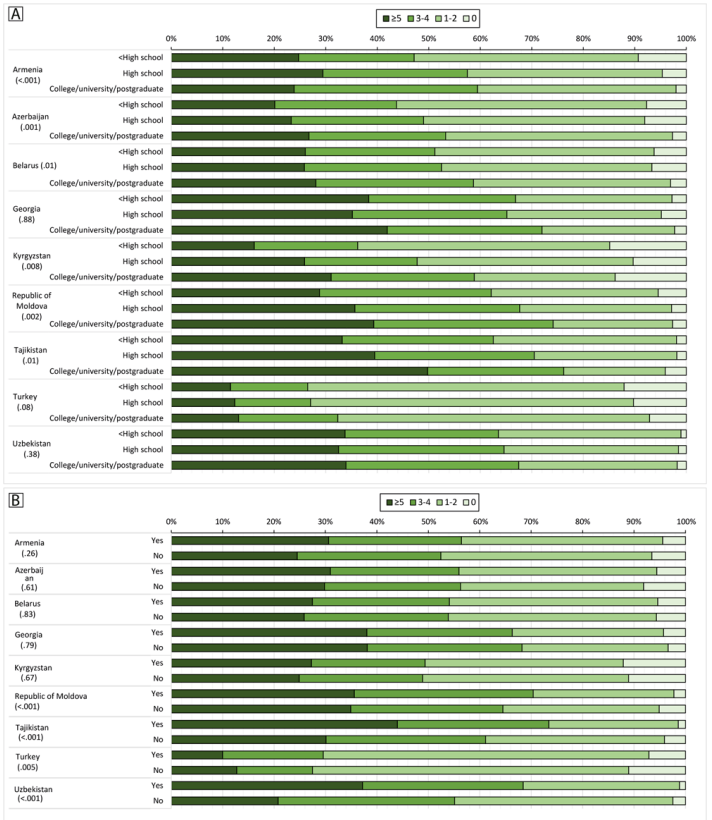

Figure. National prevalence of daily servings of fruit and vegetables (0, 1-2, 3-4, ≥5), by education (A) and by receipt of advice from a health care professional to eat at least 5 daily servings of fruits or vegetables (B). Education level was determined by using national education categories mapped to UNESCO's (United Nations Educational, Scientific and Cultural Organization's) International Standard Classification of Education (ISCED)

(12). ISCED provides a comprehensive framework of uniform and internationally agreed definitions to facilitate comparisons of education systems across countries. Value in parentheses after country name is *P* value.

Rates of fruit and vegetable consumption were higher among participants who had received advice from a health care professional to eat at least 5 daily servings of fruits or vegetables, particularly in the Republic of Moldova, Tajikistan, Turkey, and Uzbekistan (Figure). Rates of fruit and vegetable consumption were also higher among those who were overweight or obese, older participants, and among women.

Although fruit and vegetable consumption varied by work status, particularly in Armenia, Azerbaijan, Republic of Moldova, and Tajikistan, we found no clear pattern between or within countries. Similarly, consumption varied by marital status, particularly in the Republic of Moldova and Tajikistan, but no clear pattern emerged.

Discussion

This study used WHO STEPS data to assess fruit and vegetable consumption in 9 Eastern European and Central Asian countries in the WHO European Region. National consumption varied, but no country met WHO's recommendation of at least 5 servings (400 g) per day, except for Tajikistan (5.1 servings/day). Participants with more education generally consumed more daily servings, mirroring regional trends (13) and suggesting that education interventions could improve fruit and vegetable intake and, therefore, population health. Availability, affordability, and national income and development level may influence this complex relationship. Further research is needed into the relationship between fruit and vegetable consumption and education, availability, and affordability.

In some countries, participants receiving advice from health care professionals to consume at least 5 daily servings of fruit or vegetables had higher intakes than participants not receiving this advice. Health care provider–patient consultation time could be used more effectively to improve fruit and vegetable intake; for example, brief interventions are a WHO "Best Buys" intervention (14). A suite of policy options and public health strategies, such as procurement policies, in-store promotions, and subsidies, is needed to increase population-level fruit and vegetable consumption (14,15). More research on the relationship between those receiving advice and fruit and vegetable intake would help prioritize policy development.

Our study has strengths and limitations. The STEPS survey has an extensive infrastructure and a standardized methodology. Our study is the first to systematically assess fruit and vegetable consumption by using comparable indicators in Eastern European and Central Asian countries in the WHO European Region. The data are nationally representative with a high response rate, but the survey design is cross-sectional, which precludes causal inference. The data are self-reported, so they rely on participants' understanding and accurate reporting of their fruit and vegetable intake. The data are also dated (2013–2017) and do not show trends over time.

Higher NCD-related death rates in Eastern Europe and Central Asia may be partly explained by differences in diet quality, particularly rates of low fruit and vegetable consumption. Our study found that fruit and vegetable consumption in all countries was suboptimal. Survey participants with higher education who had received advice from a health care professional to eat at least 5 daily servings of fruit or vegetables generally consumed more fruits and vegetables in some countries. Awareness of the 5-a-day recommendation and the ability to operationalize awareness could lead to higher intakes, possibly especially in populations that are overweight. Evidence-based policies are needed to increase fruit and vegetable consumption and reduce the burden of and disparities in NCDs. Policy makers can use our findings to initiate further research and policy development.

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References

1. World Health Organization. Noncommunicable diseases. September 16, 2022. Accessed August 31, 2023. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases
2. World Health Organization. European Health Information Gateway. Overweight. Accessed August 31, 2023. https://gateway.euro.who.int/en/indicators/h2020_6-overweight/visualizations/#id=17077
3. World Health Organization. *Noncommunicable Diseases Country Profiles* 2018. Accessed August 31, 2023. https://www.who.int/publications/i/item/9789241514620
4. World Health Organization. WHO STEPwise approach to surveillance. 2023. Accessed August 22, 2023. https://www.who.int/europe/tools-and-toolkits/who-stepwise-approach-to-surveillance
5. World Health Organization. *Global Strategy on Diet, Physical Activity and Health*. World Health Organization; 2004.
6. Afshin A, Sur PJ, Fay KA, Cornaby L, Ferrara G, Salama JS, et al; GBD 2017 Diet Collaborators. Health effects of dietary risks in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2019; 393(10184):1958–1972. doi:10.1016/S0140-6736(19)30041-8
7. Stea TH, Nordheim O, Bere E, Stornes P, Eikemo TA. Fruit and vegetable consumption in Europe according to gender, educational attainment and regional affiliation-A cross-sectional study in 21 European countries. *PLoS One*. 2020; 15(5):e0232521. doi:10.1371/journal.pone.0232521
8. Baars AE, Rubio-Valverde JR, Hu Y, Bopp M, Brønnum-Hansen H, Kalediene R, et al. Fruit and vegetable consumption and its contribution to inequalities in life expectancy and disability-free life expectancy in ten European countries. *Int J Public Health*. 2019;64(6):861–872. doi:10.1007/s00038-019-01253-w
9. World Health Organization European Region. Health for All database. 2014. Accessed August 21, 2023. https://gateway.euro.who.int/en/datasets/european-health-for-all-database
10. World Health Organization. Noncommunicable disease surveillance, monitoring, and reporting. STEPS manual. 2023. Accessed August 21, 2023. https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps/manuals
11. World Health Organization. Noncommunicable disease surveillance, monitoring, and reporting. STEPS instrument. 2023. Accessed August 21, 2023. https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps/instrument
12. UNESCO Institute for Statistics. *International Standard Classification of Education (ISCED) 2011*. UNESCO Institute for Statistics; 2012.
13. Prättälä R, Paalanen L, Grinberga D, Helasoja V, Kasmel A, Petkeviciene J. Gender differences in the consumption of meat, fruit and vegetables are similar in Finland and the Baltic countries. *Eur J Public Health*. 2007;17(5):520–525. doi:10.1093/eurpub/ckl265
14. World Health Organization. *Tackling NCDs: 'Best Buys' and Other Recommended Interventions for the Prevention and Control of Noncommunicable Diseases*. World Health Organization; 2017.
15. World Health Organization. *European Food and Nutrition Action Plan 2015–2020*. World Health Organization, Regional Office for Europe; 2015.

Tables

Table 1. Characteristics of Selected Participants (N = 30,455) in WHO STEPS in 9 Countries in Eastern Europe and Central Asia, 2013–2017[a]

Characteristic	Armenia (n = 1,878)	Azerbaijan (n = 4,700)	Belarus (n = 4,224)	Georgia (n = 3,399)	Kyrgyzstan (n = 2,623)	Republic of Moldova (n = 3,983)	Tajikistan (n = 2,237)	Turkey (n = 4,208)	Uzbekistan (n = 3,203)
Survey year	2016	2017	2016	2016	2013	2013	2016	2017	2014
Response rate, %	82	97	87	76	100	84	99	70	89
Mean age, y	42	42	42	42	42	42	42	42	42
Female, %	47	51	51	52	50	49	45	51	49
Marital status, %									
Never married	12	10	15	15	5	8	3	12	5
Currently married or cohabiting	80	82	63	77	80	77	92	83	81
Other	8	8	22	8	15	15	5	5	14
Highest level of education, %[b]									
Less than high school	46	12	18	20	10	20	21	35	48
High school	28	43	53	22	66	58	63	46	39
College/university/ postgraduate	25	44	28	58	23	23	16	19	13
Work status, %									
Employed	45	50	80	44	49	59	37	46	46
Nonpaid/homemaker/ student	28	26	5	0.2	29	18	34	39	25
Retired	3	6	9	56	12	9	7	10	13
Unemployed	24	18	5	—[c]	10	14	23	5	15
Weight status, %[d]									
Underweight	5	4	2	3	2	2	2	0.9	2
Normal weight	43	34	37	31	39	36	36	27	36
Overweight	30	39	36	33	34	35	40	40	34
Obese	22	23	25	33	25	27	22	32	28

Abbreviation: WHO, World Health Organization.

[a] The WHO STEPwise approach to Surveillance (STEPS) is a standardized tool for collecting, analyzing, and disseminating data on NCD risk factors to inform NCD prevention policies (4); 37,311 adults participated in this survey during 2013–2018 in these 9 countries in WHO's European Region; after exclusions, the analytic sample consisted of 30,455 adults aged 25 to 65 years. Percentages may not add to 100 because of rounding.

[b] Determined by using national education categories mapped to UNESCO's (United Nations Educational, Scientific and Cultural Organization's) International Standard Classification of Education (ISCED) (12). ISCED provides a comprehensive framework of uniform and internationally agreed definitions to facilitate comparisons of education systems across countries.

[c] Data not available.

[d] Weight status based on body mass index (BMI), derived from measured height and weight and calculated as weight in kg divided by height in m^2: underweight, BMI <18.5, normal weight; BMI 18.5 to <25.0; overweight, BMI 25.0 to <30.0; obese, BMI ≥30.0.

Table 2. Fruit and Vegetable Consumption Among Selected Participants (N = 30,455) in WHO STEPS in 9 Countries in Eastern Europe and Central Asia, 2013–2017[a]

Measure	Armenia	Azerbaijan	Belarus	Georgia	Kyrgyzstan	Republic of Moldova	Tajikistan	Turkey	Uzbekistan
Mean no. of days fruit consumed/week	5.4	5.1	5.1	5.3	4.9	5.6	4.9	4.6	4.4
Mean no. of days vegetables consumed/ week	5.0	5.9	5.6	6.0	5.3	5.9	6.6	5.1	6.2
Mean no. of servings of fruit consumed/day	2.2	2.1	2.2	2.5	2.3	2.3	2.5	2.0	2.4
Mean no. of servings of vegetables consumed/day	2.1	2.2	2.3	2.7	2.0	2.3	3.3	2.0	3.2
Mean no. of servings fruits and vegetables consumed/day	3.6	3.5	3.7	4.5	3.4	4.1	5.1	3.1	4.6
% Consuming <5 portions fruit and vegetables/day	76	76	73	62	74	65	60	88	67

Abbreviation: WHO, World Health Organization.

[a] The WHO STEPwise approach to Surveillance (STEPS) is a standardized tool for collecting, analyzing, and disseminating data on non-communicable disease (NCD) risk factors to inform NCD prevention policies (4); 37,311 adults participated in this survey during 2013–2018 in these 9 countries in WHO's European Region; after exclusions, the analytic sample consisted of 30,455 adults aged 25 to 65 years.

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ORIGINAL RESEARCH

Linking Adverse Childhood Experiences and Other Risk Factors to Subjective Cognitive Decline in an Aging Population

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PEER REVIEWED

Summary

What is already known on this topic?

More than 16 million US adults live with some form of cognitive impairment, costing $206 billion in annual Medicare and Medicaid payouts. Previous studies have identified risk factors associated with subjective cognitive decline (SCD), such as physical inactivity, hypertension, diet, and smoking status.

What is added by this report?

Ours is among the first studies to examine the relationships between SCD and adverse childhood experiences along with other risk factors by using data from the 2020 Behavioral Risk Factor Surveillance System survey.

What are the implications for public health practice?

We identify modifiable SCD risk factors across the life course while providing examples of policy, environment, and systems changes that support implementation of the Centers for Disease Control and Prevention's Healthy Brain Initiative.

Abstract

Introduction

The Centers for Disease Control and Prevention's Healthy Brain Initiative (HBI) encourages an interdisciplinary approach to addressing the burden of subjective cognitive decline (SCD) among the aging US population as that population continues to increase. Our study is one of the first to evaluate associations between SCD and adverse childhood experiences (ACEs) and other modifiable risk factors to support implementation of the initiative.

Methods

We used multivariate logistic regression to assess data from the 2020 Behavioral Risk Factor Surveillance System survey to evaluate associations between SCD and ACEs scores and sociodemographic, behavioral, and clinical risk factors. Models were weighted to account for the complex survey design.

Results

Approximately 8.1% of survey respondents reported experiencing SCD within the past 12 months. Adjusted regression analysis showed that conditions such as depression (AOR, 2.85; 95% CI, 2.29–3.55), arthritis (AOR, 1.30; 95% CI, 1.05–1.60), and diabetes (AOR, 1.33; 95% CI, 1.05–1.68) were significantly associated with SCD. SCD was also associated with experiencing more than 3 falls per year (AOR, 2.95; 95% CI, 2.13–4.09), sleeping more than 9 hours per night (AOR, 2.06; 95% CI, 1.37–3.09), and physical inactivity (AOR, 1.32; 95% CI, 1.03–1.68). Two or more ACEs also significantly increased the odds of SCD (AOR, 1.69; 95% CI, 1.36–2.10).

Conclusion

Findings from our study can be used to inform policy, environment, and systems change efforts aimed at addressing modifiable risk factors to support healthy aging. The role of ACEs as determinants of brain health across the life course should also be considered in the design of clinical and community-based interventions.

Introduction

In recent years, the aging population in the United States has increased following the baby boom of the 1940s to 1960s and a rising life expectancy (1). More than 16 million US adults are living with some form of cognitive impairment, costing $206 billion in annual Medicare and Medicaid payouts alone (2,3). From 1996

to 2014, the prevalence of cognitive impairment increased annually among adults aged older than 50 years by an average of 0.7% for women and 1.0% for men (4).

In 2005, the Centers for Disease Control and Prevention (CDC) established the Healthy Brain Initiative (HBI), which uses an interdisciplinary approach to address the challenges associated with cognitive decline and to promote overall brain health (5). As part of this initiative, a subjective cognitive decline (SCD) module was added to the Behavioral Risk Factor Surveillance System (BRFSS) survey in 2011 (6). Data from this module provide information on the burden of SCD, as well as risk and protective factors (6).

The objective of our study was to examine sociodemographic, behavioral, and health-related risk factors for SCD by using recent BRFSS data to support the implementation of HBI through changes to clinical practice and policy. We used the lens of the socioecological model to explore how changes at multiple levels (individual, interpersonal, community, organizational, environmental, and policy) may be used to address SCD and dementia as a complex systems issue (7).

Previous studies have used BRFSS data to identify risk factors associated with SCD, such as physical inactivity, hypertension, diet, and smoking status (8,9). Felitti et al extensively described a dose–response relationship between adverse childhood experiences (ACEs) and various health risk behaviors and chronic diseases in adulthood (10). Our study aimed to expand on prior literature by examining associations between ACEs and other risk factors for SCD to inform prevention initiatives.

We used data from the 2020 BRFSS survey to examine the independent relationship between ACEs and SCD above and beyond other known risk factors (11). We provide examples of policy, environment, and systems changes that can address risk factors across the life course in support of HBI implementation.

Methods

Study sample

BRFSS is a cross-sectional telephone survey collected at the state level that asks US residents questions about health-related risk behaviors, chronic health conditions, and preventive services (12). Participants are noninstitutionalized adults aged 18 years or older located in all 50 states, the District of Columbia, and 3 US territories (12). States are required to ask a set of core component questions and may choose to add optional modules, including the SCD and ACEs modules (12). In 2020, the average BRFSS response rate was 47.9%, comparable to other national telephone surveys (13). A total of 103,610 participants were included in our study from the 18 states that opted to include the SCD common module. Five hundred and forty-seven survey participants responded "don't know/not sure" or refused to answer the first SCD screening question, 30,306 were excluded for being under the age of 45, and 8,905 were not asked all the SCD questions or had missing data (n = 63,852). Only 9 states participated in both the SCD and ACEs modules, and 22,434 participants answered all 11 ACEs questions. Our final analytic sample consisted of 17,042 observations for which no data were missing for any variable in the model. CDC publishes a list of modules used, by state (14).

Measures

Our primary outcome of interest was SCD. Survey respondents were asked if they had "experienced confusion or memory loss that is happening more often or is getting worse" in the past 12 months (15). If a participant responded affirmatively, they were identified as having SCD and were then asked a series of 5 additional questions regarding their level of difficulty with day-to-day activities, whether they needed help with these activities, whether they were able to get help when needed, whether SCD interfered with socialization, and whether they had discussed their confusion or memory loss with a clinician.

Guided by prior research, we examined a total of 11 behavioral, clinical, and environmental factors in the 2020 BRFSS that were hypothesized to increase risk of SCD (8,11). These included having 2 or more ACEs; being a current or former smoker; physical inactivity; having diabetes, obesity, arthritis, coronary heart disease (CHD), stroke, or depression; having a history of recurrent falls; and the average number of hours of sleep per night (16).

Binary variables were coded as either "yes" or "no". For variables where the survey question was asked on a Likert scale, responses of "always," "usually," or "sometimes" were coded as yes, and responses of "rarely" or "never" were coded as no, to be consistent with prior literature (8).

Other variables were derived and coded as follows:

ACEs score. Eleven questions (Box) regarding ACEs were converted into a summed ACEs score variable. The median ACEs score was 2. A binary variable representing an ACEs score of 2 or more was then used as a cut point for analysis.

Box. Behavioral Risk Factor Surveillance System: Adverse Childhood Experiences Module Questions

1. Did you live with anyone who was depressed, mentally ill, or suicidal?
2. Did you live with anyone who was a problem drinker or alcoholic?
3. Did you live with anyone who used illegal street drugs or who abused

prescription medication?

4. Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?

5. Were your parents separated or divorced?

6. How often did your parents or adults in your home ever slap, hit, kick, punch, or beat each other up?

7. Not including spanking, (before age 18) how often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way?

8. How often did a parent or adult in your home ever swear at you, insult you, or put you down?

9. How often did anyone at least 5 years older than you or an adult ever touch you sexually?

10. How often did anyone at least 5 years older than you or an adult try to make you touch them sexually?

11. How often did anyone at least 5 years older than you or an adult force you to have sex?

Obesity. Obesity was defined as a body mass index (weight in kg divided by height in m^2) greater than or equal to 30.

Falls. The number of falls in the last year were grouped into 3 categories: 1) none, 2) between 1 and 3 falls, and 3) more than 3 falls.

Sleep. Hours of sleep per night were grouped into 3 categories based on prior research (16): 1) short duration (<7 h/night), 2) adequate sleep (7–9 h/night), and 3) long duration (>9 h/night).

Physical inactivity. Physical inactivity was defined as no physical activity in the last 30 days, other than that associated with the respondent's regular job.

Five sociodemographic variables were also analyzed. These were race or ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, or Other Non-Hispanic), age (<65 y vs ≥65 y), education (high school or less, some college or technical school, and graduated from college or technical school), sex (male or female), and poverty status (at or below the federal poverty level of $25,000 annual income for a family of 3). The BRFSS survey contains deidentified, publicly available data that did not meet the definition of research involving human subjects and thus did not require institutional review board review.

Statistical analyses

We used the SAS 9.4 statistical program (SAS Institute Inc) for all analyses. Appropriate sampling weights were applied to all analyses. BRFSS uses a 3-tiered weighting system to account for differences in probability of selecting geographic strata, density of telephone numbers in a given block, and the number of adults who use a particular telephone number (17). This system serves as a blanket adjustment for noncoverage of an area and nonresponse (17). We conducted descriptive univariate and bivariate analyses first, calculating frequencies and prevalence rates of risk factors to compare respondents with and without SCD. We used Wald χ^2 tests to calculate associated *P* values.

Next, we used the SAS SURVEYLOGISTIC procedure to conduct multivariate modeling. The first model examined associations between SCD and potential demographic, behavioral, and health-related risk factors except ACEs. A second model assessed the associations between SCD and all risk factors, including ACEs. Adjusted odds ratios (AORs) and 95% CIs were calculated. Multicollinearity was assessed by examining variance inflation factors and correlation coefficients. A factor of less than 10 and a correlation coefficient of less than 0.8 was observed, suggesting that multicollinearity was not a major concern in the analysis.

Results

Of the 63,852 respondents who participated in the SCD module, 5,443 (8.1%, percentage weighted) reported having experienced SCD in 2020. Of these, 41.2% reported having given up day-to-day household activities or chores because of their symptoms, and 38.0% reported needing assistance with these day-to-day activities (Table 1). Of the 38.0% who reported needing assistance, 87.4% said they were able to get the help they needed from family members or friends. Additionally, 35.9% of respondents with SCD said their confusion and memory loss had interfered with their ability to engage in social activities outside the home. Less than half (45.6%) of respondents with SCD had discussed their symptoms with their health care provider.

Demographics

Compared with those without SCD, respondents who self-reported SCD were more likely to be aged 65 years or older, have incomes below the federal poverty level, and have a lower education level (Table 2).

In both the intermediate (AOR,1.46; 95% CI, 1.14–1.86) and final (AOR, 1.44; 95% CI, 1.13–1.84) models, having an income below the federal poverty level was associated with increased odds of reporting SCD compared with having an income above the federal poverty level (Table 3). Similarly, being aged 65 years or older was significant in the intermediate model (AOR, 1.35; 95% CI, 1.09–1.62) and after adjustment for ACEs in the final model (AOR, 1.45; 95% CI, 1.17–1.79). Race, sex, and education level were not significant risk factors for SCD in any model.

Health conditions

Respondents who self-reported SCD were more likely than those without to have any of the 6 health conditions measured (Table 2). After adjusting for ACEs in the final model, respondents who reported having arthritis were 30% more likely to have SCD (AOR, 1.30; 95% CI, 1.05–1.60) as were those who reported having depression, who were almost 3 times as likely to report SCD (AOR, 2.85; 95% CI, 2.29–3.55) (Table 3) as those without either condition. Having diabetes (AOR, 1.33; 95% CI, 1.05–1.68) or CHD (AOR, 1.37; 95% CI, 1.02–1.84) were also associated with an increased risk of SCD after adjusting for ACEs in the final model. Having had a stroke or having obesity were insignificant in the final model.

Health behaviors

Compared with those without SCD, those with SCD were more likely to report behavioral risk factors (Table 2). Of the 4 health behaviors examined, 3 were significantly associated with increased odds of reporting SCD after adjusting for ACEs in the final model (Table 3). Both insufficient and excessive sleep habits resulted in increased odds of reporting SCD: those sleeping less than 7 hours a night had 1.35 times the odds (AOR, 1.35; 95% CI, 1.08–1.68) and those sleeping more than 9 hours a night had more than 2 times the odds (AOR, 2.06; 95% CI, 1.37–3.09) of reporting SCD compared with those who slept between 7 and 9 hours a night in the final model. Repeated falls were strongly associated with SCD in the final model; respondents who had between 1 and 3 falls in the last year were 68.0% more likely (AOR, 1.68; 95% CI, 1.34–2.10) to report SCD than those who reported no falls, and those with more than 4 falls in the last year were almost 3 times more likely (AOR, 2.95; 95% CI, 2.13–4.09). Physical inactivity also increased a person's odds of SCD by 32.0% (AOR, 1.32; 95% CI, 1.03–1.68) in the final model. Being a former or current smoker was not a significant risk factor for SCD in either model.

Adverse childhood events

In fully adjusted models that included ACEs controlling for other risk factors, respondents who reported 2 or more ACEs had 1.69 times greater odds of reporting SCD (AOR, 1.69; 95% CI, 1.36–2.10) compared with those who reported fewer than 2 ACEs (Table 3).

Discussion

The literature examining risk factors for SCD has progressed in recent years to include consideration of ACEs as well as other exposures across the life course (11). Our study explored relationships between ACEs, SCD, and other risk factors by using 2020 BRFSS data collected at the height of the COVID-19 pandemic. In 2020, 8.1% of adults participating in the BRFSS SCD module reported having experienced SCD. Compared with prior years, a lower prevalence of SCD was self-reported in 2020 (18). In multivariate models, the most significant predictors of SCD were a history of depression, repeated falls, physical inactivity, and sleeping more than 9 hours per night. These modifiable risk factors could be managed appropriately if disclosed to a health care provider. For example, physical inactivity was associated with a 32.0% increased risk of SCD, consistent with prior research (9). Also consistent with prior studies, chronic conditions such as diabetes, arthritis, and CHD were found to be significant predictors of cognitive decline (1,8). Prior studies also found that adults with more than 1 comorbid chronic disease were more likely to have associated functional difficulties (1). In turn, worsening memory, as seen in SCD, makes managing these illnesses more difficult (1). Fewer than half of the respondents in the present study reported that they had discussed their SCD symptoms with a health care provider, comparable to prior years (18). This suggests an opportunity to educate both patients and clinicians about the importance of discussing SCD, reducing stigma, and framing SCD in the context of general wellness.

Lifestyle medicine is an evidence-based practice that has extensively demonstrated its ability to provide cost-effective solutions that may prevent and improve neurocognitive impairment (19). The "six pillars of lifestyle medicine for healthy aging" described by Jaqua et al include plant-forward diets (with an emphasis on plant-based foods), physical activity, stress management, avoiding substances such as alcohol and tobacco, restorative sleep, and maintaining social connections (19). Many of these 6 pillars correlate with risk factors identified in our study and should be considered fundamental to any prevention initiative addressing SCD.

We also found a significant association between SCDs and higher levels of childhood adversity, defined as experiencing 2 or more ACEs, independent of other risk factors. In the 2020 BRFSS, having experienced 2 or more ACEs was associated with a 69.0% increased risk of SCD later in life. This finding aligns with prior literature (11). Terry et al combined 2019 and 2020 BRFSS data and found that those with ACEs scores of 3 or more were more likely to report SCD as well as specific types of ACEs (sexual, physical, psychological, and environmental) (11). There is evidence to suggest that the stress induced by childhood adversity affects the development of executive functions, leading to decreased capacity for cognitive flexibility and working memory (20). This downstream effect of childhood adversity may partly explain the association between higher ACE scores and risk of SCD observed in our study.

We found no significant differences in SCD prevalence by race or education level in fully adjusted models. This finding contradicts prior research that demonstrated higher SCD prevalence among non-White groups and groups with lower levels of educational attainment (21). In contrast, poverty was associated with a 44.0% greater likelihood of SCD. This aligns with research conducted by Peterson on the effects of socioeconomic status across the life course and its effects on SCD (22). Peterson posits that social exposures are cumulative over time, and a high quality and quantity of diverse experiences over the life course may offer protection against SCD (22). Included in these experiences are factors such as education, income, and geographic area, which play a role in cognitive preservation (22). Additionally, lower educational attainment and income have been linked to lower health literacy — an individual's ability to use information to make sound health-related decisions (23). Studies show that people with low health literacy skills are more likely to delay accessing care and lack a primary care physician (24). Care access plays a critical role in prevention or early identification of SCD. Policies that provide incentives to health care providers to screen for social determinants of health and that aim to increase opportunities for social and economic advancement may decrease the incidence of SCD among these socioeconomically vulnerable populations (25).

