DATA SHARING BETWEEN TRANSPORTATION PLANNING AND PUBLIC HEALTH: ISSUES AND OPPORTUNITIES USING A REGIONAL ECO-LOGICAL FRAMEWORK

by

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ABSTRACT

DATA SHARING BETWEEN TRANSPORTATION PLANNING AND PUBLIC HEALTH:

ISSUES AND OPPORTUNITIES UNDER

A REGIONAL ECOSYSTEM

FRAMEWORK

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Transportation planning has been shown to strongly impact public health yet collaboration and data or information sharing between the two communities is lacking. The Eco-Logical approach is a potential solution designed to advance transportation planning through an integrated planning process that includes other stakeholders. However, since the Eco-Logical approach provides no guidance on forming collaborations, network theory will be used to fill this hole. Both the Eco-Logical approach and network theory place heavy emphasis on information sharing and data exchange. This study will examine the current status of data sharing between transportation planning and public health through an analysis of available literature and case studies, and a survey of transportation planners and public health professionals in the Dallas Fort-Worth Metropolitan Area. Dallas-Fort Worth is area is significant for its growing population and lack of state or regional controls over planning. The purposes of

the research are to identify opportunities and barriers to data sharing between the two communities and to make recommendations to improve data sharing.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Figure Page

LIST OF TABLES

CHAPTER 1

THE RELATIONASHIP BETWEEN TRANSPORTATION PLANNING AND PUBLIC HEALTH, THE ECO-LOGICAL FRAMEWORK, AND NETWORK THEORY

1.1 Introduction

The relationship between public health and transportation planning continues to be examined by researchers. Current research shows health access, health behaviors, and public health outcomes are influenced by transportation and the built environment. Transportation planning is related to opportunities for physical activity (Frank et al 2004; Frank & Engeike 2001; Lin & Moudon 2010; Saelens & Handy 2008). Transportation has also been linked to exposure to harmful pollutants caused by vehicle emissions (Maantay 2007). Asthma, obesity, diabetes, and heart disease are a few of the negative public health effects influenced by transportation (APHA 2010).

Despite recognition of the relationships between the two fields, public health and public health data are not a traditional part of the transportation planning process. Public health is still not often invited to the planning table. A series of case studies in collaboration by the Federal Highway Administration (FHWA) reveals that only two of fourteen case studies on successful collaboration for major transportation projects noted public health as a stakeholder (TRB 2010f, TRB 2010a). The lack of incorporating health data and health organizations into the planning process is unfortunate since human health is an important part of the ecology of cities and is influenced by transportation. Public health needs to be included in the regional planning process to ensure that health factors are considered. Issues of obesity, asthma, and access to medical services are outcomes of the complex individual factors and environments that neither field has adequate or complete information to address. Collaboration between these two fields, especially sharing data, is needed to create more thorough understandings of health and

environments. Public health brings information on local and regional health issues while transportation planning brings in a regional infrastructure perspective. Both perspectives and datasets are needed to address complex public health issues. Planners and public health professionals need to identify common goals and data used by both agencies needs to be analyzed early in the planning process. Areas of missing data should be identified and useful data needs to be shared with transportation planners in order to create plans that better consider health factors for healthier communities.

The main purposes of this thesis are to understand the status of data sharing between the two fields in general, and to identify barriers to and opportunities for data sharing between public health and transportation planning through an internet survey of transportation planning and public health organizations in the DFW area. This research is a piece of a larger project that looks at improving collaboration between these two fields using the Eco-Logical Framework and Network Theory in the Dallas Fort Worth Area. The Eco-Logical Framework promoted by the Federal Highway Administration (FHWA) delineates a system of planning that differs from traditional transportation planning. It is a more inclusive, collaborative process that allows for comprehensive consideration of all factors including public health. Collaboration is needed to address current and complex health issues in metropolitan regions. To better understand interagency collaboration, it is necessary to supplement the Ecological Framework with another theory about how collaborations work. Network theory is chosen because it provides a framework for understanding non-hierarchical collaborations among organizations. Knowledge management, one of the key elements of the theory, will be particularly useful in understanding data and information sharing between the two fields. Knowledge management views data sharing activities as an avenue for new understandings and knowledge creation that can lead to action and collaboration. Improving data and information sharing can help planners and public health develop new information and knowledge. To improve and encourage data sharing, barriers and opportunities at all levels should be identified and addressed.

The DFW Metroplex was chosen as the location for the research because it is a large, growing metropolitan area with a number of counties and cities, representative of fragmented government structure in many other regions across the United States. DFW is also nationally significant by virtue of its large population and economy. The 2010 census placed the population of the Dallas-Fort Worth-Arlington Combined Statistical Area at 6,371,773 people making it the fourth largest in the county and one of the fastest growing (US Census 2010). In addition it is ranked 9th in the nation for Total Personal Income by the Bureau of Economic Analysis (2011). No case studies on collaboration between transportation planning and public health have taken place in Texas to date despite the fact that public health is included in the Vision North Texas process, a public outreach project that motivates all stakeholders to develop a vision for the future of the region (Parker, Jones, Janoski, Slonaker, and Morales 2009).

1.2 The Relationship between Transportation Planning and Public Health

The relationship between transportation planning and public health is an important motivator for collaboration. The common threads that link the two fields are too large or complex for one organization to tackle alone. Five main linkages emerge from the literature on transportation and public health. One link is the affects of transportation based air pollution on respiratory disease, particularly asthma in children. A second has focused on the relationship of increased car dependence to obesity and related diseases such as diabetes and heart disease. Similarly living in walkable environments and using public transit have been linked to increased levels of physical activity, though results are mixed. A third, and more obvious link, is deaths and injuries that result from vehicle accidents. Stress from commuting is another component, though less understood. Lastly, direct access to medical care and services can be provided or hindered by transportation services. Understanding these links provides direction for collaborations and data sharing. This literature helps to identify areas of overlap and gives direction on what data could be shared to benefit both transportation planning and public health.

1.2.1 Traffic and Asthma

Research has shown that certain transportation infrastructure aggravates asthma, particularly for children who are more vulnerable to the disease. One study found that living near high traffic roads has been shown to increase the odds of chronic respiratory symptoms for children, using NO2 levels to define the difference (Oosterllee et al. 1996). Living in proximity to high densities of roads has also been correlated to increased asthma hospitalization for children when controlling for demographic and income factors (Li and Newcomb 2009). Another study found that adults living within highway buffers have a 17 percent increased likelihood of asthma hospitalization, though this study did not control for economic or racial disparities (Maantay 2007). The reason for increase asthma aggravation near roads is that vehicle emissions are sources of ozone, nitrogen dioxide, sulfur dioxide and particulate matter, compounds that have been shown to aggravate asthma (Maantay 2007, Grineski 2007). Those living in close proximity to heavy traffic appear to suffer more from asthma and respiratory illness.

Transportation infrastructure that can reduce asthma hospitalization is public transit and non-motorized modes. In a frequently cited study, childhood hospitalization for asthma decreased significantly in Atlanta during the 1996 Olympics when citizens were heavily encouraged to switch to public transit (Friedman et al 2001). This suggested respiratory health might be improved significantly if non-motorized and transit modes were used more frequently and personal vehicles less frequently.

The traffic and asthma connection also raises issues of environmental justice. Consistently, low-income and minority persons have been found to have higher exposure to traffic related environmental air pollutants (Grineski 2007). Adding to this research it is found that even though they are more likely to suffer from poor air quality low income persons are less likely to be contributing to pollution (Kingham et al 2007). This environmental justice issue is particularly important to consider as low-income persons and minorities have less access to health care and higher rates of health disparities.

1.2.2 Transportation and Obesity

A large and recent body of literature looks at transportation infrastructure and its effects on obesity and related diseases. Many reviews of this literature have concluded that the built environment does affect physical activity in terms of walking (Frank & Engeike 2001; Lin & Moudon 2010; Papas et al. 2007; Saelens & Handy 2008). Furthermore, the changes in activity patterns have the potential to impact public health (Lin & Moudon 2010; Saelens & Handy 2008).

Walkable neighborhoods supporting active transportation and transit use can benefit health while car dependent neighborhoods are detrimental and linked to higher rates of obesity and disease. Walkable areas with connected street patterns were associated with increases in non-motorized transportation, lower body mass index (BMI), and fewer Vehicle Miles Travels (VMT) (Frank et al 2006, Sallis et al. 2009; Rodriguez et al 2006). Looking at factors of the transportation environment that make neighborhoods walkable, accessible sidewalks (Rodriguez et al 2006) and connected street patterns (Frank et al 2006) are important. Public transit may help to reduce obesity as most transit users walk to transit or from transit to reach their end destination. In the process they attain higher levels of physical activity. A study of transit and non-transit users shows transit users are more likely to meet the recommended 30 minutes of moderate physical activity per day suggested by public health (Besser and Dannenberg 2005). This research suggests that transit networks may help in encouraging physical activity to reduce obesity and related diseases.

Urban sprawl, or living in less walkable neighborhoods, has been associated with increased likelihood of obesity, weight, and hypertension (Ewing & Cervero 2001, Ewing et al 2003; Giles-Corti 2003; Sallis et al. 2009). Living near a highway, lacking sidewalks, and the perception of no walking paths are characteristics of the built transportation environment that deter walking (Giles-Corti et al 2003). Higher vehicle dependency can also be problematic, every hour spent in a car is found to be correlated to a six percent increase likelihood of obesity

(Frank et al 2004). Not only do transportation environments affect behaviors but these behaviors have been directly correlated with various health indicators and outcomes.

1.2.3 Traffic Accidents and Public Health

An obvious link is that of traffic accidents. The Center for Disease Control (CDC) maintains information on crash deaths and cost of those deaths. Every year 30,000 people die in car accidents costing 41 billion dollars. This is the leading cause of death for those 5 to 34 in the United States. The 2.3 million adults injured are estimated to cost another 99 billion dollars (CDC June 8, 2011). The National Highway Traffic Safety Administration under the National Department of Transportation also maintains data on vehicle crashes with the Fatalities Analysis Reporting System (NHTSA June 8, 2011). This area is noted by public health as an area where public health should take an interest in transportation (American Public Health Association 2010). Pedestrian, bicycle, motorcycle, and car safety all should be improved.

1.2.4 Transportation and Mental Health

A forth link is the stress created by long car commutes and heavy traffic that can have detrimental effects on mental health. Noise, stress from time spent in traffic, and accidents all have a negative impact on mental health (American Public Health Association 2010). Though little concrete information is available on this link between the two fields, it is felt important by some in public health.

1.2.5 Access to Medical Services.

Lastly, access to medical services is another important factor for transportation to address. Transportation infrastructure can affect access to medical services by making it more or less difficult to reach clinics, hospitals, and other places where people receive medical care. Doctors can be clustered in one area of a city making access unequal. Guagliardo (2004) used GIS kerneling techniques to show that the density of pediatricians in Washington DC was clustered in such a way that low-income and minority youth had less access. The Children's Health Fund also reports that many low-income children lack physical access to doctors (Grant

2001). Public transportation advocates support the idea that transit provides a transportation service for many to reach the doctor's office citing the percentages of clinic patients that use public transportation for non-emergency visits. Others find through interviews that geographic factors and transportation systems do contribute to access to medical services and may be even more significant than individual factors (Wellstood et al 2006). This is an important link where the two fields could work together to improve access to healthcare.

1.3 Eco-Logical Framework

The Eco-Logical approach may help incorporate public health into transportation planning based on the five linkage above. This framework is promoted by the FHWA to improve the transportation planning process in order to create sustainable ecosystem. According to Brown (2006), Eco-Logical framework is defined as:

> "*A method for sustaining or restoring Eco-Logical systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates Eco-Logical, economic, and social factors. It is applied within a geographic framework defined primarily by Ecological boundaries*." (Brown 2006, p.#).

The framework does this by developing a more collaborative planning process. It is designed to involve more agencies in defining issues to be addressed in a regional context rather than having one agency be responsible. Under the Eco-Logical framework stakeholders first meet to determine mutual goals and visions and then engage in integrated planning. The data from each organization is shared at the beginning of the planning process providing complete understandings of environment, transportation needs, and constraints. This allows areas where heavy mitigation might be required to be excluded from consideration at the outset. This can be thought of as a more proactive multi-agency approach to planning. The Eco-Logical framework better incorporates mitigation opportunities, lessons costs, and results in better planned infrastructure.

1.3.1 Structure of the Eco-Logical Framework

The first step in the Eco-Logical approach is integrated planning, the second step is mitigation and the third is performance review. Step one; integrated planning means goals and visions are developed across organizations. Planning then makes use of all data and expertise in each participating organizations. An eight step method is proposed to facilitate integrated planning:

1. Build and Strengthen Collaborative Partnerships;
2. Identify Management Plans;
3. Integrate Plans;
4. Assess Effects;
5. Establish and Prioritize Opportunities;
6. Document Agreements;
7. Design Projects Consistent with Regional Ecosystem Framework and;
8. Balance Predictability and Adaptive Management (Brown 2006).

Using an integrated planning approach will help identify areas where step two: mitigation will be most effective. Mitigation can include avoiding an impact, minimizing an impact, repairing an impact, reducing an impact, or compensating for an impact. Performance measurements, step three, are used to quantitatively review results of the integrated planning and mitigation. Performance measurement is important in determining the successfulness of the project and for improving future works. It is important to note that the Eco-Logical framework process is non-prescriptive; it may be modified to suit the needs of the particular agency or the plans they are working on.

1.3.2 Comparison with Traditional Transportation Planning

This Eco-Logical framework differs significantly from traditional transportation planning in terms of method and information used. Traditional transportation planning has predominantly followed the rational planning method. Though several collaborative and public processes are

required by federal transportation legislation, currently the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), little has fundamentally changed in the process. Transportation planning legislation brings in elements of equity planning theory and communicative planning theory but largely the process adheres to the rational method.

1.3.2.1 Method

The first major difference is that the rational planning approach functions like a scientific method, outlining procedural steps. Should the steps be followed the outcome will likely be optimal. Rational planning begins by defining goals and objectives, then problems are identified, alternatives are devised, and then evaluated. Mitigation is considered only at the end of the process so optimal alternatives might not be considered as they would in the Eco-logical Framework. Finally, the optimal alternative will be selected (Meyers and Miller 2001). This process is very linear, though in practice there is overlap and iteration between steps.

Over the years the process has become even more transparent and iterative allowing for meaningful public engagement and the ability to address concerns that might be raised primarily as a result of federal level legislation. For example, SAFETEA-LU passed in 2005 requires public input as well as consultation with historical and environmental agencies. Previously the Transportation Equity Act of1998 and Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) had similar requirements. Amendments to the Clean Air Act in 1990 require plans for obtaining National Ambient Air Quality Standards. The National Environmental Protection Agency requires even more consideration of environmental data as all federally funded projects are required to submit Environmental Analysis (EA) and, if necessary, an Environmental Impact Study (EIS) (FHWA 2010). Widespread involvement of stakeholders and examining impacts of air quality, environment, and environmental justice in planning came about largely because of federal legislation.

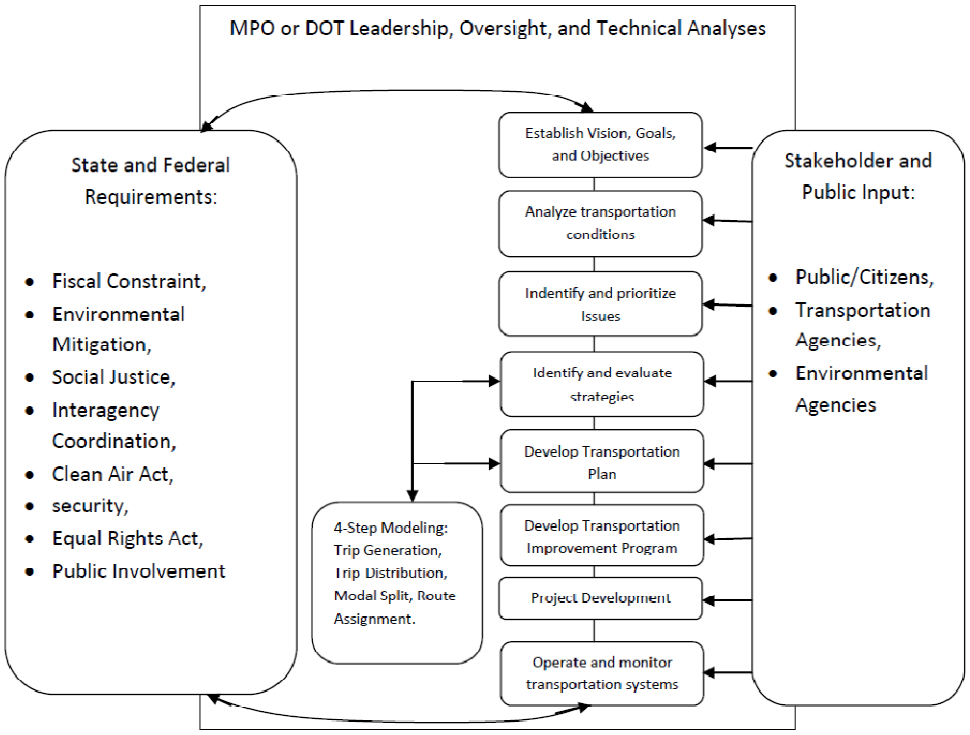


Figure 1.1 The Current Transportation Planning Process

The Eco-Logical framework, on the other hand, uses three main steps discuss previously; integrated planning, mitigation options, and performance measurement. While these steps can be broken down further the process is more easily tailored to various agencies and their needs. This allows multiple agencies to be involved in identifying issues and setting goals. It lacks the prescriptive oversight of a single group, "The approach shifts the Federal government's traditional focus from individual agency jurisdiction to the actions of multiple agencies within larger ecosystems. It finds ways to increase voluntary collaboration with State, tribal, and local governments, and to involve other landowners, stakeholders, interested organizations, and the public" (Brown, 2006, p.vi). This is one of the most significant differences. In the integrated planning process multiple agencies are deciding on the issues and determining goals and objectives. This has a significant impact on what is determined to be an issue, what information will be used in the process, and ultimately the outcome of the

process. When only traditional transportation agencies are in charge the issues and goals tend to focus on capacity or safety and are less likely to include the environment or social needs. Through the Eco-logical Framework collaborations obtain a better understanding of how projects will affect environments and human health.

