HealthLandscape

Integrating ACS Data into a Population Health Profiler to Improve Clinical Practice

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American Academy of Family Physicians

American Community Survey Data Users Group
2019 DATA USERS CONFERENCE

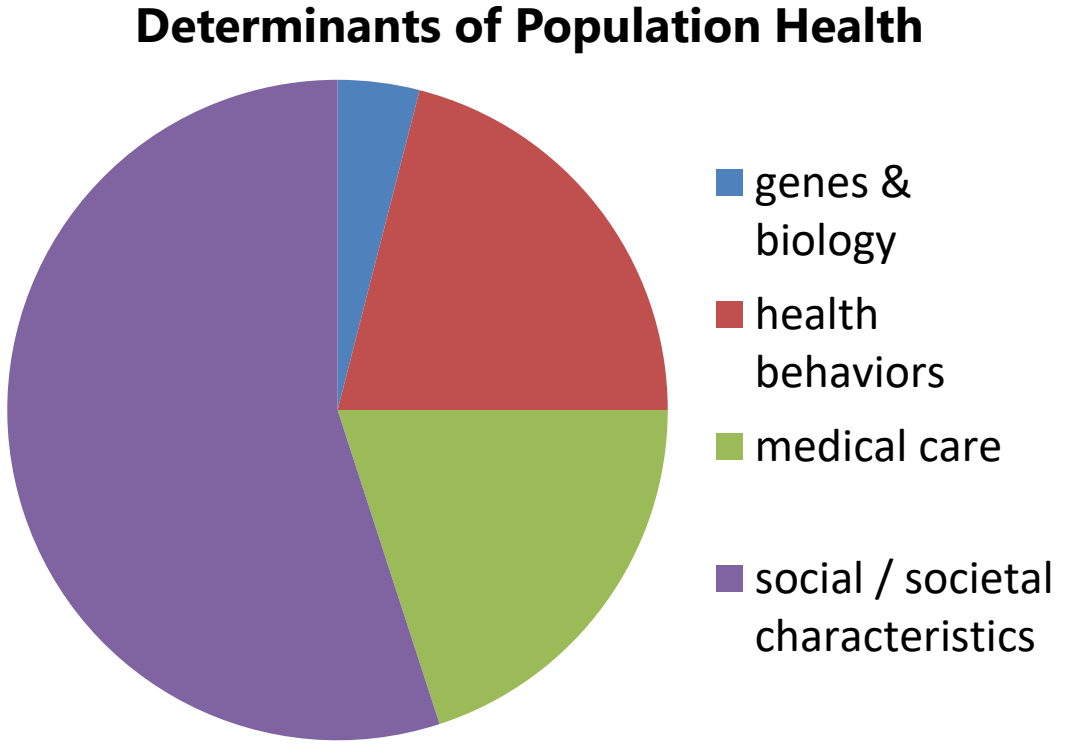
Chronic Disease Management

- Six in ten Americans live with at least one chronic disease
- Chronic diseases are the leading causes of death and disability in the U.S., and are a leading driver of health care costs[1]
- Chronic Disease Management (CDM) is ongoing care and support for individuals with a chronic health condition, which has pieces at several levels:
  - Patient
  - Provider panel
  - Practice
  - Population

[1] https://www.cdc.gov/chronicdisease/index.htm

Social Determinants of Health and Chronic Disease

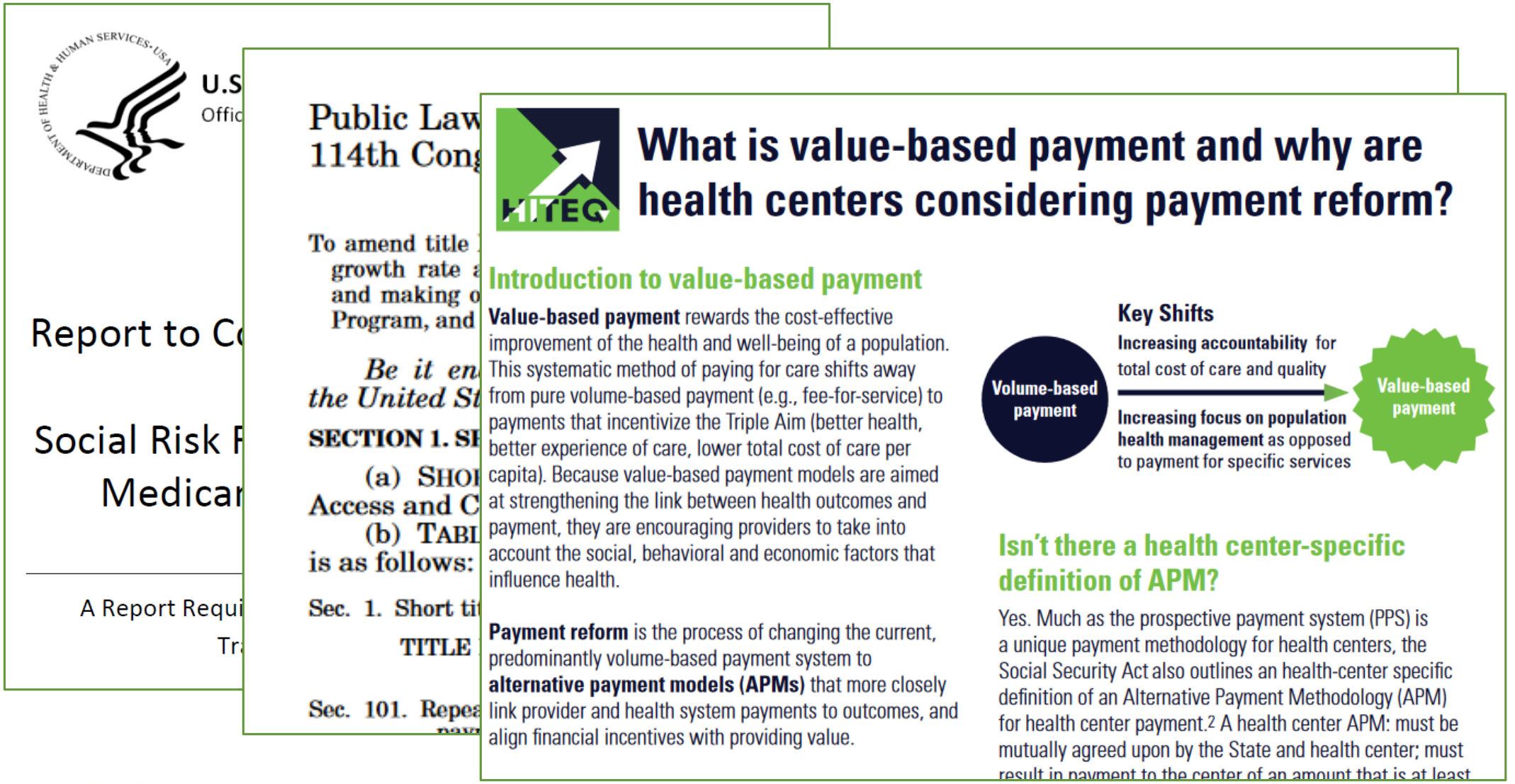
- The close association between chronic disease and patients' social determinants of health (SDOH) adds to the complexity of treating and preventing these disorders
- SDOH are the conditions in which we are born, grow, live, work, and age[3]



[3] http://www.who.int/social_determinants/en/

[4] Annals of the New York Academy of Sciences Volume 896, Issue 1, pages 281-293, 6 FEB 2006 DOI: 10.1111/j.1749-6632.1999.tb08123.x http://onlinelibrary.wiley.com/doi/10.1111/j.1749-6632.1999.tb08123.x/full#f1

Taking SDOH Into Consideration



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What is value-based payment and why are health centers considering payment reform?

Introduction to value-based payment

Value-based payment rewards the cost-effective improvement of the health and well-being of a population. This systematic method of paying for care shifts away from pure volume-based payment (e.g., fee-for-service) to payments that incentivize the Triple Aim (better health, better experience of care, lower total cost of care per capita). Because value-based payment models are aimed at strengthening the link between health outcomes and payment, they are encouraging providers to take into account the social, behavioral and economic factors that influence health.

Payment reform is the process of changing the current, predominantly volume-based payment system to **alternative payment models (APMs)** that more closely link provider and health system payments to outcomes, and align financial incentives with providing value.