Furthermore, policies that support healthy behaviors across the life course, such as walkable built environments and interventions that address ACEs early in life, may help to prevent cognitive decline in later life (Table 4) (9). Chronic conditions such as obesity and diabetes are significant predictors of future cognitive impairment. Thus, policies targeting ACEs and chronic disease prevention could be framed as levers for HBI implementation, because they may help reduce the incidence of SCD and improve health outcomes.

Beyond clinical interventions, policy and systems changes can help create environments that promote healthy behaviors among older adults, reducing their risk of SCD, falls, and associated functional difficulties (Table 4).

Older adults face unique challenges related to their social, physical, and economic environments (26). For example, retirement can impose distinctive financial limitations, and transportation becomes a barrier because adults tend to drive less frequently, or not at all, as they age (26). In response to these unique challenges, 4 states have adopted Master Plans for Aging — a collection of comprehensive state and local policy approaches to address the needs of older adults and their caregivers (Table 4) (26). For example, Massachusetts Executive Order 576 (2017) established the Governor's Council to Address Aging, which released a blueprint outlining 28 recommendations and 67 action steps across 5 areas: caregiving, employment, housing, transportation, and innovation and technology (27). The overarching goals of this blueprint aim to ensure that aging is embedded in all policies with input from older adults, residents have the resources to live a meaningful life in the community of their choice, and people of all ages have access to health and social support (27). Not only is Massachusetts heavily tackling the lifestyle medicine pillar of social connection, but it is also attempting to lessen the economic burdens of aging, increase access to care, and promote independence and mobility in an effort to prevent chronic disease. This blueprint is an important example of a policy approach that addresses the downstream influences of healthy aging.

Limitations

Our study has several limitations that warrant mention. First, BRFSS survey data are self-reported, which may challenge the validity of our results because of recall bias, potentially resulting in an underestimated prevalence of SCD. Second, survey participants are noninstitutionalized adults, excluding those in nursing homes or other long-term care facilities. Third, the BRFSS survey is conducted through random digit dialing of landlines and cellular telephones (12). Systematic biases may be introduced by excluding those who do not have access to a telephone. Nevertheless, the BRFSS survey includes a representative sample of the US population and is largely generalizable.

Another limitation is that the cross-sectional design of our study precludes causal inferences. The risk factors are particularly subject to a reverse causality effect in which the presence of cognitive decline could lead to feelings of depression, being more prone to frequent falls because of functional difficulties, or experiencing an increase in hours of sleep per night. Self-selection bias and recall bias also may affect the interpretation of the results.

Lastly, all models excluded observations in which data were missing for any given variable included in the analysis. Response bias may have been conferred by including only those who completed the ACEs questions. Previous studies found that participants without missing ACEs data may be more affluent compared with other participants (28). This reduced the final analytic sample size, potentially resulting in a loss of power. Methods such as multiple imputation can be used to address missing data; however, these methods have only recently been applied to ACEs because of their complexity and challenges in achieving model convergence. Houtepen et al applied a pragmatic imputation strategy in a recent longitudinal ACEs study, offering a method that could be explored in future research (29). Additionally, future research should examine mediation and moderation with respect to specific ACEs, other risk factors, and SCD.

An unexpected finding in our analysis was the lower prevalence of survey respondents who reported SCD in 2020 (8.1%) compared with prepandemic years. Historically, SCD prevalence has hovered around 11.0 %, as it did in 2019 (18). This may be due to a healthy worker effect, a form of selection bias, resulting from the COVID-19 pandemic (30). Respondents in 2020 were less likely to be employed, more likely to be working from home, and more likely to report good or better health than in 2019 (18). Participants who answered the survey in 2020 may have been relatively healthy individuals who would otherwise have been working outside the home as in prepandemic years. This argument is supported when comparing the prevalence of other chronic conditions in 2020 versus 2019. For example, the number of respondents who reported having had a prior stroke was 4.5% in 2019 compared with 3.9% in 2020 (15,18). Similar trends were observed for other diseases, such as diabetes, cancer, and chronic obstructive pulmonary disease (18). Future research should assess whether these trends continue in postpandemic years.

In conclusion, the results of our study can be used to support the HBI by informing primary and secondary prevention interventions and policies that address modifiable risk factors across the life course. Initiatives such as Master Plans for Aging, as well as those that address ACEs, can provide critical synergistic frameworks for policy, environment, and systems change that engage communities in reducing disparities faced by aging populations.

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References

1. Centers for Disease Control and Prevention. Subjective cognitive decline — a public health issue. Published March 25, 2019. Accessed May 16, 2022. https://www.cdc.gov/aging/data/subjective-cognitive-decline-brief.html
2. Centers for Disease Control and Prevention. Cognitive impairment: a call for action, now! Published online February 2011. Accessed May 16, 2022. https://www.cdc.gov/aging/pdf/cognitive_impairment/cogimp_poilicy_final.pdf
3. Alzheimer's Impact Movement. Cost of Alzheimer's to Medicare and Medicaid. alzimpact.org. Published online March 2020. Accessed May 16, 2022. https://act.alz.org/site/DocServer/2012_Costs_Fact_Sheet_version_2.pdf?docID=7161#:~:text=skyrocket%20to%20%24777%20billion%20(in%202020%20dollars)&text=Alzheimer's%20will%20total%20%24584%20billion,of%20total%20estimate%20Medicare%20spending.&text=increase%20278%25%20between%20now%20and,reach%20%24194%20billion%20in%202050
4. Hale JM, Schneider DC, Gampe J, Mehta NK, Myrskylä M. Trends in the risk of cognitive impairment in the United States, 1996–2014. *Epidemiology*. 2020;31(5):745–754. doi:10.1097/EDE.0000000000001219
5. Centers for Disease Control and Prevention. Healthy Brain Initiative. Alzheimer's disease and healthy aging. Centers for Disease Control and Prevention. Published July 30, 2020. Accessed May 16, 2022. https://www.cdc.gov/aging/healthybrain/index.htm
6. Centers for Disease Control and Prevention. BRFSS statistical brief: cognitive decline optional module. National Center for Chronic Disease Prevention and Health Promotion. Published March 2020. Accessed May 16, 2022. https://www.cdc.gov/aging/publications/BRFSS-cognitive-decline-brief-508.pdf
7. Aytur SA, Carlino S, Bernard F, West K, Dobrzycki V, Malik R. Social-ecological theory, substance misuse, adverse childhood experiences, and adolescent suicidal ideation: applications for community-academic partnerships. *J Community Psychol*. 2022;50(1):265–284. doi:10.1002/jcop.22560
8. Adams ML, Grandpre J, Katz DL, Shenson D. Cognitive impairment and cardiovascular disease: a comparison of risk factors, disability, quality of life, and access to health care. *Public Health Rep*. 2020;135(1):132–140. doi:10.1177/0033354919893030
9. Miyawaki CE, Bouldin ED, Kumar GS, McGuire LC. Associations between physical activity and cognitive functioning among middle-aged and older adults. *J Nutr Health Aging*. 2017;21(6):637–647. doi:10.1007/s12603-016-0835-6

10. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245–258. doi:10.1016/S0749-3797(98)00017-8
11. Terry RM, Schiffmacher SE, Dutcher AA, Croff JM, Jelley MJ, Hartwell ML. Adverse childhood experience categories and subjective cognitive decline in adulthood: an analysis of the Behavioral Risk Factor Surveillance System. *J Osteopath Med.* 2022;123(3):125–133. doi:10.1515/jom-2022-0140
12. Centers for Disease Control and Prevention. Behavioral Risk Factors Surveillance System. About BRFSS. Published February 9, 2019. Accessed May 10, 2022. https://www.cdc.gov/brfss/about/index.htm
13. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System. 2020Summary data quality report. Published August 2, 2021. Accessed May 10, 2022? https://www.cdc.gov/brfss/annual_data/2020/pdf/2020-sdqr-508.pdf
14. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System. CDC - BRFSS - Questionnaires 2020 modules by state by data set & weight. Published August 31, 2021. Accessed May 10, 2022. https://www.cdc.gov/brfss/questionnaires/modules/state2020.htm
15. Centers for Disease Control and Prevention. LLCP 2020 Codebook Report. Overall version weighted with LLCPWT. Behavioral Risk Factor Surveillance System. Published online August 6, 2021. Accessed May 10, 2022. https://www.cdc.gov/brfss/annual_data/2020/pdf/codebook20_llcp-v2-508.pdf
16. Xie B. Association between sleep duration and cognitive impairment: a cross-sectional study using the BRFSS Database. IEEE 2020 International Conference on Public Health and Data Science (ICPHDS), November 20–22, 2020. Guangzhou, China. Pp 108–115. [REMOVED IF= FIELD] doi:10.1109/ICPHDS51617.2020.00030
17. Centers for Disease Control and Prevention. Weighting the BRFSS data. 2017. Accessed September 6, 2022. https://www.cdc.gov/brfss/annual_data/2017/pdf/weighting-2017-508.pdf
18. Centers for Disease Control and Prevention. LLCP 2019 codebook report. Overall version data weighted with _LLCPWT. July 31, 2020. Accessed May 19, 2022. https://www.cdc.gov/brfss/annual_data/2019/pdf/codebook19_llcp-v2-508.HTML
19. Jaqua E, Biddy E, Moore C, Browne G. The impact of the six pillars of lifestyle medicine on brain health. *Cureus.* 2023; 15(2):e34605. doi:10.7759/cureus.34605
20. Ji S, Wang H. A study of the relationship between adverse childhood experiences, life events, and executive function among college students in China. *Psicol Reflex Crit.* 2018; 31(1):28. doi:10.1186/s41155-018-0107-y
21. Gupta S. Racial and ethnic disparities in subjective cognitive decline: a closer look, United States, 2015-2018. *BMC Public Health.* 2021;21(1):1173. doi:10.1186/s12889-021-11068-1
22. Peterson R. Lifecourse contexts and policy opportunities to reduce cognitive aging and dementia disparities. Virtual interview presented on March 15, 2022. Oregon State University, Zoom recording. Accessed May 23, 2022. https://media.oregonstate.edu/media/t/1_g7szuymd
23. Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR. The prevalence of limited health literacy. *J Gen Intern Med.* 2005;20(2):175–184. doi:10.1111/j.1525-1497.2005.40245.x
24. Levy H, Janke A. Health literacy and access to care. *J Health Commun.* 2016;21(suppl 1):43–50. doi:10.1080/10810730.2015.1131776
25. Bradywood A, Leming-Lee TS, Watters R, Blackmore C. Implementing screening for social determinants of health using the Core 5 screening tool. *BMJ Open Qual.* 2021;10(3): e001362. doi:10.1136/bmjoq-2021-001362
26. National Conference of State Legislatures. Comprehensive policy approaches to support the aging population. Updated May 3, 2021. Accessed April 23, 2023. https://www.ncsl.org/health/comprehensive-policy-approaches-to-support-the-aging-population
27. Executive Office of Health and Human Services. Aging in Massachusetts: governor's council to address aging in Massachusetts. Blueprint recommendations. Presented October 12, 2018. Accessed April 23, 2023. https://www.mass.gov/doc/governors-council-to-address-aging-in-massachusetts-blueprint-recommendations-december-2018/download
28. Howe LD, Tilling K, Galobardes B, Lawlor DA. Loss to follow-up in cohort studies: bias in estimates of socioeconomic inequalities. *Epidemiology.* 2013;24(1):1–9. doi:10.1097/EDE.0b013e31827623b1
29. Houtepen LC, Heron J, Suderman MJ, Tilling K, Howe LD. Adverse childhood experiences in the children of the Avon Longitudinal Study of Parents and Children (ALSPAC). *Wellcome Open Res.* 2018;3:106. doi:10.12688/wellcomeopenres.14716.1
30. Chowdhury R, Shah D, Payal AR. Healthy worker effect phenomenon: revisited with emphasis on statistical methods – a review. *Indian J Occup Environ Med.* 2017;21(1):2–8. doi:10.4103/ijoem.IJOEM_53_16
31. Compass MP. Points on the Compass. Adverse Childhood Experiences Response Team (ACERT). Manchester Proud. Published 2023. Accessed April 23, 2023. https://manchesterproudcompass.org/agencies/adverse-childhood-experiences-response-team-acert
32. Enhance Fitness. What is Enhance Fitness? Accessed April 23, 2023. https://projectenhance.org/enhancefitness/

33. Romanova M, Liang LJ, Deng ML, Li Z, Heber D. Effectiveness of the MOVE! multidisciplinary weight loss program for veterans in Los Angeles. *Prev Chronic Dis*. 2013; 10:E112.
34. Ahrendt AD, Kattelmann KK, Rector TS, Maddox DA. The effectiveness of telemedicine for weight management in the MOVE! Program. *J Rural Health*. 2014;30(1):113–119. doi:10.1111/jrh.12049
35. van den Brink AC, Brouwer-Brolsma EM, Berendsen AAM, van de Rest O. The Mediterranean, Dietary Approaches to Stop Hypertension (DASH), and Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) Diets are associated with less cognitive decline and a lower risk of Alzheimer's Disease — a review. *Adv Nutr*. 2019;10(6):1040–1065. doi:10.1093/advances/nmz054
36. Aytur SA, Ray KL, Meier SK, Campbell J, Gendron B, Waller N, et al. Neural mechanisms of acceptance and commitment therapy for chronic pain: a network-based fMRI approach. *Front Hum Neurosci*. 2021;15:587018.
37. Sexton CE, Sykara K, Karageorgiou E, Zitser J, Rosa T, Yaffe K, et al. Connections between insomnia and cognitive aging. *Neurosci Bull*. 2020;36(1):77–84. doi:10.1007/s12264-019-00401-9
38. Zubatsky M, Berg-Weger M, Morley J. Using telehealth groups to combat loneliness in older adults through COVID-19. *J Am Geriatr Soc*. 2020;68(8):1678–1679. doi:10.1111/jgs.16553
39. da Rosa MC, Rosa CB, Boff RM, Oliveira MS, Schwanke CHA. Transtheoretical model for lifestyle changes in older persons: a systematic review protocol. *Ann N Y Acad Sci*. 2022;1508(1):172–177. doi:10.1111/nyas.14714
40. MaineHealth. Fall prevention: a matter of balance. Published 2023. Accessed April 23, 2023. https://www.mainehealth.org/care-services/older-adult-care-geriatric-medicine/fall-prevention-matter-balance

Tables

Table 1. Prevalence of Functional Difficulties and Other Factors Related to Subjective Cognitive Decline (SCD) Among Participants (N = 5,729), Behavioral Risk Factor Surveillance System Survey, 2020[a]

SCD-Related factors (N = 5,729)	Prevalence, %	
	Yes[b]	No[c]
Have you given up day-to-day household activities or chores?	41.2	58.8
Do you need assistance with these day-to-day activities?	38.0	62.0
Are you able to get the help you need with day-to-day activities?	87.4	12.6
Has confusion or memory loss interfered with your ability to engage in social activities outside the home?	35.9	64.1
Have you discussed your SCD symptoms with a health care professional?	45.6	54.4

[a] Taken from respondents to the Subjective Cognitive Decline module.
[b] Participant answered “always,” “usually,” or “sometimes.”
[c] Participant answered “rarely” or “never.”

Table 2. Demographic, Health, and Behavioral Characteristics of Survey Participants Who Did And Did Not Report Subjective Cognitive Decline (SCD), Behavioral Risk Factor Surveillance System Survey, 2020[a]

Characteristics	Without SCD, (n = 20,441), n (%)[b]	With SCD, (N = 1,993), n (%)[b]	*P* value[c]
Demographics			
Sex			
Male	9,052 (47.0)	907 (46.0)	.65
Female	11,389 (53.0)	1,086 (54.0)	
Age ≥65 years	10,573 (42.2)	1,166 (48.2)	.004
Annual income below federal poverty level[d]	3,574 (24.0)	695 (44.4)	<.001
Education			
High school or less	5,711 (37.9)	736 (48.1)	<.001
Attended college	6,116 (33.5)	646 (33.3)	
College Graduate	8,548 (28.6)	607 (18.6)	
Race			
White, Non-Hispanic	14,338 (69.9)	1,441 (70.6)	.48
Black, Non-Hispanic	1,093 (6.4)	109 (6.4)	
Hispanic	1,366 (12.7)	147 (14.0)	
Other, Non-Hispanic	3,216 (11.0)	259 (8.9)	
Health conditions			
Obesity	5,674 (32.5)	628 (37.9)	.008
Diabetes	3,084 (16.3)	508 (28.9)	<.001
Depression	2,853 (14.5)	827 (46.1)	<.001
Arthritis	7,529 (37.8)	1,170 (58.5)	<.001
Stroke	934 (4.8)	248 (13.2)	<.001
Coronary heart disease	1,266 (6.6)	287 (14.1)	<.001
Behavioral			
Smoking			
Nonsmoker	11,624 (54.6)	819 (40.4)	<.001
Former Smoker	6,396 (32.0)	775 (36.3)	
Current Smoker	2,296 (13.4)	391 (23.3)	
Physical inactivity[e]	15,522 (73.0)	1,238 (55.8)	<.001
Falls (last 12 mo)			
None	15,416 (77.3)	953 (49.3)	<.001
1–3	4,126 (19.3)	695 (33.9)	
≥4	703 (3.4)	298 (16.8)	
Sleep (h/night)			
<7	5,938 (32.1)	770 (45.3)	<.001

Abbreviation: ACE, adverse childhood event.
[a] Taken from respondents to the Subjective Cognitive Decline module.
[b] Values calculated by using appropriate weighting system and by restricting observations to those for which ACEs is not missing.
[c] *P* value calculated by using Wald χ^2 test.
[d] Annual income below $25,000 for a family of 3.
[e] Physical inactivity defined as participant reporting no physical activity within the past 30 days.
[f] Score reflects the number of "yes" answers to the eleven ACEs questions for an individual.

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(continued)

Table 2. Demographic, Health, and Behavioral Characteristics of Survey Participants Who Did And Did Not Report Subjective Cognitive Decline (SCD), Behavioral Risk Factor Surveillance System Survey, 2020[a]

Characteristics	Without SCD, (n = 20,441), n (%)[b]	With SCD, (N = 1,993), n (%)[b]	*P* value[c]
7–9	13,596 (63.9)	1,020 (45.2)	
>9	737 (4.0)	166 (9.4)	
ACE score[f]			
0–1	13,633 (65.2)	948 (41.6)	<.001
≥2	6,808 (34.8)	1,045 (58.4)	

Abbreviation: ACE, adverse childhood event.
[a] Taken from respondents to the Subjective Cognitive Decline module.
[b] Values calculated by using appropriate weighting system and by restricting observations to those for which ACEs is not missing.
[c] *P* value calculated by using Wald χ^2 test.
[d] Annual income below $25,000 for a family of 3.
[e] Physical inactivity defined as participant reporting no physical activity within the past 30 days.
[f] Score reflects the number of "yes" answers to the eleven ACEs questions for an individual.

Table 3. Crude and Adjusted Odds Ratios for the Association Between Subjective Cognitive Decline and Adverse Childhood Experiences (ACEs) and Demographic, Health, and Behavioral Risk Factors, Participants (N = 17,042), Behavioral Risk Factor Surveillance System Survey, 2020[a]

Characteristics (N = 17,042)	Crude, OR (95% CI)[b]	Intermediate model, AOR (95% CI)[c]	Fully adjusted model, AOR (95% CI)[d]
ACEs score of ≥2	2.63 (2.23–3.11)	Not applicable	1.69 (1.36–2.10)[e]
Health conditions			
Obesity	1.27 (1.06–1.51)	0.92 (0.73–1.14)	0.89 (0.71–1.11)
Diabetes	2.09 (1.73–2.52)	1.33 (1.05–1.68)[f]	1.33 (1.05–1.68)[f]
Depression	5.03 (4.23–5.99)	3.03 (2.45–3.76)[e]	2.85 (2.29–3.55)[e]
Arthritis	2.32 (1.95–2.75)	1.31 (1.07–1.61)[f]	1.30 (1.05–1.60)[f]
Stroke	3.03 (2.36–3.88)	1.29 (0.94–1.77)	1.28 (0.93–1.76)
Coronary heart disease	2.34 (1.83–2.98)	1.36 (1.01–1.82)[f]	1.37 (1.02–1.84)[f]
Physical inactivity	2.14 (1.80–2.54)	1.30 (1.02–1.65)[f]	1.32 (1.03–1.68)[f]
Smoking			
Non-smoker	1.0 [Reference]		
Former smoker	1.54 (1.28–1.85)	1.15 (0.92–1.45)	1.08 (0.85–1.36)
Current smoker	2.35 (1.88–2.95)	1.26 (0.94–1.68)	1.18 (0.88–1.58)
No. of falls in last 12 months			
None	1.0 [Reference]		
1–3	2.77 (2.30–3.33)	1.72 (1.38–2.15)[e]	1.68 (1.34–2.10)[e]
≥4	7.71 (5.89–10.12)	3.17 (2.29–4.38)[e]	2.95 (2.13–4.09)[e]
Sleep (h/night)			
<7	2.00 (1.68–2.38)	1.39 (1.12–1.73)[g]	1.35 (1.08–1.68)[g]
7–9	1.0 [Reference]		
>9	3.33 (2.40–4.61)	2.09 (1.40–3.13)[e]	2.06 (1.37–3.09)[e]
Sex			
Male	1.0 [Reference]		
Female	1.04 (0.88–1.23)	0.85 (0.69–1.06)	0.84 (0.67–1.04)
Race			
White, Non-Hispanic	1.0 [Reference]		
Black, Non-Hispanic	1.0 (0.68–1.47)	0.92 (0.52–1.63)	0.89 (0.50–1.61)
Hispanic	1.09 (0.81–1.47)	1.33 (0.91–1.94)	1.31 (0.90–1.91)
Other, Non-Hispanic	0.81 (0.62–1.04)	0.86 (0.61–1.19)	0.85 (0.61–1.20)
Age ≥65 years	1.27 (1.08–1.50)	1.35 (1.09–1.62)[g]	1.45 (1.17–1.79)[e]
Annual income below federal poverty level	2.54 (2.11–3.05)	1.46 (1.14–1.86)[g]	1.44 (1.13–1.84)[g]
Education	0.73 (0.66–0.80)	0.93 (0.82–1.07)	0.93 (0.82–1.07)

[a] Taken from respondents to the Subjective Cognitive Decline module.
[b] Crude and intermediate odds ratios calculated by restricting observations to those for whom ACEs score is not missing.
[c] Adjusted for all variables in the table except for ACEs score.
[d] Adjusted for all variables in the table.
[e] Significant at $P < .001$.
[f] Significant at $P < .05$.
[g] Significant at $P < .01$.

Table 4. Examples of Policy, Environment, and Systems Changes and Interventions That Address Modifiable Risk Factors for Subjective Cognitive Decline Across the Life Course

Type of Policy or Intervention	Description
Master plans for aging	Comprehensive plans that can be adopted at the state or municipal level to address the needs of older adults and their caregivers. These multisectoral plans include strategies such as financing, infrastructure, health and social services, workforce development, housing, and transportation. Notably, these strategies could help to support healthy active living for people of all ages (26).
Adverse Childhood Experiences Response Team	The City of Manchester, New Hampshire, implemented the Adverse Childhood Experiences Response Team (ACERT) as a collaborative approach to addressing the negative effects of childhood trauma. The initiative operates through a referral mechanism that connects families to trauma-informed mental health services and social supports in the city. ACERT represents a partnership between the Manchester Police Department, YWCA-New Hampshire, and Amoskeag Health, which work collaboratively to provide assistance to families and their children who have had recent involvement with law enforcement. The program is voluntary and facilitates connections to a variety of therapies and services such as youth support groups, domestic violence services, athletic enrichment programs, home visits, and other community-based resources (31).
Built environment and infrastructure investments	Environmental and structural strategies such as increased sidewalk width, adequate lighting, increased time of pedestrian crossing lights at intersections, and intermittently spaced benches for resting can be implemented at the local level (9).
Evidence-based physical activity programs	Evidence-based programs, such as EnhanceFitness, can be funded through local or state governments to engage older adults in a more physically active lifestyle. EnhanceFitness (EF) is an effective group exercise and falls prevention program that focuses on flexibility, strength training, balance, and low-impact aerobics to improve functional abilities and independence among older adults (32). Aside from the physical benefits of exercise, this program has been proven to increase socialization, decrease depression symptoms, and reduce unplanned hospitalizations. Another evidence-based program is the Managing Overweight and Obesity for Veterans Everywhere (MOVE!) program. Approximately 78% of Veterans are overweight or obese. The VA Central Office partnered with the VA National Center for Health Promotion and Disease Prevention to develop the program. The MOVE! program was piloted between 2002 and 2004 before it was nationally implemented in 2006. The program consists of essential components including medical advisement concerning physical activity, nutrition, and behavioral health, ongoing screening and treatment of overweight or obesity, and medical documentation of weight and physical activity status (33). Veterans who participated in MOVE! were more likely to lose weight compared with those who did not participate, and the program has expanded to offer videoconferencing classes with similar outcomes (34).
Healthy diets	Diets that are associated with cognitive protection include the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH) diet, and the Mediterranean-DASH diet Intervention for Neurodegenerative Delay (MIND). The DASH diet focuses on plant-based foods and limits the intake of short fatty acids, total fat, cholesterol, sugar, and sodium. The MIND diet incorporates elements of the Mediterranean and DASH diets. It was developed with the aim of neuroprotection and dementia prevention. The MIND diet focuses on the consumption of plant-based foods with an emphasis on berries and green vegetables while restricting red meats, sweets, dairy, and fast-fried foods. An Australian longitudinal study demonstrated a 53% decreased risk of dementia with high adherence to the MIND diet and a 35% decrease with moderate compliance (35).
Stress management	Mindfulness-based approaches, such as Acceptance and Commitment Therapy (ACT), are transdiagnostic and can help people manage stressors associated with chronic disease and pain. This type of cognitive behavioral therapy can be accessed in clinical or community settings, including via telehealth. ACT has been shown to change brain network connectivity (36).
Restorative sleep	Educational approaches focusing on sleep hygiene, combined with early screening, diagnosis, and treatment of sleep disorders, can support healthy aging. Nonpharmacological approaches such as cognitive behavioral therapy are considered first line approaches (37).
Strong social connections	Interventions using telehealth have shown promise for enabling people to maintain healthy social connections, even during the COVID-19 pandemic. Family resource centers are holistic centers for intergenerational support and kinship navigation. They can also provide intergenerational social support (38).
Avoiding misuse of substances such as alcohol and tobacco	Many examples of evidence-based interventions using theoretically grounded approaches are available in the literature. daRosa et al provide a systematic review focused on the Transtheoretical Model of behavior change for older persons (39).
Falls prevention	A Matter of Balance is a falls prevention program that has been implemented in several states. The program is designed to reduce the fear of falling and increase activity levels among older adults. Community classes can be offered both in person and virtually. The program was developed at the Roybal Center at Boston University. MaineHealth provides master trainer training sessions that prepare organizations to offer A Matter of Balance in their communities. Master trainers are responsible for teaching the Matter of Balance curriculum to coaches and providing them with guidance and support as they lead the Matter of Balance classes (40).

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ORIGINAL RESEARCH

Physical Activity–Friendly Policies and Community Design Features in the US, 2014 and 2021

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PEER REVIEWED

Summary

What is already known?

Physical activity is influenced by community-level factors. A 2014 survey of US municipalities determined the prevalence of policy and community design supports for physical activity–friendly places.

What is added by this report?

Prevalence of some municipal supports for physical activity was higher in 2021 than in 2014. Adoption of Complete Streets policies and zoning codes for block size disproportionately increased in more populous municipalities. Adoption of zoning codes for mixed land use disproportionately increased in municipalities where most of the population had at least some college education.

What are the implications for public health practice?

Additional communities could consider adopting physical activity–friendly policies and design features.

Abstract

Introduction

The 2014 Community-Based Survey of Supports for Healthy Eating and Active Living documented the prevalence of US municipal policy and community design supports for physical activity. The survey was repeated in 2021. Our study examined change in the prevalence of supports from 2014 to 2021, overall and by municipality characteristic.

Methods

Municipalities were sampled independently each survey year. We calculated prevalence in 2014 and 2021 and the prevalence ratio (PR) for 15 supports covering zoning codes, park policies and budgets, design standards, Complete Streets policies, and shared use agreements. We used a Bonferroni-corrected Breslow-Day test to test for interaction by municipality characteristic.