Since information is shared from the beginning among different departments, it also inverts the mitigation process to come before identifying potential infrastructure locations. Instead of a plan being created and then analyzed for environmental mitigation or social justice issues, mitigation information is included from the outset. This method allows for areas where higher level of mitigation would be necessary to be precluded from the beginning of the process.

Figure 1.2 The Ecosystem Approach (Source Brown 2006)

1.3.2.2 Data Used

Secondly, the data required for the two processes is different. The data traditional transportation planning considers is often transportation specific, examples are population, employment, traffic counts, travel diaries, congestion rates, and Vehicle Miles Traveled (VMT). These datasets have been found to be useful in the four-step transportation modeling process. This process seeks first to understand where trips are generated, then to understand where

they end, select the most likely mode of transportation, and then select a route for from the start point to the end point. The modeling process is very technical and supported through transportation modeling software.

More and more environmental data is being used earlier in the traditional transportation process to expedite environmental permitting and avoid plans that would carry expensive mitigation requirements but health data is still not included despite evidence that transportation infrastructure can affect public health. Much of the impetus for expanding environmental data use in planning is a result of federal legislation that requires the use of environmental data and environmental justice data. However, public health organizations are not required to participate as historic preservation and environmental agencies are under SAFETEA-LU. Disregard for health data results in many quality of life issues related to transportation not being considered.

The Eco-Logical framework expands the breadth and variety of data used. It focuses on collaborative planning where a broad range of agencies pull together information to best understand the regional context, identify issues, and set goals. For example, in Montana a team collected data on streams, lakes, wetlands, land ownership, road kill, and animal habitats to help plan a highway section to be safer for motorists and wildlife (Brown 2006). The expansion from traditional data to other types of environmental data is due to the Eco-Logical framework's flexibility and multi-agency involvement. The framework is designed to include a variety of data not typically included in traditional planning activities.

1.3.3 Current Application of the Eco-Logical Approach

The Eco-Logical framework is supported by the Federal Highway Administration and outlined in Appendix A to SAFTEA-LU, but it is not required. All implementations to date have been purely voluntary applied primarily to environmental issues. However it is "a vision of how infrastructure development and ecosystem conservation can be integrated to harmonize economic, environmental, and social needs and objectives." (FHWA 2010). The social needs part has not been implemented. Examples where the framework has been used include the

Indiana Habitat Conservation Plan, and Alaska Habitat Connectivity (Brown 2006). Both these focus on environmental issues.

- The Indiana Habitat is focused on protecting bat habitat as highway improvements are made near an international airport.
- The Alaska project looked preventing habitat fragmentation and created a GIS data based tool with environmental information to help transportation planning (FHWA 2010).
- Another more recent example is the North Central Texas Council of Government Regional Eco-system Framework (REF). The REF is organized around water basins. As part of the REF they are working on creating a regional database of contacts (NCTCOG 2010). The list of contacts includes many in environmental management but none in public health (Ryan Strickler, personal correspondence, December 2, 2010).

It appears that while the Eco-Logical approach leaves room for social and human health concerns it has not yet been used to incorporate these needs. In order to address human health needs, which are economic, environmental, and social, public health data also needs to be incorporated and public health organizations should be included as stakeholders in the transportation planning process. As links between public health and transportation systems and the environment are more clearly understood, public health data needs to be incorporated along with environmental data. This will complete the sustianbility triangle ensuring that economic, environmental, and equity factors are included. This research is intended to address this gap in application of the Eco-Logical framework by addressing the potential data types, barriers, and opportunities for data sharing with public health. Incorporating social and health needs in addition to environmental and transportation needs will complete the Eco-Logical Framework.

1.4 Network Theory

One thing the Eco-Logical framework fails to address it how collaborations form and work. Network theory is a useful tool for understanding integrated planning and collaboration required for the Eco-Logical framework. This theory looks at what enables various agencies to form horizontal collaborative networks where actions and learning are mutual. While the focus for this project is on the knowledge management components of network theory, it is good to have a broader understanding. Network theory consists of five main components the management of the collaboration, the decision making process, the structure of the network, knowledge including data and information shared, and performance (Arganoff 2007). Management of the network refers to the leadership of the network and how network members interact. For example, many transportation planning activities are lead by a single organization while others, such as the Woodrow Wilson Bridge Project are lead by a coalition. The leading coalition for the Woodrow Wilson Bridge included the Virginia Department of Transportation, Maryland State Highway Administration, District of Columbia Department of Public Works, FWHA (Transportation Research Board [TRB] 2010f) The decision making process refers to how decisions are made and who is actually involved in decision making. During the Woodrow Wilson Bridge project the four project partners made final decisions but three work groups were established to decide on specific issues, including bridge aesthetics, environmental analysis, and coordination with other groups (TRB2010f). Network structure is how the network is formed. It deals with motivation for collaboration from voluntary collaboration based on similar goals to forced collaboration based on government mandates. In the case of the Woodrow Wilson Bridge, the network formed after a lawsuit through a memorandum of agreement to make the process more collaborative and transparent. Others formed networks based on mutual interest in an issue, such as the network formed in Ingham County between planners, public health, and academics to bring health language into the comprehensive plan.

Performance is the end-result of the network and includes an assessment of how successful the network is in meeting its goals.

Network theory is particularly useful in regards to examining knowledge management as a part of collaboration. Knowledge management is the process of turning data into a product that can be acted on. Knowledge management is a core component of networks and the reason for many networks' existence. As Arganoff states "networks are employed to bridge organizational information gaps and asymmetries." (2006, page 4). Many networks are driven by the need or desire to share data and information to obtain a better result.

Three progressive steps are outlined for knowledge management; they are data, information, and knowledge (Arganoff 2007). Understanding the difference between data, information and knowledge is important to understanding the knowledge management process. Data is processed into information which is in turn processed into knowledge. This is also thought of as "sensemaking, creating meaning in conjunction with others" (Mischen and Jackson 2008). This created knowledge enables collaborative action in networks (Mischen and Jackson 2008, Arganoff 2007). The knowledge can be explicit or implicit, clearly defined and shared or not tracked or shared. At the root of either type of knowledge is some form of data that needs to be shared and a process to create understandings and action. Data sharing through knowledge management can be simultaneously a motivating factor for networks, a tool to facilitate collaboration, and an end result of network collaboration.

The first step using network theory and knowledge management to build collaboration is integrating the existing data and information in both the transportation planning and public health communities. This integration can be done through a variety of tools. Arganoff outlines databases, scientific studies, on-line data collections, reports or studies from federal agencies, and GIS mapping as tools to begin this exchange of knowledge (2007). Sharing information must be completed before the data can be processed into knowledge for action. This thesis looks at the barriers to data sharing in knowledge management to see where barriers might

prevent public health and transportation from being created under a regional Eco-Logical framework.

CHAPTER 2

THE CURRENT STATE OF DATA AND DATA SHARING

2.1 Data Sharing

The current state of data sharing between planning and public health appears to be limited despite a wealth of data in both fields and a growing recognition of the relationships between the fields. In addition a growing number of technologies exist to promote information and data sharing. Likely, technical, organizational, and policy barriers prohibit the exchange of useful information. These barriers need to be indentified and eliminated.

Little is published about interagency data sharing between transportation planning and public health. One survey explored this issue through a stratified electronic survey of 350 National Association of County and City Health Officials (NACCHO) members and 350 American Planning Association (APA) members conducted in 2004 by the APA through membersurvey.com (Morris 2006). The focus was not on transportation planning but on planning in general. The survey found public health representatives reported collaborating fairly regularly and the type of data given by public health to planning department were most likely to be 'environmental quality' (41%), then the 'Behavioral Risk Factor Surveillance System (BRFSS)' (23%), 'obesity' (20%), 'exercise' (18%), 'asthma' (14%) and 'other' (10%) (Morris 2006). The category environmental quality is unclear and could encompass a large range of diverse datasets. The survey focused on bringing health into planning as opposed to creating a two-way exchange, so there was no question addressing data types provided by planners to health organizations. The survey also did not inquire as to how useful the health information was to planners.

In addition to the survey, there are a few examples of data or information sharing between transportation planning and public health in published case studies. In San Francisc0

CA, Atlanta GA, Seattle-King County WA, Denver CO, Ingham County MI, and Delaware County OH public health representatives worked with planners, and usually researchers, to increase collaborations and plan healthier cities and transportation networks.

Many of the collaborations collected new data. Georgia Tech in Atlanta, Georgia carried about an intensive HIA with the Center for Disease Control and Department of Transportation performing an extensive survey to collect data. Seattle-King County also employed a survey modeled off Atlanta's experience. Delaware County OH used the Protocol for Assessing Community Excellence- Environmental Health (PACE-EH) survey a tool from public health for assessing community health and environment as a collaborative tool. These collaborative groups relied on explicit data they gathered specifically for collaboration purposes. New information and knowledge was created though this collaboration leading to consideration of public health in plans and the education of decision makers.

In the case studies, when existing data was shared it was often through reports or written evaluation, rather than the raw data. For example, Denver CO health and planning departments focused more on information exchange then data exchange during development review stage of the planning process. The health department provides feedback on development plans and specific recommendations but does not provide data (Roof and McLennan 2008). This has led to more collaboration and communication between the health and planning departments. The exceptions to focusing on written reports are San Francisco and Ingham County, MI. In Michigan the county health department, university, and government agencies used and shared GIS data. The goal was to bring health into the comprehensive plan. The team collected health data and added it to a GIS inventory to create a tool for Health Impact Analysis. This represents explicit data sharing where the data is posed to be transformed in to information when needed.

The case studies also highlight certain types of data and information that can be shared. In San Francisco the project included census data, hospitalization records, air and

noise modeling and traffic counts (San Francisco Department of Public Health 2010). A survey of planners by the Tri-County Health Department in Denver Colorado found the issues planners most valued health's input on were "wastewater (100%), solid waste/hazardous materials/waste (60%), air quality (60%), and water quality (47%) (Roof and Maclennan 2008). The Delaware General Health District found through that several planning and health issues needed attention including, "an increase in car crash and pedestrian injuries and fatalities, air pollution, asthma, reduced physical activity, weight gain, decreased cardiovascular health, water contamination, threats to mental health, and a reduced "sense of community". The Delaware General Health District came to these conclusion as the result of " county-wide focus groups, key informant telephone interviews, facilitated discussions, and a survey." (Roof and Sutherland 2008 p1). In Seattle and King County it was felt that:

> *"Environmental health professionals can provide added value by giving planners strong health data to support "smart growth" designs and zoning and initiatives that promote a healthier environment and improved quality of life for all. Their involvement also can help make the case for effective street and trail connectivity and design, allowing the public to move around smoothly and safely, breathe cleaner air, drink clean water, and interact in quieter, more cohesive neighborhoods. Conversely, planners can provide health professionals with knowledge of zoning and other planning practices and opportunities and options for engagement in the planning process." (Roof and Oleru 2008, p24).*

From the case studies environmental data and safety data are stressed as information that should be shared.

The current literature on transportation planning and public health is limited to indentifying how transportation affects health, case studies of specific collaborations, and Health Impact Assessments. Identify how transportation affects health is the first step but improving planning and transportation systems to make them healthier is not addressed. While some

case studies speak to planning healthier systems they do not give guidance for others. Health Impact Assessments (HIA) are one option for including health in the planning process but are reactive, much like the current Environmental Impact Analysis, not proactive. Plans are created without using important environment data and then modifications are introduced after environmental groups or health groups review the plan. This does not represent the Eco-Logical framework nor will it provide the most efficient results. This research tries to fill some of these holes by indentifying information that could impact the transportation planning process when used during integrated planning in the Eco-Logical Framework.

2.2 Data Available

As little data sharing currently exists between transportation planning and public health, it is important to see if there is available data that might be useful if shared. Looking at the literature, case studies, and websites of transportation planning and public health organizations, both transportation planning and public health have a wealth data sources available to them. Potentially relevant data sets originate from public health agencies, environmental agencies, the US Census, transportation agencies, and planning departments. This means using the data requires access to many different agencies that have collected different types of data, using different scales and different formats.

2.2.1 Transportation Planning Data

National datasets on transportation are maintained by the Bureau of Transportation Statistics (BTS) and Census Bureau. The BTS maintains many datasets including the Nationwide Personal Transportation Survey. Data is organized by transportation mode or subject such as ‘safety’ or ‘environment’. Additionally, the US Census provides information on demographics and work commutes that are used regularly by transportation planners.

At the regional level, MPOs maintain large amounts of transportation data. Both have data available through online downloads, though security and tracking mechanisms vary. In the case of the North Central Texas Council of Governments (NCTCOG), the MPO for the Dallas

Fort Worth area, GIS data must be requested and is then e-mailed to the requestor, tracking how often and where data is being used. MPOs also provides links to relevant data collected by other groups, such as air quality or water quality data.

At the local level, many cities maintain their own geodatabases of data on transportation, land use, and community features. Some cities allow residents to download static transportation maps while others provide an interface for on-line display of the data. City websites only provide information within the city boundaries but may provide extra detail not covered by regional datasets.

Transportation data available includes infrastructure, land use, economics, travel demand, future plans, political boundaries, natural resources, demographics, air quality, traffic safety and active transportation (or mode choice information). Such commonly used transportation data are further explained below:

- Existing infrastructure refers to all roads, transit routes, bike and hike trails, rail lines and any other aspect of the built environment that relates to transportation.
- Land use data refers to the use of parcels and is important as commercial, residential and industrial uses all have different transportation needs planners address.
- Current and past travel demand is measured in cars per time period traveling over a specific spot. Projections are used to analyze future travel demand.
- Political boundaries refer to boundaries for cities, voting districts, counties and the MPO region.
- Natural resources data refers to data on natural features often including data on soils, slopes, and watersheds.

2.2.2 Public Health Data

In the public health field the Center for Disease Control (CDC) and Department of Human Health Services (HHS) are national organizations overseeing the collection of national data sets. The CDC and HHS maintain the National Health Interview Survey (NHIS), National

Health and Nutrition Examination Survey (NHANES), Community Health Status Indicators (CHSI), Medically Underserved Areas (MUA) and Health Professional Shortage Areas (HPSA). These datasets measure different aspects of public health and cover the entire country, though the geographic unit of aggregation is most often a state or county.

State and county public health departments collect their own data to supplement national level statistics. Several tools used for assessing public health have been developed nationally for local public health departments. Such tools include the BRFSS, PACE-EH, and Mobilizing for Action through Planning and Partnerships (MAPP). The BRFSS is administered locally to develop a dataset; the PACE-EH tool identifies community concerns in environmental health with open-ended questions. MAPP provides a community assessment of health conditions. The results of these tools in aggregated report form are available through downloads or website interfaces. In addition, health departments track various other health indicators and disease rates.

County health departments and some large cities or hospitals collect public health data, though few make it available to the public. An example of a hospital collecting local data is Cooks Children's Hospital's Community-wide Children's Health Assessment and Planning Survey (CCHAPS). The survey is designed to collect information related to home environment, health behaviors, physical and mental health problems, and adult behaviors in the household to understand health risks and behaviors of children in the community (CCHAPS August 22, 2010). Hospitals also maintain release records, used in many studies to find incidence and cause of mortality and ambulatory hospitalizations. These records are reported to state health departments (Texas Department of State Health Services 2010). Records are kept private or data is aggregated to higher levels to ensure no patient's health information is released.

This data used by the public health community can be categorized into health behaviors, health outcomes, safety, health disparities, sanitation, quality of life, environmental quality, demographics, air quality, traffic safety, and active transportation.

