



HHS Public Access

Author manuscript

J Acad Nutr Diet. Author manuscript; available in PMC 2020 January 01.

Published in final edited form as:

J Acad Nutr Diet. 2019 January ; 119(1): 39–44. doi:10.1016/j.jand.2018.09.008.

Local Food Sources to Promote Community Nutrition and Health: Storefronts Businesses, Farmers' Markets, and a Case For Mobile Food Vending

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Keywords

Food environment; food store; restaurant; famers' market; mobile vending; street vending; fruits and vegetables; food desert; food access

Researchers, policy makers, and advocates of public health are increasingly interested in local food environments (i.e., sources of foods within communities) as mechanisms to improve community nutrition and health.^{1–4} Improved nutrition and health may follow from increasing access to healthful foods and/or by limiting access to less-healthful foods.⁵

“Healthful” foods can be variably defined but, for the purposes of this commentary, a reasonable-if-not-comprehensive definition might be foods from *plants*–the living botanical kind, whereas “less-healthful” foods might be products from *plants*–the industrial processing kind. In other words, healthful foods would include, for example, fruits, vegetables, whole grains, and nuts, consistent with dietary guidelines;⁶ less-healthful foods would include processed meats, refined items, and concoctions full of added sugars, fats, and/or sodium: i.e., ultra-processed products.

To limit access to ultra-processed products and expand access to more-healthful items, community strategies commonly focus on the placement of restaurants and food stores. Such strategies include restricting locations for fast-food outlets,^{7,8} promoting supermarket development,^{8–11} and attracting grocery stores to neighborhoods.^{7,8,10,11} These strategies have a rational basis given the predominant role restaurants and food stores can play in people's overall food purchasing.¹² Indeed, interventions focused on siting food stores and restaurants might reasonably benefit community nutrition and health.

Author contributions

SCL conceived the editorial, performed the literature review, and wrote the manuscript.

Conflict of interest Disclosure

The author does not have any conflicts to report.

Ethical Standards Disclosure

All of the author's cited studies were approved or considered exempt by the Albert Einstein College of Medicine IRB under federal regulations 45 CFR 46.110 and 21 CFR 56.110.

NOTE: Permissions have been given for all Acknowledgements

However, food-store and restaurant strategies have important limitations. One limitation relates to assumptions about the healthfulness of offerings. For example, supermarkets are usually thought of a “healthful” food sources, yet supermarkets can be principal suppliers of less-healthy fare (e.g., salty snacks, candies, sugar-sweetened beverages).^{13,14} Conversely, fast-food restaurants are usually thought of “unhealthy” food sources, yet many fast-food outlets offer healthy options such as fresh fruit and green salads (and some fast-food chains even focus their entire business models on healthier offerings^{15,16}). Additional limitations of strategies based on the placement of food stores and restaurants include requirements for substantial capital, physical space, developer buy-in, and/or corporate or political will to bring change.

Bringing change--specifically towards healthier food access in communities--might come more easily through supplemental approaches having fewer practical barriers. Lower-barrier approaches include those focused on other community sources of food.

Storefronts Beyond Food Stores and Restaurants

Community sources of “food” (which, for the purposes of this commentary, also includes beverages) can be diverse. Although food stores (especially supermarkets) and restaurants (especially fast-food outlets) are by far the most-studied among local food sellers,^{17–19} other sources of foods in communities can include a wide variety of storefront businesses. These businesses might range from gas marts, pharmacies, and dollar stores,^{20–24} to hardware stores, automobile shops, furniture stores, apparel outlets, and just about every other kind of storefront retail imaginable.^{25–30} Such businesses, or “other storefront businesses” (OSBs) may not primarily focus on selling food but can account for as much as a third of all storefront food options in a community.^{29–31} Food-selling OSBs can be comparable in number to restaurants and greater in number than so-called “food stores.”³¹

In fact, OSBs may be the fastest growing category of storefront food sources; food-selling OSBs nearly doubled their presence over a five-year period in one study.³¹ In another study (Lucan and colleagues, 2016–2017, unpublished data), it was noted that increased food-selling in a community was mostly due to existing businesses adding to their provided services (by offering food), not due to the opening of new “food stores” or restaurants.

