Big Cities, Big Data, Big Lessons!

Leveraging Multi-Sector Data in Public Health to Address Social Determinants of Health

December 13, 2017

Data Across Sectors for Health (DASH)

- DASH, a national program of the **Robert Wood Johnson Foundation,** was launched to align health care, public health, and other sectors to compile, share, and use data to address social determinants of health**.**

- DASH awarded **10 grants totaling $2 million** to support projects that improve community health through multi-sector data sharing collaborations.

- DASH is a founding partner for a national peer learning network, ***All In: Data for Community Health***, which includes representatives from over 60 community projects from around the country.

Empowering communities through shared information.

Data Across Sectors for **Health**

10 DASH grantees

Public Health - Seattle & King County

White Earth Reservation Tribal Council

Lutheran Social Service of Minnesota

Chicago Dept. of Public Health

HealthInfoNet

Center for Health Care Services

Parkland Center for Clinical Innovation

Allegheny County Health Dept.

Baltimore City Health Dept.

NYC Dept. of Mental Health and Hygiene

Data Across Sectors for Health

60 All In Communities

Data Across Sectors for Health

Core components of DASH and *All In*

Collaborative Partners

Multi-sector Approach

Data and Information Sharing
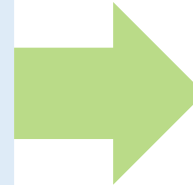
Outcomes:

Increased local capacity to drive community health Improvement

Data Across Sectors for **Health**

Speakers

Carrie Hoff,
Deputy Director, Health &
Human Services Agency, San
Diego County

Kevin Konty, MS, Director,
Research and Analytics, NYC
Department of Health and
Mental Hygiene

Karen Hacker, MD, MPH,
Director, Allegheny County
Health Department

Amy Laurent, MSPH,
Epidemiologist III, Public
Health, Seattle & King County

Darcy Phelan-Emrick, DrPH,
Chief Epidemiologist,
Baltimore City Health
Department

Data Across
Sectors for **Health**

Neighborhood Tabulation Areas: Enhancing population health improvement capacity in NYC through shared information at the small area level

Kevin Konty

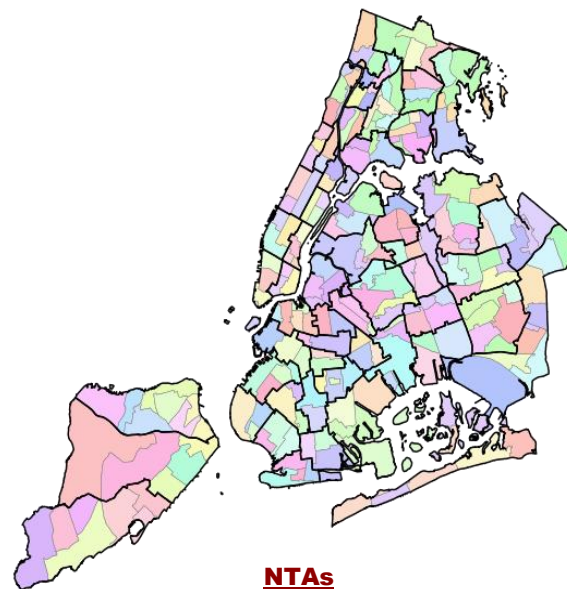New York City Department of Health and Mental Hygiene

Big Cities, Big Data, Big Lessons!

DASH-APHA Webinar

December 13th, 2017

Neighborhood Tabulation Area Project

Objective: to work with partners to bring together health and social determinants of health data at the neighborhood-level using a new geographic scale, the Neighborhood Tabulation Area (or NTA).

NTAs

Count = 188

Median Population = 36,600

NYC
Health

Partners

City Agencies

- **New York City Department of Health and Mental Hygiene (DOHMH)**
- **Department of City Planning (DCP)**
- **Center for Innovation through Data Intelligence (CIDI)**
- Department of Correction (DOC)
- Department for the Aging (DFTA)
- Department of Social Services (DSS)
  - Department of Homeless Services (DHS)
  - Human Resources Administration (HRA)

Organizations

- The New York Academy of Medicine (NYAM)
- United Hospital Fund of New York (UHF)
- The Fund for Public Health in New York City (FPHNYC)

NTA Project Motivation

- Increased focus on Social Determinants of Health (SDOH)
- Health data often lack SDOH information
- Necessity of linking health with census and other data at census geography
- Optimal census geography for neighborhood health?

Source: https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health

10

# Neighborhood Defined as Community District (CD)

- 59 CDs in NYC
- Benefits of CD:
  - Critical geography for community planning and decision making
  - Each CD approximates a Public Use Microdata Area (PUMA): readily available census data
  - Example: Community Health Profiles 2015
- Limitation of CD: median population of 140,000 may mask potential heterogeneity
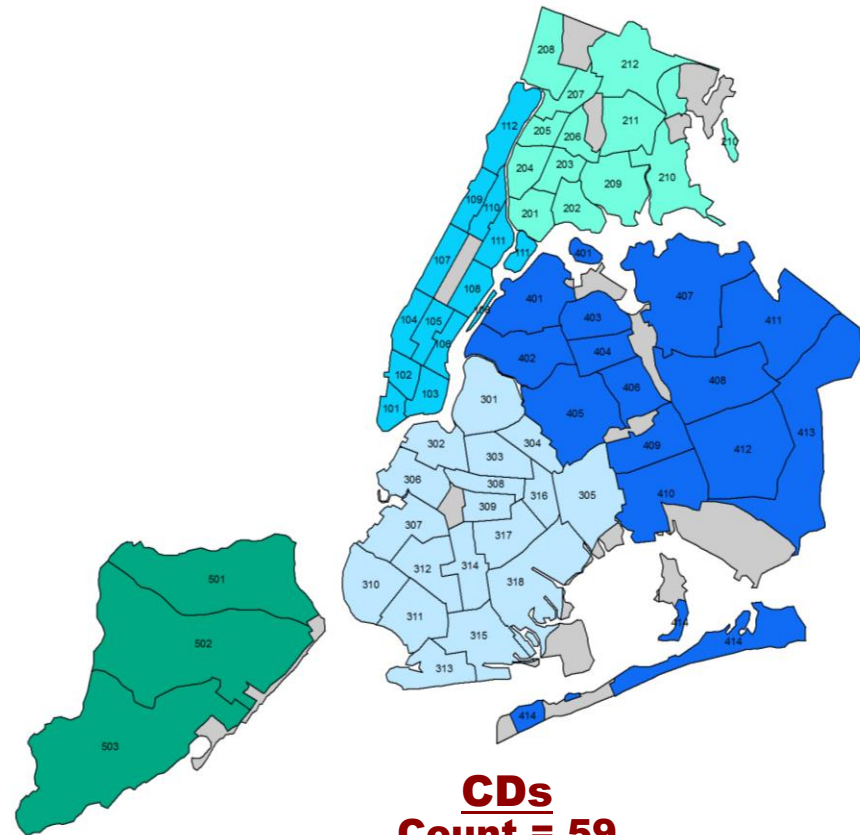
CDs
Count = 59
Median Population = 140,000

Neighborhood Tabulation Area (NTA)

- Statistical area created by Department of City Planning

- NTA is aggregation of census tracts within the same PUMA

- "Minimum" population of 15,000

- A useful geography for assessing and analyzing neighborhood health
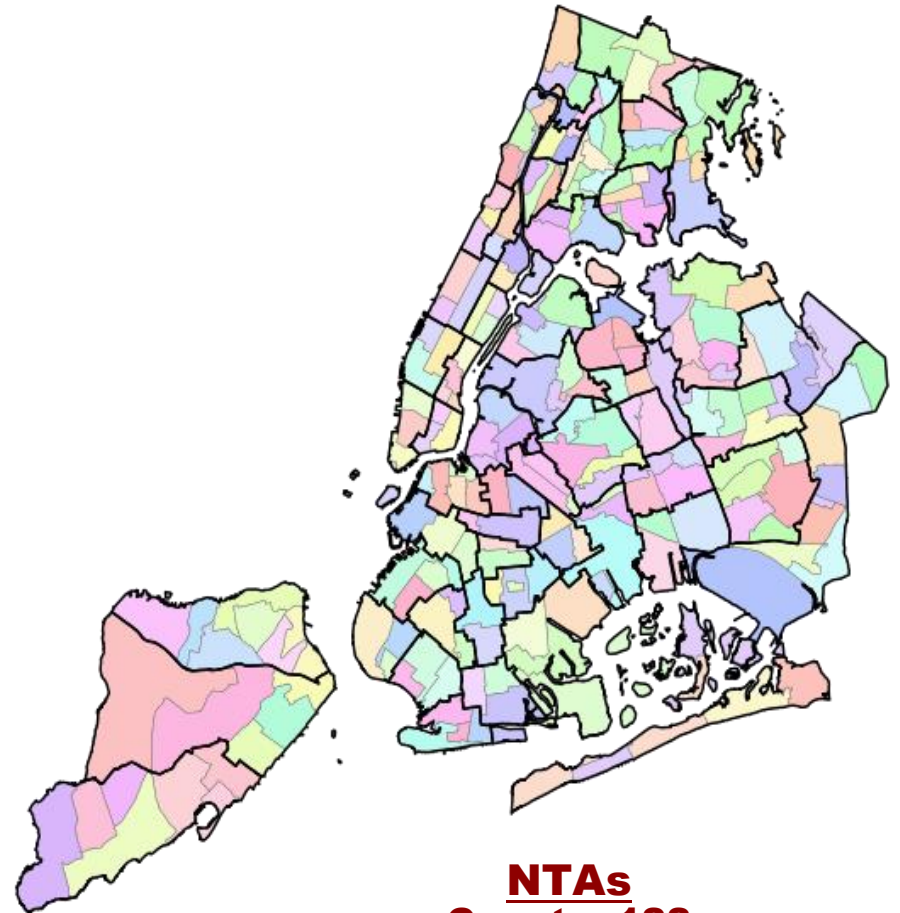
NTAs
Count = 188
Median Population = 36,600

Desirable Properties of Geography for Neighborhood Health Assessment and Analysis

- Granularity
- Reliability
- Correspondence to neighborhood boundaries
- Spatial congruity
- Temporal consistency
- Compared with other geographies with available census data (CD, census tract, ZIP Code), NTAs generally represent the best tradeoff among these desirable attributes
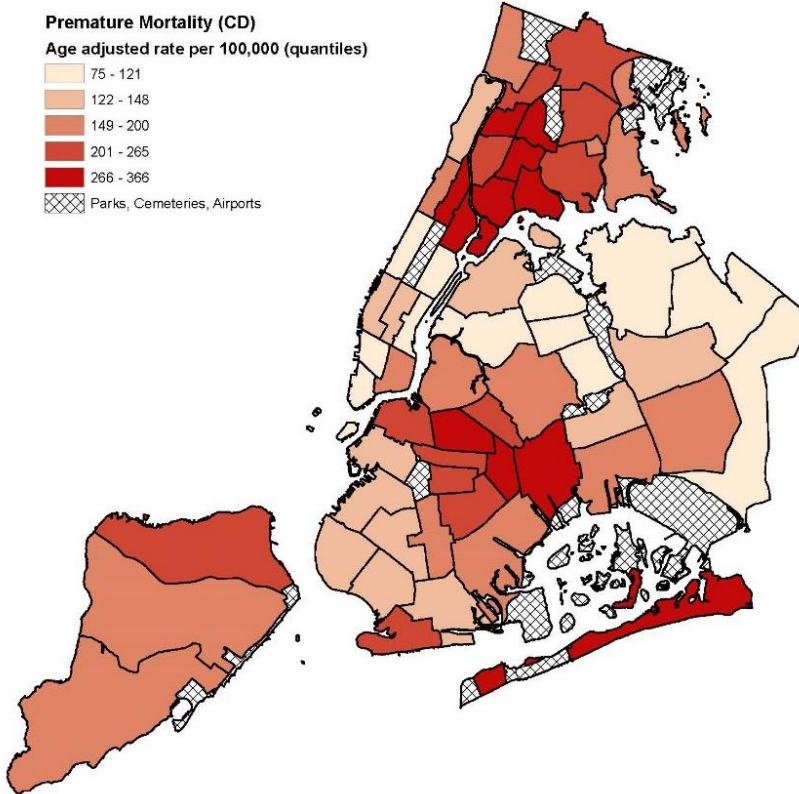
NTA is more granular than CD (PUMA)

**Premature Mortality Rates
by Community District (CD)
in New York City, 2009-2013**

Premature Mortality (CD)
Age adjusted rate per 100,000 (quantiles)
- 75 - 121
- 122 - 148
- 149 - 200
- 201 - 265
- 266 - 366
- Parks, Cemeteries, Airports

Source: NYC DOHMH Bureau of Vital Statistics;
NYC Planning Population Estimates Adapted from the American Community Survey 2009-2013.