Key Shifts

Volume-based payment

Increasing accountability for total cost of care and quality

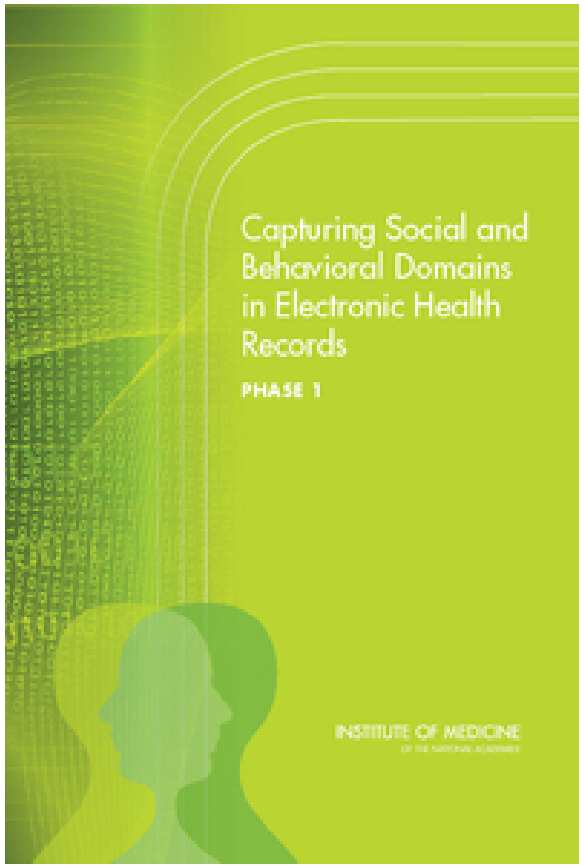
Increasing focus on population health management as opposed to payment for specific services

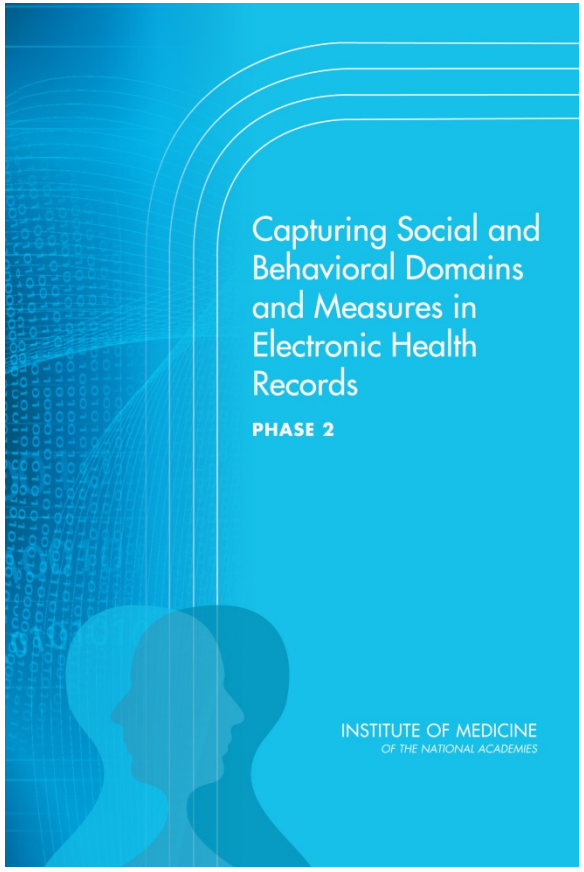
Value-based payment

Isn't there a health center-specific definition of APM?

Yes. Much as the prospective payment system (PPS) is a unique payment methodology for health centers, the Social Security Act also outlines an health-center specific definition of an Alternative Payment Methodology (APM) for health center payment.[2] A health center APM: must be mutually agreed upon by the State and health center; must result in payment to the center of an amount that is at least

Capturing SDOH in EHRs





IOM (Institute of Medicine). 2014. *Capturing Social and Behavioral Domains and Measures in Electronic Health Records: Phase 1 or Phase 2.* Washington, DC: The National Academies Press.

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Community Vital Signs
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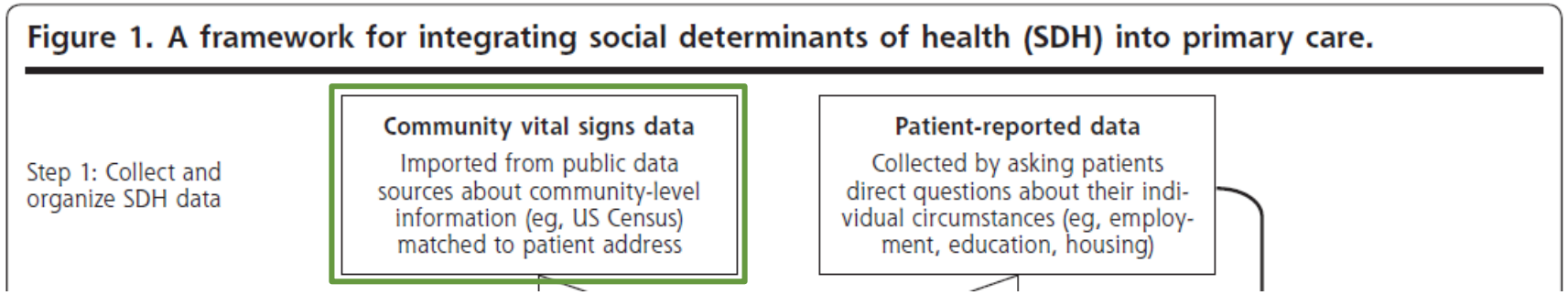
IOM/NAM SDOH Domains

Domains include:

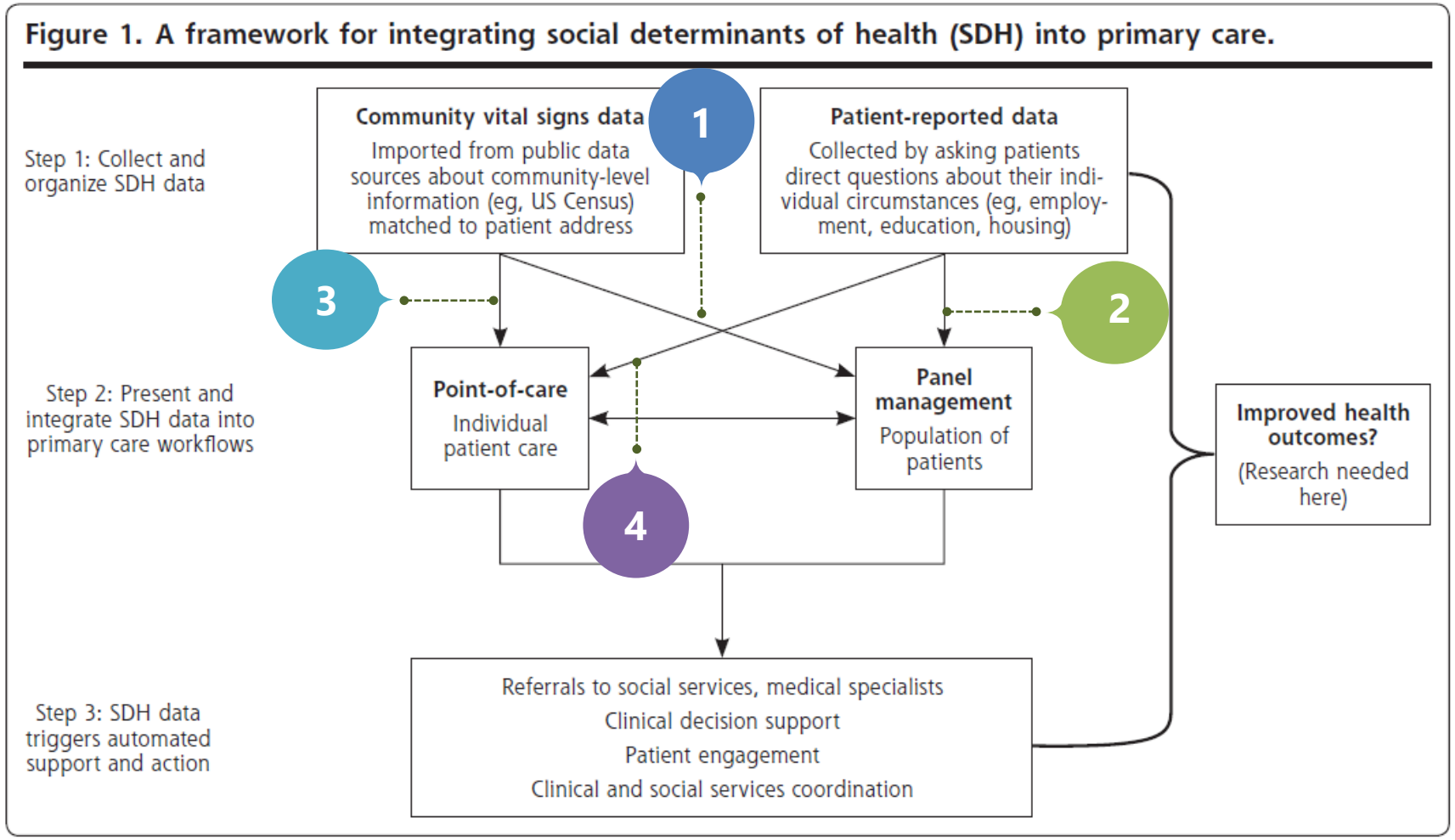
- Sexual Orientation
- Race/Ethnicity
- Country of Origin
- Education
- Employment
- Financial Resource Strain (Food and Housing Insecurity)
- Health Literacy
- Stress
- Negative Mood and Affect (Depression and Anxiety)
- Psychological Assets
- Dietary Patterns
- Physical Activity
- Tobacco Use and Exposure
- Alcohol Use
- Social Connections and Social Isolation
- Exposure to Violence
- Neighborhoods/Community Compositional Characteristics

SDOH Data Source?



- IOM/NAM suggests collecting individual level SDOH and supplementing with neighborhood characteristics
  - Will patients provide honest answers to these questions?
  - How good will the data be if the questions are not consistently asked the same way?
  - How good will the data be if we use different methods (PRAPARE, Minnesota, AAFP?)
  - Will the quality of the data collected via this extra data burden outweigh what can already be found in community level data?

Integrating SDOH into Primary Care



DeVoe JE, Bazemore AW, Cottrell EK, et al. Perspectives in Primary Care: A Conceptual Framework and Path for Integrating Social Determinants of Health Into Primary Care Practice. *Ann Fam Med*. 2016;14(2):104-108. doi:10.1370/afm.1903.

