

Arizona Partnership for Healthy Communities

The Arizona Healthy Communities Opportunities Index

Determining at-need zip codes through analysis
of public health, transportation, housing, and
socioeconomic indicators

Paul Minnick

2016

Executive Summary

Research increasingly demonstrates that where we live has a profound impact on our health, or to put it succinctly: “our zip code is more important to our health than our genetic code.” A recent study of life expectancies in the Phoenix Metropolitan Area showed a difference of as many as 14 years in life expectancy¹ for zip codes that are only about a fifteen-minute car ride apart.

So why are there such large differences in life expectancy just miles apart within the city? The disparities in life expectancy are due to not only genetics, but also other factors including social circumstances, physical environment, access to medical care, and behavioral choices. These inequities between neighborhoods can manifest themselves in various ways such as residents’ access to healthy food, transportation options, affordable housing, and socioeconomic and demographic dynamics.

Nonprofits, individuals, government agencies, and the private sector in Arizona have all led numerous efforts to improve community health. While many of these efforts have been successful and resulted in positive changes, they usually have only involved a single sector. Since health is impacted by a number of factors, integrated, multi-sector work is a better approach to significantly reducing health disparities across the state.

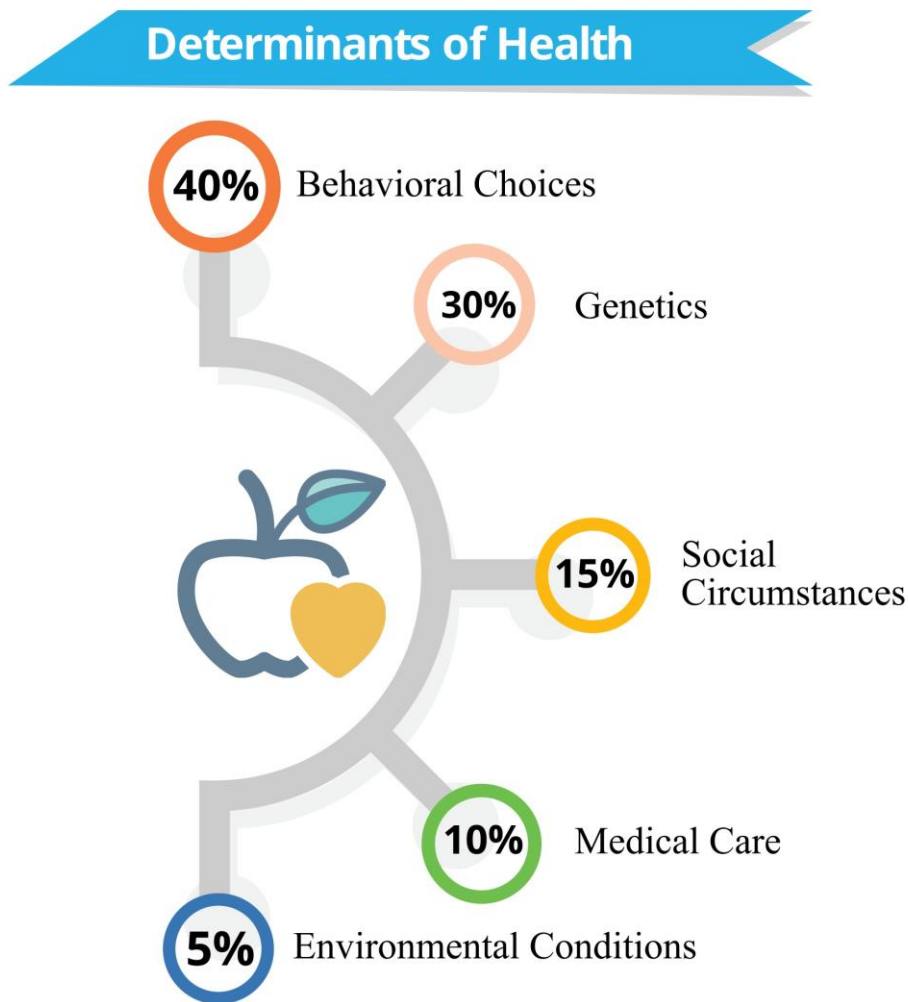
The Arizona Healthy Communities Opportunities Index (Index) was created to provide a fuller picture of the health disparities across the State of Arizona and to identify areas of opportunity for healthy communities projects. Using existing research, the Index ranks every zip code in Arizona based on 15 different health indicators. The Index goes deeper than just looking at the differences in life expectancy among zip codes in Arizona. It considers not only public health, but also examines key determinants of health including housing, transportation, and socioeconomic factors.

The Index ranks the 403 zip codes in all 15 counties of Arizona for which data is available. Fifteen variables are assessed across four categories related to the determinants of health. In addition to ranking the zip codes, the Index provides maps of the rankings for the State of Arizona, Phoenix Metropolitan Area, and Tucson Metropolitan Area. The maps allow users to gain a high-level visual representation of the areas of most opportunity to improve health.

Introduction

Research increasingly shows that our zip code is more important to our health than our genetic code. A recent study of ten U.S. cities aimed to underscore the connection between neighborhood conditions and health, and showed an average difference of almost 13 years in life expectancy within each city.² These varied outcomes are substantially attributed to more than disparities in medical care and genetics; in fact, social circumstances, environmental conditions, and behavioral choices make up around seventy percent of the influences that determine one's health.³ **Figure I** provides a breakdown of the five leading determinants of health.

(Figure I)⁴



(McGinnis, Williams-Russo, & Knickman, 2002)

Gaps in health stem from multiple factors and sharp contrasts between neighborhoods, including:⁵

- Proximity to highways, factories, or other sources of toxic agents
- Unaffordable, unsafe, and unhealthy housing with restricted access to nutritious food
- Limited opportunities for residents to exercise, walk, or cycle
- Inadequate, unreliable, or expensive public transit, which can isolate residents
- Limited access to primary care doctors and good hospitals
- Residential segregation and features that isolate communities such as highways
- Insufficient education and poverty rates, which are directly linked to health

It is this broad range of factors that affect health, making it imperative that multi-sector partnerships are forged in an effort to reduce health disparities. The implementation of multi-sector collaboration and projects has proven effective in improving health and reducing health disparities among lower-income and underserved citizens. Multi-level and multi-sector collaborations that address education, urban design, community characteristics, access to physical activity facilities, and policies regarding food have led to significant improvements in Body Mass Index, blood pressure, and academic scores among low-income Hispanic and White children, in particular.⁶ Additionally, by engaging diverse stakeholders in the resolution of entrenched community problems, partnerships are likely to see increases in their social capital, knowledge and awareness, opportunities and impact, and resource acquisition, which leads to greater success than those working independently.⁷

Purpose

The Arizona Healthy Communities Opportunities Index (Index) is designed to provide a snapshot of what need looks like at the zip code level. The following maps and report aim to provide Arizona communities with a high-level overview of the health-related conditions that exist within them. Where we live, learn, work and play has a greater impact on how long and how well we live than our individual behaviors or our health care. The Index, therefore, focuses on the conditions present in different communities and is intended to help local communities understand factors that influence health, including transportation, housing, public health, and socioeconomic factors.

The Index is the brainchild of the Arizona Partnership for Healthy Communities (Partnership). The Partnership's vision is an Arizona where all communities are healthy places to live. A group of Arizona-based nonprofits, foundations, businesses and government agencies created the Partnership in 2014 to foster and support collaborative projects that make Arizona healthier by design. The Index aims to assist

the Partnership in its efforts to identify areas of opportunity for healthy community projects.

Construction of the Index

The Index was constructed in four steps: I. Selecting the Indicators, II. Collecting the Data, III. Normalizing the Data, and IV. Mapping the Final Scores.

A detailed methodology for collecting the data, normalizing the data, mapping the final scores, and data notes and limitations can be found in **Appendix I**.

I. Selecting the Indicators

The indicators were chosen based on the factors associated with determinants of health such as transportation, housing, public health, and socioeconomics. Fifteen indicators were chosen and then divided into four dimensions: transportation, housing and neighborhoods, access to health care, and demographics and socioeconomics.

Figure II provides a full list of the dimensions and indicators included in the Index.