**Premature Mortality Rates
by Neighborhood Tabulation Area (NTA)
in New York City, 2009-2013**

Premature Mortality (NTA)
Age adjusted rate per 100,000
- <121
- 122 - 148
- 149 - 200
- 201 - 265
- 266>
- Parks, Cemeteries, Airports
- Community District boundary (provided for comparison)

Source: NYC DOHMH Bureau of Vital Statistics;
NYC Planning Population Estimates Adapted from the American Community Survey 2009-2013.

NTA is more granular than CD (PUMA)

**Premature Mortality Rates
by Community District (CD)
in New York City, 2009-2013**

Premature Mortality (CD)
Age adjusted rate per 100,000 (quantiles)
- 75 - 121
- 122 - 148
- 149 - 200
- 201 - 265
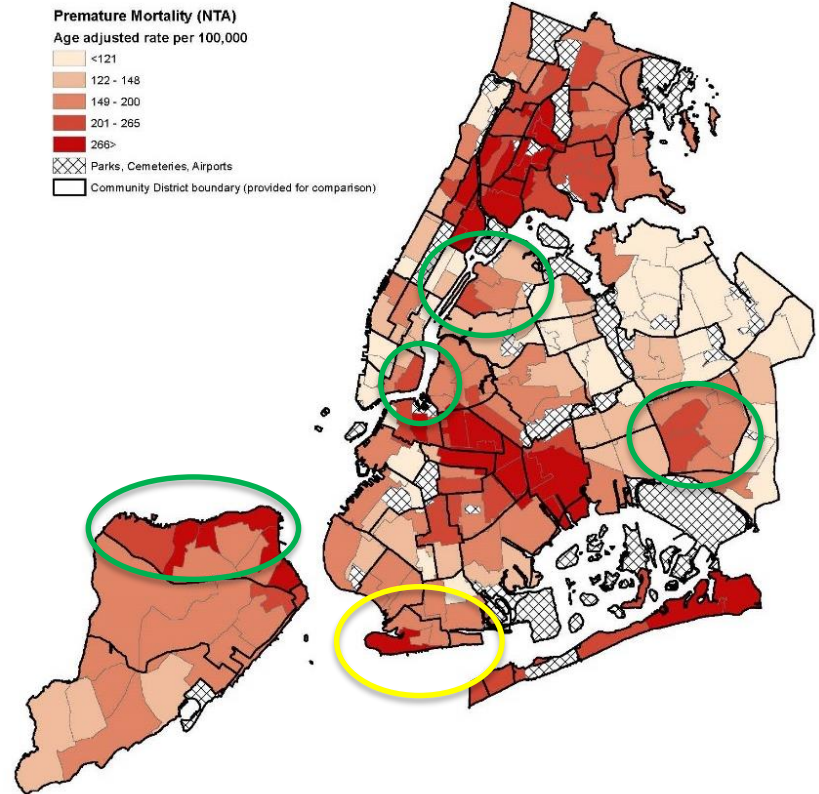- 266 - 366
- Parks, Cemeteries, Airports

Source: NYC DOHMH Bureau of Vital Statistics;
NYC Planning Population Estimates Adapted from the American Community Survey 2009-2013.

**Premature Mortality Rates
by Neighborhood Tabulation Area (NTA)
in New York City, 2009-2013**

Premature Mortality (NTA)
Age adjusted rate per 100,000
- <121
- 122 - 148
- 149 - 200
- 201 - 265
- 266>
- Parks, Cemeteries, Airports
- Community District boundary (provided for comparison)

Source: NYC DOHMH Bureau of Vital Statistics;
NYC Planning Population Estimates Adapted from the American Community Survey 2009-2013.

15

Age-adjusted Premature Mortality Rate in CD 313 (Brighton Beach & Coney Island)

CD 313 = 218 per 100,000

Gravesend (196)

Brighton Beach (192)

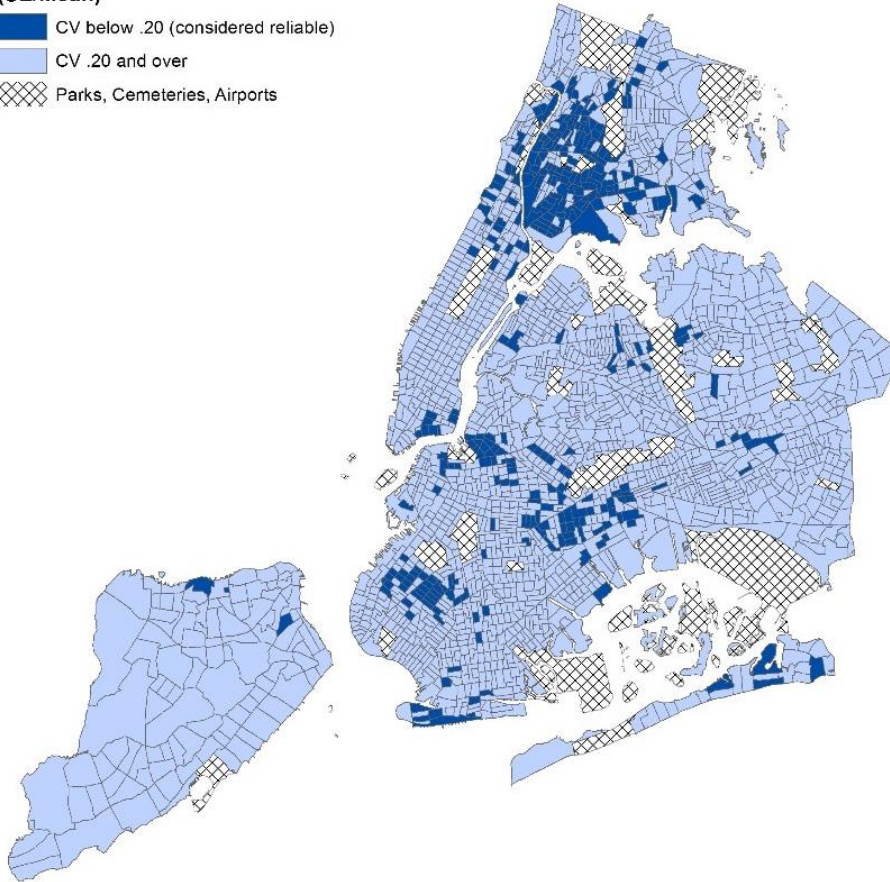West Brighton (186)

Seagate - Coney Island (378)
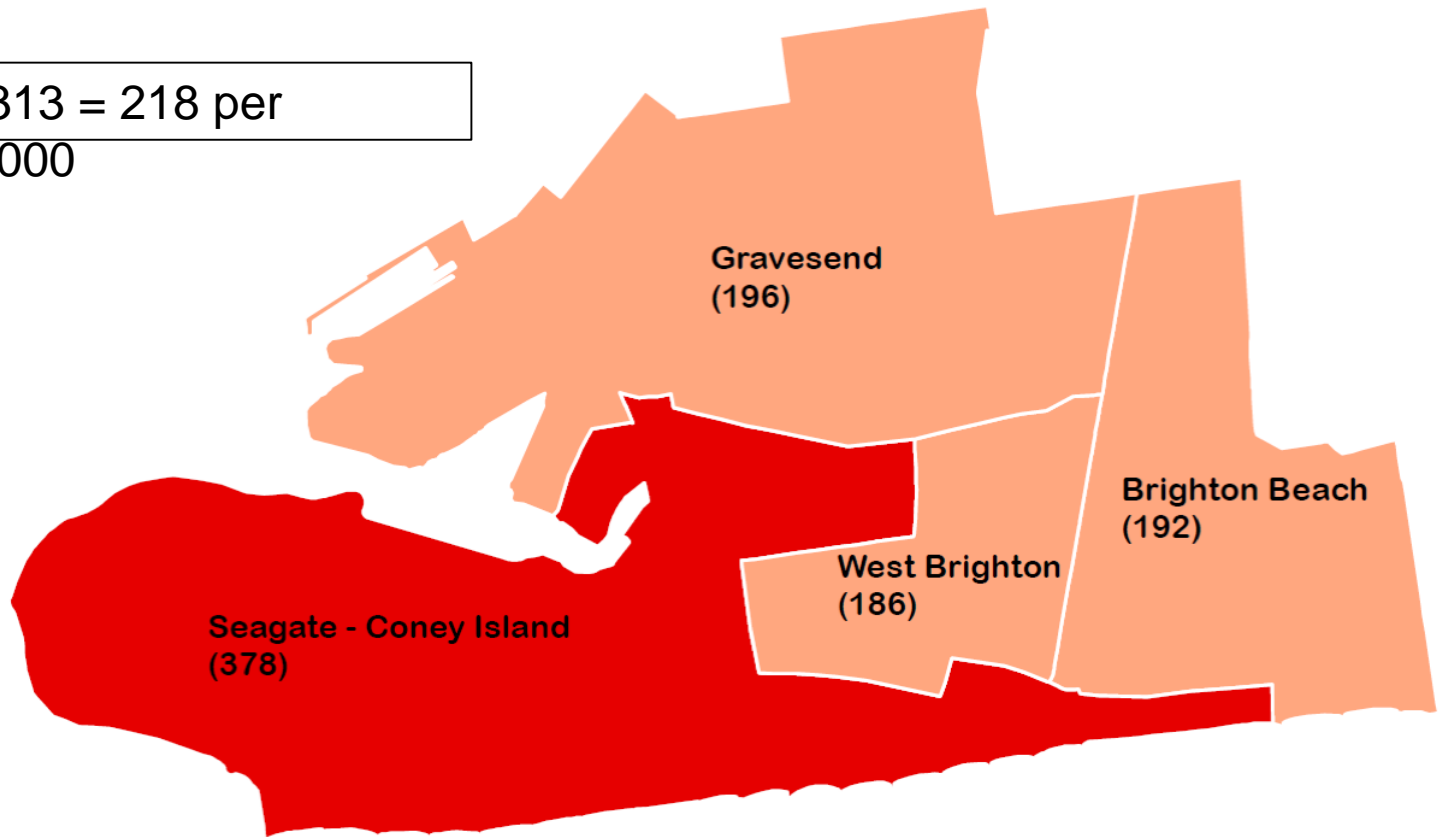
NTA estimates are more reliable than CT estimates