- Health behaviors include things such as time spent exercising or walking, eating fruits and vegetables, smoking, drinking alcoholic beverages, and other behaviors that affect personal health. (US DHHS 2000).
- Health outcomes refer to rates of chronic and infectious disease, obesity, premature births, mortality rates, and years of life lost measurements.
- Hospital in and out patient records are sometimes used to find disease rates of to do more local health analysis.
- Health disparities data shows the difference in health access, behavior, and outcomes for people of different locations, incomes, races and genders.
- Sanitation data helps guide health regulations on septic systems, restaurants and other small scale issues focused on preventing spread of infectious disease.
- Public health agencies often measure quality of life in terms of self reported stress, depression, and contentment.

2.2.3 Data Overlaps

There are a few data overlaps between transportation and public health. The overlaps are demographics, air quality, traffic safety, and transportation mode or active transportation data. However, the way these overlapping data are used varies between the two fields. For example:

- Demographics used by planners are those relevant to determining trip generation in the four-step model and include income, age, employment, education, and number of people in the household. For public health common demographics are also age, education, income, and race (Georgia Institute of Technology 2007, TCPHD 2010, TCPHD MAPP II 2004), but this data is often used to highlight special populations that may be a greater health risk. For example, health disparities reports show minorities and women have higher health risk (National Health Disparities Report 2008).

- Air quality is important to planners as all Metropolitan Planning Organizations must maintain conformance with Environmental Protection Agency air quality standards and pay close attention to the six pollutants the EPA regulates. For public health, air quality is related to asthma, respiratory disease, and lung cancers.
- Traffic safety refers the vehicle accidents and is important to transportation planners for improving the safety of transportation systems and important to health because of the injuries and deaths accidents cause.
- Active transportation refers to biking or walking, or any other non-motorized transportation option. For transportation planners this is considered a mode of transportation that is accounted for in the four-step model. For health active transportation is related to higher levels of physical activity and reduced risk for obesity and related diseases.

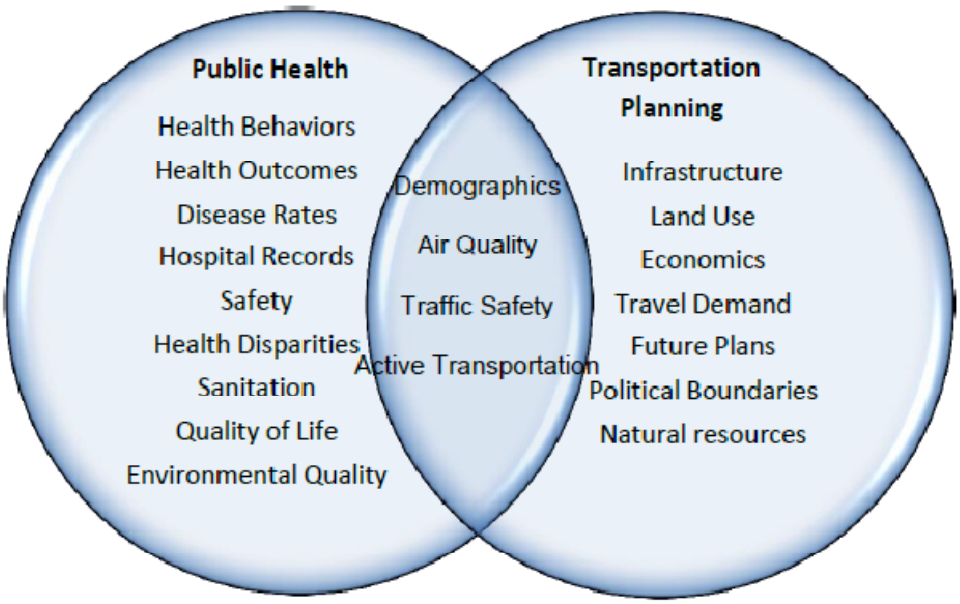


Figure 2.1 Data Overlaps

In addition to current data overlaps, the literature suggests many more opportunities exist for public health data use by transportation planners. Particularly quality of life, health disparities, and health behaviors data may be useful.

- Quality of life data is not examined by planners though transportation infrastructure and land use affect quality of life. Higher exposure to pollution and more time spent in long congested commutes lower quality of life. Quality of life is also strongly related to public health through access to medical services and health outcomes. Higher access to services and health improve quality of life.
- Health disparities are also valuable indicators for transportation planners to be aware of. Minorities are found to have less access to health care (Guagliardo 2004) and suffer more from pollutants (Grineski 2007, Brown 1995). Depending on the specific health disparity, transportation solutions may offer increased access, decreased air pollution, or more opportunity for physical exercise.
- Health behavior data should also be examined by transportation planners to make sure access to appropriate healthy infrastructure or healthy food outlets is not an issue. Health organizations track exercise and eating behaviors (TCPHD BRFSS 2009). Planners can address health issues through creating walkable built environments (Rodriguez et al 2006) and considering food access (Lewis et al 2005), to compliment action steps taken by public health and other agencies.

Demographics, safety, air quality, health disparities, health behaviors, and quality of life appear to be useful to both fields and should be shared. It is unclear if these types of data are being shared between the fields though the literature suggests this might be useful.

2.3 Tools and Technology for Data and Information Sharing

Many tools exist that can help with sharing the above data and information. Arganoff (2007) lists databases, scientific studies, online data collections, reports or studies from federal

agencies, technical bulletins, and GIS Mapping as tools and technologies that promote data sharing under knowledge management. These tools range in terms of the level of technology used and the type of data or information they exchange. Databases, online data collections, and GIS Mapping are all technically more sophisticated tools that use primarily explicit data. These tools require technical knowledge and software programs. Reports and bulletins are much less technology oriented and require readily available software if any.

Looking specifically at the use of technology in collaboration between transportation planning and public health, very little information is available. What is available must be gleaned from case studies on specific collaborations. Transportation collaborations used GIS, visioning software, and modeling programs. The visioning software MetroQuest was used in three of the Transportation Research Board case studies for planning state-wide and regional systems (TRB 2010c, TRB 2010g, TRB 2010e). However, none of these collaborations included public health partners and none stated they used health data, though data lists were not available. This tool was used mostly for displaying information to the public, but quickly combined data and feedback from stakeholders to examine the effect of suggestions. Visioning software, GIS and modeling programs were used for sharing information with network partners, stakeholders, and the public. Other tools, such as ProjectSolve2 are designed to assist in secure communication between organizations leading the project. ProjectSolve2 was used for security in sharing information on the TX I-69 large regional planning project, which did not include public health (TRB 2010b). These are more technical tools that require a larger amount of expertise and technology.

Public health used Health Impact Analysis, reports, checklists and one example used GIS mapping as tools for data exchange in collaborations (Roof and Glandon 2008). These are important tools for sharing information even if they are less technical. HIA and reports have been used by public health organizations in Atlanta, Denver, and San Francisco (Georgia

Institute of Technology 2007; Roof and McLennan 2008; Corburn and Bhatia 2007). These groups prepared reports to provide processed information to planners and decision makers.

The disparity in the case studies between the heavy reliance on modeling and visioning technologies for data sharing in transportation planning and relatively low reliance on these technologies in public health could be a potential barrier. If health departments do have the technology needed they cannot receive or process data sent by transportation planners. Transportation planners, on the other hand, might not know what to do with data and information that does not fit into the tools they currently use. GIS is being used by some health departments and might be a good tool for sharing spatial data as well as visualizing information.

2.4 Potential Data Sharing Issues

From the previous section it is clear many data sources cover information relevant to both transportation planning and public health. However, there are several issues with sharing data that are technical, organizational or related to broad policy environments. Technical barriers can include inability to access the data, or trouble using the data due to various constraints or incompatibilities of systems. Conflicts in the technology used might also present technical difficulties. In addition, issues of scale and data format may affect data sharing between transportation planning and public health. These technical barriers are often the easiest to overcome. At the organizational level the motivation to engage in data sharing or the ability use and process information may be lacking. In addition, planners cannot incorporate health concerns into their plans without accurate and specific information and knowledge of how to interpret that information. These barriers are more difficult and often involve education processes to overcome. Broader policy frameworks such as the Health Insurance and Portability and Accountability Act (HIPAA) laws can also impede data sharing. These barriers need to be addressed before data sharing can be successful.

2.4.1 Technical Barriers

Technical barriers can be further broken down into the location and ownership of the data, the scale, and the data format.

2.4.1.1 Ownership and Collection

Collection of data for transportation planning and public health happens through a number of organizations at different levels; national, regional, and local. This can make finding and accessing the data difficult. Some examples of these data sets by scale and home organization are shown in Table 2.1 below.

Table 2.1 Organizations Collecting and Holding Data

National Organizations	***Data Sets***
Bureau of Transportation Statistics (BTS)	TranStats Intermodal Passenger Connectivity Database
Environmental Protection Agency (EPA)	Toxic Release Inventory (TRI)
Center for Disease Control (CDC)	Behavioral Risk Factor Surveillance Survey (BRFSS) National Health Interview Survey(NHIS) National Health and Nutrition Examination Survey (NHANES)
Department of Health and Human Services(HHS)	Community Health Status Indicators (CHSI) Medically Underserved Areas (MUAs) Health Professional Service Areas (HPSAs)
Regional and Local Organizations	***Data Sets***
Metropolitan Planning Organizations (MPOs)	Traffic Counts Population Commute Patterns Infrastructure
City Planning Departments	City Streets Zoning Transportation Plan Demographics
City or County Public Health Department	Local BRFSS PACE-EH MAPP Hospital Records

Though much data is collected somewhere, the scattered nature of the data makes collecting it time consuming and difficult. Due to this fractured system many public health and transportation professionals will not know what useful data is available outside of their own field.

This is a technical barrier to gathering the data. Solutions include data repository websites clearly structured with variety of data by data type and geography.

2.4.1.2 Data Scale

Compatible data scales are important technical considerations for data sharing. In general transportation data are kept at smaller geographic scales than public health data. Traffic Analysis Zones (TAZ) and census blocks are commonly used geographic scales in transportation data. TAZ and census block are used for transportation modeling, corridor studies, and other planning activities. Even between transportation agencies data scales have posed problems. In Binghamton, the consultant working on the long range transportation plan used different unit of analysis than the MPO's established TAZs. The zones did not align and which created technical problems for the MPO when using the consultant's results (TRB 2010a). While this barrier was overcome in the case study it is a potential issue for other collaborations.

Furthermore, while public health data is collected from individuals, it is aggregated to a high level to protect privacy under HIPAA laws and used to examine regional health patterns. National data from the BRFSS is maintained at the county or metropolitan area scale (CDC BRFSS 2010). Even local health departments only present information at the zip code level (TCPHD BRFSS 2007). The exceptions to these higher levels of aggregations are MUAs and HPSAs which can be as small as census tracks or even specific medical facilities (DHHS HRSA 2011). Table 2.2 shows the common scales used listed from largest to smallest between transportation and public health. Similar scales are lined up so gaps can easily be seen.

Table 2.2 Common Data Scales

Common Transportation Data Scales	*Common Public Health Data Scales*
National	National
County	County
Metropolitan Area	Metropolitan Area
City	City
Population Forecast District	Zip Code
Traffic Analysis Zones	--

Table 2.2 – *Continued*

Census track Parcel	Census track Medical Facility

Scale is an obstacle in incorporating health information into transportation planning because fine grain data is needed for transportation projects. TAZs are particularly important to transportation planners but little public health data is available on such a small scale. Privacy requirements and HIPPA require any potentialy identifying health information or data to be aggregated to larger geographies larger geographies. If some solution could be found to securely share public health data with planners before aggregating it, compare and analyze health with other transportation factors would be easier.

2.4.1.3 Format

Format of publically available data also varies. Format is crucial when incorporating public health data sets into the transportation planning process. Similar formats are needed to compare information, run analysis, and view data. Each organization responsible for maintaining data chooses the format to use. The formats reflect how data is use by its providing organization. Even the method of data collection can pose problems as some variables may be measured differently. CALTRANS and the Texas Department of Transportation encountered these issues during state-wide planning activities. The data they were using came from various MPOs and was not always comparable (TRB 2010b, TRB 2010d). In California, CALTRANS and stakeholders solved this issue by adopting guidelines on consistent indicators and measurement to be used everywhere (TRB 2010d). This suggests format is likely to be a barrier to sharing data.

Looking at the format of data in the public health and transportation planning datasets, there are some distinct differences. Transportation planners rely heavily on visual representations of infrastructure, modeling software, and geo-statistical analysis. Public health

professionals use statistics related to health behaviors and prevalence of disease and use statistical softwares. Most transportation data from national level sources is geographical and quantitative. It is stored as GIS files and occasionally in spreadsheets or databases. National public health data, on the other hand, is most often stored in formats to facilitate statistical analysis, such as Excel, SAS, SPSS, and ASCII files, see Table 2.3. Increasingly, public health is using GIS to visually display data.

Table 2.3 Common Data Formats

Field	**Data Set**	**Format**
Transportation	Streets and Highways	GIS
	Population Projections	Excel, GIS
	Traffic Survey	GIS
	Commute Data	Excel, GIS
	Environmental data	GIS
Public Health	BRFSS	Excel
	CHSI	Excel
	NHIS	ASCII files (can be extracted in to SAS, SPSS, and STATA)
	NHANES	SAS
	HPSA	Excel
	MUA	Excel

These format differences may make data more difficult to use and prevent sharing and joint processing of certain data to create knowledge. While each field can process its own data into information, creating knowledge that leads to mutual action will require new joint interpretation of information.

2.4.2 Organizational Barriers

Organizational barriers to data sharing are those that are controlled at the organizational level. Common organizational barriers to collaboration include time, funding, personnel, and values. The organization may lack the time and funding to devote to data sharing because it is bogged down with other activities. Staff may not have needed expertise. Most case studies indicated a period of education before collaboration or data sharing began.

The education period lasted for a year before the Ingham County Michigan project began (Roof and Glandon 2008). Not prioritizing or valuing collaboration and data sharing is a significant organizational barrier. These can be strong barriers but organizational values can be influential in determining how money is spent and what activities are prioritized.

Another potential barrier more specific to transportation planning and public health is the manner that they use data. Though they share the goal of creating healthy cities, transportation planners and public health apply data they do have in different ways Transportation planners are concerned with future needs and predictions while public health looks at current data and focuses on individual behaviors. Transportation uses quantitative data to determine congestion, pollution, infrastructure requirements, and predict future transportation conditions for a large population. Transportation planners are less concerned with changing individual behavior and more concerned with group behaviors. Public health, on the other hand uses both qualitative and quantitative data to identify the biggest health risks in a community. Information on quality of life, health behavior, health outcomes and disparities is used to develop programs that reduce individual risk. Public health departments often partner with schools or other organizations to encourage individuals to adopt more healthy behaviors. Members of one field may not have the expertise to interpret or use data from other fields. This could be significant if the way data is used within the organization makes using new data sets difficult.

For example, traffic safety, air quality, active transportation, and demographic data overlap between the two fields, shown in Figure 2.1. However, the purpose and interpretation of the data is very different between public health and planning.

- Traffic safety
    - For transportation planners the goal is to improve traffic safety and reduce accidents.

    - For public health traffic safety is a leading cause of death and injury among several demographics.
- Active transportation
    - For transportation planners walking or bicycling is viewed as a way to reduce congestion on roads and vehicle emissions (Rodriguez et al 2006).
    - For public health walking or bicycling is a great way to meet exercise guidelines aimed at reducing obesity and related diseases (Frank et al 2004).
- Air quality standards
    - For transportation planners there are required by the EPA and nonattainment carries financial burdens so planners try to reduce vehicle emissions.
    - For public health this information is used looking at increasing rates of asthma and respiratory disease (Oosterllee et al. 1996; Maantay 2007).
- Demographic data from the US census
    - For Transportation demographics factors such as income, employment, children, and car ownership are used in the transportation modeling process to find how many trips by what mode are occurring so infrastructure can be built accordingly.
    - For Public Health the same census data on income, employment, children, and access to a car is use to identify areas of high health vulnerability (Georgia Institute of Technology 2007).

From these examples it is clear that in addition to obstacles of scale, format and access to data, different processes for creating information and knowledge from this data might be another barrier to effective data integration.

2.4.3 Policy Barriers

Transportation planning and public health are both subject to national policies that regulate them. Transportation planners follow the Clean Air Act, SAFETEA-LU, and Equal

Rights Act. These national policies require planners to include certain types of data. While these policies leave room for transportation to include public health, it is never required. This lack of mandate is one reason data is not shared. On the public health side HIPAA and policies regarding privacy hinder data sharing. The laws require health information to remain confidential, which means it must be aggregated to larger geographies before it can be made public or shared. Often times this means to the county or zip code level making it difficult to use in transportation planning.

Several potential technical, organizational and policy barriers to data sharing using the Eco-Logical framework and network theory have been identified. Though research has recognized data types that would be useful to planners and public health officials, and much of this data is collected, the data is not being shared. The reasons for this are unclear. Technical barriers such as data scale, format, and access could complicate data sharing. Organizational barriers of time, money, and priorities could prevent desired exchanges. Also, interpretations and processes to use the data differ making received data unusable. Further complicating the scale issues are policy barriers such as HIPAA and no national level mandate to consider human health. These barriers merit more exploration to see if they truly hinder data sharing between public health and transportation planning.

