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| **About the Measure** |
| **Protocol Id** | 741202 |
| **Domain:** | Tobacco Regulatory Research: Vector  |
| **Measure:** | Tobacco Retailer Density/Proximity  |
| **Definition:** | Using geospatial data, density measures the spatial concentration of tobacco retailers in a neighborhood, defined by either an area centered on a respondent’s residence, school/workplace, or an administrative area, such as counties, school districts, or census tracts. Proximity measures distance to the nearest tobacco retailer from a point of interest (e.g., residence, school/workplace, or another retailer). |
| **Purpose:** | There is growing evidence that tobacco retailers are concentrated in areas of economic disadvantage, and that greater physical access is associated with increased tobacco use, particularly among youth. There is some evidence that proximity to tobacco retailers is associated with lower efficacy to quit and less success with quitting. This measure describes the retail availability of tobacco products by characterizing the quantity and location of retailers with respect to a respondent’s residence, school or workplace. |
| **Essential PhenX Protocols:** |  |
| **Related PhenX Protocols:** |  |
| **Measure Release Date:** | October 17, 2016  |

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| **About the Protocol** |
| **Protocol Release Date:** | October 17, 2016  |
| **Protocol Review Date:** | October 17, 2016  |
| **PhenX Protocol Name:** | Tobacco Retailer Density/Proximity - Known Residence  |
| **Protocol Name From Source:** | Young-Wolff, K., et al. Tobacco Retailer Proximity and Density and Nicotine Dependence Among Smokers with Serious Mental Illness, Am J Public Health, 2014  |
| **Protocol Availability:** | Available  |
| **Keywords:** | residence; neighborhood; Tobacco Retailer; Tobacco Advertising; Proximity; Density; retail; geocode; geocoding; geographic information systems; availability; access.  |
| **Description:** | The Young-Wolff et al. protocol uses Geographic Information Systems (GIS) to determine the retailer density and proximity of tobacco retailers in neighborhoods defined by person-centered buffers. |
| **Specific Instructions:** | Collectively, this measure for tobacco retailer density/proximity includes the following components: 1. Valid data sources providing the location of tobacco product retailers are required.
2. Density requires a definition of "neighborhood" or other spatial unit that is then linked with census-based information about neighborhood characteristics, such as land area, roadway miles, or population size. Density is typically a ratio measure (retailer count divided by neighborhood attribute) and the "correct" choice for the denominator depends on the research question. The Young-Wolff et al. protocol used land area for 500-meter and 1 kilometer person-centered buffers defined by roadway network (that is, as far as one can walk/drive on all roads going in any direction for the specified distance. The protocol computes density for each neighborhood by dividing the count of retailers by the land area (e.g., retailers per km2). Alternatively, one could compute density by dividing the count of retailers by the population in a spatial unit (e.g., retailers per 1,000 people).
3. Proximity of tobacco retailers may be computed for residence, schools, or other locations (e.g., distance between two retailers). The Young-Wolff et al. protocol measures the distance from a known residence to the nearest tobacco retailer in roadway miles and the latter contains a discussion about data confidentiality.