Determinants of Health

The first step in the creation of the Index was to research the determinants of health in an effort to best select the indicators for the project. The basis for the selections was guided by various forms of expert knowledge in the field of health. The selection of indicators involved an extensive study of journals, foundations, and government entities, including (but not limited to): the American Journal of Preventive Medicine, the Robert Wood Johnson Foundation, and U.S. Department of Agriculture. The determinants selected were: transportation, housing and neighborhoods, access to health care, and demographics and socioeconomics. The following section offers a basis for their selection.

Transportation

Communities that include transportation options such as walking, biking, and the use of transit tend to have residents that have lower body weights, are more physically active, have lower rates of traffic injuries, and produce less air pollution. Currently, over one-third of the United States is obese with an overall age-adjusted obesity prevalence of 35.7%⁸, which is significantly associated with diabetes, high blood pressure, high cholesterol, asthma, arthritis, and poor health status.⁹ The United States' auto-dependence is a contributing factor to the high rates of obesity. Presently, the federal government spends 80 percent of its transportation funding on building highways and improving road infrastructures, which means that funding for active, healthier transportation options (such as public transit, walking, and biking) is limited.¹⁰ Public

transit users are inherently more active than automobile users as they walk an average of 19 minutes getting to and from public transportation; about 30% of transit users get 30 minutes of physical activity a day.¹¹ The risk of obesity increases 6 percent with every additional mile spent in the car; however, it decreases almost 5 percent with every half mile walked.¹² Finally, there are 33,804 motor vehicle traffic deaths a year nationally and significant amounts of air pollution, much of which could be avoided by opting for different transportation methods in lieu of the automobile.¹³

Housing and Neighborhoods

Housing plays a significant role in a person's physical and mental health. Major housing factors affecting health include physical conditions within the home, conditions in the neighborhood surrounding the residence, and the house's affordability. Poor housing conditions can impact health negatively in many ways; a few examples include lead and carbon monoxide poisoning, respiratory health from circulation issues, and injuries.¹⁴ Furthermore, the location of housing can be just as important to the inhabitants' health as the condition of the home. The physical characteristics of the neighborhood where a home is located can promote health by providing: safe places for children to play and for adults to exercise that are free from crime, violence, and pollution; access to stores selling fresh produce; employment opportunities; and public resources. Households paying more than 30 percent of their income on monthly housing costs, including rent, mortgage payments, utilities, and taxes are considered to be housing cost burdened, which can negatively affect health. Low-income families with housing cost burdens have much less money to spend on healthy food, health care, transportation, and other necessities that influence health.¹⁵ The ability to access affordable, nutritious foods plays a large role in determining the health of those below the poverty line. People living below the poverty line are nearly twice as likely to live more than 1 mile from a supermarket, or what is commonly known as a "food desert," than the rate of all U.S. households.¹⁶

Access to Health Care

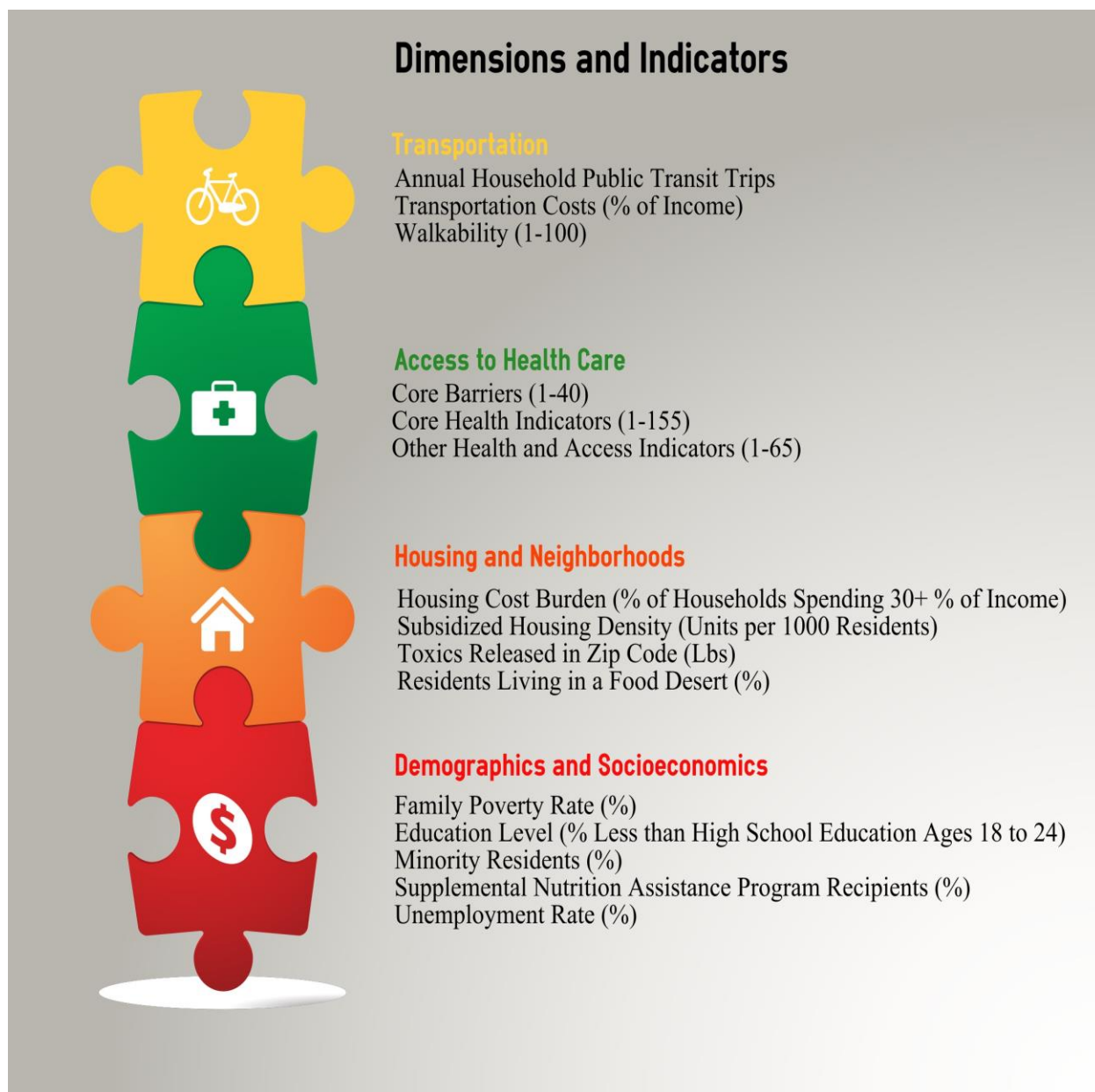
Barriers that reduce access to health care – including being uninsured, a lack of physicians, and being linguistically isolated – can have deleterious consequences on one's health. First, and probably the biggest barrier to receiving health services, is an individual's lack of health insurance. The uninsured report higher rates of having no usual source of health care, postponing or going without care due to cost, and not being able to afford prescription drugs.¹⁷ Those who are insured may also face a lack of access to healthcare due to a lack of physicians in relation to the population. Projections suggest a shortfall of as many as 90,400 physicians, including a shortage of 12,500 to 31,100 primary care doctors and a deficit of as many as 63,700 non-primary care physicians nationally.¹⁸ Finally, being a linguistically isolated household, which is

defined as one in which all members 14 years old and over have at least some difficulty with English, can lead to insufficient health data. The proportion of linguistically isolated households who participate in major health surveys is often lower than the percentage for the overall U.S., and thus the health risks and health problems that they face may be inadequately described.¹⁹

Demographics and Socioeconomics

Demographic and socioeconomic influences such as education level, race, poverty level, and employment have a significant effect on one's health. The lack of an adequate education can seriously influence the longevity of a person's life. College graduates, on average, live more than five years longer than those who have not graduated from high school. An additional four years of schooling leads to lower rates of diabetes, heart disease, smoking, and being overweight.²⁰ Next, racial minorities are more likely to live in areas that expose them to many harmful conditions. Blacks and Hispanics are more likely to live in regions that have more serious problems with particle pollution, and Blacks are also more likely to live in districts with worse ozone pollution.²¹ Finally, employment or lack thereof plays a significant role in many factors regarding health. Stable employment enables individuals to provide their families with more nutritious foods, obtain quality child care, reduce stress, and afford to live in healthier homes and neighborhoods.²²

(Figure II)



Appendix II provides a full list of the indicator's definitions and sources.