Results

In 2014 (2,009 municipalities) compared with 2021 (1,882 municipalities), prevalence increased for several zoning codes: block sizes of walkable distances (PR = 1.46), minimum sidewalk width (PR = 1.19), pedestrian amenities along streets (PR = 1.15), continuous sidewalk coverage (PR = 1.14), and building orientation to pedestrian scale (PR = 1.08). Prevalence also increased for design standards requiring dedicated bicycle infrastructure for roadway expansion projects or street retrofits (PR = 1.19). Prevalence declined for shared use agreements (PR = 0.87). The prevalence gap widened between the most and least populous municipalities for Complete Streets policies (from a gap of 33.6 percentage points [PP] in 2014 to 54.0 PP in 2021) and for zoning codes requiring block sizes that were walkable distances (from 11.8 PP to 41.4 PP).

Conclusion

To continue progress, more communities could consider adopting physical activity–friendly policies and design features.

Introduction

Being physically active is one of the best ways to improve and preserve health. Regular physical activity enhances daily quality of life and reduces the incidence or severity of many diseases (1). However, physical activity is often influenced by contextual factors that lie beyond a person's control. Community-level strategies to increase physical activity may reach a larger audience than those directed at the individual (2).

Community design approaches offer an evidence-based solution to increasing participation in physical activity by making it safer and more accessible to everyone (3). Strategies range from updating zoning codes that improve overarching land use patterns to tangible changes in the built environment, such as adding street furnishings (eg, benches) and park lighting. Effective strategies include pedestrian and bicycle network expansion through well-maintained sidewalks and bicycle lanes, initiatives such as Safe Routes to School, and policies such as Complete Streets (4). The last is an infrastructure approach that considers the ages, abilities, and transportation modes of all users (including pedestrians and bicyclists) as part of major road project designs, thereby enhancing safety and opportunities for active transportation (4).

To better understand the uptake of municipal-level supports for physical activity, in 2014 the Centers for Disease Control and Prevention (CDC) launched the Community-Based Survey of Supports for Healthy Eating and Active Living (CBS HEAL) (5). This nationally representative survey of municipalities documented the prevalence of policy and community design supports for physical activity and identified differences by geographic and sociodemographic characteristics (6–9). Communities with smaller and less formally educated populations and those located in the South were less likely to report many policy and community design supports (6–8). Complete Streets policies, for example, were twice as common among communities in the West as in the South, adjusted for population size, urbanicity, and socioeconomic status (7). Some interventions, such as budget provisions for park maintenance and lighting, were less common in communities with fewer than 2,500 people or with a lower percentage of college-educated residents (8).

Ongoing surveillance of changes in the presence of these community-level supports is important for identifying where improvements are occurring, where inequitable distribution is widening or narrowing, and where resources may need to be prioritized. To obtain updated information, CDC administered CBS HEAL again in 2021. The objective of our study was to examine changes in prevalence of US municipal policy and community design supports for physical activity from 2014 to 2021, and to determine if any changes differed by municipality characteristic.

Methods

Community-Based Survey of Supports for Healthy Eating and Active Living (CBS HEAL) overview

CBS HEAL is a nationally representative survey of US municipalities that collects information on environmental and policy supports for healthful diets and regular physical activity. The survey is administered by CDC's Division of Nutrition, Physical Activity, and Obesity. Our study used cross-sectional data from the 2014 and 2021 CBS HEAL surveys. Detailed methodology of the 2014 survey is available elsewhere (6). Responses for the second administration of CBS HEAL were collected from May through September 2021. As with the 2014 survey, all US municipalities with a population of at least 1,000 people (N = 10,300 municipalities) were eligible for selection; population estimates were derived from the 2017 Census of Governments file (10). To achieve a nationally representative sample, municipalities were randomly selected after stratification by census region (Northeast, Midwest, South, or West) and by urbanicity status (urban or rural). To define urbanicity, the percentage of each municipality's population that lived in a census-designated urban area was obtained from the 2010 US Census Urban Area to Place Relationship file. Municipalities with percentages above the 30th percentile of the national distribution were classified as urban. Based on the sampling frame, a total of 4,417 municipalities were invited to participate (11).

Questionnaire contents

We investigated 15 questions related to policy and community design supports for physical activity that were included in CBS HEAL for both 2014 and 2021. These questions fall into 4 categories: zoning codes design/development guidelines (6 questions); policies or budget provisions related to parks or outdoor recreation areas (4 questions); design standards, guidelines, and policies (3 questions); and other supports (2 questions) (Table 1). We excluded municipalities missing a response on at least 1 of these 15 questions.

Questionnaire administration

For each sampled municipality, the web-based questionnaire was sent to a city or town planner or someone with an equivalent title. The primary respondent could electronically nominate someone in the municipality to complete a particular questionnaire section to enhance completion and accuracy. For instance, the primary respondent could refer park questions to the director of the parks and recreation department. (Although referral to municipal experts was encouraged in 2014, the digitized nominate feature was not added until 2021.) Respondents could select "yes," "no," or "don't know," or they could leave the answer blank. We defined a "don't know" response as "no" for all primary analyses, and blank answers were excluded.

Municipality characteristics

We used data from the US Census Bureau, merged by Federal Information Processing Standards (FIPS) place codes, to characterize municipalities by population size, urbanicity, region, race or ethnicity, education, and poverty. We stratified population size as

small (1,000–2,499 people), medium (2,500–49,999 people), or large (≥50,000 people) by using the 2007 and 2017 Census of Governments files (10) for the 2014 and 2021 surveys, respectively. Urbanicity was defined differently for the analyses than for the sampling plan (11). For analyses, we dichotomized urbanicity as either urban or rural, with urban defined as having more than 50% of the population living in an urban area, according to population data from the 2012 and 2017 Census of Governments files and land area from the US Census Urban Area to Place Relationship files (12). Regions, based on US Census Bureau schema, were classified as Northeast, Midwest, South, or West (13).

Sociodemographic categories for the respective surveys were based on 5-year population estimates from the 2013 and 2020 American Community Survey (14). We categorized race and ethnicity as majority (>50%) or minority (≤50%) non-Hispanic White. For education we restricted the population to residents aged 25 years or older and dichotomized as high school graduate or less (if the majority of municipality residents had only a high school diploma or less) and some college or more (if the majority had at least some college education). We categorized poverty as high if 20% or more of the population, or low if less than 20%, lived below the poverty threshold at the time of the survey, defined by the total family income in the last 12 months, family size, and household composition (15).

Statistical analysis

We compared municipality characteristics between the 2014 and 2021 CBS HEAL by using the Wald χ^2 test. For each of the physical activity supports, we calculated prevalence in 2014 and 2021 with 95% CIs. We also calculated the unadjusted prevalence difference (PD, defined as 2021 minus 2014) and the unadjusted prevalence ratio (PR, defined as 2021 divided by 2014). CIs were estimated via the Taylor linearization method, and significance was established at a 2-sided $P < .05$. We used the Breslow–Day test to determine if any municipality characteristic modified the prevalence change between 2014 and 2021, defining significance as a Bonferroni-corrected $P < .008$. For significant associations, we developed slope graphs to depict the change by the effect-modifying characteristic.

With the exception of these effect-modifying associations, we investigated measured confounding by municipality characteristic by using Mantel-Haenszel tests and multiple logistic regression. Because all adjusted PRs were within 10% of unadjusted estimates, we assumed that municipality characteristics were not substantively confounding the relationship between support prevalence and survey year. Subsequently, to simplify presentation of findings, we reported unadjusted PRs. Some municipalities participated in both the 2014 and 2021 surveys and were not independent; we performed a sensitivity analysis that excluded those municipalities. We also conducted a sensitivity analysis that excluded "don't know" responses. We conducted all analyses in SAS version 9.4 (SAS Institute) and SAS-callable SUDAAN, release 11.0.0 (RTI International). Analyses accounted for the survey design, nonresponse, and weights.

Results

Municipality characteristics

Of the 2,029 municipalities that returned the questionnaire in 2014, the sample size was 2,009 after excluding those with missing answers; of the 1,982 who returned it in 2021, the sample size was 1,882 municipalities. Most municipalities in 2014 and 2021 were medium sized, urban, and located in the Midwest or South (Table 2). The proportion of municipalities with majority non-White populations increased from 13.4% in 2014 to 16.4% in 2021. In addition, the proportion of communities with most of the population having some college education increased from 55.5% to 67.7%; the proportion with a low poverty level also increased from 69.6% to 78.7%. Distributions of municipalities by population size, urban status, and region were similar in 2014 and 2021.

Overall prevalence

The 2014 prevalence of supports ranged from 14.2% for block size zoning codes to 87.3% for park dog leash policies. In 2021, supports ranged from 20.9% for block size zoning codes to 86.0% for park maintenance policies. Of the 15 supports, prevalence significantly increased for 7, significantly decreased for 3, and remained statistically equivalent for 5 (Table 3).

Prevalence increased for zoning codes related to walkable block sizes, continuous sidewalks, minimum width of sidewalks, pedestrian-friendly building orientation, and pedestrian amenities on streets. It also increased for design standards related to bicycle infrastructure during roadway expansion projects and reserving space for local jurisdictions to develop bicycle infrastructure. The largest absolute gain was for zoning codes for minimum sidewalk width, which increased from 43.9% to 52.2% — an absolute gain of 8.3 percentage points (PD = 8.3; 95% CI, 5.1–11.5). The largest relative gain was for zoning codes for block size, which increased from 14.2% to 20.9% — a relative gain of 46% (PR = 1.46; 95% CI, 1.27–1.69).

Prevalence decreased for shared-use agreements, police and security patrols in parks, and park dog leash policies. The largest absolute decline was for park patrols, which decreased from 84.6% to

75.6% — an absolute drop of 9.0 percentage points (PD = –9.0; 95% CI, –11.5 to –6.4). The largest relative decline was for shared use agreements, which decreased from 43.5% to 37.6% — a relative drop of 13% (PR = 0.87; 95% CI, 0.80–0.94) (Table 3).

Effect modification by municipality characteristics

Population size modified the change in prevalence of Complete Streets policies (*P* for interaction = .004) and zoning codes for block size (*P* for interaction < .001). Prevalence of Complete Streets policies remained low in small-sized municipalities (16.0% and 13.4%; *P* = .17) and in medium sized municipalities (27.5% and 28.1%; *P* = 0.75) and increased in large-sized municipalities (from 49.6% to 67.4%; *P* = .002). The prevalence gap between small and large municipalities widened from 33.6 percentage points (PP) in 2014 to 54.0 PP in 2021. A similar trend was seen for zoning codes for block size: the gap between small and large municipalities widened from 11.8 PP in 2014 to 41.4 PP in 2021 (Figure 1).

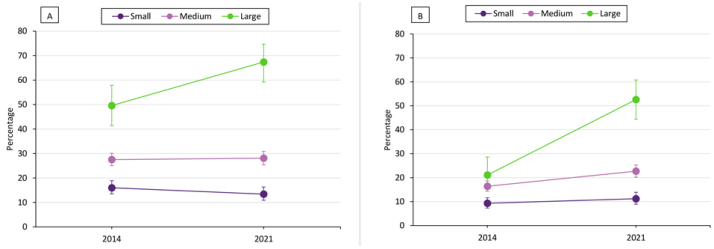

Figure 1. Prevalence of (A) Complete Streets Policy and (B) zoning code for block size, by population size of US municipalities. Population size is based on the 2007 and 2017 US Census of Government (15) files for respective survey administrations (large: ≥50,000 people; medium: 2,500 – 49,999 people; small: 1,000–2499 people). Source: Community-Based Survey of Supports for Healthy Eating and Active Living (CBS HEAL 2014 and 2021) (5). .

Community-level educational attainment modified the change in prevalence of zoning codes for mixed land use (*P* = .007 for interaction). Municipalities in which most of the population had some college had a stable prevalence (74.1% and 76.7%; *P* = .15), whereas those where the majority had a high school diploma or less experienced a decline (from 62.7% to 56.6%; *P* = .02). This expanded the prevalence gap from 11.4 PP to 20.1 PP (Figure 2).

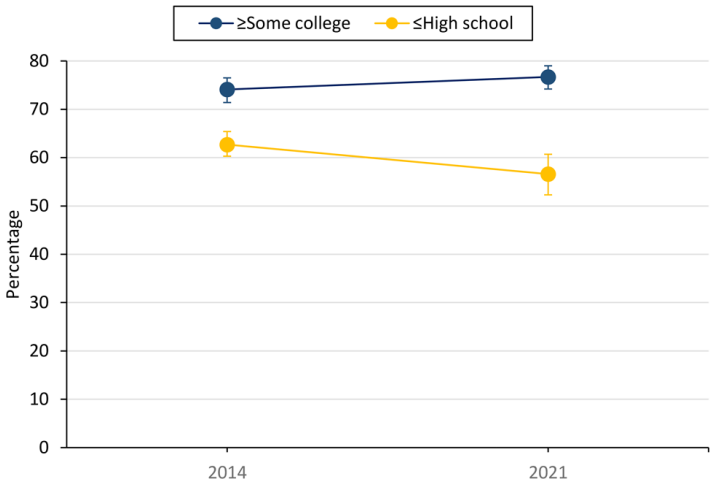

Figure 2. Prevalence of zoning code for mixed land use, by educational attainment of US municipalities, from the Community-Based Survey of Supports for Healthy Eating and Active Living (CBS HEAL) (5), 2014 and 2021. Educational attainment is based on the 2013 and 2020 American Community Survey (14) 5-year population estimates for respective survey administrations (some college or more, at least 50% of the population aged 25 years or older has at least some college as the highest level of formal education; high school diploma or less, at least 50% of the population aged 25 years or older has a high school diploma or less as the highest level of formal education).

Sensitivity analyses

Excluding the 424 municipalities that participated in both 2014 and 2021 did not substantially alter our findings. Of the 10 significant differences in the overall analysis, only 1 (zoning codes for pedestrian-friendly building orientation) was insignificant in the sensitivity analysis. For the 15 supports in our analysis, "don't know" responses ranged from 2.8% for police and security patrols in parks to 21.2% for block size zoning codes in 2014 and 3.2% for parks maintenance to 19.8% for Complete Streets policies in 2021. The median was 10.3% in 2014 and 9.7% in 2021. Reassigning "don't know" responses as missing did not substantially alter the findings.

Discussion

In this national study of changes in physical activity–friendly policies and community design features, the prevalence of some municipal supports was higher in 2021 than in 2014. Prevalence increased for some zoning codes and design standards supportive of physical activity and decreased for shared use agreements and some parks and outdoor recreation policies. Adoption of Complete Streets policies and zoning codes for block size disproportionately increased in populous municipalities; adoption of zoning

codes for mixed land use disproportionately decreased in municipalities where most of the population had less formal education compared with municipalities with populations that had some college education.

Complete Streets

Our findings regarding Complete Streets policies illustrate a widening disparity gap. From 2014 to 2021, Complete Streets policy adoption improved from 50% to 67% in municipalities with large populations (≥50,000 residents), but not in less populous communities. In the 2014 survey, medium and large municipalities, compared with small municipalities and adjusted for geographic and socioeconomic factors, had 57% and 218% greater odds of reporting a Complete Streets policy, respectively (7). According to Smart Growth America (16), from 2014 to 2021 the number of US cities and towns with a Complete Streets policy increased from 894 to 1,520. The widening prevalence gap by population size suggests that large municipalities are recognizing the importance of polices like Complete Streets that consider the safety of all road users. It may also suggest that adopting these policies in smaller towns is less practical or unnecessary. Our results further indicate that Complete Streets policies might benefit from more publicity, because many responded "don't know" in our questionnaire (7).

Small communities may face unique challenges in adopting Complete Streets policies, including resource limitations and limited control over key roadways (eg, where state-owned highways serve as main streets). Acknowledging these challenges, the Federal Highway Administration developed *The Small Town and Rural Multimodal Networks*, a practical resource that helps small towns and rural communities promote "safe, accessible, comfortable, and active travel for people of all ages and abilities" (17). Depending on the needs and priorities of the community, strategies to promote active transportation may include adding, expanding, or connecting sidewalks, bicycle lanes, and shared use paths; enhancing lighting, signage, and painted markings at intersections; decreasing vehicle speeds through curb extensions, roadway narrowing, and other traffic-calming measures; installing benches and climbable art for children; and landscaping along walking paths to provide a tree shade canopy (4,17–19). Given the rural–urban discrepancy in obesity and physical inactivity among children (20) and adults (21), an emphasis on improving activity opportunities in rural areas may be especially important.

Zoning codes and design standards

Design standards that encourage bicycling and zoning codes that support walking are associated with greater physical activity for transportation (22) and for leisure (23). In the 2021 survey, prevalence increased for 7 of 9 design standards or zoning codes supportive of physical activity, and 2 supports remained consistent from 2014. Design standards that integrate bicycle infrastructure into roadway expansion and retrofit projects are important for supporting the expansion of bicycle networks. Zoning codes that widen and connect sidewalks improve safety and convenience for pedestrians. Although prevalence of these supports increased, the 2021 estimates were modest, ranging from 32% to 52%. Moreover, traffic-calming design features remained statistically flat (at 51% in 2021), despite vehicle speed being identified as the overwhelming concern for US adults who report traffic as a barrier to walking (24).

For some physical activity supports, the prevalence gap widened by municipality characteristics. The prevalence of zoning codes for mixed land use differed between municipalities with more- and less-educated populations in 2014, and this gap widened in 2021. Municipalities that serve populations with less education may have less funding and experience to support policy gaps. This finding warrants deeper investigation to identify barriers and solutions. Compared with large municipalities, medium and small municipalities (<50,000 residents) were less likely to report activity-friendly design policies, and some of these gaps also widened over time. These trends may deserve attention, because activity-friendly zoning codes have been associated with reduced economic disparities in active transportation to work (25). Our results suggest that tailoring community design approaches to promote physical activity may need to be based on municipality population size and preferences (26). Municipal leaders may consider using CDC's Active Communities Tool to appraise the current zoning code environment, develop an action plan, and monitor progress (27).

Parks and outdoor recreation

Parks and outdoor recreation areas contribute to the built and natural environments of physical activity–friendly communities (28). Prevalence of parks and outdoor recreation policies assessed in CBS HEAL exceeded 75% in 2021. Compared with 2014, each support had a similar or slightly reduced prevalence, with the notable exception of a 9.0 percentage point decline for police or security patrols. The Community Preventive Services Task Force recommends multicomponent interventions that support access to and use of parks, trails, and greenways. These interventions, which combine an infrastructural component (eg, playground facilities) with a non-infrastructural component (eg, community engagement efforts), are associated with greater use of parks, trails, and greenways and with expanded participation in moderate-to-vigorous leisure-time physical activity. Municipalities can apply this evidence-based strategy by ensuring adequate park lighting

and signage, maintaining green space and equipment, offering outdoor recreation programs, expanding public awareness, and increasing safety (28).

Shared use agreements

Among all supports, the largest relative decline was for shared use agreements between municipalities and schools. By permitting the public to use designated school facilities during nonschool hours, shared use agreements can expand community access to recreational facilities. This finding may be important, because inconvenience and unsafe conditions are common barriers to engaging in physical activity (6,19), although decreases may reflect temporary school closures and public health orders to minimize the impact of COVID-19. Regardless of cause, the low 2021 prevalence of shared use agreements may present an opportunity for expanding physical activity access in communities, because schoolyards may offer a convenient park space. Just as Complete Streets policies require partnership with transportation departments, municipality officials are encouraged to collaborate with school districts and the private sector to develop these agreements. A Shared Use Playbook offers practical suggestions for drafting agreements and navigating issues of funding, liability, and safety (29).

Challenges and opportunities

In addition to up-front costs, some infrastructure changes for active living may increase property values, raising concerns about gentrification and displacement and potentially worsening physical activity disparities by income level and by race and ethnicity (30). In the 2018 SummerStyles survey, however, over half of US adults favored community development projects to make it easier to walk or bicycle, even if they increased the cost of living. Moreover, support was equally high across income and racial and ethnic groups (30). Personal safety and security — both real and perceived — are also important constructs to consider when designing activity-friendly communities (31). A recent meta-analysis found that levels of both objectively measured crime rates and subjectively measured safety concerns were associated with reduced physical activity (32).

Through funding and technical assistance, CDC is supporting communities to implement these physical activity supports. Three funding programs — State Physical Activity and Nutrition, High Obesity Program, and Racial and Ethnic Approaches to Community Health (33) — currently support 71 states and municipalities in their efforts to promote health, prevent chronic diseases, and reduce racial and ethnic health disparities. For example, High Obesity Program recipients have renovated community parks (34) and installed crosswalks and speed bumps to encourage safe walking and bicycling to everyday destinations (35). Both are strategies endorsed by CDC's Active People, Healthy Nation initiative (36).

The increased prevalence of many zoning codes and other activity-friendly design features is encouraging, although the presence of a policy does not guarantee successful implementation. To establish intervention priorities and to operationalize policies, community members should be engaged throughout the process, from identifying their most salient needs to monitoring their implementation. Members with different concerns, access, and barriers to physical activity need to be included in these conversations. For example, the Community Preventive Services Task Force's *Implementation Resource Guide* emphasizes the importance of disability inclusion, whereby people who use wheelchairs help identify what facilitates or hinders rolling (37). Because physical activity interventions can have broad effects on residents across age and income levels, ensuring community engagement in planning, delivering, and maintaining the intervention can also help foster civic engagement and social cohesion. Additional barriers to implementation should also be considered, including budget and training constraints and performance metrics that favor motor vehicles over other road users (38–40).

Strengths and limitations

To the best of our knowledge, CBS HEAL is the only nationally representative survey of municipal policies that support healthy eating and active living. Nonetheless, it has some limitations, which may be reflected in the results of our study. Questions may be open to interpretation, and responses may not accurately reflect municipal code. Differences in reporting may vary according to community sociodemographic characteristics. In the 2014 survey, smaller and more rural municipalities less accurately reported Complete Streets policies, compared with the National Complete Streets Coalition's database (7). A minor methodologic change between the 2014 and 2021 surveys could introduce another potential source of outcome misclassification bias. Principal respondents in both administrations were encouraged to contact colleagues as needed for survey completion; however, the 2021 survey streamlined that process by providing a "nominate" button on each module. Given similar frequency of "don't know" responses in both surveys, combined with unremarkable results from the sensitivity analyses, we suspect this change did not substantially alter our findings. Survey administration in 2021, during the COVID-19 pandemic, also may have affected responses regarding shared use agreements. Finally, despite weighting the results for sampling design and nonresponse, some residual bias may exist from the lower response rate.

Conclusion

Opportunities for physical activity can be enhanced through policy and community design interventions (3). Municipalities with these policies are situated to cultivate activity-friendly environments, the benefits of which may extend beyond personal health to a stronger local economy, cleaner air quality, and greater community development (4). Findings from CBS HEAL 2021 showed that prevalence of many municipal supports for physical activity was higher in 2021 than in 2014. Nonetheless, disparities by population size and education level widened for Complete Streets policies and some zoning codes supportive of physical activity. US municipalities can consider adopting activity-friendly zones, parks and outdoor recreation policies and budgets, design standards, Complete Streets policies, and shared use agreements to improve access to safe environments for physical activity for people of all ages and abilities.

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References

1. US Department of Health and Human Services. Physical activity guidelines for Americans. 2nd edition. US Department of Health and Human Services; 2018.
2. Frieden TR. A framework for public health action: the health impact pyramid. Am J Public Health 2010;100(4):590–5.
3. Community Preventive Services Task Force. Physical activity: built environment approaches combining transportation system interventions with land use and environmental design. Updated April 28, 2017. Accessed July 26, 2022. https://www.thecommunityguide.org/sites/default/files/assets/PA-Built-Environments.pdf
4. Young DR, Cradock AL, Eyler AA, Fenton M, Pedroso M, Sallis JF, et al; American Heart Association Advocacy Coordinating Committee. Creating built environments that expand active transportation and active living across the United States: a policy statement from the American Heart Association. Circulation 2020;142(11):e167–83.
5. Centers for Disease Control and Prevention. Community-based survey of supports for healthy eating and active living. Accessed June 13, 2023. https://www.cdc.gov/nccdphp/dnpao/division-information/data-stats/cbs-heal/index.html
6. Omura JD, Carlson SA, Paul P, Sliwa S, Onufrak SJ, Fulton JE. Shared use agreements between municipalities and public schools in the United States, 2014. Prev Med 2017;95(suppl):S53–9.
7. Carlson SA, Paul P, Kumar G, Watson KB, Atherton E, Fulton JE. Prevalence of Complete Streets policies in U.S. municipalities. J Transp Health 2017;5:142–50.
8. Peterson EL, Carlson SA, Ussery EN, Dunn I, Brown DR, Galuska DA. Differences in park plans and policies across US municipalities. J Park Recreat Admi 2021;39(4):81–94.
9. Peterson EL, Carlson SA, Schmid TL, Brown DR, Galuska DA. Supporting active living through community plans: the association of planning documents with design standards and features. Am J Health Promot 2019;33(2):191–8.
10. US Census Bureau. Surveys and programs. Tables. Updated October 8, 2021. Accessed Mar 17, 2023. https://www.census.gov/programs-surveys/cog/data/tables.html
11. Centers for Disease Control and Prevention. Community Based Survey of Supports for Healthy Eating and Active Living (CBS HEAL). Last reviewed August 31, 2022, Accessed March 17, 2023. https://www.cdc.gov/nccdphp/dnpao/division-information/data-stats/cbs-heal/index.html
12. US Census Bureau. 2010 Urban area relationship files. Updated February 28, 2022. Accessed December 29, 2022. https://www.census.gov/geographies/reference-files/2010/geo/relationship-files.html#par_list

13. US Census Bureau. Census regions and divisions of the United States. Accessed July 26, 2022. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf
14. US Census Bureau. American Community Survey (ACS). Updated March 11, 2022. A ccessed Mar 17, 2023. https://www.census.gov/programs-surveys/acs/
15. US Census Bureau. American Community Survey and Puerto Rico community survey: 2020 subject definitions. Accessed July 26, 2022. https://www2.census.gov/programs-surveys/acs/tech_docs/subject_definitions/2020_ACSSubjectDefinitions.pdf
16. Smart Growth America. Complete Streets policy adoption. Updated June 18, 2021. Accessed July 26, 2022. https://smartgrowthamerica.org/wp-content/uploads/2021/09/CS-policies-2000-2020.pdf
17. US Department of Transportation, Federal Highway Administration. Small town and rural multimodal networks. December 2016. Accessed July 26, 2022. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf
18. US Department of Transportation, Federal Highway Administration. Moving to a Complete Streets design model: a report to Congress on opportunities and challenges. March 2022. Accessed July 26, 2022. https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-03/Complete%20Streets%20Report%20to%20Congress.pdf
19. US Department of Health and Human Services. Step It Up! The Surgeon General's call to action to promote walking and walkable communities. Office of the Surgeon General; 2015.
20. Liu JH, Jones SJ, Sun H, Probst JC, Merchant AT, Cavicchia P. Diet, physical activity, and sedentary behaviors as risk factors for childhood obesity: an urban and rural comparison. Child Obes 2012;8(5):440–8.
21. Trivedi T, Liu J, Probst J, Merchant A, Jhones S, Martin AB. Obesity and obesity-related behaviors among rural and urban adults in the USA. Rural Remote Health 2015;15(4):3267.
22. Chriqui JF, Leider J, Thrun E, Nicholson LM, Slater S. Communities on the move: pedestrian-oriented zoning as a facilitator of adult active travel to work in the United States. Front Public Health 2016;4:71.
23. Chriqui JF, Nicholson LM, Thrun E, Leider J, Slater SJ. More active living-oriented county and municipal zoning is associated with increased adult leisure time physical activity-United States, 2011. Environ Behav 2016;48(1):111–30.
24. Soto GW, Whitfield GP, Webber BJ, Omura JD, Chen TJ, Zaganjor H, et al. Traffic as a barrier to walking safely in the United States: Perceived reasons and potential mitigation strategies. Prev Med Rep 2022;30:102003.
25. Chriqui JF, Leider J, Thrun E, Nicholson LM, Slater SJ. Pedestrian-oriented zoning is associated with reduced income and poverty disparities in adult active travel to work, United States. Prev Med 2017;95 (Suppl):S126-33.
26. Whitfield GP, Carlson SA, Ussery EN, Watson KB, Berrigan D, Fulton JE. National-level environmental perceptions and walking among urban and rural residents: Informing surveillance of walkability. Prev Med 2019;123:101–8.
27. Centers for Disease Control and Prevention. The Active Communities Tool (ACT) assessment modules: an action planning guide and assessment modules to improve community built environments to promote physical activity. September 2019. Accessed July 29, 2022. https://www.cdc.gov/physicalactivity/community-strategies/active-communities-tool/active-communities-toolkit-form-h.pdf
28. Community Preventive Services Task Force. Physical activity: park, trail, and greenway infrastructure interventions when combined with additional interventions. July 2021. Accessed July 26, 2022. https://www.thecommunityguide.org/findings/physical-activity-park-trail-greenway-infrastructure-interventions-combined-additional-interventions
29. ChangeLabSolutions. Shared use playbook. 2018. Accessed July 26, 2022. https://www.changelabsolutions.org/sites/default/files/SharedUsePlaybook-FINAL_20181128.pdf
30. Dsouza N, Serrano N, Watson KB, McMahon J, Devlin HM, Lemon SC, et al. Exploring residents' perceptions of neighborhood development and revitalization for active living opportunities. Prev Chronic Dis 2022;19:E56.
31. Cradock AL, Buchner D, Zaganjor H, Thomas JV, Sallis JF, Rose K, et al. Priorities and indicators for economic evaluation of built environment interventions to promote physical activity. J Phys Act Health 2021;18(9):1088–96.
32. Rees-Punia E, Hathaway ED, Gay JL. Crime, perceived safety, and physical activity: A meta-analysis. Prev Med 2018;111:307–13.
33. Centers for Disease Control and Prevention. Division of Nutrition, Physical Activity, and Obesity. Local programs. Accessed June 13, 2023. https://www.cdc.gov/nccdphp/dnpao/state-local-programs/index.html
34. Centers for Disease Control and Prevention. CDC funding in action: park updates promote physical activity for tribal nation. Accessed July 26, 2022. https://nccd.cdc.gov/nccdsuccessstories/TemplateCDC.aspx?s=17630&ds=1
35. Centers for Disease Control and Prevention. Arkansas town makes strides to create safe streets for walking and cycling. Accessed July 26, 2022. https://nccd.cdc.gov/nccdsuccessstories/TemplateThree.aspx?s=15008&ds=1

36. Centers for Disease Control and Prevention. Active people, healthy nation: tools for action. Updated February 3, 2022. Accessed July 26, 2022. https://www.cdc.gov/physicalactivity/activepeoplehealthynation/everyone-can-be-involved/index.html
37. Community Preventive Services Task Force. Implementation resource guide. Updated January 2018. Accessed March 14, 2023. https://www.cdc.gov/physicalactivity/downloads/built-environment-implementation-resource-guide.pdf
38. Porter JM, Rathbun SL, Bryan SJ, Arseniadis K, Caldwell LP, Corso PS, et al. Law accommodating nonmotorized road users and pedestrian fatalities in Florida, 1975 to 2013. Am J Public Health. 2018;108(4):525–31.
39. Litt JS, Reed HL, Tabak RG, Zieff SG, Eyler AA, Lyn R, et al. Active living collaboratives in the United States: understanding characteristics, activities, and achievement of environmental and policy change. Prev Chronic Dis 2013;10:E19.
40. Dodson EA, Langston M, Cardick LC, Johnson N, Clayton P, Brownson RC. "Everyone should be able to choose how they get around": how Topeka, Kansas, passed a complete streets resolution. Prev Chronic Dis 2014;11:E25.

