Characterizing the Food Retail Environment: Impact of Count, Type, and Geospatial Error in 2 Secondary Data Sources

Angela D. Liese, PhD, MPH[1,2]; Timothy L. Barnes, MPH[1,2]; Archana P. Lamichhane, PhD[1,2]; James D. Hibbert, MS[1]; Natalie Colabianchi, PhD[3]; Andrew B. Lawson, PhD[4]

ABSTRACT

Objective: Commercial listings of food retail outlets are increasingly used by community members and food policy councils and in multilevel intervention research to identify areas with limited access to healthier food. This study quantified the amount of count, type, and geospatial error in 2 commercial data sources.

Methods: InfoUSA and Dun and Bradstreet were compared with a validated field census and validity statistics were calculated.

Results: Considering only completeness, Dun and Bradstreet data undercounted 24% of existing supermarkets and grocery stores, and InfoUSA, 29%. In addition, considering accuracy of outlet type assignment increased the undercount error to 42% and 39%, respectively. Marked overcount existed as well, and only 43% of existing supermarkets were correctly identified with respect to presence, outlet type, and location.

Conclusions and Implications: Relying exclusively on secondary data to characterize the food environment will result in substantial error. Whereas extensive data cleaning can offset some error, verification of outlets with a field census is still the method of choice.

Key Words: retail food environment, secondary data sources, validity, geography, food desert (*J Nutr Educ Behav*. 2013;45:435-442.)

INTRODUCTION

Access to healthier food retailers is a topic of public health and political interest. Over the past decade, an increasing number of studies have characterized the food environment and evaluated its influence on health behaviors and health outcomes.[1-4] Via the Food, Conservation, and Energy Act of 2008, the United States (US) Congress directed the US Department of Agriculture (USDA) "to assess the extent of areas with limited access to affordable and nutritious food, identify characteristics and causes of such areas, consider how limited access affects local populations, and outline recommendations to address the problem."[5] Since then, a variety of approaches to the identification of so-called "food deserts" or, conversely, environments supporting healthy food choices, have been proposed.[6-9] Interactive Web sites, such as the USDA Food Environment Atlas and the Food Desert Locator, provide geographic information on food access and the spatial distribution of food retailers.[10-12]

Local food policy councils are increasingly advocating for improvements in food access, including spatial access to healthier retail outlets. Furthermore, multilevel nutrition interventions frequently entail an assessment of and changes to the retail food environment. In response, a number of toolkits have been developed that assist community members in mapping and evaluating their local retail food environment.[13,14]

Inherent in these efforts is the need to identify specific types of retail outlets, such as supermarkets or grocery stores. Government reports and Web sites have been based on readily available commercial (eg, Dun and Bradstreet, InfoUSA) or public secondary data. Most commercial databases include an outlet type designation such as the North American Industry Classification System (NAICS) code or Standard Industry Codes, and consider their code assignments proprietary.[15]

This group of investigators has previously explored the completeness of several secondary databases' listings of food retail outlets, noting marked overcount and undercount of outlets.[16] At that time, the assignment to outlet type categories was based

[1]Center for Research in Nutrition and Health Disparities, Arnold School of Public Health, University of South Carolina, Columbia, SC
[2]Department of Epidemiology and Biostatistics, Arnold School of Public Health, University of South Carolina, Columbia, SC
[3]Institute of Social Research, University of Michigan, Ann Arbor, MI
[4]Public Health Sciences, College of Medicine, Medical University of South Carolina, Charleston, SC
Address for correspondence: Angela D. Liese, PhD, MPH, Center for Research in Nutrition and Health Disparities, Arnold School of Public Health, University of South Carolina, 921 Assembly St, Columbia, SC 29208; Phone: (803) 777-9414; Fax: (803) 777-2504; E-mail: liese@sc.edu
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on a research-intense approach, not an automated algorithm that used the NAICS codes contained within the databases. Because national policies on spatial food access are largely directed at specific food outlet types and based on secondary data without further validation, this study extends research to a comprehensive evaluation of the validity of Dun and Bradstreet and InfoUSA data. The purpose of the present study was to quantify sequentially the impact of errors resulting from the number of food retails outlets (count), type of retail outlet, and errors in location (geospatial error) in these 2 secondary data sources by comparison with a field census of food outlets that was validated in person for both location and type. In addition, this study explored whether the errors differed across a spectrum of Census tract demographic and socioeconomic characteristics, because this type of differential misclassification could potentially lead to biases in etiologic research and undermine the identification of neighborhoods that are particularly disadvantaged with respect to their food environment.[17-19]

METHODS

This study was part of a larger effort aimed at developing spatial accessibility measures of the built food environment for urban and rural areas in South Carolina.[16] The study region consisted of a geographically contiguous area of 5,575 square miles, including 1 urban county and 7 rural counties.