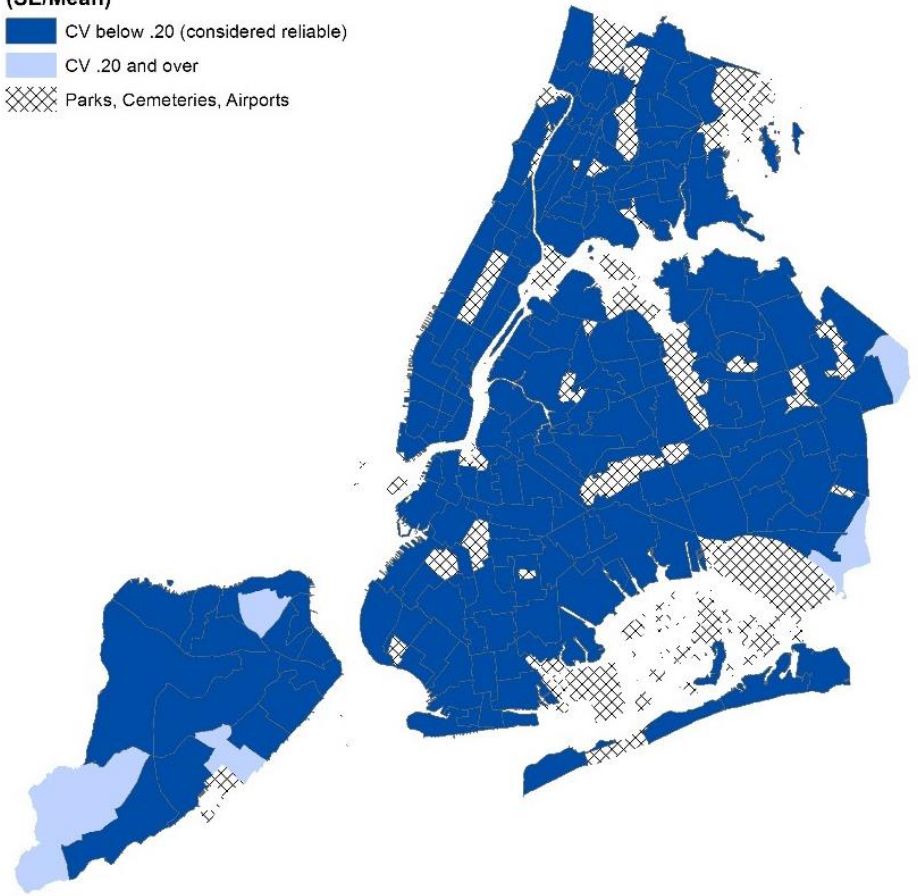**Coefficients of Variation for Census Tract Poverty Estimates**

(SE/Mean)

- CV below .20 (considered reliable)
- CV .20 and over
- Parks, Cemeteries, Airports

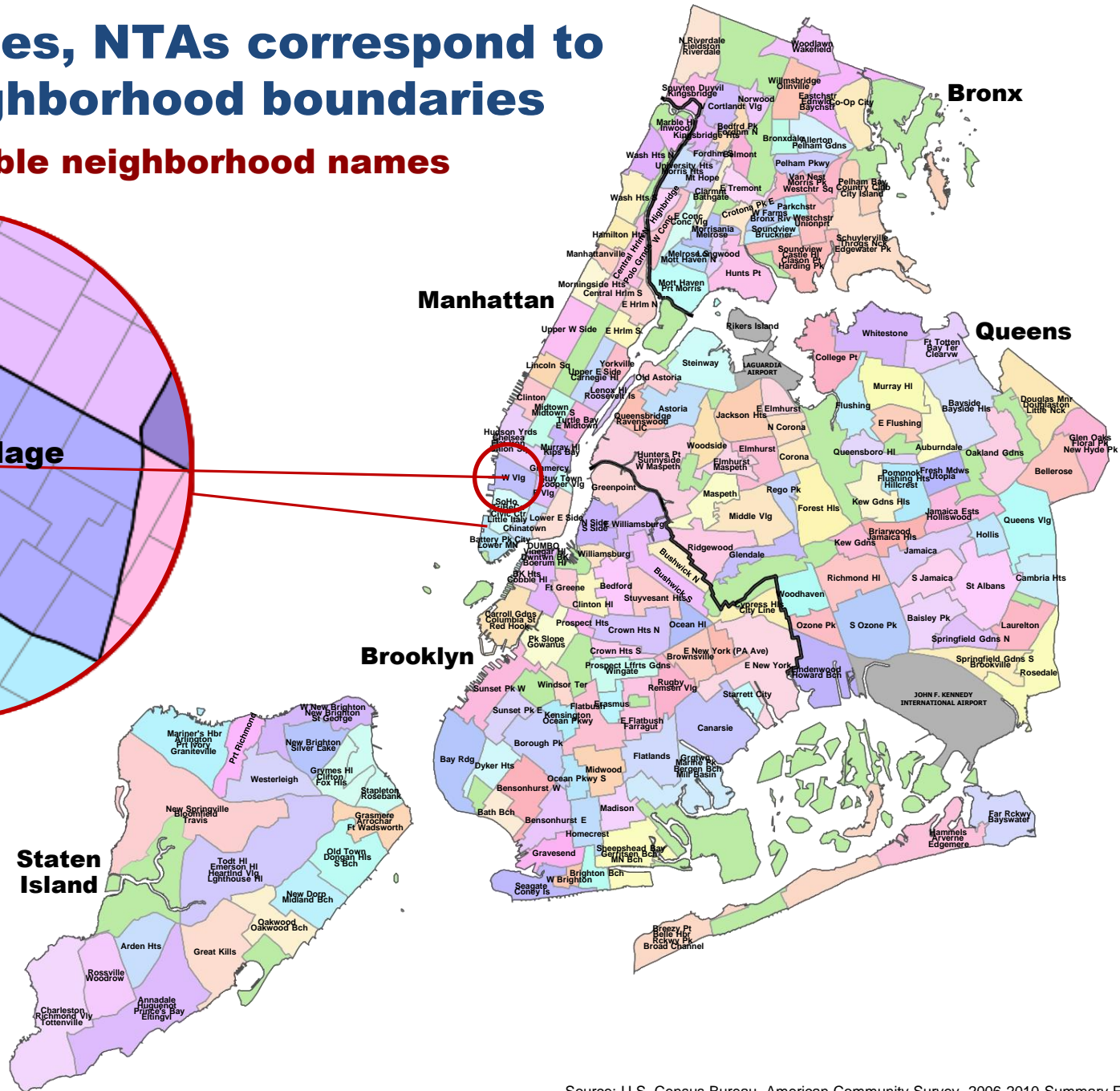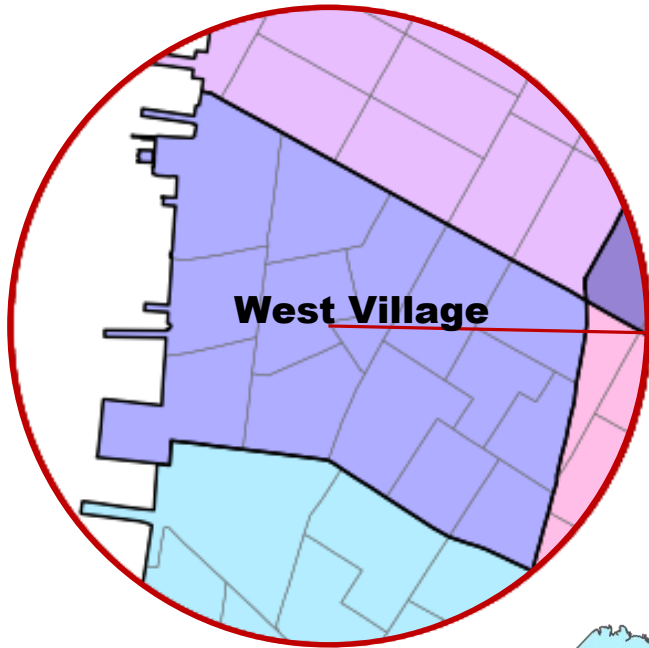**Coefficients of Variation for NTA Poverty Estimates**

(SE/Mean)

- CV below .20 (considered reliable)
- CV .20 and over
- Parks, Cemeteries, Airports

Unlike zip codes, NTAs correspond to historical neighborhood boundaries

NTAs have identifiable neighborhood names

West Village

Bronx

Manhattan

Queens

Brooklyn

Staten Island

Neighborhood Tabulation Areas or NTAs, are aggregations of census tracts that are subsets of New York City's 55 Public Use Microdata Areas (PUMAs). Primarily due to these constraints, NTA boundaries and their associated names may not definitively represent neighborhoods.

Data Sources

- American Community Survey
- NYC Department of Health and Mental Hygiene
  - Vital Statistics
  - Disease Control
  - Environmental Health
  - A1C Registry
- Other city agencies
  - Administration for Children's Services
  - Department of Social Services
    - Human Resources Administration
    - Department of Homeless Services
  - Department for the Aging
  - Department of Correction
  - Department of Education (YC FITNESSGRAM)
- ED/hospitalizations claims database
  - Statewide Planning and Research Cooperative System (SPARCS)
- NYC Medicaid data
- Health Data NY
- NYC Open Data

- 100+ indicators have been created and linked using the above data to assess social determinants of health

Key Project Activities

- Inclusion of 100+ indicators
- Automated geocoding routine
- DOHMH NTA population estimates
- Data Dissemination
- Development of use cases

NYC
Health

Data Uses

- **Identify health concerns and disparities at the neighborhood scale**
  - Targeting, surveillance, evaluation
  - Pockets of high burden areas outside of Neighborhood Health Action Center neighborhoods

- **Uncover social determinants of heath in communities**
  - Premature mortality and jail incarceration
  - Legionnaires' disease and cooling tower density

- **Emergency Preparedness**

- **Help drive community prevention planning and investments**
  - TCNY Neighborhood Health Initiative investments
  - IMAGE-NYC (interactive map of aging in NYC)
  - UHF Medicaid Institute report(s)

Potential Uses

- **Long-term cross-agency surveillance and reporting**
  - Expansion to other agencies
  - Systemization of initial efforts
- **Hierarchical/multi-level modeling efforts**
  - Neighborhood context
- **Ecological cost exercises**
- **Long term planning**
  - NTAs were constructed for long term population projections
- **Increased cooperation/coordination**
  - Between agencies
 - With Community-Based Organizations
  - With the public

Conclusions

- NTAs represent a useful geography to organize NYC data to examine and promote neighborhood health

- Issues with incorporating survey data such as Community Health Survey represent potential limitation

Acknowledgements

- Funding for this project is provided by RWJF Data Across Sectors for Health (DASH)

- The project was led by **Tsu-Yu Tsao** and the **Office of Policy Planning and Strategic Data Use**

- Special thanks to the **Department of City Planning and the Center for Innovation through Data Intelligence** who played (and will play) key roles in the success of the project.

