



Field validation of secondary data sources for enumerating retail tobacco outlets in a state without tobacco outlet licensing

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ABSTRACT

Identifying tobacco retail outlets for U.S. FDA compliance checks or calculating tobacco outlet density is difficult in the 13 States without tobacco retail licensing or where licensing lists are unavailable for research. This study uses primary data collection to identify tobacco outlets in three counties in a non-licensing state and validate two commercial secondary data sources. We calculated sensitivity and positive predictive values (PPV) to examine the evidence of validity for two secondary data sources, and conducted a geospatial analysis to determine correct allocation to census tract. ReferenceUSA had almost perfect sensitivity (0.82) while Dun & Bradstreet (D&B) had substantial sensitivity (0.69) for identifying tobacco outlets; combined, sensitivity improved to 0.89. D&B identified fewer "false positives" with a PPV of 0.82 compared to 0.71 for ReferenceUSA. More than 90% of the outlets identified by ReferenceUSA were geocoded to the correct census tract. Combining two commercial data sources resulted in enumeration of nearly 90% of tobacco outlets in a three county area. Commercial databases appear to provide a reasonably accurate way to identify tobacco outlets for enforcement operations and density estimation.

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1. Introduction

Access to supermarkets, convenience stores, and recreational facilities has been associated with smoking (Henriksen et al., 2008), obesity (Lovasi et al., 2009), and physical activity (Gordon-Larsen et al., 2006) and may create an environment that either enhances or diminishes a resident's ability to make health promoting choices. The number, types and locations of retail outlets are often proxies for access to tobacco products (Henriksen et al., 2008), food (Larson et al., 2009), or places to be physically active (Boone-Heinonen et al., 2010). For example, studies have found youth living in communities with comparatively higher retail tobacco outlet density were more likely to use tobacco and living near tobacco outlets made it more difficult for adults to quit smoking (Novak et al., 2006; Reitzel et al., 2011). Lower income and racial/ethnic minority neighborhoods have disproportionately higher exposure to retail tobacco outlets (Hyland et al., 2003; Fakunle et al., 2010; Peterson et al., 2005; Rodriguez et al., 2013; Schneider et al., 2005), potentially contributing to higher tobacco use among these groups (Frieden, 2011). To further our understanding of how the tobacco retail environment influences tobacco use valid data sources are needed

to enumerate tobacco outlets and to accurately identify areas with increased exposure to tobacco products.

In the United States (US), tobacco retail licensing data is often used to calculate tobacco outlet density (Fakunle et al., 2010; Henriksen et al., 2008; Lipperman-Kreda et al., 2012; Hyland et al., 2003; Peterson et al., 2005; Schneider et al., 2005). Yet, licensing lists may be unavailable to researchers, and 13 States do not require tobacco retailer licensing (CDC, 2012), making such estimation difficult. The quality of the sampling list used for US Food and Drug Administration (FDA) compliance checks or to enforce youth tobacco access laws determines whether and how many tobacco outlets will be missed. A state without a licensing list as a starting point may create a sampling frame from state or local business lists, statewide retail license/permit lists or statewide liquor license/permit lists.

Over the last decade, obesity researchers have increasingly relied on secondary data sources (e.g., ReferenceUSA or government food registries) to enumerate retail food and recreational environments. They have linked information on the location of food and activity resources to neighborhood characteristics to understand the impact on weight status and disparities in obesity faced by lower income, certain racial/ethnic groups and rural communities (Powell et al., 2011; Fleischhacker et al., 2011).

Although primary data collection is the most accurate approach (Hosler and Dharssi, 2010; Sharkey, 2009), it is resource intensive.

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“Ground-truthing,” or identifying outlets through a systematic field canvass of a targeted study area without using secondary data sources, may be feasible in small cities or counties, but is daunting in larger areas (Fleischhacker et al., 2013). Researchers or state-level staff may need to rely on secondary data sources to enumerate larger study areas. For example, tobacco outlets may be located anywhere on the over 40,000 miles of primary and secondary roads in Kentucky or Virginia, neither of which has tobacco retailer licensing. Commercial secondary data sources have several benefits compared with primary data collection: they can be searched by establishment type (e.g., convenience stores), provide telephone numbers and addresses to aid in the verification process, and are typically less expensive than primary data collection.

Since grocery and convenience stores also sell tobacco products (Hosler and Kammer, 2012), similar methods could potentially help identify tobacco outlets. While there have been numerous studies examining the validity for enumerating food outlets (Fleischhacker et al., 2013), no studies, to our knowledge, have examined the validity of secondary data sources for enumerating tobacco outlets. One study in Chicago estimated tobacco outlet density by gathering primary data (Novak et al., 2006) and another identified 88% of the outlets on Washington State's licensing list using a secondary data source without conducting primary data collection (Rodriguez et al., 2013).