II. Collecting the Data

Data was collected from official statistics from a variety of sources, including, but not limited to: the U.S. Census Bureau, the U.S. Department of Agriculture, the U.S. Department of Housing and Urban Development, and the Arizona Department of Health Services. Out of a total of 403 zip codes, 89 zip codes are excluded from the Index due

to missing data for any one indicator. **Appendix II** provides a complete list of the data definitions and sources for all fifteen indicators.

III. Normalizing the Data

Data for the indicators used in the Index comes in many different forms, including percentages, rates, pounds, and ratios. To combine the indicators into the Index, they must be normalized in order to weight the data equally. Normalization allows values measured on different scales to all be expressed in a common form. In this case, the data was normalized so that it provides each zip code with a number from 0 to 100 for each of the 15 indicators, where 0 represents very low need, and 100 represents very high need. A complete list of the scores for all of the 403 zip codes included in the Index is provided in **Appendix III**.

IV. Mapping the Final Scores

The choropleth maps for the Index were created using Environmental Systems Research Institute's (ESRI) ArcGIS software, which helps one to understand and visualize data to assist in making decisions. A choropleth map is a thematic map in which areas are shaded or patterned in proportion to the measurement of the statistical variable being displayed on the map. The Jenks optimization method, also called the Jenks natural breaks classification method, was the data clustering method used to determine the five need levels. **Appendix I** provides a detailed description of the mapping process.

Interpreting the Maps

The following maps allow users to gain a high-level visual representation of the zip codes most in need of assistance in improving public health. The five zip code needs levels, which are indicated by color for the mapping, are as follows:

- Very low need, 0-19, Yellow
- Low need, 20-32, Orange
- Moderate need, 33-46, Gold
- High need, 47-63, Light Brown
- Very high need, 64-100, Dark Brown

The legend provided on each map provides a visual illustration of these need levels, their colors, and corresponding scores.

Map Analysis

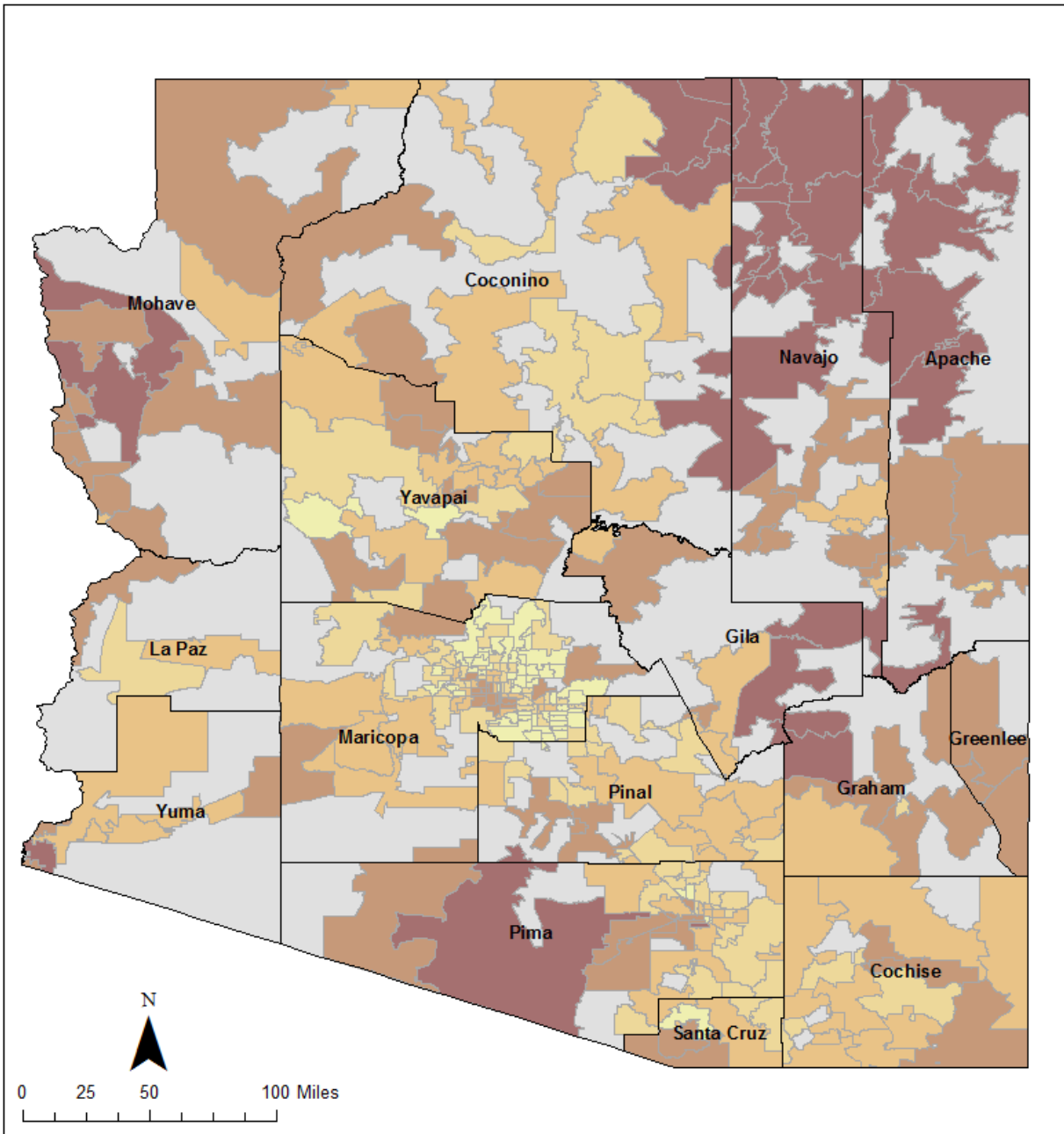
The maps of Arizona's Counties, the Phoenix Metropolitan Area, and the Tucson Metropolitan Area show some similar and different trends. There are also similarities and differences between the rural and urban areas of the state.

A look at the Arizona's Counties Map (**Map I**) shows a distinct area in need of assistance in developing healthier communities. The northeast corner of the state, which includes both Navajo and Apache counties in **Map I**, shows a large number of at-need zip codes. These counties are primarily rural communities and contain vast areas of Native American Tribal Lands and Reservations. The northern parts of both counties, which show significant portions of very-high need, are home to both the Hopi and Navajo Tribes. A look at where these counties rank in the five dimensions and the fifteen indicators shows trends including, but not limited to: a large number of vulnerable demographics, almost all residents living in a food desert, and high transportation costs. However, these areas show strengths as well, such as very limited amounts of toxics released, low rates of housing cost burdens, and many residents currently receiving supplemental nutrition assistance.

The Phoenix Metropolitan Area (**Map II**) and the Tucson Metropolitan Area (**Map III**) maps share some similarities in their areas of need. The fact that these are both more urban areas may contribute to them having comparable trends. **Map II** displays the highest level of need in the regions of South Phoenix, including the Central City, Estrella, and South Mountain Villages. The West Phoenix areas of Maryvale Village and Central Glendale also show high levels of need. Comparatively, **Map III** shows a high level of need in the South Tucson region. The two regions share very similar trends in their areas of need. The districts contain a high level of vulnerable demographics, large percentages of those who are housing cost burdened and are more likely to have higher levels of toxics released in those zip codes. In contrast, their high need areas on average have fewer citizens residing in food deserts, lower transportation costs and scores high in the multi-sector opportunities indicator.

A key takeaway from the maps is that the rural and urban areas of the state have different areas of need in regards to their standings in the determinants of health. The data suggests that vulnerable demographics, including minority residents, families below the poverty line, and residents lacking a high school education, are at the greatest risk of facing health issues throughout the State of Arizona. **Appendix V** provides further data analysis in regards to public health and its connection with the fifteen indicators used in the Index.