Given the extent to which OSBs can make foods available in neighborhoods, strategies to improve community food options might focus on these storefronts. Food-selling OSBs almost all offer unhealthy items (e.g., chips, cookies, soda), yet only about 10% offer such items exclusively.^{29,30} More-healthy options (e.g. dried fruits, whole-grain snacks, nuts) might be made more available in OSBs through approaches tested in other settings; for example, targeting their vending machines,^{32,33} checkouts,^{34–36} or broader inventories more generally.^{37–39}

However, OSB approaches--like the food-store and restaurant strategies mentioned earlier--are limited by the fixed geographic nature of storefront setups. The reality of being confined to set physical locations may not allow for the most flexible responses to local food-environment changes.

Yet local changes can be substantial. In one study, nearly 30% more storefronts offered food, on 22% more streets, between 2010 and 2015.³¹ In another study, the number of OSBs offering any unhealthful foods--and the number offering *only* unhealthful foods--increased over a single year by 63% and 60% respectively (Lucan and colleagues, 2016–2017, unpublished data).

In such context, trying to make OSB offerings more healthful could be a worthy pursuit. But the most nimble responses to storefront changes might not be further changing storefronts.

The Potential of Farmers' Markets

One non-storefront approach to improve food options in a community could be farmers' markets. Farmers' markets have an advantage over fixed storefront businesses in being able to locate in a variety of spaces, with less investment, planning, or permanency. As such, farmers' markets may be better able to address communities' changing needs in settings of shifting food availability. Indeed, farmers' markets could provide communities with paths towards healthier food access.

“Access”--first described for health care⁴⁰ and later applied to local food sources¹--is a concept that can encompass five related dimension: *availability*, *accessibility*, *affordability*, *acceptability*, and *accommodation*. *Availability* refers to the variety or selection of items offered. *Accessibility* is about physical location and hours of operation. *Affordability* refers to price and people's perceptions of cost and value. *Acceptability* implies how well personal expectations and standards are met (e.g., as relating to food quality). *Accommodation* suggests the degree to which consumers' needs are satisfied (e.g., with regard to accepted methods of payment or cultural familiarity of offerings).

While each of the access dimensions can be applied to any food source (including the storefront sources already discussed), one of the few studies to evaluate all five dimensions did so considering farmers' markets--and compared farmers' markets to nearby produce-selling stores.⁴¹ Findings revealed that farmers' markets carried much smaller selections of produce than stores and had much more restricted hours; farmers markets were generally open only one day a week and often only for limited times in the middle of the workday. Also, the food at farmers' markets was generally more expensive, and tended to be of uncommon--and perhaps culturally unfamiliar--varieties (e.g., purslane, spilanthes, lamb's quarter, and sorrel).⁴¹ In other words, famers' markets fell short on *availability*, *accessibility*, *affordability*, and *accommodation*. Their produce did tend to be fresher, but farmers' markets also tended to offer and promote many items of dubious nutritional value (such as pies, cakes, cookies, donuts, and juice drinks).⁴¹

The study that uncovered these findings included all the farmers' markets operating in a single urban county. It is of course possible that famers' markets operating in other geographic locations might offer better “access” to healthful foods in their communities.. Research from other locales, however, does not suggest this is the case.⁴²

Farmers' markets could certainly play a role in improving nutritional offerings for some,⁴³ but they might not represent an ideal response for improving access to healthier foods in general. Another non-storefront option may hold greater promise.

Mobile Food Vending as an Option

Mobile food vending is a worldwide phenomenon.^{44–52} Mobile vendors include operators of push carts, trucks, vans, and other vehicles from which food is sold.⁵³ Vendors can also include those selling from informal sidewalk arrangements like tables, coolers, and blankets.

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Mobile vendors, specifically those selling fresh produce, were the subject of a recent systematic review.⁵⁴ In the review, authors considered aspects of vending related to all five access dimensions: *availability* (produce selection), *accessibility* (selling locations), *affordability* (item prices), *acceptability* (perceived quality), and *accommodation* (e.g., methods of payment). Optimal access within each dimension was not found (or, indeed, even assessed) in all studies. Nonetheless, mobile vendors may have considerable potential within access dimensions and greater flexibility within the dimensions than other food sellers.