CHAPTER 3

METHODOLOGY

To understand the regional state of data sharing between transportation planners and public health professionals in the Dallas-Fort Worth Area, as well as to identify gaps, barriers and opportunities for data sharing a survey was designed. Perspectives from local planners and public health professionals will be used to identify barriers and potential solutions. The DFW area faces many of the challenges or rapidly growing metropolitan areas and, similar to most has no regional authority to implement plans.

3.1 Design of Survey

The survey was designed based on the information from the review of existing data and the information gleaned from the case studies. It is expected that while there will be significant interagency communication and data sharing between like agencies; transportation planners sharing data with other transportation planners and public health sharing with other public health. As the literature and Figure 2.1 suggest, data shared is likely to be either environmental, active transportation, or demographics information. Barriers are likely to be related to organizational priorities, understanding of the issues, time, funding, personnel, technologies used, and state and national policies. Questions to be answered include:

- What types of data are currently shared in the Dallas-Fort Worth metroplex?
- What data is found to be useful to transportation planning and public health?
- What technologies are used to share data? Are there gaps in technologies used between transportation and public health?
- What are barriers to sharing data? Are these barriers technical, organizational or policy related?
- What data might be useful but isn't shared? and,

- Is including public health information in transportation planning valued?

The survey was designed and sent via surveymonkey.com to the indentified subjects (n=214). The bulk of the survey focuses on the participant's experience sending data to and receiving data from public health or transportation planning organizations. Skip logic was used to jump participants to appropriate follow-up questions. A few questions asked for the participant's perspective on what data types might be helpful and how important data sharing is. Finally, information about the individual including age, employer, position, years of experience, and educational background is captured. A copy of the survey is shown in Appendix A.

The survey was sent with a letter of introduction to the researcher and the project. The participant could either chose a link to open the survey or a link to decline taking the survey. After one week a reminder e-mail was sent to those that had not acted on the survey or had not completed the survey. One week following the reminder e-mail, phone calls were made to those that had still not acted on the survey. The survey and methods were approved by the Institutional Review Board of the University of Texas at Arlington.

3.2 Selection of Survey Participants

The survey is designed for those working in the fields of transportation planning or public health, specifically for those professionals that are generating, using, and sharing data. Planning or public health department managers or individuals with titles such as manager, planner, epidemiologist, inspector, or specialist were identified. These are thought to be the people using data on a regulation basis. To include the correct participants for the survey it was necessary to clearly define transportation planning and public health stakeholders included. Next the challenge was indentifying who these people were in Dallas Fort Worth and obtaining their contact information.

3.2.1. Transportation Planners

Transportation planners for this survey are defined as those with titles of planner, transportation planner, and transportation engineer. Transportation planners represented cities,

counties, local transit agencies, and planning firms. While transportation planners are the focus of this survey many municipalities do not have designated transportation planners on staff. To expand the list of potential participants, those with the title of "planner" were also contacted as in many cities planners deal with a variety of transportation and land use issues. These participants may come from government, quasi-government, or private organizations.

3.2.2. Public Health Professionals

Public health professionals were defined as those working in public health, or health outreach. The goal was to reach those that worked with various types of public health information in the region, whether it was informing people about healthy lifestyles or generating information on community health through surveys and statistics. The list includes epidemiologists for county health departments, managers of community health centers that provide community outreach, and hospital employees. These professionals should have an understanding of the public health data that is available and constraints in using it. They may or may not have an understanding of the role transportation planning might play in public health.

3.2.3. Sources of Contact Information

Several sources of contact information for these professionals were used including the North Central Texas Council of Governments and Tarrant County Public Health Department. The North Central Texas Council of Governments maintains the Regional Directory of cities, counties, and other governmental organizations and contacts at each. NCTCOG also provided a list of transportation planning contacts they gathered through their Regional Ecosystem Framework project, which uses the Eco-Logical framework. Contacts from the Tarrant County Public Health Department were not in any organized database but came from individual employee's contact lists. Internet searches and phones calls to public health organizations identified additional potential participants to supplement names gathered from NCTCOG and TCPHD. These sources combined provided a list of 214 contacts from transportation planning and public health.

3.3 Analysis of Results

Results from the survey will be compared using descriptive statistics to find differences between transportation planning and public health. In particular the ways they send and receive information and what information they feel is valuable are compared. Percents or rates of response by field are compared. In addition to looking at difference between the two fields some attention was given to age and education. No strong differences in results were found between respondents of various ages, genders, employers, or education. Most respondents had obtained advanced degrees. The types of degrees varied greatly and did not have any strong relationship to results. The focus of the analysis will be on the differences between the two fields.

Where differences in responses appeared high Chi Square statistics were employed using SPSS to find if differences between transportation planners and public health can be expected. Chi Squared analysis was chosen as the data collected is nominal and the goal is to compare responses from two populations, public health and transportation planning. The null hypothesis being that there is no differences between the two fields. If differences between responses from public health and transportation planning were significant at the 0.05 level or higher the results of the Chi squared test are presented with the descriptive statistics in Chapter Four below.

CHAPTER 4

RESULTS

4.1 Responses

The survey was sent to 214 public health professionals, transportation planners, and city planners. In total, 85 surveys were completed, a response rate of 39.7 percent. The response rate from transportation planning was 37 percent while the response rate from public health is 47 percent. This was a better than hoped for rate. Of completed responses, 27 are from public health and 58 are from transportation planning. This difference in number is due to the fact that fewer public health professionals were identified, only 57 compared to 157 transportation planners. This represents a difference in regional employment in these fields. According to May 2011 data from the Bureau of Labor Statistics 599,300 people were employed in the trade, transport, and utilities industry while 372,000 were employed in health services in the Dallas and Fort Worth Metropolitan Areas (Bureau of Labor Statistics 2011). These numbers include many other transportation and health jobs but are still useful for understanding general employment distribution.

4.2 Demographics of Sample

The transportation planning respondents are generally younger than public health respondents, more likely to be male, and have been in their position for fewer years then public health respondents. Of transportation planners responding, 55 percent were younger than 40 while only 29 percent of public health respondents are younger than 40, see Figure 4.1. Public health respondents were about 62 percent female while transportation planners were a majority male, see Figure 4.2. In addition public health respondents have been in their position longer than transportation planners on average, 9.3 years versus 6.7 years.

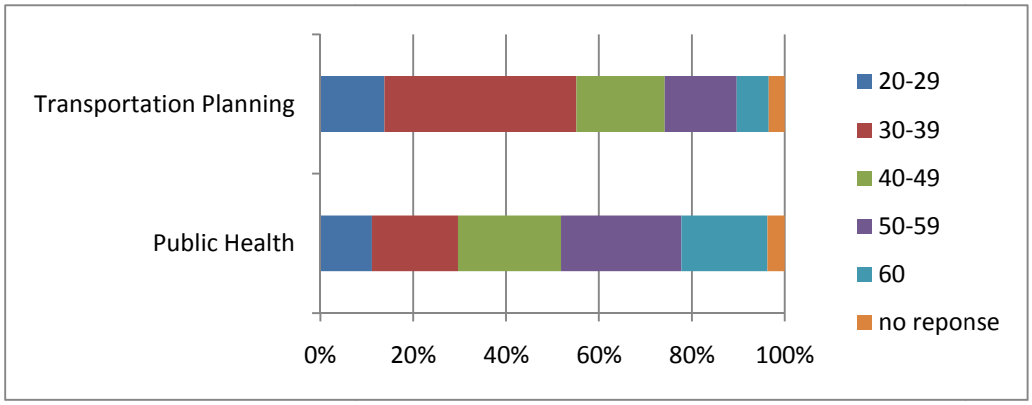


Figure 4.1 Ages of Respondents by Field

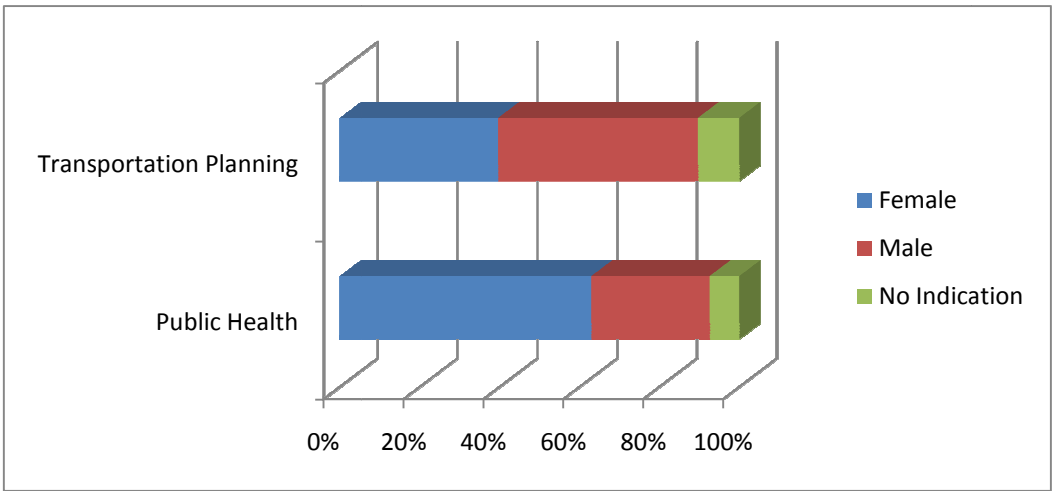


Figure 4.2 Sex of Respondents by Field

Thirty seven percent of public health respondents and 81 percent of transportation respondents, see Figure 4.3. There was a greater variety of employers reported by public health including county governments, hospital systems and non-profit organizations. A minority of transportation planners worked for transit agencies, the MPO, or planning consultant firms.

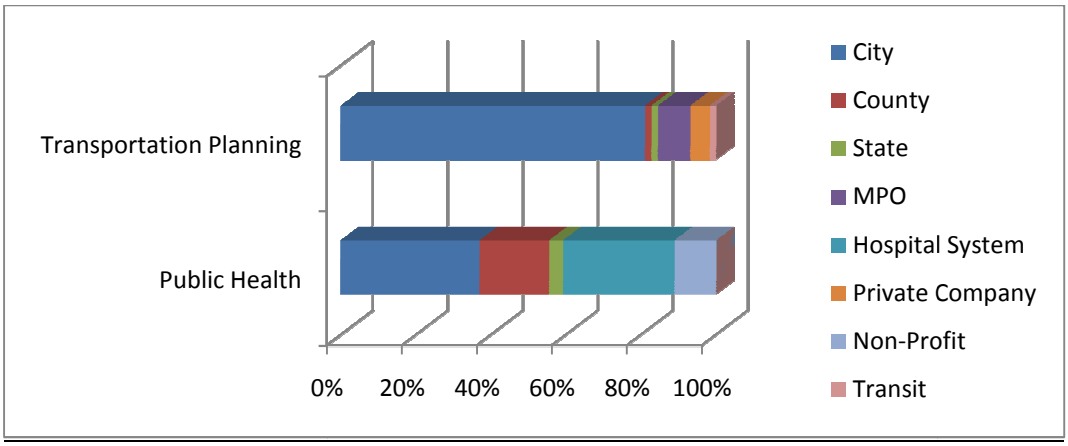


Figure 4.3 Employer by Field

4.3 Survey Results

4.3.1 Communicating, Receiving Data, and Sending Data

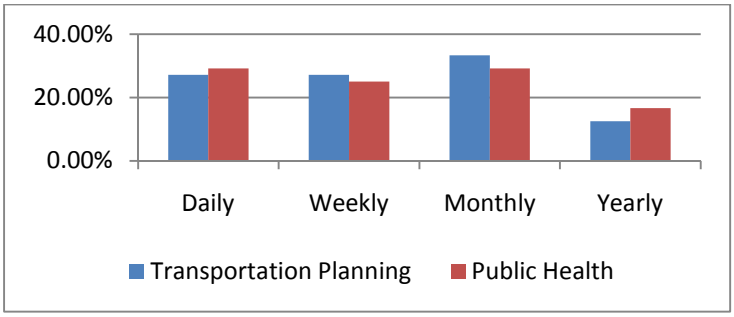
In examining the frequencies of communication, receiving data and sending data the majority of public health and transportation planners do communicate, send, or receive data. The questions asked were, “In your role, do you communicate with public health or transportation planning organizations?”, “Does your organization receive data provided by public health or transportation planning organizations?”, and “Does your organization send data to public health or transportation planning organizations”. Table 4.1 shows the percentage of respondents from each field that report communicating, receiving data from, or sending data to a transportation planning or public health organization. It is interesting that more transportation planning respondents reported receiving data than sending data, 71 percent as opposed to 83 percent while the opposite was true for public health. This trend is not significant nor has this been addressed in previous literature or case studies.

Table 4.1 Communicating, Sending Data and Receiving Data

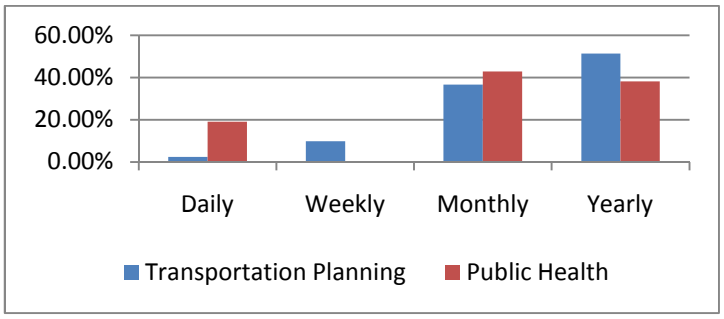
	Communicate	Receive Data	Send Data
Transportation Planning	84%	83%	71%
Public Health	89%	74%	78%

Frequency of communication, sending data is equally spread on a daily, weekly or monthly basis. For those that received and sent data this activity happens most frequently on a

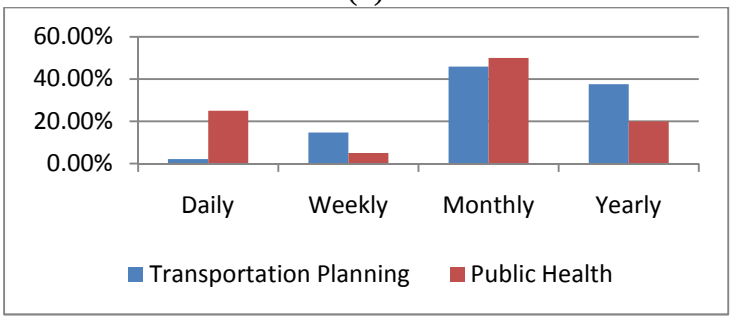
monthly or yearly basis. The follow-up questions for those that receive or send data were “How often does your organization receive/send data provided by/to public health or transportation planning organizations?”. The majority of the data was sent and received monthly or yearly, as shown in Figure 4.4.



(a)



(b)



(c)

Figure 4.4 Frequencies of (a) Communication, (b) Sending Data and Receiving Data between (c) Public Health and Transportation Planning

Information is being exchanged on a fairly regular basis with the majority of the respondents. However, what data is being shared and by whom is still unclear. It is likely that the frequencies of communication, sending and receiving data reported capture information being shared among similar type agencies. To address this, participants were also asked "Who do you communicate with?".

Unsurprisingly, public health respondents communicate most with hospitals, state, county, and city health departments. They communicate least with traffic engineers and the Texas Department of Transportation (TxDOT). A reversal appears for transportation planning respondents. They communicate the most with city planning departments, the Texas Department of Transportation and traffic engineers. They communicate the least with neighborhood clinics, non-profit public health organization, and state health departments. Figures 4.5 and 4.6 show how public and health and transportation planning organizations communicate with like and unlike organizations. There is some cross communication, 53 percent of public health respondents report some level of communication with city planning department while 48 percent of planning respondents report some level of communication with county health departments. The survey conducted by the APA and NACCHO found 46% of public health respondent reported collaboration with planning department while on 36% of planning respondent reported collaborating with public health departments (Morris 2006). Our results and the APA's show public health is collaborating more with planning than planning is with public health.