Tables

Table 1. Analysis of Physical Activity Support Questions, Community-Based Survey of Supports for Healthy Eating and Active Living (CBS HEAL), 2014 and 2021[a]

Feature	Question[a]
Zoning codes design and development guidelines	
Variable	Does your local government include the following features in policies for development, including zoning codes design/ development guidelines that
Block size	Require short to medium pedestrian-scale block sizes?
Continuous sidewalks	Require continuous sidewalk coverage?
Sidewalk width	Require minimum sidewalk widths of 5 feet?
Building orientation	Require buildings to be oriented to pedestrian scale (eg, entrances or windows face the street, reduced front setbacks)?
Pedestrian amenities	Require pedestrian amenities such as trees or furniture along the street?
Allow mixed land uses	Allow mixed land uses (eg, zoning that combines residential land use with one or more commercial, institutional, or public land uses)?
Policies or budget provisions related to parks or outdoor recreation areas	
Variable	Does your local government have policies or budget provisions related to parks or outdoor recreation areas, such as
Lighting	Lighting in parks or outdoor recreation areas?
Patrols	Patrols by police or security in parks or outdoor recreation areas?
Maintenance	Maintenance of green space and equipment?
Dog leashes	Prohibition of unleashed or unrestrained dogs in parks and outdoor recreation areas (excluding dog parks)?
Design standards, guidelines, and policies	
Variable	Does your local government have design standards, guidelines, or policies that require
Roadway expansion	Installation of dedicated bicycle infrastructure for roadway expansion projects or when retrofitting streets?
Bicycle space reservation	Developers to reserve space for use by the local jurisdiction for development of bicycle infrastructure?
Traffic-calming features	Traffic-calming features (eg, speed bumps, reduced speed zones, signal modifications) that increase roadway safety in areas with high pedestrian and bicycle volume (not including school zones)?
Other supports	
Complete Streets policy	Does your local government have a formal Complete Streets policy, as defined by the National Complete Streets Coalition, for designing and operating streets with safe access for all users?
Shared use agreement	Has your local government adopted a joint or shared use agreement or memorandum of understanding with any school that allows the public to use school recreational facilities (eg, gymnasiums, athletic fields, playgrounds) during nonschool hours?

[a] Centers for Disease Control and Prevention. Community-based survey of supports for healthy eating and active living (5). Response options were “yes,” “no,” or “don’t know”; shared use agreement also included the option of “our municipality does not have schools in our jurisdiction.”

Table 2. Characteristics of US Municipalities, Community-Based Survey of Supports for Healthy Eating and Active Living, 2014 and 2021[a]

Characteristic	2014 N (weighted %)	2021 N (weighted %)	*P* value[b]
All	2,009 (100.0)	1,882 (100.0)	NA
Population, no.			
1,000–2,499	717 (35.0)	641 (33.9)	.80
2,500–49,999	1,151 (58.2)	1,093 (59.1)	
≥50,000	141 (6.9)	148 (7.0)	
Urban status			
Urban[c]	1,372 (69.9)	1,280 (70.0)	.97
Rural	637 (30.1)	602 (30.0)	
Census region			
Northeast	232 (14.5)	278 (13.7)	.92
Midwest	742 (35.1)	631 (35.2)	
South	703 (36.1)	540 (36.3)	
West	332 (14.3)	433 (14.7)	
Racial or ethnic composition			
>50% non-Hispanic White	1,742 (86.6)	1,578 (83.6)	.009
≤50% non-Hispanic White	267 (13.4)	304 (16.4)	
Educational attainment			
≤High school graduate	888 (44.5)	569 (32.3)	<.001
≥Some college	1,121 (55.5)	1,313 (67.7)	
Poverty prevalence			
High (≥20%)	610 (30.4)	380 (21.3)	<.001
Low (<20%)	1,399 (69.6)	1,502 (78.7)	

Abbreviation: NA, not applicable.
[a] Centers for Disease Control and Prevention. Community-based survey of supports for healthy eating and active living (5). Based on municipalities that responded "yes," "no," or "don't know" for all 15 policy and community design supports.
[b] Based on the Wald χ^2 test.
[c] Defined as more than 50% of the population residing within a census-designated urban area.

Table 3. Prevalence, Prevalence Differences, and Prevalence Ratios of Policies and Community Design Supports for Physical Activity Among US Municipalities, Community-Based Survey of Supports for Healthy Eating and Active Living, US, 2014 and 2021[a]

Variable	2014 (n = 2,009) Prevalence (95% CI)[b]	2021 (n = 1,882) Prevalence (95% CI)[b]	Prevalence difference (95% CI)[c]	Prevalence ratio (95% CI)[d]
Zoning codes design and development guidelines				
Block size	14.2 (12.8 to 15.8)	20.9 (19.1 to 22.8)	6.6 (4.2 to 9.0)	1.46 (1.27 to 1.69)
Continuous sidewalks	40.1 (38.0 to 42.3)	45.7 (43.4 to 48.0)	5.5 (2.4 to 8.7)	1.14 (1.06 to 1.23)
Sidewalk width	43.9 (41.8 to 46.1)	52.2 (49.9 to 54.5)	8.3 (5.1 to 11.5)	1.19 (1.11 to 1.27)
Building orientation	38.7 (36.6 to 40.8)	42.0 (39.7 to 44.3)	3.3 (0.1 to 6.4)	1.08 (1.00 to 1.17)
Pedestrian amenities	33.6 (31.6 to 35.7)	38.6 (36.4 to 40.9)	5.0 (1.9 to 8.1)	1.15 (1.05 to 1.25)
Allow mixed land uses	69.0 (67.0 to 71.0)	70.2 (68.0 to 72.3)	1.2 (−1.8 to 4.1)	1.02 (0.97 to 1.06)
Policies or budget provisions related to parks or outdoor recreation areas				
Lighting	78.1 (76.2 to 79.9)	76.4 (74.4 to 78.4)	−1.7 (−4.4 to 1.0)	0.98 (0.95 to 1.01)
Patrols	84.6 (83.0 to 86.1)	75.6 (73.5 to 77.6)	−9.0 (−11.5 to −6.4)	0.89 (0.87 to 0.92)
Maintenance	86.9 (85.3 to 88.3)	86.0 (84.2 to 87.5)	−0.9 (−3.1 to 1.3)	0.99 (0.96 to 1.02)
Dog leashes	87.3 (85.8 to 88.7)	84.0 (82.2 to 85.7)	−3.3 (−5.6 to −1.0)	0.96 (0.94 to 0.99)
Design standards, guidelines, and policies				
Roadway expansion	27.2 (25.4 to 29.2)	32.4 (30.4 to 34.6)	5.2 (2.3 to 8.1)	1.19 (1.08 to 1.31)
Bicycle space reservation	18.7 (17.1 to 20.5)	22.6 (20.7 to 24.5)	3.8 (1.3 to 6.4)	1.21 (1.06 to 1.36)
Traffic-calming features	49.5 (47.3 to 51.7)	51.3 (49.0 to 53.6)	1.8 (1.4 to 5.0)	1.04 (0.97 to 1.10)
Other supports				
Complete Streets policy	25.0 (23.2 to 27.0)	25.9 (23.9 to 27.9)	0.9 (−1.9 to 3.6)	1.03 (0.93 to 1.15)
Shared use agreement[e]	43.5 (41.3 to 45.7)	37.6 (35.4 to 40.0)	−5.9 (−9.1 to −2.6)	0.87 (0.80 to 0.94)

[a] Centers for Disease Control and Prevention. Community-based survey of supports for healthy eating and active living (5).
[b] Weighted prevalence, with "don't know" recorded as "no."
[c] Unadjusted prevalence difference (absolute change) from 2014 to 2021.
[d] Unadjusted prevalence ratio (relative change) comparing 2021 to 2014 referent group.
[e] Only municipalities with schools were included (2014, n = 1,915; 2021, n = 1,768).

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ORIGINAL RESEARCH

Changes in Policy Supports for Healthy Food Retailers, Farmers Markets, and Breastfeeding Among US Municipalities, 2014–2021: National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL)

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PEER REVIEWED

Summary

What is already known on this topic?

Local governments can use policies and practices to facilitate healthy nutrition and breastfeeding to help prevent chronic disease.

What is added by this report?

Between 2014 and 2021, the percentage of governments reporting policies to support healthy food retail in supermarkets, corner stores, and farmers markets did not substantially increase; however, some policies to support breastfeeding among government employees increased significantly.

What are the implications for public health practice?

Opportunities exist to improve municipal-level policies that support healthy eating and breastfeeding among community residents and employees.

Abstract

Introduction

Policies and practices at the local level can help reduce chronic disease risk by providing environments that facilitate healthy decision-making about diet.

Methods

We used data from the 2014 and 2021 National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living to examine prevalence among US municipalities of policies to support access to healthier food in supermarkets, convenience stores, and farmers markets, as well as policies to support breastfeeding among government employees. Chi-square tests were conducted to compare prevalence estimates from 2021 to 2014 overall and according to municipal characteristics.

Results

In 2021, 29% of municipalities had at least 1 policy to encourage full-service grocery stores to open stores, which was not significantly different from 31% in 2014. Prevalence of having at least 1 policy to help corner stores sell healthier foods declined significantly from 13% in 2014 to 9% in 2021. Prevalence of policies providing all local government employees who were breastfeeding breaktime and space to pump breast milk increased significantly from 25% in 2014 to 52% in 2021. The percentage of municipalities that provided 8 or more weeks of paid maternity leave for employees increased significantly from 16% in 2014 to 19% in 2021.

Conclusion

Prevalence of supports for supermarkets, convenience stores, and farmers markets generally did not increase among US municipalities from 2014 to 2021, while some supports for breastfeeding among municipal employees increased during this time. Opportunities exist to improve municipal-level policies that support healthy eating and breastfeeding among community residents and employees.

Introduction

The environments in which people live, learn, work, and play influence their ability to consume nutritious foods, access safe places for physical activity, and engage in other health-promoting behaviors, such as breastfeeding (1). These behaviors can reduce risk for chronic health conditions, including obesity, high blood pressure, type 2 diabetes, and certain cancers (2,3). Furthermore, breastfeeding confers short- and long-term health benefits for both mothers and infants (4). Policies and practices at the local, state, and federal levels can help improve nutritional risk factors for health by providing environments that facilitate healthy decision making (1). In 2009, the Institute of Medicine (IOM) and Centers for Disease Control and Prevention (CDC) released recommended strategies for communities and municipalities to prevent obesity and related chronic diseases through facilitating healthy eating, breastfeeding, and physical activity among residents (5,6). Some of these strategies include policies and practices aimed at increasing community access to healthy foods for supermarkets, convenience stores, and farmers markets. For example, local governments may encourage supermarkets to open in underserved areas, encourage existing corner or convenience stores to stock healthier foods, or facilitate access to farmers markets by streamlining operational processes or providing technical assistance, loans, or grants (5,6). Other recommended strategies promote and support optimal breastfeeding practices in the community and in government worksites (5,6). These strategies include policies to provide paid maternity leave to municipal employees and to permit breaktime and private spaces for breastfeeding employees to pump breast milk while at work (5,6).

Although many studies have examined and evaluated individual policies that aimed to improve access to healthy foods and support breastfeeding, less information exists on how commonly these policies and practices are found across the US. To ascertain the prevalence of policies and practices that support healthy eating, physical activity, and breastfeeding among US municipalities, CDC conducted a survey of municipal governments in 2014, the National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL). Using a nationally representative sample of US municipalities with a population of 1,000 or more, the CBS-HEAL study examined municipal policies and practices to support healthy eating and active living, including many recommended by IOM and CDC (5,6). Using data from CBS-HEAL, Lange et al found that two-thirds (67%) of US municipalities reported that they provided support for local farmers markets, while fewer provided support for supermarkets (34%) or convenience or corner stores (14%) (7). Of note, these healthy food retail policies were more common in larger municipalities (≥50,000 people) (7). These national data were important to set benchmarks, and they substantiated the notion that some local governments have taken action. They also suggested opportunities for municipalities to better support healthy decision making among community residents and employees.

In 2021, CDC conducted a second administration of CBS-HEAL using a similar sample design and survey items to the 2014 CBS-HEAL survey to enable comparisons and monitoring of progress in communities over time. Our analysis aimed to 1) document the national prevalence of municipal-level efforts to support healthy food retail (supermarkets, corner stores, and farmers markets) in communities and breastfeeding for government employees in 2021, overall and by municipality characteristics; and 2) compare the prevalence estimates from 2021 to the estimates from 2014.

Methods

Study design and population

The 2014 and 2021 CBS-HEAL surveys are nationally representative surveys of US municipalities with populations of 1,000 or more; similar sampling methods were used for both surveys. The sampled municipalities for 2014 and 2021 were drawn from the 2007 and 2017 US Census of Governments respectively, which were the most recent available at the time of each survey. The surveys used explicitly stratified sampling by US Census region (Northeast, Midwest, South, and West) and urban/rural status, which was defined on the basis of proportion of a Census place's population that resides within a Census-designated urban area. Further implicit stratification, performed by sorting by population size, was also used in each stratum to ensure that small, medium, and large municipalities from each stratum were included in the sample. The survey was sent to the city or town manager, city planner, city administrator, or someone in a similar role in each municipality who could complete the survey through an electronic module or, if requested, paper- or interviewer-administered telephone survey. In 2014, 4,484 municipalities were sampled and 2,029 completed the survey, and in 2021, 4,417 municipalities were sampled and 1,982 completed the survey, both of which correspond to a response rate of 45%. Most (>80%) completed the survey via web. More information about the survey can be found at www.cdc.gov/nccdphp/dnpao/division-information/data-stats/cbs-heal/index.html. For this study, municipalities with missing data on any of the healthy food retail supports examined (n = 90; 35 from 2014 and 55 from 2021) or missing data on breastfeeding supports (n = 57; 15 from 2014 and 42 from 2021) were excluded from analyses of those variables.

Variables

We examined policies and practices to support access to healthier foods in supermarkets, convenience stores, and farmers markets as well as policies to support government employee breastfeeding (Box). These policies were included on both the 2014 and 2021 surveys using very similar questions. In the context of this study, "policy supports" may encompass a range of policies, regulations, guidelines, programs, or practices to capture the diverse approaches municipal governments may take to support healthy nutrition in the framework of their local government.

Box. Municipal Policies and Practices that Support Access to Healthy Foods in Supermarkets, Convenience Stores, and Farmers Markets and Policies to Support Breastfeeding Among Municipal Employees, Community-Based Policy and Environmental Supports for Healthy Eating and Active Living Survey, 2014 and 2021

Policies and practices to encourage supermarkets or full-service grocery stores to open stores

- Tax incentives
- Grant or loan programs
- Programs to link store openings to broader revitalization projects
- [If Yes to Any Above] Do any of these policies or programs used by your community to encourage supermarkets and other full-service grocery stores to open stores explicitly prioritize low-income or under-resourced areas?

Policies and practices to help convenience or corner stores sell healthier foods

- Grant or low-interest loan programs to purchase equipment for storage or sales of healthful food
- Technical assistance or training programs to increase the ability to sell healthier foods
- Programs to link stores to broader neighborhood revitalization projects
- [If Yes] Do any of these policies or programs used to help convenience or corner stores sell healthier foods explicitly prioritize low-income or under-resourced areas?

Policies and practices related to farmers' markets, farm stands, or green/produce carts

- Allow vendors to sell fresh produce on city-owned property
- Streamline processes for obtaining health or food safety permits and licenses
- Extend waivers of required business permits or retail licensing fees or taxes
- Provide funds or in-kind services for personnel, signage, or advertising
- Provide funding for Electronic Benefits Transfer (EBT) machines or provide technical assistance on how to obtain or use EBT machines

Municipal characteristics were derived from the 2013 and 2020 American Community Survey 5-year estimates (8). Characteristics included population size (1,000–2,499, 2,500–49,999, or ≥50,000), rural/urban status (based on whether ≥50% of population for a municipality resides in an urbanized area), US Census region (Northeast, Midwest, South, or West) (9), median educational attainment (≥some college or ≤high school graduate), percentage of the population living below the federal poverty level (<20% or ≥20%) to reflect persistent poverty as defined by the US Department of Agriculture (10), and racial/ethnic composition of the municipality (>50% non-Hispanic White or ≤50% non-Hispanic White).

Analyses

The prevalence and 95% CI of each policy support for supermarkets, convenience stores, farmers markets, and employee breastfeeding was estimated for 2014 and 2021 using SAS survey procedures (SAS Institute) to account for design variables, nonresponse, and sample weights. We also assessed the prevalence of having at least 1 of any of the policy supports for each of the 3 domains: supermarkets, convenience stores, and farmers markets. Chi-square tests were used to compare prevalence between survey years with $P < .05$ set as significance. Among municipalities that reported at least 1 policy support for supermarkets or convenience stores, we also assessed the percentage of municipalities that indicated that the policy prioritized low-income or under-resourced areas and compared 2014 and 2021 prevalence using χ^2 tests.

Finally, we assessed prevalence of having at least 1 policy support for each of the 3 retail domains (supermarkets, convenience stores, and farmers markets) and breastfeeding supports according to municipal characteristics. Chi-square tests were performed to assess whether prevalence of each policy support differed between 2014 and 2021 for each level of municipal characteristic (eg, comparing the prevalence of any paid maternity leave between 2014 and 2021 among municipalities in the South).

For this study, municipalities who responded "don't know" for a specific policy support were classified as having responded "no." The median percentage of "don't know" responses across all policies examined was 8.4% (range, 6.0% ["Technical assistance or training programs to increase the ability to sell healthier foods" in convenience or corner stores] to 21.6% ["Does your local government have a policy that allows ALL (salaried and hourly) local government employees breaktime and space to pump breast milk?"]). To investigate the potential impact of differing patterns of "don't know" responses between survey years on results, we also performed sensitivity analyses where "don't know" responses were excluded from calculations of overall prevalences and related statistical tests.

Results

No significant differences were found between the 2014 and 2021 CBS-HEAL samples according to population size, rural/urban status, or Census region (Table 1). In both years, approximately one-third of municipalities had a population of 1,000 to 2,499; 58% to 59% had a population of 2,500 to 49,999; 7% had a population of 50,000 or more; and approximately one-quarter were rural. Regarding region, 14% to 15% of municipalities were in the Northeast, 35% were in the Midwest, 36% were in the South, and 15% were in the West. The 2014 and 2021 samples differed significantly in terms of education, poverty, and race and ethnicity. Compared with the 2014 sample, the 2021 sample had a higher percentage of municipalities whose residents had some college education (67.7% vs 55.4%, $P < .01$), a smaller percentage of municipalities with poverty prevalence of 20% or more (21.5% vs 30.4%, $P < .01$), and a greater percentage of municipalities that were 50% or less non-Hispanic White (16.3% vs 13.4%, $P = .01$).

Prevalence of approaches to encourage supermarkets or full-service grocery stores to open did not significantly change between 2014 and 2021, and approximately 30% of municipalities reported at least 1 support during both survey years (Table 2). The most commonly reported support in this domain was tax incentives, which were reported by 21.8% of municipalities in 2021 and 20.5% of municipalities in 2014. In 2021, 19.5% of municipalities with supermarket policies explicitly prioritized low-income or under-resourced areas as part of their policies, not significantly different than 15.8% in 2014 (data not shown).

Supports to help convenience or corner stores sell healthier foods were less commonly reported than supermarket supports, and the percentage of municipalities reporting at least 1 convenience store support decreased from 13.4% in 2014 to 8.6% in 2021 (Table 2). Programs to link convenience or corner store improvements to broader neighborhood revitalization projects were the most common convenience store support in 2021 (5.6%) but had decreased significantly from 2014 (10.5%). In 2021, 28.9% of municipalities with convenience or corner store policies explicitly prioritized low-income or under-resourced areas as part of their policies, a prevalence not significantly different from 21.4% in 2014 (data not shown).

Supports for farmers markets were the most commonly reported domain in both 2014 and 2021 although the prevalence of at least 1 farmers market support decreased significantly from 64.3% to 60.1% during that time (Table 2). Allowing vendors to sell fresh produce on city-owned property was the most commonly reported support in this domain but decreased from 59.6% in 2014 to 54.5% in 2021 ($P < .01$). Streamlining processes for obtaining health and food safety permits and licenses was the second most common farmers market support and increased ($P < .01$) from 18.7% to 22.4% between survey years. Among municipalities with farmers markets, the proportion that provided funding or technical assistance to farmers markets for electronic benefits transfer (EBT) increased from 7.5% in 2014 to 11.2% in 2021 ($P < .01$).

From 2014 to 2021, the percentage of municipalities with a policy allowing all government employees who were breastfeeding break time and space to pump breast milk more than doubled from 25.2% to 52.1% ($P < .001$) (Table 2). Although the prevalence of municipalities offering any paid maternity leave to employees did not significantly change from 2014 to 2021 (37.4% vs 38.5%), the percentage of those who offered 8 or more weeks of paid maternity leave increased from 15.5% to 18.9% ($P = .01$). However, the percentage of municipalities that provided ≥12 weeks did not significantly increase and remained between 2% and 3%.

Overall, the prevalence of having at least 1 supermarket, convenience store, and farmers market support policy remained stable or somewhat declined from 2014 to 2021 across municipality characteristics (Table 3). Significant decreases from 2014 to 2021 in the prevalence of having at least 1 supermarket policy were observed among medium-sized municipalities (33.6% to 29.2%, $P = .03$), Northeastern municipalities (23.8% to 16.2%, $P = .03$), municipalities with higher median educational attainment (31.3% to 27.5%, $P = .047$), and those with lower poverty prevalence (30.8% to 26.9%, $P = .03$). Regarding convenience store policies, significant declines over time were observed in small- (8.5% to 5.3%, $P = .02$) and medium-sized municipalities (14.3% to 9.0%, $P < .01$), urban municipalities (14.9% to 9.6%, $P < .01$), and in each Census region except the Northeast. Declines were also observed among those with both high and lower median educational attainment, high and lower poverty prevalence, and in both majority and minority non-Hispanic White municipalities. Farmers market supports decreased among medium sized municipalities (69.7% to 63.4%, $P < .01$), urban municipalities (66.5% to 61.4%, $P = .01$), municipalities with higher median educational attainment (65.3% to 60.7%, $P = .02$), and in majority non-Hispanic White municipalities (64.4% to 60.1%, $P = .01$).

Regarding breastfeeding policy supports, providing any paid maternity leave to all government employees increased only among large municipalities (41.1% to 53.2%, $P = .04$) (Table 4). Providing 8 or more weeks paid maternity leave increased among urban municipalities (17.3% to 21.3%, $P = .01$), Northeastern municipalities (12.2% to 19.6%, $P = .03$), those with higher poverty prevalence (14.9% to 21.7%, $P = .01$), and those where most of the population was not non-Hispanic White (15.1% to 18.1%, $P = .02$). Providing 12 or more weeks paid maternity leave increased only in the West (3.0% to 7.8%, $P = .01$). Regarding policies to provide

breaktime and space to pump breast milk, significant increases in prevalence between 2014 and 2021 were observed across all municipal characteristics. For example, prevalence more than tripled among small municipalities (13.2% to 42.3%, $P < .01$), while substantial increases were also observed among both medium (29.2% to 55.5%, $P < .01$) and large municipalities (52.6% to 71.7%, $P < .01$). Likewise, prevalence more than doubled in every Census region except the West, which still increased substantially from 45.1% to 67.3%.

In sensitivity analyses (not shown) where "don't know" responses were excluded from overall prevalence estimates and χ^2 tests, results remained similar with a few exceptions. Specifically, tax incentives to encourage supermarket openings increased significantly from 18.7% in 2014 to 22.4% in 2021 ($P = .02$). Two previously significant declines in prevalence from 2014 to 2021 were no longer significant: technical assistance or training programs to increase the ability to sell healthier foods in convenience stores (2.8% vs 2.5%; $P = .64$) and the prevalence of 1 or more policies to support farmers markets (62.9% vs 59.6%; $P = .07$).

Discussion

Our findings suggest that municipal-level policy supports for healthy food retail in supermarkets, convenience stores, and farmers markets did not increase in prevalence between 2014 and 2021, with prevalence of most policies remaining either unchanged or decreasing slightly. However, prevalence of policy supports for government employees who were breastfeeding increased substantially during the same time. In particular, the prevalence of policies to allow all breastfeeding employees time and space to pump breast milk doubled from approximately one-quarter of municipalities in 2014 to more than half in 2021 with significant increases observed across municipalities of all sizes and regions. Furthermore, the percentage of municipalities that offered 8 or more weeks of maternity leave increased significantly overall.

