

El Paso Socio-Economic-Health Data Assessment



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Project performed by
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Project performed for
Center for International Intelligent Transportation Research
Texas A&M Transportation Institute

August 2013

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ACKNOWLEDGEMENTS AND DISCLAIMER

The authors acknowledge the generous support of the Center for International Intelligent Transportation Research (CIITR) for this investigation. The authors also wish to express their appreciation to representatives of the various agencies and organizations included in this paper that participated in interviews about socio-economic-health data uses and needs, and/or provided supporting documentation. The opinions expressed in this paper are those of the authors and do not reflect the official positions of the CIITR.

ABSTRACT

In order to better identify impacts of transportation, it is important to understand the characteristics of affected communities, especially vulnerable populations. This paper describes outcomes of an investigation into use of socio-economic-health data by agencies and organizations in the El Paso Area, data sources, and associated needs. The paper also provides recommendations for utilization of social, economic, and health data in transport and vulnerability assessment applications for the El Paso area and other border communities.

1 INTRODUCTION

1.1 VULNERABILITY AND HAZARDS

Information about communities and their vulnerable populations, including data on community social, economic, and health characteristics, is an important resource for planners, administrators, and researchers, whether for addressing environmental justice in transportation (Kingham, Pearce, & Zavar-Reza, 2007), planning for disasters and management of associated consequences (Lindell, Prater, & Perry, 2006), or other planning issues. Transportation presents both benefits and risks to communities and their residents. One example is transport of hazardous materials (HazMat), which are integral to nearly all aspects of modern society, such as fuels for transport vehicles or feedstocks for manufacturing and agricultural operations. Specialized vessels and vehicles are used for transporting hazmat, and hazmat carriers and transport operations are regulated at federal, state, and local levels. HazMat transport also places populations at risk in the event of an explosion, leak, or other release, especially those with limited mobility or ability to understand emergency messages. Another example is vehicle emissions. The transportation sector provides time and cost benefits of moving goods and people along transport corridors. At the same time, vehicle emissions can have negative impacts on air quality and the public, particularly those with underlying health conditions or limited access to health care.

Exposure to HazMat releases and vehicle emissions are examples of *environmental hazards*, a term which has varying descriptions and meanings in the literature. We adopt a broad definition of an environment hazard as a threat to people and their valuables following Hunter (2005) and Cutter (2001a). This perspective is also used by the Centers for Disease Control and Prevention’s Environmental Hazards and Health Effects Program, which “promotes health and quality of life by preventing or controlling diseases or deaths that result from interactions between people and their environment,” and includes focus areas on air pollution and respiratory health, and health studies on effects of “exposure to environmental hazards ranging from chemical pollutants to natural, technologic, or terrorist disasters” (CDC, 2013).

In summarizing previous research, Rygel, O’Sullivan, & Yarnal (2006) describe that “vulnerability can be defined as ‘the capacity to be wounded’ (Kates 1985; Dow 1992) or the ‘potential for loss’ (Cutter, 1996).” Wu, Yarnal, & Fisher (2002) state that vulnerability is an “essential concept in human-environment research” (p. 256) and discuss concepts of vulnerabilities that are 1) associated with potential hazard exposures and 2) coping abilities of affected populations, which can be combined in frameworks that 3) consider vulnerability of places, “in which vulnerability is both a biophysical risk and a social response, but within a specific geographic domain (p. 256). Thus, hazards researchers conceptualize the social characteristics of populations and associated vulnerabilities as among the intervening factors between risks associated with hazard exposures and vulnerabilities of specific places. An example of an exploratory model from Cutter (1996) linking hazard exposure risk to place vulnerability is illustrated in Figure 1.

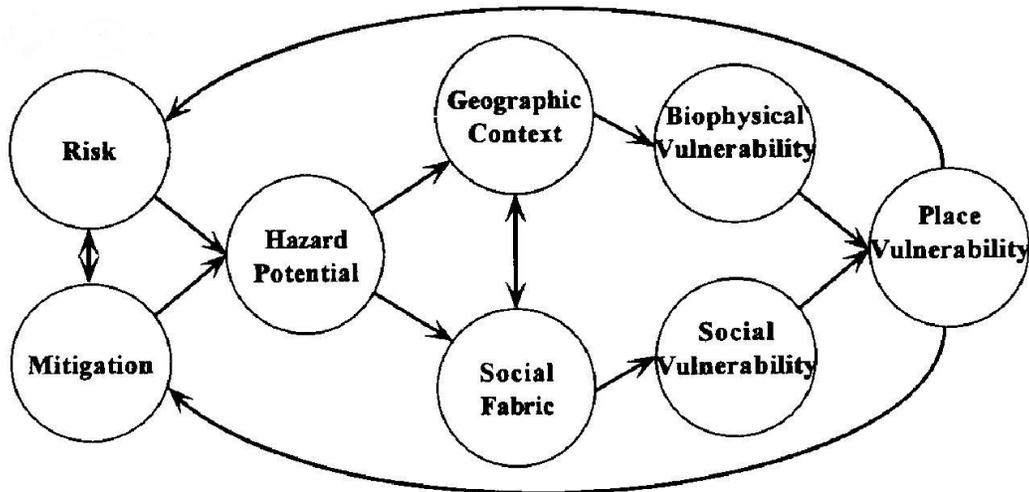


Figure 1. The Hazards of Place Model of Vulnerability (Cutter, 1996).

1.2 VULNERABILITY CONSTRUCTS

It is increasingly recognized that including social dimensions is important for success of efforts to reduce hazard vulnerabilities, and indicators of social vulnerability have started to become part of planning processes (Tate, 2012). A significant challenge for researchers is identifying linkages between hazard exposure and risk and their effects on populations, and then accounting for these factors in identifying actions of affected populations, and vulnerability of places. Compounding this challenge is the fact that metrics that are most-readily and widely available for evaluating populations and their vulnerabilities are highly interrelated. Hazard vulnerability can be extremely challenging to predict using any single demographic characteristic. For example, Lindell and Perry (2004) note that “In the United States particularly, ethnicity is related to income and education (Wilkson, 1999), which in turn, influence housing quality and location, access to community resources, preference for communication channels, and ability to comprehend environmental threats in the context of scientific information” (p. 21). Lindell and Perry indicate that “unless age, ethnicity, income, and education are all included in an analysis, it is difficult to determine which one (or combination) of these is responsible for a particular pattern of cognitive and behavioral response...” (p. 88).

A typical approach of researchers in addressing this challenge is to use combinations of variables as composite indexes that are representative of key social constructs. Examples include the Social Vulnerability Index, which has been used in U.S. applications at county levels (Burton & Cutter, 2008; Cutter, Boruff, & Shirley, 2003; Rygel, et al., 2006) and internationally, and other indices such as the Livelihood Vulnerability Index, which has been used in international applications (Hahn, Riederer, & Foster, 2009; Shah, Dulal, Johnson, & Baptiste, 2013). Such indices can be constructed using deductive (theoretically based), hierarchical, or inductive (empirically based) approaches (Adger, Brooks, Kelly, Bentham, Agnew, & Eriksen, 2004; Tate, 2012), however regardless of the approach, selected constructs, variables, and measures should have a strong theoretical basis for conceptual representation (Adger, et al., 2004).

Inductive approaches dominate indices construction techniques (Tate, 2012) due to challenges in obtaining specific theoretically-based measures and availability of secondary data. Using this approach, data for a number of measures representing key concepts are compiled and evaluated using factor-analytic methods such as Principal Component Analysis (e.g., Burton & Cutter, 2008). Measures that are highly associated with key concepts are identified, standardized, and combined. The combination can be accomplished additively (Burton & Cutter, 2008; Cutter, et al., 2003) by including weighting, using a Pareto ranking (Rygel, et al., 2006), or other approaches (Tate, 2012). While this process does not necessarily explain underlying causes of social vulnerabilities, they provide opportunities of ‘operationalizing’ or representing the concepts in empirical analysis (Wu, et al., 2002). Factor-analytic approaches have a number of limitations, including but not limited to representativeness (Burton & Cutter, 2008), selection biases (Hahn, et al., 2009; Tate, 2012), and accounting for error in underlying data sources (Tate, 2012).

Understandings of social vulnerability and its relationships with hazards are relatively new and continuing to develop (Burton & Cutter, 2008). The following are examples of constructs that have been used by researchers to relate social vulnerability to environmental hazards at local/regional levels.

