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Short Report

Mobile food vendors in urban neighborhoods—Implications for diet and diet-related health by weather and season

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ABSTRACT

This study describes mobile food vendors (street vendors) in Bronx, NY, considering neighborhood-level correlations with demographic, diet, and diet-related health measures from City data. Vendors offering exclusively "less-healthy" foods (e.g., chips, processed meats, sweets) outnumbered vendors offering exclusively "healthier" foods (e.g., produce, whole grains, nuts). Wet days and winter months reduced all vending on streets, but exclusively "less-healthy" vending most. In summer, exclusively "less-healthy" vending per capita inversely correlated with neighborhood-mean fruit-and-vegetable consumption and directly correlated with neighborhood-mean BMI and prevalences of hypertension and hypercholesterolemia (Spearman correlations 0.90–1.00, p values 0.037 to <0.001). In winter, "less-healthy" vending per capita directly correlated with proportions of Hispanic residents and those living in poverty (Spearman correlations 0.90, p values 0.037). Mobile food vending may contribute negatively to urban food-environment healthfulness overall, but exacerbation of demographic, diet, and diet-related health disparities may vary by weather, season, and neighborhood characteristics.

1. Introduction

Most food-environment research to date has focused on proximity to and density of food stores and restaurants (Kirkpatrick et al., 2010; McKinnon et al., 2009). Few studies have examined mobile food vending (e.g., roadside carts, trucks, and stands) (Abusabha et al., 2011; Lucan et al., 2011; Sharkey et al., 2012; Tester et al., 2010, 2012, 2011; Valdez et al., 2012; Widener et al., 2012). Studies in rural settings suggest that mobile vendors sell a limited range of mostly prepared foods, refined sweets, and salty snacks (Sharkey et al., 2012; Valdez et al., 2012). Studies in urban settings suggest that mobile vendors offer various nutrient-poor, energy-dense options (Tester et al., 2010) and tend to locate around schools in lower-income neighborhoods (Tester et al., 2011). Studies in both settings suggest that "healthier" options, like fruits and vegetables, are available from at least some vendors (Abusabha et al., 2011; Lucan et al., 2011; Tester et al., 2010; Valdez et al., 2012; Widener et al., 2012).

Prior studies have generally not examined mobile vending on scales larger than just a few carts or considered the possible shifting nutritional contributions of vendors related to their mobility. Investigators in the current study sought to understand the variable contributions of mobile vendors to neighborhood food environments for an entire urban county; to understand where, when, and what vendors sell, and potential implications for community nutrition and health.

2. Methods

With IRB approval, investigators conducted a primary assessment of mobile vending in the Bronx, also performing neighborhood-level correlations with demographic, diet, and diet-related health measures from the City. Vending vehicle (e.g., cart, truck, stand), not person selling, was the unit of observation and analysis.

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2.1. Surveying streets

Two pairs of researchers systematically scanned streets for vending vehicles, assessing all streets at least once. Investigators covered all 42 mi^2 of Bronx County, NY during usual business hours, requiring a total of 40 weekdays summer-fall 2010 (Lucan et al., 2013).

2.2. Brief interviews

Investigators asked vendors about hours, days, months and locations for selling, and if weather is a factor. Specific questions are available in another publication (Lucan et al., 2013).

2.3. Direct observations

Investigators made observations about the vending vehicle, including unique identifier (e.g., permit number, license plate, distinctive features) and location (i.e., nearest street address or street intersection). Investigators determined foods and beverages offered from displayed items, signs, and menu boards, and clarified uncertainties by asking vendors.

2.4. Categorizing vending by items offered

Vending categories included: category A: *fresh produce*, i.e., fruit and/or vegetable stands and carts; category B: *ethnic foods*, e.g., empanada stands, Chinese-food trucks, Halal carts; category C: *other prepared foods*, e.g., hot-dog carts, barbeque vendors, cheesesteaks; category D: *frozen novelty*, e.g., ice-cream trucks, Italian-ice carts, snow-cone stands; and category E: *other*, e.g., honey-roasted nut, bagged salty-snack, and candy vendors.

2.5. Types of vending by healthfulness

Investigators categorized vending as "healthier" (offering only whole foods like fruits, vegetables, unprocessed grains, unsweetened nuts), "less-healthy" (offering only processed or prepared foods like bagged chips, preserved meats, assorted confections), or "mixed" (offering both "healthier" and "less-healthy" items).