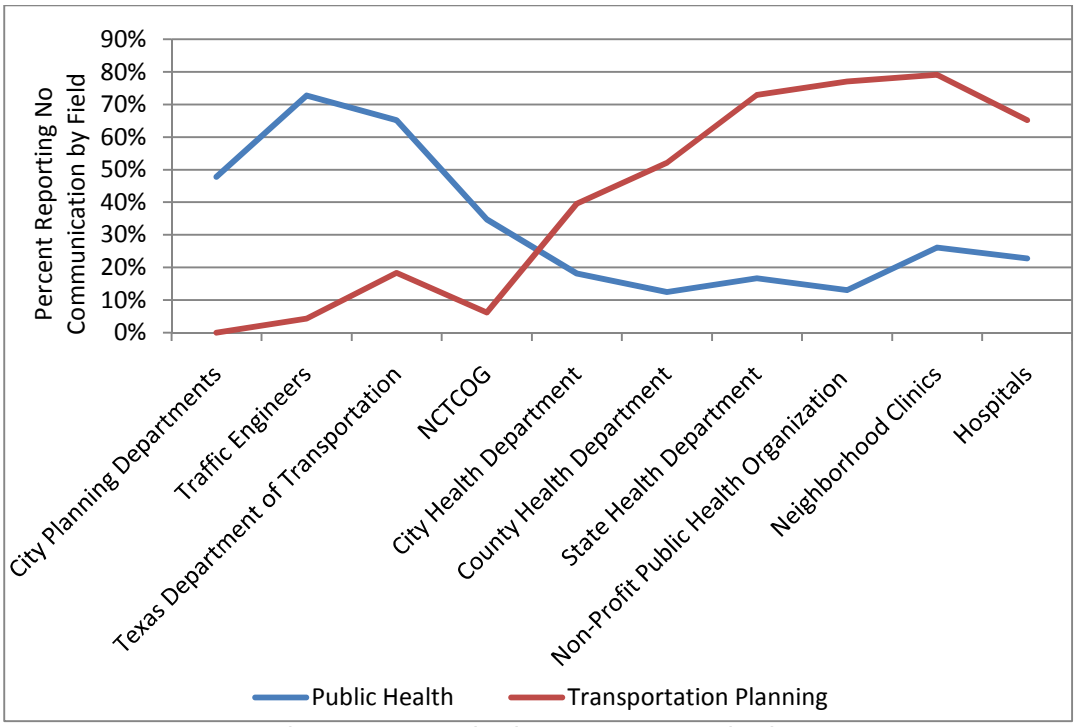


Figure 4.5 Organizations Not Communicating

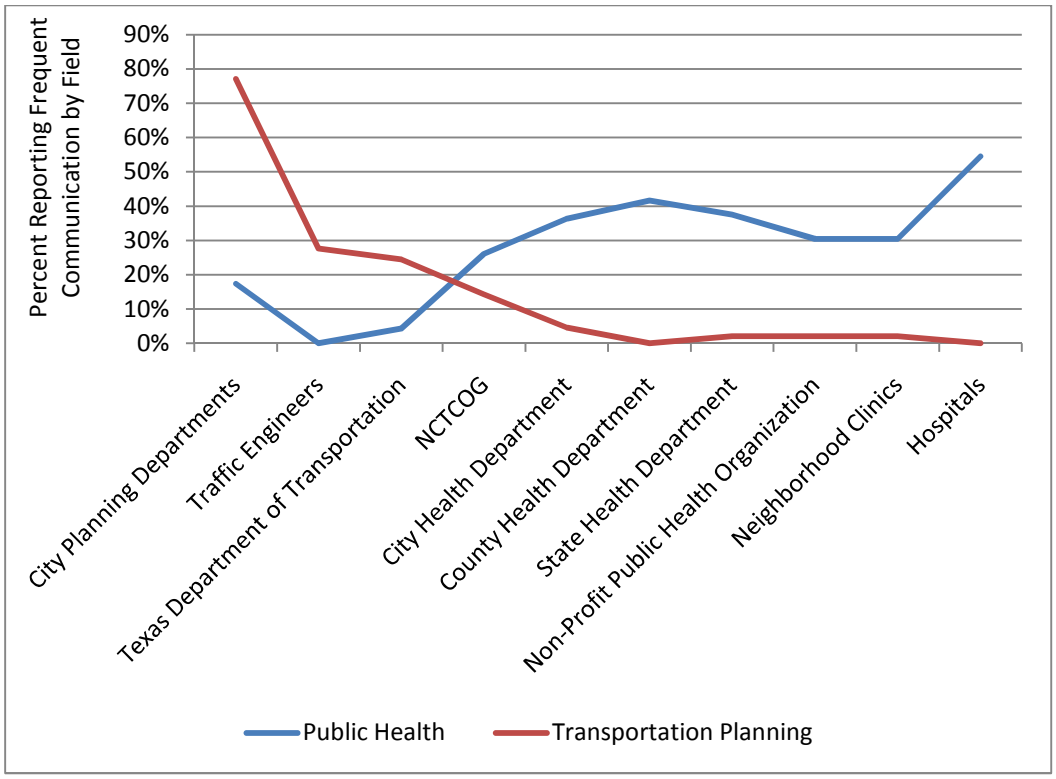


Figure 4.6 Organizations Frequently Communicating

Those that received data were asked the follow-up question, "What type(s) of data are received and what type(s) are useful to your organization?". The results show that the data types received also comes from similarly focused organizations. Figure 4.7 displays this information. The data types most commonly received by transportation planners are demographic forecasts (89%), future transportation plans (87%), and development plans (75%). These three types also felt to be the most useful by over 60 percent of transportation respondents. Health data most frequently received by transportation planners is safety data (43%) followed by quality of life data (20%). Very few transportation planners reported receiving data on health behaviors (10%), health outcomes (8%), or disease rates (4%). None reported receiving the BRFSS. This was slightly surprising as the APA survey showed 23 percent of planners receiving the Behavior Risk Factor Surveillance Survey data (Morris 2006).

The data types most received by public health are community health indexes (55%), health outcomes (55%) and disease rates (65%). Transportation data most frequently received by public health is air quality (45%) and demographic projections (35%) and development plans (35%). Data infrequently received includes natural resource data (15%), Infrastructure (10%), and travel demand (5%). Public health receives more transportation data than transportation receives public health data. This follows the findings from previous surveys that public health reports collaborating with planning more than planning does with public health (Morris 2006).

Data types received almost equally by both fields were safety, water quality, and air quality. These data types are currently used by both fields as shown in Figure 2.1. This finding is also supported by the Tri-County Health Department survey finding that planners most valued public health input on issues of wastewater, solid waste/hazardous materials/waste, air quality, and water quality (Roof and Maclennan 2008). Environmental quality is an important areas where data exchange can take place.

Respondents were also asked if the data they received was useful or not. Respondents marked data received, received and useful, useful, or neither received nor useful. There were some significant differences in the responses about data received and useful between transportation planners and public health. Health outcomes, hospital records, disease rates, and the BRFSS are more frequently received and found useful by public health, though many planners who don't receive this data marked that it might be useful (<.01). Health care costs and community health indicators followed a similar pattern (<.05). Future transportation plans, infrastructure data, travel demand, and demographics were more often received and found useful by transportation planners though public health might receive or find the information useful (<.01). Development plans followed a similar pattern (<.05). These results were expected but they do illuminate the data types that may be useful to other fields.

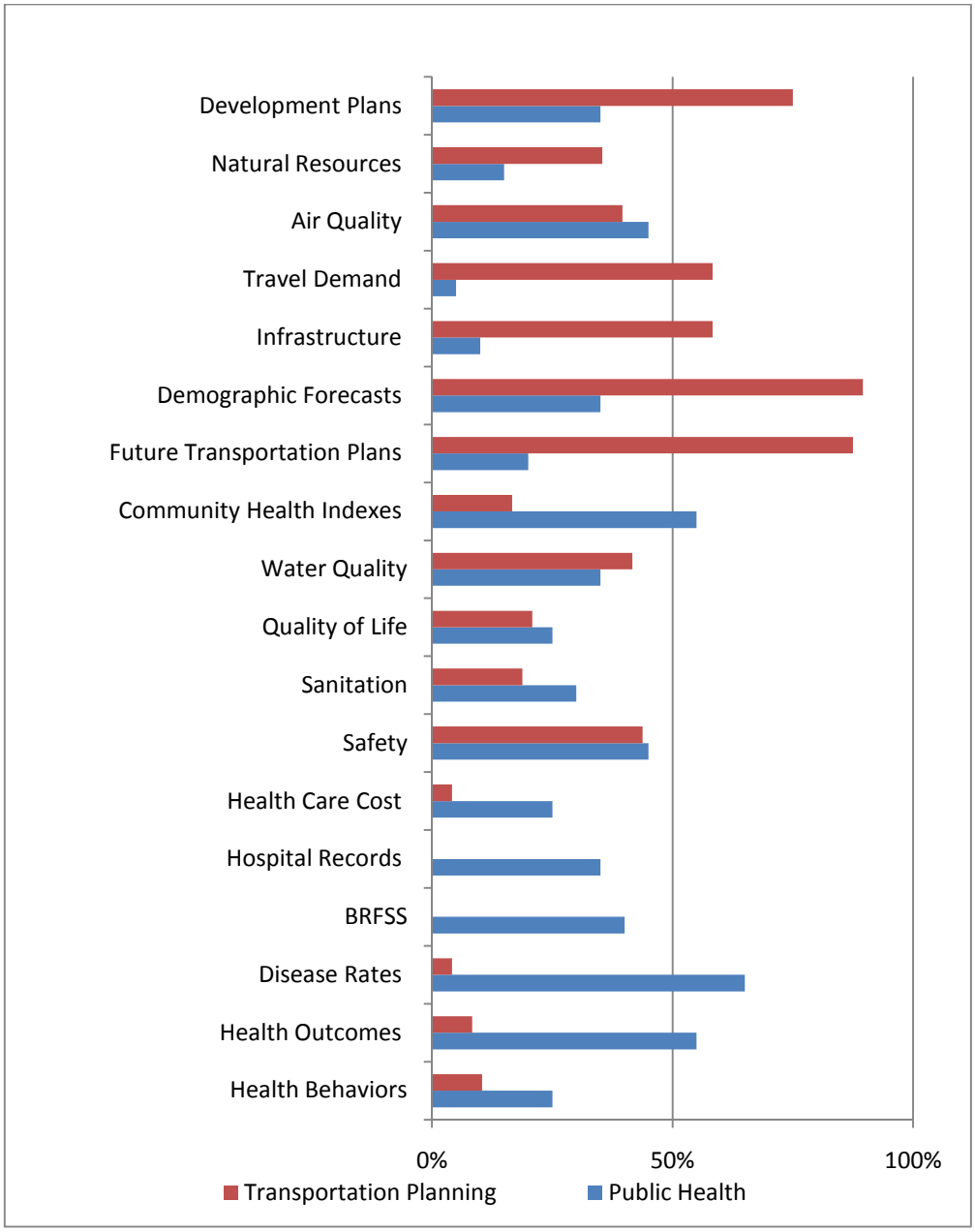


Figure 4.7 Data Types Received by Transportation Planning and Public Health

4.3.2 Format and Technologies Used

Those that reported receiving or sending data were also asked the follow-up question, "In what format(s) does your organization receive/send information or data?". Written reports were by far the most common way data was shared with other organizations. The only exceptions were future transportation plans, which were shared most frequently using GIS files, and demographic and travel demand data, mostly shared using spreadsheets. Figures 4.8 and 4.9 show formats sent and received by each field.

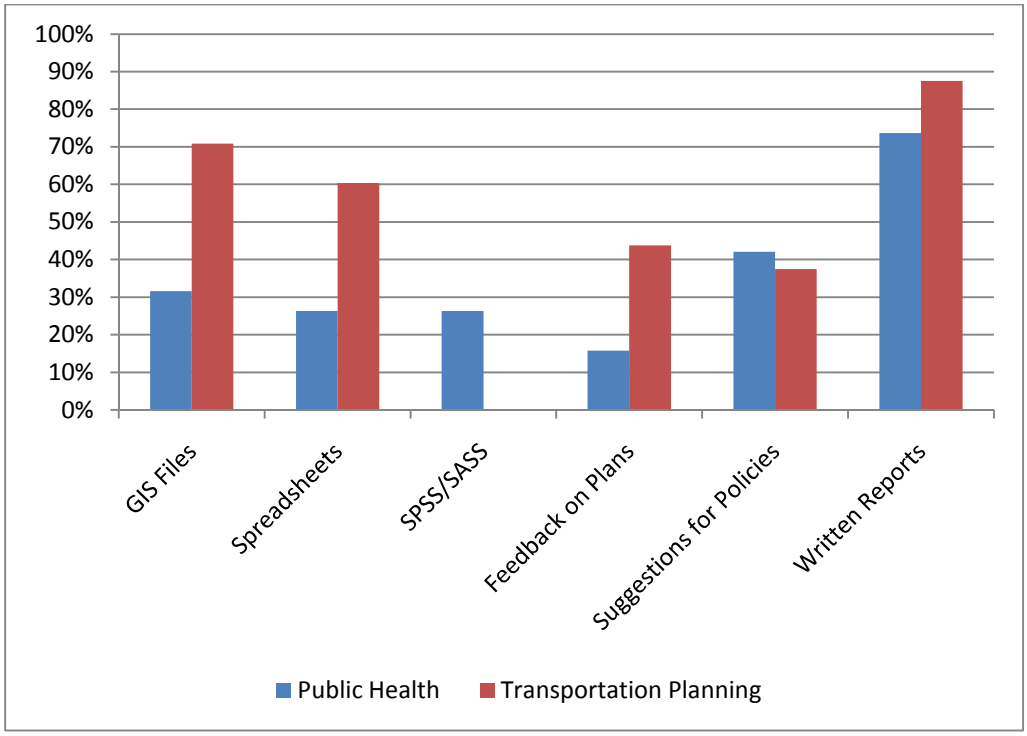


Figure 4.8 Format Received by Public Health and Transportation Planning

There were a few significant differences between planning formats sent and received. GIS was more commonly sent by transportation planners (<.05). Spreadsheets were also more commonly sent by transportation planners (<.05). This pattern was even stronger for receiving GIS files (<.01) and spreadsheets (<.01). Public health was more likely to receive either SPSS or SAS files than transportation planning (<.01). This is not an unexpected pattern but may

affect data sharing if professionals do not have access to certain software or the expertise on how to interpret data. Figure 4.9 shows the results for formats sent.

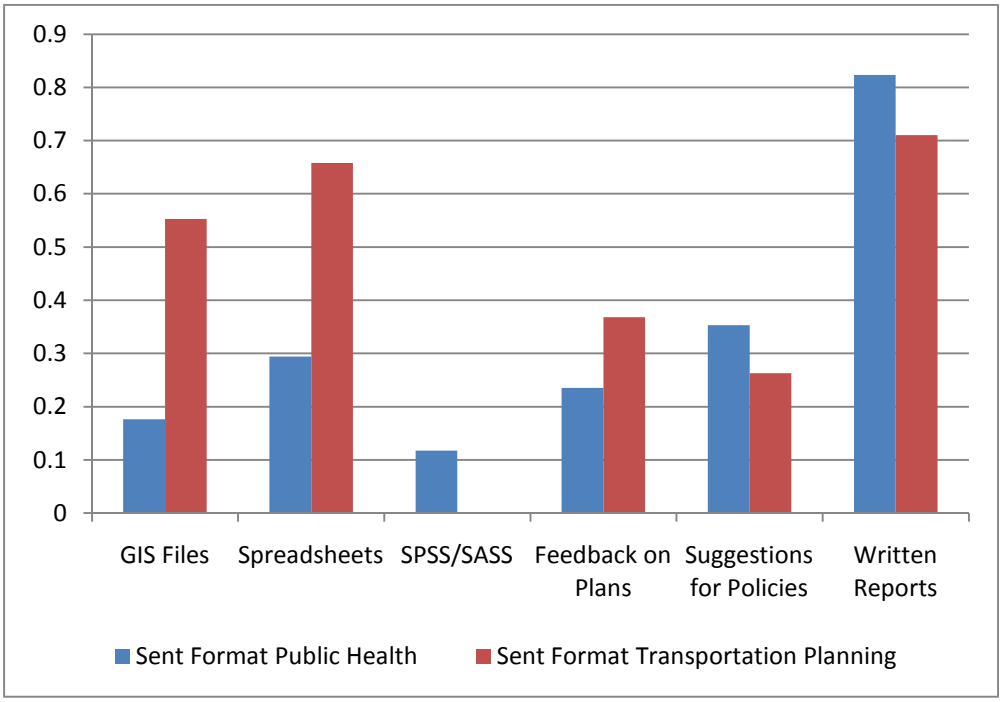


Figure 4.9 Format Sent by Public Health Transportation Planning

In addition, all respondents were asked to complete a technology matrix, "Find technologies used in the left column and mark how they are applied." A list of technologies and possible implementations was provided. Results are shown in Figure 4.10. Both fields used technology in similar ways. The most frequent used technologies for communication are e-mail, followed by GIS, and then websites. E-mail, websites, and on-line downloads are frequently used for sharing with other agencies. Geographic information systems and shared databases are frequently used for communicating within the agency. GIS and websites are the most often used tools for visualizing information. GIS was also the most commonly used tool for creating documents or modeling data. Public health and transportation planning both rely heavily on e-mail and websites. There are differences in technologies used. Transportation planners use on-line documents and GIS more frequently while public health uses shared databases and cloud networking more frequently. This was expected based on the use of GIS tools in case

studies. Many transportation based cases, such as those in Binghamton and California (TRB 2010a, TRB2010b), mentioned GIS while only one public health focused case study in Michigan did (Roof and Glandon 2008). These differences in preferred technologies were not significant in Chi squared tests.