Wu, et al., (2002) used block-level data from the 1990 Census to relate social vulnerability to flooding hazards in a coastal county in the Northeast U.S. Measures included total population, number of housing units, number of females, number of non-White residents, number of people under 18, number of people over 60, number of female-headed single parent households, number of renter-occupied housing units, and median house value. They also evaluated impacts of potential climate changes on different populations and found mixed results for population effects depending on the vulnerability measure. They ultimately identified total population as “the most important variable to represent future development because changes in other factors, such as facilities, housing units, and land-use patterns, are usually driven by—and highly correlated with—future population growth” (p. 267).

Cutter, et al. (2003) reviewed a range of social vulnerability constructs and identified examples in the literature including socio-economic status (income, political power, prestige), gender, race & ethnicity, age, commercial and industrial development, employment loss, rural/urban settings, residential property, infrastructure and lifelines, renter status, occupation, family structure, education, population growth, medical services, social dependence, and special needs populations. While some of these are clearly related so social vulnerabilities, others suggest a greater relationship with characteristics of geographic and physical vulnerabilities.

Based on their background analysis, Cutter, et al. (2003) analyzed 85 associated measures for U.S. counties using factor analysis and identified underlying composite dimensions: personal wealth, age, density of built environment, single-sector economic dependence, housing stock and tenancy, race, ethnicity, occupation, and infrastructure dependence. The first three of these dimensions account for around 35 percent of the variance in the dataset. They did not identify a discernible trend in relationships between presidential disaster declarations and degree of social vulnerability.

Rygel, et al. (2006) indicated that “broad factors appear repeatedly in social vulnerability analyses, although it is possible to choose different proxies for each indicator” (p. 748). Based on their literature review, they included the following vulnerability indicators in their study: poverty, gender, race and ethnicity, age, and disabilities. They found that three components accounted for around 50% of the variance in the dataset: poverty, immigrants, and old age/disabilities. Data were combined using Pareto rankings; no attempt was reported to relate vulnerability indicators with hazard outcomes, and they identified areas in the community with vulnerability hotspots.

Burton and Cutter (2008) identified that age, gender, race, education, socioeconomic status, quality of built environment, special needs (e.g., infirmed), language, and institutionalization are major factors to influence social vulnerability. They noted a limited availability of measures at subcounty level and ultimately used 36 measures to relate social vulnerability with flooding risks in the Sacramento, California area. They identified nine vulnerability dimensions using a factor analysis without using a scree plot: socioeconomic status (poverty), race/ethnicity (Hispanics), age (elderly), developmental density, renters, females, race (African American/Asian), race (Native Americans), and health care institutions. The first three of these dimensions together account for around 50 percent of the explained variance.

Schmidtlein and Deutsch (2008) examined the sensitivity of quantitative features of the Cutter et al. (2003) approach to social vulnerability to its construction, selection of variables and the geographical scale. Three study sites were selected: Charleston, SC; Los Angeles, CA; and New Orleans, LA. They demonstrated that the algorithm of social vulnerability is robust to minor changes in variable composition and to changes in scale, but is sensitive to changes in its quantitative construction.

Hahn, et al., (2009) used a Livelihood Vulnerability Index to identify regional vulnerabilities to climate change in Mozambique. While some of the primary constructs of vulnerability were similar to those used in U.S. applications, specific variables and measures reflected the different social and economic pressures of the research setting. Variables were included to represent social (age, gender, education, orphans), economic (work outside community, income source diversity, borrow/lending ratios, government assistance, food saving/storage), and health (accessibility, absenteeism, disease vectors exposure, mortality, water supply) constructs. They used the index to identify differences in climate change exposure, sensitivity, and adaptive capacity in two districts of Mozambique.

Tate (2012) presented a review of approaches used for social vulnerability analyses. He identified examples of social vulnerability indicators, including include income, education, age, ethnicity, gender, occupation, and disability. He did not relate indices to hazard risks or outcomes, but rather performed sensitivity analyses to identify the robustness of different approaches.

1.3 LOCAL USE AND APPLICATION OF VULNERABILITY DATA

The literature demonstrates that social vulnerability indicators continue to be developed by researchers and are beginning to be included in planning and policy evaluations, including those at local levels. Key constructs of social vulnerability include variables that measure the social,

economic, and health conditions of populations. Social constructs include age, race, ethnicity, education, gender, language, immigration, family structure, and density of housing/population. Economic constructs include poverty, income/wealth, employment, sector dependence, housing ownership/value, assistance, and saving. Health constructs include disabilities, accessibility, absenteeism, disease/mortality, and sustenance (food/water). As noted previously, many of these constructs are highly interrelated. In the U.S., a primary source for many of the measures associated with these constructs is U.S. Census or American Community Survey data. While these data are broadly available, they also have associated issues of timeliness, spatial definition, and error. Other data are not broadly available, particularly for health-related issues, and require collection by other means.

Section 2 of this paper reviews whether and how departments and organizations at local, state, and non-governmental levels in the El Paso area are using social, economic, and health data. Section 3 discusses sources of these data for the El Paso area, including U.S. Census data and data collected by local agencies. Section 4 discusses needs for social, economic, and health data in El Paso, and Section 5 provides recommendations for using and obtaining these data.

2 USE OF SOCIAL, ECONOMIC, AND HEALTH DATA IN EL PASO

2.1 DATA USE BY EL PASO AGENCIES/ORGANIZATIONS

This section reviews existing data usage practices by El Paso agencies and organizations. Local and state agencies and other organizations that have offices in El Paso were contacted regarding their use of social, economic, and health data about the population in El Paso. Representatives were contacted by phone in July and August 2013 and asked fact-based questions about whether they use these data, and if so what types of data are used, how they are used, and their sources. They were also asked about what data, if any, are not available and their applications. We also reviewed examples of recent documents that used these kinds of data and the sources that were used.

Social, economic, and health data usage as indicated by El Paso agency and organization representatives is summarized in Table 1. Based on our review, primary users of population social, economic, and/or health data by local and state agencies in El Paso include:

- City of El Paso – City Development (Planning)
- City of El Paso – City Development (Economic Development)
- City of El Paso – Community & Human Development;
- City of El Paso – Fire Department;
- City/County of El Paso – Public Health; and
- El Paso County – Housing Authority

We note that although we were able to contact many of the agencies and organizations in El Paso that we expected might use population information, we were not able to contact all of them. Further, while contacted representatives were able to provide information about data use by their respective divisions, they may not have been able to identify whether other agency/organization divisions used social, economic, or health data. Thus, the information included in Table 1 is limited and should be taken as examples of how such data are used by agencies/organizations, and not as a comprehensive evaluation.

Table 1. Social, Economic, and Health Data Use by Agencies and Organizations in El Paso, Texas.

Agency/Department	Data Category			Notes/Examples/Sources
	Social	Econ.	Health	
City of El Paso – City Development (Planning)	X	X	X	Planning department uses a wide range of data as background information in comprehensive plan (described in section below) and assists other city departments with their data needs and applications. Uses primarily Census 2010 data. Has assisted fire and police departments with analyses. Does not use data to assess population vulnerabilities.
City of El Paso – City Development (Economic Development)	X	X		Economic development uses a variety of secondary data sources in their forecasts and in working with other city departments. Utilized measures include population densities and projected growth, income, labor force, education, employment, and wages. Prepares evaluations primarily for other city departments and business/industry interests. Uses Census and American Community Survey data, industry growth and business data is provided by Labor Market Institute. Demographic information needs are currently met by existing sources; however, could use better information about spending by Mexican nationals in the U.S. Does not use data to assess population vulnerabilities.
City of El Paso – Communications & Public Affairs				Department does not use these types of data for their own evaluations, but may use data as they assist other departments with projects. Data needs depend on the project.
City of El Paso – Community & Human Development		X	X	Department collects information on household income from applicants for assistance, which are compared against Census data for area median HHI to determine eligibility. Data requirements are determined by federal statute and if other data were available, they would not have use for it. Also a concern is forecasting the number of properties in an area that should be constructed to accommodate disabilities.
City of El Paso – Fire Department and El Paso City-County – Office of Emergency Management	X	X	X	Department uses information about population health characteristics to assist with evacuation planning. Information of particular interest are disabilities and other special needs, particularly with respect to mobility needs (e.g., buses, wheelchairs) and specialized equipment (e.g., oxygen, dialysis, other equipment with water or power needs). El Paso FD Standards of Cover analysis presents background information and uses a number of demographic variables (described in following section)

Agency/Department	Data Category			Notes/Examples/Sources
	Social	Econ.	Health	
City of El Paso – Environmental Services				Department focuses primarily on landfill permitting issues, while they would use address information for population notifications on permitting issues, they do not use information about population characteristics.
City of El Paso – Mass Transit (Sun Metro)				Agency does not use social, economic, or health data.
City of El Paso – Police Department	X			Uses predominantly population density information. Organizational priorities, resources, and external considerations generally limit the extent that other demographic data are utilized, although including those kinds of data in evaluations might be informative. Data at Census Block group and tract levels is sufficient.
City/County of El Paso – Public Health	X	X	X	The Department of Public Health at the city provides services for the whole county. Department collects socio-economic-health data from the following sources: 1) Socio-economic-health data collected from participants of their programs; 2) The Behavioral Risk Factor Surveillance survey, an on-going telephone health survey; 3) Consultants; e.g. the Community Health Assessment and Improvement Plan was just developed; 4) Census data are occasionally used to understand the socio-economic profiles of the communities; 5) The Paso del Norte Health Information Exchange, an electronic medical record sharing network.
El Paso County – Housing Authority	X	X		Department collects information about housing needs (family size) and financial resources (income) from applicants for assistance; Information is compared against criteria provided by HUD. Also has agreement with a private data provider which performs annual evaluations of reasonable rental costs by Zip Code.
Texas Commission on Environmental Quality				TCEQ’s El Paso Office rarely uses social, economic, or health data.
Rio Grande Council of Governments				Homeland security office does not use demographic data in analyses, but agency may use data such as population numbers or density in working with other organizations.