- Please contact Tsu-Yu Tsao with questions and suggestions: ttsao@health.nyc.gov

- or me kkonty@health.nyc.gov

NYC
Health

Thank You
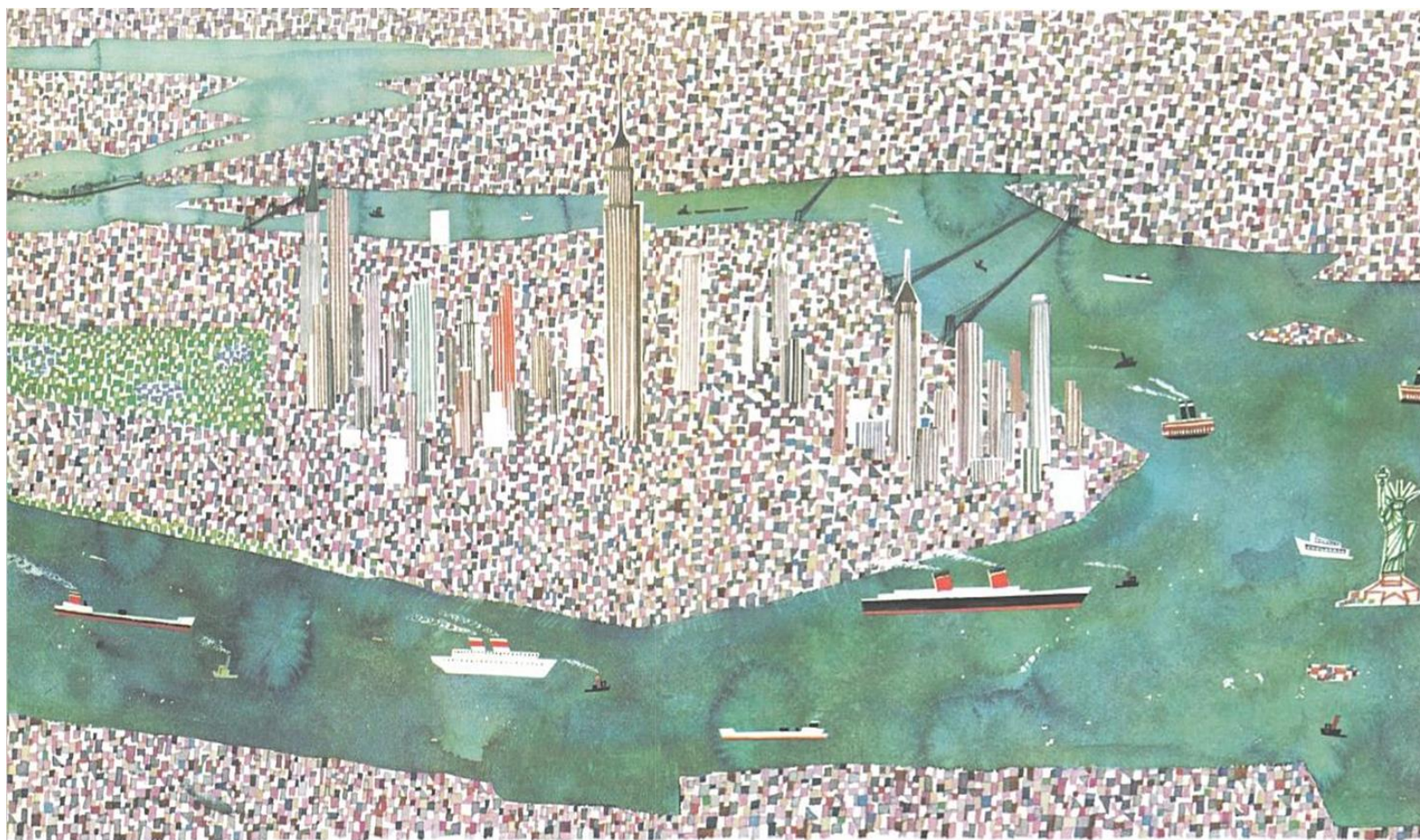
Allegheny County Data Sharing Alliance for Health (ACDSAH)
Public health, Human services, Economic development, Health care and Transportation
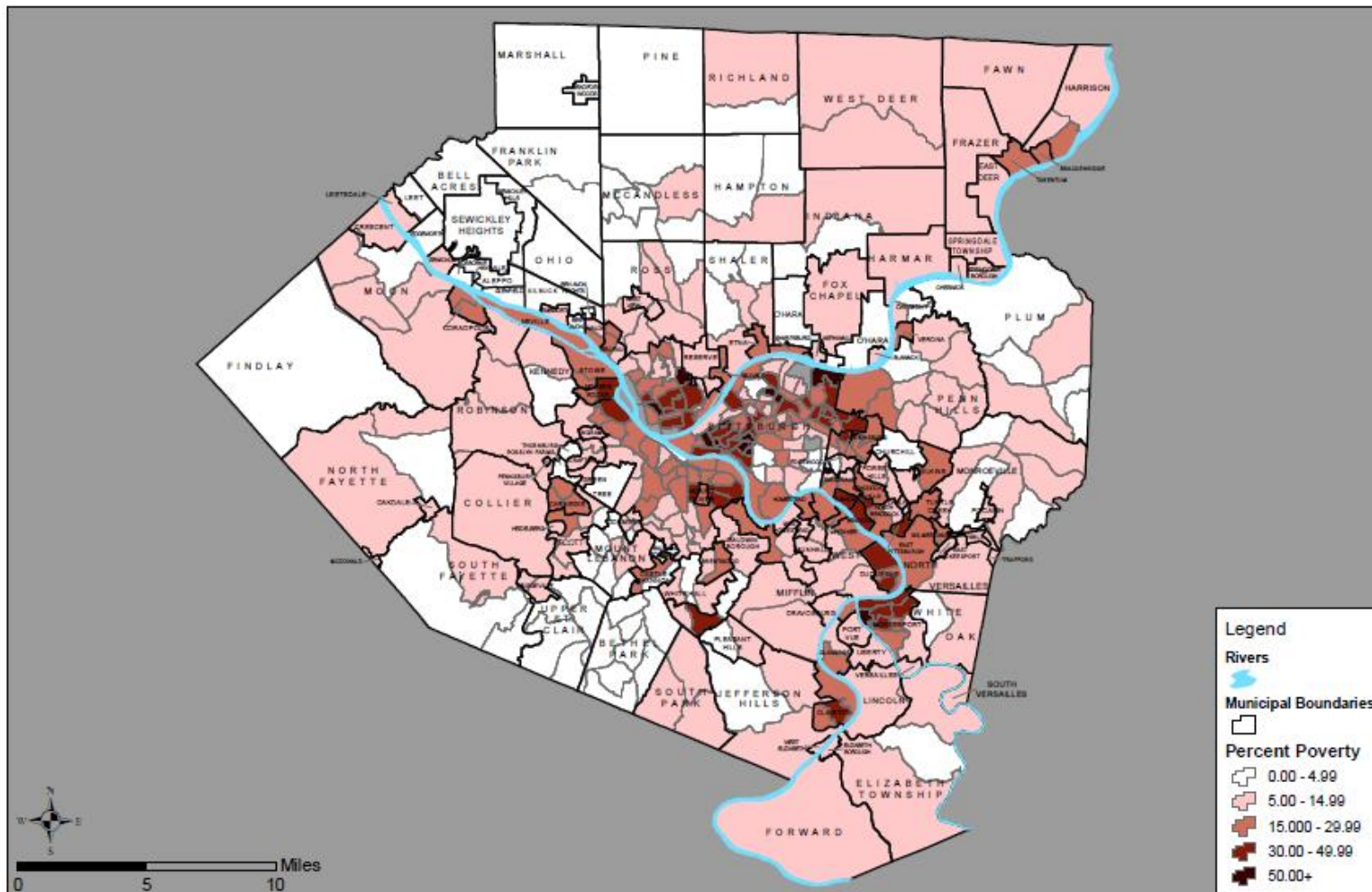
Vision: a connected data warehouse that provides multi-source data for cross sector decision making to impact the health of the 130 municipalities and 1.2 million residents in Allegheny County.
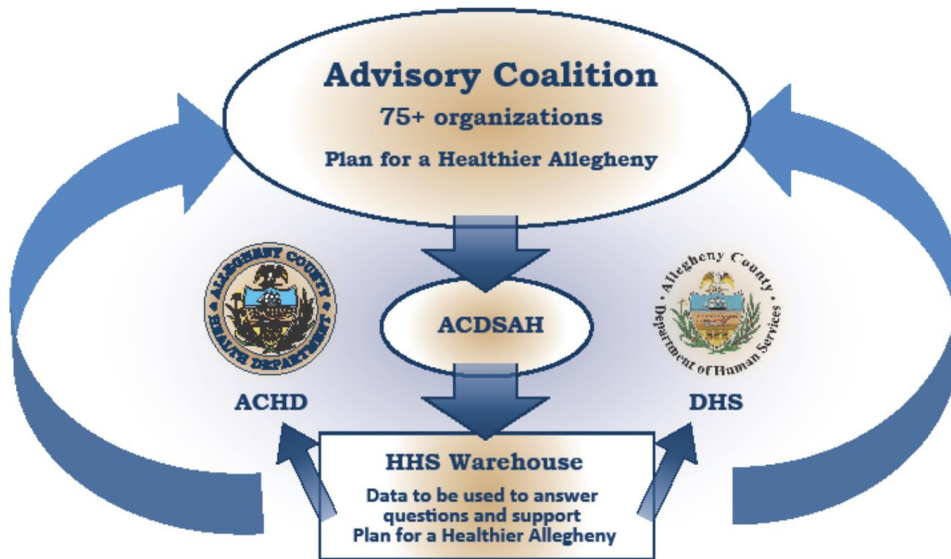
Allegheny County

Percent Below Poverty Level 2012

Source: US Census Bureau

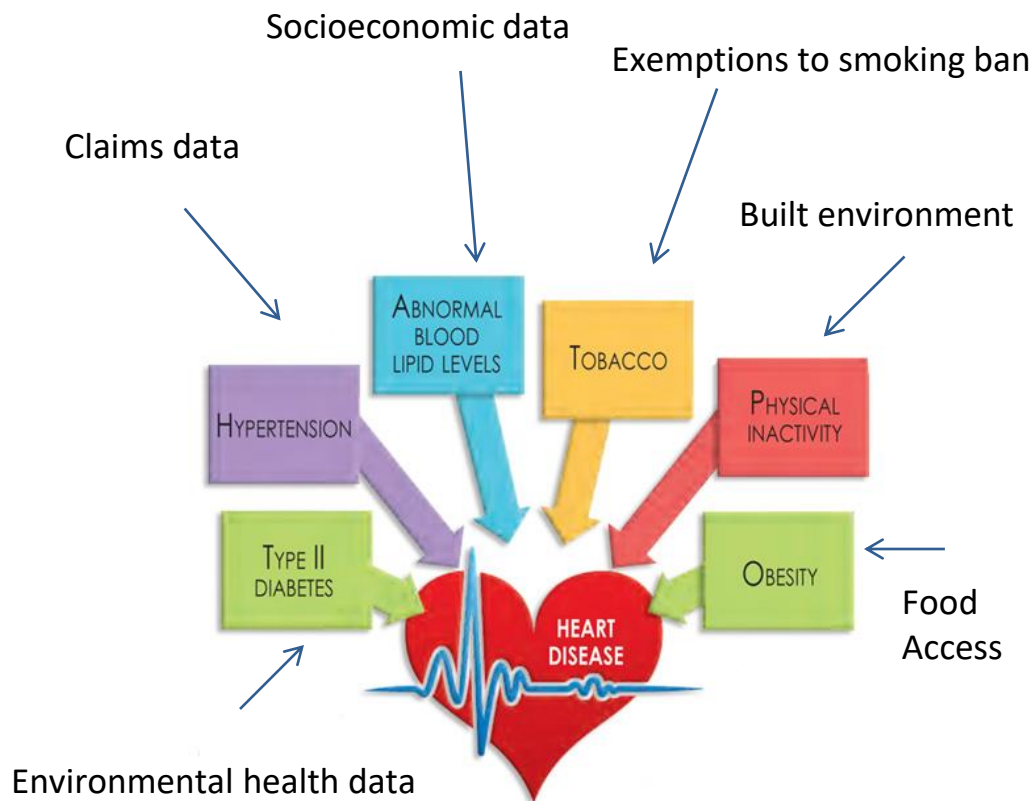Population (2013): 1,231, 527

Stakeholders/Partners

- Intergovernmental

Human Services, Economic Development, CountyStat

- Managed Care Organizations

UPMC, Gateway, Highmark

- Advisory Coalition for ACHD

- Local organizations

Jewish Healthcare Foundation, Traffic 21, RAND, University center for social and urban research, Public Health Dynamics Laboratory, American Heart Association, American Diabetes Association

Allegheny County Data Sharing Alliance for Health (ACDSAH)

GOALS:

- To merge existing cross-sector data sets for decision making

- To understand the risk of cardiovascular mortality across Allegheny County

- To integrate data into a single accurate model (FRED)to assess impact of social determinants