2.6. Neighborhood data

Information on neighborhoods came from the New York City Department of Health and Mental Hygiene (DOHMH). DOHMH conducts a yearly, random-digit-dialed, Community Health Survey of adults including various demographics and health-related questions (http://www.nyc.gov/html/doh/html/survey/survey.shtml). Questions for 2010 included items about dietary intake (e.g., servings of fruits and vegetables consumed yesterday), and diet-related health (e.g., ever told you have diabetes). Data were available for United Hospital Fund "neighborhoods" (UHFs), dividing the Bronx into five regions having notable demographic, population-density, and health differences. Details about survey response rates (37% by landline, 46% by cell phone), stratified sampling design, survey weights, and adjustments for number of adults per household are available on the DOHMH website (http://www.nyc.gov/html/doh/html/survey/survey.shtml).

2.7. Weather and seasonality

Vendors reported their months of operation and whether they suspended operations during precipitation (e.g., rain). Based on reported months of operation investigators characterized vendors as operating in summer (July–September), winter (January–March), or both.

2.8. Data analysis and mapping

Investigators used Stata version 11 (Stata Corp LP, College Station, TX) to aggregate individual-level DOHMH-survey responses to the level of the "neighborhood" (UHF), with sampling weights reflecting the survey design. Analyses included frequencies and percentages of vendors selling different items in neighborhoods by weather and season. Analyses also included Spearman correlations between the number of "healthier", "less-healthy" or "mixed" vendors per number of residents in a neighborhood and neighborhood characteristics (i.e., demographic, diet, and diet-related health measures). Investigators used ArcGIS software (version 9.3.1, ESRI, Redlands, CA) to map seasonal variation in "healthier", "less-healthy", and "mixed" vending.

3. Results

A total of 372 vending vehicles were identified. Fresh-produce vendors (vending category A), totaling 84, were outnumbered more than 3:1 by other vendors (vending categories B–E) that typically offered "less-healthy" items.

Seventy-two vendors were "in transit" (e.g., ice-cream trucks driving through neighborhoods), precluding detailed assessment of the foods they offered. Of the 300 vendors assessed in detail, a similar percentage offered "less-healthy" prepared foods like hot dogs and fried rice as offered fruits or vegetables like apples or vegetable side dishes (29% vs. 31% respectively). Only one of the vendors assessed in detail offered whole grain (brown rice) despite our study protocol's liberal inclusion of popcorn, whole-grain chips, and sweetened granola products in what could have been counted as whole grain. A majority of vendors (59%) offered processed foods like candies and salty snacks, including 15% of fresh-produce vendors (vending category A) who sold pastries, cookies, and/or onion rings. Conversely, only 5% of non-produce vendors (vending categories B–E) offered any fruit or vegetable (e.g., sliced melon and green salad).

Among vendors answering questions regarding weather (Table 1), all vendor types were less numerous on rainy days; only 14% reported working irrespective of precipitation. Nearly 90% of fresh-produce vendors and 95% of frozen-novelty vendors reported not coming out on wet days. Overall, the preponderance of "less-healthy" vending decreased with precipitation such that the proportion of vendors offering at least some healthier options (i.e., "healthier"+"mixed" vending) increased in relative terms. A similar shift in vending proportions was seen with the transition from summer to winter (see supplementary Table A1).

Fig. 1 shows seasonal variation in vending type and geographic distribution by neighborhood. A mix of vending across the Bronx in summer shifted to a southwest concentration of vending in winter, with greater relative proportions of "healthier" and "mixed" vending types. More than 75% of all vendors located in the most southwestern neighborhood in winter, home to the poorest Bronx communities with Hispanics representing 65% of populations (United States Census Bureau, Profile of General Population and Housing Characteristics, 2010).

Table 2 shows correlations by season between *exclusively* "less-healthy" vending per capita, and mean neighborhood diet, diet-related health, and demographic characteristics. In summer, there were generally strong correlations between exclusively "less-healthy" vending per capita and neighborhood-mean characteristics. In winter, correlations were in the same direction but generally smaller in magnitude. Exceptions were correlations with the proportions of Hispanic residents and residents living below the federal poverty level; these correlations with per-capita "less-healthy" vending became stronger in winter.