Agency/Department	Data Category			Notes/Examples/Sources
	Social	Econ.	Health	
Texas Department of Transportation	X	X		Agency uses primarily social and economic data in environmental justice or environmental impact statement analyses for new projects. Examples include income, ethnicity/race, ESL/English proficiency, and populations/households. Data sources are primarily Census and American Community Survey. Other demographic information may be included in travel demand models, particularly socio-economic forecasting, however that data would be provided by MPO. Could foresee using such data as part of other analyses, if needed. Does not use health data. Data needs are currently met by existing sources.
Texas Division of Emergency Management				Agency assists local governments by providing assistance and support with mitigation and evacuation planning, preparedness, and during emergencies. Local governments gather data and develop plans with assistance from regional and state organizations. During a major event or disaster, the local governments utilize the data and TDEM provides support and resources when the local resources are depleted.

2.2 DATA APPLICATIONS BY EL PASO AGENCIES/ORGANIZATIONS

Based on documents found on the Internet or provided by agency/organization representatives, several example applications of social, economic, and/or health data in the El Paso region are described below.

2.2.1 Housing + Transportation Affordability in El Paso

The February 2009 *Housing + Transportation Affordability in El Paso* report by the Center for Neighborhood Technology, a non-profit planning organization, presents a ‘H+T Affordability Index’ and describes creation of the Affordability Index as follows:

The independent, input variables utilized were obtained from the 2000 US Census. Specifically, four neighborhood variables (residential density, average block size, transit connectivity index, and job density) and four household variables (household income, household size, workers per household, and average journey to work time) were utilized as independent variables. These variables are used to predict, at a neighborhood level (Census block group), three dependent variables – auto ownership, auto use, and public transit usage – that determine the total transportation costs. The costs resulting from these calculations in conjunction with the well defined housing costs provide a picture of the affordability of the region. (CNT, 2009, p. 35).

The index is used to illustrate the average housing and transport costs as a percentage of average median income (AMI) for Census block groups in El Paso County, an example of which is shown in Figure 1. According to the report, “[t]hese figures clearly indicate that affordability measures that consider housing costs alone, without taking into account transportation costs, do not provide a complete view of affordability” (CNT, 2009, p. 22). Presumably, such information could be used to inform local policies on housing and transportation in the El Paso area, and the report suggests some examples through which El Paso City government has the ability to influence such costs and their impacts on residents.

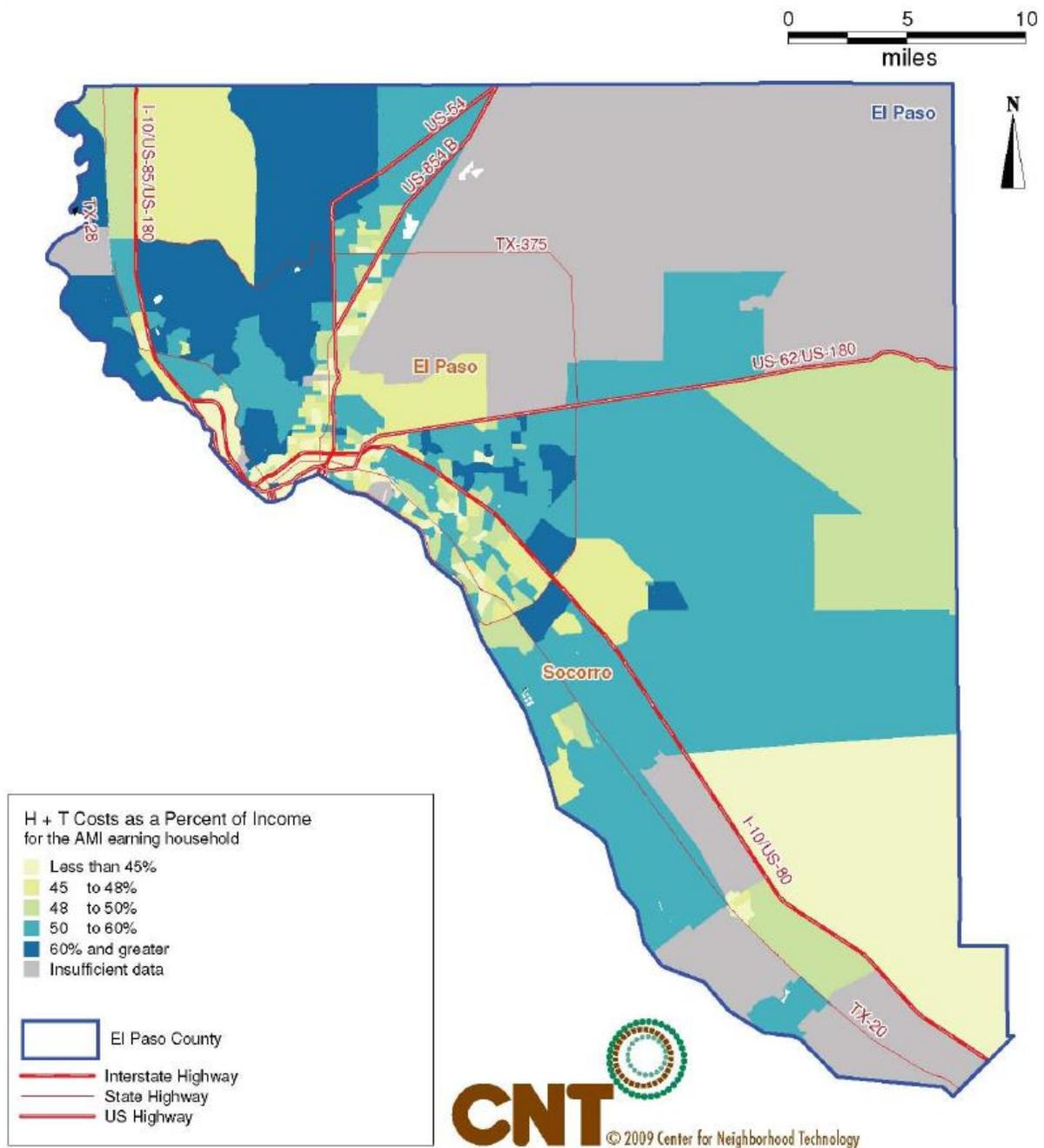


Figure 2. Housing + Transportation Costs as a Percent of AMI (CNT, 2009, p. 23).

2.2.2 Plan El Paso

The City of El Paso released a Comprehensive Master Plan in 2012 titled *Plan El Paso* (or the *Plan*). The *Plan* is extensive, totaling around 750 pages in length. Its first volume covers city patterns (city form and community character) including regional land use patterns, urban design, downtown, transportation, public facilities, and housing. Its second volume covers community life (prosperity and quality of life), including economic development, historic preservation, health, sustainability, border relations, and Fort Bliss. The second volume also includes matrices of goals for plan implementation and other appendices.

Among its goals, Housing Affordability Policy 6.4.1 of the *Plan* states that the CNT Housing + Transportation Affordability Index should be adopted “as a tool to determine the true cost of living in various locations around El Paso” (City of El Paso, 2012, p. 6.17). As described above, this index includes some elements of social and economic characteristics of the El Paso population. This appears to be the most explicit application for such data as discussed in the *Plan*. We also reviewed the *Plan* for discussion of key social, economic, and health vulnerability constructs described in Sections 1.2 and 1.3 of this paper. Given the extent of the *Plan*, an exhaustive analysis of all applications for these constructs is beyond the scope of this paper. However, the following discussion summarizes general themes for use and application of such data in the *Plan*.