Small Area Estimation - Background

- Local level health data typically not available through national surveys
- Demand for public health data for small geographies is on the rise
- Small areas - Estimates from national surveys
    - o large variance
    - o not reliable
    - o privacy and confidentiality issues
- Therefore, Small Area Estimation (SAE) is the key to develop local area level health measures

Small Area Estimation - Background

SAE methods can be broadly classified into

- Design-based – design-based distribution
- **Model-based** – estimation solely depends on the model specified
- Multilevel regression and poststratification (MRP) is a model-based SAE
- CDC researchers developed MRP to estimate census tract level health measures for 500 cities
- HealthLandscape and the Robert Graham Center - ZCTA level prevalence of select chronic diseases and health behaviors

Small Area Estimation – Data Sources

Variable Type	Data Source	Measure
Outcome	BRFSS/National database	Health Behavior/Chronic Disease
Independent	BRFSS/National database	Age (13 groups)
		Sex (male, female)
		Race/Ethnicity (8 categories)
	ACS	County level – Percent population <150% FPL
		Tract level – Percent population <150% FPL
	Census 2010	Block level population (for each of the 208 combinations)

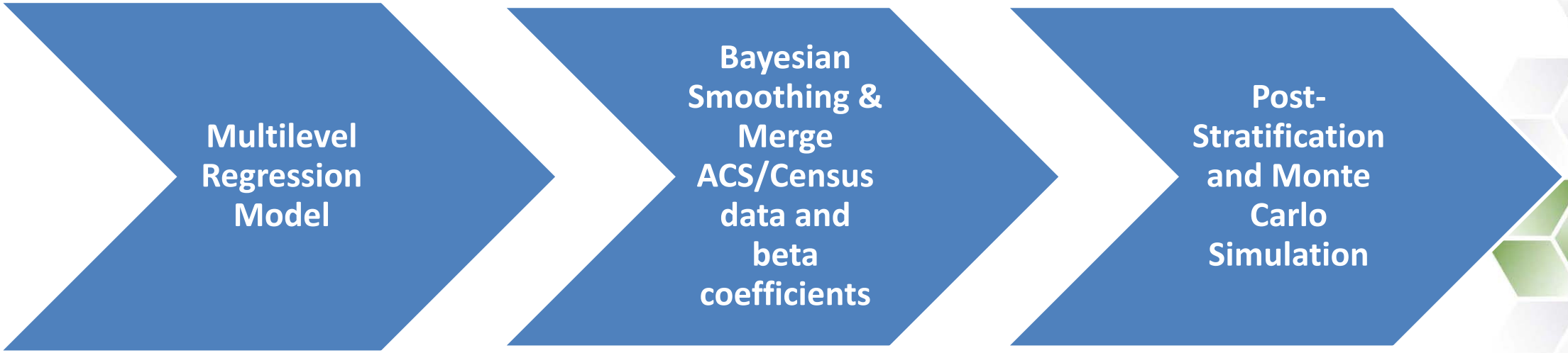
Zhang et al., Am J Epidemiol. 2014;179: 1025–1033

Small Area Estimation - Measures

Age	Sex	Race/Ethnicity	Poverty	County	State
18-24	Male	NH, White	County level <150% FPL	Sampled	Sampled
25-29	Female	NH, Black	Census Tract <150% FPL		
30-34		American Indian/Alaska Native			
35-39		Asian			
40-44		Native Hawaiian /Pacific Islander			
45-49		Other, Single Race			
50-54		Two or More Races			
55-59		Hispanic			
60-64					
65-69					
70-74					
75-79					
80+					

Zhang et al., Am J Epidemiol. 2014;179: 1025–1033

Small Area Estimation - Methodology



Zhang et al., Am J Epidemiol. 2014;179: 1025–1033

Small Area Estimation - Methodology

First Step

- Multilevel logistic regression models for each outcome - 13 categories of age, sex, 8 groups race/ethnicity and county level poverty (<150% FPL)
- Used SAS Proc GLIMMIX
- Fixed effects for age, sex, race/ethnicity and county level poverty
- County and state random effects

Zhang et al., Am J Epidemiol. 2014;179: 1025–1033

Equation

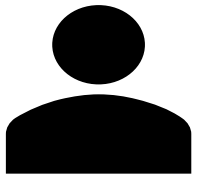
$$
\begin{aligned}
P^{b}_{ijkcs}(y_{ijkcs} &= 1) \\
&= \text{logit}^{-1}(\alpha_i + \beta_j + \gamma_k + x_b'\eta + \mu_c + \nu_s) \\
&= \frac{\exp(\alpha_i + \beta_j + \gamma_k + x_b'\eta + \mu_c + \nu_s)}{1 + \exp(\alpha_i + \beta_j + \gamma_k + x_b'\eta + \mu_c + \nu_s)}
\end{aligned}
$$

Level

State s

County c

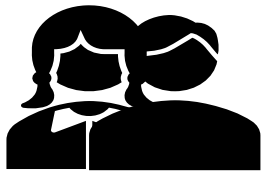
Person



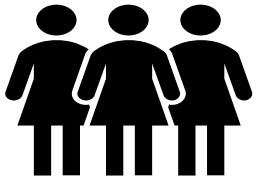
Measure

Poverty b

Age i



Gender j



Race/Ethnicity k

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Zhang et al., Am J Epidemiol. 2014;179: 1025–1033

Small Area Estimation - Methodology

Second Step

- Bayesian Spatial Smoothing with adjacent county random effects for counties not sampled in BRFSS
- Merged this dataset with census tract level poverty (<150% FPL) and Census block level population for each of the 208 age, sex and race combinations

Third Step

- Solved the regression equation
- Post-stratification with census demographics
- Monte Carlo simulations (1000) Model-based

Validated against survey-based estimates (correlations)

Zhang et al., Am J Epidemiol. 2014;179: 1025–1033

Small Area Estimation - Purpose

- public health prevention program planning
- resource allocation
- health policy formulation
- health care decision-making and delivery

Small Area Estimation - Limitations

- Geographic context – is critical to evaluate the relationship between the health outcomes and demographic characteristics
- Area-level poverty indicator used and not the individual-level poverty
- Different independent variables may need to be included in the multilevel models to estimate different health outcomes
- Cannot track trends
- Cannot evaluate the effectiveness of intervention unless intervention variables included in the source survey

References

- Zhang, X, Holt, J B, Lu, H, Wheaton, A G, Ford, E S, Greenlund, K J and Croft, J B. Multilevel regression and poststratification for small-area estimation of population health outcomes: a case study of chronic obstructive pulmonary disease prevalence using the behavioral risk factor surveillance system. Am J Epidemiol. 2014;179: 1025–1033. DOI: https://doi.org/10.1093/aje/kwu018
- Lehtonen R, Veijanen A. Design-based methods of estimation for domains and small areas. InHandbook of statistics 2009 Jan 1 (Vol. 29, pp. 219-249). Elsevier.
- Wang Y, Holt JB, Xu F, Zhang X, Dooley DP, Lu H, et al. Using 3 Health Surveys to Compare Multilevel Models for Small Area Estimation for Chronic Diseases and Health Behaviors. Prev Chronic Dis 2018; 15:180313. DOI: https://doi.org/10.5888/pcd15.180313.
- Berkowitz Z, Zhang X, Richards TB, Sabatino SA, Peipins LA, Holt J, White MC. Multilevel regression for small-area estimation of mammography use in the United States, 2014. Cancer Epidemiology and Prevention Biomarkers. 2019 Jan 1;28(1):32-40.

About HealthLandscape

- HealthLandscape develops, administers, and markets geospatial analysis software tools and professional services
- HealthLandscape is a division of the American Academy of Family Physicians (AAFP)
- HealthLandscape is an interdisciplinary, closely-knit team with extensive experience in GIS applications relating to health centers and primary care

About the Community Vital Signs Application Suite

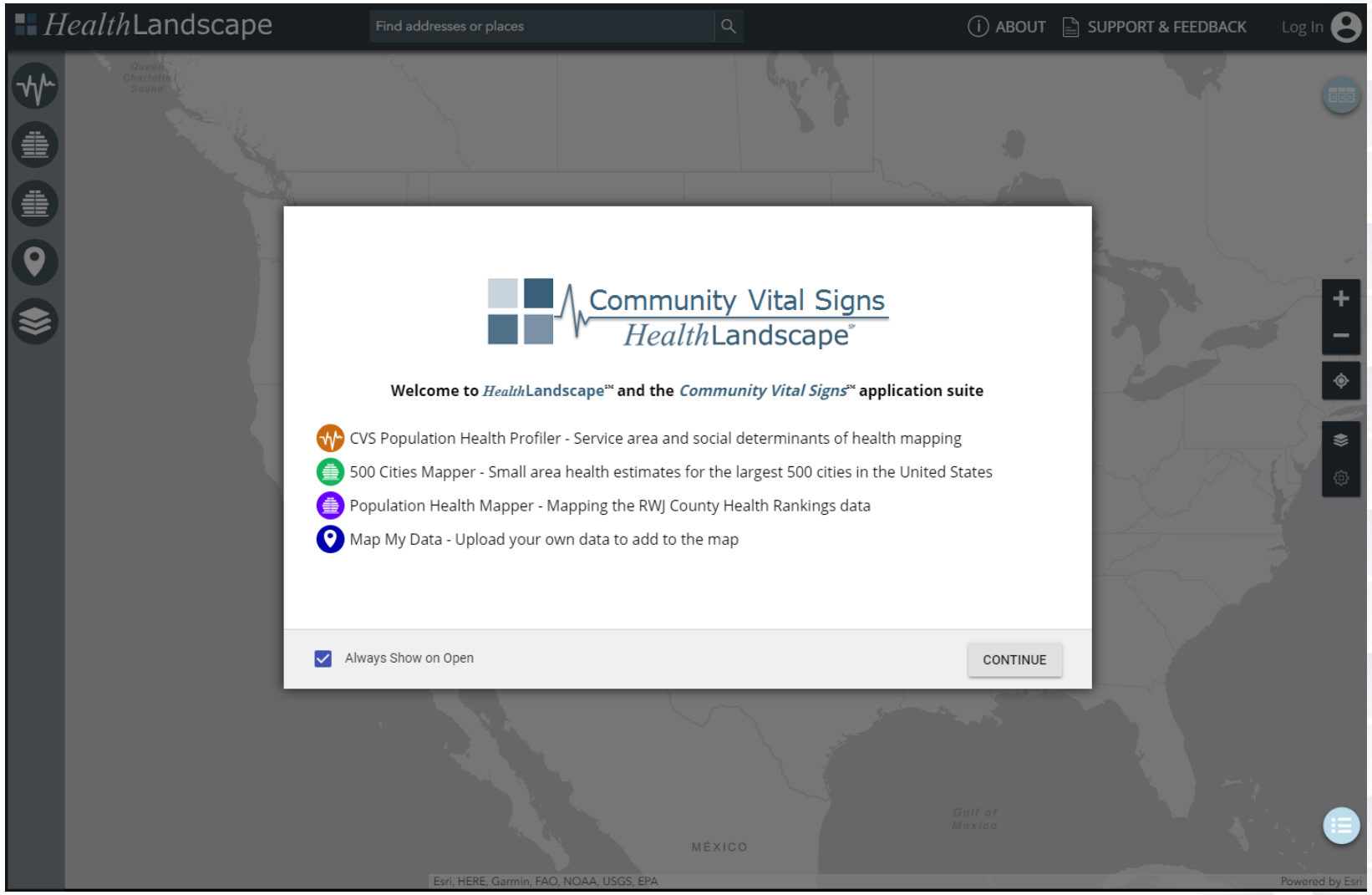
- While the research value of appending community characteristics to the clinical record is well established in academic literature, it's equally important to be able to summarize this information in a practical and actionable way that can be integrated into clinical practice
- The Community Vital Signs℠ application suite aligns with HealthLandscape's goal of advancing the science of integrating social determinants of health (SDoH) into clinical practice
- **This Population Health Profiler, part of the Community Vital Signs℠ application suite, is designed to demonstrate the ease of using SDoH for health and well-being**