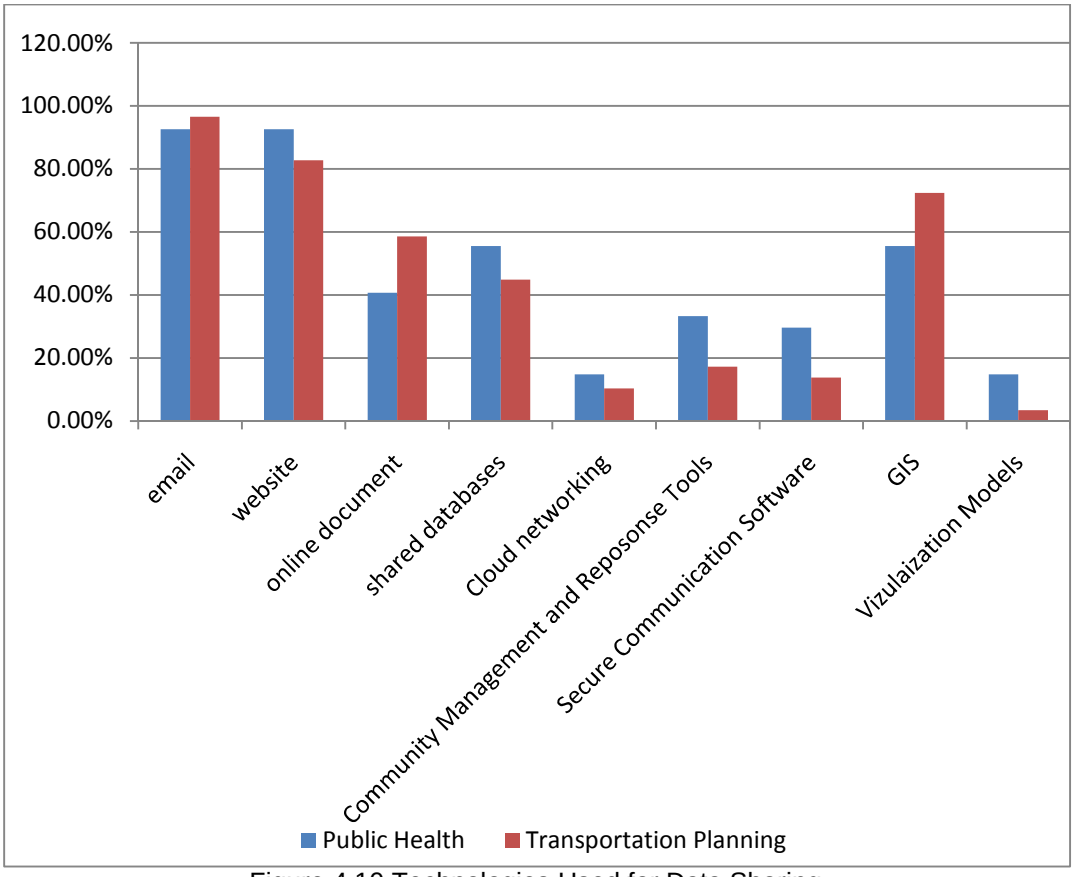


Figure 4.10 Technologies Used for Data Sharing

4.3.3 When Public Health Data is Used in the Planning Process

All respondents were also asked to indicate "At what points in the planning process are public health data used?". Twelve percent of respondents marked that health data is was not used at all in the planning process and 20 percent marked they did not know when public health data might be used, see Figure 4.11. The remaining 68 percent of public health and planners marked visioning and goal setting followed by public outreach and involvement. Public health

data is not frequently used in transportation modeling or forecasting, mitigation, or reviewing and monitoring results.

Differences between fields are that planners report public health information being used during environmental analysis while public health respondents reported their data being used during cost-benefit analysis. Public health was more likely to report their data was used in the transportation planning process than transportation planners did. Public health respondents marked health data was used for cost benefit analysis (<.01) and public outreach and involvement (<.05) significantly more often than transportation planners. It is interesting that planners did not report using health data in cost benefit analysis. Public health has a wealth of data on the cost of accidents, obesity and health outcomes related to transportation. This data might be used to better understand the cost of plans. It appears transportation planners are unaware of how public health could be used or beneficial at these stages. This is a divergence in perception about how and when the data is being used.

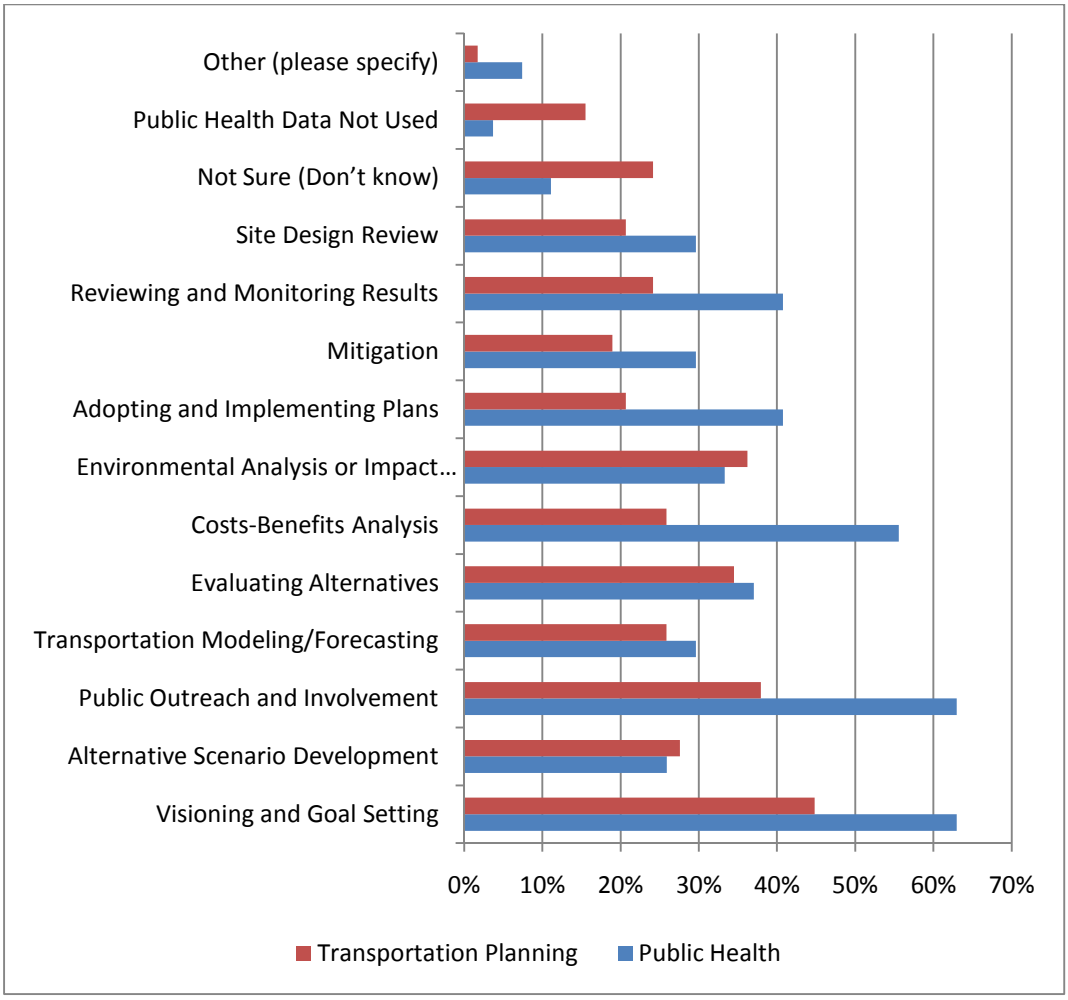


Figure 4.11 When Health Data is Used in the Planning Process

4.3.4 Potential Useful Data

All participants were asked "What public health data might be useful in transportation planning?", see Figure 4.12. Only 4 percent of all respondents, both public health and transportation planning, did not feel any public health data would be useful. This result is surprising as only two the TRB case studies on collaboration mention public health as a participant in the planning process. However, 19 percent of all respondents were unsure what data would be useful, if anything. Of the remaining 77 percent, there were some interesting differences between public health and transportation planners.

The literature indicates safety, air quality, health disparities, health behaviors, and quality of life data are potential useful to transportation planning. A majority of planners and public health professionals in marked safety, community health indicators, health behaviors, and quality of life as useful, supporting evidence from the case studies. Public health respondents also felt that disease rates (51%) and health outcomes (51%) would also be useful. Only 31 percent and 40 percent of transportation planners felt these datasets would be useful. Significant differences between transportation planners and public health are hospital records (<.05) and health costs (<.05) both of which public health thought would be more useful than transportation planners.

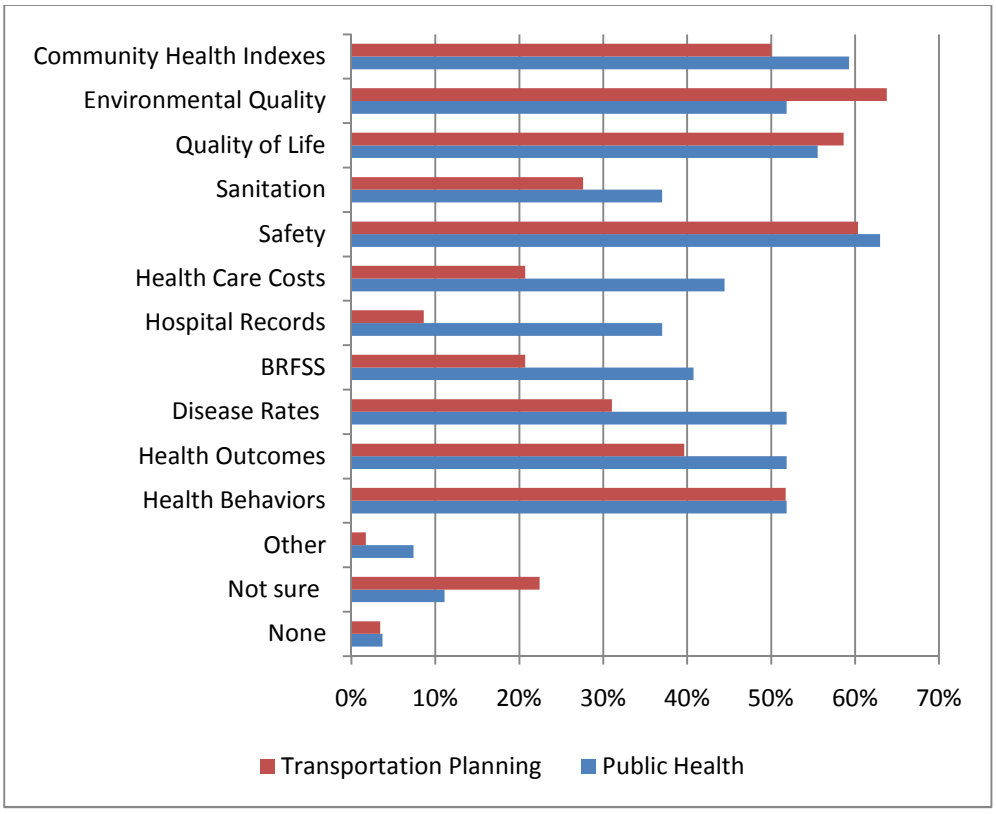


Figure 4.12 Public Health Data Useful for Transportation Planning

Similarly all respondents were asked “What transportation planning data might be useful to public health organizations?”, see Figure 4.13. The literature and case studies

suggest demographics information may be the most useful and this is supported by the survey results. The majority of both transportation planners and public heath respondents felt demographics forecasts would be useful. In addition, respondents from both fields listed future transportation plans, infrastructure, air quality, and development plans as possibly useful to public health. The majority of transportation planners also marked travel demand data as potentially useful to public health.

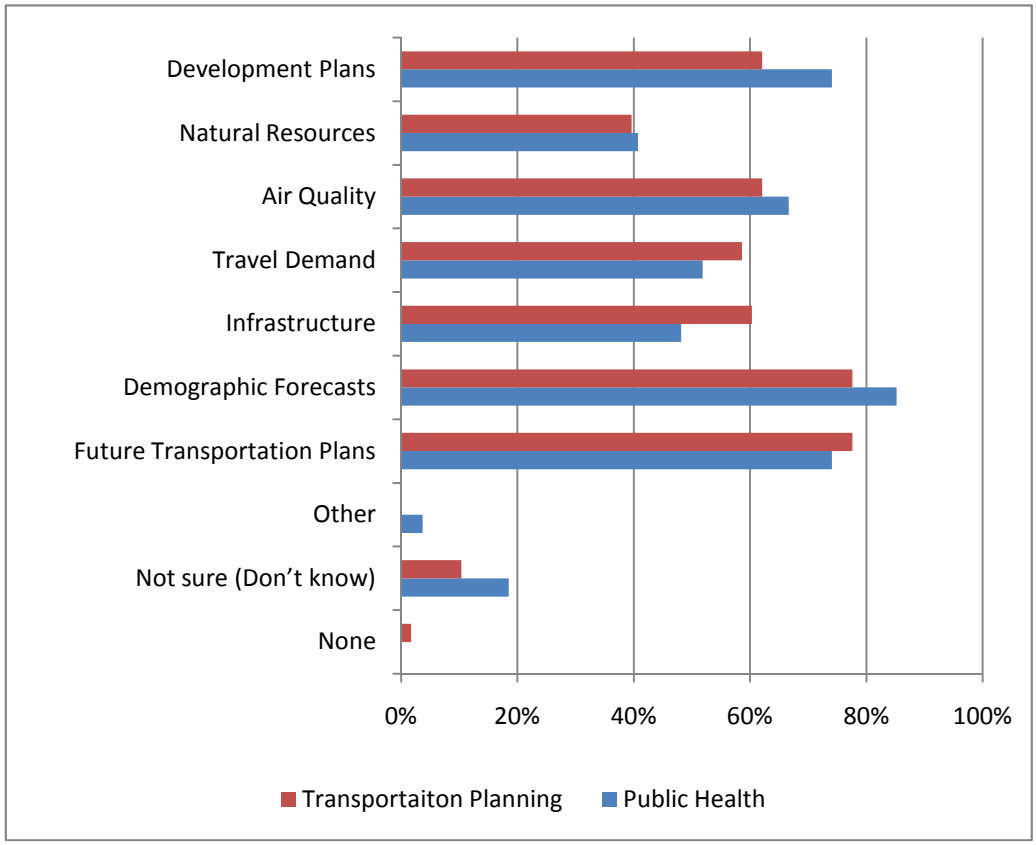


Figure 4.13 Transportation Data Useful to Public Health

It is interesting that public health respondents marked more public health data useful to transportation planning than transportation planners did. Similarly more transportation planners marked more transportation data useful to public health than public health did.

4.3.5 Barriers to Communication and Data Sharing

All respondents were also asked "What barrier(s) prohibit data sharing between transportation planning and public health?". Respondents were asked about three technical

barriers; formats, scales, and relevant data, four organizational barriers; lack of interest, lack of staff expertise, time, and funding, and two policy barriers; HIPAA and privacy requirements. Respondents marked each potential barrier listed as either a “Strong Barrier”, “Barrier”, “Not a Barrier”, or “Don’t Know.” Most of the reported barriers to communication and data sharing reported were organizational, however, several did report technical and policy barriers. Figure 4.14 shows what is perceived as to be a strong barrier, Figure 4.15 shows what is perceived as to be a barrier, Figure 4.16 shows what respondents are unsure of and Figure 4.17 shows what is not seen as a barrier.