Arizona Counties (Map I)



Zip Code Need (0-100)

- Very Low (0 - 19)
- Low (20 - 32)
- Moderate (33 - 46)
- High (47 - 63)
- Very High (64 - 100)
- Insufficient or No Data

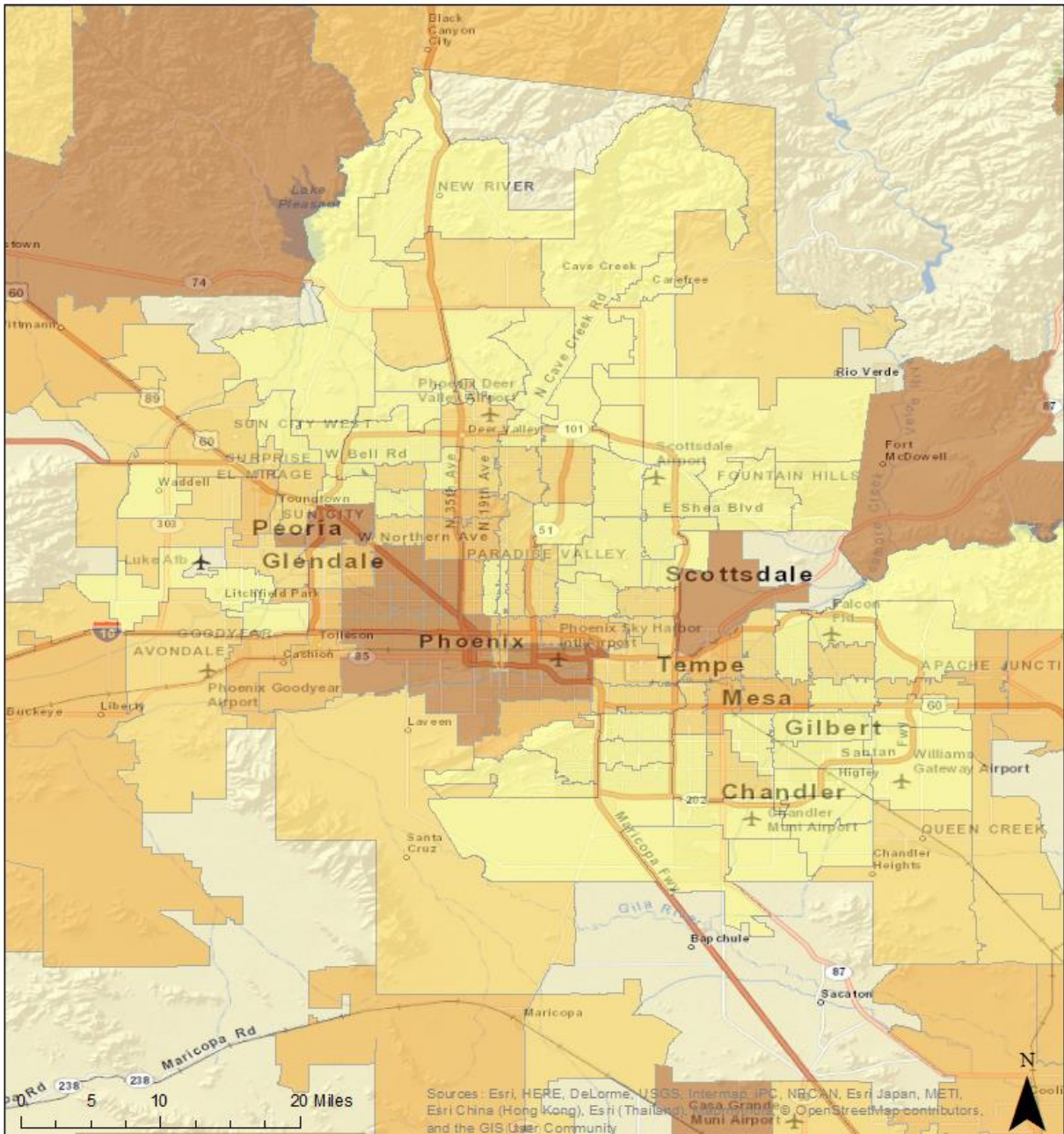
Arizona Healthy Communities Opportunity Index Counties



ARIZONA PARTNERSHIP FOR HEALTHY COMMUNITIES

Footnote: Zip code need score intervals were calculated using Jenks natural breaks classification method.

Phoenix Metropolitan Area (Map II)



Zip Code Need (0-100)

- Very Low (0 - 19)
- Low (20 - 32)
- Moderate (33 - 46)
- High (47 - 63)
- Very High (64 - 100)
- Insufficient or No Data

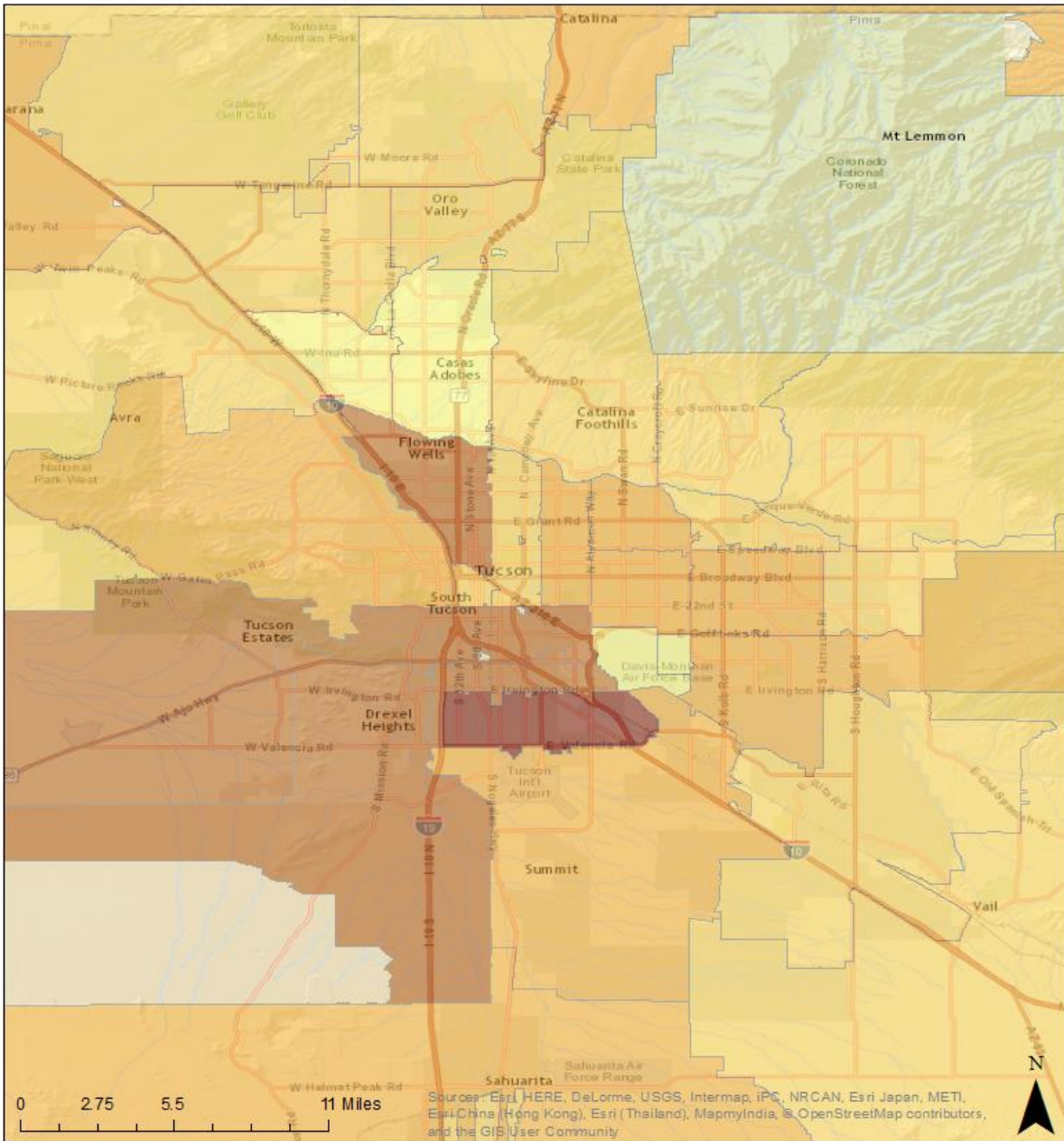
Arizona Healthy Communities Opportunity Index Phoenix Metropolitan Area



ARIZONA PARTNERSHIP FOR
HEALTHY COMMUNITIES

Footnote: Zip code need score intervals were calculated using Jenks natural breaks classification method.

