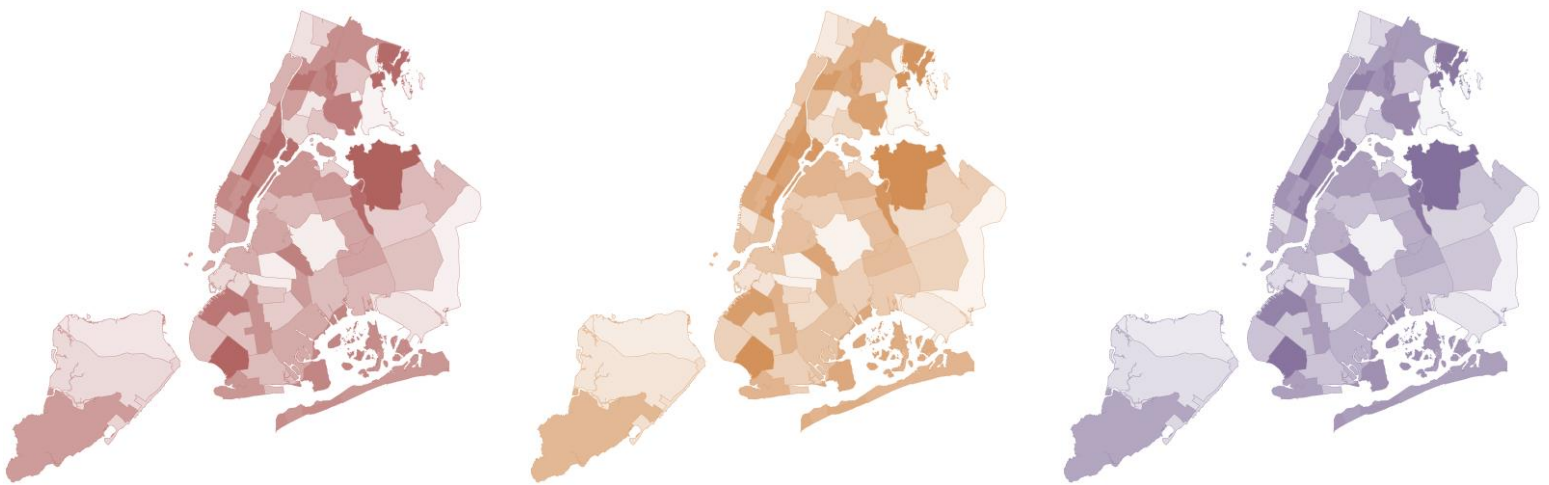




GIS Code Book: New York City Community District Metrics



♣ Last Updated: 12-December-2014

Prepared for:

New York City Department of Health and
Mental Hygiene (DOHMH)



Prepared by:

James W. Quinn, MA
Geographer, Senior GIS Analyst
Built Environment and Health Working Group
Department of Epidemiology
Mailman School of Public Health
Columbia University
e: jq2145@columbia.edu | p: (212) 343-6371
www.beh.columbia.edu



 Columbia University
Built Environment & Health Project
www.beh.columbia.edu 

Community District Variables

cd_id – Unique ID assigned by James Quinn for GIS processing.

boro_cd – Unique 1-digit Borough Code (where: 1=Mn; 2=Bx; 3=Bk; 4=Qn; and 5=Si) followed by 1- 2-digit Community District Code (e.g., boro_cd 101 = Manhattan, Community District 1).

cd_km2 – Total area of Community District geography in km2.

cd_indkm2 – Total **land** area of Community District geography in km2 (*inland water bodies removed*).

cd_id	cd_name	cd_id	cd_name
101	MN1 - Financial District	311	BK11 - Bensonhurst
102	MN2 - Greenwich Village/Soho	312	BK12 - Borough Park
103	MN3 - Lower East Side/Chinatown	313	BK13 - Coney Island
104	MN4 - Clinton/Chelsea	314	BK14 - Flatbush/Midwood
105	MN5 - Midtown	315	BK15 - Sheepshead Bay
106	MN6 - Stuyvesant Town/Turtle Bay	316	BK16 - Brownsville
107	MN7 - Upper West Side	317	BK17 - East Flatbush
108	MN8 - Upper East Side	318	BK18 - Flatlands/Canarsie
109	MN9 - Morningside Heights/Hamilton	401	QU1 - Astoria
110	MN10 - Central Harlem	402	QU2 - Woodside/Sunnyside
111	MN11 - East Harlem	403	QU3 - Jackson Heights
112	MN12 - Washington Heights/Inwood	404	QU4 - Elmhurst/Corona
201	BX1 - Mott Haven/Melrose	405	QU5 - Ridgewood/Maspeth
202	BX2 - Hunts Point/Longwood	406	QU6 - Rego Park/Forest Hills
203	BX3 - Morrisania/Crotona	407	QU7 - Flushing/Whitestone
204	BX4 - Highbridge/Concourse	408	QU8 - Hillcrest/Fresh Meadows
205	BX5 - Fordham/University Heights	409	QU9 - Ozone Park/Woodhaven
206	BX6 - Belmont/East Tremont	410	QU10 - S. Ozone Park/Howard Beach
207	BX7 - Kingsbridge Hgths/Bedford P	411	QU11 - Bayside/Little Neck
208	BX8 - Riverdale/Fieldston	412	QU12 - Jamaica/Hollis
209	BX9 - Parkchester/Soundview	413	QU13 - Queens Village
210	BX10 - Throgs Neck/Co-op City	414	QU14 - Rockaway/Broad Channel
211	BX11 - Morris Park/Bronxdale	501	SI1 - St. George/Stapleton
212	BX12 - Williamsbridge/Baychester	502	SI2 - S. Beach/Willowbrook
301	BK1 - Greenpoint/Williamsburg	503	SI3 - Tottenville/Great Kills
302	BK2 - Fort Greene/Brooklyn Height		
303	BK3 - Bedford Stuyvesant		
304	BK4 - Bushwick		
305	BK5 - East New York/Starrett City		
306	BK6 - Park Slope/Carroll Gardens		
307	BK7 - Sunset Park		
308	BK8 - Crown Heights		
309	BK9 - South Crown Heights/Prospect		
310	BK10 - Bay Ridge/Dyker Heights		