Socioeconomic data

Exemptions to smoking ban

Claims data

Built environment

ABNORMAL BLOOD LIPID LEVELS

TOBACCO

PHYSICAL INACTIVITY

HYPERTENSION

TYPE II DIABETES

OBESITY

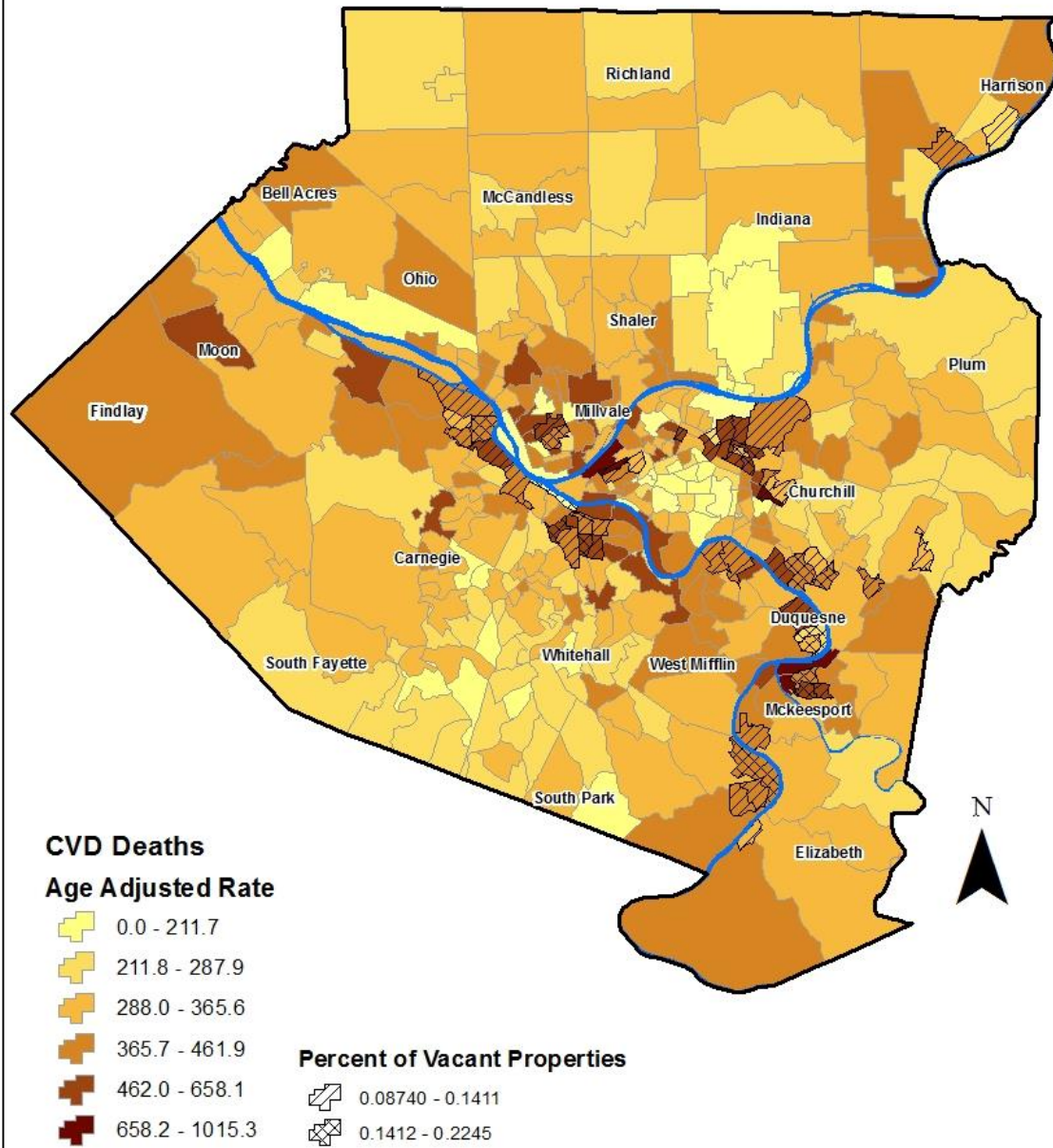HEART DISEASE

Food Access

Environmental health data

Allegheny County DASH Coverage
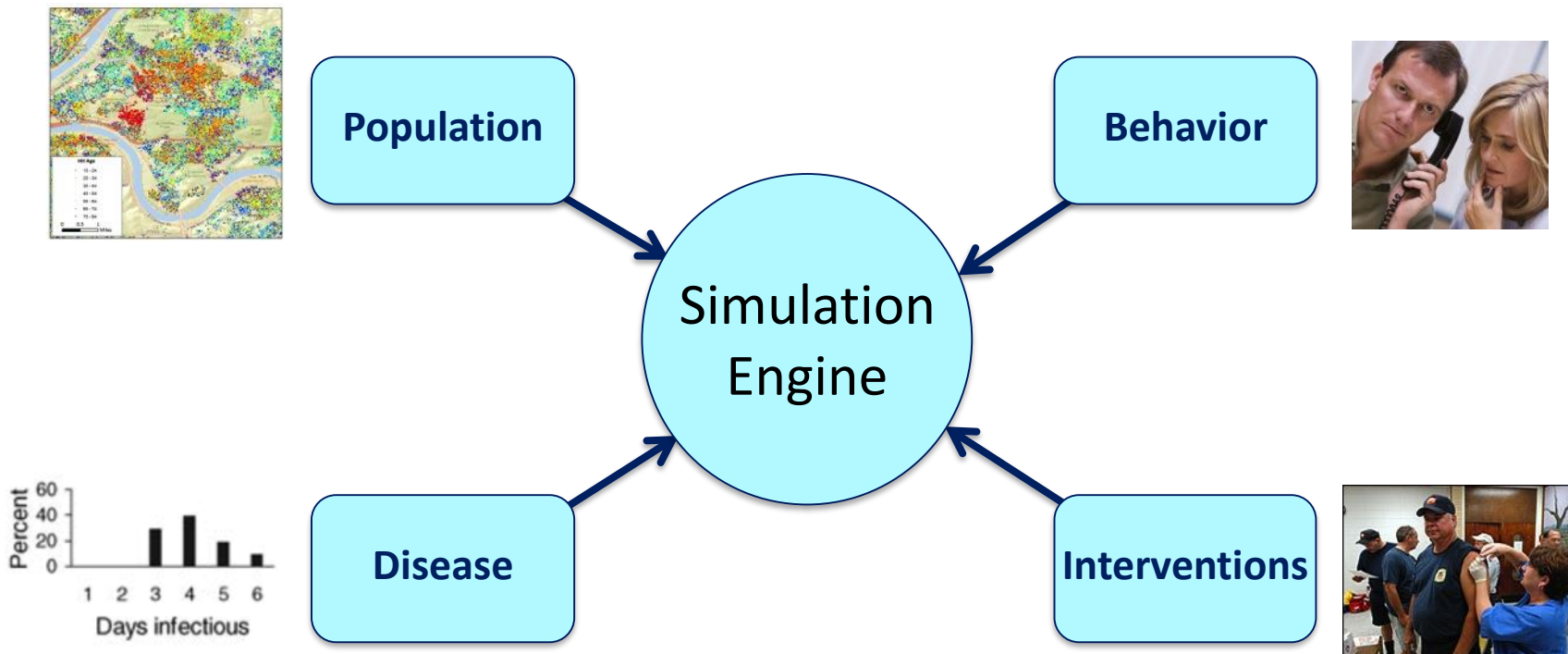DASH Denominator / Insured Population
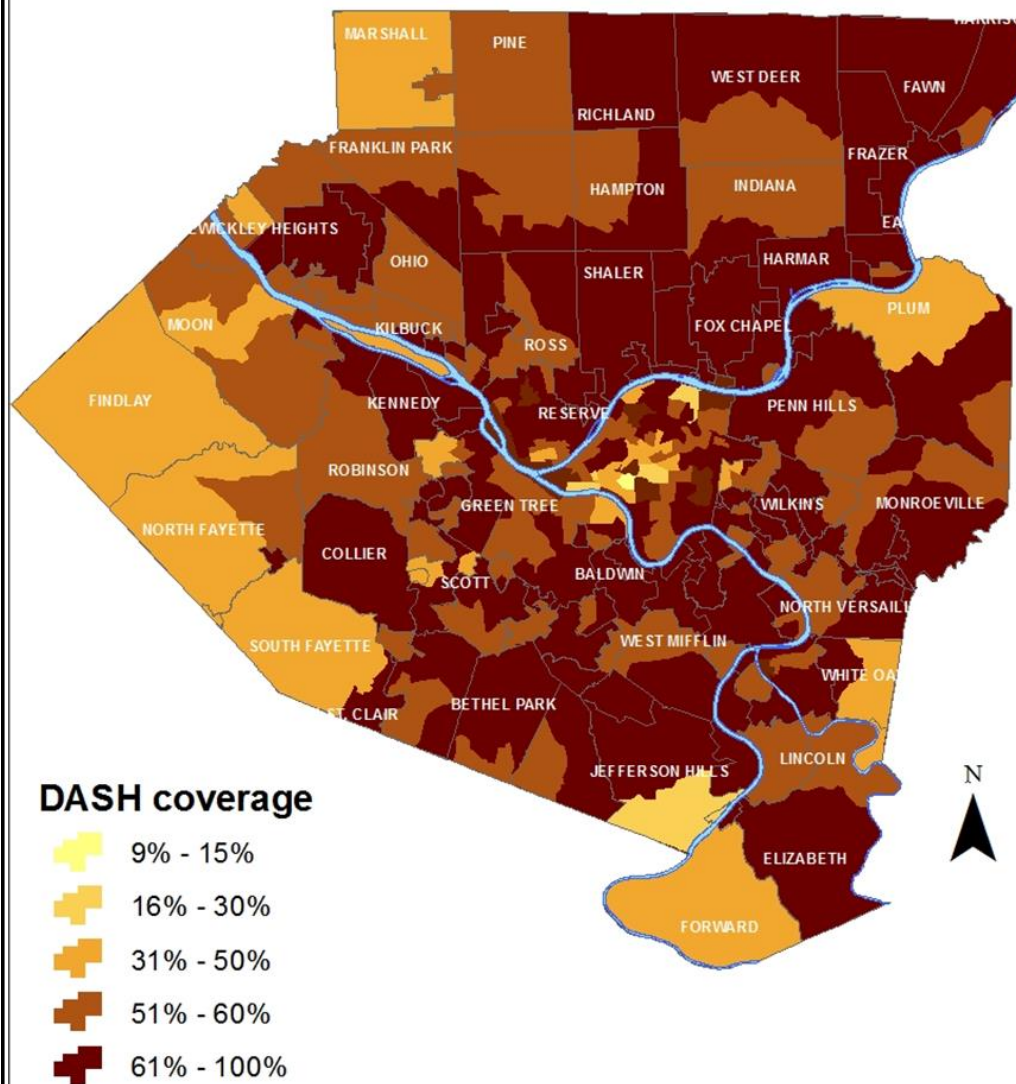
Cardiovascular Disease Deaths
Age Adjusted Rates & Vacant Properties

Framework for **R**econstructing **E**pidemiologic **D**ynamics

FRED is an open-source, agent-based modeling platform developed by the Public Health Dynamics Laboratory at University of Pittsburgh Graduate School of Public Health

Grefenstette JJ, Brown ST, Rosenfeld R, et al. FRED (A Framework for Reconstructing Epidemic Dynamics): An open-source software system for modeling infectious diseases and control strategies using census-based populations. *BMC Public Health,* 2013 Oct;13(1), 940.