Social constructs include age, race, ethnicity, education, gender, language, immigration, family structure, and density of housing/population. Age of the El Paso population is discussed in the *Plan* in terms of future population growth; while the term ‘youth’ is found few times in the *Plan*, the term ‘elderly’ is covered in relation to social support structures, health insurance needs, and transport access needs. Sources cited for age data include the U.S. Census and the Institute for Policy and Economic Development (IPED) at the University of Texas at El Paso. The terms ‘race’ and ‘ethnicity’ are discussed in regards general population trends in El Paso and El Paso’s need for healthy food options in a section on community food assessment. Sources cited for ethnicity data are the U.S. Census Bureau.

Education levels of the El Paso population are discussed primarily in relationship to the need for an educated workforce to support El Paso economic development, and is noted as a contributing factor for innovation, as shown in Table 2 (below), and measured in an Innovation Index, which is included in the *Plan*. Sources cited for education data are StatsAmerica.org (which appears to use primarily 5-year American Community Survey demographic data). There is little to no mention in the *Plan* of the population terms ‘gender’ or ‘sex’ (in terms of gender), or the terms ‘language’ or ‘immigrant’, although issues related to immigration and migration policies are mentioned. Family structure is discussed to some extent, particularly with respect to changing community characteristics, and population numbers and density are discussed extensively in the *Plan*, especially in relation to future housing and land use needs. Sources cited for household size data are the U.S. Census Bureau.

Economic constructs include poverty, income/wealth, employment, sector dependence, housing ownership/value, assistance, and saving. Poverty is discussed regarding its relationship with border populations, health issues, lack of insurance, and access to nutrition and exercise.

Poverty, income, employment, and sector dependence are all elements included in analysis of the community's economic and workforce development needs, also shown in Table 2 below. The *Plan* also describes that there are regions of higher and lower income in El Paso which should be considered with respect to development goals. The Texas Housing Affordability Index is also described as an indicator of low housing affordability in El Paso. Sources cited for these economic data sources include StatsAmerica.org, the Bureau of Economic Analysis, the American Community Survey, and IPED.

**Table 2. Comparison of Innovation Factors for El Paso, Texas
(City of El Paso, Texas, 2012, p. 7.12).**

	El Paso	Texas	Austin	USA
Overall Innovation Index	79.5	94.6	124.5	100
Human Capital	80.4	101.4	146.2	100
Population with Bachelors Degree or Higher	17.7%	24.7%	29.1%	26.5%
Growth in 25-44 Age Demographic	-0.2%	0.9%	3.1%	-0.2%
Average High Tech Employment 1997-2009	2.6%	5.0%	10.3%	4.8%
Tech-Based Knowledge Share of Employment 2009	7.0%	8.4%	12.4%	8.4%
Economic Dynamics	75.9	82.7	111.3	100
Venture Capital per \$10,000 GDP 2003-2008	\$ 0	\$ 27.55	\$ 214.08	\$ 52.45
Broadband Density	500	500	727	700
Establishment Churn/Indicator of Change	80.2%	76.9%	82.7%	77.50%
Small Establishments per 10,000 Workers	317.8	328.6	328.2	372.6
Large Establishments per 10,000 Workers	1.02	1.10	0.99	1.10
Productivity and Employment	75.7	97.2	122.5	100
Change in High Tech Employment Share	1.20%	-1.90%	-3.20%	-0.3%
Job Growth to Employment Growth Ratio	1.05	0.72	0.62	0.87
GDP per Worker 2008	\$ 69,391	\$ 84,556	\$ 74,323	\$ 79,057
% change in GDP/Worker 1997 to 2008	2.36%	4.13%	3.37%	3.48%
Average Patents per 1,000 Workers	0.03	0.47	1.06	0.51
Economic Well-Being	99.2	101.9	101.2	100
Poverty Rate (3 year Average 2007 to 2009)	27.0%	16.3%	12.6%	13.2%
Unemployment (3 year Average 2007 to 2009)	7.1%	5.7%	5.0%	6.6%
Average Internal Net Migration per 10,000 Residents 2000 to 2009	(70.6)	37.3	159.6	0%
% Change Per Capita Income 1997-2008	4.8%	4.2%	3.4%	4.1%
Change in Wage Earnings 1997-2008	3.4%	4.0%	3.90%	3.8%
Change in Proprietor Income 1997-2008	3.4%	1.8%	0.8%	1.2%

Source: StatsAmerica.org, Bureau of Commerce

The *Plan* includes extensive discussion of economic and employment needs. It includes what is describes as ‘Socio-economic’ forecast estimates for population, employment (total and by occupation), personal income, and gross regional product, using the Regional Economic Model, Inc. (REMI) model from IPED. The model includes five interacting blocks for output and demand; labor and capital demand; population and labor supply; wages, prices and costs;

and market shares. External data sources indicated for the REMI model include the U.S. Census Bureau, U.S. Bureau of Economic Analysis, Fort Bliss Transformation Office, and the El Paso Regional Economic Development Corporation. Evaluations of economic development and employment in the *Plan* include education and housing needs as mentioned previously as well as anticipated job growth by sector and in different community locations.

Health constructs include disabilities, accessibility, absenteeism, disease/mortality, and sustenance (food/water). The *Plan* discusses a number of diseases present in the El Paso population, including diabetes (also related to insurance and poverty levels), heart disease, and obesity. Pollution, particularly particulates, is described as an ongoing environmental concern that affects health outcomes in El Paso. Delivery of social and health care services are described as being fragmented in El Paso, and employment is cited as a contributing factor to lack of health care.

As described above, several factors contributing to social, economic, and health vulnerabilities are indicated as being closely related. The *Plan* indicates that “[t]he population in the border region generally has lower educational attainment, lower income status, higher rates of unemployment and poverty, and a significant shortage of health care providers. These unique border challenges contribute to diminished health, well-being, and access to health care.” (City of El Paso, Texas, 2012, p. 7.13). These issues cut especially across housing, land use, employment, transportation, and health care.

For example, in discussing the psychological and emotional well-being of the community, the *Plan* indicates that “[e]ach district should be studied to determine how it can be made more balanced in order to shorten commutes [to work] and encourage walking” (City of El Paso, Texas, 2012, p. 9.24). Transportation Bicycle Outreach Policy 4.9.10 of the *Plan* states a goal of “[developing] bicycle policies and programs that address geographic, racial, ethnic, economic, environmental, and public health disparities” (City of El Paso, Texas, 2012, p. 4.81). The H+T Affordability Index addresses primarily economic vulnerability, and the Innovation Index described in the *Plan* includes constructs of social and economic vulnerabilities. However, the *Plan* does not appear to specifically identify assessments or indices that include health-related constructs for assessing population vulnerabilities in El Paso.

2.2.3 Community Risk Analysis and Standards of Cover

The El Paso Fire Department (EPFD) conducted a Standards of Cover (SOC) assessment for the City of El Paso, which is used to identify department resource allocations and assess performance. EPFD published the SOC results in 2012 in a report titled *Community Risk Analysis and Standards of Cover* (Drozd III, Calderazzo, Warling, Pena, Cadd, Quinn IV, Rodela, & Reglen, 2012). The SOC includes a risk assessment,

...in which a three dimensional risk classification model was used to establish risk categories for portions of the city as a function of incident probability, community consequence, and agency impact. Embedded in the risk classification model are community expectations for the department as well as consideration for key resources and critical infrastructure items (Drozd III, et al, 2012, Executive Summary, ¶4).

The SOC report includes summaries of El Paso demographics for population totals, ethnicity, number of households, average household size, types of households, population density, age distributions, poverty, median household income, citizens who do not speak English as a primary language, and education. Sources cited for these data include the U.S. Census 2000, American Community Survey, 2005-2009, and Advameg, Inc. Among potential disasters described in the SOC, extreme temperatures are cited as a hazard for which the elderly and very young are susceptible, and wind and dust storms are cited as hazards that can contribute to respiratory health problems and limited roadway visibility.

The lists and maps in the SOC report identify significant development features in El Paso including locations of mass population congregations, educational facilities, and hospitals. Demographic features such as major highways and transport infrastructures, hazardous cargo routes, critical infrastructure locations (e.g., fire stations), and fire department resources are also described and mapped. Medical incidents are the predominately-reported incident types for 2008, 2009, and 2010 – nearly 70 percent of all incidents that the Fire Department responded to in these years. While HazMat incidents were only around one percent of the total number of incidents during this timeperiod, HazMat incident mitigation ranked fourth in community stakeholder priorities out of nine categories.