CVS Population Health Profiler Overview

Access via the HealthLandscape website:

https://www.healthlandscape.org/PopHealthProfiler/

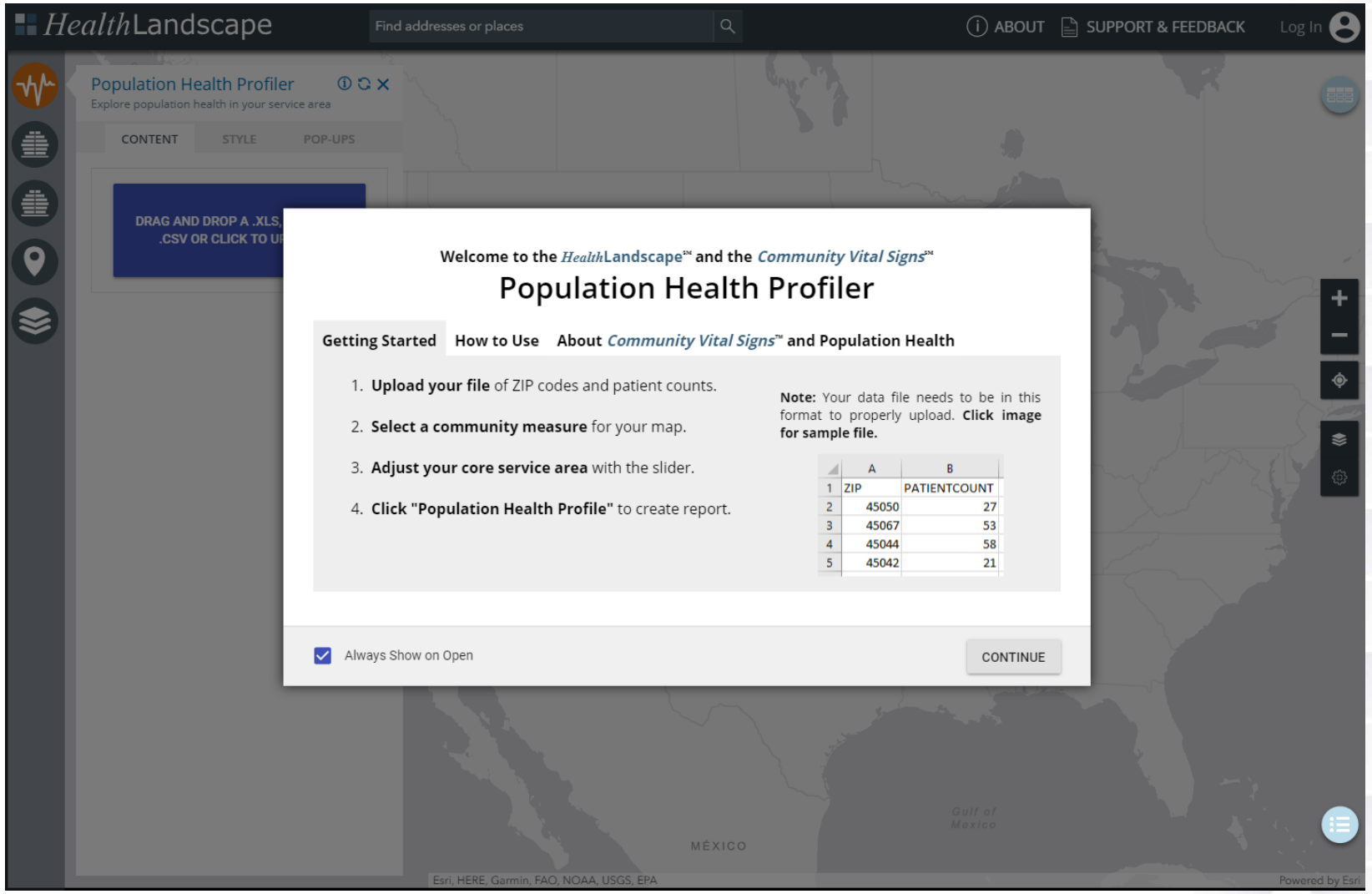
- The welcome screen lists all the tools available on the site



CVS Population Health Profiler Welcome Screen

When you open the tool, a welcome screen appears and includes

- Getting started instructions
- Downloadable sample data
- Detailed “How to Use” instructions
- Background information



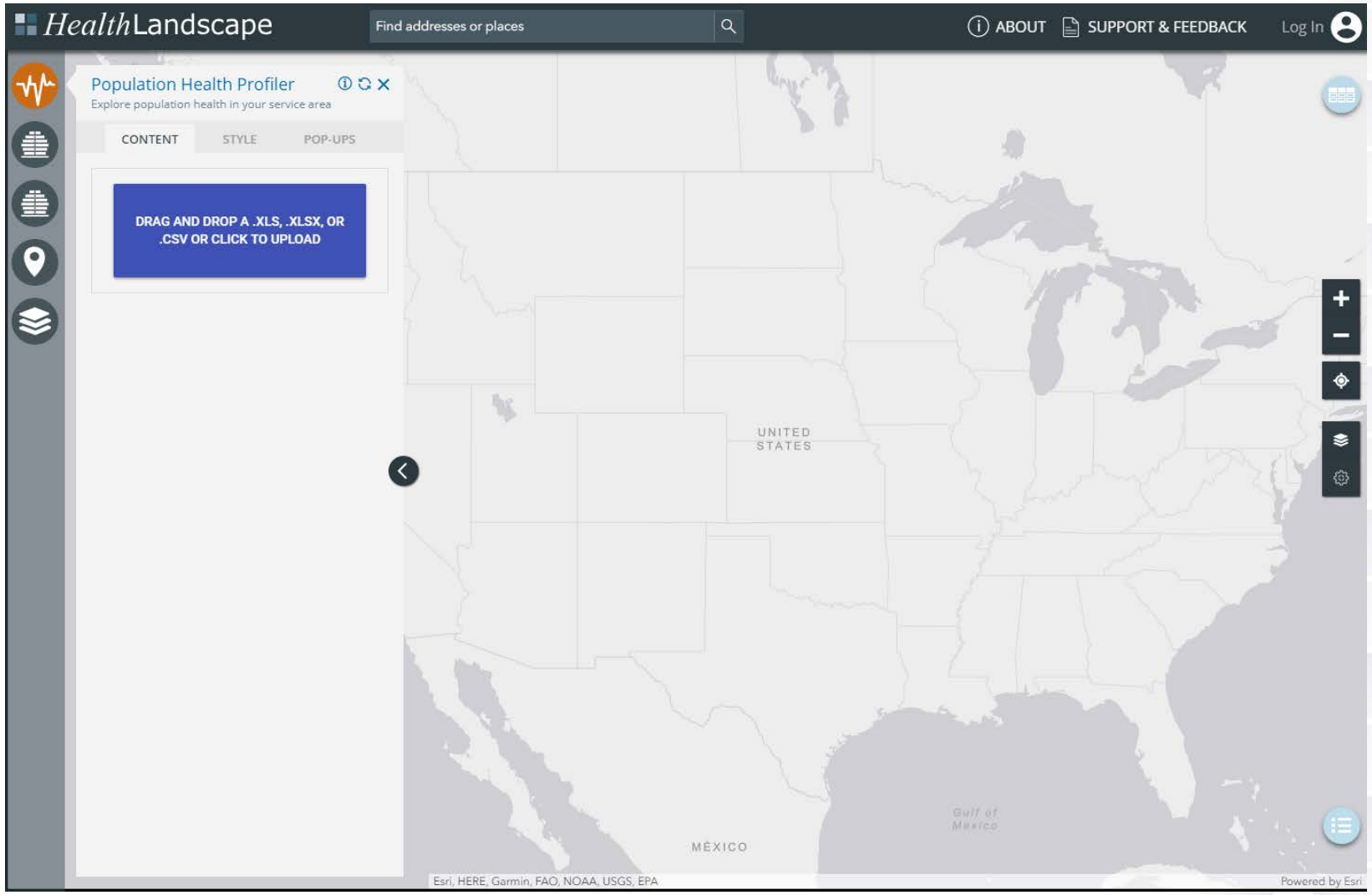
Upload Your Data

	A	B	C
1	ZIP	PATIENTCOUNT	
2	45002	78	
3	45011	666	
4	45013	456	
5	45014	307	
6	45015	162	
7	45030	113	
8	45039	15	
9	45040	32	
10	45044	702	
11	45050	31	
12	45052	14	
13	45069	90	
14	45102	327	
15	45103	480	
16	45241	74	