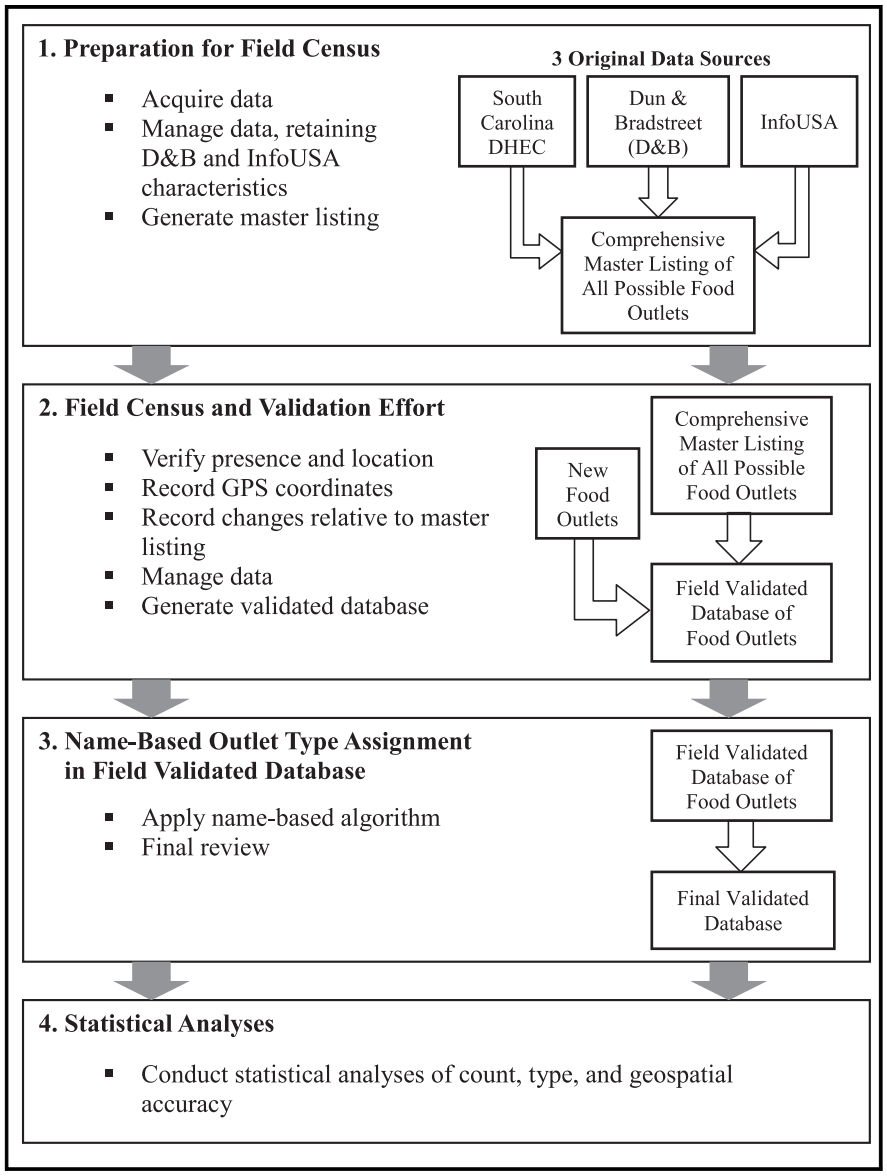

Figure. Flow diagram of study methods of a South Carolina food retail environment study. DHEC indicates Department of Health & Environmental Control; GPS, global positioning system.

Field Census of Food Outlets

In preparation for the field census (ie, direct observation and verification of all food outlets), data from Dun and Bradstreet, InfoUSA, and the Licensed Food Services Facilities Database from the South Carolina Department of Health and Environmental Control had been obtained and were used to generate a comprehensive master listing (Figure, step 1).[16] Duplicate entries and food outlets that were ineligible had been removed before merging the 3 data sources into a single file by name and address. Certain types of food outlets were excluded, such as those only sporadically open; food outlets that serve special populations such as school cafeterias or cafeterias in nursing homes, assisted living facilities, or institutionalized settings; military settings; food preparation facilities for catering businesses that have no publicly accessible retail store; alcoholic beverage drinking places; and liquor stores.

The fieldwork was conducted by 6 persons who were trained under a standardized protocol; they took 114 trips that covered nearly 7,000 miles (Figure, step 2). Counties were treated individually in the field census and trips varied from 2 per county (Calhoun County) to 27 (Richland County). The fieldwork began in September 2008 and was concluded in July 2009. The location (latitude and longitude) was recorded using a global positioning system (Trimble Juno ST GPS, 3–5 m spatial accuracy, Trimble Navigation Ltd., Sunnyvale, CA) and software (Arc-Pad 7.1, ESRI, Redlands, CA, 2007).

Name-based Outlet Type Assignment

To assign each food outlet to a retail type, a name-based approach was developed (Figure, step 3).[16] An

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