For example, in contrast to stationary storefronts or semi-fixed farm stands, mobile vendors often have the ability to relocate at a moment's notice (*accessibility*). If a selling location is not working out, mobile food vendors can simply pick up and move. In fact, in a study of mobile food vendors in the Bronx, more than 70% of vendors had set-ups that could accommodate easy and rapid movement, and nearly 30% of vendors reported selling in more than one location--sometimes even within a given day.⁵³

Mobility may allow vendors to be particularly responsive to changing food environments within communities. For example, if there is increasing availability of less-healthy options through storefront businesses on some streets, a mobile produce vendor might be able to come in, find a niche, and meet a community need. In contrast, for a brick-and-mortar supermarket or produce store to do the same, constructing and setting up at a new location could be a considerable and costly undertaking. Likewise for farmers' markets, the logistics of siting in a new location would not be trivial.

Logistics of siting (*accessibility*) aside, mobile vendors might be better able than storefronts--or even than farmers' markets--to experiment with other dimensions of access. For instance, when it comes to hours of operation, food offerings, and food prices (*accommodation, availability, affordability*), mobile vendors may be able to make changes more spontaneously; vendors often operating as individuals having flexible relationships with wholesalers.⁵⁵ For brick-and-mortar storefronts, hours of operation and food offerings and prices may be more constrained by set contracts with employees and suppliers. Farmers' market may face similar hurdles to changes in these dimensions, and additionally may be constrained by needing to feature the limited products a farm produces. In contrast, mobile vendors can more freely experiment to find the right combination of hours, offerings, and prices. Mobile vendors can rapidly evolve their business models through trial and error; they

can quickly and continuously course correct within access dimensions to best, and most sustainably, meet their own needs and those of the community.

Community Benefits of Mobile Vending

Those engaged in mobile vending--as opposed to those who own stores, restaurants, and farm stands--tend to come from within the communities they serve.^{55,56} As such, they may have an inherently high understanding of community needs, preferences, and expectations. Mobile vendors may support cultural *accommodation* (and not serve as a regular reminder of economic exclusion like storefront businesses--or potentially even farmers' markets--owned by community outsiders can⁵⁷). Like other food selling, mobile vending can provide economic opportunity for residents⁵⁸ and might provide additional economic benefits for communities (e.g., by generating foot traffic for other local establishments).^{59,60} Additionally, mobile-vending sites can serve as hubs for social engagement⁶¹ and health education.⁶²

Regarding food offerings specifically, mobile vendors can promote demand for healthier items. For example, an evaluation of the impact of mobile produce vendors in New York City showed that the proportion of *all* food establishments (including fixed storefronts) selling fruits and vegetables tended to increase in areas in which mobile produce vending was present.⁶³ The suggestion is that mobile produce vendors increase general demand for produce and prompt other businesses to offer fruits and vegetables themselves (improving *accessibility* and *availability* at a minimum among access dimensions).

Mobile vendors may have additional benefits too when it comes to healthful-food access. Vendors can make healthful foods available to residents who might otherwise have *accessibility* issues (e.g., due to mobility problems or lack of transportation).⁶¹ Additionally, it is possible that increased competition through mobile vending can drive down prices across all food sources; and mobile vendors can certainly, themselves, support *affordability* of healthier items.⁵⁵

As for dietary intake, the previously referenced systematic review of mobile produce vending assessed vending's association with produce consumption.⁵⁴ The review revealed mostly direct correlations with consumption of fruit and/or vegetables, however findings were not entirely consistent. For the review, there were only a small number of published studies and all had methodological limitations (e.g., observational designs, selection bias, lack of control groups). In the future, additional research using randomized controlled trials or quasi-experimental studies would be helpful to clarify possible effects of mobile vending on dietary intake. Fortunately, some such efforts are currently underway in this regard and will be helpful moving forward.⁶⁴

Mobile Vending as a Strategy Moving Forward

As it stands, mobile food vending may offer several advantages over other local food sellers for improving community nutrition and health. However, mobile vendors do not currently represent a sizeable proportion of existing food sources in communities. Vendors likely account for 10% of all food sellers, even in communities in which mobile vending is

prevalent (Lucan and colleagues, 2015, 2016, 2017, unpublished data). To become bigger players on the food-access scene, there are at least two challenges mobile vendors must overcome.