- Upload patient counts by ZIP Code using file as shown
- CVS Population Health Profiler will convert data to ZIP Code Tabulation Area (ZCTA) and display a service area based on user data
- Dataset must include at least two columns, left-most in the spreadsheet, titled ZIP and PatientCount
  - Column headers should not have spaces
  - If there are other columns, those data will be ignored

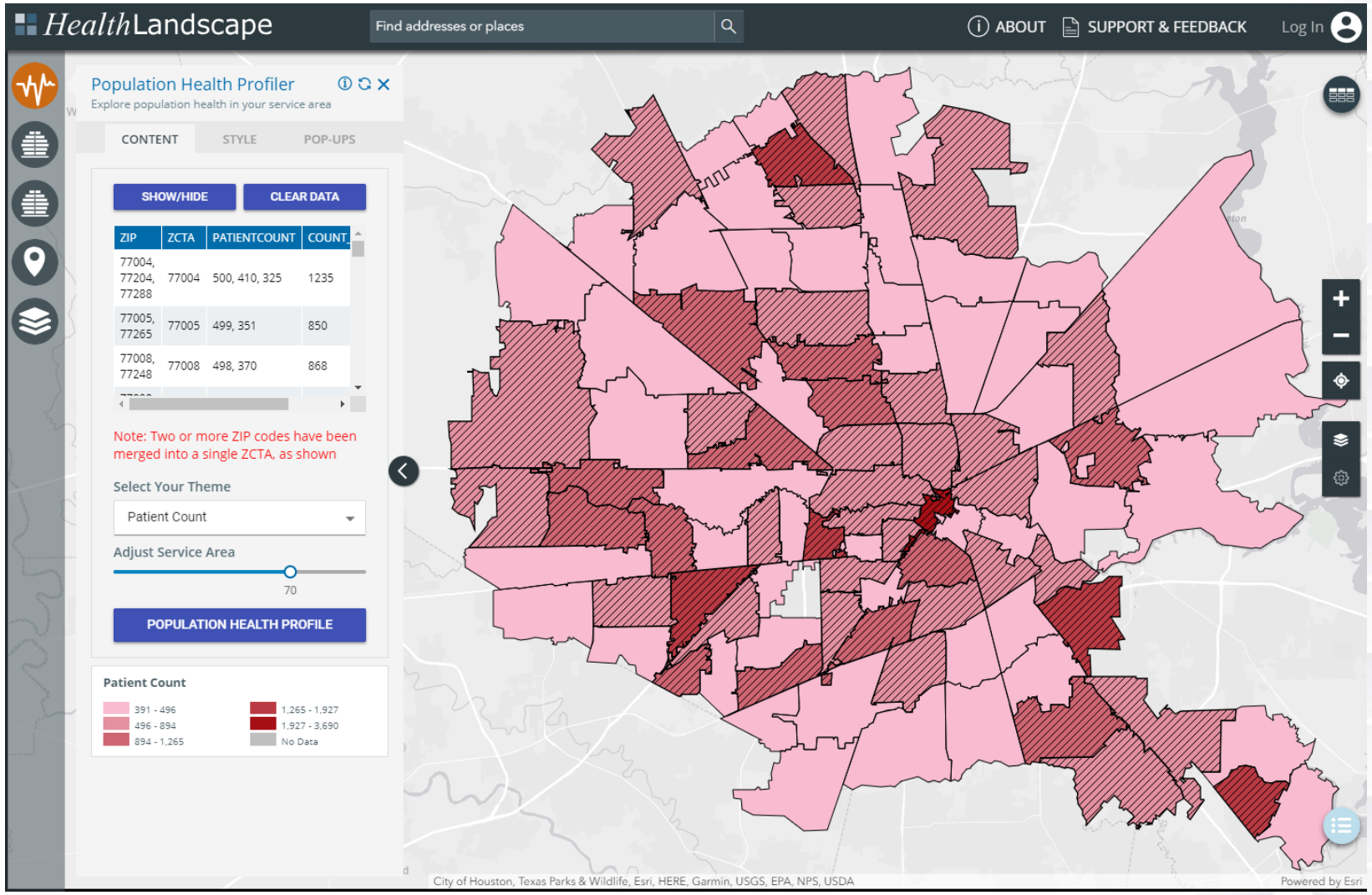
Upload File

Drag and drop or browse to select your dataset



View Data

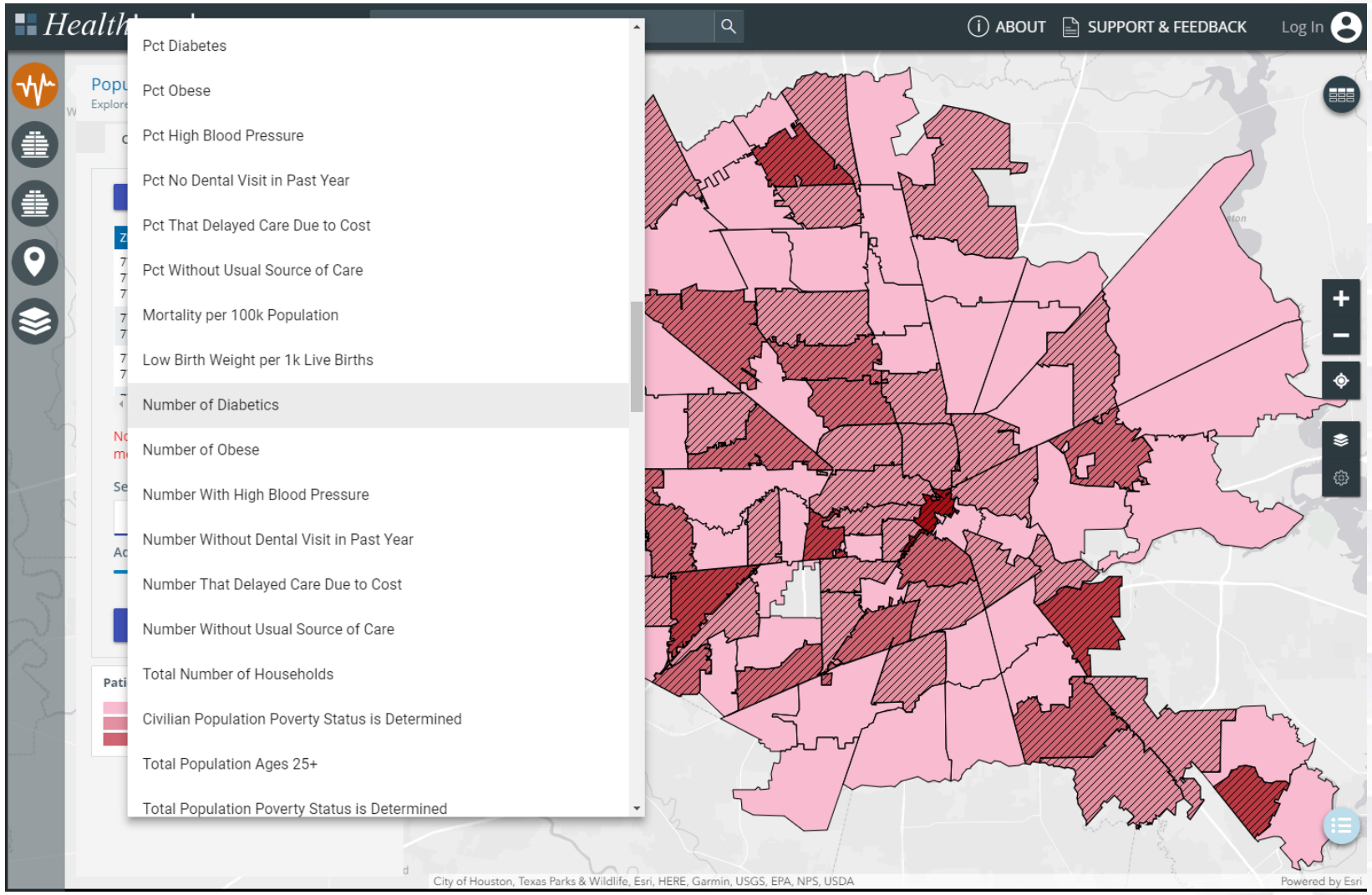
- The ZIP Codes have been converted to ZCTAs
  - A ZCTA with fewer than 10 patients will NOT be shown
  - ZIP without a direct ZCTA match will be collapsed into the ZCTA that best matches the ZIP Code location
- Data table will be displayed
- Map will zoom to area and service area will be displayed
- ZCTAs with any pink/red color are within the entire service area (100%)
- ZCTAs with diagonal lines comprise the core service area (70%)
- By default, pink/red represent patient count in each ZCTA