Tucson Metropolitan Area (Map III)



Zip Code Need (0-100)

- Very Low (0 - 19)
- Low (20 - 32)
- Moderate (33 - 46)
- High (47 - 63)
- Very High (64 - 100)
- Insufficient or No Data

Arizona Healthy Communities Opportunity Index Tucson Metropolitan Area



ARIZONA PARTNERSHIP FOR
HEALTHY COMMUNITIES

Footnote: Zip code need score intervals were calculated using Jenks natural breaks classification method.

Conclusion

The Arizona Healthy Communities Opportunity Index and accompanying maps demonstrate that location and built environment have a profound impact on a person's health. In Arizona, like much of the country, people's zip codes are even more important to their health than their genetic codes.

The Index shows a pressing need for improvements in the health of the Arizona's residents, especially among its vulnerable demographics, including minority residents, families below the poverty line, and residents lacking a high school education. Alleviating the problem is much more complex than just looking at basic health statistics and improving on them. Future endeavors to improve health should be integrated, multi-sector efforts to improvement areas where citizens live, learn, work and play.

To make Arizona a place where all communities are healthy places to live, Arizona's residents must be given the opportunity to live in quality and affordable housing, work stable and well-paying jobs, be provided support throughout their educational journey, and have access to healthcare and various modes of transportation. These may sound like lofty goals, but they are certainly achievable if the right approach is taken. The private, nonprofit, and government sectors must collaborate and advocate for changes in public policy, community design, and individual behaviors to improve the health and well-being of Arizonans. Together, we can achieve a transformation of our communities by working to share ideas, pool resources, develop funding sources, and support projects for healthy communities.

Appendix I (Methodology)

Collecting the Data

Data was collected from official statistics from a variety of sources, including, but not limited to: the U.S. Census Bureau, the U.S. Department of Agriculture, the U.S. Department of Housing and Urban Development, and the Arizona Department of Health Services. The Data Definitions and Sources section in **Appendix I** provides a complete list of data sources and indicators. The core health indicators section of the Arizona Department of Health Services (ADHS) Need for Assistance Worksheets²³ provides detailed data regarding a zip code's health in six dimensions, including diabetes, cardiovascular disease, cancer, prenatal and perinatal health, child health, and behavioral health. The six dimensions are made up of a total of 31 indicators, which are provided in **Appendix IV**; more-detailed public health data for all of the available zip codes can be accessed through the following link: [Need for Assistance Worksheets](#). Out of a total of 403 zip codes, 89 zip codes are excluded from the Index due to missing data for any one indicator.

Normalizing the Indicators

Data for the indicators used in the Index comes in many different forms, including percentages, rates, pounds, and ratios. To include the indicators in the Index, they must be normalized in order to weight the data equally. Normalization allows values measured on different scales to all be expressed in a common form. In this case, the data was normalized so that it provides each zip code with a number from 0 to 100 for each of the 15 indicators, where 0 represents very low need, and 100 represents very high need. The method used to rescale the data for the Index was min-max normalization. Min-max normalization performs a linear transformation on the original data. The benefit of this form of rescaling is that it preserves the relationships among the data values.²⁴ Once all fifteen of the indicator scores were normalized, they were averaged to reach a final need score for each zip code. All of the indicators in the Index are weighted equally within each dimension, and each of the five dimensions makes up one-fifth of the final Index value.

The formula for rescaling the indicators using min-max normalization is given below:

$$\text{Observed Outcome Rescaled} = \frac{\text{Observed Outcome} - \text{Lowest Outcome}}{\text{Highest Outcome} - \text{Lowest Outcome}} \times 100$$

$$\text{Inverse Outcome Rescaled} = 1 - \frac{\text{Observed Outcome} - \text{Lowest Outcome}}{\text{Highest Outcome} - \text{Lowest Outcome}} \times 100$$

A complete list of the normalized needs scores for all of the 403 zip codes included in the Index is provided in **Appendix III**.

Mapping the Final Scores

The choropleth maps for the Index were created using Environmental Systems Research Institute's (ESRI) ArcGIS software, which helps one to understand and visualize data to assist in making decisions. A choropleth map is a thematic map in which areas are shaded or patterned in proportion to the measurement of the statistical variable being displayed on the map. The Jenks optimization method, also called the Jenks natural breaks classification method, was created by 20th century American cartographer George Frederick Jenks and was the data clustering method used to determine the five need levels. The Jenks natural breaks classification method aims to minimize each class's average deviation from the class, and, in the meantime, maximize each category's deviation from the means of the other groups.²⁵ The method has proven most effective when compared to traditional classification methods to create choropleth maps, including quartile, equal interval, and standard deviation.²⁶ The needs levels for the mapping are as follows: very low need, 0-19, yellow; low need, 20-32, orange; moderate need, 33-46, gold; high need, 47-63, light brown; and very high need, 64-100, dark brown.

Appendix II (Data Definitions and Sources)

Environmental Characteristics (Built Environment)

Indicator: Walkability

Definition: Analysis of hundreds of walking routes to nearby amenities. Points are awarded based on the distance to amenities in each category. Amenities within a 5-minute walk (.25 miles) are given maximum points. A decay function is used to give points to more distant amenities, with no points given after a 30-minute walk.

Source: Walk Score. (2015). Get Your Walk Score. Retrieved from www.walkscore.com

Indicator: Number of Residents Living in a Food Desert

Definition: The percentage of individuals living at least 1 mile from the nearest supermarket, supercenter, or large grocery store.

Sources: U.S. Department of Agriculture. (2010). Food Access Research Atlas. U.S. Department of Housing and Urban Development. (2013). HUD USPS ZIP Code Crosswalk Files. Retrieved from <http://www.ers.usda.gov/data-products/food-access-research-atlas.aspx> & https://www.huduser.gov/portal/datasets/usps_crosswalk.html

Indicator: Toxics Released in Area

Definition: The pounds of toxics releases emitted into the air or water or placed in some land disposal. Toxics includes those that cause cancer or other chronic human

health effects, significant adverse acute human health effects, or substantial adverse environmental effects.

Source: U.S. Environmental Protection Agency. (2013). Toxics Release Inventory Program. Retrieved from <http://www.epa.gov/toxics-release-inventory-tri-program>

Public Health

Indicator: Core Barriers

Definition: Need scores for the percentage of the population that is uninsured and the population to one full-time equivalent primary care physician. Need scores are determined by allocating zip codes between one and twenty points based on their level of need for each indicator.

Source: Arizona Department of Health Services. (2015). Need for Assistance Worksheet.

Indicator: Core Health Indicators

Definition: Need scores for health factors, including diabetes, cardiovascular disease, cancer, prenatal and perinatal health, child health, and behavioral health. Need scores are determined by allocating zip codes above the national benchmark four points and those that are above the severe baseline five points for each indicator.

Source: Arizona Department of Health Services. (2015). Need for Assistance Worksheet.

Indicator: Other Health and Access Indicators

Definition: Need scores for other health and access factors, including sexually transmitted diseases, asthma prevalence, population linguistically isolated, influenza and pneumonia death rate, adults without a visit to the dentist in the past year, unintentional injury deaths, and the percentage of elderly residents. Need scores are determined by allocating zip codes above the national benchmark four points and those that are above the severe baseline five points for each indicator.

Source: Arizona Department of Health Services. (2015). Need for Assistance Worksheet.

Economics

Indicator: Housing Cost Burden

Definition: The percentage of households spending more than 30 percent of their household income on rent and utilities for households who rent or on mortgage payments and other housing costs for those who own their homes.

Source: U.S. Census Bureau. (2013). American Community Survey. Retrieved from <https://www.census.gov/programs-surveys/acs/>

Indicator: Transportation Costs

Definition: The modeled transportation costs as a percentage of the regional median income.