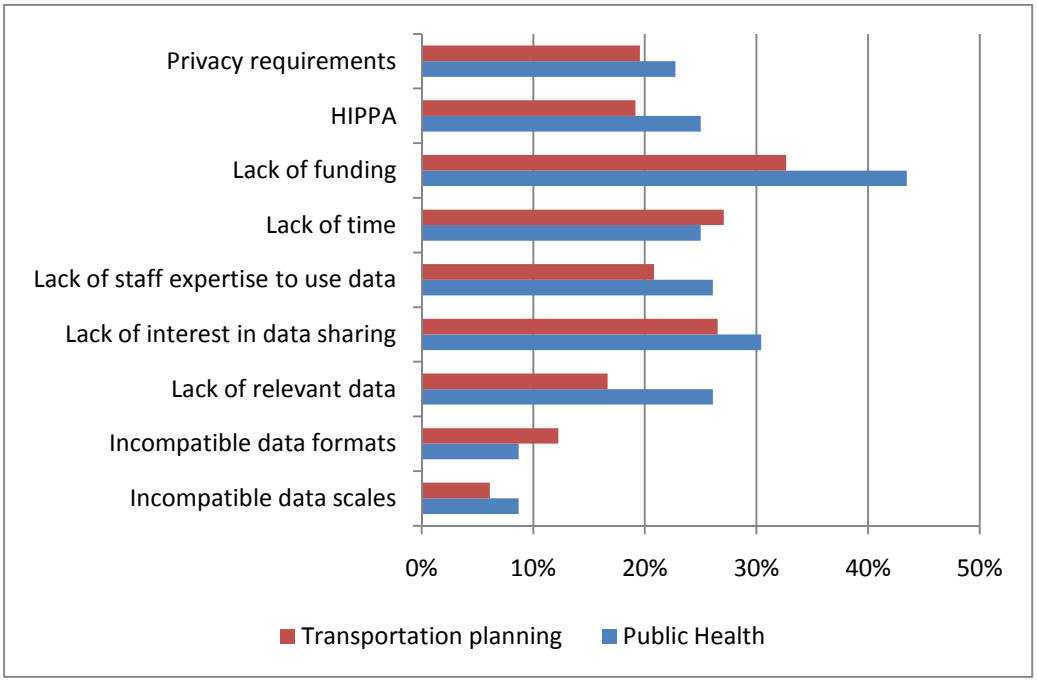


Figure 4.14 Strong Barriers

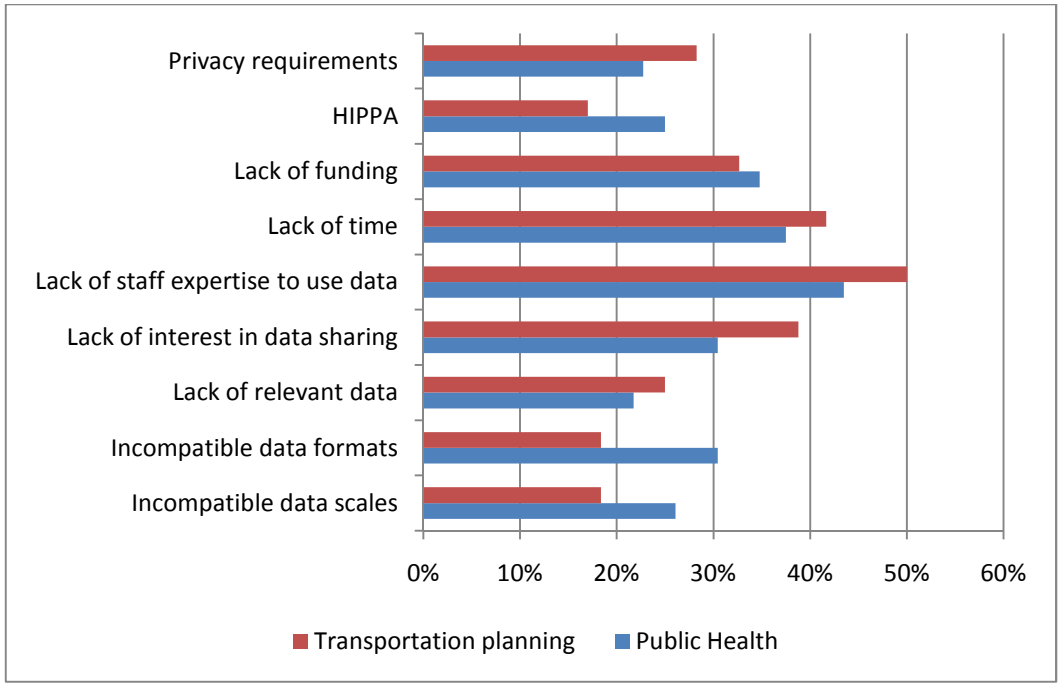


Figure 4.15 Barriers

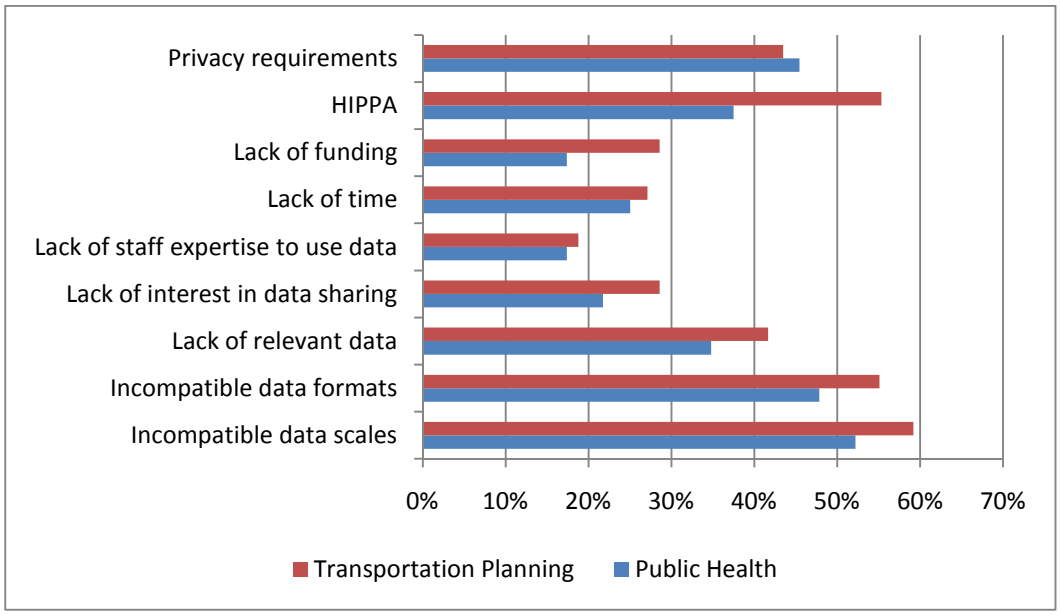


Figure 4.16 Unsure if a Barrier

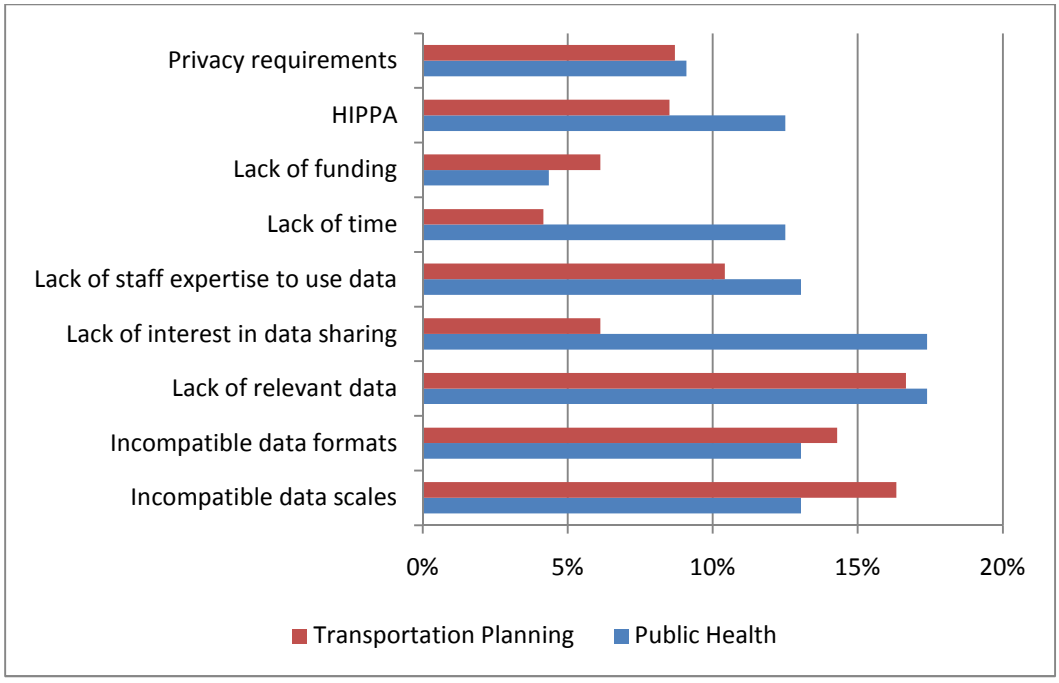


Figure 4.17 Not Perceived to be a Barrier

4.3.5.1 Technical Barriers

Close to half of transportation planners and public health respondents were unsure if data scales and formats were barriers to data sharing. Scale and format issues were listed as barriers in the Binghamton, Caltrans, and TXDOT transportation case studies (TRB 2010a, TRB 2010b, TRB 2010d). It is surprising that so many were unsure if this might be a barrier. This finding may suggest subjects have not yet tried data sharing and do not know what formats other data is in. The other technical barrier, lack of relevant data was split fairly evenly among the categories provided.

4.3.5.2 Organizational Barriers

Organizational barriers from the public health perspective are lack of funding (78%), lack of staff expertise to use data (69%), and lack of interest (60%). Transportation planning seconds these barriers to data sharing. Sixty-five percent of transportation planners report lack of funding is a barrier, 70 percent report lack staff expertise to use data is a barrier, and 65 percent report lack of interest is a barrier. Transportation planners add lack of time (68%) to the

list of barriers. All of these barriers will need to be address as data sharing is a two-way process.

After funding, lack of staff expertise and interest were the largest barriers, with the majority of both fields listing it as either a barrier or strong barrier. Lack of staff expertise was discussed in many of the cases studies. Many case studies report spending time educating staff on the intersection between planning and health. Lack of interest is less of a barrier for public health than for transportation planners. Only six percent of transportation planners indicating lack of interest is not a barrier and 17 percent of public health indicating it is not a barrier. This suggests slightly more interest in data sharing from public health than from transportation planning. This finding is supported by the case study of the Tri-County Health Department in Denver, Colorado. One of three the county planning departments approached by the Tri-County Health Department was not interested in collaborating (Roof and Maclennan 2008).

In addition to asking all respondents about perceived barriers, respondents who reported not communicating, receiving, or sending data and were asked the follow-up questions, “If you do not communicate with public health or transportation planning, why not?”, “If your organization does not receive data from public health or transportation planning organizations, why not?”, and/or “If your organization does not send data to public health or transportation planning, why not?”. Each respondent could check as many as apply. Chi squared tests were not run on these results because the number of respondents answering these question was so small, less than ten in most instances.

For those that do not communicate, the clear reasons from both fields are that communication is not necessary or they were never asked to communicate, see Figure 4.18. This indicates that while an organization may not initiate communication they may be receptive to it. No respondents marked being legally prohibited from data sharing.

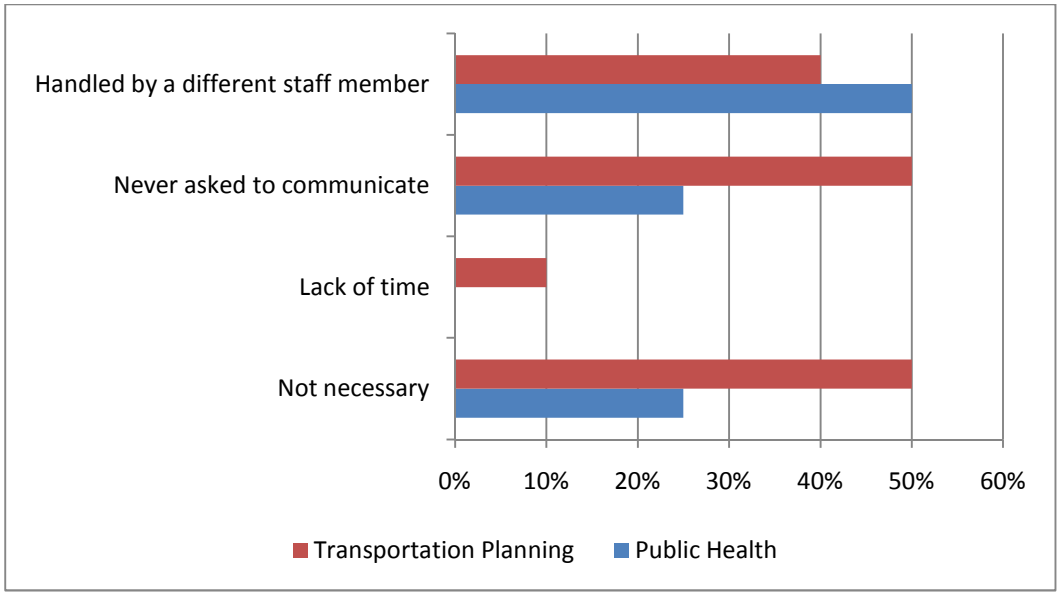


Figure 4.18 Reasons for Not Communicating

For those that do not receive data the major reasons appear to differ between transportation planners and public health, as seen in Figure 4.19. For transportation planners the major reasons data is not received are that data is not viewed as relevant and that data sharing is not an organizational priority. For public health the major reason for not receiving data is that there is no process to use received data. In addition several public health respondents marked other specifying either that they had requested data and it was never sent or that they were unsure. No one marked privacy concerns as a reason for not sending or receiving data and no one marked format issues as a reason for not receiving data.

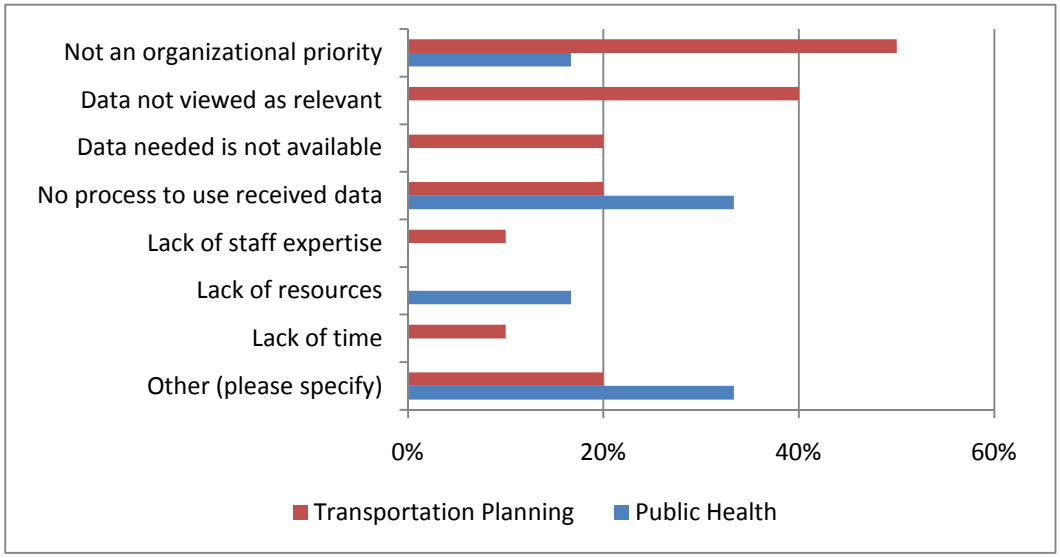


Figure 4.19 Reasons for Not Receiving Data

The reasons for not sending data are shown in Figure 4.20. The biggest reason public health does not send data is that data is not requested. Again this indicates that while public health is not initiating data exchange there may be little opposition to sharing data. However, 41 percent of transportation planning respondents marked that it was not an organizational priority. This is a much more significant organizational barrier. It appears transportation planners view data sharing with public health as irrelevant or not an organizational priority. Public health respondents seem more willing to communicate and share information. This attitude is a barrier on the transportation side that must be addressed in order for data sharing to be valued and successful.

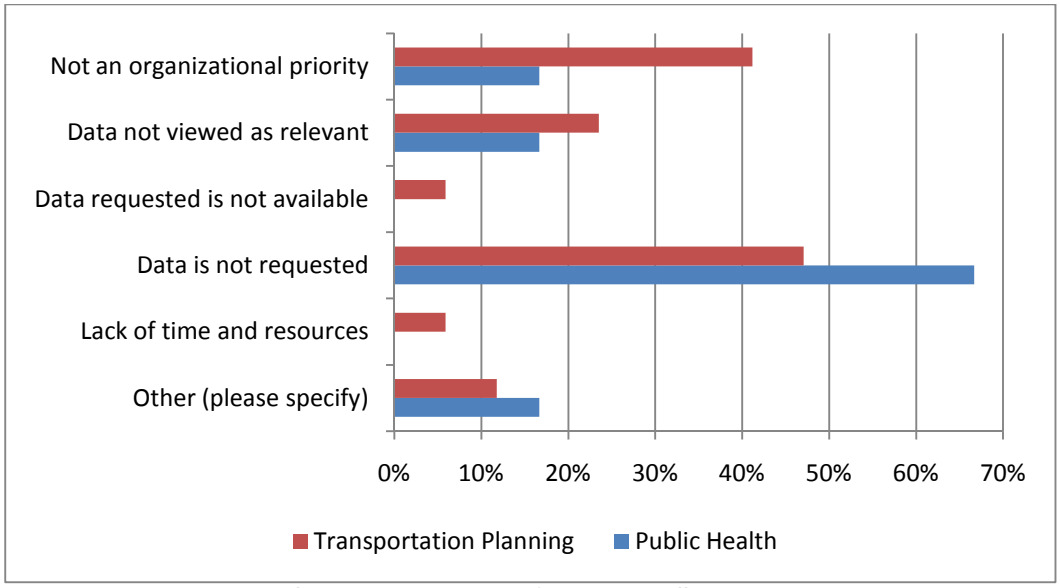


Figure 4.20 Reasons for Not Sending Data

4.3.5.3. Policy Barriers

Policy barriers were addresses in the survey. Unsurprisingly, public health recognized HIPAA as a policy barrier (50%) though transportation respondents were uncertain (55%) if this was barrier or not. On the transportation side, one transportation respondent felt that lack of transportation policy requiring more environmental review was a barrier. The respondent stated, “Texas is a development friendly state. As a result, Texas legislature does not require municipalities to conduct Impact Analyses or statements before development as it might increase a developers cost. Some cities have taken the initiative to incorporate "green" or health conscious design features and guidelines.” indicating that state regulatory structure is a potential barrier.