Change Theme

- Theme refers to the data layer that is initially colored pink/red

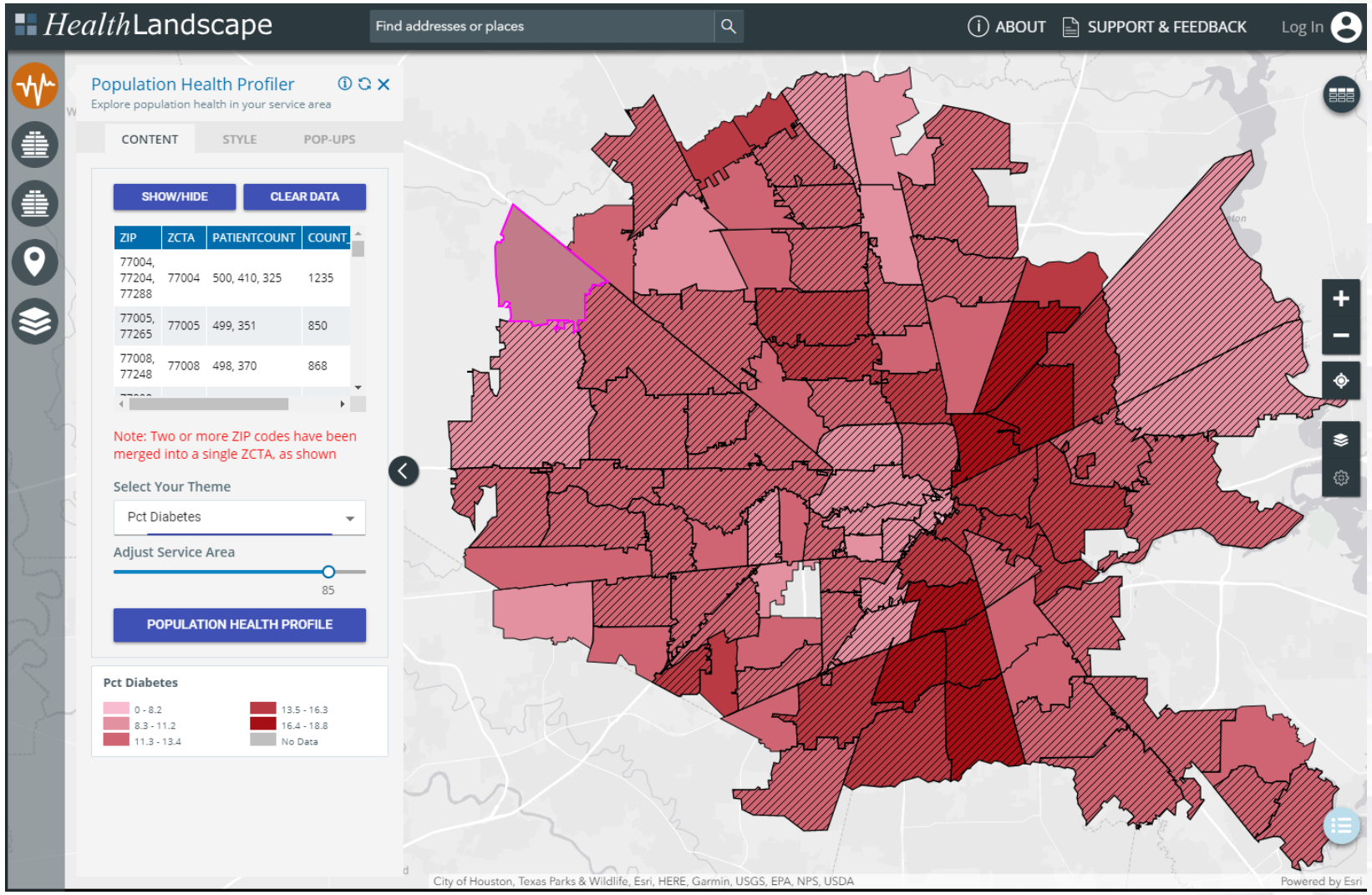
- Click the down arrow in the **Select Your Theme** box to view social determinants of health or other data for your patient service area



Adjust Service Area

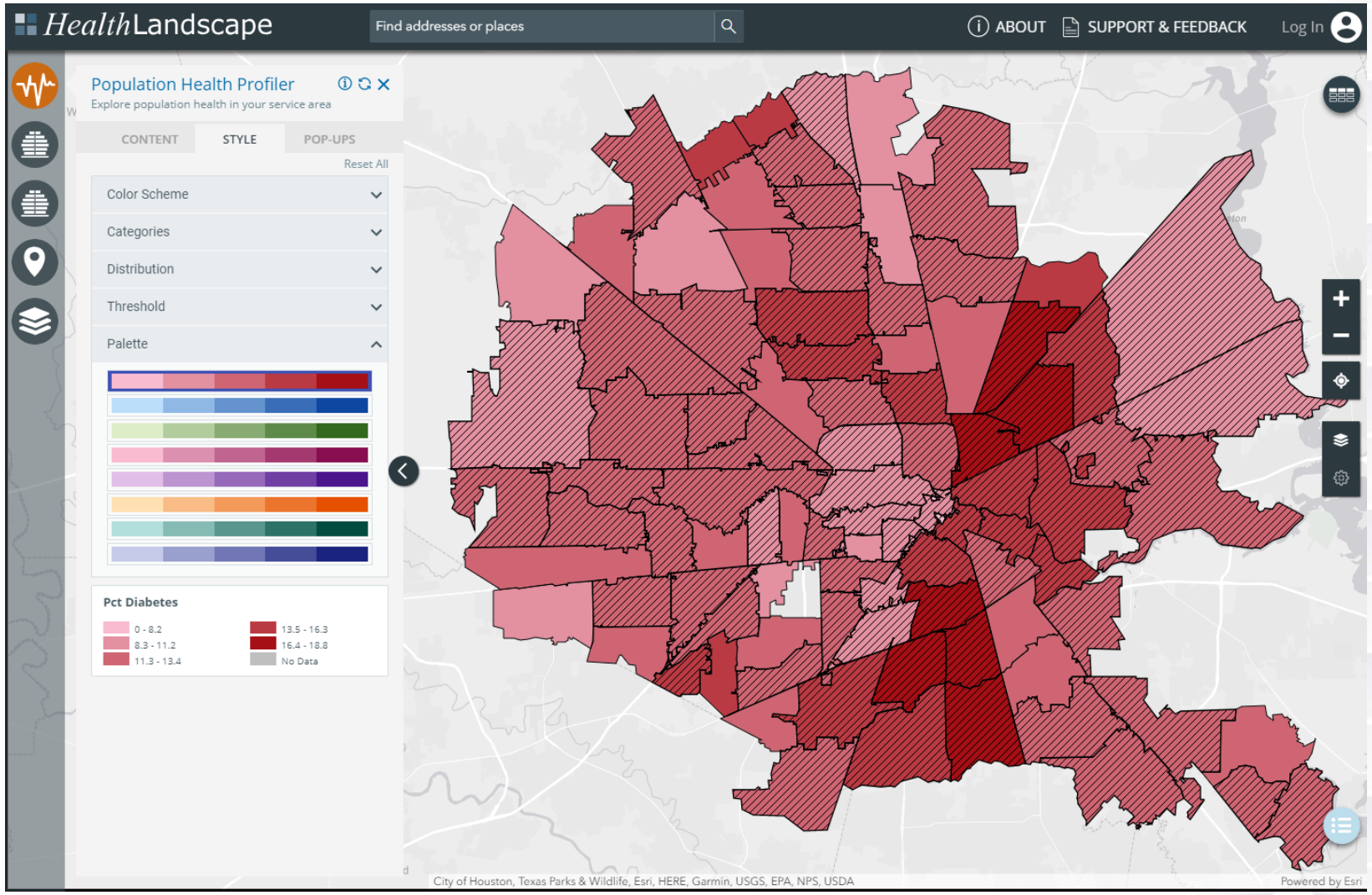
- Service area is initially based on a 70% core calculation
  - All ZCTAs are ranked based on number of patients
  - ZCTAs are added to the service area starting at the top of the list with the ZCTA that has the most patients
  - ZCTAs are then added until 70% of patients are accounted for