Sources: U.S. Department of Housing and Urban Development. (n.d.). Location Affordability Index. U.S. Department of Housing and Urban Development. (2013). HUD USPS ZIP Code Crosswalk Files. Retrieved from https://www.huduser.gov/portal/datasets/usps_crosswalk.html & <http://portal.hud.gov/hudportal/HUD>

Indicator: Unemployment Rate

Definition: The percentage of the civilian labor force that is unemployed. These individuals are not members of the Armed Services who are age 16 years or older, and are not in institutions such as prisons, mental hospitals, or nursing homes and are currently seeking work.

Source: U.S. Census Bureau. (2013). American Community Survey. Retrieved from <https://www.census.gov/programs-surveys/acs/>

Vulnerable Demographics

Indicator: Family Poverty Rate

Definition: The percentage of families with related children under 18 years old that are below the poverty level.

Source: U.S. Census Bureau. (2013). American Community Survey. Retrieved from <https://www.census.gov/programs-surveys/acs/>

Indicator: Education Level

Definition: The percentage of population 18 to 24 years old that are less than high school graduates.

Source: U.S. Census Bureau. (2013). American Community Survey. Retrieved from <https://www.census.gov/programs-surveys/acs/>

Indicator: Percentage of Minority Residents

Definition: The percentage of minority residents.

Source: U.S. Census Bureau. (2013). American Community Survey. Retrieved from <https://www.census.gov/programs-surveys/acs/>

Multi-sector Opportunities

Indicator: Subsidized Housing Density

Definition: The number of subsidized housing units, including HUD Project-Based Rental Assistance, Section 202 Direct Loans, HUD Insurance Programs, State Housing Finance Agency Funded Section 236, Low Income Housing Tax Credits, HOME Rental Assistance, Section 515 Rural Rental Housing Loans, Rural Development Section 538,

and Public Housing per 1000 residents.

Source: Affordable Housing Research Corporation and the National Low-Income Housing Coalition. (2015). National Housing Preservation Database. Retrieved from <http://www.preservationdatabase.org/>

Indicator: Supplemental Nutrition Assistance Program Recipients

Definition: The percentage of residents enrolled in the Supplemental Nutrition Assistance Program.

Source: U.S. Census Bureau. (2013). American Community Survey. Retrieved from <https://www.census.gov/programs-surveys/acs/>

Indicator: Annual Household Public Transit Trips

Definition: The modeled household annual public transit trips for a regional median-income family.

Sources: U.S. Department of Housing and Urban Development. (n.d.). Location Affordability Index and U.S. Department of Housing and Urban Development. (2013). HUD USPS ZIP Code Crosswalk Files. Retrieved from https://www.huduser.gov/portal/datasets/usps_crosswalk.html & <http://portal.hud.gov/hudportal/HUD>

Appendix III (Zip Code Need Scores)

Zip Code	Level of Need	Score	Zip Code	Level of Need	Score	Zip Code	Level of Need	Score
85003	Moderate	37	85268	Very Low	15	85606	High	61
85004	Low	32	85281	Low	30	85607	High	47
85006	Moderate	44	85282	Low	20	85608		Insufficient Data
85007	High	55	85283	Very Low	19	85609		Insufficient Data
85008	Moderate	39	85284	Very Low	0	85610	Low	27
85009	High	56	85286	Very Low	18	85611	Low	22
85012	Very Low	11	85295	Very Low	9	85613	Low	20
85013	Very Low	15	85296	Very Low	10	85614	Low	31
85014	Low	29	85297	Very Low	12	85615	Moderate	42
85015	Moderate	43	85298	Very Low	10	85616	Moderate	35
85016	Low	21	85301	High	56	85617	Moderate	37
85017	High	51	85302	Low	28	85618	Moderate	41
85018	Very Low	16	85303	Moderate	39	85619		Insufficient Data
85019	High	47	85304	Very Low	19	85620		Insufficient Data
85020	Low	23	85305	Low	22	85621	High	59
85021	Moderate	34	85306	Low	24	85622		Insufficient Data
85022	Low	25	85307	Low	29	85623	Moderate	39
85023	Low	26	85308	Very Low	8	85624	Moderate	41
85024	Very Low	18	85309		Insufficient Data	85625	Moderate	47
85027	Low	23	85310	Very Low	9	85626		Insufficient Data
85028	Very Low	10	85320		Insufficient Data	85627		Insufficient Data
85029	Moderate	34	85321	High	50	85629	Moderate	33
85031	High	55	85322	Moderate	40	85630	Low	31
85032	Low	27	85323	Moderate	42	85631	Low	30
85033	Moderate	46	85324	Moderate	46	85632	Moderate	35
85034	High	57	85325		Insufficient Data	85633		Insufficient Data
85035	High	54	85326	Moderate	43	85634	Very High	65
85037	Moderate	38	85328		Insufficient Data	85635	Moderate	36
85040	High	59	85331	Very Low	13	85637	Low	21
85041	Moderate	46	85332	High	51	85638	Moderate	35
85042	Moderate	40	85333	High	58	85640	Low	32
85043	High	51	85334		Insufficient Data	85641	Low	28
85044	Very Low	14	85335	Moderate	36	85643	Moderate	45
85045	Low	21	85336		Insufficient Data	85645	Moderate	39
85048	Very Low	4	85337	Moderate	46	85646	Very Low	13
85050	Very Low	16	85338	Low	30	85648	High	54
85051	Moderate	38	85339	Low	27	85650	Moderate	37
85053	Very Low	15	85340	Very Low	18	85653	Moderate	40
85054	Very Low	5	85341		Insufficient Data	85654		Insufficient Data
85083	Very Low	10	85342	Moderate	46	85658	Low	21
85085	Very Low	17	85343		Insufficient Data	85701	High	29
85086	Low	23	85344	High	53	85704	Very Low	19
85087	Very Low	17	85345	High	49	85705	High	53
85118	Very Low	23	85346	Low	31	85706	Very High	67
85119	Low	32	85347	Moderate	45	85707	Very Low	18
85120	Moderate	36	85348	Moderate	41	85708	Very Low	17
85121		Insufficient Data	85349	High	55	85710	Moderate	33
85122	Low	24	85350	Very High	66	85711	Moderate	40
85123		Insufficient Data	85351	Low	23	85712	Moderate	36
85128	Moderate	44	85352		Insufficient Data	85713	High	59

Zip Code	Level of Need	Score	Zip Code	Level of Need	Score	Zip Code	Level of Need	Score
85131	High	62	85353	Moderate	39	85714	High	60
85132	Moderate	33	85354	Moderate	34	85715	Low	21
85135		Insufficient Data	85355	Low	28	85716	Moderate	34
85137	Low	32	85356	Moderate	33	85718	Low	26
85138	Low	31	85357		Insufficient Data	85719	Moderate	27
85139	Moderate	37	85360		Insufficient Data	85723		Insufficient Data
85140	Low	30	85361	Moderate	35	85724		Insufficient Data
85141		Insufficient Data	85362		Insufficient Data	85726		Insufficient Data
85142	Low	25	85363	Low	30	85730	Moderate	43
85143	Low	31	85364	High	55	85735	High	51
85145	Low	26	85365	Moderate	35	85736	High	62
85147		Insufficient Data	85367	Moderate	37	85737	Low	21
85172		Insufficient Data	85371		Insufficient Data	85739	Moderate	34
85173	Low	23	85373	Very Low	7	85741	Very Low	19
85192	Moderate	44	85374	Low	23	85742	Low	29
85193	High	47	85375	Low	21	85743	Low	24
85194	Low	31	85377	Very Low	5	85745	Moderate	38
85201	Moderate	37	85379	Low	20	85746	High	57
85202	Low	29	85381	Very Low	8	85747	Low	22
85203	Low	23	85382	Very Low	13	85748	Low	23
85204	Moderate	33	85383	Very Low	13	85749	Low	28
85205	Low	21	85387	Low	31	85750	Low	28
85206	Very Low	14	85388	Very Low	18	85755	Low	20
85207	Very Low	18	85390	Low	29	85756	Moderate	45
85208	Low	23	85392	Very Low	14	85757	High	59
85209	Very Low	14	85395	Low	22	85901	High	59
85210	Moderate	40	85396	Low	31	85911		Insufficient Data
85212	Very Low	17	85501	Moderate	45	85912		Insufficient Data
85213	Very Low	16	85530	Very High	86	85920		Insufficient Data
85215	Very Low	15	85531		Insufficient Data	85922		Insufficient Data
85224	Very Low	10	85533	High	47	85923		Insufficient Data
85225	Low	20	85534	High	55	85924	High	63
85226	Very Low	11	85535		Insufficient Data	85925	Low	30
85233	Very Low	14	85536		Insufficient Data	85926		Insufficient Data
85234	Very Low	15	85539	High	54	85927		Insufficient Data
85248	Very Low	13	85540	High	49	85928	High	61
85249	Very Low	15	85541	High	51	85929	High	58
85250	Very Low	5	85542	Very High	88	85930		Insufficient Data
85251	Low	21	85543	High	49	85931		Insufficient Data
85253	Very Low	18	85544	Moderate	38	85932		Insufficient Data
85254	Very Low	10	85545		Insufficient Data	85933	High	61
85255	Very Low	16	85546	High	56	85934		Insufficient Data
85256	High	59	85550	Very High	79	85935	Moderate	42
85257	Low	23	85551		Insufficient Data	85936	High	49
85258	Very Low	13	85552	Moderate	33	85937	Moderate	39
85259	Very Low	18	85553		Insufficient Data	85938	High	57
85260	Very Low	15	85554		Insufficient Data	85939	Moderate	45
85262	Low	22	85601	Low	30	85940		Insufficient Data
85263		Insufficient Data	85602	Moderate	39	85941	Very High	100
85264	High	50	85603	Moderate	41	85942		Insufficient Data
85266	Very Low	12	85605		Insufficient Data	86001	Low	24