Our findings on the prevalence of healthy food retail policies suggest that the motivation to implement such policies may have waned or been surpassed by other policy priorities since 2014. For example, during 2020 and 2021, many local governments were likely occupied by responding to the COVID-19 pandemic, making food access policies through retail venues less of a priority (11). It is also possible that local governments may have been seeking different types of policies to improve access to healthy food. For example, it has been posited that focusing only on the distance to supermarkets and the need for more supermarkets may oversimplify the concept of access, which also encompasses transportation and the economic means to purchase healthy foods (12). In addition, evaluations of corner store initiatives have demonstrated mixed effectiveness in increasing fruit and vegetable availability, purchasing, or consumption (13,14). Reviews of the evidence evaluating efforts to increase supermarket access also suggest that such efforts may be of limited effectiveness (15). Nonetheless, evidence exists that encouraging supermarkets to open or remain open in food desert areas can provide access to healthy foods to local residents as well as employment and economic benefits to the local communities (16), and several studies have found modest effects of changes in supermarket or convenience store access on reducing children's weight gain in low-income urban settings (17,18). Furthermore, evidence exists that access to farmers markets may be associated with increased purchasing or consumption of fruits and vegetables (19,20). Taken together, improving access to healthy foods in the retail food environment may require more complex and comprehensive efforts rather than focusing on one type of store, and some organizations have proposed a systems approach to improve healthy food access in communities (21). Future studies may seek to examine how to better address and improve healthy food access in communities using such a systems approach.

Our study suggests that the prevalence of some policies that support breastfeeding among municipal employees increased between 2014 and 2021. Breastfeeding has numerous short- and long-term health benefits for both children and mothers (22), and the Dietary Guidelines for Americans 2020–2025 recommend exclusive breastfeeding for 6 months followed by continued breastfeeding to complement solid foods until age 1 or longer (2). Workplaces have been recognized as important settings to support breastfeeding among working mothers (23,24). Worksite interventions to support breastfeeding, including providing break time and a space for nursing mothers to breastfeed or pump breast milk, have demonstrated improved breastfeeding duration and exclusive breastfeeding outcomes (24). The Breaktime for Nursing Mothers provision under the Fair Labor Standard Act (Section 7 of the FLSA) requires employers to provide reasonable breaktime and a private space, other than a bathroom, for hourly employees to express breast milk for 1 year after a child's birth (25). While employees that fall within certain FLSA job categories (eg, executive, administrative, and professional employees) were not covered by this law, employers could have chosen to develop a policy that provides these benefits to all employees. Nonetheless, despite improvements observed in this study, only half of municipalities had such a policy in 2021, suggesting further room for improvement in supporting breastfeeding among local employees.

The prevalence of any paid maternity leave for all municipal employees only increased among large US municipalities but did not change significantly among US municipalities overall between 2014 and 2021, with approximately 37% to 39% of municipal

governments offering it to their employees. This finding is consistent with the 40% prevalence observed among US employers in general (26) and suggests that more than 60% of municipalities do not offer any paid maternity leave. The Family and Medical Leave Act requires covered employers to provide unpaid maternity or medical leave but does not require employers to provide paid maternity leave (27). We did observe an increase from 2014 to 2021 in the prevalence of municipalities offering 8 or more weeks of paid maternity leave, but still only approximately 1 in 5 municipalities offer this. Paid maternity leave has been associated with improved breastfeeding outcomes with further improvements observed with increased duration of maternity leave (28). One study showed a modest increase in exclusive breastfeeding at 6 months with 6 weeks or more of paid family leave (29). Additional studies showed that a shorter duration of breastfeeding was associated with leave, either paid or unpaid, of less than 12 weeks (30). In our study, only 2% to 3% of municipalities offered 12 or more weeks of paid maternity leave. Although increased prevalence was observed among municipalities in the West, prevalence among every subgroup of municipalities was less than 10%. Thus, there remains a large opportunity for municipal governments to improve this breastfeeding support for their employees.

The CBS-HEAL study is the only nationally representative survey of US municipalities regarding policies and practices that support healthy eating and active living. Nonetheless there are some limitations to our study. First, because the survey relies on self-report of the respondent, we are unable to confirm whether a reported policy exists officially or has been implemented. Second, approximately half of eligible municipalities participated in the study and although we accounted for nonresponse in our sample weights, it is possible that some nonresponse bias still exists. Third, the frequency of "don't know" responses ranged from 6% to 15% for food retail supports and was nearly 25% for the breastfeeding support policy for space and time to pump breast milk. Since we coded "don't know" as "no," it is likely that our prevalence estimates may underestimate the true prevalence of each policy because some municipalities that responded "don't know" may have such a policy. However, our sensitivity analysis suggests that overall changes in healthy food retail and breastfeeding support policies observed in this study are unlikely to be the result of changes in "don't know" responses between the 2 survey periods. Finally, because federal law already requires lactation accommodation for hourly employees, it is possible that local jurisdictions may accommodate all employees but have not written this into policy.

In conclusion, we found that the prevalence of healthy food retail supports for supermarkets, convenience stores, and farmers markets generally did not increase among US municipalities between 2014 and 2021, while policy supports for breastfeeding among municipal employees increased substantially during this time. Opportunities remain for municipalities to support healthy eating and breastfeeding among residents and employees.

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References

1. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health* 2010;100(4):590–5. doi:10.2105/AJPH.2009.185652
2. Dietary guidelines for Americans, 2020–2025. Washington (DC): US Department of Agriculture, US Department of Health and Human Services.
3. Physical activity guidelines for Americans. Washington (DC): US Department of Agriculture, US Department of Health and Human Services; 2018.
4. Centers for Disease Control and Prevention. Breastfeeding benefits both baby and mom. July 27, 2021. Accessed April 29, 2023. https://www.cdc.gov/nccdphp/dnpao/features/breastfeeding-benefits/index.html
5. Institute of Medicine, National Research Council Committee on Childhood Obesity Prevention Actions for Local Governments. Local government actions to prevent childhood obesity. Parker L, Burns AC, Sanchez E, editors. Washington (DC): National Academies Press; 2009.

6. Khan LK, Sobush K, Keener D, Goodman K, Lowry A, Kakietek J, et al; Centers for Disease Control and Prevention. Recommended community strategies and measurements to prevent obesity in the United States. *MMWR Recomm Rep* 2009;58(RR-7):1–26.
7. Lange SJ, Moore LV, Galuska DA. Local government retail incentives for healthier food retailers in the USA, 2014. *Public Health Nutr* 2019;22(13):2521–9. doi:10.1017/S1368980019000983
8. US Census Bureau. American Community Survey (ACS); 2022. Accessed April 29, 2023. https://www.census.gov/programs-surveys/acs
9. US Census Bureau. Geographic levels; 2021. Accessed April 29, 2023. https://www.census.gov/programs-surveys/economic-census/guidance-geographies/levels.html
10. US Department of Agriculture, Economic Research Service. Rural poverty and well-being; 2022. Accessed April 29, 2023. https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/
11. Kim CM, Fry V. Responses of municipal governments to the COVID-19 pandemic; 2021. Accessed April 29, 2023. https://www.boisestate.edu/bluereview/municipal-governments-covid19/
12. Defining low-income, low-access food areas (food deserts); 2021: Washington (DC): Congressional Research Service. Accessed April 29, 2023. https://crsreports.congress.gov/product/pdf/IF/IF11841
13. Ortega AN, Albert SL, Chan-Golston AM, Langellier BA, Glik DC, Belin TR, et al. Substantial improvements not seen in health behaviors following corner store conversions in two Latino food swamps. *BMC Public Health* 2016;16(1):389. doi:10.1186/s12889-016-3074-1
14. Paluta L, Kaiser ML, Huber-Krum S, Wheeler J. Evaluating the impact of a healthy corner store initiative on food access domains. *Eval Program Plann* 2019;73:24–32. doi:10.1016/j.evalprogplan.2018.11.004
15. Adam A, Jensen JD. What is the effectiveness of obesity related interventions at retail grocery stores and supermarkets? -a systematic review. *BMC Public Health* 2016;16(1):1247. doi:10.1186/s12889-016-3985-x
16. The Food Trust. HFFI impacts: the nationwide success of healthy food financing initiatives, a proven, economically sustainable solution. Accessed April 29, 2023. https://www.policylink.org/resources-tools/library/hffi-impacts-report
17. Ohri-Vachaspati P. Evidence that changes in community food environments lead to changes in children's weight: results from a longitudinal prospective cohort study. *J Acad Nutr Diet* 2021;121(3):419–34.
18. Rummo P, Sze J, Elbel B. Association between a policy to subsidize supermarkets in underserved areas and childhood obesity risk. *JAMA Pediatr* 2022;176(7):646–53. doi:10.1001/jamapediatrics.2022.1153
19. Jilcott Pitts SB, Hinkley J, Wu Q, McGuirt JT, Lyonnais MJ, Rafferty AP, et al. A possible dose–response association between distance to farmers' markets and roadside produce stands, frequency of shopping, fruit and vegetable consumption, and body mass index among customers in the Southern United States. *BMC Public Health* 2017;17(1):65. doi:10.1186/s12889-016-3943-7
20. Jilcott Pitts SB, Wu Q, Demarest CL, Dixon CE, Dortche CJ, Bullock SL, et al. Farmers' market shopping and dietary behaviours among Supplemental Nutrition Assistance Program participants. *Public Health Nutr* 2015;18(13):2407–14. doi:10.1017/S1368980015001111
21. Healthy Food Policy Project. Local laws and policies that promote access to healthy food: a food system crosswalk. Accessed April 29, 2023. https://healthyfoodpolicyproject.org/crosswalk
22. Meek JY, Noble L. Technical report: breastfeeding and the use of human milk. *Pediatrics* 2022;150(1):e2022057989. doi:10.1542/peds.2022-057989
23. Tang X, Patterson P, MacKenzie-Shalders K, van Herwerden LA, Bishop J, Rathbone E, et al. Workplace programmes for supporting breast-feeding: a systematic review and meta-analysis. *Public Health Nutr* 2021;24(6):1501–13. doi:10.1017/S1368980020004012
24. Vilar-Compte M, Hernández-Cordero S, Ancira-Moreno M, Burrola-Méndez S, Ferre-Eguiluz I, Omaña I, et al. Breastfeeding at the workplace: a systematic review of interventions to improve workplace environments to facilitate breastfeeding among working women. *Int J Equity Health* 2021;20(1):110. doi:10.1186/s12939-021-01432-3
25. US Department of Labor, Wage and Hour Division. Section 7(r) of the Fair Labor Standards Act — break time for nursing mothers provision. Accessed April 29, 2023. https://www.dol.gov/agencies/whd/nursing-mothers/law
26. Society for Human Resource Management. Parental, family leave programs see boost in 2023 SHRM Employee Benefits Survey; 2023. Accessed April 29, 2023. https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/shrm-2023-employee-benefits-survey-paid-parental-family-leave.aspx
27. US Department of Labor. Leave benefits: Family and medical leave (FMLA). 2022. Accessed July 10, 2023. https://www.dol.gov/general/topic/benefits-leave/fmla
28. Shumbusho DI, Kucera CW, Keyser EA. Maternity leave length impact on breastfeeding and postpartum depression. *Mil Med* 2020;185(11-12):1937–40. doi:10.1093/milmed/usaa137

29. Hamad R, Modrek S, White JS. Paid family leave effects on breastfeeding: a quasi-experimental study of US policies. *Am J Public Health* 2019;109(1):164–6. doi:10.2105/AJPH.2018.304693
30. Van Niel MS, Bhatia R, Riano NS, de Faria L, Catapano-Friedman L, Ravven S, et al. The impact of paid maternity leave on the mental and physical health of mothers and children: a review of the literature and policy implications. *Harv Rev Psychiatry* 2020;28(2):113–26. doi:10.1097/HRP.0000000000000246

Tables

Table 1. Characteristics of Participating Municipalities, National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL), 2014 and 2021[a]

Municipality characteristic (n)	Survey year		*P* value[b]
	2014 (n = 1,994) % (95% CI)	2021 (n = 1,927) % (95% CI)	
Population size			
1,000–2,499 (n = 1,367)	34.9 (33.1–36.8)	33.8 (31.8–35.8)	.73
2,500–49,999 (n = 2,259)	58.2 (56.8–61.1)	59.0 (56.8–61.1)	
≥50,000 (n = 295)	6.8 (5.8–7.9)	7.2 (6.1–8.3)	
Rural/urban status			
Urban (n = 2,875)	74.7 (73.2–76.1)	75.6 (74.0–77.2)	.50
Rural (n = 1,038)	25.3 (23.8–26.8)	24.4 (22.8–26.0)	
Census region			
Northeast (n = 523)	14.6 (13.3–15.9)	14.0 (12.8–15.1)	.95
Midwest (n = 1,383)	35.0 (33.6–36.5)	35.4 (33.8–37.0)	
South (n = 1,239)	35.9 (34.4–37.4)	35.9 (34.2–37.6)	
West (n = 776)	14.5 (13.4–15.6)	14.8 (13.8–15.7)	
Median educational attainment			
Some college or more (n = 2,458)	55.4 (53.3–57.6)	67.7 (65.6–69.9)	<.01
High school graduate or less (n = 1,463)	44.6 (42.4–46.7)	32.3 (30.1–34.4)	
Poverty prevalence, %[c]			
<20 (n = 2,924)	69.6 (67.7–71.6)	78.5 (76.3–80.5)	<.01
≥20 (n = 997)	30.4 (28.4–32.3)	21.5 (19.5–23.4)	
% Non-Hispanic White			
>50 (n = 3,347)	86.6 (85.1–88.1)	83.7 (82.0–85.4)	.01
≤50 (n = 574)	13.4 (11.9–14.9)	16.3 (14.6–18.0)	

[a] Values may not sum to total because of missing data.
[b] Determined by using χ^2 test.
[c] Percentage of the population living below the federal poverty line.

Table 2. Prevalence of Healthy Food Retail and Breastfeeding Supports Among US Municipalities, National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL), 2014 and 2021[a]

Support type	Survey year, 2014	Survey year, 2021	*P* value
	% (95% CI)		
Healthy food retail			
Does your local government currently use any of the following approaches to encourage supermarkets and other full-service grocery stores to open stores? (n = 3,921)			
Tax incentives (eg, tax abatement, tax credit, or property tax exemption)	20.5 (18.7–22.2)	21.8 (19.9–23.7)	.32
Grant or loan programs	11.8 (10.4–13.2)	13.4 (11.9–15.0)	.13
Programs to link store openings to broader neighborhood revitalization projects	12.0 (10.6–13.5)	11.0 (9.6–12.5)	.35
At least 1 of the above supports for supermarkets	30.7 (28.7–32.7)	28.6 (26.5–30.6)	.16
Does your local government provide any of the following to help convenience or corner stores sell healthier foods? (n = 3,921)			
Grant or low-interest loan programs to purchase equipment for storage or sales of healthful foods (eg, refrigeration or a point of sale system)	3.4 (2.6–4.2)	4.2 (3.3–5.1)	.23
Technical assistance or training programs to increase the ability to sell healthier foods (eg, support for new point of sale systems, marketing assistance, produce handling training, product placement)	3.7 (2.9–4.5)	2.5 (1.8–3.2)	.04
Programs to link convenience or corner store improvements to broader neighborhood revitalization projects (improvements to lighting, signage, safety, walkability)	10.5 (9.2–11.9)	5.6 (4.5–6.6)	<.01
At least 1 of the above supports for convenience/corner stores	13.4 (11.9–14.9)	8.6 (7.3–9.9)	<.01
Does your local government have any policies related to farmers markets, farm stands, or green/produce carts that . . . (n = 3,921)			
Allow vendors to sell fresh produce on city-owned property	59.6 (57.5–61.8)	54.5 (52.2–56.8)	<.01
Streamline processes for obtaining health and food safety permits and licenses	18.7 (16.9–20.4)	22.4 (20.5–24.4)	<.01
Extend waivers of required business permits or retail licensing fees or taxes	13.6 (12.1–15.1)	15.2 (13.6–16.9)	.15
Provide funds or in-kind services for personnel, signage, or advertising	15.5 (13.9–17.1)	14.0 (12.4–15.6)	.21
At least 1 of the above supports for farmers markets	64.3 (62.2–66.4)	60.1 (57.9–62.4)	.01
Does your local government provide funding for electronic benefits transfer (EBT) machines or provide technical assistance on how to obtain or use EBT machines at local farmers markets, farm stands, or green/produce carts?[b] (N = 3,063; n = 1,590 in 2014; n = 1,473 in 2021)	7.5 (6.2–8.8)	11.2 (9.6–12.9)	<.01
Breastfeeding			
Is there a policy that allows all breastfeeding employees in the local government breaktime and space to pump breast milk? (% yes) (n = 3,954)	25.2 (23.3–27.1)	52.1 (49.8–54.4)	<.01[c]
Does your local government provide paid maternity leave for its employees? (% yes) (n = 3,954)	37.4 (35.9–39.5)	38.5 (36.3–40.8)	.47[c]
Does your local government provide ≥ 8 weeks of paid maternity leave for employees? (% yes) (n = 3,954)	15.5 (13.9–17.1)	18.9 (17.1–20.7)	.01[c]
Does your local government provide >12 weeks of paid maternity leave for employees? (% yes) (n = 3,954)	2.1 (1.5–2.8)	2.7 (2.0–3.4)	.30[c]

[a] Sample sizes for food retail support: n = 1,994 in 2014 and n = 1,927 in 2021. Sample sizes for breastfeeding support: n = 2,014 in 2014 and n = 1,940 in 2021.
[b] Among municipalities that currently have or formerly had farmers markets.
[c] *P* values for breastfeeding support determined using χ^2 test.

Table 3. Prevalence of at Least 1 Policy to Support Healthy Food Access in Supermarkets, Convenience Stores, and Farmers Markets According to Municipality Characteristics; National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL) 2014 and 2021

Municipality characteristic	Supermarket policy[a]			Convenience store policy[b]			Farmers market policy[c]		
	% (95% CI)		X^2 *P* value[d]	% (95% CI)		X^2 *P* value[d]	% (95% CI)		X^2 *P* value[d]
	2014	2021		2014	2021		2014	2021	
Population size									
1,000–2,499 (n = 1,367)	24.9 (21.7–28.0)	24.2 (20.9–27.7)	.80	8.5 (6.5–10.6)	5.3 (3.6–7.1)	.02	53.4 (49.7–57.1)	50.4 (46.4–54.4)	.29
2,500–49,999 (n = 2,259)	33.6 (30.9–36.4)	29.2 (26.4–31.9)	.03	14.3 (12.3–16.4)	9.0 (7.2–10.7)	<.01	69.7 (67.0–72.4)	63.4 (60.4–66.3)	<.01
≥50,000 (n = 295)	35.2 (27.2–43.2)	43.7 (35.8–51.7)	.14	30.5 (22.7–38.2)	21.0 (14.5–27.5)	.07	73.7 (66.5–81.0)	79.6 (73.2–86.0)	.23
Rural–urban status									
Urban (n = 2,875)	31.9 (29.5–34.3)	28.7 (26.3–31.1)	.07	14.9 (13.0–16.7)	9.6 (8.0–11.1)	<.01	66.5 (64.1–69.0)	61.4 (58.8–64.0)	.01
Rural (n = 1,038)	27.0 (23.3–30.7)	28.0 (23.9–32.1)	.73	9.0 (6.5–11.4)	5.8 (3.7–7.9)	.06	57.6 (53.4–61.8)	56.3 (51.7–60.9)	.68
Census region									
Northeast (n = 523)	23.8 (18.3–29.4)	16.2 (11.8–20.7)	.03	15.2 (10.5–19.8)	10.5 (6.9–14.2)	.12	62.1 (55.8–68.3)	53.4 (47.3–59.5)	.05
Midwest (n = 1,383)	41.6 (38.0–45.2)	41.4 (37.6–45.2)	.94	14.1 (11.6–16.6)	9.9 (7.6–12.2)	.02	66.7 (63.3–70.2)	62.7 (59.0–66.5)	.12
South (n = 1,239)	27.8 (24.4–31.1)	25.5 (21.9–29.2)	.39	12.5 (10.0–15.0)	7.1 (4.9–9.2)	<.01	61.8 (58.2–65.4)	59.3 (55.2–63.4)	.38
West (n = 776)	18.4 (14.2–22.6)	16.8 (13.2–20.3)	.56	12.1 (8.6–15.6)	7.3 (4.9–9.8)	.03	66.7 (61.6–71.8)	62.4 (57.8–66.9)	.21
Median educational attainment									
≥Some college (n = 2,458)	31.3 (28.5–34.0)	27.5 (25.1–30.0)	.047	13.7 (11.6–15.7)	8.9 (7.3–10.4)	<.01	65.3 (62.5–68.1)	60.7 (58.0–63.4)	.02
≤High school graduate (n = 1,463)	29.9 (26.9–33.0)	30.8 (26.9–34.6)	.75	13.1 (10.8–15.3)	8.1 (5.8–10.3)	<.01	63.0 (59.8–66.2)	59.0 (54.9–63.1)	.13
Poverty prevalence[e]									
<20% (n = 2,924)	30.8 (28.4–33.2)	26.9 (24.7–29.2)	.03	12.2 (10.5–14.0)	8.3 (6.9–9.7)	<.01	62.3 (59.7–64.8)	59.4 (56.8–61.9)	.12
≥20% (n = 997)	30.4 (26.7–34.1)	34.5 (29.6–39.4)	.19	16.0 (13.1–19.0)	9.7 (6.7–12.6)	<.01	68.9 (65.2–72.6)	63.0 (58.1–68.0)	.06
% Non-Hispanic White									
>50 (n = 3,347)	30.3 (28.1–32.4)	27.7 (25.4–29.9)	.11	12.4 (10.8–14.0)	7.9 (6.6–9.2)	<.01	64.4 (62.1–66.7)	60.1 (57.6–62.6)	.01
≤50 (n = 574)	33.3 (27.6–39.0)	33.1 (27.6–38.5)	.95	16.7 (14.8–24.5)	12.2 (8.5–16.0)	.02	63.3 (57.5–69.1)	60.5 (54.9–66.2)	.50

[a] One or more of the following policies for supermarkets: tax incentives, grant or loan programs, or programs to link store openings to broader neighborhood revitalization projects.
[b] One or more of the following policies for convenience stores: grant or low-interest loan programs to purchase equipment for storage or sales of healthful foods, technical assistance or training programs to increase the ability to sell healthier foods, or programs to link convenience or corner store improvements to broader neighborhood revitalization project.
[c] One or more of the following policies for farmers markets: allowing vendors to sell fresh produce on city-owned property, streamlining processes for obtaining health and food safety permits and licenses, waivers of required business permits or retail licensing fees or taxes, or providing funds or in-kind services for personnel, signage, or advertising.
[d] Chi-square tests significance of difference between prevalence in 2014 vs 2021 for each level of each municipal characteristic.
[e] Percentage of the population living below the federal poverty line.

Table 4. Prevalence of Policies to Support Breastfeeding Among Local Government Employees According to Municipality Characteristics, National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS-HEAL), 2014 and 2021

Municipality characteristic	Provide paid maternity leave			Provide ≥8 weeks paid maternity leave			Provide ≥12 weeks paid maternity leave			Provide breaktime and space to pump breast milk		
	% (95% CI)		χ^2 *P* value[a]	% (95% CI)		χ^2 *P* value[a]	% (95% CI)		χ^2 *P* value[a]	% (95% CI)		χ^2 *P* value[a]
	2014	2021		2014	2021		2014	2021		2014	2021	
Population size												
1,000–2,499 (n = 1,383)	32.0 (28.5–35.4)	30.6 (26.9–34.3)	.60	9.0 (6.9–11.1)	11.8 (9.2–14.4)	.10	0.9 (0.2–1.5)	1.1 (0.3–2.0)	.60	13.2 (10.8–15.7)	42.3 (38.3–46.2)	<.01
2,500–49,999 (n = 2,273)	40.2 (37.4–43.1)	41.4 (38.4–44.3)	.59	18.1 (15.9–20.3)	20.9 (18.5–23.3)	.09	2.6 (1.7–3.5)	3.0 (2.0–4.0)	.58	29.2 (26.6–31.8)	55.5 (52.5–58.5)	<.01
≥50,000 (n = 298)	41.1 (33.0–49.3)	53.2 (45.2–61.1)	.04	26.9 (19.6–34.2)	35.9 (28.3–43.5)	.10	5.0 (1.3–8.6)	7.2 (3.4–11.0)	.41	52.6 (44.3–60.9)	71.7 (64.4–79.0)	<.01
Rural–urban status												
Urban (n = 2,897)	38.7 (36.2–41.2)	41.2 (38.6–43.8)	.18	17.3 (15.3–19.2)	21.3 (19.2–23.5)	.01	2.6 (1.7–3.4)	3.3 (2.4–4.2)	.23	28.9 (26.6–31.2)	55.4 (52.7–58.0)	<.01
Rural (n = 1049)	33.5 (29.5–37.5)	31.0 (26.8–35.3)	.40	10.4 (7.8–13.0)	11.7 (8.8–14.7)	.50	0.9 (0.1–1.8)	0.7 (0.0–1.6)	.74	14.4 (11.5–17.4)	42.3 (37.8–46.9)	<.01
Census region												
Northeast (n = 525)	29.4 (23.6–35.3)	36.3 (30.4–42.1)	.11	12.2 (7.9–16.4)	19.6 (14.7–24.4)	.03	2.2 (0.3–4.1)	3.5 (1.2–5.8)	.39	16.9 (12.0–21.7)	44.6 (38.6–50.7)	<.01
Midwest (n = 1,398)	39.1 (35.7–42.7)	35.7 (32.0–39.4)	.18	15.5 (12.9–18.1)	15.6 (12.8–18.4)	.95	1.6 (0.7–2.5)	1.1 (0.3–1.9)	.42	24.7 (21.6–27.8)	52.1 (48.3–56.0)	<.01
South (n = 1,256)	36.8 (33.2–40.4)	38.6 (34.5–42.6)	.52	14.2 (11.6–16.8)	18.3 (15.1–21.5)	.05	2.3 (1.2–3.4)	1.8 (0.7–2.8)	.50	21.1 (18.1–24.1)	48.9 (44.8–53.1)	<.01
West (n = 775)	42.6 (37.3–47.9)	47.5 (42.8–52.2)	.18	22.3 (17.8–26.7)	27.6 (23.3–31.8)	.10	3.0 (1.2–4.9)	7.8 (5.2–10.4)	.01	45.1 (39.7–50.4)	67.3 (63.0–71.7)	<.01
Median educational attainment												
≥Some college (n = 2,476)	39.2 (32.3–42.0)	39.3 (36.6–42.0)	.93	17.1 (14.9–19.3)	20.0 (17.8–22.2)	.07	2.3 (1.4–3.2)	2.7 (1.9–3.6)	.49	30.1 (27.5–32.8)	53.6 (53.6–59.1)	<.01
≤High school graduate (n = 1,478)	35.2 (32.1–38.4)	36.9 (32.9–40.9)	.52	13.5 (11.3–15.8)	15.6 (13.5–19.7)	.11	2.0 (1.1–2.9)	2.5 (1.2–3.7)	.50	19.1 (16.5–21.7)	43.3 (39.2–47.4)	<.01
Poverty prevalence[b]												
<20% (n = 2,950)	37.5 (35.0–40.1)	37.6 (35.1–40.1)	.98	15.8 (13.9–17.7)	18.1 (16.4–20.1)	.10	2.2 (1.4–2.9)	2.6 (1.8–3.4)	.43	26.3 (24.0–28.5)	53.2 (50.6–55.8)	<.01
≥20% (n = 1,004)	37.1 (33.3–40.9)	42.0 (37.0–47.0)	.13	14.9 (12.1–17.7)	21.7 (17.5–25.9)	.01	2.1 (1.0–3.2)	2.8 (1.2–4.4)	.46	22.8 (19.5–26.1)	48.2 (43.1–53.3)	<.01
% Non-Hispanic White												
>50% (n = 3,377)	36.6 (34.4–38.9)	36.6 (34.2–39.1)	.99	18.2 (13.6–22.8)	22.9 (18.1–27.6)	.17	2.1 (1.4–2.7)	2.1 (1.4–2.8)	.93	25.1 (23.0–27.1)	52.4 (49.9–54.9)	<.01
≤50% (n = 577)	42.4 (36.4–48.4)	48.2 (42.5–54.0)	.17	15.1 (13.4–16.8)	18.1 (16.2–20.0)	.02	2.7 (0.7–4.6)	5.4 (3.0–7.8)	.10	26.3 (21.0–31.6)	50.9 (45.1–56.6)	<.01

[a] Chi-square tests significance of difference between prevalence in 2014 vs 2021 for each level of each municipal characteristic.
[b] Percentage of the population living below the federal poverty line.