- Use the slider to adjust service area size



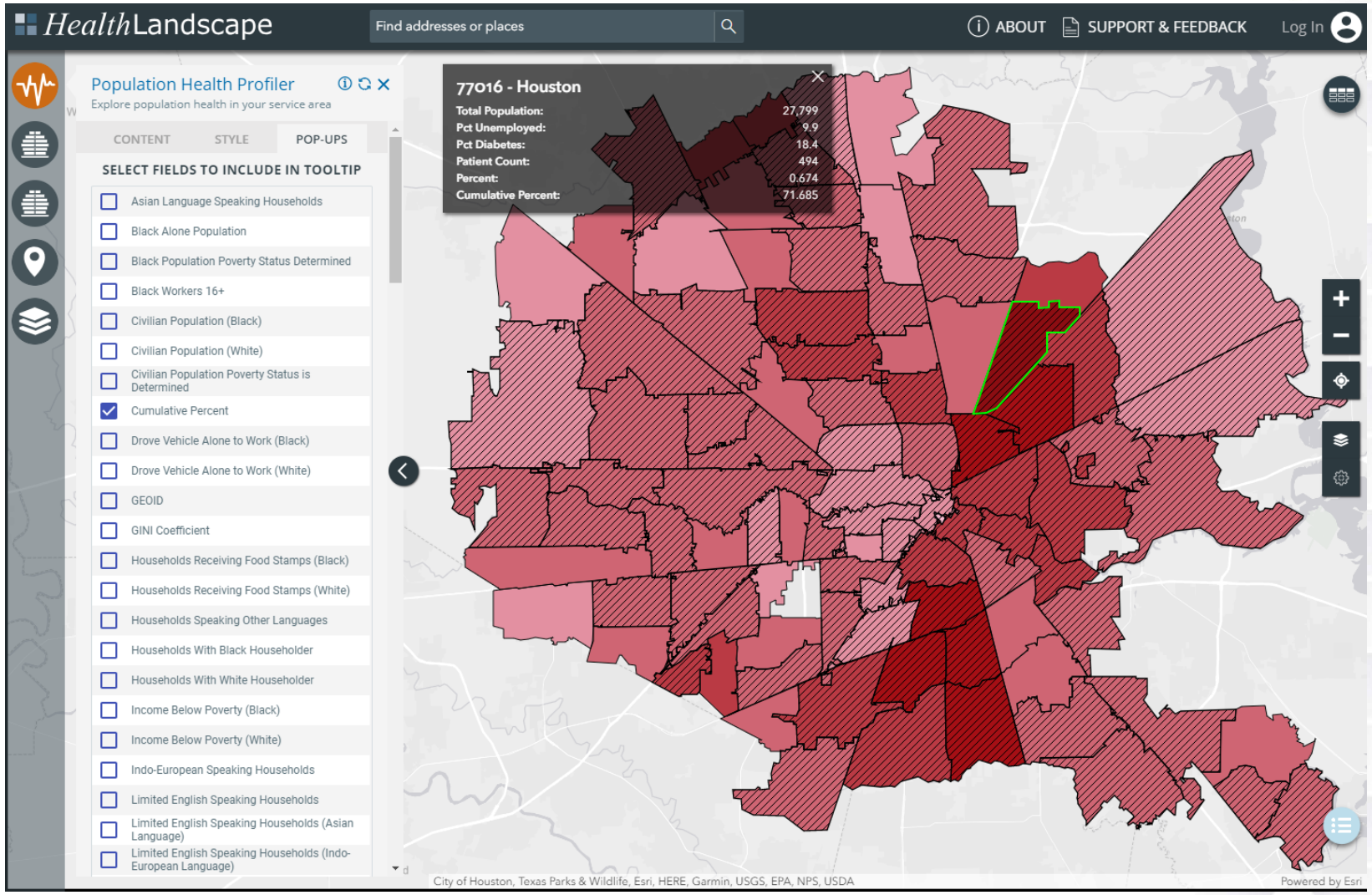
Change the Way the Map Looks

- The **Style** tab options allow you to change the way the data are displayed and include
  - Color Scheme - change based on the type of data (default is quantitative)
  - Categories - change the number of data breaks (default is 5)
  - Distribution - change how the data are broken into categories (default is natural breaks)
  - Threshold - remove ZCTAs from the map based on upper or lower limits of the dataset (default is entire dataset)
  - Palette - change the colors on the map (default is pink/red)
- Changes are reflected on the map and in the key in the lower portion of the tool



Tooltips

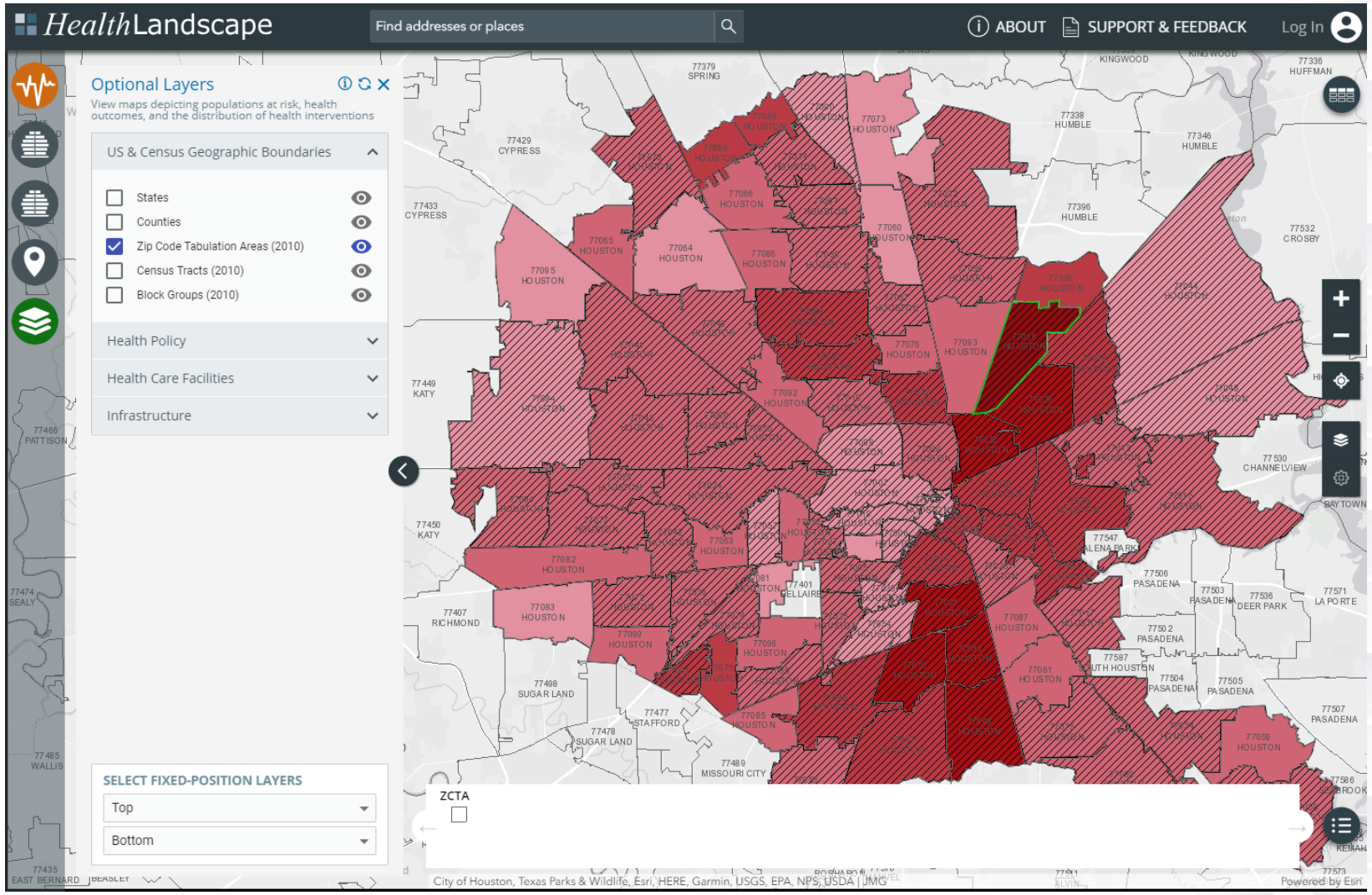
- Click on a ZCTA to see a box, or tooltip, with information about the ZCTA
- Click on the **Pop-Ups** tab to specify the information that appears in the tooltip



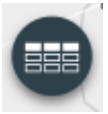
Optional Layers

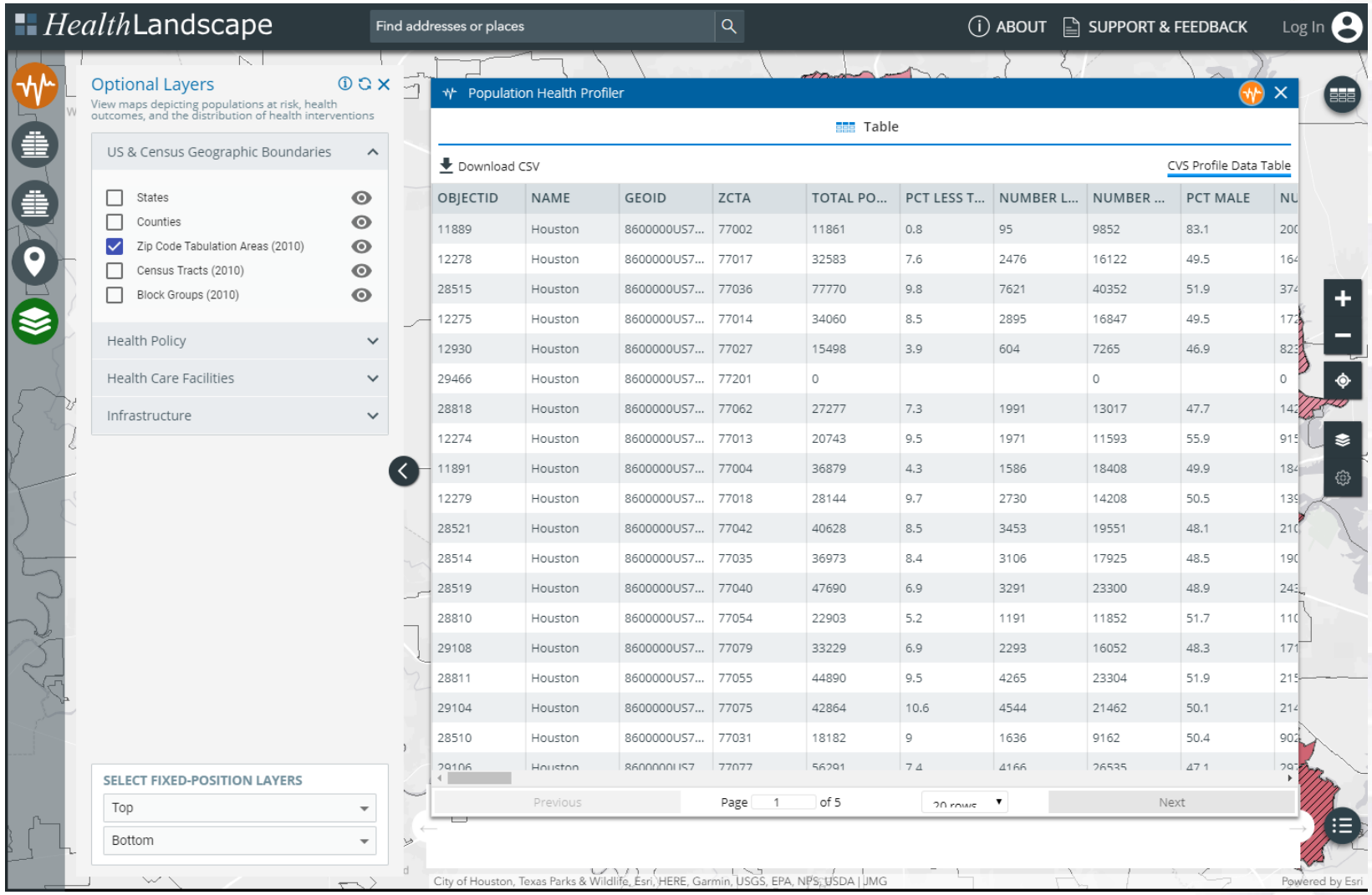
- Click on the bottom icon (looks like a stack of cards) to add other layers to the map 
    - Options include ZIP Code Tabulation Areas, other boundaries, and other health facilities