The risk analysis included in the SOC report uses geographic information systems (GIS) to identify risk management zones categorized in terms of low, medium, high, and special risks. Service types evaluated are fire, emergency medical services, hazardous materials, technical rescue, and aircraft rescue and firefighting. The SOC report indicates that the methods used were “designed to conform to recommendations made by the Center for Public Center Excellence in the *CFAI: Standards of Cover, 5rd Ed.*, and the *CFAI: Fire & Emergency Service Self-Assessment Manual, 8th Ed.* (Drozd III, et al., 2012, p. 47). The SOC report describes the assessment as follows:

The assessment was parcel based, using GIS parcel data defined by the El Paso Central Appraisal District. GIS layers were selected as risk data and were assessed within the parcels. Weights were given to these risk categories based on the relative impact each had on the overall risk. As there is not any definitive work on the relative impact of different risk types to overall risk, these weights were based on the experience of the SOC team in terms of community applicability (Drozd III, et al., 2012, p. 48).

The SOC report does not describe the specific weightings that were used for respective data layers. An additive formula for risk score is described using Heron’s formula that incorporates probability, agency impact, and community consequence.

The SOC risk analysis includes ‘fire analysis risk data’ and ‘population data’ categories. Social, economic, and health-related data included in the fire analysis risk data category are major employers, general hospitals, cultural/historic landmarks, residential areas, schools, mental health facilities, child care facilities, assembly occupancies, populated areas, poverty levels, and populations over 65. Also included are essential infrastructures, incident histories, and fire department resources. The risk analysis uses parcel data from the El Paso Central Appraisal District, and major employer data from the El Paso Economic Development Department. Population data included in the risk analysis are categorized in terms of population density, accessibility, and land use in terms of metropolitan, urban, suburban, rural, and wilderness areas.

Outputs of the SOC risk analysis are presented using maps and tables. For example, Figures 3 and 4 illustrate maps of incident density and Fire Department performance in El Paso. The figures illustrate that incident density is concentrated in the Downtown El Paso area, while system performance is lowest on the Northwestern and Southeastern outskirts of the city.

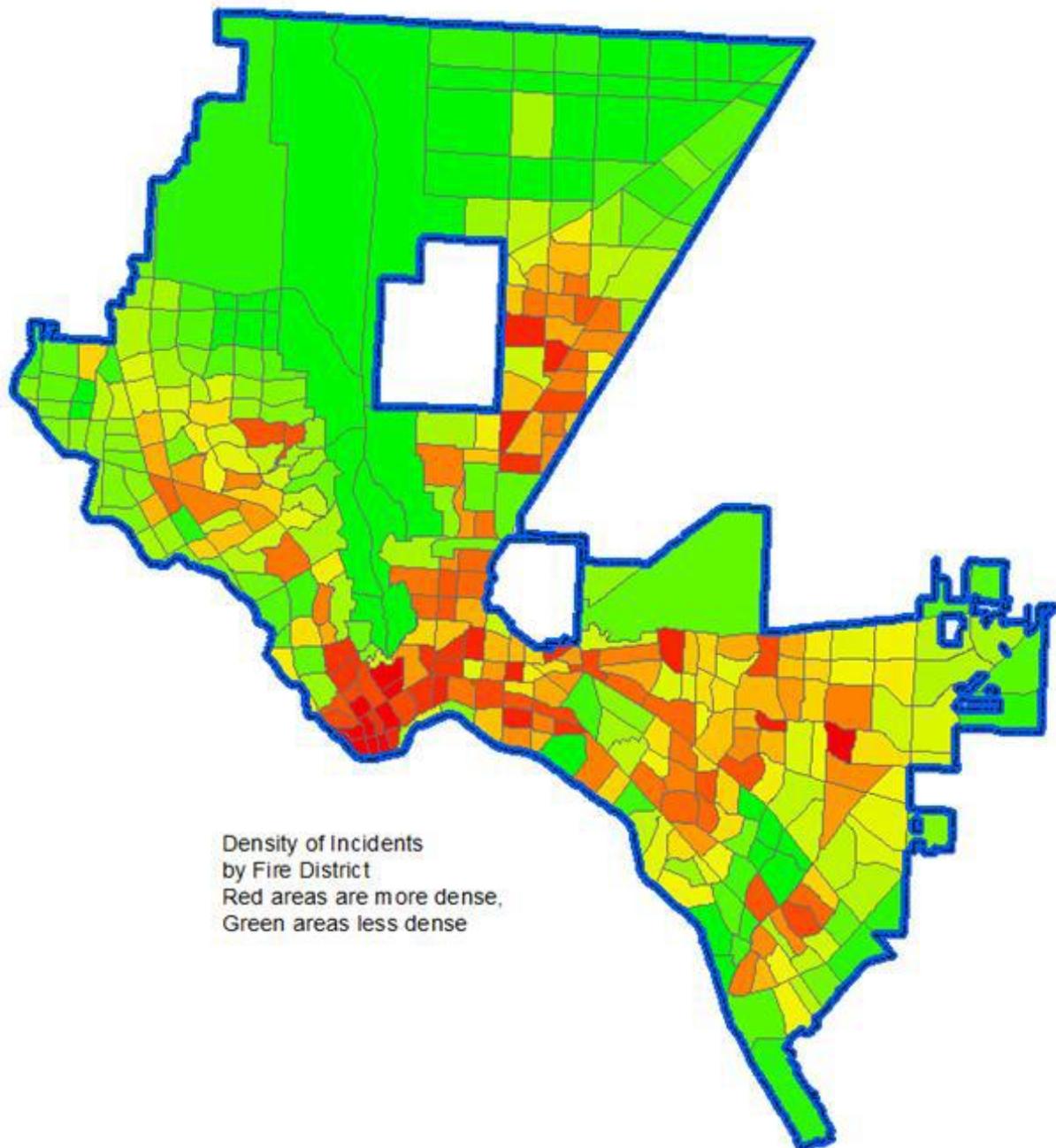


Figure 3. Density of Incidents by Fire District (Drozd III, et al., 2012, p. 164).

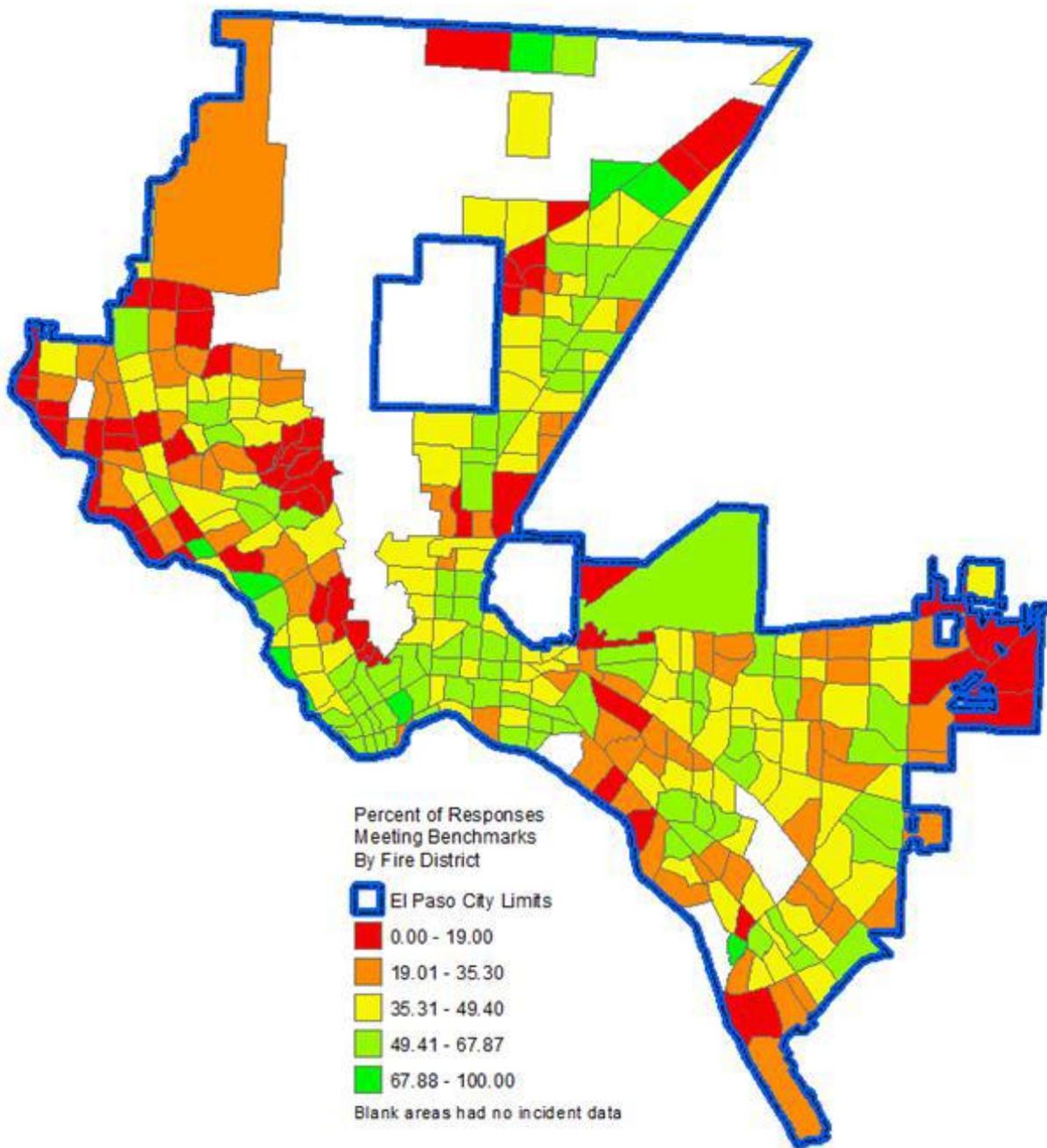


Figure 4. Percent of Responses Meeting Benchmarks by Fire District (Drozd III, et al., 2012, p. 165).