The purpose of this study is to provide evidence-informed guidance on whether secondary data sources are a reasonable alternative to primary data collection in order to enumerate the tobacco retail environment. A second purpose is to examine whether secondary data sources allocate outlets to the correct census tract, and to compare tobacco outlet density calculated by primary and secondary sources, particularly in jurisdictions that do not have a comprehensive list of tobacco outlets.

2. Methods

2.1. Study area

The study area described previously (Rose et al., 2013) included three geographically diverse counties in North Carolina (NC),

USA, a state without tobacco retail licensing. Buncombe County, including the Asheville, NC Metro Area, has a median household income of \$44,190, 6.4% of the population is African American, and encompasses 656.7 square miles in Appalachia. Durham County is more urban and includes the Durham–Chapel Hill, NC Metro Area, has a median household income of \$49,894, 38.0% of the population is African American and encompasses 286.0 square miles. New Hanover County includes the coastal Wilmington, NC Metro Area, has a median household income of \$48,553, 14.8% of the population is African American, and encompasses 191.5 square miles (U.S. Census Bureau, 2012).

2.2. Identifying probable tobacco outlets using secondary data sources

We searched ReferenceUSA (Infogroup, Inc.) in May 2011 using primary North American Industry Classification System (NAICS) codes (U.S. Census Bureau, 2007) for the top ten retail industries that sell tobacco products (U.S. Census Bureau, 2010) (Table 1). We selected NAICS codes that represented approximately 98% of all tobacco sales in 2007 (D'Angelo et al. 2012) and used them to produce a list of probable tobacco retail outlets in the three study counties. Unlike retail food outlets that can be identified by NAICS codes directly (e.g., convenience stores), the tobacco product category is sold at a variety of outlet types and not every outlet of a particular type sells tobacco. The one exception is “tobacco stores,” that account for only 10% of tobacco product sales, while convenience and gas/convenience stores account for over 50% of tobacco product sales (U.S. Census Bureau, 2010). Therefore, we first identified *probable tobacco outlets*, outlets that are a store type listed in Table 1 and then secondarily verified them in the field as *actual tobacco outlets* if they sold tobacco products. To estimate the validity of an additional business list, we obtained a list from Dun & Bradstreet, Inc. (Dun and Bradstreet, 2005) (D&B) in November 2011 after primary data collection using the same 10 NAICS codes.

We cleaned the ReferenceUSA and D&B lists first, by sorting the lists by NAICS code and excluding those not on our inclusion list (e.g., Food Health Supplement Stores). Next, we excluded chains that do not sell tobacco products (e.g. Target™ (Target, 2009)).

Table 1

Primary NAICS^a codes used to search for probable tobacco outlets in ReferenceUSA and Dun & Bradstreet, Inc. in three North Carolina counties.

NAICS code	Industry	Description
445110	Supermarkets and other grocery (except convenience) stores	Establishments generally known as supermarkets and grocery stores primarily engaged in retailing a general line of food, such as canned and frozen foods; fresh fruits and vegetables; and fresh and prepared meats, fish, and poultry. Included in this industry are delicatessen-type establishments primarily engaged in retailing a general line of food.
445120	Convenience stores	Establishments known as convenience stores or food marts (except those with fuel pumps) primarily engaged in retailing a limited line of goods that generally includes milk, bread, soda, and snacks.
453991	Tobacco stores	Establishments primarily engaged in retailing cigarettes, cigars, tobacco, pipes, and other smokers' supplies.
447110	Gasoline stations with convenience stores	Establishments engaged in retailing automotive fuels (e.g., diesel fuel, gasohol, gasoline) in combination with convenience store or food mart items. These establishments can either be in a convenience store (i.e., food mart) setting or a gasoline station setting. These establishments may also provide automotive repair services.
452910	Warehouse clubs and supercenters	Establishments known as warehouse clubs, superstores or supercenters primarily engaged in retailing a general line of groceries in combination with general lines of new merchandise, such as apparel, furniture, and appliances.
451212	News dealers and newsstands	Establishments primarily engaged in retailing current newspapers, magazines, and other periodicals.
445310	Beer, wine, and liquor stores	Establishments primarily engaged in retailing packaged alcoholic beverages, such as ale, beer, wine, and liquor
446110	Pharmacies and drug stores	Establishments known as pharmacies and drug stores engaged in retailing prescription or nonprescription drugs and medicines.
452112	Discount department stores	Establishments known as department stores that have central customer checkout areas, generally in the front of the store, and that may have additional cash registers located in one or more individual departments. Department stores in this industry sell a wide range of general merchandise (except fresh, perishable foods).
447190	Other gasoline stations	Establishments known as gasoline stations (except those with convenience stores) primarily engaged in one of the following: (1) retailing automotive fuels (e.g., diesel fuel, gasohol, gasoline) or (2) retailing these fuels in combination with activities, such as providing repair services; selling automotive oils, replacement parts, and accessories; and/or providing food services.

^a North American Industry Classification System.

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