One challenge is weather. Weather is a substantial issue for mobile vendors, especially those directly exposed to the elements. In one study, more than 60% of mobile vendors did not operate in the winter and about 90% of fresh produce vendors did not operate on rainy days.⁶⁵ Some authors have suggested partnering with community organizations for as-needed indoor spaces during these times.⁵⁴ Another solution might be greater use of enclosed set-ups for vending (e.g., selling from inside of trucks as opposed to outside from push carts); only about 20% of vendors in one study had enclosed set ups.⁵³

A second challenge is that, currently, most vendors do not sell healthful foods like fruits and vegetables. In fact, about two thirds of all mobile vendors may offer no healthful items at all.⁶⁵ Moreover, in a context of unofficial selling (a majority of vendors operating without permits or licenses⁵³) and lack of centralized planning, vendors of healthful items like fresh produce may not locate in areas of greatest need.^{66,67} Fortunately, models have been developed to help optimize the placement of healthful-food vendors.⁶⁸ What would be helpful now are policies to support more vendors selling healthful foods, and getting those vendors to sell in areas where the are most needed..

Among policy initiative that could help improve the number and distribution of healthful-food vendors are the following: offering preferential availability, pricing, and handling of vending permits for those choosing to sell healthful items in challenged communities; having stiffer penalties for unlicensed vendors who offer only less-healthful fare; modifying credit-history requirements towards the purchases of vehicles for produce vending (e.g. trucks for selling fruits and vegetables) and having leasing options for vendors unable to purchase vehicles outright; establishing secure affordable spaces for selling healthful items in inclement weather and for storing vending vehicles when not in use; coordinating bulk purchasing of fruits and vegetables for vendors to help keep costs down (and help keep prices charged to customers low). Additionally, cities could expand community partnerships to help create local demand for healthful foods and to help recruit new vendors. Cities could also explore establishing electronic benefit transfer (EBT) as a payment option for mobile-vendor customers having Supplemental Nutrition Assistance Program (SNAP or “Food Stamps”) benefits.

Summary

Improvements in community nutrition and health may follow from healthier food access. Strategies to support healthier food access might focus on a wide array of local food sellers. Strategies focused on placing “food stores” and restaurants could be valuable, but might be costly and complicated and lack precision with regard to healthfulness. Strategies focused on OSBs and their offerings may be logistically simpler and more precise, although--like other storefront approaches--not entirely flexible from a geographic standpoint. Farmers’ markets offer greater geographic flexibility, but may fall short in several dimensions of access for

many community residents. By comparison, mobile food vending holds promise as a flexible, adaptable, and dynamic strategy to optimize healthier food access more broadly.

Currently, mobile food vending may represent a small proportion of food selling overall. “Food stores” and restaurants typically play the largest role in people’s food purchases; the role of OSBs may be increasing; farmers’ markets can be variably important. Nonetheless, food environments shift and there is potential for change. Mobile vendors may have distinct advantages that could allow them greater roles in food provision. Mobile vending may be able to address many of the limitations and deficits of other food sellers within access dimensions. Support for mobile food vending could be a viable strategy to improve community nutrition and broader community health.

Acknowledgments

The author would like to thank all the students who have contributed to work on food-environment assessments, particularly research on mobile food vending (Tara Adames, Clarissa Blanco, Joel Bumol, Aixin Chen, Ilirjan Gjonbalaj, Gustavo Hernandez, Aurora Jin, Brooke Lawrence, Evans Osei Sarpong Nduro, Salamatu Nurudeen, Charles Pan, Achint N. Patel, Kevin Sarmiento, Geohaira Sosa, Luis Torrens, Monica Varona) and research on other food sources (Mamadou Bah, Alexander Bryan, Andrew Carmona, Hilary Frankel, Rafael Frias, Zoë Ginsburg, Omar Sanon, Jason L. Seitchik, Luisa E. Sperry, and Don Yoon). The author would also like to thank collaborators who have participated in research on mobile food vending (William B. Jordan Andrew R. Maroko, Judith Wylie-Rosett, Clyde B. Schechter, and Renee Shanker). Thanks also goes to Tatjana Dragic, of the Einstein Office of Grant Support, for providing feedback and edits on an early draft of this manuscript. Finally, the author would like to acknowledge Matthew Shapiro, of the Street Vendor Project of the Urban Justice Center, for providing review and comments.