Zip Code	Level of Need	Score	Zip Code	Level of Need	Score
86003		Insufficient Data	86332	Moderate	37
86004	Low	28	86333	High	55
86011		Insufficient Data	86334	High	53
86015		Insufficient Data	86335	High	51
86016		Insufficient Data	86336	Low	21
86017		Insufficient Data	86337	Moderate	33
86018		Insufficient Data	86338		Insufficient Data
86020		Insufficient Data	86343		Insufficient Data
86021	High	59	86351	Moderate	33
86022	Moderate	38	86401	High	57
86023	Low	28	86403	Moderate	40
86024	Moderate	37	86404	High	52
86025	High	53	86406	Moderate	46
86028		Insufficient Data	86409	Very High	64
86029		Insufficient Data	86411		Insufficient Data
86030	Very High	65	86413	Very High	74
86031		Insufficient Data	86426	High	49
86032		Insufficient Data	86429	High	61
86033	Very High	66	86431		Insufficient Data
86034	Very High	75	86432	High	47
86035		Insufficient Data	86433		Insufficient Data
86036	Moderate	36	86434	Moderate	38
86038		Insufficient Data	86435	High	55
86039	Very High	73	86436	High	58
86040	Moderate	28	86437		Insufficient Data
86042	Very High	69	86438		Insufficient Data
86043	Very High	74	86440	High	62
86044	Very High	64	86441	High	49
86045	Moderate	43	86442	High	54
86046	Moderate	36	86443		Insufficient Data
86047	Very High	68	86444		Insufficient Data
86052		Insufficient Data	86445	Very High	69
86053	Very High	79	86502	Very High	75
86054	Very High	75	86503	Very High	69
86301	Moderate	35	86504		Insufficient Data
86303	Very Low	18	86505	Very High	79
86305	Low	30	86506		Insufficient Data
86313		Insufficient Data	86507	Very High	70
86314	High	47	86508		Insufficient Data
86315	Moderate	36	86510	Very High	79
86320	High	55	86511		Insufficient Data
86321	Very Low	17	86512		Insufficient Data
86322	High	57	86514	Very High	69
86323	Moderate	40	86515		Insufficient Data
86324	Moderate	37	86520		Insufficient Data
86325	Moderate	37	86535	Very High	72
86326	Moderate	36	86538	Very High	78
86327	Low	29	86540		Insufficient Data
86329		Insufficient Data	86544		Insufficient Data
86331	Moderate	43	86545		Insufficient Data
			86547		Insufficient Data

Appendix IV

Dimension	Indicator
Diabetes	Age-adjusted Diabetes Prevalence (%) Adult Obesity Prevalence (%) Age-Adjusted Diabetes Mortality Rate (Per 100,000 Residents) Diabetic Medicare Enrollees not Receiving a Hemoglobin A1C Test (%) Adults with no Physical Activity in Past 30 Days (%)
Cardiovascular Disease	Hypertension Hospital Admission Rate (Per 100,000 Residents age 18+) Congestive Heart Failure Hospital Admission Rate (Per 100,000 Residents age 18+) Age-adjusted Mortality from Disease of the Heart (Per 100,000 Residents) Adults Reporting Diagnosis of High Blood Pressure (%) Adults who have not had Their Blood Cholesterol Checked within the Last 5 Years (%) Age-Adjusted Cerebrovascular Disease Mortality (Per 100,000 Residents)
Cancer	Women 18+ with no PAP Test in Past 3 Years (%) Women 50+ with no Mammogram in Past 2 Years (%) Adults 50+ with no Fecal Occult Blood Test in Past 2 Years (%) Adults who Currently Smoke Cigarettes (%) Age-adjusted Colorectal Cancer Mortality Rate (Per 100,000 Residents) Age-Adjusted Breast Cancer Mortality Among Females (Per 100,000 Residents)
Prenatal and Perinatal health	Low Birth Weight Rate 5 Year Average <2500 Grams (%) Infant Mortality Rate 5 year average (Per 1,000 Live Births) Births to Teenage Mothers Ages 15-19 3 Year Average (%) Late Entry into Prenatal Care After First Trimester 3 Year Average (%) Cigarette use During Pregnancy 3 Year Average (%) Births that are Preterm <37 Weeks Gestational Age (%)
Child Health	Children Ages 19-35 Months not Receiving Immunizations 4-3-1-3-3-1-4 (%) Children not Tested for Elevated Blood Lead Levels by 72 Months of Age (%) Pediatric Asthma Hospital Admission Rate Ages 2-17 (Per 100,000 Residents) Children Ages 10-17 years who are Obese (%)
Behavioral Health	Adults with at Least One Major Depressive Episode in the Past Year (%) Suicide Death Rate (Per 100,000 Residents) Bing Alcohol use in the Past Month 12 Years and Older (%) Age-Adjusted Drug Poisoning (i.e. Overdose) Mortality Rate (Per 100,000 Residents)