2.2.4 Amended Mission 2035 Metropolitan Transportation Plan

The El Paso Metropolitan Planning Organization (EPMPO) released the *Amended 2035 Metropolitan Transportation Plan* (or, the *Transportation Plan*) in 2012, which covers all of El Paso County and parts of Doña Ana and Otero Counties in New Mexico, and identifies priority transportation improvement program projects. This amended document is intended to resolve inconsistencies between TXDOT project documentation and content of the original *Transportation Plan*.

Socio-economic data for the area covered by the *Transportation Plan* were analyzed to identify whether growth forecasts for west El Paso necessitate modification to development plans and growth scenarios. While this is described early in the *Transportation Plan*, the document presents limited discussion of data specifics or their method of analysis. Summarized data for year 2010 and forecasted numbers through year 2035 are presented for total population, number of households, numbers of employment and numbers of persons per household in the study area.

The *Transportation Plan* also describes the importance of Title VI of the Civil Rights Act of 1964 prohibiting discrimination on basis of race, color, or national origin for Federal financial assistance, and Executive Order 12898, requiring environmental justice (EJ) for minority and low-income populations. In the *Transportation Plan*, the EPMPO indicates that it has committed to:

- Enhance [its] analytical capabilities to ensure that the long-range transportation plan and the transportation improvement program (TIP) comply with Title VI.
- Identify residential, employment, and transportation patterns of low-income and minority populations so that their needs can be identified and addressed, and the benefits and burdens of transportation investments can be fairly distributed.
- Evaluate and - where necessary - improve [its] public involvement processes to eliminate participation barriers and engage minority and low-income populations in transportation decision making. (EPMPO, 2012, pp. 7-8).

The *Transportation Plan* also describes that:

Effective transportation decision making depends upon understanding and properly addressing the unique needs of different socioeconomic groups. To further promote transportation equity throughout the Study Area, a more effective transportation decision process and GIS-based analysis is underway to understand and properly address the unique needs of different minority and socioeconomic groups. (EPMPO, 2012, p. 8).

Included in the document are several maps of socio-demographic population characteristics for the study area, including limited English proficiency from U.S. Census 2010, and female head of household, population under 14, and population over 65 from U.S. Census 2000. The stated goal is to be able to expand the travel demand model with respect to population demographics to be able to evaluate whether EJ requirements are met. The described model expansion does not appear to have been completed at the time of publication. Rather, the *Transportation Plan* reviews projected travel impacts on EJ and non-EJ zones, which appear to be based rather on

income/poverty levels, and identify that there are no disproportionate effects for EJ/non-EJ areas based on this factor in projected travel times.

In TXDOT's Title VI Review of EPMPO, (TXDOT, 2013), Requirement #8 for Data Collection states that:

Subrecipients of federal financial assistance must collect and analyze statistical data (race, color, national origin) of participants and beneficiaries of their programs and activities.

and TXDOT's Findings of the review for Requirement #8 are:

Using Geographic Information System (GIS) evaluations, the MPO staff has developed a map that divides the entire El Paso MPO study area into Public Planning Areas. The El Paso MPO used the 2010 Census data to determine the number of LEP individuals in its planning area. (TXDOT, 2013, p. 9)

In its section on Scenario Planning, the *Transportation Plan* describes its Surface Transportation Assessment and Research Scenario (STARS) initiative, which includes the objective of accommodating non-motorized transport in the transportation planning process, including pedestrians, bicyclists, and disabled persons. The *Transportation Plan* indicates this is met through joint reviews among staff from the MPO, the City of El Paso, and TXDOT, "to ensure that proposed improvements do not inhibit mobility" (EPMPO, 2012, p. 18).

2.2.5 Community Health Assessment

The City of El Paso's Department of Public Health released its *Community Health Assessment (CHA)* report in July 2013. The Department conducted the *CHA* study from December 2012 through May 2013 by gathering data from many community partners. The New Solutions, Inc. was the contractor for preparing the final report. The *CHA* was the first study to comprehensively assess the community health status in the city of El Paso. The *CHA* report, together with the Community Health Improvement Plan (CHIP) to be developed based on the *CHA* results, will be used to apply for the National Public Health Department Accreditation.

Four major sources of health related data were identified in the *CHA*: the *2013 County Health Rankings and Roadmaps (CHRR)* by the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute; the *Behavior Risk Factor Surveillance System (BRFSS)* by the Centers for Disease Control and Prevention; the U.S. Census Bureau; and the Texas Department of State Health Services.

The CHRR was cited throughout the *CHA* to provide comparisons between El Paso with other Texas counties and national benchmarks. The CHRR was developed by the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute to measure the overall health of each county in all 50 states on the factors that influence health. The rankings were made for two dimensions: first, Health Outcomes, which include mortality and morbidity; second, Health Factors, including health behaviors, clinical care, social and economic factors and physical environment.

The BRFSS by the Centers for Disease Control and Prevention was also utilized throughout the CHA report to reveal various community health outcomes and factors, including:

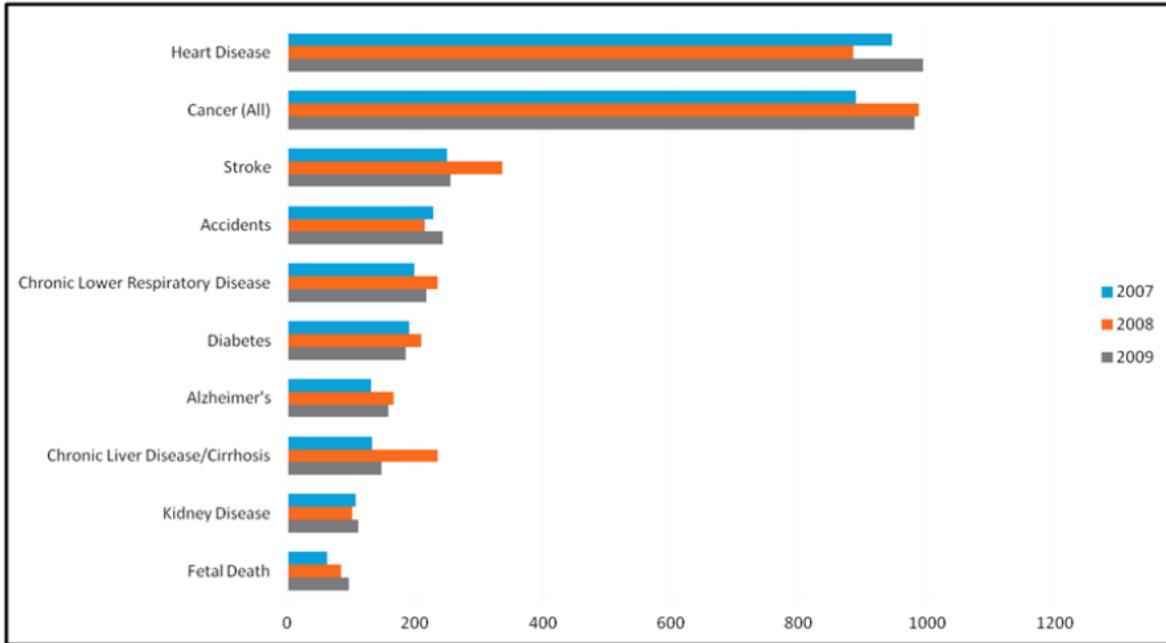
- Percent of adults who are overweight
- Percent of Adults Consuming <5 Servings of Fruits/Vegetables Daily
- Percent of adult cigarette smokers
- Percent of adults never screened for HIV
- Percent of women receiving pap test
- Percent accessing sigmoid/colonoscopy
- Percent of adults with heart disease
- Percent of adults not taking HBP medication
- Percent of adults reporting adequate social or emotional support