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ORIGINAL RESEARCH

Measuring Policy, Systems, and Environmental Changes at Elementary Schools Involved in SNAP-Ed New Mexico Programming, 2018–2022

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PEER REVIEWED

Summary

What is already known on this topic?

Strong evidence exists for policy, systems, and environmental (PSE) strategies that address obesity and chronic diseases by promoting healthy eating and physical activity in the school setting. PSE strategies can be implemented in low-income communities to improve equity.

What is added by this report?

School-specific recommendations for PSE strategies resulted in a significant increase in the number of nutrition-supportive PSEs in participating elementary schools.

What are the implications for public health practice?

Standardized PSE assessments, tailored evidence-based recommendations, and technical assistance can improve nutrition policies and environments at elementary schools in low-income communities.

Abstract

Introduction

In 2018, the New Mexico Supplemental Nutrition Assistance Program–Education (SNAP-Ed NM) incorporated policy, systems, and environmental (PSE) strategies into the state plan to increase healthy eating and physical activity. Studies of multiple PSE strategies in elementary schools are lacking.

Methods

We conducted assessments of physical activity and nutrition environments at 11 elementary schools in New Mexico before and after schools were given school-specific PSE recommendations and technical assistance. Baseline data were collected in 2018 by using the School Physical Activity and Nutrition Environment Tool (SPAN-ET), which measures policy, situational, and physical environments in elementary schools. PSE scores were calculated as the proportion of criteria met within and across 27 areas of interest. Implementation of evidence-based PSE interventions began in 2019. COVID-19 school closures delayed follow-up assessments until 2022. We analyzed descriptive data to examine changes in PSE scores over time.

Results

Overall mean PSE scores increased significantly from baseline (53.6%) to follow-up (62.7%). Nutrition PSE scores significantly increased by 17.6 percentage points; the policy environment showed the largest improvement (+26.0 percentage points), followed by the situational environment (+13.8 percentage points), and physical environment (+9.1 percentage points). We found a nonsignificant increase in the overall average physical activity score (+2.7 percentage points).

Conclusion

Use of a standardized instrument for assessing implementation of PSE strategies across multiple schools showed significant overall improvement in nutrition scores and nonsignificant increases in physical activity scores. Providing school-specific recommendations combined with technical assistance may be an effective approach to implementing evidence-based nutrition and physical activity PSE strategies.

Introduction

Obesity among people aged 2 to 19 years in the US increased from 17.7% to 21.5% from 2011 to 2020 (1). In 2022, 28.0% of New Mexico third-grade students were obese, with substantial disparities among American Indian (46.8%) and Hispanic (28.7%) third-graders compared with their non-Hispanic White counterparts (15.9%) (2). American Indian and Hispanic children are also more

likely to live in poverty (3) and have limited access to healthy foods (4) and safe places to be physically active (5) compared with non-Hispanic White children.

Childhood obesity increases the risk of chronic diseases (6), mental health concerns (7), and obesity in adulthood (8). Policy, systems, and environmental (PSE) approaches have a greater reach and impact compared with health behavior curricula alone (9), and schools play a vital role in health promotion and disease prevention efforts (10). Implementing PSE interventions in schools improves health outcomes, reduces health disparities, and enhances health equity (10).

In 2018, the New Mexico Supplemental Nutrition Assistance Program–Education (SNAP-Ed NM) incorporated PSE interventions into a state plan to increase healthy eating and physical activity. Data on the effectiveness of individual PSE interventions (eg, implementing nutrition standards for school meals, providing access to drinking water, and redesigning playgrounds to encourage physical activity during recess) are available (11,12). However, data on efforts to implement multiple PSE strategies in partnership with multiple elementary schools are not. To address this gap, the SNAP-Ed NM evaluation team developed a 3-year plan to assess PSE efforts at a sample of elementary schools. Our study aimed to determine the effectiveness of efforts to implement evidence-based PSE interventions by SNAP-Ed implementing agencies, in partnership with schools, in a real-world context. The findings have implications for future school-based PSE initiatives to increase healthy eating and physical activity in low-income communities.

Methods

We used a quasi-experimental design wherein we selected a purposeful sample of schools to partner with SNAP-Ed implementing agencies in the testing of the implementation of PSE interventions. We conducted baseline measures in 2018 and follow-up measures in 2022 at the school level. We collected baseline measures before implementation of PSE interventions to inform potential PSE strategies for implementation and as a comparison measure for evaluation. The follow-up assessment was scheduled for 2021. The 3-year time frame allowed for implementation of changes to school policies and environments, which often takes considerable time. The COVID-19 pandemic and related school closures and restrictions delayed the follow-up assessment until 2022.

Population

SNAP-Ed NM implementing agencies have long-standing relationships with elementary schools throughout New Mexico, where they have been providing nutrition education for more than a decade. Schools are eligible to receive SNAP-Ed programming, in general, if they meet the Community Eligibility Provision, meaning they must be located in high-poverty areas where at least 40% of students were deemed eligible for free and reduced-price meals from the National School Lunch Program in the previous year (13). Each year, SNAP-Ed NM implementing agencies provide programming for more than 150 schools.

In 2018, 5 implementing agencies contacted principals and other staff members at partner schools to discuss the opportunity to participate in a new effort to implement and evaluate PSE strategies for increasing opportunities for physical activity and healthy eating. Schools were eligible and perceived ready to participate if they received SNAP-Ed NM programming in 2018, had leadership that expressed interest, and identified at least 1 evidence-based PSE strategy that they were prepared to implement in the coming academic year. Nineteen schools met these criteria. We assessed these 19 schools at baseline and 14 at follow-up (73.7% retention rate). The 5 schools that were lost to follow-up were inaccessible because of COVID-19 pandemic–related policy changes that restricted access to school campuses. Schools participating at both time points included 11 elementary, 1 middle, and 2 high schools. We excluded the middle and high schools from the analysis because the assessment tool had not been validated in these settings. The final sample comprised 11 elementary schools.

Intervention

We conducted the baseline PSE assessment and provided the results to SNAP-Ed implementing agencies and school leadership with recommendations for PSE changes specific to their school context. No single evidence-based PSE strategy was implemented across all schools. Recommendations varied by school and included such evidence-based strategies as strengthening written wellness policies, developing school gardens, teaching nutrition education in all grades, having an active wellness committee, and increasing the amount of portable equipment (eg, balls, jump ropes, hula hoops) for active play. Schools chose and implemented selected strategies at their own pace with technical assistance from SNAP-Ed implementing agencies. Schools obtained funding for strategies with real costs (eg, school gardens, shade structures), often with the assistance of SNAP-Ed implementing agencies. Funding came from various sources, including the federal government, foundations, and community donations. The unanticipated COVID-19 pandemic–related school closures and restrictions in the 2019–2020 and 2020–2021 academic years disrupted implementation and affected both existing and new PSE strategy selection and implementation.

Instrument

We used a validated instrument, the School Physical Activity and Nutrition Environment Tool (SPAN-ET) (14), to conduct an assessment of PSE interventions at participating schools. We measured effectiveness as the extent to which SPAN-ET PSE scores increased over time in schools. SPAN-ET is a reliable instrument for evaluating the physical activity and nutrition environments in elementary schools (15). It provides comprehensive data to assess the school environment consistently and identify areas affecting obesity-preventing behaviors among students. The SPAN-ET comprises 27 areas of interest (AOIs) that evaluate the physical, situational, and policy environments related to physical activity and nutrition (Figure). Each AOI is assessed via multiple criteria, and each criterion is assigned a value of 0 (not met) or 1 (met). These scores are then summed and divided by the total number of criteria to attain scores represented as the proportion of criteria met within each AOI, domain, and category; the scores are presented as percentages ranging from 0% to 100%. We added criteria to 2 SPAN-ET AOIs: 1) assessing sustainability resources for existing garden spaces or greenhouses (AOI 18: nutrition–garden features) and 2) documenting social marketing materials and nutrition education areas and equipment (AOI 20: nutrition–food and beverage habits). We added these items to provide a more comprehensive assessment based on the specific PSE strategies and goals of the implementing agencies working in collaboration with the schools. Although the instrument developer made some modifications to the original SPAN-ET between 2018 and 2022, we assessed only items that were included in both years.

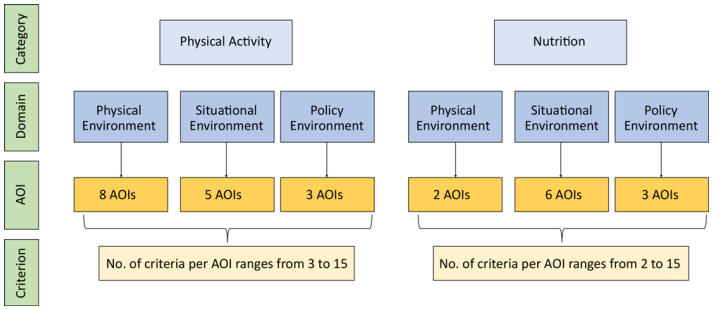

Figure. The categories, domains, areas of interest (AOIs), and number of criteria per AOI in the School Physical Activity and Nutrition Environment Tool (SPAN-ET).

SPAN-ET has 3 key domains: physical environment, situational environment, and policy environment.

Physical environment. The physical environment domain includes built environment features in and around the school that contribute to physical activity or nutrition. Eight AOIs assessed the physical environment for physical activity, including gymnasiums, outdoor play areas, shade structures, natural features, school gardens, and neighborhood features. Two AOIs assessed the physical environment for nutrition: the cafeteria and school gardens.

Situational environment. The situational environment domain includes the use of the physical environment, such as the appearance and atmosphere of the space and the promotion of actions or activities in the space. Five AOIs assessed the situational environment for physical activity: portable equipment, spaces that stimulate the senses, features that promote physical activity, opportunities to be active in before- and after-school programs, and landscape/garden spaces that promote physical activity. Six AOIs assessed the situational environment for nutrition, including school meals, food habits and practices, availability of water, cafeteria atmosphere, and extracurricular activities.

Policy environment. The policy environment domain includes wellness policies, wellness committees and objectives, and policies on hiring trained staff. Three AOIs assessed the policy environment for physical activity, including physical activity wellness policy, a wellness committee, and structured physical education policies. Three AOIs assessed the policy environment for nutrition, including nutrition wellness policy, wellness committee, and health and nutrition education.

Data collection

Per SPAN-ET protocol, the assessments included a document review (eg, school wellness policies, meal menus, parent handbooks), on-site observations of facilities (eg, cafeteria, gymnasium, playground, physical education class), and interviews with school administrators and staff members about AOIs, including school staffing, curricula, and policies. Before each data collection period (2018 and 2022), the data collection team, which included both the research team and SNAP-Ed implementing agencies, were rigorously trained on the instrument and methods, beginning with a 6-hour class conducted by the developer of the tool. After the classroom training, the research team participated in internal reviews and trainings and conducted a training assessment at a school that was not part of the study to gain experience with the tool.

The research team then systematically analyzed policies and other relevant written materials by using standardized scoring criteria in the SPAN-ET. In both 2018 and 2022, document review was followed by a day-long visit to each school for observations and structured interviews, with criteria scored per SPAN-ET protocols. All assessments were scored independently by 2 data collectors, who met to reconcile scores until consensus was achieved. Any

scoring differences were resolved by examining the original data (eg, observational photographs and notes, policy documents, interview transcripts). If further clarification was needed to reach 100% agreement, data collectors revisited the site or recontacted school personnel. Incorporating rigorous training, opportunities to practice on-site at schools, quality improvement checks, observational photographs, and meetings to reconcile assessments supported strong interrater reliability.

Data analysis

For each school in 2018 and 2022, we collected data on the number of students enrolled, the percentage of students eligible for free or reduced-price lunch through the National School Lunch Program, the percentage of Hispanic students, and the percentage of American Indian students. We obtained these data from the New Mexico Public Education Department (16) and the National Center for Education Statistics (17).

We calculated the proportion of met criteria for each AOI and averaged scores across schools within each domain. We calculated the overall proportion of met criteria for the physical activity and nutrition domains. Mean scores were calculated for each AOI across schools and transformed into a percentage representing the number of schools that met criteria. Within schools, the proportion of met AOIs in physical activity and nutrition categories was calculated, resulting in an overall score for each school with a maximum of 100%. A paired-samples *t* test assessed differences between mean baseline and follow-up scores for each domain and category.

Results

At baseline, 10 of 11 student populations at participating schools were majority Hispanic and all students at 8 of 11 schools were eligible for free or reduced-price lunch through the National School Lunch Program (Table 1). Student enrollment ranged from 75 to 616 at baseline.

Change in proportion of criteria met among all schools

We found no significant differences in mean overall physical activity scores from baseline to follow-up for the 3 physical activity domains across all schools (Table 2). Two nutrition scores increased significantly from baseline to follow-up: nutrition–situational environment, which increased from 60.9% to 74.7% (+13.8 percentage points; $P = .005$), and nutrition–policy environment, which increased from 28.9% to 54.9% (+26.0 percentage points; $P < .001$). The overall score for nutrition PSEs increased significantly by 17.6 percentage points, from 50.8% to 68.5% ($P < .001$).

The highest average increase in mean scores (+30.3 percentage points) from baseline to follow-up among AOIs across all schools was in the physical activity–physical environment domain, AOI 3, which addresses shelter and shade structures (Table 3). The highest average decrease (−5.5 percentage points) in this domain was for AOI 1, which addresses gymnasiums and dedicated multipurpose spaces for physical activity. The highest average increase (+12.1 percentage points) in the physical activity–situational environment domain was for AOI 13, gardening activity spaces and programs. The highest average decrease (−12.7 percentage points) in this domain was for AOI 9, portable equipment. The highest average increase (+56.4 percentage points) in the physical activity–policy environment domain was for AOI 15, which addresses physical activity and wellness committees. The highest average decrease (−44.4 percentage points) in this domain was for AOI 16, structured physical education. The highest average increase (+13.6 percentage points) in the nutrition–physical environment domain was for AOI 18, school garden features. We found no decreases from baseline to follow-up in this domain. The highest average increase (+22.1 percentage points) in the nutrition–situational environment domain was for AOI 20, promoting healthy food and beverage habits. We found no decreases in this domain. The highest average increase (+78.2 percentage points) in the nutrition–policy environment domain was for AOI 26, which addresses nutrition and wellness committees. The highest average decrease (−6.8 percentage points) in this domain was for AOI 27, nutrition education.

Change in mean school scores from baseline to follow-up

We observed a significant increase (+9.1 percentage points) in overall scores from baseline to follow-up: from 53.6% at baseline to 62.7% at follow-up ($P = .02$) (Table 4). We found a significant increase (+17.6 percentage points) in average nutrition scores from baseline to follow-up, from 50.8% at baseline to 68.5% at follow-up ($P < .001$). We found no significant differences in physical activity scores from baseline to follow-up ($P = .44$).

Discussion

Our study aimed to determine the effectiveness of efforts to improve nutrition and physical activity policies, systems, and environments across multiple elementary schools in a real-world context. Our results demonstrated a significant increase in elementary school nutrition policies and environments during the 4-year intervention period using a standardized PSE assessment. This study was novel in its examination of changes in SPAN-ET PSE scores across 11 schools implementing evidence-based strategies of their choosing following school-specific recommendations combined

with technical assistance from SNAP-Ed implementing agencies. Our findings are consistent with other research showing that identifying gaps, making recommendations, and providing technical assistance can improve adoption of new policies or practices in the school environment (18).

Among the 11 participating elementary schools in our study, we observed a significant increase of 17.6 percentage points in the overall nutrition score across schools. This increase was largely driven by the addition of active wellness councils and nutrition policies, improved access to healthier foods outside school meals, and an increase in the number of school gardens. Wellness councils and nutrition policies can improve the healthfulness of foods consumed by students in the school environment (19). Additionally, school gardens can improve student health behaviors and outcomes, particularly among students facing economic disadvantages (20), which can lead to increases in health equity. In addition to recommendations for and technical assistance with these PSE strategies, decisions by participating schools to implement new nutrition policies and improved nutrition environments may have been influenced by the increased recognition of food insecurity among students during the COVID-19 pandemic (21).

In our research, none of the physical activity domains showed significant increases in PSE scores. However, scores increased substantially among some AOIs. For example, we noted several improvements to the outdoor environment, including improvements to playground areas, development of school gardens, and the addition of shade structures. Research indicates that gardening, coupled with food preparation, nutrition education, and physical activity instruction, can improve children's vegetable intake and physical activity levels (22). Additionally, providing shade in outdoor areas can substantially promote use of play areas, reduce sun exposure, and prevent heat-related injury (23). The COVID-19 pandemic produced an unexpected opportunity as funding to construct shade structures was made available to support outdoor learning environments. These structures continue to provide a safe, comfortable area for outdoor active play among school students.

We observed major declines in both the nutrition and physical activity categories in the teaching of nutrition and physical education. Research suggests that education on healthy lifestyles results in improvements in nutrition and physical activity among students (24). However, consistent with the national literature (25), participating schools reported difficulty in maintaining qualified staff, including health and nutrition educators and trained physical education teachers (26), during the COVID-19 pandemic. Additionally, schools restricted access to nonschool personnel during the pandemic, limiting access by SNAP-Ed nutrition educators. Declines in PSE scores in these areas may rebound as schools work to recruit qualified physical education and health staff and return to permitting access to external nutrition education programming.

Additionally, our results showed that PSE supports for physical activity declined unexpectedly from baseline to follow-up in 2 areas. These were access to a gymnasium for physical activity and active play and the availability of portable play equipment. Research demonstrates that students, particularly girls, with access to portable equipment engage in more moderate to vigorous physical activity than students without such access (27). Declines in scores in these areas may be attributable to the COVID-19 pandemic, which resulted in some schools closing gymnasiums in favor of outdoor play and some schools limiting use of portable play equipment due to the additional cleaning requirements.

Our research also demonstrated the successful implementation of evidence-based PSE strategies in schools characterized by disproportionately high populations of Hispanic students and American Indian students, where nearly all students qualified for the National School Lunch Program. In the US, people with low socioeconomic status, as well as those identifying as Hispanic or American Indian, have an elevated prevalence of obesity and other chronic health conditions (28,29). SNAP-Ed NM purposefully focuses programming, including PSE intervention efforts, on schools located in low-income communities that, in New Mexico, predominantly serve Hispanic and American Indian students. Effective PSE efforts in these schools can improve physical activity and nutrition, reduce health disparities linked to obesity, and improve health equity (12).

Our study was designed in 2018, and interventions began in 2019. The disruptions caused by the COVID-19 pandemic were unanticipated and had a substantial effect on the study. These disruptions altered the timing and implementation of PSE strategies, ultimately affecting scores and effectiveness. Some scores were reportedly positively influenced (eg, shade structures) while others were negatively influenced (eg, recruitment and retention of qualified physical education teachers). The pandemic also introduced additional factors, including the mental health of staff members and students, workforce changes, and limited access to resources, which may have influenced engagement in PSE implementation. Despite the pandemic, we observed improvements in most nutrition and physical activity PSEs over time.

Strengths and limitations

Study strengths include the use of a standardized instrument to assess school-level nutrition and physical activity PSEs and identify gaps for strategic intervention. Additionally, using the SPAN-ET

to evaluate SNAP-Ed programming across multiple schools provided a standardized way to measure and assess PSE implementation across the state. This tool and standardized protocol allowed us to capture changes over time, offering insights into the effectiveness of efforts to implement evidence-based strategies. We also incorporated a rigorous training protocol and reconciliation process to enhance reliability. The study also capitalized on existing partnerships between nutrition educators and schools and provided flexibility for schools to identify the PSE strategies that they were interested in pursuing in a real-world context. We provided school leadership with a detailed breakdown of scores and school-specific recommendations for PSE strategies to inform their choices.

Our study has several limitations. It lacked a standard intervention across sites; each school chose the evidence-based PSE strategies that they determined were important and feasible to implement. However, our approach aligns with principles of community-engaged research and implementation science. Additionally, the absence of a comparison group or control condition makes it challenging to establish causality or differentiate the effects of implementation efforts from other factors, including the COVID-19 pandemic. Some of these limitations could be addressed by examining implementation in the postpandemic period, incorporating an appropriate control group, and measuring the dissemination and implementation of specific strategies over time. Additionally, the COVID-19 pandemic and resultant school district policies precluded capturing data from all 19 original sites. These additional data may have altered the findings if the schools that did not participate in the follow-up assessment had differed in their implementation of PSE strategies.

Implications

Standardized PSE assessments, combined with tailored evidence-based recommendations and technical assistance, are effective at improving nutrition policies and environments in elementary schools in low-income communities. Additionally, the SPAN-ET can be used to evaluate changes over time in the nutrition and physical activity PSEs in place across multiple schools. Because it is a standardized, reliable tool, comparisons can also be made across studies.

Conclusion

Use of the SPAN-ET, both for identifying potential PSE strategies and evaluating SNAP-Ed programming across multiple schools in the state, revealed significant overall improvement in nutrition scores and nonsignificant increases in physical activity scores. We found considerable variation in the pre–post changes in score among AOIs: these changes ranged from a decrease of 44.4 percentage points for having a physical education program coordinated by a trained physical educator to an increase of 78.2 percentage points for having an active wellness committee with nutrition objectives. Providing school-specific recommendations combined with technical assistance may be an effective approach to implementing evidence-based nutrition and physical activity PSE strategies in real-world contexts. However, the COVID-19 pandemic affected the types of strategies implemented, the timing of implementation, and the timing of data collection for evaluation. Future research may include use of a comparison group to assess the causal effect of the interventions. However, some evidence suggested that the collection of baseline data itself influenced the intentions of school staff to implement PSE changes. Dissemination and implementation studies would also be useful to answer research questions about the characteristics of schools or school leadership that adopt different strategies, the fidelity with which the interventions are implemented, and whether interventions are sustained over time and with new school leadership.

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References

1. Hu K, Staiano AE. Trends in obesity prevalence among children and adolescents aged 2 to 19 years in the US from 2011 to 2020. *JAMA Pediatr.* 2022;176(10):1037–1039. doi:10.1001/jamapediatrics.2022.2052

2. New Mexico Department of Health. *The Weight of Our Children: New Mexico Childhood Obesity 2022 Update*. 2023. Accessed June 28, 2023. https://www.nmhealth.org/data/view/chronic/2763
3. Moskowitz R. *New Mexico Department of Workforce Solutions. Poverty in New Mexico* . 2019. Accessed May 30, 2023. https://www.dws.state.nm.us/Portals/0/DM/LMI/Poverty_in_NM.PDF
4. Beaulac J, Kristjansson E, Cummins S. A systematic review of food deserts, 1966–2007. *Prev Chronic Dis*. 2009;6(3):A105.
5. Bennett GG, McNeill LH, Wolin KY, Duncan DT, Puleo E, Emmons KM. Safe to walk? Neighborhood safety and physical activity among public housing residents. *PLoS Med*. 2007; 4(10):1599–1606. doi:10.1371/journal.pmed.0040306
6. Katzmarzyk PT, Powell KE, Jakicic JM, Troiano RP, Piercy K, Tennant B; 2018 Physical Activity Guidelines Advisory Committee. Sedentary behavior and health: update from the 2018 Physical Activity Guidelines Advisory Committee. *Med Sci Sports Exerc*. 2019;51(6):1227–1241. doi:10.1249/MSS.0000000000001935
7. Suchert V, Hanewinkel R, Isensee B. Sedentary behavior and indicators of mental health in school-aged children and adolescents: a systematic review. *Prev Med*. 2015;76:48–57. doi:10.1016/j.ypmed.2015.03.026
8. Lee EY, Yoon KH. Epidemic obesity in children and adolescents: risk factors and prevention. *Front Med*. 2018; 12(6):658–666. doi:10.1007/s11684-018-0640-1
9. Institute of Medicine (US) Committee on Prevention of Obesity in Children and Youth. *Preventing Childhood Obesity: Health in the Balance*. Koplan JP, Liverman CT, Kraak VI, eds. National Academies Press; 2005.
10. Schmid TL, Pratt M, Howze E. Policy as intervention: environmental and policy approaches to the prevention of cardiovascular disease. *Am J Public Health*. 1995;85(9): 1207–1211. doi:10.2105/AJPH.85.9.1207
11. Merlo C, Smarsh BL, Xiao X. School nutrition environment and services: policies and practices that promote healthy eating among K-12 students. *J Sch Health*. 2023;93(9):762–777. doi:10.1111/josh.13365
12. Cornett K, Murfay K, Fulton JE. Physical activity interventions during the school day: reviewing policies, practices, and benefits. *J Sch Health*. 2023;93(9):778–787. doi:10.1111/josh.13371
13. US Department of Agriculture. *FY 2024 Supplemental Nutrition Assistance Program Education (SNAP-Ed) Plan Guidance, Nutrition Education and Obesity Prevention Program*. 2023. Accessed September 26, 2023. https://snaped.fns.usda.gov/library/materials/fy-2024-snap-ed-plan-guidance
14. Oregon State University, OSU Extension Service. School Physical Activity and Nutrition Environment Tool. Accessed June 28, 2023. https://extension.oregonstate.edu/span-et
15. John DH, Gunter K, Jackson JA, Manore M. Developing the School Physical Activity and Nutrition Environment Tool to measure qualities of the obesogenic context. *J Sch Health*. 2016;86(1):39–47. doi:10.1111/josh.12348
16. New Mexico Public Education Department. Stars. Accessed June 28, 2023. https://webnew.ped.state.nm.us/bureaus/information-technology/stars/
17. National Center for Education Statistics. Search for public schools. Accessed June 28, 2023. https://nces.ed.gov/ccd/schoolsearch/index.asp
18. Hoke AM, Pattison KL, Hivner EA, Lehman EB, Kraschnewski JL. The role of technical assistance in school wellness policy enhancement. *J Sch Health*. 2022;92(4): 361–367. doi:10.1111/josh.13136
19. Cullen KW, Watson K, Zakeri I. Improvements in middle school student dietary intake after implementation of the Texas Public School Nutrition Policy. *Am J Public Health*. 2008; 98(1):111–117. doi:10.2105/AJPH.2007.111765
20. Utter J, Denny S, Dyson B. School gardens and adolescent nutrition and BMI: results from a national, multilevel study. *Prev Med*. 2016;83:1–4. doi:10.1016/j.ypmed.2015.11.022
21. Van Lancker W, Parolin Z. COVID-19, school closures, and child poverty: a social crisis in the making. *Lancet Public Health*. 2020;5(5):e243–e244. doi:10.1016/S2468-2667(20)30084-0
22. Hermann JR, Parker SP, Brown BJ, Siewe YJ, Denney BA, Walker SJ. After-school gardening improves children's reported vegetable intake and physical activity. *J Nutr Educ Behav*. 2006;38(3):201–202. doi:10.1016/j.jneb.2006.02.002
23. Holman DM, Kapelos GT, Shoemaker M, Watson M. Shade as an environmental design tool for skin cancer prevention. *Am J Public Health*. 2018;108(12):1607–1612. doi:10.2105/AJPH.2018.304700
24. Haghani S, Shahnazi H, Hassanzadeh A. Effects of tailored health education program on overweight elementary school students' obesity-related lifestyle: a school-based interventional study. *Oman Med J*. 2017;32(2):140–147. doi:10.5001/omj.2017.25
25. Schwartz HL, Diliberti MK. *Flux in the Educator Labor Market: Acute Staff Shortages and Projected Superintendent Departures: Selected Findings from the Fourth American School District Panel Survey*. Rand Corporation; 2022. doi:10.7249/RRA956-9
26. Centeio E, Mercier K, Garn A, Erwin H, Marttinen R, Foley J. The success and struggles of physical education teachers while teaching online during the COVID-19 pandemic. *J Teach Phys Educ*. 2021;40(4):667–673. doi:10.1123/jtpe.2020-0295

27. Parrish AM, Okely AD, Batterham M, Cliff D, Magee C. PACE: a group randomised controlled trial to increase children's break-time playground physical activity. *J Sci Med Sport.* 2016;19(5):413–418. doi:10.1016/j.jsams.2015.04.017
28. Gaskin DJ, Thorpe RJ Jr, McGinty EE, Bower K, Rohde C, Young JH, et al. Disparities in diabetes: the nexus of race, poverty, and place. *Am J Public Health.* 2014;104(11): 2147–2155. doi:10.2105/AJPH.2013.301420
29. Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, Metzler M, et al. Socioeconomic status in health research: one size does not fit all. *JAMA.* 2005;294(22):2879–2888. doi:10.1001/jama.294.22.2879

Tables

Table 1. Demographic Characteristics at Baseline and Follow-Up of a Sample of 11 Elementary Schools in New Mexico Participating in the SNAP-Ed PSE Evaluation, 2018 and 2022[a]

School	Student enrollment, no.		Students eligible for free or reduced-price lunch, %		Hispanic students, %		American Indian students, %	
	Baseline (2018)	Follow-up (2022)	Baseline (2018)	Follow-up (2022)	Baseline (2018)	Follow-up (2022)	Baseline (2018)	Follow-up (2022)
ES1	99	98	100	100	93	98	1	≤5
ES2	298	302	69	100	78	80	2	2
ES4	559	521	67	100	72	71	2	2
ES5	420	384	88	100	85	86	0	≤1
ES7	79	80	100	100	0	0	100	100
ES8	75	78	100	100	64	68	0	≤5
ES9	552	541	100	100	62	62	1	≤1
ES10	296	279	100	100	67	69	0	≤2
ES11	616	616	100	100	76	75	0	≤1
ES12	394	377	100	100	73	72	3	≤5
ES16	307	303	100	100	69	70	1	≤1

Abbreviations: ES, elementary school; PSE, policy, systems, and environment; SNAP–Ed, Supplemental Nutrition Assistance Program–Education.
[a] Sources: New Mexico Public Education Department (16); National Center for Education Statistics (17).