- Click the eye icon  to add labels to any layer



Data Table

- All available data can be downloaded in table form
- To access the file, click the round button in the upper right corner of the map 
- Then, click the word **Table** near the top of the pop-up box
- When data table appears, click **Download CSV** in the upper left of the table to download the data



Population Health Profile

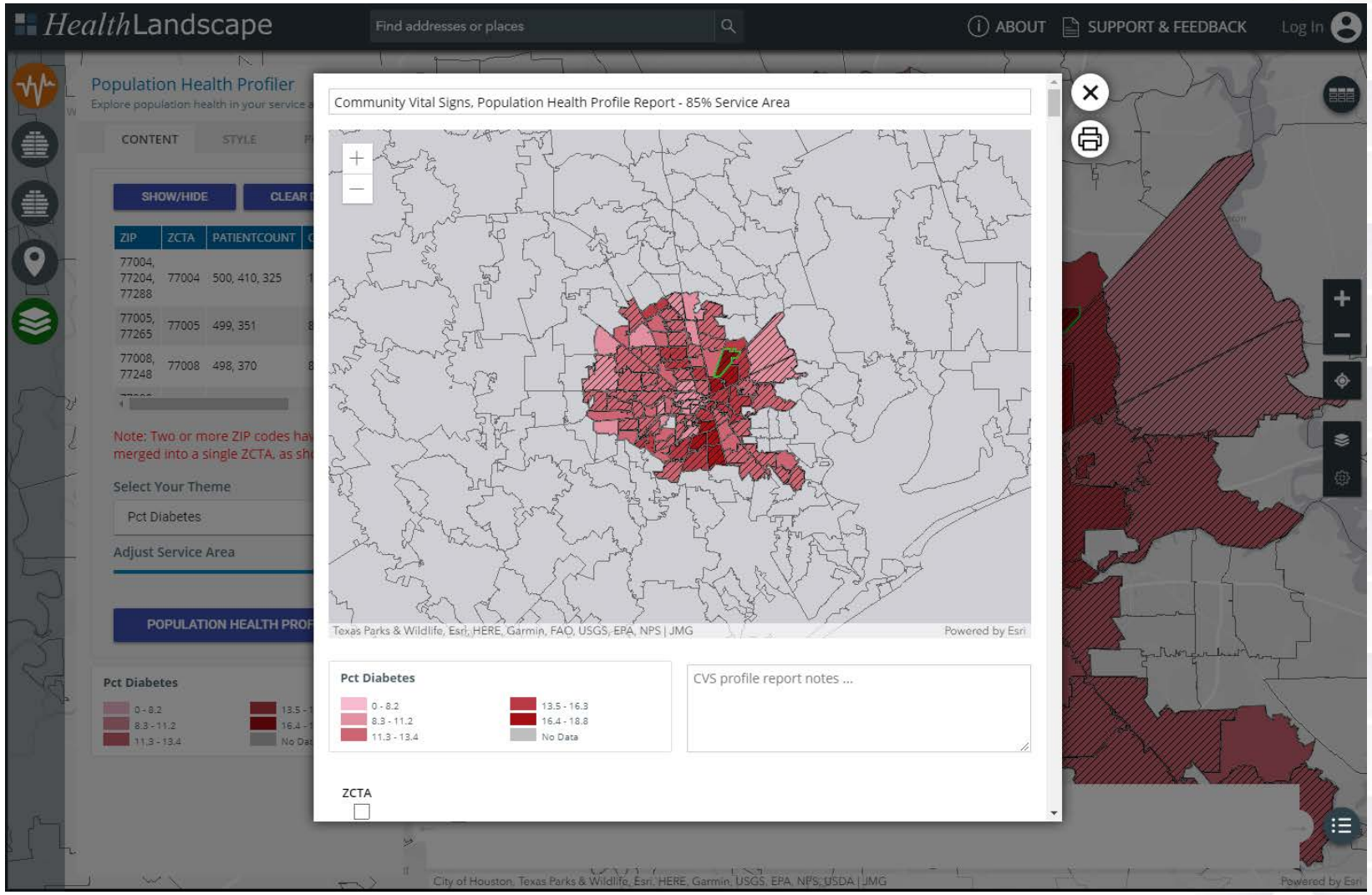
- Click the blue **Create Population Health Profile** button on the left of the map to print the map and data table

  POPULATION HEALTH PROFILE

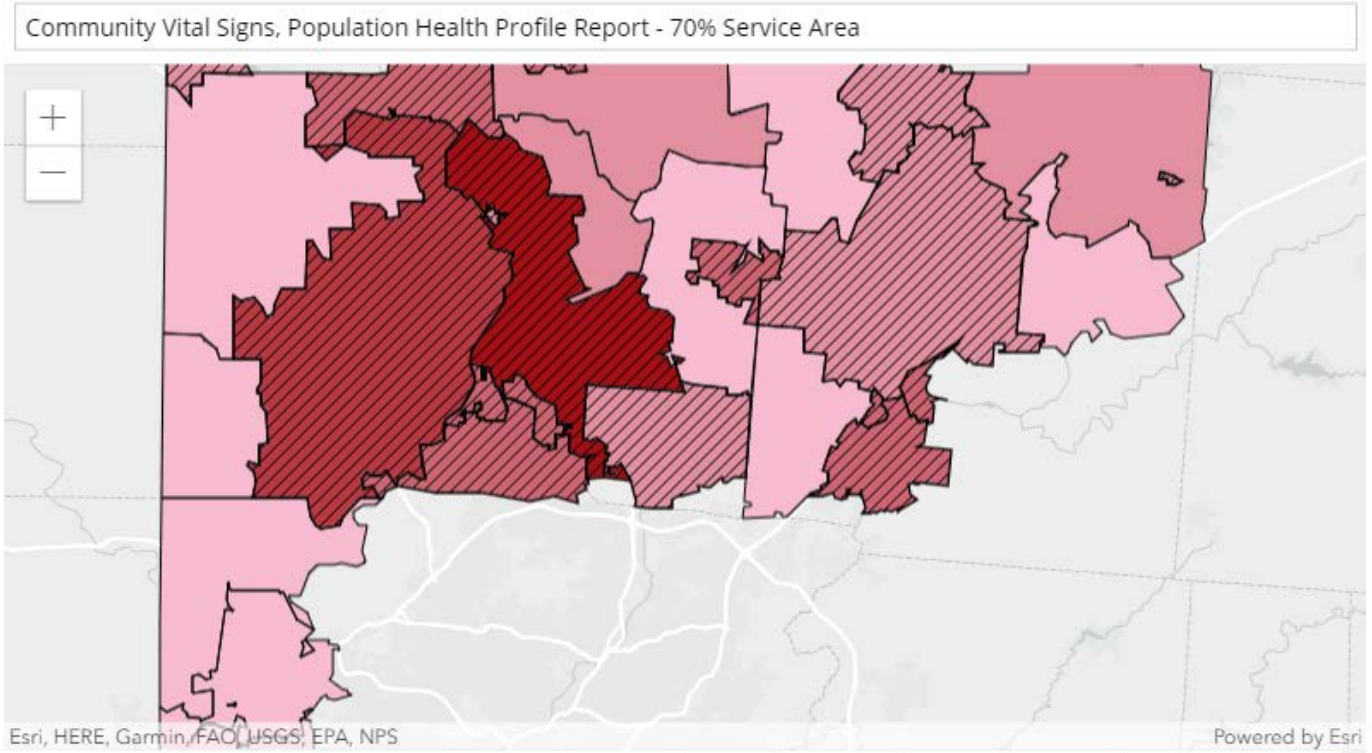
- Edit the title in the map header, if desired

- Add notes below the map, if desired

- Click the printer icon to export a community profile PDF



Population Health Profile



ZCTA	Pct with Diabetes	Pct Obese	Pct with High Blood Pressure	Pct no Dental Visit Past Year	Pct Delayed Care Due to Cost Past Year	Pct Without Usual Source of Care	Pct Un-insured	Mortality per 100k Pop	Low Birth Weight Rate
Service Area Summary:	9.08%	32.82%	33.86%	28.56%	10.89%	19.13%	6.91%	n/a	n/a
45011 - Hamilton	8.9%	34.8%	33.2%	30.4%	12.0%	21.4%	8.4%	811.3	8.2
45013 - Hamilton	9.3%	33.2%	35.5%	28.4%	10.3%	18.6%	6.7%	852.1	7.9
45015 - Hamilton	8.8%	34.9%	32.8%	31.9%	12.8%	22.3%	10.7%	825.4	8.1
45064 - Somerville	10.8%	33.5%	38.3%	35.2%	11.9%	19.0%	3.1%	843.7	7.5
45050									

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Questions or Comments?

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- www.HealthLandscape.org/PopHealthProfiler