Funding/Support Disclosure

The author and much of the cited research are supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health under award K23HD079606. The content of this manuscript is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

1. Caspi CE, Sorensen G, Subramanian SV, Kawachi I. The local food environment and diet: a systematic review. *Health Place*. 2012;18(5):1172–1187. [PubMed: 22717379]
2. Engler-Stringer R, Le H, Gerrard A, Muhajarine N. The community and consumer food environment and children’s diet: a systematic review. *BMC Public Health*. 2014;14:522. [PubMed: 24884443]
3. Sisnowski J, Street JM, Merlin T. Improving food environments and tackling obesity: A realist systematic review of the policy success of regulatory interventions targeting population nutrition. *PLoS One*. 2017;12(8):e0182581. [PubMed: 28783757]
4. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health*. 2010;100(4):590–595. [PubMed: 20167880]
5. Lucan SC. When food isn’t medicine - A challenge for physicians and health systems. *Preventive Medicine Reports*. 2018;10:62–65. [PubMed: 30023160]
6. Dietary Guidelines for Americans 2015–2020: Eighth edition. For Professionals: Recommendations At-A-Glance. March 2016; https://health.gov/dietaryguidelines/2015/resources/DGA_Recommendations-At-A-Glance.pdf. Accessed February 22, 2018.
7. Babey SH, Wolstein J, Diamant AL. Food environments near home and school related to consumption of soda and fast food. Policy brief. 2011(PB2011–6):1–8.
8. Keener D, Goodman K, Lowry A, Zaro S, Kettel Khan L Recommended community strategies and measurements to prevent obesity in the United States: Implementation and measurement guide.

- Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.;7 2009.
9. Giang T, Karpyn A, Laurison HB, Hillier A, Perry RD. Closing the grocery gap in underserved communities: the creation of the Pennsylvania Fresh Food Financing Initiative. *J Public Health Manag Pract* 2008;14(3):272–279. [PubMed: 18408552]
 10. Centers for Disease Control. National Center for Chronic Disease Prevention and Health Promotion - Division of Nutrition, Physical Activity, and Obesity “State Initiatives Supporting Healthier Food Retail: An Overview of the National Landscape”. 2011; http://www.cdc.gov/obesity/downloads/Healthier_Food_Retail.pdf. Accessed January 23, 2012.
 11. Institute of Medicine. Local Government Actions to Prevent Childhood Obesity. Washington, DC: National Academy of Sciences; 9 2009 2009.
 12. Todd JE, Scharadin B. Where Households Get Food in a Typical Week: Findings From USDA’s FoodAPS - report from the Economic Research Service of the United States Department of Agriculture. July 2016; <https://www.ers.usda.gov/webdocs/publications/80542/eib-156.pdf?v=42663>. Accessed July 16, 2018.
 13. Vaughan CA, Cohen DA, Ghosh-Dastidar M, Hunter GP, Dubowitz T. Where do food desert residents buy most of their junk food? Supermarkets. *Public Health Nutr* 2017;20(14):2608–2616. [PubMed: 27702412]
 14. Chrisinger BW, DiSantis KI, Hillier AE, Kumanyika SK. Family food purchases of high- and low-calorie foods in full-service supermarkets and other food retailers by Black women in an urban US setting. *Preventive Medicine Reports*. 2018;10:136–143. [PubMed: 29755932]
 15. Garfield L An up-and-coming drive-thru salad bar could threaten legacy fast food chains. *Business Insider* Nov. 1, 2017; <http://www.businessinsider.com/salad-and-go-drive-thru-fast-food-2017-5>. Accessed July 16, 2018.
 16. Garfield L 10 up-and-coming healthy fast food chains that should scare McDonald’s *Business Insider* Feb. 19, 2018; <http://www.businessinsider.com/new-healthy-fast-food-chains-better-than-mcdonalds-2017-2>. Accessed July 16, 2018.
 17. Lucan SC. Concerning limitations of food-environment research: a narrative review and commentary framed around obesity and diet-related diseases in youth. *J Acad Nutr Diet*. 2015;115(2):205–212. [PubMed: 25443565]
 18. McKinnon RA, Reedy J, Morrissette MA, Lytle LA, Yaroch AL. Measures of the food environment: a compilation of the literature, 1990–2007. *Am J Prev Med* 2009;36(4 Suppl):S124–133. [PubMed: 19285203]
 19. Lytle LA, Sokol RL. Measures of the food environment: A systematic review of the field, 2007–2015. *Health Place*. 2017;44:18–34. [PubMed: 28135633]
 20. Caspi CE, Pelletier JE, Harnack L, Erickson DJ, Laska MN. Differences in healthy food supply and stocking practices between small grocery stores, gas-marts, pharmacies and dollar stores. *Public Health Nutr* 2016;19(3):540–547. [PubMed: 26411535]
 21. Laska MN, Caspi CE, Pelletier JE, Friebur R, Harnack LJ. Lack of Healthy Food in Small-Size to Mid-Size Retailers Participating in the Supplemental Nutrition Assistance Program, Minneapolis-St. Paul, Minnesota, 2014. *Prev Chronic Dis* 2015;12:E135. [PubMed: 26312380]
 22. Racine EF, Batada A, Solomon CA, Story M. Availability of Foods and Beverages in Supplemental Nutrition Assistance Program-Authorized Dollar Stores in a Region of North Carolina. *J Acad Nutr Diet*. 2016;116(10):1613–1620. [PubMed: 27161028]
 23. Caspi CE, Lenk K, Pelletier JE, et al. Association between store food environment and customer purchases in small grocery stores, gas-marts, pharmacies and dollar stores. *Int J Behav Nutr Phys Act* 2017;14(1):76. [PubMed: 28583131]
 24. Racine EF, Kennedy A, Batada A, Story M. Foods and Beverages Available at SNAP-Authorized Drugstores in Sections of North Carolina. *J Nutr Educ Behav* 2017;49(8):674–683 e671. [PubMed: 28889856]
 25. Farley TA, Baker ET, Futrell L, Rice JC. The ubiquity of energy-dense snack foods: a national multicity study. *Am J Public Health*. 2010;100(2):306–311. [PubMed: 20019297]