Controlling for "expected" risk

Predicted Risk

Predicted 4-year Risk of Death by Cardiovascular Disease by Tract

> 0.021
0.017+
0.014+
0.012+
0.009+
< 0.009

−
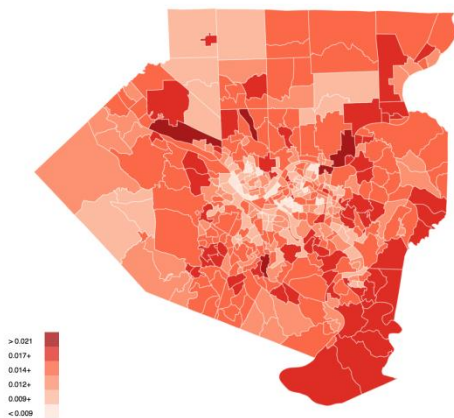
Actual Mortality

Cardiovascular Disease Death Rates (2010 - 2013) by Tract

> 0.021
0.017+
0.014+
0.012+
0.009+
< 0.009

=
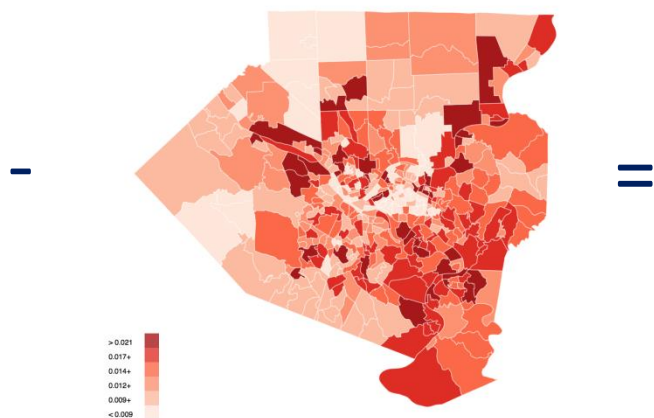
Expected-Observed

Difference Between Predicted and Actual by Tract

> 0.002
0+
-0.005+
-0.007+
-0.013+
< -0.013

Lower than expected deaths

Higher than expected deaths

"difference" – larger negative numbers are *worse*

Difference Between Observed and Expected Risk by Census Tract

Modeled CVD Mortality Risk With 40% Reduction in all SDOH

Food Stamps
Obesity
Percent of housing in poor condition
Percent vacant housing
Diabetes
Hypertension
Diabetes and hypertension

Top Lessons Learned

- Data on the direct impact of social determinants on CVD is lacking

- Getting <u>all</u> major insurers involved is critical for coverage

- It is difficult to get agreement on a single intervention-so allow for independence

Next Steps

- Strategize with partners possible interventions

- Refocus on another outcome-asthma, opioid overdoses

- Continue to refine FRED

- Sustain data

Baltimore Falls Reduction Initiative Engaging Neighborhoods and Data (B'FRIEND)

Darcy Phelan-Emrick, DrPH, MHS

December 13, 2017

First presented at APHA Session 3157.0 on November 6, 2017

Leana Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

Catherine E. Pugh
Mayor, Baltimore City

@Bmore_Healthy
@DrLeanaWen
BaltimoreHealth

health.baltimorecity.gov

Presenter Disclosures

Darcy Phelan-Emrick

The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

BALTIMORE CITY HEALTH DEPARTMENT

Background

In 2015, over 3 million older adults were treated for falls in emergency departments (EDs) in the US[1]

Effective falls prevention includes exercise, home modification, vision screening, etc.

Health information exchanges (HIEs) can be leveraged for public health use cases, including surveillance[2]

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

[1] WISQARS, 2015, non-fatal injury query for unintentional falls among 65+ years, NEISS All Injury Program, accessed 10/30/2017;
[2] PMC3052326

Sectors Involved

- Maryland's HIE, CRISP (Chesapeake Regional Information System for Our Patients)

- Baltimore City Housing

- Baltimore City 311 System (citizen requests for service)

- Social service providers

- Hospitals

- Academic institutions

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

BALTIMORE CITY HEALTH DEPARTMENT

B'FRIEND Goal

B'FRIEND is a collaboration between the Baltimore City Health Department, CRISP, and many partners
    Funding for infrastructure provided by RWJF DASH (ID 73348)

Goal: To decrease the rate of falls leading to an ED visit or hospitalization among older adults (65+ years) by one-third in three years in Baltimore City, Maryland

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

BALTIMORE CITY HEALTH DEPARTMENT

Methods

Surveillance population: Older adult residents (65+ years) of Baltimore City

Timeframe: October 2015 – Present

Data source: Maryland Health Services Cost Review Commission (ED and hospitalization case-mix data with CRISP unique identifier)

Outcome: Falls-related ED visits and hospitalizations identified by ICD codes[3]

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

[3] Consensus Recommendations For Surveillance of Falls and Fall-Related Injuries, Injury Surveillance Workgroup on Falls (ISW4), 2006

BALTIMORE CITY HEALTH DEPARTMENT

ZIP code 21211
Number of falls-related ED visits and hospitalizations among older adults by month, Oct 2015 – Aug 2017

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

Data source: Maryland HSCRC Inpatient and Outpatient Case Mix Data with CRISP EID since October 2015

BALTIMORE CITY HEALTH DEPARTMENT

ZIP code 21211
Percent sex and percent race of falls-related ED visits and hospitalizations among older adults, Oct 2015 – Aug 2017

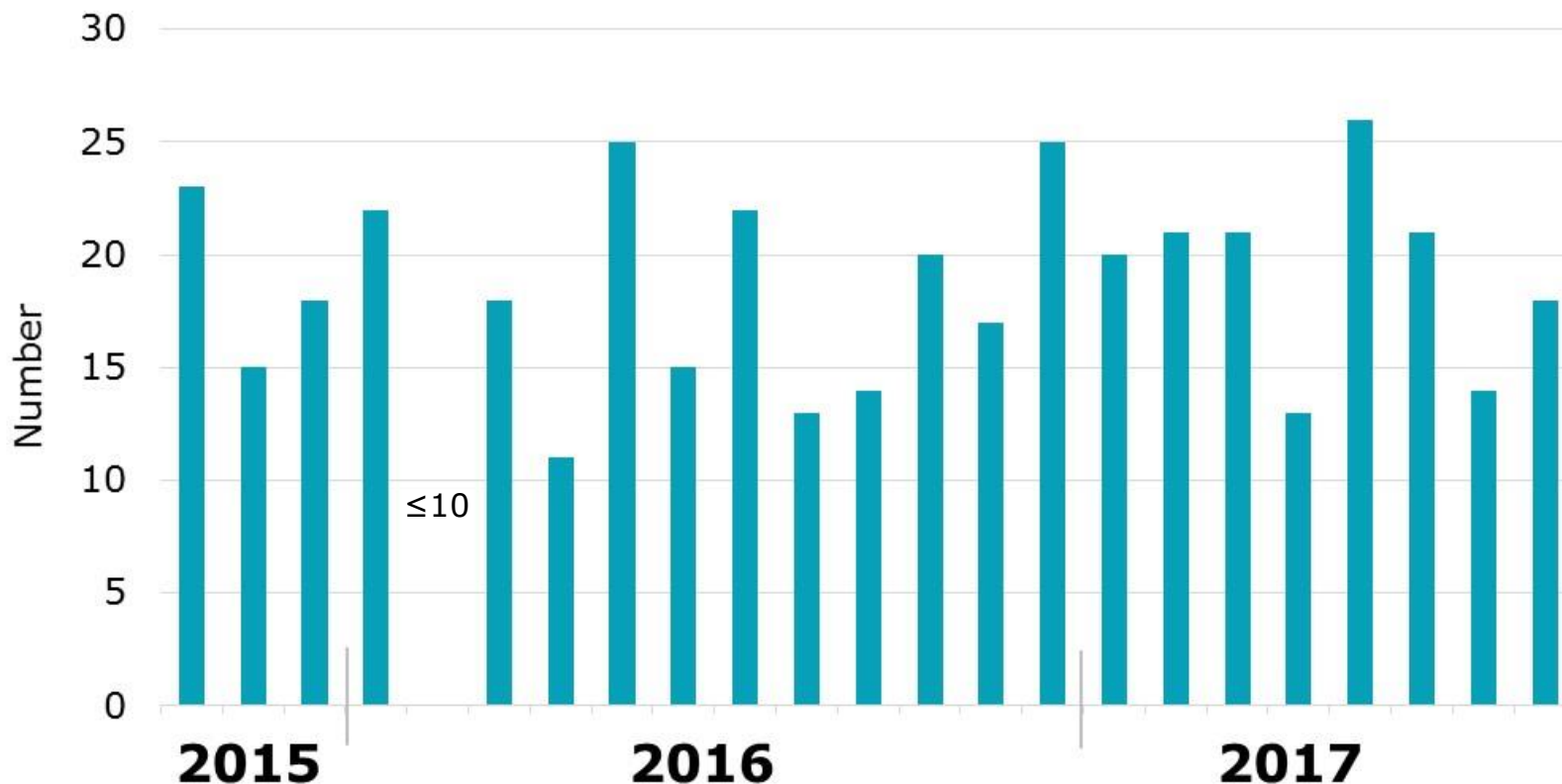**Sex**

31%
69%

■ Female ■ Male

Race

1%
17%
82%

■ Black ■ White ■ Other

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

Data source: Maryland HSCRC Inpatient and Outpatient Case Mix Data with CRISP EID since October 2015

BALTIMORE CITY HEALTH DEPARTMENT

ZIP code 21211
Number of falls-related ED visits and hospitalizations among older adults by age group , Oct 2015 – Aug 2017

Catherine E. Pugh
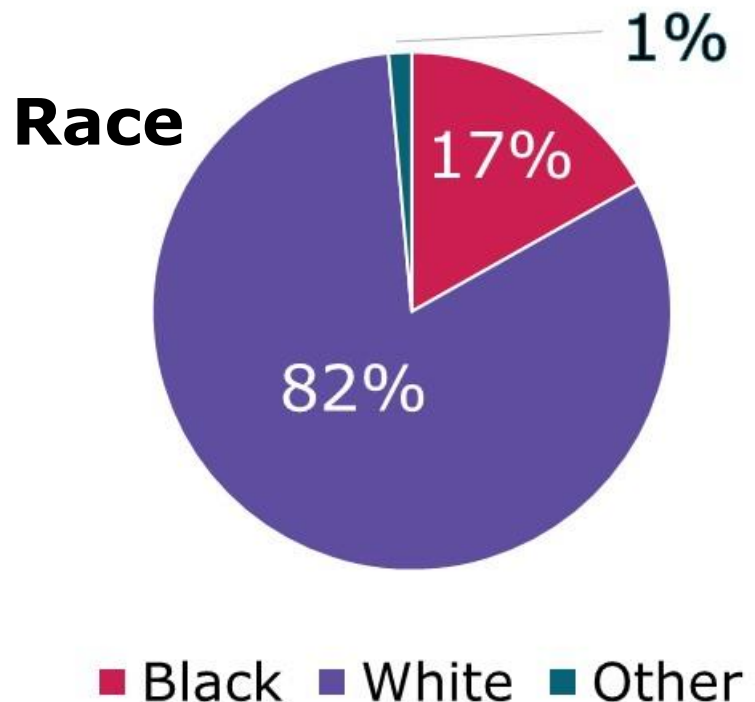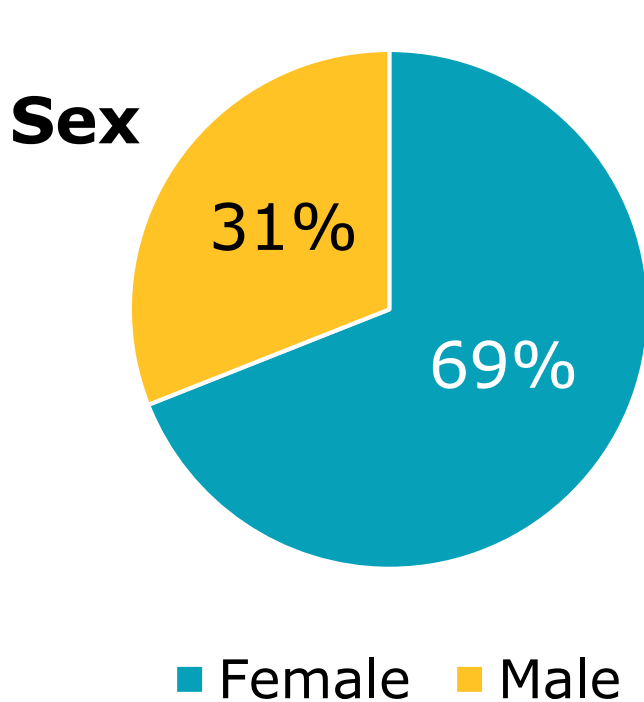Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