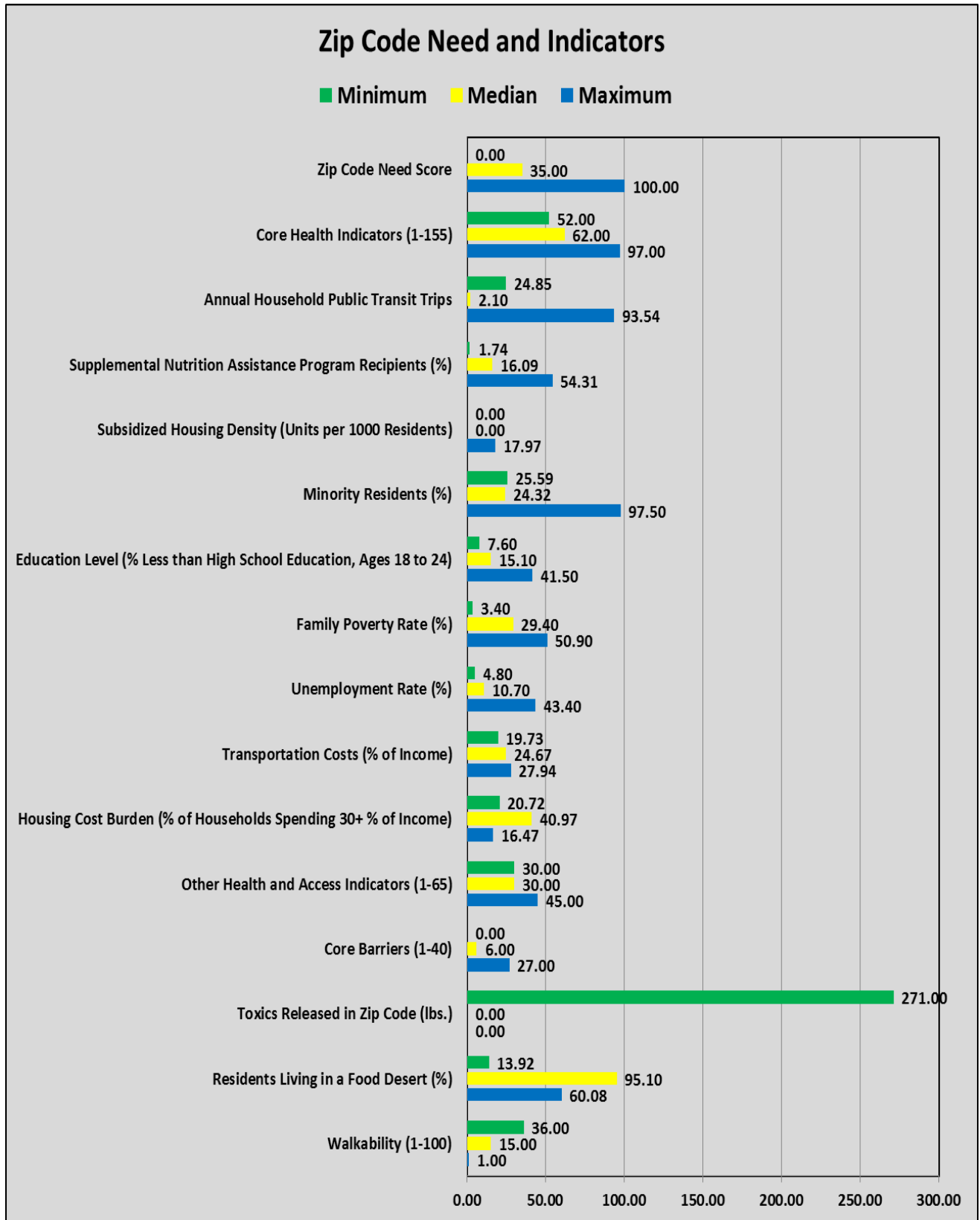
Source: (Arizona Department of Health Services, 2015)

Appendix V (Data Analysis)

An analysis of the data collected suggests a connection between public health and the conditions of housing, transportation, and socioeconomics within the zip codes studied. There are direct correlations between the core health indicators data provided in the ADHS Need for Assistance Worksheets,²⁷ which offer an overview of a zip code's overall public health status and the other 14 indicators used in the Index's construction.

A comparison between the minimum (0), median (35), and maximum (100) need scores and the core health indicators data suggest that a zip code's housing, transportation, and socioeconomic status directly affect the health of its residents. **Graph I** provides a visual representation of the need score, core health indicator, and the other fourteen indicators for the aforementioned minimum, median, and maximum need scores. A close study of the graph suggests that public health decreases as the percentages of indicators increase, including, but not limited to: residents living in a food desert, minority residents, transportation costs, family poverty and unemployment rates, and core barriers to healthcare.

(Graph I)



Endnotes

- ¹ Virginia Commonwealth University Center on Society and Health. (2015). Mapping Life Expectancy. Retrieved from <http://www.societyhealth.vcu.edu/work/the-projects/mapsphoenix.html>
- ² Virginia Commonwealth University Center on Society and Health. (2015). Mapping Life Expectancy. Retrieved from <http://www.societyhealth.vcu.edu/work/the-projects/mapping-life-expectancy.html>
- ³ Mcginnis, J. M., Williams-Russo, P., & Knickman, J. R. (2002). The Case For More Active Policy Attention To Health Promotion. *Health Affairs*, 21(2), 78-93.
- ⁴ Mcginnis, J. M., Williams-Russo, P., & Knickman, J. R. (2002). The Case For More Active Policy Attention To Health Promotion. *Health Affairs*, 21(2), 78-93.
- ⁵ Virginia Commonwealth University Center on Society and Health. (2015). Mapping Life Expectancy. Retrieved from <http://www.societyhealth.vcu.edu/work/the-projects/mapping-life-expectancy.html>
- ⁶ Hollar, D., Lombardo, M., Lopez-Mitnik, G., Hollar, T., Almon, M., Agatston, A., & Messiah, S. (2010). Supplement Effective Multi-level, Multi-sector, School-based Obesity Prevention Programming Improves Weight, Blood Pressure, and Academic Performance, Especially among Low-Income, Minority Children. *Journal of Health Care for the Poor and Underserved*, Volume 21, Number 2, pp. 93-108
- ⁷ Nowell, B., & Foster-Fishman, P. (2011;2010;). Examining multi-sector community collaboratives as vehicles for building organizational capacity. *American Journal of Community Psychology*, 48(3), 193-207. doi:10.1007/s10464-010-9364-3
- ⁸ Flegal, K., Carroll, M., Kit, B., & Ogden, C. (2012). Prevalence of Obesity and Trends in the Distribution of Body Mass Index Among US Adults, 1999-2010. *JAMA: The Journal of the American Medical Association*, 307(5), 491-497.
- ⁹ Mokdad, A. (2003). Prevalence of Obesity, Diabetes, and Obesity-Related Health Risk Factors, 2001. *JAMA: The Journal of the American Medical Association*, 289(1), 76-79.
- ¹⁰ Robert Wood Johnson Foundation. (2012). Housing and Health. Issue Brief 7. 1-11. http://www.rwjf.org/content/dam/farm/reports/issue_briefs/2011/rwjf70451
- ¹¹ Robert Wood Johnson Foundation. (2012). How does transportation impact health? Health Policy Snapshot. Issue Brief 1. 1-2. Retrieved from http://www.rwjf.org/content/dam/farm/reports/issue_briefs/2012/rwjf402311

¹² Frank, L., Andresen, M., & Schmid, T. (2004). Obesity Relationships With Community Design, Physical Activity, And Time Spent In Cars. *American Journal of Preventive Medicine*, 27(2), 87-96.

¹³ Centers for Disease Control and Prevention. (2013). Accidents or Unintentional Injuries. Retrieved from <http://www.cdc.gov/nchs/fastats/accidental-injury.htm>

¹⁴ Shaw M. (2004). Housing and Public Health. *Annual Review of Public Health*, 25: 397-418.

¹⁵ Joint Center for Housing Studies Harvard University. (2013). The State of the Nation's Housing 2013. 1-40.

¹⁶ U.S. Department of Agriculture. (2009). Access to Affordable and Nutritious Food. Measuring and Understanding Food Deserts and Their Consequences. Economic Research Service Report Summary. 1-4.

¹⁷ Kaiser Family Foundation. (2015) Key Facts about the Uninsured Population. Retrieved from <http://kff.org/uninsured/fact-sheet/key-facts-about-the-uninsured-population/>

¹⁸ Association of American Medical Colleges. (2015). The Complexities of Physician Supply and Demand: Projections from 2013 to 2025. 1-59.

¹⁹ Link M., Mokdad A., Stackhouse H., Flowers N. (2006). Race, ethnicity, and linguistic isolation as determinants of participation in public health surveillance surveys. *Preventing Chronic Disease*, 3(1), 1-12.

²⁰ Robert Wood Johnson Foundation. (2012). Better Education=Healthier Lives. Health Policy Snapshot Retrieved from http://www.rwjf.org/en/culture-of-health/2012/08/better_educationhea.html

²¹ American Lung Association. (2013). State of the Air. Retrieved from <http://www.stateoftheair.org/2013/assets/ala-sota-2013.pdf>

²² Commission to Build a Healthier America. (2008). Work Matters for Health 2008. Robert Wood Johnson Foundation. Issue Brief 4, 1-18.

²³ Arizona Department of Health Services. (2015). Need for Assistance Worksheet.

²⁴ Jayalakshmi, T., & Santhakumaran, A. (2011). Statistical Normalization and Back Propagation for Classification. *International Journal of Computer Theory and Engineering*, 3(1), 89-93.

²⁵ Brewer, C. A., & Pickle, L. (2002). Evaluation of Methods for Classifying Epidemiological Data on Choropleth Maps in Series. *Annals of the Association of American Geographers*, 92(4), 662–681.

²⁶ Smith, R. (1986). Comparing Traditional Methods For Selecting Class Intervals On Choropleth Maps*. *The Professional Geographer*, 38(1), 62-67.

²⁷ Arizona Department of Health Services. (2015). Need for Assistance Worksheet.