26. Wright J, Kamp E, White M, Adams J, Sowden S. Food at checkouts in non-food stores: a cross-sectional study of a large indoor shopping mall. *Public Health Nutr* 2015;18(15):2786–2793. [PubMed: 25712753]
27. Dixon H, Scully M, Parkinson K. Pester power: snackfoods displayed at supermarket checkouts in Melbourne, Australia. *Health Promot J Austr* 2006;17(2):124–127. [PubMed: 16916315]
28. Basch CH, Kernan WD, Menafro A. Presence of Candy and Snack Food at Checkout in Chain Stores: Results of a Pilot Study. *J Community Health*. 2016;41(5):1090–1093. [PubMed: 27101366]
29. Lucan SC, Maroko AR, Seitchik JL, Yoon D, Sperry LE, Schechter CB. Sources of Foods That Are Ready-to-Consume ('Grazing Environments') Versus Requiring Additional Preparation ('Grocery Environments'): Implications for Food-Environment Research and Community Health. *J Community Health*. 2018.
30. Lucan SC, Maroko AR, Seitchik JL, Yoon DH, Sperry LE, Schechter CB. Unexpected Neighborhood Sources of Food and Drink: Implications for Research and Community Health. *Am J Prev Med* 2018;55(2):e29–e38. [PubMed: 29907454]
31. Lucan SC, Maroko AR, Patel AN, et al. Change in an Urban Food Environment: Storefront Sources of Food/Drink Increasing Over Time, and Not Limited to 'Food Stores' and Restaurants. *J Acad Nutr Diet*. In Press.
32. Wilbur CS, Zifferblatt SM, Pinsky JL, Zifferblatt S. Healthy vending: a cooperative pilot research program to stimulate good health in the marketplace. *Prev Med* 1981;10(1):85–93. [PubMed: 6894494]
33. Van Hulst A, Barnett TA, Dery V, Cote G, Colin C. Health-promoting vending machines: evaluation of a pediatric hospital intervention. *Can J Diet Pract Res* 2013;74(1):28–34. [PubMed: 23449211]
34. Winkler LL, Christensen U, Glumer C, et al. Substituting sugar confectionery with fruit and healthy snacks at checkout - a win-win strategy for consumers and food stores? a study on consumer attitudes and sales effects of a healthy supermarket intervention. *BMC Public Health*. 2016;16(1):1184. [PubMed: 27876025]
35. van Kleef E, Otten K, van Trijp HC. Healthy snacks at the checkout counter: a lab and field study on the impact of shelf arrangement and assortment structure on consumer choices. *BMC Public Health*. 2012;12:1072. [PubMed: 23231863]
36. Adjoian T, Dannefer R, Willingham C, Brathwaite C, Franklin S. Healthy Checkout Lines: A Study in Urban Supermarkets. *J Nutr Educ Behav* 2017;49(8):615–622 e611. [PubMed: 28889850]
37. Bodor JN, Ulmer VM, Dunaway LF, Farley TA, Rose D. The rationale behind small food store interventions in low-income urban neighborhoods: insights from New Orleans. *The Journal of nutrition*. 2010;140(6):1185–1188. [PubMed: 20410086]
38. Gittelsohn J, Suratkar S, Song HJ, et al. Process evaluation of Baltimore Healthy Stores: a pilot health intervention program with supermarkets and corner stores in Baltimore City. *Health promotion practice*. 2010;11(5):723–732. [PubMed: 19144859]
39. Dannefer R, Williams DA, Baronberg S, Silver L. Healthy bodegas: increasing and promoting healthy foods at corner stores in New York City. *Am J Public Health*. 2012;102(10):e27–31.
40. Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. *Med Care*. 1981;19(2):127–140. [PubMed: 7206846]
41. Lucan SC, Maroko AR, Sanon O, Frias R, Schechter CB. Urban farmers' markets: accessibility, offerings, and produce variety, quality, and price compared to nearby stores. *Appetite*. 2015;90:23–30. [PubMed: 25733377]
42. Freedman DA, Vaudrin N, Schneider C, et al. Systematic Review of Factors Influencing Farmers' Market Use Overall and among Low-Income Populations. *J Acad Nutr Diet*. 2016;116(7):1136–1155. [PubMed: 27021526]
43. McCormack LA, Laska MN, Larson NI, Story M. Review of the nutritional implications of farmers' markets and community gardens: a call for evaluation and research efforts. *J Am Diet Assoc* 2010;110(3):399–408. [PubMed: 20184990]