Table 2. Change in Mean Scores[a] From Baseline to Follow-Up, by SPAN-ET Domain and Category, in a Sample of 11 Elementary Schools in New Mexico, 2018 and 2022

Domain	Category							
	Physical activity				Nutrition			
	Baseline score (2018)	Follow-up score (2022)	Percentage-point change in score	*P* value[b]	Baseline score (2018)	Follow-up score (2022)	Percentage-point change in score	*P* value[b]
Physical environment	64.4	70.2	+5.8	.21	72.7	81.8	+9.1	.07
Situational environment	53.7	56.5	+2.8	.67	60.9	74.7	+13.8	.005
Policy environment	40.2	36.0	−4.2	.50	28.9	54.9	+26.0	<.001
Overall[c]	55.7	58.3	+2.7	.44	50.8	68.5	+17.6	<.001

Abbreviation: SPAN-ET, School Physical Activity and Nutrition Environment Tool.
[a] Reported as the percentage of schools that met criteria.
[b] Paired samples *t* test conducted to compare mean scores from baseline to follow-up; significance set at $P \leq .05$.
[c] Mean score across all 11 schools for the category, including all 3 domains.

Table 3. Change in Mean Scores[a] From Baseline to Follow-Up, by SPAN-ET Area of Interest (AOI), in a Sample of 11 Elementary Schools in New Mexico, 2018 and 2022

AOI no./description	Mean score		
	Baseline (2018)	Follow-up (2022)	Percentage-point change
Category: physical activity			
Domain: physical activity–physical environment			
1. Gymnasium and/or dedicated multipurpose space is available to accommodate physical education, physical activity/active play.	68.5	63.0	−5.5
2. Outdoor space is adequately sized for teaching and physical activity, has clearly defined boundaries, and comprises a variety of appropriate activity settings, fixed equipment, and materials.	69.7	77.8	+8.1
3. Shade (natural and/or artificial structures) and/or shelters provide protection from sun and/or inclement weather.	33.3	63.6	+30.3
4. Natural or green playground areas, elements, and/or features are available.	38.6	56.8	+18.2
5. Gardens and landscaping includes a variety of plantings, growing environments (eg, orchards, inground beds, raised beds, and/or containers), and topical conditions.	27.3	45.5	+18.2
6. Indoor and outdoor surfaces and surface markings support movement and activity variety and safety.	84.1	79.5	−4.5
7. School yard, grounds, and outdoor facilities are enclosed and safe for physical activity.	90.9	96.1	+5.2
8. Built environment features and neighborhood proximal to the school property provide safe physical activity/active transportation access for pedestrian and bicycle circulation from the neighborhood to the site entrances to the building.	50.9	63.6	+12.7
Domain: physical activity–situational environment			
9. Portable equipment is available, easily accessible, and offers a wide variety/range of experiences.	58.2	45.5	−12.7
10. Indoor and outdoor spaces have a friendly, welcoming, inclusive, and inviting atmosphere that is culturally appropriate and stimulates the senses (ie, touch/textures, smell, listening, looking, vestibular and proprioceptive input).	67.5	76.6	+9.1
11. Indoor and outdoor fixed and portable features promote physical activity, active play, and a variety of developmental movements.	68.2	74.2	+6.1
12. School supports and/or partners with community resources to provide physical activity opportunities before and/or after school and in the summer. Extracurricular programs are available in various indoor and outdoor facilities.	43.0	44.6	+1.7
13. Existing landscape/garden spaces are designated and used to promote physical activity/active lifestyle habits.	24.2	36.4	+12.1
Domain: physical activity–policy environment			
14. School has implemented the district wellness policy, drafted a written physical activity policy, and communicated with school staff, families, and the district regarding students' physical activity progress on an annual basis; school's physical activity goals are integrated into the school's overall long-range wellness goals/plan.	25.5	27.3	+1.8
15. Active wellness council/committee exists that has specific physical activity–related objectives and/or an active physical activity council/subcommittee.	3.6	60.0	+56.4
16. School has a structured physical education/physical activity program that is coordinated and/or instructed by trained/credentialed physical educator(s).	76.8	32.3	−44.4
Category: nutrition			
Domain: nutrition–physical environment			
17. Cafeteria or alternative meal service area (ie, classroom) offers a clean, pleasant, and safe setting with adequate space for eating meals.	90.9	98.2	+7.3

Abbreviation: SPAN-ET, School Physical Activity and Nutrition Environment Tool.
[a] Reported as the percentage of schools that met criteria.

(continued on next page)

(continued)

Table 3. Change in Mean Scores[a] From Baseline to Follow-Up, by SPAN-ET Area of Interest (AOI), in a Sample of 11 Elementary Schools in New Mexico, 2018 and 2022

AOI no./description	Mean score		
	Baseline (2018)	Follow-up (2022)	Percentage-point change
18. School has orchards, greenhouses, in-ground gardens, raised beds, and/or container gardens to grow edible produce.	27.3	40.9	+13.6
Domain: nutrition–situational environment			
19. Program meets or exceeds food and nutrition standards and is managed efficiently and inclusively.	71.7	79.8	+8.1
20. Promoting healthy food and beverage choices and habits is accepted and integrated into the school culture.	50.6	72.7	+22.1
21. All foods and beverages served or sold outside of the school meals program during the regular and extended school day meet or exceed federal and/or state standards for foods and beverages sold in schools.	52.7	74.5	+21.8
22. Clean, safe, palatable drinking water is available, accessible, and promoted to all students and staff throughout the school day.	75.0	75.0	0
23. Meals served to students are attractively presented in a pleasant (friendly, comfortable, and inviting) environment with sufficient time for eating.	71.8	88.2	+16.4
24. School provides and/or partners with community resources to provide healthy foods and beverages, and nutrition education opportunities before and/or after school and in the summer.	71.8	88.2	+16.4
Domain: nutrition–policy environment			
25. School has implemented the district wellness policy, drafted a written nutrition policy, and communicates with school staff, families, and the school district regarding its nutrition progress on an annual basis. The school's nutrition goals are integrated into the school's overall long-range wellness improvement goals/plan.	27.3	53.3	+26.1
26. Active wellness council/committee exists and has specific nutrition-related objectives and/or an active nutrition council/subcommittee.	3.6	81.8	+78.2
27. Health education program includes functional knowledge and skills-based nutrition lessons. Nutrition behaviors/habits are taught in all grades.	47.7	40.9	−6.8

Abbreviation: SPAN-ET, School Physical Activity and Nutrition Environment Tool.
[a] Reported as the percentage of schools that met criteria.

Table 4. Change in Overall Mean SPAN-ET Scores From Baseline to Follow-Up in a Sample of 11 Elementary Schools, 2018 and 2022

School	Overall score[a]			Overall physical activity			Overall nutrition		
	Baseline (2018)	Follow-up (2022)	Percentage-point change	Baseline (2018)	Follow-up (2022)	Percentage-point change	Baseline (2018)	Follow-up (2022)	Percentage-point change
ES1	49.7	61.0	+11.2	49.1	55.7	+6.6	50.6	67.9	+17.3
ES2	61.5	64.7	+3.2	65.1	66.0	−0.9	56.8	63.0	+6.2
ES4	66.8	52.9	−13.9	76.4	55.7	−20.1	54.3	49.4	−4.9
ES5	48.1	59.4	+11.2	52.8	49.1	−3.8	42.0	72.8	+30.9
ES7	56.1	55.1	−1.1	53.8	52.8	+14.2	59.3	69.1	+9.9
ES8	39.6	57.8	+18.2	38.7	44.3	−9.4	40.7	64.2	+23.5
ES9	55.1	77.5	+22.5	58.5	73.6	+15.1	50.6	82.7	+32.1
ES10	57.2	69.0	+11.8	60.4	64.2	+3.8	53.1	75.3	+22.2
ES11	51.3	70.1	+18.7	50.0	64.2	+14.2	53.1	77.8	+24.7
ES12	53.5	66.8	+13.4	53.8	58.5	+4.7	53.1	77.8	+24.7
ES16	50.3	55.6	+5.3	53.8	57.6	+3.8	45.7	53.1	+7.4
All	53.6	62.7	+9.1[b]	55.7	58.3	+2.7	50.8	68.5	+17.6[c]

Abbreviations: ES, elementary school; SPAN-ET: School Physical Activity and Nutrition Environment Tool.
[a] Overall score combines the physical activity and nutrition categories for each school.
[b] $P = .02$; paired-samples *t* test conducted to compare overall mean scores from baseline to follow-up for all 11 schools; significance set at $P \leq .05$.
[c] $P < .001$; paired samples *t* test conducted to compare overall nutrition mean scores from baseline to follow-up for all 11 schools; significance set at $P \leq .05$.

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IMPLEMENTATION EVALUATION

Integrating Healthy Nutrition Standards and Practices Into Food Service Contracting in a Large US County Government

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PEER REVIEWED

Summary

What is already known about this topic?

Integrating healthy nutrition standards and practices into the procurement process of an institutional food service is a promising public health strategy for improving nutrition.

What is added by this report?

We describe how a large county government operationalized a model practice to integrate nutritional requirements into its procurement process with food vendors.

What are the implications for public health practice?

Healthy nutrition standards and practices can change the quality of food served. Although implementation of such standards is feasible, organizational barriers exist across the various phases of the process.

Abstract

Purpose and Objectives

Although considered a promising model of practice, integrating healthy nutrition standards and practices into a large county government's contracting process with food vendors has not been widely described in empirical literature. We conducted an implementation evaluation project to address this gap.

Intervention Approach

County of Los Angeles food vendors provide food or meals annually to more than 100,000 employees and millions of clients and visitors. In 2011, the County of Los Angeles Board of Supervisors adopted a policy to integrate healthy nutrition standards and practices into its requests for proposals (RFPs) and contracting process with food vendors. The policy required all contracts awarded to adhere to these new standards.

Evaluation Methods

In 2011, the Los Angeles County Department of Public Health (DPH) began reviewing RFPs for food services for county departments that procured, served, or sold food. From 2011 through 2021, DPH applied a 4-pronged formative–evaluative approach to help county departments implement the Board of Supervisors policy and ensure that nutritional requirements were appropriately integrated into all RFPs for new and renewing contracts with food vendors. We focused our evaluation on understanding the process and tracking the progress of this policy intervention. Our evaluation included 13 key informant interviews, a 2-part survey, reviews of contract data, and synthesis of lessons learned.

Results

Based on reviews and subsequent actions taken on more than 20 RFPs, DPH successfully assisted 7 county departments to incorporate healthy nutrition standards and practices into their food vendor contracts. Implementation of the food policy encountered several challenges, including staffing and training constraints and a limited infrastructure. An iterative approach to program improvement facilitated the process.

Implications for Public Health

Although the model for integrating healthy nutrition standards and practices into a government contracting process is promising, more work is needed to make it less resource-intensive and to increase user buy-in.

Introduction

Recent national data suggest that most of the US population has or is at risk of developing chronic diseases such as diabetes, hypertension, or heart disease (1). Data from regional population health

surveys point to a similar pattern at the local level. In 2021, 33.5% of Los Angeles County adults reported ever being diagnosed with hypertension or prehypertension and 12.1% with diabetes (2). These and other chronic conditions represent a major public health problem that has substantial social and economic costs (3).

Diet plays a central and critical role in the development of chronic diseases (4,5). Diets high in sugar, sodium, saturated fat, and trans-fatty acids and the nutrients and ingredients in processed foods are linked to chronic ailments (6–8). The Dietary Guidelines for Americans (DGA) encourage increased intake of fruits and vegetables, whole grains, dairy foods, and lean proteins; they also encourage limited consumption of foods high in sodium, added sugars, and saturated fat (9). Since 2010, federal and local governments have increased efforts to integrate DGA-recommended nutrition standards and behavioral economics strategies into their food service contracting processes (10–12). At the federal level, nutrition standards are derived from DGA and form the foundation of the Food Service Guidelines for Federal Facilities of the US Department of Health and Human Services and the US General Services Administration. These guidelines are intended for government-operated food services and, as a model, highlight the importance of implementing standards in food service as a way to enhance population-level nutrition and public health (13). Although long considered an innovative and promising model of practice (14,15), limited literature has been published on the implementation of such food service requirements through institutional or governmental policy.

Purpose and Objectives

The objective of our implementation evaluation was to address this gap in research and practice by describing how a large county government integrated healthy nutrition standards and practices into the food service contracting process of its departments. We present practice-based experiences and lessons learned from the County of Los Angeles in implementing such a policy, from 2011 through 2021. With the county's extensive reach, which included over 100,000 employees and millions of annual clients and visitors, this decade-long food policy had the potential to generate significant health effects across the diverse communities it served.

Intervention Approach

Historical context

In response to the growing prevalence of obesity and related chronic diseases, particularly among its employees, in March 2011 the County of Los Angeles Board of Supervisors adopted an organizational policy on food quality entitled Healthy Food Promotion in LA County Food Services Contracts (16). This policy called for the Los Angeles County Department of Public Health (DPH) to ensure that healthy nutrition standards and practices were incorporated into all county food service and vending solicitations or requests for proposals across all the government's 37 departments. DPH designed a review procedure to ensure that these nutrition requirements (eg, food purchasing and serving standards for fruit, vegetables, grains, protein, dairy, sodium, sugar) — including evidence-based behavioral economics strategies — were accurately incorporated and faithfully executed in contracts with food vendors (17).

Present day action

The Board of Supervisors landmark policy remains active to this day. A food policy and procurement (FPP) team in DPH continues to provide support and serve as this implementation program's subject matter expert and lead. The team is presently tasked with reviewing all food-related RFPs initiated under the county government's umbrella; it can make recommendations on nutrition standards and practices and on how each department should conduct business with their food vendors (Figure).

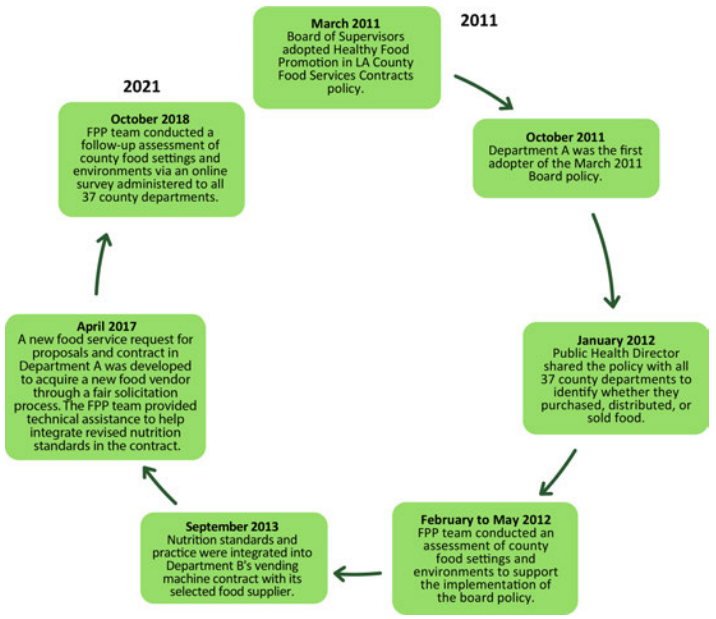

Figure. Timeline of the Los Angeles County Department of Public Health Food Policy and Procurement (FPP) team's implementation process for reviewing and integrating nutrition standards and behavioral economics practices into more than 20 requests for proposals (RFPs) and food service contracts with food vendors conducting business with the County of Los Angeles, from 2011 to 2021. Department A refers to the first adopter of the March 2011 board policy. Department B refers to a second department that integrated nutrition standards and practices into its vending machine contract with its selected food supplier.

Evaluation Methods

In our evaluation of the implementation of the Board of Supervisors policy, we sought to 1) summarize the contracting process that allowed the FPP team to integrate healthy nutrition standards and practices into the county's RFPs for new and renewing food vendor contracts, 2) review and document contents of the reviewed RFPs and their contracts from 2011 through 2021, and 3) share practice-based experiences and lessons learned from the implementation of the board's historic policy.

The FPP team applied a formative, multimethod, evaluative approach to achieve these goals and captured the progress and nuances of implementing the food policy. This approach consisted of 1) an organizational landscape analysis through key informant interviews, 2) a 2-part survey of county departments, 3) a document review of county food vendor RFPs and resulting contracts, and 4) a synthesis of lessons learned from implementing the policy. As an example, in 2012 (after the board's policy was adopted but before the policy was implemented), the FPP team conducted an organizational landscape analysis with key informants to identify and better understand the types of contracts covered under the Board of Supervisors policy. This assessment included disseminating a memorandum requiring each of the 37 county departments affected by the policy to inform DPH of whether they operated any food services. "Food vendor" was defined as any vendor who prepares, sells, distributes, or serves food for the county. Key informant interviews were then conducted with representatives from departments that reported they purchased, distributed, or sold food.

To gauge implementation progress, in 2018 the FPP team administered a 2-part survey. The first part was emailed to selected participants from the county's 37 departments. The second part was administered only to departments that indicated they operated food service venues or programs. A document review of county food vendor RFPs and their contracts, including a case assessment of an early county department adopter, was carried out to learn about the implementation process. Finally, a synthesis of lessons learned from the field was compiled to inform future policy implementation and refinements.

Organizational landscape analysis via key informant interviews, 2012

We conducted a landscape analysis to 1) support the implementation of the Board of Supervisors policy, 2) engage key stakeholders to better understand the county's diverse food environments (where food was prepared, served, or sold), and 3) inform the resources and planning needed to comply with the food policy. County departments were initially sent a memorandum asking them to complete a brief questionnaire indicating whether their department purchased, distributed, or sold food. Departments that indicated they did were then asked to designate a department contact who could participate in a key informant telephone interview with the FPP team. The team then scheduled interviews with the designated department contacts.

Interviews were carried out by using an interview guide informed by data and information from the literature (what was known about food policy adoption and implementation at the time) (15,17). The goal of the interviews was to gather information from county departments before implementation of the Board of Supervisors policy. Information gathered consisted of types of food venues and populations served by each of the departments; current contracts, such as the number of agreements and food vendors each department was handling; the existing nutrition guidelines or practices the department followed; the number of meals the department prepared, sold, or served across their food venues and environments; and any challenges or barriers encountered with purchasing or preparing healthy food items. Each interview took about 1 hour.

Two-part survey, 2018

The FPP team developed the 2-part survey in 2018 and sent it to all 37 county departments. The survey's primary goal was to better understand the departments' approach to conducting business with their food vendors and to identify any major changes that may have occurred in their approach since the adoption of the 2011 Board of Supervisors policy. The first part of the survey was a brief questionnaire designed to collect information on 1) each department's name, number of employees, and the physical and mailing addresses for their headquarters; 2) the name and contact information of the staff member(s) who would represent each department and complete the survey; and 3) whether each department at the time of the survey distributed, sold, or served food or beverages to county employees, their dependents, or visitors. The questionnaire was web-based and programmed by using the SurveyMonkey platform (SurveyMonkey). The first part of the survey was emailed to all 37 departments, asking the appropriate contact or representative to complete the questionnaire. The second part was sent to departments that indicated they prepared, sold, or served food or beverages at their facilities to get further details about their food service environments (eg, types of venues, types of contracts, populations served, food service operation characteristics).

Data and information obtained from interviews and the survey were reviewed and synthesized as lessons learned or field-tested practices (Table 1). These results are currently being used to update and refine policy implementation efforts.

Review of food vendor requests for proposals

With results from the key informant interviews, and subsequent findings from the 2-part survey, the FPP team developed a document review procedure to streamline the process of examining each food service RFP. These results helped the team plan for and update the overall review process, by 1) categorizing the types of food venues operating in the county, 2) gaining a better understanding of the population served by each contract, 3) determining whether a department was using existing nutrition standards, 4) documenting the implementation challenges each department encountered, and 5) learning how best to build policy implementation capacity (eg, tailored technical assistance, support tools) across the county. The review procedure has been refined iteratively over the past 10 years to improve the implementation of the Board of Supervisors policy.

Since the policy's adoption in 2011, the FPP team has reviewed and paved the way for 7 county departments to incorporate healthy nutrition standards and practices into 21 food service RFPs; most of the resulting contracts were successfully executed. For each RFP, the review focused on adherence to the county's recommended nutrition standards and practices and the factors that may have facilitated or impeded the execution of these requirements (Table 2). These factors included vendor readiness, the feasibility of standardizing nutrition quality, types of contracts and timelines (ie, new or renewing), and types of food service settings or environments encountered (ie, distributive meal programs, institutionalized meal programs, concession stands, worksite cafeterias, restaurants, or vending machines). The review also provided an opportunity for the FPP team to make recommendations regarding contract language that focused on facilitating the feasible integration and operationalization of healthy nutrition standards and practices. In most cases, departments accepted the FPP team's recommendations.

The implementation of healthy nutrition standards and practices has evolved over the past 10 years, especially for environments like cafeterias, cafés, and concessions. The integration of these standards has become more venue-specific and often requires careful consideration of where the food is being sold or served. Making this distinction is important because where the food is being sold (cafés, regular food stands) may be quite different from where meals are being served (eg, county's detention facilities, no-cost or reduced-cost meal programs). Based on these lessons learned, and the latest nutrition science, in 2020 the FPP team revised its DPH Nutrition Standards for Prepared Foods, Snacks, and Beverages.

Documentation and synthesis of lessons learned

Ten years of lessons learned from the various RFPs, such as what facilitated the policy implementation and the challenges encountered during implementation, were documented and synthesized by the FPP team. These were used to build a comprehensive compendium (inventory) of the strategies used to integrate healthy nutrition standards and practices into the county's food vendor contracting process. A series of brainstorming meetings based on the FPP team's implementation and evaluation findings were convened internally by the team throughout the policy implementation period to develop, establish, and periodically refine the policy objectives, nutrition and practice recommendations, and the review procedure that aided the processing of the RFPs.

Results

Organizational landscape and the two-part survey

In 2012, for the organizational landscape, 28 (76%) of the 37 county departments responded to the initial DPH memorandum requesting information from departments on whether they purchased, distributed, or sold food. Thirteen departments that indicated in their response that they purchased, distributed, or sold food were subsequently interviewed.

Twenty-six (70%) of the county departments participated in the first part of the 2018 survey. A total of 34 representatives, 1 to 2 per department, completed the questionnaire. More than half (53.0%) of the respondents were identified as being an administrative deputy or an administrative or section manager. Of these 26 departments that participated in the first part of the survey, only 15 identified as distributing, selling, or serving food to county employees, dependent populations, or visitors. All 15 departments completed the questionnaire.

Results of the second part of the survey indicated that each department spent an average of $2,808,340 per year on food and beverages; the total annual spending across all departments ranged from $500 to $27,000,000. Most (66.7%) indicated they purchased food and beverages internally for department-sponsored meetings and events. About half (53.3%) reported they offered food at no or low cost to community members and to those who depended on food programs such as CalFresh (Supplemental Nutrition Assistance Program) and the National School Lunch Program. Less than a third (25.6%) reported they operated their own food service (ie, via their own department staff). More than half (53.3%) reported contracting most of their food services needs to external companies such as Aramark, Morrison Healthcare, or Sodexo. Although less than half (46.7%) indicated their department offered healthy

foods (eg, fruit, vegetables, whole grains, minimally processed foods), about 60% had a registered dietician on staff who either worked for the department or for the contracted food vendor.

Document review and synthesis of lessons learned

Based on reviews of more than 20 food-related RFPs issued from 2011 through 2021, the FPP team drew several takeaways and lessons learned from the county's effort to implement the Board of Supervisors policy. For example, the reviews provided information and pointed to key places in the county's RFP and contracting process where standards and best practices could be reasonably incorporated without leading to costly delays or issues with execution of the contracts. The resulting 4-phase contracting framework provided the FPP team with a roadmap to guide implementation decisions, inform strategy selections, provide an illustrative case example, and discuss implementation facilitators and challenges.

The 4-phase food service RFP and resulting contracting process

The addition or integration of evidence-based nutrition standards and practices into the county's food service RFP and contracting process for food vendors was lengthier and more resource-intensive than originally anticipated. For example, the FPP team reviewed more than 20 county RFPs and related documents on food services and food procurement at the beginning of policy implementation and continued to do so throughout the 10 years to keep pace with new and renewing contract development. For renewals, many contracts had expired and RFPs were subsequently reissued after the board policy was adopted. The RFP process across all departments turned out to be less uniform than initially anticipated, requiring additional time to gain a better understanding of the differences and similarities between departments. For instance, government food programs operated by the County of Los Angeles are often governed by existing local, state, or federal laws (eg, Title 15, National School Lunch Program). Adding new standards and practices required careful review of these existing laws so that the new Board of Supervisors policy did not disrupt, contradict, or exceed existing legal requirements.

To develop the framework on contracting (Table 3), the FPP team worked collaboratively with at least 7 county departments to document and understand the nuanced workflows that governed the various RFPs. The FPP team used this information to conceptualize the county's food service contracting process as a 4-phase solicitation and contract execution procedure. This procedure incorporated healthy nutrition standards and practices strategically at places where they could be inserted or implemented along the continuum of actions, taking into account each department's needs and considerations (eg, program readiness, laws a department had to follow, how large or small food vendors worked with each department). The 4 phases are as follows: 1) the development of the RFP (an optimal time for including standards and practices as part of the proposed scope of work for each contract), 2) the release of the RFP (an opportune time to educate prospective vendors about the required nutrition standards and practices), 3) the evaluation of vendor proposals (an important leverage point where information about complying with the Board of Supervisors policy could be emphasized), and 4) the selection of the food vendor (timepoint where the final execution of the contract allowed for the codification of the healthy nutrition standards and practices, that is, standards and practices that could be required in the food vendor's contractual agreement).

On average, each contract review — activities such as reviewing the RFP, developing nutrition standards and contract language, corresponding with county departments — took approximately 2 to 3 weeks. In the early stages of policy implementation, reviews took much longer, because the implementation program was new and the FPP team was still building the program's infrastructure. Reviews of RFPs for low- or no-cost meal programs, and food served to populations that are dependent on meals, such as those in detention facilities, often required additional time and extensive review. This was due to the need to ensure that the proposed standards and practices adhered to requirements set by local, state, and federal laws.

Illustrative case example

The contract for cafeteria and vending machine vendors of the first county department to adopt the board's policy, referred to in this article as Department A, was an example of how the FPP team worked with one of the county's largest departments to introduce and embed healthy nutrition standards and practices into their food service RFP and resulting contract. Department A's on-site cafeteria sold food to county employees and visitors at their department headquarters. Their RFP was the first solicitation the FPP team worked on; the team's review took place shortly after the enactment of the Board of Supervisors policy. As the first RFP to be reviewed, the sequence of steps the FPP team took to move the process forward was iterative, and a learning experience. The workflow required the development of an entirely new set of contract language that delineated required nutrient standards and limits to follow as well as the "dos and don'ts" of practices for purchasing food under these new standards. Language specified how signage and behavioral economics strategies should be used in the cafeteria. Some of the recommended standards and practices were menu labeling, requiring at least 2 healthy entrée selections and 2 healthy side options on the menu, using pricing incentives, specifying nutritional requirements for combination meals, develop-

ing and implementing a sodium reduction plan, setting size limits for sugar-sweetened beverages, and requiring 25% of snack options to be healthy (ie, low in sugar and sodium). Many of the standards and practices were also applied to vending machines; a separate nutrition policy, the County of Los Angeles Vending Machine Nutrition Policy (19), guides nutritional quality of foods in vending machines.