Walkability Index Scale

A number of researchers have constructed walkability indices which summarize built environment features believed to promote walking. Although specification details vary, these indices typically include measures of population density, land use, and street network. Our walkability measure was adapted from that employed in recent papers by Frank and colleagues (2005 and 2006), which includes four components: residential population density (density of population per total residential land area), intersection density, an entropy measure of land use based on the distribution of building floor area among six land use types (education, entertainment, single-family residential, multi-family residential, retail, and office), and the retail floor area ratio, or the ratio of retail building floor area to retail land area. All of the Frank components were z-scored and summed, with intersection density receiving a double weight for the *Frank Scale*, but not for our scale. Our “BEH walkability scale” is documented in a paper by Neckerman and colleagues (2009).

Frank et al. Linking objectively measured physical activity with objectively measured urban form: findings from SMARTRAQ. American Journal of Preventive Medicine. 2005;28(2 Suppl 2):117-125.

Frank et al. Many Pathways from Land Use to Health: Associations between Neighborhood Walkability and Active Transportation, Body Mass Index, and Air Quality. Journal of the American Planning Association. 2006;72(1):75-87.

Neckerman et al. Disparities in urban neighborhood conditions: Evidence from GIS measures and field observation in New York City. Journal of Public Health Policy. 2009;1(1 Suppl): S264-S285.



Walkability Index Scale “Component” Variables

****_intden** – Density of unique streets intersections per km2.

****_sub12d** – Density of subway stations per km2.

****_rtlfar** – Retail floor area ratio – Retail building floor area divided by retail land area in km2.

****_resdn1** – Density of res units – Number of residential units divided by total residential building floor area in km2.

****_entrp** – Land Use Mix – An entropy measure using the five of the six land use types employed in Frank et al. (2006). Single- and multi-family residential areas were combined because most housing in New York City is multi-family. Parcel-level measures of residential, office, and retail floor area were available from the MapPLUTO (version 10v2; March 2010 – September 2010) database. We used the MapPLUTO building class codes to identify buildings associated with education (schools) or entertainment (theaters, recreational facilities), and attributed the entire floor area of the identified building to education or entertainment. The entropy formula used was adapted from Frank et al. (2005), which yielded more plausible results: $\text{Land Use Mix} = A / \ln(N)$ where: $A = -((b1/a) * \ln(b1/a) + (b2/a) * \ln(b2/a) + \dots)$ and $b1$ is the building floor area covered by the first land use, $b2$ is the building floor area covered by the second land use, etc., a is the total floor area across the five land uses, and N is the total number of land uses considered (i.e., 5) in the Community District. Zero values for $b1 \dots b5$ were set to .000001 to avoid zero or undefined terms.

Components of the Entropy Measure:

****_b1** – Total building area for Education uses in square feet (set to .000001 if 0)

****_b2** – Total building area for Entertainment uses in square feet (set to .000001 if 0)

****_b3** – Total building area Residential uses in square feet (set to .000001 if 0)

****_b4** – Total building area for Retail uses in square feet (set to .000001 if 0)

****_b5** – Total building area for Office uses in square feet (set to .000001 if 0)

****_a** – Total floor area across the five land uses in square feet (set to .000001 if 0)

****_n** – The total number of land uses considered (i.e., 5)

ArcMap Entropy Field Calculation Expression:

entropy = $-\left(\left(\left([b1] / [a]\right) * \log\left([b1] / [a]\right)\right) + \left(\left([b2] / [a]\right) * \log\left([b2] / [a]\right)\right) + \left(\left([b3] / [a]\right) * \log\left([b3] / [a]\right)\right) + \left(\left([b4] / [a]\right) * \log\left([b4] / [a]\right)\right) + \left(\left([b5] / [a]\right) * \log\left([b5] / [a]\right)\right) / \log([n])\right)$

Walkability Index Scale Variables

To date, BEH has created and used two different versions of the Walkability Index Scales, which we refer to here as the “Frank *et al.* 2006” and BEH scales. The “Frank 2006” includes z-scored variables: residential density, land use mix using 5 land use types, intersection density * 2, and retail area ratio. The BEH scale includes z-scored variables: residential density, land use mix using 5 land use types, intersection density, retail area ratio, and subway stop density. Note that the BEH scale does not multiply intersection density by 2 and does include subway density.

** **_intden_z** – Density of unique streets intersections per km2: z-scored.

** **_sub12d_z** – Density of subway stations per km2: z-scored.

** **_rtlfar_z** – Retail floor area ratio: z-scored.

** **_resdn1_z** – Density of residential units: z-scored.

** **_entrpz_z** – Entropy land use mix: z-scored.

** **_beh_walk** – BEH Walkability Scale.

** **_beh_walk_cat** – Quintiles of BEH Walkability Scale.

Walkability Index Scale by Community District

Legend

Walkability Index Score,
by Community District
and Quantile Classification