44. Patel K, Guenther D, Wiebe K, Seburn R-A. Promoting food security and livelihoods for urban poor through the informal sector: a case study of street food vendors in Madurai, Tamil Nadu, India. *Food Security*. 2014;6(6):861–878.
45. Namugumya BS, Muyanja C. Contribution of street foods to the dietary needs of street food vendors in Kampala, Jinja and Masaka districts, Uganda. *Public Health Nutr* 2012;15(8):1503–1511. [PubMed: 22015148]
46. Mwangi AM, den Hartog AP, Mwadime RK, van Staveren WA, Foeken DW. Do street food vendors sell a sufficient variety of foods for a healthful diet? The case of Nairobi. *Food Nutr Bull*. 2002;23(1):48–56.
47. Freese E, Romero-Abal ME, Solomons NW. The street food culture of Guatemala City: a case study from a downtown, urban park. *Arch Latinoam Nutr* 1998;48(2):95–103. [PubMed: 9830483]
48. Oguntona CR, Kanye O. Contribution of street foods to nutrient intakes by Nigerian adolescents. *Nutr Health*. 1995;10(2):165–171. [PubMed: 7491168]
49. Odoms-Young AM, Zenk S, Mason M. Measuring food availability and access in African-American communities: implications for intervention and policy. *Am J Prev Med* 2009;36(4 Suppl):S145–150. [PubMed: 19285205]
50. Valdez Z, Dean WR, Sharkey JR. Mobile and home-based vendors' contributions to the retail food environment in rural South Texas Mexican-origin settlements. *Appetite*. 2012;59(2):212–217. [PubMed: 22531289]
51. Sharkey JR, Dean WR, Johnson CM. Use of vendedores (mobile food vendors), pulgas (flea markets), and vecinos o amigos (neighbors or friends) as alternative sources of food for purchase among Mexican-origin households in Texas border colonias. *J Acad Nutr Diet*. 2012;112(5):705–710. [PubMed: 22709775]
52. Tester JM, Yen IH, Laraia B. Mobile food vending and the after-school food environment. *Am J Prev Med* 2010;38(1):70–73. [PubMed: 20117559]
53. Lucan SC, Varona M, Maroko AR, Bumol J, Torrens L, Wylie-Rosett J. Assessing mobile food vendors (a.k.a. street food vendors)--methods, challenges, and lessons learned for future food-environment research. *Public Health*. 2013;127(8):766–776. [PubMed: 23891280]
54. Hsiao BS, Sibeko L, Troy LM. A Systematic Review of Mobile Produce Markets: Facilitators and Barriers to Use, and Associations with Reported Fruit and Vegetable Intake. *J Acad Nutr Diet*. 2018.
55. Fuchs E, Holloway SM, Bayer K, Feathers A. Innovative Partnership for Public Health: an Evaluation of the New York City Green Cart Initiative to Expand Access to Healthy Produce in Low-Income Neighborhoods. Columbia University School of International and Public Affairs Case Study Series in Global Public Policy: Volume 2, Case 2, 6 2014.
56. Zepeda L, Reznickova A, Lohr L. Overcoming challenges to effectiveness of mobile markets in US food deserts. *Appetite*. 2014;79:58–67. [PubMed: 24727100]
57. Cannuscio CC, Weiss EE, Asch DA. The contribution of urban foodways to health disparities. *J Urban Health*. 2010;87(3):381–393. [PubMed: 20354910]
58. Rajiman R, Tienda M. Immigrants' pathways to business ownership: a comparative ethnic perspective. *Int Migration Rev* 2000;34(3):682–706.
59. Richardson AS, Ghosh-Dastidar M, Beckman R, et al. Can the introduction of a full-service supermarket in a food desert improve residents' economic status and health? *Ann Epidemiol* 2017;27(12):771–776. [PubMed: 29198367]
60. Bell J, Mora G, Hagan E, Rubin V, Karpyn A. Access to Healthy Food and Why It Matters: A Review of the Research. 2013; http://thefoodtrust.org/uploads/media_items/access-to-healthy-food.original.pdf.
61. Abusabha R, Namjoshi D, Klein A. Increasing access and affordability of produce improves perceived consumption of vegetables in low-income seniors. *J Am Diet Assoc* 2011;111(10):1549–1555. [PubMed: 21963022]
62. Leone LA, Haynes-Maslow L, Ammerman AS. Veggie Van Pilot Study: Impact of a Mobile Produce Market for Underserved Communities on Fruit and Vegetable Access and Intake. *J Hunger Environ Nutr* 2017;12(1):89–100. [PubMed: 28529669]