Data source: Maryland HSCRC Inpatient and Outpatient Case Mix Data with CRISP EID since October 2015

BALTIMORE CITY HEALTH DEPARTMENT

ZIP code 21211
Percent for number of visits per patient for falls-related ED visits and hospitalizations among older adults, Oct 2015 – Aug 2017

Number of falls-related ED visits and hospitalizations per patient

- ■ 1
- ■ 2
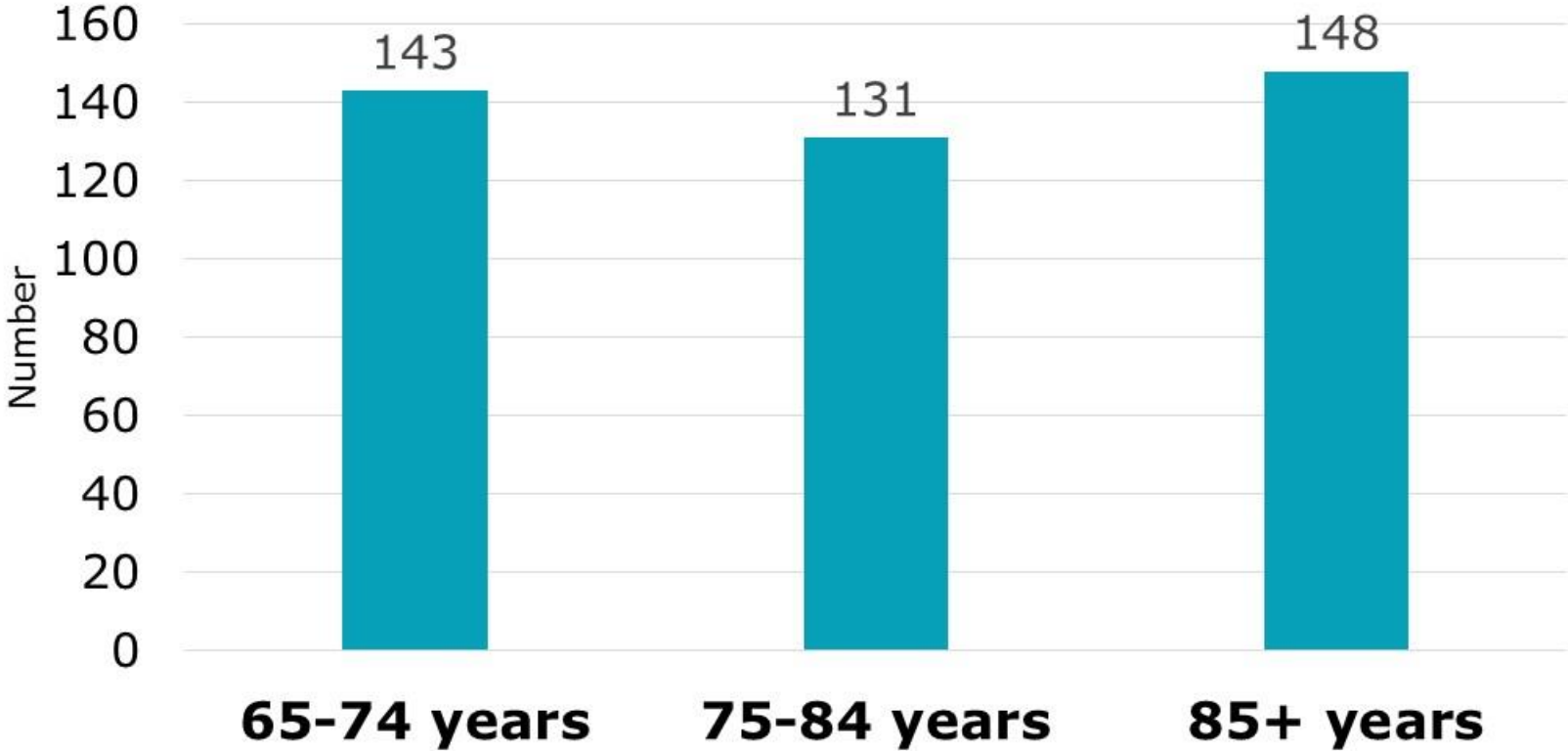- ■ 3
- ■ 4+

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

Data source: Maryland HSCRC Inpatient and Outpatient Case Mix Data with CRISP EID since October 2015

BALTIMORE CITY HEALTH DEPARTMENT

Lessons Learned

Working across sectors can be more difficult than one expects

Local government bureaucracy and politics present notable challenges to innovation
    Contracting
    Changes in elected/appointed leaders
    Legal agreements

Local and meaningful data excite partners and create momentum for real change!

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

BALTIMORE CITY HEALTH DEPARTMENT

Next Steps

Continue using B'FRIEND for surveillance and targeting falls prevention activities

Incorporate additional data from sources such as EMS calls for service, transportation, older adult home visiting programs, weather, etc.

Conduct further epidemiologic and geospatial analyses ("hot spots")

Catherine E. Pugh
Mayor, Baltimore City

Leana S. Wen, M.D., M.Sc.
Commissioner of Health, Baltimore City

BALTIMORE
CITY HEALTH
DEPARTMENT

King County Data Across Sectors for Housing and Health

Amy Laurent, Epidemiologist

Life expectancy in King County by census tract varies by 24 years

Housing Stability

Neighborhood Conditions

Housing Affordability

Housing Quality

Health

75% of adults who live in public housing also receive Medicaid

and yet

data between these two sectors isn't linked

Rank
Lowest

Highest

Washington State
Health Care Authority

Public Health — Seattle & King County
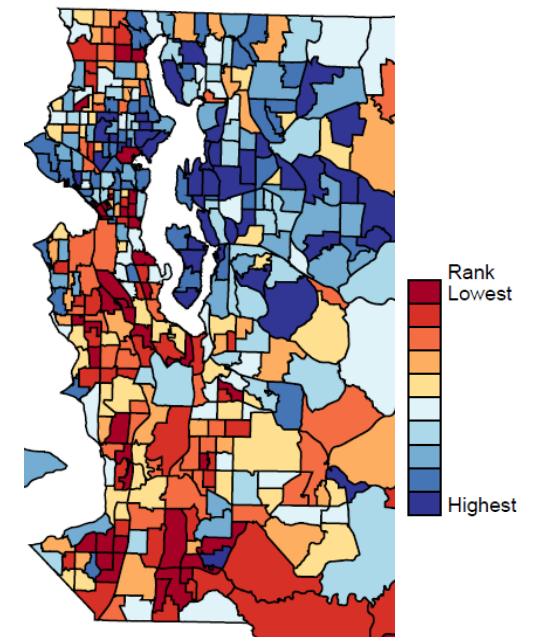

Seattle HOUSING AUTHORITY

King County Housing Authority

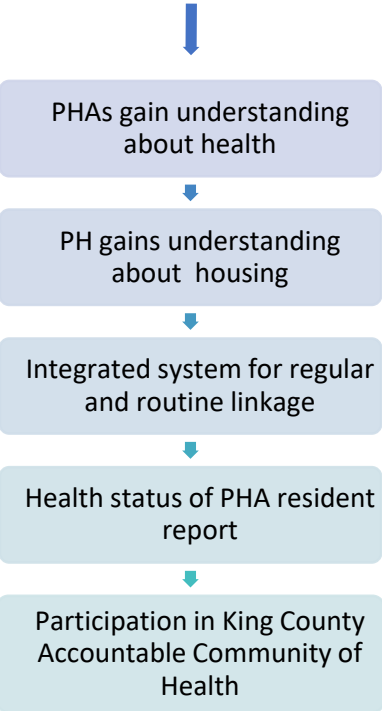Washington State Health Care Authority

To help public housing authorities have a better understanding of the health conditions of their population; enable program and policy development and evaluation

- Task 1: Link Medicaid claims data with PHA resident data
  - Medicaid claims hold the information from a medical encounter with a provider (doctor, hospital, procedure, prescription)
  - PHA resident data from the Moving To Work (MTW) 50058 form
- Task 2: Provide PHAs a de-identified dataset and visualizations with coded health conditions for enhanced in-house ability for assessment and evaluation
- Task 3: Sustain this process for regular exchange

Allows PHAs to take a deeper dive into the data and start to answer questions that previous static linkages have raised.