The U.S. Census Bureau was also an important *CHA* data source for the social-economic-health status and neighborhood food business environment in El Paso, including:

- Population and Population Density (2006-2010 American Community Survey 5-Year Estimates)
- Percent change of population from 2000-2010 (2000 Census of Population and Housing, Summary File 1; U.S. Census Bureau, 2010 Census of Population and Housing, Summary File 1)
- Linguistic isolation (2006-2010 American Community Survey 5-Year Estimates)
- Median age (2006-2010 American Community Survey 5-Year Estimates)
- Percent population living below 100% Federal Poverty Level (2006-2010 American Community Survey 5-Year Estimates)
- Percent children living below 100% Federal Poverty Level (2006-2010 American Community Survey 5-Year Estimates)
- Percent population living below 200% Federal Poverty Level (2006-2010 American Community Survey 5-Year Estimates)
- Percent children living below 200% Federal Poverty Level (2006-2010 American Community Survey 5-Year Estimates)
- Percent Population Receiving SNAP Benefits (Small Area Income and Poverty Estimates (SAIPE), 2009)
- Percent Population with No High School Diploma (2006-2010 American Community Survey 5-Year Estimates)
- Fitness Facility Rate – 2010 (County Business Patterns, 2010)
- Fast Food Restaurant Establishment Rate – 2010 (County Business Patterns, 2010)
- Grocery Store Establishment Rate – 2010 (County Business Patterns, 2010)
- Uninsured Population (2008-2010 American Community Survey 3-Year Estimates)
- Population Receiving Medicaid (2008-2010 American Community Survey 3-Year Estimates)
- Liquor Store Establishment Rate – 2010 (County Business Patterns, 2010)

The Texas Department of State Health Services was a source of *CHA* data about children vaccinations, density of diseases (e.g. tuberculosis, Gonorrhea, Syphilis) and leading causes of

death in El Paso, late AIDS diagnoses, prenatal care, infant and fetal deaths, low birth weights, as well as screening tests (blood stool test, prostate cancer screening, cholesterol check). Figure 5 is a chart of El Paso County mortality causes.



Source: Texas Department of State Health Services Center for Health Statistics

Figure 5. Leading Causes of Death in El Paso County, 2007-2009.
(New Solutions, Inc., 2013, p. 66).

3 SOCIAL, ECONOMIC, AND HEALTH DATA SOURCES

As summarized from the previous Section, sources of social, economic, and health vulnerability data used by agencies and organizations in El Paso include:

- Federal sources
 - Centers for Disease Control and Prevention – Behavioral Risk Factor Surveillance System
 - U.S. Department of Commerce, Bureau of Economic Analysis
 - U.S. Department of Commerce, U.S. Census Bureau – Census 2000, Census 2010, and American Community Survey
 - U.S. Department of Housing & Urban Development
- Local/University sources
 - El Paso Central Appraisal District
 - El Paso Economic Development Department
 - Institute for Policy & Economic Development, UTEP
 - Paso Del Norte Information Exchange
- Private sources
 - Advameg, Inc.
 - Consultants/other private data providers
 - Labor Market Institute
 - Program participants
 - StatsAmerica.org

Many of the local/university and private data sources utilize U.S. Census Bureau data as well, and the ubiquity and coverage of this demographic data source, particularly for social and economic population characteristics, is especially relevant. Census data are discussed further in Section 3.1, and health data sources are described further in Section 3.2.

3.1 CENSUS DATA

The U.S. Census data are good sources to help local governments and researchers understand the socio-economic status of communities and their residents. Useful Census data include:

- Public data from the decennial census available at various geographic levels, such as Tracts, Block Groups, and Blocks. The data provide information about the socio-economic characteristics of a community. Decennial data, especially those at finer geographic levels such as Block Groups, can only be accessed a few years after original data are collected.
- Public data from the American Community Survey (ACS), conducted every year, provide socio-economic data about a community based on a limited sample (about 2 million respondents every year for the whole country). The 5-year estimates, which

- are produced based on five year averages of ACS data, provide socio-economic data at the Block Group level, and have smaller margins of error than 3-year estimates.
- Public Use Microdata Sample (PUMS) files, available for the Decennial Census and the American Community Survey, provide socio-demographic information at the individual level. The data are synthetic in that the “individuals” are created and assigned socio-economic characteristics so that they could be used to prepare tabulation at any level (e.g. a particular area in a city) while preserving confidentiality.
 - Census Microdata, which are individual level data collected directly from the respondents, may be accessed through a Census Data Research Center. The only center in the Southern US is the Texas Census Data Research Center located on the Texas A&M University campus. The approval process for using these data is lengthy and data must be used under strict conditions and under close supervision from CDRC managers.

3.2 HEALTH DATA

Health data can be accessed from various sources:

- Programmatic administrative data—Participants of the health programs often fill out forms to report their socio-economic-health information. For example, about 45,000 participants of the WIC (Women, Infants and Children) program in El Paso have reported their socio-economic-health status to the government (e.g. education, income, family sizes, smoking/non-smoking,) and their residential locations could be identified at least to the Zip Code level.
- Health statistics available at the State Department of Health. For example, in Texas, the Department of State Health Services Center for Health Statistics is a portal for comprehensive health data in Texas. Their data could be used to assess community health and plan for public health.
- National health survey data. For example, the Behavioral Risk Factor Surveillance System survey is an on-going telephone survey by the Centers for Disease Control and Prevention (CDC). Local governments could extract the data for their communities. A limitation of BRFSS, as reported by a representative from El Paso local government, is that the telephone-based approach may automatically exclude some residents.
- Regional health information networks. The sharing of electronic medical records is still rare in the US, but is on a rising trend. On November 26, 2012, the Paso del Norte Health Information Exchange was established as an electronic medical record sharing network in El Paso. This system provides access to data about patients’ hospital/physician visit and lab results. While helping the doctors, such a system could be a potential great source of information to better understand the status of community health in El Paso.

4 SOCIAL, ECONOMIC, AND HEALTH DATA NEEDS

The public Census data, including those from the Decennial Census, the American Community Survey and the Public Use Microdata Sample, have two major issues in revealing the socio-economic characteristics of local communities. First, a significant time lag exists. These data are usually unavailable for a few years after being collected. Second, these data may be biased due to under-reporting, especially in communities with high proportion of immigrants. Third, underlying variability in population estimates that are derived from surveys/sample data (such as the American Community Survey) are often unaccounted for when used in analyses.

In spite of these limitations, representatives from the agencies and organizations who we contacted generally indicated the level of data available for social and economic population characteristics in El Paso meet their needs. Some representatives indicated that even if population data were available at more refined scales, e.g., block or individual levels, current agency programmatic, personnel, or analytical resource constraints would preclude use of these data.

However, micro-level data are currently being used in some analyses, including those that consider aspects of population vulnerability; for example, the El Paso Fire Department uses parcel level data in its SOC/risk analysis. For evacuation operations, knowledge of individuals' characteristics and locations would also be very important, especially about residents with limited mobility and disabilities. While such data may be available on a piecemeal basis from social and faith-based organizations, or provided by community members themselves, a comprehensive source of social vulnerabilities of community residents could be useful for emergency planning.

Other assessments might examine population risks and vulnerabilities to hazardous materials incidents, including those associated with HazMat transport. Depending on the type and nature of the incident and the material involved, the potential impact zone may range from hundreds of feet to several miles. Data are available about sources of risk, such as locations of facilities, transportation routes, and HazMat transport incidents, and incorporating micro-level data in these analyses could be especially informative. This can also apply to populations in close proximity to other environmental hazards, such as measuring effects of vehicle particulate emissions on public health. However, as noted in Chapter 3, Census microdata have limited availability for public use. Thus, a mechanism by which such data could be made available for research on population vulnerabilities in El Paso is essential for this level of analysis.

According to our interviews with agency/organizations, many immigrants living or working in El Paso avoid reporting data to government agencies. While the needs cited for data about these populations as discussed in our interviews were regarding economic and health assessments, they are applicable for environmental hazard vulnerability assessments as well. A related need for the El Paso area is data availability for Juarez, Mexico. For example, the El Paso Fire Department SOC/Risk Analysis notes the need to analyze cross-border risks. This applies not only to sources of risk in Juarez, but also to impacts on its citizens.