63. Leggat M, Kerker B, Nonas C, Marcus E. Pushing produce: the New York City Green Carts initiative. *J Urban Health*. 2012;89(6):937–938. [PubMed: 22684423]
64. Leone LA, Tripicchio GL, Haynes-Maslow L, et al. Cluster randomized controlled trial of a mobile market intervention to increase fruit and vegetable intake among adults in lower-income communities in North Carolina. *Int J Behav Nutr Phys Act* 2018;15(1):2. [PubMed: 29304862]
65. Lucan SC, Maroko AR, Bumol J, Varona M, Torrens L, Schechter CB. Mobile food vendors in urban neighborhoods-implications for diet and diet-related health by weather and season. *Health Place*. 2014;27:171–175. [PubMed: 24631725]
66. Lucan SC, Maroko A, Shanker R, Jordan WB. Green Carts (mobile produce vendors) in the Bronx--optimally positioned to meet neighborhood fruit-and-vegetable needs? *J Urban Health*. 2011;88(5):977–981. [PubMed: 21691925]
67. Li KY, Cromley EK, Fox AM, Horowitz CR. Evaluation of the placement of mobile fruit and vegetable vendors to alleviate food deserts in new york city. *Prev Chronic Dis* 2014;11:E158. [PubMed: 25211506]
68. Widener MJ, Metcalf SS, Bar-Yam Y. Developing a mobile produce distribution system for low-income urban residents in food deserts. *J Urban Health*. 2012;89(5):733–745. [PubMed: 22648452]