53

Short term

↓

PHAs gain understanding about health

↓

PH gains understanding about housing

↓

Integrated system for regular and routine linkage

↓

Health status of PHA resident report

↓

Participation in King County Accountable Community of Health

Intermediate

↓

Increase datasets being linked

↓

Use for program planning and evaluation

↓

Share programming across ACHs

↓

Elucidation of housing-health relationships

↓

Partnership structure to build on for other cross-sector work

Long term

↓

Decreased health inequities

↓

Potential for care coordination

↓

Return on investment

↓

Triple Aim

Raw KCHA files
2004-2016

Link, append, and reshape

KCHA data[1]
35,377 households
94,932 individuals

Align formats, append

Raw SHA files
2004-2016

Link and append

SHA data[1]
38,084 households
85,986 individuals

PHA data
63,671 households
149,401 individuals
361,037 records

Deduplication, remove those who exited prior to 2012

103,494 individuals
103,494 records

Inner join on SSN

Raw Medicaid files
2012-2016

Restructure to have start and end date

864,843 individuals[2]
1,150,021 records

Restrict to most recent data for each individual

764,207 individuals[2]
764,207 records

88,351 individuals
89,289 records
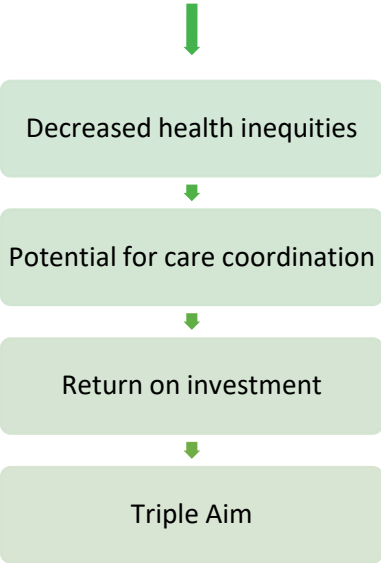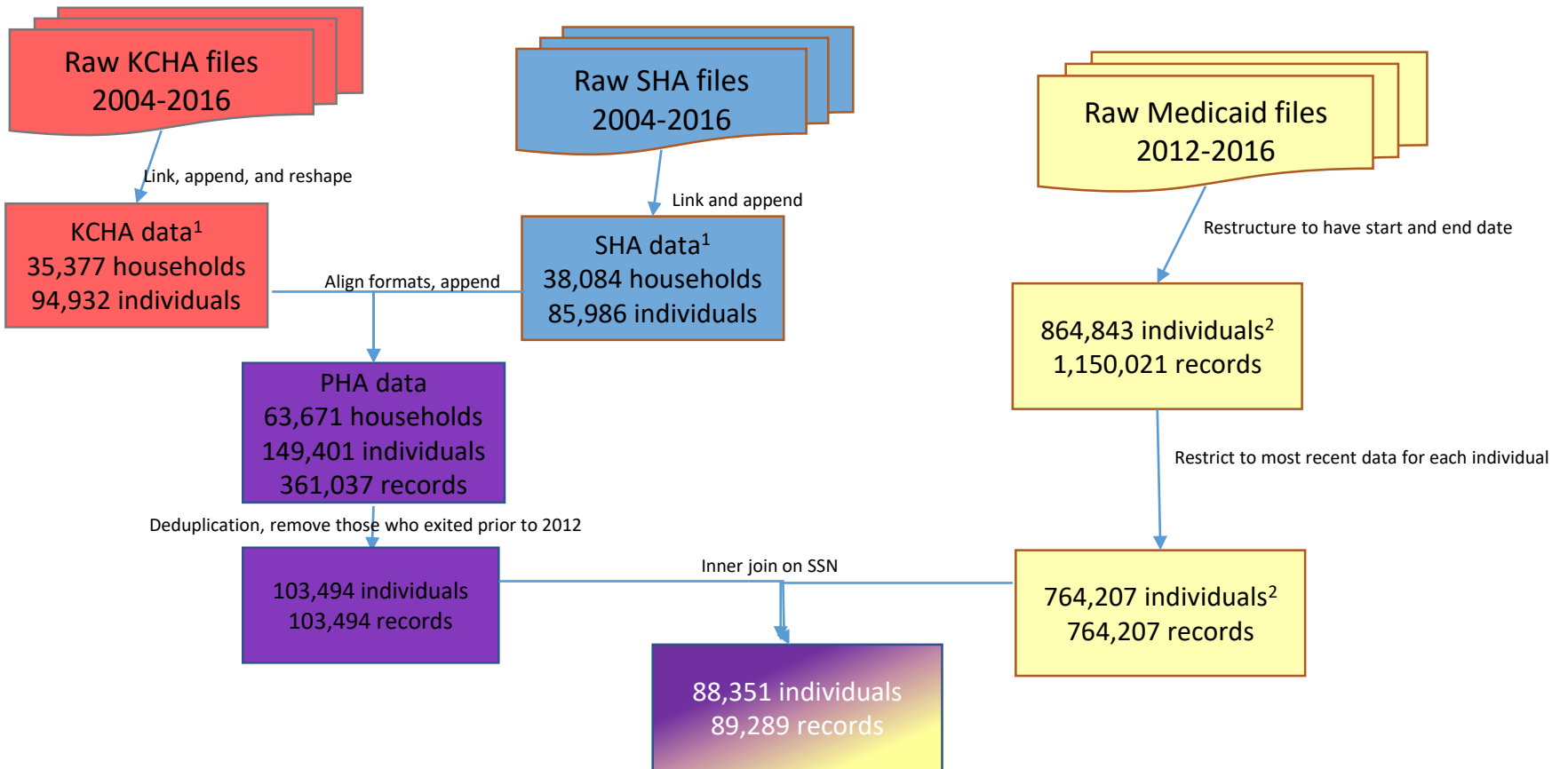
1 Households identified by unique HH SSN Individuals identified by unique combos of SSN and DOB for both PHAs
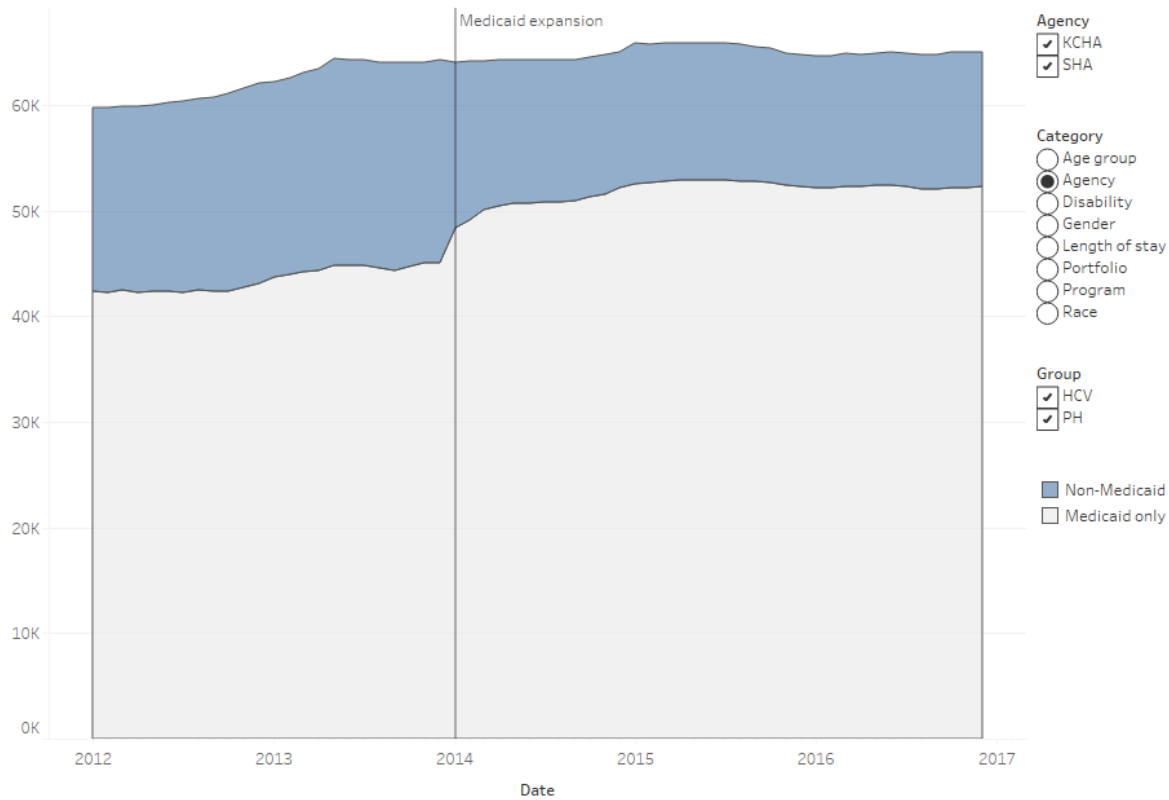
2 Defined as a unique Medicaid ID and SSN combo

PHA and Medicaid enrollment over time
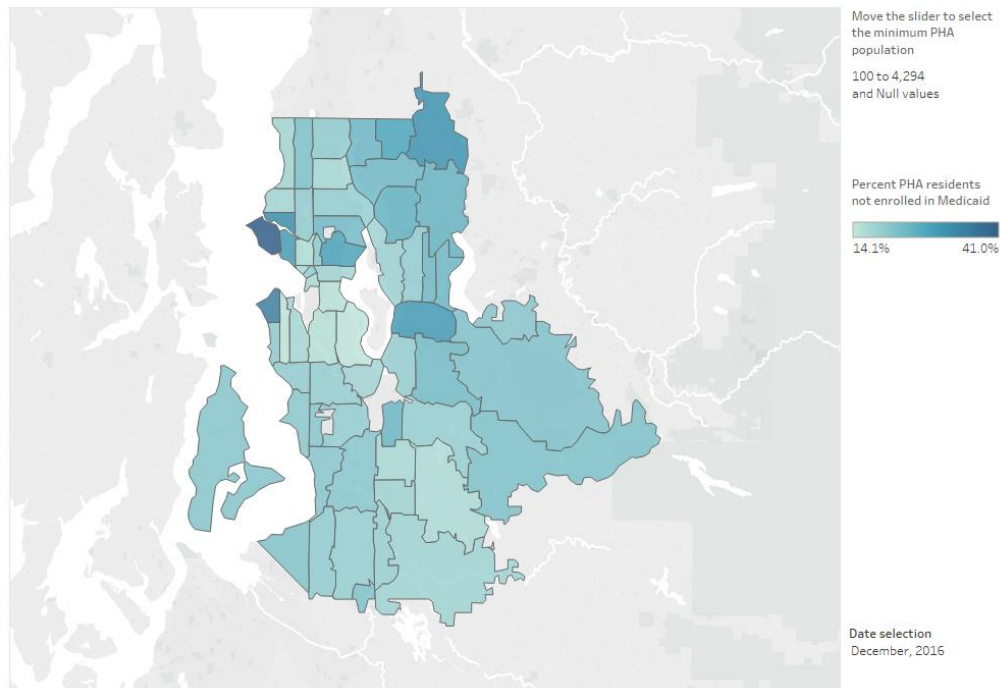
Maps to identify enrollment opportunities

We can use the combined housing and Medicaid data to identify PHA populations that may be eligible for Medicaid but are not enrolled.

Move the slider to select the minimum PHA population

100 to 4,294 and Null values

Percent PHA residents not enrolled in Medicaid

14.1%   41.0%

Date selection
December, 2016

- Data are under review before release
- PHAs serve a Medicaid population with higher rates of
  - Chronic disease
  - Injury
  - Adult asthma
- We see different distributions of disease and opportunities for programming across the PHAs
- Avoidable ED use remains off target
- Rates of prevalence computed using claims fall below the general population measures for many chronic diseases
- There may be room for improvement on enrollment into Medicaid

- Bringing the right data people to the table is essential
- The importance of partnering and discussion can't be dismissed
  - Housing tends to look at their analysis units at the household level; public health at an individual
  - Large datasets require a lot of clean up and discourse, even when using "standardized" data
  - DSA among the PHAs
- When possible, fund the partner to do to their data work
- Valuable insights from the data
- Opportunities for partners to drill down into their data
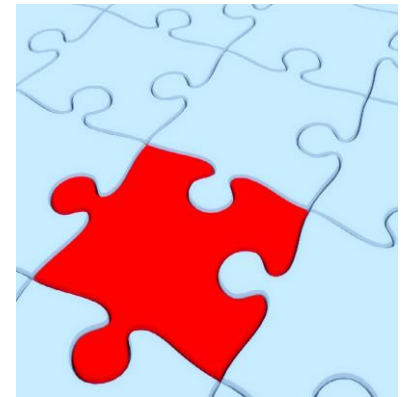- Complexities in working with claims data

- Continued analytics

- Share code for processing the HUD 50058 form

- Non-federally funded low-income housing data

- Identified Medicare data

- Refine code and continue to make publically available via Github

- Revisit the data extract from PHA; perhaps non-50058 information may be helpful for data accuracy

- Project funded by RWJF

- Illinois Public Health Institute and the Michigan Public Health Institute

- Washington State Health Care Authority

- Partners: Sarah Oppenheimer and Alexis Warth from KCHA and Denille Bezemer and Kate Allen from SHA; Betsy Lieberman

- Superstar PH Analysts: Alastair Matheson, Lin Song

Questions?

Carrie Hoff,
Deputy Director, Health &
Human Services Agency, San
Diego County

Kevin Konty, MS, Director,
Research and Analytics, NYC
Department of Health and
Mental Hygiene

Karen Hacker, MD, MPH,
Director, Allegheny County
Health Department

Amy Laurent, MSPH,
Epidemiologist III, Public
Health, Seattle & King County

Darcy Phelan-Emrick, DrPH,
Chief Epidemiologist,
Baltimore City Health
Department

Data Across Sectors for Health

Keep in Touch and Join the Network

Connect with DASH

- Visit our website: dashconnect.org

- Follow @DASH_connect on Twitter

Connect with All In: Data for Community Health

- Visit our website: allindata.org

- Join the online virtual learning community! allin.healthdoers.org

- Subscribe to the All In newsletter

- Follow #AllInData4Health on Twitter

Upcoming Webinars: dashconnect.org/calendar

Data Across Sectors for **Health**