With respect to health data, the El Paso Department of Public Health is very interested in participating in the Paso del Norte Health Information Exchange system. The data about the

hospital/physician visit and lab results would be very helpful to the department in understanding the community health status. Such a system was just launched with a limited number of products. The city just completed the Community Health Assessment and Improvement Plan (described in Section 2.2.5). The plan was developed in order to apply for the national public health agency accreditation and could help the city effectively plan its resources in addressing the community health issues. The CHA lists five-year goals, and the city Department of Public Health expects to perform another assessment in five years. Diabetes and obesity are among the top priorities for the city. The Department currently relies on data from the Behavioral Risk Factor Surveillance System (BRFSS) to monitor diabetes and obesity status for El Paso. However, the Department is aware of the sample selection bias of BRFSS as a telephone survey, and therefore needs a better data source to assess the diabetes and obesity status.

Finally, we note the need for better integration of currently-available socio-economic-health data, and for the use of a comprehensive range of such data in public policy evaluations, recommendations, and decision-making. Recalling comments by Lindell and Perry (2004) about the interrelatedness of population characteristics that contribute to hazard vulnerabilities, our research indicates that population data are typically presented as single-variable background data about the El Paso community, and only in select instances are these data being considered jointly, across data types, to assess population vulnerabilities. Where this is being done, such as in EPFD's Standards of Cover analysis, a limited number of constructs are included.

Another example, the H+T Affordability index (described in Section 2.2.1), includes eight variables that relate primarily to housing, transport, and economic characteristics of El Paso residents. As indicated by CNT (2009) these data alone do not provide a complete view of the concept affordability. Further, while the City of El Paso's comprehensive plan recommends adoption of the H+T Affordability index as part of its housing policies, it is not mentioned in the *Plan's* chapter on transportation. The *Plan's* Transportation Bicycle Outreach Policy 4.9.10 states a goal of "[developing] bicycle policies and programs that address geographic, racial, ethnic, economic, environmental, and public health disparities;" however, this is not extended to other transportation applications. EPMPO's *Transportation Plan* does not mention the H+T Affordability Index either (possibly because it does not fully address requirements for Title VI/environmental justice analyses). While EPMPO's *Transportation Plan* refers to development of GIS models, this is described as a work in progress.

By considering a range of population characteristics across social, economic, and health constructs, planning for transportation, health, local economy, and environmental hazards mitigation can be made more equitable and effective, and can also satisfy regulatory requirements at the same time. Such data need be carefully evaluated for inclusion in indices and/or multivariate models which are intended to measure causality, since high collinearity among independent variables can result in biased and inconsistent estimates of effects.

5 RECOMMENDATIONS

Based on our literature review and interviews, we provide the following recommendations for improve social, economic, and health data availability for agencies, organizations, and researchers, including for El Paso, Texas.

First, organize training sessions about how to utilize the census data to understand and forecast the socio-economic characteristics of local communities, estimate future needs for health, housing and transportation for the future. Various application tools are available. For example, the Federal Highway Administration has the Census Transportation Planning Products (CTPP), which make the Census data, especially the American Community Survey data, accessible for local planners.

Second, improve the communication with national/state agencies. Many national/state agencies maintain databases about a corresponding issue. For example, the Department of State Health Services maintains a Center for Health Statistics, which could be used as a source of information for assessing community health and for public health planning. The center could also provide technical assistance to help the local agencies to appropriately use the data and develop innovative techniques for data dissemination.

Third, access and/or collect socio-economic-health data through a third party. Expertise about socio-economic-health data is widely available among researchers and consultants in research institutions, and private companies, and non-profit organizations. Depending on their needs, local communities may hire consultants/researchers to collect needed data, or access a third-party database (e.g. the Paso del Norte Health Information Exchange System) through a contract. Public health researchers from the University of Texas at El Paso have carried out a number of projects in the Paso del Norte region; valuable health related data have been collected through these efforts, e.g. from migrant farm workers and children living in high air pollution neighborhoods.

Fourth, establish relationships with Census Data Research Centers that would enable access to micro-level Census data. These data could be extremely valuable for a wide range of research on transportation and environmental hazards assessments and population vulnerabilities. The nature of CDRC data access requires extended approval processes and strict protocols regarding data usage, and establishing on-going relationships and research project topical areas may help with understanding CRDC processes by researchers, and research topical areas by CRDC managers.

Fifth, identify social, economic, and health variables that are applicable to El Paso as well as other border regions, representative of underlying constructs, are broadly-available, and satisfy regulatory requirements such as those of Title VI and Executive Order 12898. These data can be combined using appropriate statistical techniques into indices that represent the underlying constructs, and made available to researchers and agencies/organizations. Developing a comprehensive set of social, economic, and health measures and making associated data and documentation broadly available could build on prior efforts and help ensure analytical consistency across a variety of applications.

Sixth, use social, economic, and health variables in to enhance assessment and analysis in planning studies for transportation, health and emergency management. Examples include analysis of population vulnerabilities to hazardous materials transport incidents, or to particulate emissions from vehicles. Some agency/organization applications are beginning to use a range of data types in comprehensive analyses, and academic research on socio-economic-health vulnerabilities to environmental hazards continues to develop. This can be expanded as more data become available, analytical resources improve, and data utility and applications are better understood.

REFERENCES

- Adger, W.N., Brooks, N., Kelly, M., Bentham, G., Agnew, M., & Eriksen, S. (2004). *New Indicators of Vulnerability and Adaptive Capacity*. Technical Report 7. Norwich, UK: University of East Anglia, Tyndall Centre for Climate Change Research.
- Burton, C., & Cutter, S.L. (2008). Levee failures and social vulnerability in the Sacramento-San Joaquin Delta Area, California. *Natural Hazards Review*, 9(3): 136-149.
- Centers for Disease Control and Prevention [CDC]. (2013). Environmental hazards and health effects: About the program. Environmental Hazards and Health Effects Program. Accessed online August 2013 at: <http://www.cdc.gov/nceh/ehhe/>.
- Center for Neighborhood Technology [CNT]. (2009). *Housing + Transportation Affordability in El Paso*. Chicago, IL. February.
- City of El Paso, Texas. (2012). *Plan El Paso*. March 6.
- Cutter, S.L. (1996). Vulnerability to environmental hazards. *Progress in Human Geography*, 20(4), 529-539.
- Cutter, S.L., Boruff, B.J., & Shirley, W.L. (2003). Social vulnerability to environmental hazards. *Social Science Quarterly*, 84(2): 242-261.
- Drozd III, O., Calderazzo, M., Warling, W., Pena, S., Cadd, G., Quinn IV, T., Rodela, E., & Reglen, D. (2012). *Community Risk Analysis and Standards of Cover*. El Paso, TX: El Paso Fire Department. February.
- El Paso Metropolitan Planning Organization [EPMPO]. (2012). *Amended Mission 2035 Metropolitan Transportation Plan*. December 7.
- Hahn, M.B., Riederer, A.M., & Foster, S.O. (2009). The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique. *Global Environmental Change*, 19: 74-88.
- Hunter, L.M., (2005). Migration and environmental hazards. *Population & Environment*, 26(4): 273-302.
- Kingham, S., Pearce, J., & Zawar-Reza, P. (2007). Driven to injustice? Environmental justice and vehicle pollution in Christchurch, New Zealand. *Transportation Research Part D*, 12: 254-263.
- Lindell, M.K. & Perry, R.W. (2004). *Communicating Environmental Risk in Multiethnic Communities*. Thousand Oaks, CA: Sage Publications.
- Lindell, M.K., Prater, C.S., & Perry, R.W. (2006). *Fundamentals of Emergency Management*. Emmitsburg, MD: Federal Emergency Management Institute, Federal Emergency Management Agency.

- New Solutions, Inc. (2013). *Community Health Assessment: Final Report*. City of El Paso, Department of Public Health. July.
- Rygel, L., O'Sullivan, D., & Yarnal, B. (2006). A method for constructing a social vulnerability index: An application to hurricane storm surges in a developed country. *Mitigation and Adaptation Strategies for Global Change, 11*: 741-764.
- Schmidtlein, M.C., Deutsch, R.C., Piegorsch, W.W., & Cutter, S.L. (2008). A sensitivity analysis of the social vulnerability index. *Risk Analysis, 28*(4), 1099-1114.
- Shah, K.U., Dulal, H.B., Johnson, C., & Baptiste, A. (2013). Understanding livelihood vulnerability to climate change: Applying the livelihood vulnerability index in Trinidad and Tobago. *Geoforum, 47*: 125-137.
- Tate, E. (2012). Social vulnerability indices: A comparative assessment using uncertainty and sensitivity analysis. *Natural Hazards, 63*:325-347.
- Texas Department of Transportation [TXDOT], Office of Civil Rights. (2013). *Title VI Review of the El Paso Metropolitan Planning Organization*. July 16.
- Wu, S., Yarnal, B., & Fisher, A. (2002). Vulnerability of coastal communities to sea-level rise: A case study of Cape May County, New Jersey, USA. *Climate Research, 22*: 255-270.