A half-decade after the initial contract was developed, Department A's cafeteria and vending machine services contract expired, and a new RFP cycle was initiated in 2017. This new cycle gave the FPP team an opportunity to apply lessons learned from the first contracting process to streamline and improve the second RFP (Table 2). For example, a major challenge with Department A's RFP development was the need to draft contract language where allowable nutrient limits were clearly delineated and could be easily enforced, but at the same time, flexible enough to account for unanticipated problems in putting the program into practice. Standards had to address clientele dissatisfaction with the food or a decline in sales volume as a result of changes in food options, account for supply chain and workflow issues that were barriers for food vendors seeking to comply with the recommended standards and practices and consider potentially higher costs of food low in sodium or sugar. Sorting through many of these challenges was an invaluable learning experience for the FPP team. Department A's experience built the FPP team's confidence and gave it the opportunity to experiment with the review procedure and with the standards and practices that were ultimately recommended to improve the nutritional quality of foods offered by selected food vendors from each of the RFPs. In making these nutritional recommendations, we synthesized and applied lessons learned from integrating nutritional requirements into Department A's and other county departments' contractual processes with food vendors (Table 4).

Lessons learned: facilitators

The Board of Supervisors policy played a pivotal role in prioritizing and institutionalizing nutritional quality in the food service contracting process. The policy established a mindset that access to healthy food should be the norm in practice. The policy initiated a process in which DPH's review of food-related RFPs and their contracts became an accepted routine practice, standardizing how the county conducts business with food vendors. Early in the implementation process and shortly after the policy's adoption, efforts were made to understand the solicitation process of each county department. This understanding acknowledged that departmental protocols might differ, and that certain department staff and food vendors might need to be educated about the RFPs and contracts. Key insights from this phase guided the FPP team as they mapped the necessary implementation steps to translate the board's policy into practice.

In the early phases of working with RFPs, the FPP team quickly recognized the importance of establishing strong partnerships with key members of county departments. These partnerships proved essential for effectively incorporating the recommended standards and practices into contract solicitations. Recognizing this, the team made a top priority of working diligently and respectfully with administrators overseeing a department's food service contracts or the contract managers who monitored food-related contracts. The team also discovered that standards and practices had to align with each department's overall business goals. These considerations reflected important realities that influenced the speed, or lack thereof, at which a given RFP could be developed and administered. After 10 years of policy implementation, the integration of healthy nutrition standards and practices into government food service RFPs and their resulting contracts has become a qualified success. However, investments in staffing and support were limited at the policy's launch and remain underresourced to this day.

Implementing contract requirements involves a multipronged approach and technical assistance resources, such as culinary training, marketing, and leveraging data to drive nutritional changes. A robust evaluation component was imperative to guide and refine implementation. For instance, the FPP team provided ongoing monitoring and evaluation support to county departments throughout the 10 years; this was a key facilitator for implementing the food policy. Food environment assessments were conducted before and after contract execution for selected departments by using internally developed checklist tools that assessed the implementation of the recommended standards and practices (eg, implementation of behavioral economics strategies). Quality assurance reports with checklist results were developed for use by departments. The FPP team also developed implementation guides and resources (eg, toolkits, recipes) and nutrition promotional materials (eg, signage, table tents, decals) for staff and visitors to use. These resources played a critical role in educating implementers (county departments and food vendors), county employees, and community members who visited county food settings about the changes that were being made to the food at county facilities.

Lessons learned: challenges

We encountered several notable challenges to integrating healthy nutrition standards and practices into the county contracting process. First, the contracting system across the county was complex and continues to pose challenges to this day. For instance, the learning curve for the FPP team was steep. It took the team some time to grasp the nuances of how contracts with food vendors

functioned in the county. The county contracting process is also multilevel and nonlinear, with variations based on food service type or venue, department staffing, and inter- and intradepartmental workflow. Other challenges resulted from the diverse procedures among departments. Often, each department had separate contracts and grant units, each with its own operating procedures and solicitation mechanisms (eg, RFPs, invitations for bids, *requests for statements of interest*). The county system's size and complexity may also explain why some departments were not involved in implementation, because they were unfamiliar with the board's policy or had food vendor contracts that were signed for a long term (≥10 y), precluding meaningful review. Staff turnover and gaps in staffing may have precluded engagement, participation, and intracounty collaboration.

A second challenge was that some of the department administrative structures that were created to ensure checks and balances and a seamless pathway to contracting did not always work smoothly. Instead, they often generated operational inefficiency, which led to unforeseen delays with the RFP process and poor contract execution. For instance, the limited adherence to a strict timeline and a lack of standardization of the contracting process across several departments meant that even simple adjustments to contract language was a daunting task to coordinate, especially when these adjustments affected more than one department. Long delays became an undesirable norm because the sparse standardization and lack of structure frequently allowed for competing institutional priorities to redirect human resources away from the contracting process. In some instances, the FPP team never received final copies of the contracts or were not informed by the county department whether the contracts had been executed. In some cases, it was unknown or unclear whether the RFPs the FPP team worked on were ever released to the public.

Third, most contract managers within the county departments had limited nutrition knowledge and experience with operationalizing nutrition standards or implementing behavioral economics strategies. As such, the time required to train contract managers (eg, how to market healthier meals, how to improve consumer buy-in, how to collect relevant evaluation data) was a labor-intensive task. This was not something the FPP team, a small group with only one full-time–equivalent staff position dedicated to the policy's implementation, had anticipated. Currently, the FPP team still has only one full-time–equivalent position allocated for implementing the Board of Supervisors policy. Other difficult-to-overcome challenges in implementation included cost and budget constraints, limited contract oversight, and limited institutional capacity to monitor contracts and activities for adherence to DPH-recommended nutrition standards and practices (17).

Lastly, the collection of data on food purchased, sold, and served by county departments posed multiple challenges. Often, the only pertinent data came from publicly available menus. Almost no nutritional analysis data were collected or reported by contracted food vendors, and in several cases, vendors did not use standardized recipes.

Implications for Public Health

Although the Board of Supervisors policy adopted in 2011 has made tremendous progress in helping to solidify a review procedure and a set of nutrition recommendations for the county's food service contracting process, notable challenges remain. Funding and human resources for ongoing administration, compliance monitoring, and program evaluation remain elusive, despite their being essential for sustaining implementation of the Board of Supervisors policy. Because of challenges with data collection and limited funding and human resources, the FPP team has been unable to assess the level of adherence to nutrition standards and practices in food services operated by the county. Most county-contracted food vendors shared only menus and have been unable to provide additional information on the nutrients and ingredients they use in food preparation. As a result, it has been difficult to fully assess whether healthy menus actually complied with the DPH-recommended nutrition standards and practices.

In summary, our model to integrate nutritional requirements into the county contracting process with food vendors appears to be a promising approach for institutionalizing healthy nutrition standards and practices in a large California county government. The approach's goal was to increase the quality of food that government entities purchase, sell, and serve. Based on field findings and early evaluation results, our model has the potential to perform similarly in other agencies or jurisdictions interested in taking similar action within their organization to improve food quality, health, and financial sustainability (11,20–22).

Although some best practices introduced by the model require further research for codification, efforts on the ground and in the field should continue to build a business case for implementing food policies like the one embedded in the contracting process of the County of Los Angeles government. For instance, convening contracts and grants specialists from each of the relevant departments would be beneficial to discuss lessons learned and gather input on how best to leverage their department's contracting process, enforcement mechanisms, and purchasing power to improve the nutritional quality of foods served or sold in county facilities.

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References

1. Buttorff C, Ruder T, Bauman M. Multiple chronic conditions in the United States. RAND Corporation. Published 2017. Accessed June 28, 2023. https://www.rand.org/pubs/tools/TL221.html
2. California Health Interview Survey. Ever diagnosed with high blood pressure - borderline included. AskCHIS. Accessed March 6, 2023. https://ask.chis.ucla.edu/AskCHIS/tools/_layouts/AskChisTool/home.aspx#/results
3. Muka T, Imo D, Jaspers L, Colpani V, Chaker L, van der Lee SJ, et al. The global impact of non-communicable diseases on healthcare spending and national income: a systematic review. *Eur J Epidemiol*. 2015;30(4):251–277. doi:10.1007/s10654-014-9984-2
4. Cena H, Calder PC. Defining a healthy diet: Evidence for the role of contemporary dietary patterns in health and disease. *Nutrients*. 2020;12(2):334. doi:10.3390/nu12020334
5. Schulze MB, Martínez-González MA, Fung TT, Lichtenstein AH, Forouhi NG. Food based dietary patterns and chronic disease prevention. *BMJ*. 2018;361:k2396. doi:10.1136/bmj.k2396
6. Bunnell R, O'Neil D, Soler R, Payne R, Giles WH, Collins J, et al; Communities Putting Prevention to Work Program Group. Fifty communities putting prevention to work: accelerating chronic disease prevention through policy, systems and environmental change. *J Community Health*. 2012;37(5):1081–1090. doi:10.1007/s10900-012-9542-3
7. Kelly MP, Barker M. Why is changing health-related behaviour so difficult? *Public Health*. 2016;136:109–116. doi:10.1016/j.puhe.2016.03.030
8. Townshend T, Lake A. Obesogenic environments: current evidence of the built and food environments. *Perspect Public Health*. 2017;137(1):38–44. doi:10.1177/1757913916679860
9. Dietary Guidelines for Americans, 2020–2025, and Online Materials. Accessed October 7, 2023. https://www.dietaryguidelines.gov/resources/2020-2025-dietary-guidelines-online-materials
10. Lowry-Warnock A, Strombom N, Mugavero K, Harris D, Blanck HM, Onufrak S. Advancing healthy food service in the United States: state food service guidelines policy adoption and implementation supports, 2015–2019. *Am J Health Promot*. 2023;37(3):300–312. doi:10.1177/08901171221123311
11. Kimmons J, Wood M, Villarante JC, Lederer A. Adopting healthy and sustainable food service guidelines: emerging evidence from implementation at the United States Federal Government, New York City, Los Angeles County, and Kaiser Permanente. *Adv Nutr*. 2012;3(5):746–748. doi:10.3945/an.112.002642
12. Jilcott Pitts SB, Graham J, Mojica A, Stewart L, Walter M, Schille C, et al. Implementing healthier foodservice guidelines in hospital and federal worksite cafeterias: barriers, facilitators and keys to success. *J Hum Nutr Diet*. 2016;29(6):677–686. doi:10.1111/jhn.12380
13. Centers for Disease Control and Prevention. Food service guidelines for federal facilities. Published 2017. Accessed December 7, 2023. https://www.cdc.gov/obesity/downloads/guidelines_for_federal_concessions_and_vending_operations.pdf

14. Noonan K, Miller D, Sell K, Rubin D. A procurement-based pathway for promoting public health: innovative purchasing approaches for state and local government agencies. *J Public Health Policy*. 2013;34(4):528–537. doi:10.1057/jphp.2013.30
15. Gardner CD, Whitsel LP, Thorndike AN, Marrow MW, Otten JJ, Foster GD, et al. Food-and-beverage environment and procurement policies for healthier work environments. *Nutr Rev*. 2014;72(6):390–410. doi:10.1111/nure.12116
16. County of Los Angeles Board of Supervisors. (2011, March 8). Motion by Supervisor Mark Ridley-Thomas. Healthy Food Promotion in LA County Food Services Contracts. Accessed 14 February 2024. https://file.lacounty.gov/SDSInter/bos/supdocs/59493.pdf.
17. Robles B, Wood M, Kimmons J, Kuo T. Comparison of nutrition standards and other recommended procurement practices for improving institutional food offerings in Los Angeles County, 2010–2012. *Adv Nutr*. 2013;4(2):191–202. Erratum in: *Adv Nutr*.2013 Jul;4(4):479. doi:10.3945/an.112.003285
18. Robles B, Kuo T, Leighs M, Wang MC, Simon P. Using population reach as a proxy metric for intervention impact to prioritize selection of obesity prevention strategies in Los Angeles County, 2010–2012. *Am J Public Health*. 2014;104(7):e14–e19. doi:10.2105/AJPH.2014.301979
19. Board Policy 3.115. County of Los Angeles Vending Machine Nutrition Policy. Los Angeles County Board of Supervisors Policy Manual. Accessed January 18, 2024. http://countypolicy.co.la.ca.us/BOSPolicyFrame.htm
20. Lederer A, Curtis CJ, Silver LD, Angell SY. Toward a healthier city: nutrition standards for New York City government. *Am J Prev Med*. 2014;46(4):423–428. doi:10.1016/j.amepre.2013.11.011
21. Kimmons J, Jones S, McPeak HH, Bowden B. Developing and implementing health and sustainability guidelines for institutional food service. *Adv Nutr*. 2012;3(3):337–342. doi:10.3945/an.111.001354
22. Jilcott Pitts S, Schwartz B, Graham J, Warnock AL, Mojica A, Marziale E, et al. Best practices for financial sustainability of healthy food service guidelines in hospital cafeterias. *Prev Chronic Dis*. 2018;15:E58. doi:10.5888/pcd15.170477

Tables

Table 1. Policy[a] to Integrate Healthy Nutrition Standards and Practices Into Requests for Proposals[b] (RFPs) for Contracting with Food Vendors, County of Los Angeles Departments, by Food Setting and Environment, 2011–2021

Type of food service setting or food environment	Food service site or venue	Audience	How many RFPs, including the proposed scope of work of prospective food vendors, were reviewed by DPH during the contracting process	Estimated number of people reached or exposed to a program or intervention per year[c]
Meal distribution programs	Parks and recreation sites that administer the Summer Food Service and After School Snack programs	Children and adolescents	1 RFP reviewed	88,391
	Shelter care center within a court	Children and adolescents in county custody awaiting court hearings	2 RFPs reviewed	9,612
Detention facility meal programs	Juvenile halls and camps	Adolescents and young adults in detention facilities	6 RFPs reviewed	2,714
Concession stands	Beach concession stands and mobile carts	Community members and visitors	1 RFP reviewed	550,000
Worksite cafeterias	Workplace cafeteria (Department A[d])	Employees and visitors	2 RFPs reviewed	1,400
	Workplace cafeteria	Employees and visitors	1 RFP reviewed	2,334
	Public hospital cafeterias, snack shops, and vending machines	Employees, patients, and visitors	3 RFPs reviewed	393,321
	Workplace cafeteria	Employees and visitors	1 RFP reviewed	1,465
	Health center cafeteria	Employees, patients, and visitors	2 RFPs reviewed	32,380
Restaurants	Restaurant on government beach property	Community members and visitors	1 RFP reviewed	34,790
Vending machines	Worksite locations (Department B[e])	Employees and visitors	1 RFP reviewed	82,516
	Recreation facilities	Employees, community members, and visitors		15,074

Abbreviation: DPH, Los Angeles County Department of Public Health.
[a] Healthy Food Promotion in LA County Food Services Contracts policy (16).
[b] The Board of Supervisors policy (16) requires the review of RFPs to integrate healthy nutrition standards. In some cases, county departments used other types of solicitation mechanisms (eg, invitations for bids, *requests for statements of interest*). Each row represents a different county department or food service type with separate RFPs and contracts.
[c] Population reach estimates were based on publicly available data or internal records and determined by using the definitions and methodology described in Robles et al (18).
[d] County department selected as a case example of the policy implementation in the study.
[e] County department that administers a large vending machine contract.

Table 2. Nutrition Standards and Practices[a] Integrated Into Department A's[b] Request for Proposals (RFPs) in 2017, Policy to Integrate Healthy Nutrition Standards and Practices Into Food Vendor Contracts, County of Los Angeles, 2011–2021

Aspect of food service	Requirements for vendor proposals in response to RFPs[a]
Proposal preparation and submission of the Work Plan	
Menu	Description of menu options including but not limited to breakfast menu selections, value menu, lunch entree selections, healthy food choices, snacks, and beverages. Please note that the successful contractor is required to comply with the Concession Nutrition Standards identified in Part II, Exhibit H[c]. Description should also include: i. A list of prices as well as nutritional information for all menu options. ii. More than two healthy low fat and low calorie selections for lunch. iii. Portion sizing iv. Quality of food v. Indication that menu items will comply with Concession Nutrition Standards identified in Part II, Exhibit H[c].
Vending machine operations	A description of vending machine services, qualifications, experience, staffing, and schedules . . . Please note that the successful contractor shall be required to comply with the County of Los Angeles Vending Machine Nutrition Policy, 3.115, as described in Exhibit G[d].
Wellness and sustainability policy	A description of the Proposer's existing wellness and sustainability policy that demonstrates their commitment to promoting wellness programs such as healthier menu offerings and beverages, menu labeling, healthy checkout registers, etc. to support healthy eating. The description of the wellness and sustainability policy should also demonstrate how this policy has been implemented.
Registered dietician	The Proposer's staffing plan must include a Registered Dietitian who will provide menu and meal planning services that comply with the Concession Nutrition Standards, Exhibit H[c] and as needed to confer with Department of Public Health to implement the standards.
Sample agreement on the scope of work for cafeteria and vending machine services	
Concession nutrition standards	Plan and implement menus that contain healthy food and beverage choices as defined in Exhibit H[c], Concession Nutrition Standards.
	Contractor shall submit a nutritional analysis of all menu items to the DPH and the Contract Manager at the commencement of the Contract and when menus change with the introduction or modification of new menu items to confirm adherence with all nutrition standards in this Contract. Please refer to Exhibit M[e] for a Sample Nutritional Analysis . . . Food Production and Sales Record.
Sodium reduction	Implement the DPH's Sodium Reduction Plan within 12 months of this Contract's commencement. The Contractor shall work with DPH staff, as well as the Contract Manager to comply with the sodium standards for purchased food categories. The DPH Sodium Reduction Plan is attached as Exhibit L[f] to this Contract.
Menu labeling	Prepare and provide weekly menus, which include prices and a description of each item. Contractor shall distribute menus on Thursday afternoon for the following Monday service. The menu shall also list the nutritional information for each item in accordance with the Federal menu labeling requirements set forth under the Patient Protection and Affordable Care Act of 2010 in Exhibit K[g], Menu Labeling Requirements. This requirement shall also apply to all future menus or proposed changes.
Signage	Clearly indicate healthy menu items. Contractor shall add symbols to the menu to identify items that feature vegetarian or vegan menu items (when applicable). Contractor shall also add symbols to the menu to identify menu items that feature local produce.
	In consultation with the County Contract Manager and DPH, prominently display *Choose Health LA*[h] signage (signage shall be provided by DPH) that promotes healthy food and beverage options made available by the Contractor. Signage indicating availability of fresh, cold tap water at no charge shall be placed at fountain drink machine or hydration station. Signage identifying reduced-size portion entree options and combination meals with the alternative option to select bottled water and a nonstarchy vegetable or fruit as a side item shall be displayed.

Abbreviation: DPH, Los Angeles County Department of Public Health.

[a] Excerpted from the County of Los Angeles Department of Public Works Request for Proposals for Cafeteria and Vending Machine Services at the Department of Public Works Headquarters (2017-PA011) to illustrate what nutrition standards were integrated into the RFP to implement requirements of the Board of Supervisor's Policy. These standards were revised in 2020.

[b] County department selected as a case example of the implementation of County of Los Angeles Board of Supervisors policy, Healthy Food Promotion in LA County Food Services Contracts (16).

[c] Exhibit H: Los Angeles County Department of Public Health Concession Nutrition Standards. The standards set nutrition limits for snacks/desserts, main dish/entree, side items, beverages, combination meals, condiments, fruit, vegetables, grains, protein, and dairy. They include standards for food preparation methods, local produce, and behavioral economics strategies (ie, product placement, menu labeling, signage, price incentives).

[d] Exhibit G: County of Los Angeles Vending Machine Nutrition Policy. The policy sets nutrition guidelines for snacks and beverages sold in County of Los Angeles vending machines.

[e] Exhibit M: Sample Nutritional Analysis Food Production and Sales Record. This exhibit presents samples of data sources for menus, nutritional information, food production, and sales records. These data sources support the assessment of contract terms related to the implementation of nutrition standards.

[f] Exhibit L: Implementing a Sodium Reduction Plan. This exhibit specifies a plan to implement purchasing standards for the sodium content of food products.

[g] Exhibit K: Menu Labeling Requirements. This exhibit specifies menu labeling requirements including the display of calories for all food items.

[h] Choose Health LA is an educational campaign directed at county employees and the community to promote healthy eating through informational materials such as signage, table tents, and an informational website at worksite cafeterias in county buildings.

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Table 2. Nutrition Standards and Practices[a] Integrated Into Department A's[b] Request for Proposals (RFPs) in 2017, Policy to Integrate Healthy Nutrition Standards and Practices Into Food Vendor Contracts, County of Los Angeles, 2011–2021

Aspect of food service	Requirements for vendor proposals in response to RFPs[a]
Product placement	Position healthy food and beverage items prominently in the cafeteria with easy access for customers.
	Contractor shall only display food and beverage items meeting Concession Nutrition Standards (Exhibit H[c]). • Healthy snacks and water shall be placed within 5 feet of all checkout registers. • Candy bars, cookies, chips, and sugar-sweetened beverages (sugar-sweetened beverages include all sodas, fruit drinks, sport drinks, low-calorie drinks, and other beverages that contain added caloric sweeteners, such as sweetened tea, rice drinks, bean beverages, sugarcane beverages, and nonalcoholic wines) shall be removed from checkout register area or at point-of-purchase. • Fresh fruit shall be displayed within reach of the checkout register. • Only healthy beverages, as defined in Exhibit H[c], shall be displayed in eye-level sections of beverage cases. • Only healthy snacks/desserts, as defined in Exhibit H[c], shall be displayed in eye-level sections of display areas. • Healthy food entrees and side items, as defined in Exhibit H[c], shall be placed at the front of each food service area.
Pricing incentives	Prices of healthy entrees, side items, snacks/desserts, and beverages, as defined in Exhibit H[c], Concession Nutrition Standards, shall not exceed the price of other menu options . . .
	Pricing for the salad bar and pre-packaged salads shall be competitive with other food entree options.
Catering	Catering menus shall comply with the Concession Nutrition Standards set forth in Exhibit H[c].
Vending machines	Comply with the County of Los Angeles Vending Machine Nutrition Policy, 3.115, as described in Exhibit G[d].
Monitoring adherence to nutrition standards	Comply with all nutrition guidelines outlined in this Contract, as well as any future Board of Supervisors' policies concerning nutrition guidelines. The nutritional guidelines may be revised periodically to ensure they meet current dietary recommendations. County will provide the Contractor with the revised nutritional guidelines as they become available. DPH may periodically monitor the Contract to ensure the Contractor is in compliance with Exhibit H[c], Concession Nutrition Standards. Contractor is required to maintain and submit quarterly to the County upon the Contract Manager's request, the following records: food production records, itemized monthly sales, and a complete nutrition analysis of all menu products/items offered. Please refer to Exhibit M[e] for a Sample Nutritional Analysis Food Production and Sales Record. DPH shall review records and communicate its findings to the Contract Manager. Failure to comply with the Concession Nutrition Standards may, in the County's sole discretion, constitute a breach of this Contract.
Registered dietician	Contractor shall provide services from a registered dietitian as necessary to provide menu and meal planning services that comply with the Concession Nutrition Standards, Exhibit H[c], and as needed to confer with DPH to implement the standards. The Contractor shall immediately notify the Contract Manager of any change of the registered dietitian.

Abbreviation: DPH, Los Angeles County Department of Public Health.

[a] Excerpted from the County of Los Angeles Department of Public Works Request for Proposals for Cafeteria and Vending Machine Services at the Department of Public Works Headquarters (2017-PA011) to illustrate what nutrition standards were integrated into the RFP to implement requirements of the Board of Supervisor's Policy. These standards were revised in 2020.

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Table 3. Four Phases[a] of Food Service Contracting, Policy[b] to Integrate Healthy Nutrition Standards and Practices Into Requests for Proposals[c] for Contracting with Food Vendors, County of Los Angeles, 2011–2021

Phase 1	Phase 2	Phase 3	Phase 4
Develop an RFP that integrates healthy nutrition standards and practices into the contract(s) of food vendor(s) • DPH meets with a county department to discuss the current food environment, existing regulations that may govern food quality and the RFP process • DPH reviews the draft RFP and develops recommended nutrition standards, and behavioral economics strategies if applicable, for inclusion in the RFP • Nutrition standards are presented to the county department, and mutually agreed upon standards are finalized • Contract language describing nutrition standards are developed and integrated into the final RFP (eg, scope of work, minimum mandatory requirements)	Release the RFP with the nutrition standards and practices • County department releases the RFP with nutrition standards and behavioral economics strategies if applicable • Proposers (food service operators) may develop and submit written questions regarding the RFP • The county department that released the RFP develops a list of questions and answers, which is shared with the public • Food vendors are required to participate in a mandatory proposer's conference (eg, facility walk-through). DPH participates, if appropriate, at the mandatory proposer's conference and provides an overview of the nutritional standards • Proposals are submitted to the county department	Evaluation of food vendor proposals • An evaluation committee is developed by the county department to evaluate and score the proposals based on set criteria, including compliance to nutrition standards • Food vendors must meet minimum mandatory requirements of the RFP • Food vendors are evaluated on criteria such as experience, background, references, and their proposal to meet work plan requirements including healthy nutrition standards	Food vendor selected • Department selects new food vendor and enters into contract negotiations • The new vendor and contract is submitted to the County Board of Supervisors for approval • Final contract awarded by County of Los Angeles Board of Supervisors to selected food service operator

Abbreviations: DPH, Los Angeles County Department of Public Health; RFP, request for proposal.

[a] Entry points where integration of healthy nutrition standards and practices could be accomplished or strengthened.

[b] Healthy Food Promotion in LA County Food Services Contracts policy (16).

[c] In some cases, county departments used other types of solicitation mechanisms (eg, invitations for bids, *requests for statements of interest*). There may also be some differences in the wording, and requirements of RFPs across county departments and food service settings.

Table 4. Facilitators and Challenges to Operationalizing the Board of Supervisors Policy[a] to Integrate Healthy Nutrition Standards and Practices into Requests for Proposals for Contracting with Food Vendors, County of Los Angeles, 2011–2021

Facilitator	Description
Board policy institutionalized a contract review process	The board policy institutionalized a process to include nutrition guidelines as a standard of practice within the food contracting process.
Understanding the contracting process	Learning and understanding the contract solicitation process (ie, primarily for the RFP mechanism) of each county department that serves, sells, or distributes food was instrumental to policy implementation.
Stakeholder engagement	Building partnerships with county administrators and contract managers who oversee food contracts.
Tailored nutrition guidelines	Developing nutrition guidelines that can be integrated into all food contracts and venue-specific standards that meet the needs of specific food venues and target populations.
Multipronged approach to implementation	Implementing nutrition standards and other contract requirements requires technical assistance resources such as marketing, culinary training, and leveraging data to drive nutritional changes.
Resources to support implementation	Implementation resources and promotional materials are needed to educate implementers (eg, county employees, food vendors) and community members about nutritional changes.
Monitoring and evaluation of board policy	The FPP team provided ongoing monitoring and evaluation support to county departments throughout the 10-year period.
Challenges	**Description**
Complexity of contracting system	The contracting system is complex with various food service types and venues, departmental staffing, different contracts and grant units and workflows, operating procedures, and contract solicitation mechanisms. The contracting system across departments lacks structure and standardization.
Implementation capacity of smaller food vendors	Smaller vendors have less capacity (resources and staffing) to implement nutrition standards in contracts.
Lack of staff nutrition knowledge	County departments have limited staff capacity, training, and nutrition knowledge to implement nutrition standards.
Limited staffing for county-wide implementation	There is only one full-time–equivalent position dedicated to overseeing implementation of the board policy.
Challenges with contract monitoring and data collection	Limited resources for oversight and monitoring of food contracts for adherence to contract terms and nutrition standards. Challenges with collecting nutrition analysis and procurement data from county departments to identify opportunities for replacing unhealthy products with healthier alternatives.

Abbreviation: FFP team, Food Policy and Procurement team within the Los Angeles County Department of Public Health.
[a] Healthy Food Promotion in LA County Food Services Contracts policy (16).

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