Assuming information on current address (see PhenX Demographics - Current Address) has been collected for a study respondent, then via geocoding it is possible to link the address of a study participant to a measure of tobacco retailer proximity (distance to nearest retailer) and to a measure of density for a defined neighborhood, however defined. For any density/proximity measure, the WG suggests using GIS software, such as ESRI ArcGIS version 10.1 (ESRI, Redlands, CA). Investigators without such software or expertise may employ a third party vendor to compute these measures for a nominal cost. Multiple steps are required:* Obtain address data for licensed or likely tobacco retailers: Where there are state or local tobacco retailer licensing requirements, the investigator may obtain retailer addresses from the appropriate licensing authority. When licensing is not required or unavailable to researchers, address lists for likely tobacco retailers may be obtained from commercial vendors (e.g., Dun & Bradstreet), along with some determination of whether or not they sell tobacco products, or investigators may use on-the-ground assessments to identify tobacco retailers in communities.
* Geocode the latitudes and longitudes of addresses for tobacco retailers and participants’ residences (and/or schools and workplaces). Mapping rates of 90% or greater are typical, but the mapping rate depends on the individual data set and one would expect lower rates in rural areas. When geocoding residential address data to a random shift may be employed to avoid incidental disclosure for shared data.
* Define neighborhood: Egocentric neighborhoods (also referred to as "egocentric buffers" and "egohoods") are defined by a radius around a particular location, such as a residence, and these definitions are preferred by both the Young-Wolff and Duncan protocols. Network-based data better captures the travel distance necessary to obtain tobacco products from retailers nearest to participants’ residence. The appropriate distance (400m, 500m, 800m, 1km) depends on the research question. Street-network buffers excluding highways and ramps are created by using software similar to ESRI’s ArcGIS 10 Buffer tool, ArcGIS 10 Data and Maps, and ArcGIS Network Analysis Extension. According to the Duncan protocol, when residential address data are unavailable, alternative definitions of neighborhood are administrative units, such as census block group, tract, zip code tabulation area, city or county.
* Extract census data to characterize each neighborhood: Use data from decennial census or intercensal estimates to compute the land area (or other attribute, such as roadway miles, population size). When buffers overlap multiple tracts, buffer characteristics are weighted in proportion to tract area inside the buffer.
* Compute density: Use software (such as ArcGIS Spatial Join tool) or third-party vendor to calculate the count of tobacco retailers in each neighborhood, and compute retailer density by dividing by the count of retailers by the area attribute of interest (e.g., acres or roadway miles or population size).
* Compute proximity: Use ArcGIS Closest Facility tool (or comparable tool in alternate software) to determine the distance between two points, such as the roadway distance from each residential address to the nearest tobacco retailer.
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| **Protocol:** | **Density/Proximity of Tobacco Retailers to Known Residence**1. The Young-Wolff et al. protocol obtained addresses of licensed tobacco retailers from a state agency (board of equalization) and geocoded retailer and participant addresses (mapping rate=96.3%).
2. To compute tobacco retailer density, defined in the Young-Wolff et al. protocol as retailers per acre, the ArcGIS Spatial Join tool was used to calculate the count of tobacco retailers within 500-meter and 1-kilometer service areas around each participant address, then divided the count by the land area for each buffer. Land area was extracted from Census 2010 data.
3. To compute proximity, the ArcGIS Closest Facility tool was used to calculate the roadway distance (in meters) from each participant to the nearest tobacco retailer. Distance was positively skewed and the top 1% of observations were capped at the value for the 99th percentile.
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| **Selection Rationale:** | The Young-Wolff et al. protocol provides examples of using geolocation data to measure the spatial relationship of tobacco retailers to a respondent’s residence when addresses are known.  |
| **Source:** | Young-Wolff K, et al. Tobacco Retailer Proximity and Density and Nicotine Dependence Among Smokers With Serious Mental Illness, *Am J Public Health*. 2014;104: 1454-1463. doi:10.2105/AJPH.2014.301917. |
| **Language** | English  |
| **Participant:** | NA |
| **Personnel and Training Required:** | Personnel must have GIS expertise as a result of training or education (e.g., GIS Specialist).Knowledge of census data products and websites such as American Factfinder (<http://factfinder.census.gov>) and/or commercial geospatial data products After extracting the necessary data, statistical methods are used (e.g., principal component analysis (PCA) and factor analysis). |
| **Equipment Needs:** | Geospatial Data Prouducts |
| **Standards** |  |
| **General References:** | Duncan D, et al. Examination of How Neighborhood Definition Influences Measurements of Youths’ Access to Tobacco Retailers: A Methodological Note on Spatial Misclassification, *Am J Epidemiol*. 2014;179(3):373-381Frank LD, Schmid TL, Sallis JF, Chapman J, Saelens BE. Linking objectively measured physical activity with objectively measured urban form: ﬁndings from SMARTRAQ. Am J Prev Med. 2005;28(suppl 2):117---125.Timperio A, Crawford D, Telford A, et al. Perceptions about the local neighborhood and walking and cycling among children. Prev Med. 2004;38(1):39-47.Colabianchi N, Dowda M, Pfeiffer KA, et al. Towards an understanding of salient neighborhood boundaries: adolescent reports of an easy walking distance and convenient driving distance. Int J Behav Nutr Phys Act. 2007;4:66. |
| **Mode of Administration:** | Secondary Data Analysis  |
| **Derived Variables:** | None |
| **Requirements:** |

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| **Requirement Category** | **Required (Yes/No)** |
| **Major equipment** | No |
| **Specialized training** | No |
| **Specialized requirements for biospecimen collection** | No |
| **Average time of greater than 15 minutes in an unaffected individual** | Yes |

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| **Annotations for Specific Conditions:** | None |
| **Process and Review:** | Not applicable.  |