4.3.6 Importance of Considering Health in Transportation Planning

Both fields felt it was very important or important for transportation planning to consider public health, including 77% of transportation planners and 85% of public health, see Figure 4.21. However, those in public health marked ‘very important’ more than those in transportation planning. No one marked that it was not important to consider public health in the transportation planning process. This question does capture individual views rather than

organizational views. Personal views do not appear to represent organizational views that data sharing or communication with public health is not a priority. The wording and structure of the question may have also influenced the results.

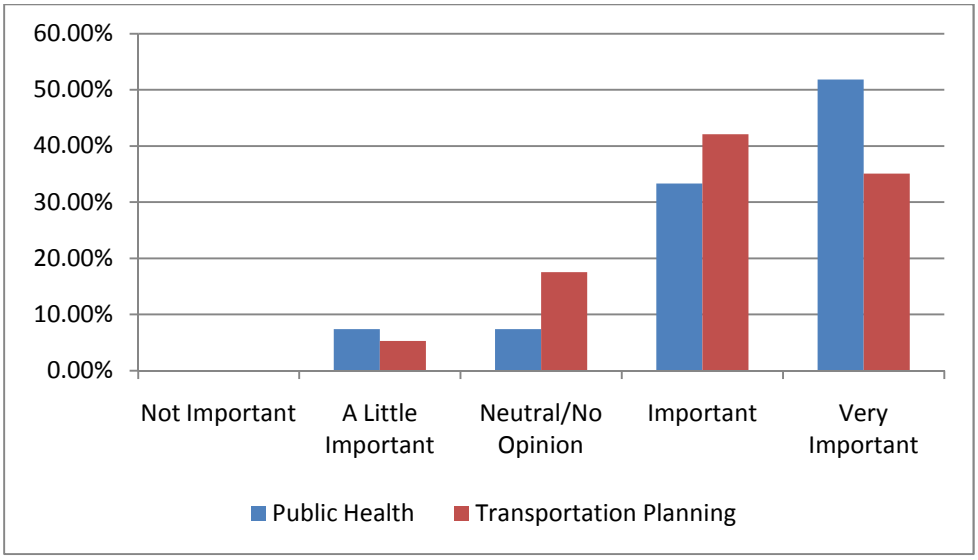


Figure 4.21 Importance of Considering Public Health in Transportation Planning

The APA survey asked if respondents saw health and planning as an important policy issue. They found 63 percent of public health respondent did and 54 percent of planning respondents felt it was an important policy issue (Morris 2006). While this is a slightly different question than asked in this survey it appears that collaboration between transportation and public health is felt to be important.

CHAPTER 5

CONCULSIONS AND RECCOMENDATIONS

5.1 Discussion

This research was design to answer several questions about data sharing and how this might play into creating network collaborations to include social, specifically health data, into the ecological framework. The questions to be addressed were:

- What types of data currently shared in the Dallas-Fort Worth Metroplex?
- What data is found useful to transportation planning and public health?
- What technologies used to share data? Are there gaps in technologies used between transportation and public health?
- What are barriers to sharing data? Are these barriers technical, organizational or policy related?
- What data might be useful but isn't shared? and,
- Is including public health information in transportation planning valued?

5.1.1 Current State of Data Sharing

It was thought that there had been little exchange between the two fields, though much within their respective communities. This appears to be the case as over 80 percent of public health and transportation respondents did report communication and over 70 percent reported data sharing on a regular basis with transportation or public health departments in DFW.

The data types reported flush out the DFW story. Only 20 percent of planners receive quality of life data, ten percent receive health behaviors data, eight percent receive

health outcomes and four percent receive disease rates. Little exchange between fields was demonstrated, most notably a lack of exchange of the Behavioral Risk Factor Surveillance System information which is an important public health survey. The APA survey showed 23 percent of planners receiving the Behavior Risk Factor Surveillance Survey data (Morris 2006). This might be a good dataset to increase data sharing in the DFW area and merits more investigation to find if other regions are using this data in transportation planning.

The survey showed environmental data was most commonly used by both fields. Forty five percent of public health respondents and 39 percent of planners receive environmental data, see Figure 4.7. The APA survey found that 41 percent of planners receive environmental quality data and the finding by the Tri-County Health Department that planners mostly value public health's input on environmental issues (Morris 2006, Roof and Maclennan 2008). Air quality or environmental data is received frequently in DFW and this trend is likely in other regions. It may be a good place to begin data sharing in DFW and elsewhere.

5.1.2 Potentially Useful Data

In DFW there was more wide recognition of data types that might be shared than expected. In particular, over 50 percent of planning respondents reported that data on health behaviors, quality of life, and community health indexes or indicators might be useful. Public health felt that disease rates, hospital records, and health outcomes would also be useful for planners. Sharing health behaviors data and health indexes would be a good starting point as both fields agree this could be useful. In return planners can share demographic forecasts, future transportation plans and infrastructure data, all of which the majority of both respondents felt would be useful to public health. This two-way data exchanges could be a fruitful start to forming partnerships in DFW, though it is not clear it would be useful in other areas.

The data felt to be useful to transportation planners may be relevant to other areas. Data sets that planners in DFW see as useful are safety, community health indicators, health behaviors, and quality of life. These data sets are also found useful in the case studies. Safety

data, health behavior, and community health indicators were useful in Delaware County OH (Roof and Sutherland 2008). Quality of life information was felt to be important in Seattle King County (Roof and Oleru 2008). Based on these case studies and the survey results these dataset may be found useful by other planners around the country. More investigation is needed.

5.1.3 Barriers

Few survey respondents reported technical barriers to data sharing. Since many DFW survey respondents had not attempted data sharing between fields, it may be that technical barriers such as scale, format, and technology have not yet been broached. Scale, format and technology might become a barrier once data sharing is attempted based on experiences in other regions and differences of technologies used between fields. Heavy GIS use by transportation planners in DFW might make sharing the data with public health more challenging. Some health respondents used GIS but not all. More research and experience is needed to see if format and scale are barriers to data sharing in DFW and other regions.

Organizational barriers of funding, lack of interest and lack of expertise were the most citied in DFW. Lack of funding was the strongest barrier. In DFW lack of interest or prioritization of health hinders transportation planners while public health is hindered primarily by their ability to use data. In addition, public health reports not sharing data because it is not being requested while a large percent of planners said this was not an organizational priority. Organizational barriers of time and funding issues will need to be addressed in DFW. These barriers are not discussed in case studies and more research is needed to see if these organizational barriers affect other regions.

Lack of interest and lack of expertise were two of the largest barriers to collaboration in DFW and may be applicable to other regions based on case studies. In Denver, only two of three county planning agencies were receptive to public health's participation (Roof and Maclennan 2008). Based on San Francisco's HIAs Corburn and Bhatia state, "environmental

planners may need to simultaneously understand and adopt a new, social orientation to environmental health, organize and sustain networks of support for HIA within and outside public agencies, and learn new methods of analysis." (2007 p332). While they are speaking of environmental planners the concept of adopting new frameworks applies to transportation planners looking at environmental and social impacts as well. These organization barriers are likely to be encountered in other regions based on evidence from case studies.

At the policy level, government mandates that fail to require consideration of health during the planning process and HIPAA are recognized as barriers by some respondents. Federal laws require environmental considerations in the regional transportation planning process but no health data is required. Mandates are the traditional impetus for change in the transportation field since the 1960's. Federal laws have required public participation, environmental justice, involvement of stakeholders and environmental reviews. Another federal law, HIPAA, prevents small scale aggregation of health data. The scale health data is aggregated to may be a barrier. Because these are national policies they may create barriers across the country, though some states may have different local or statewide regulations. More research is needed to see how HIPAA and data scale issues might be barriers.

5.2 Recommendations for DFW

Based on the survey findings several barriers need to be addressed at the technical, organizational, and policy level.

5.2.1 Organizational Barriers

Organizational barriers need to be addressed, starting with the lack of interest or understanding from transportation planning. This appears to be a barrier in the DFW area as well as in other cities. Education may be one solution. Education of staff and partnership building was the first phase in Seattle-King County collaboration (Roof and Oleru 2008). In Michigan the team spent the first year of the project researching and asking professionals to find an appropriate strategy to combine land use and health. Education was an important part

in most case studies and lack of interest in DFW may be addressed through education of planners on how transportation can affect public health.

In all the case studies, mutual education on the links between transportation and public health were needed along with education as to the value of public health and public health data in the planning process. This education is needed in the DFW area. For transportation planners in DFW the data needs to be viewed as relevant and made a higher priority for data sharing activities to begin and for transportation planners to request data. An educational process may also address the lack of understanding how to use the shared data found in the DFW survey. Funding and time barriers will be more easily addressed if sharing data between the fields is highly valued.

Organizational barriers of time and cost will be further reduced if easy processes to use data are established. Checklists and HIAs are some processes that have been well established in other areas to use data and collaborate. GIS and other technologies can help to visualize and understand shared information. In addition many case studies received grants. These techniques might be useful in the DFW area as well. These barriers are challenging but have been overcome in virtually all of the case studies through grants and genuine interest in improving public health through transportation planning.

5.2.2 Technical Barriers

Technical barriers in DFW include technologies, formats and scales that effect data sharing. Technical barriers of data scale, format, and ownership can be overcome through various technologies or collecting needed data. In many collaboration case studies surveys were used to collect new data for the project (Georgia Institute of Technology 2008, Roof and Sutherland 2008; Roof and Oleru 2008). This might not be feasible in some areas in which case Memoranda of Agreements such as used in the Caltrans project (TRB 2010d) can help agencies decide on how to store, format, and distribute data. Depending on resources available these methods can be used to overcome technical barriers.

The most immediately useful format of data is in reports. Report format is used by nearly all survey participants. Reports are useful as they have already analyzed and interpreted information. Public health can process its data and pull the important information out for transportation planners, once they know what to look for. This was helpful in Denver, Colorado with incorporating the Tri-County Health Department in development review (Roof and Maclennan 2008). Reports are a good starting point but GIS maps or other formats might be more helpful in communicating explicit spatial data with transportation planners. GIS format would reach transportation planners in their comfort zone and make for easier interpretation with relationship to the built environment.

Scale barriers also pose many challenges. While statistics and facts for the general area may be shown, it will likely be more difficult to share disaggregated data due to HIPAA laws. HIPAA protects individual privacy in terms of health records. The Tarrant County Health Department publishes and collects data at the zip code level as a result of HIPAA. Most survey respondents were unsure if this was a barrier, but it is likely to be an issue as more data sharing is attempted.

Specific data that is available and likely to be accepted by transportation planners in DFW are health behaviors, quality of life, safety, and community health indexes or indicators. The BRFSS is a good source of data on health behaviors and health outcomes. This data is not currently shared nor desired by transportation planners in DFW, though it is in other areas. The importance of these data sets are not completely understood at this time, indicating the need for more education on data meanings, implication, and usage. Data public health would be receptive of in DFW is infrastructure data, transportation plans, demographics forecasts, air quality and development plans. This is a large amount of data that could be exchanged to create the needed two-way information sharing.

5.2.3 Policy Barriers

Privacy policy barriers will likely continue but some data, such as demographics, are used by both fields and can be easily shared. The ways of interpreting the data differ and the different meanings will need to be shared. Also, public health can work through reports to give planners the needed information without compromising individual's privacy. However privacy will likely continue to be a barrier do to HIPAA laws. This will likely be an issue for other regions as well. No case studies have addressed this barrier,

Likely a governmental mandate will be needed to change the planning process and ensure public health is included. The most crucial issue to address is convincing transportation planners that public health data should be used in planning activities. Education of planners and decision makers is one method, but mandates have been more effective in the past and create faster change. Either the state or federal government should require consideration of public health in transportation planning. If this can be achieved and clear ways for transportation planners to use public health data are established, other barriers will be easier to overcome.

APPENDIX A

SURVEY

Data Survey

In your role, do you communicate with public health or transportation planning organizations?

- ◯ Yes
- ◯ No

How often do you communicate with public health or transportation planning organizations?

At least once per:

- ◯ Day
- ◯ Week
- ◯ Month
- ◯ Year

Who do you communicate with?

	No Communication	Infrequent Communication	Some Communication	Frequent Communication
City Planning Departments	◯	◯	◯	◯
Traffic Engineers	◯	◯	◯	◯
North Central Texas Council of Governments	◯	◯	◯	◯
Texas Department of Transportation	◯	◯	◯	◯
City Health Department	◯	◯	◯	◯
County Health Department	◯	◯	◯	◯
State Health Department	◯	◯	◯	◯
Non-Profit Public Health Organization (i.e., The American Lung Association)	◯	◯	◯	◯
Neighborhood Clinics	◯	◯	◯	◯
Hospitals	◯	◯	◯	◯

Other (please specify)

Data Survey

If you do not communicate with public health or transportation planning, why not? (Mark all that apply)

- ☐ Not necessary
- ☐ Lack of time
- ☐ Never asked to communicate
- ☐ Handled by a different staff member
- ☐ Other (please specify)
- ☐ Legally prohibited
- ☐ Other organizations are non-receptive
- ☐ Privacy concerns

Does your organization receive data provided by public health or transportation planning organizations?

- ◯ Yes
- ◯ No

How often does your organization receive data provided by public health or transportation planning organizations?
At least once per:

- ◯ Day
- ◯ Week
- ◯ Month
- ◯ Year

Data Survey

What type(s) of data are received and what type(s) are useful to your organization? (Mark all that apply for both types received and types useful)

	Received	Useful
Health Behaviors (physical activity, etc)	☐	☐
Health Outcomes (Obesity, etc)	☐	☐
Disease Rates (Diabetes, Heart Disease, Asthma, etc)	☐	☐
Behavioral Risk Factor Surveillance System Results	☐	☐
Hospital Records	☐	☐
Health Care Cost	☐	☐
Safety	☐	☐
Sanitation	☐	☐
Quality of Life	☐	☐
Water Quality	☐	☐
Community Health Indexes (vulnerable population, medically under-served areas, etc)	☐	☐
Future Transportation Plans	☐	☐
Demographic Forecasts	☐	☐
Infrastructure	☐	☐
Travel Demand	☐	☐
Air Quality	☐	☐
Natural Resources	☐	☐
Development Plans	☐	☐

Other (please specify)

Data Survey

In what format does your organization receive information or data? (Mark all formats that apply for each data type received)

	GIS Files	Spreadsheets	SPSS	SASS	Written Feedback on Plans	Suggestions for Policy	Written Reports	Other
Health Behaviors (physical activity, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Health Outcomes (obesity rates, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Disease Rates (diabetes, heart disease, asthma, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Behavioral Risk Factor Surveillance System	☐	☐	☐	☐	☐	☐	☐	☐
Hospital Records	☐	☐	☐	☐	☐	☐	☐	☐
Health Care Costs	☐	☐	☐	☐	☐	☐	☐	☐
Safety	☐	☐	☐	☐	☐	☐	☐	☐
Sanitation	☐	☐	☐	☐	☐	☐	☐	☐
Quality of Life	☐	☐	☐	☐	☐	☐	☐	☐
Water Quality	☐	☐	☐	☐	☐	☐	☐	☐
Community Health Indexes or Indicators (vulnerable populations, or medically underserved areas)	☐	☐	☐	☐	☐	☐	☐	☐
Future Transportation Plans	☐	☐	☐	☐	☐	☐	☐	☐
Demographic Forecasts	☐	☐	☐	☐	☐	☐	☐	☐
Infrastructure	☐	☐	☐	☐	☐	☐	☐	☐
Travel Demand	☐	☐	☐	☐	☐	☐	☐	☐
Air Quality	☐	☐	☐	☐	☐	☐	☐	☐
Natural Resources	☐	☐	☐	☐	☐	☐	☐	☐
Development Plans	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐

Please specify if you marked 'Other'

Data Survey

If your organization does not receive data from public health or transportation planning organizations, why not? (Mark all that apply)

- ☐ Lack of time
- ☐ Lack of resources
- ☐ Lack of staff expertise
- ☐ No process to use received data
- ☐ Other (please specify)
- ☐ Data needed is not available
- ☐ Data not viewed as relevant
- ☐ Data privacy concerns
- ☐ Not an organizational priority

Does your organization send data to public health or transportation planning organizations?

- ◯ Yes
- ◯ No

How often does your organization send data to public health or transportation planning organizations?
At least once per:

- ◯ Day
- ◯ Week
- ◯ Month
- ◯ Year

Data Survey

In what format(s) does your organization send information or data? (Mark all formats that apply for each data type sent)

	GIS Files	Spreadsheets	SPSS	SASS	Feedback on Plans	Suggestions for Policies	Written Reports	Other
Health Behaviors (physical activity, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Health Outcomes (obesity rates, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Disease Rates (diabetes, heart disease, asthma, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Behavioral Risk Factor Surveillance System	☐	☐	☐	☐	☐	☐	☐	☐
Hospital Records	☐	☐	☐	☐	☐	☐	☐	☐
Health Care Costs	☐	☐	☐	☐	☐	☐	☐	☐
Safety	☐	☐	☐	☐	☐	☐	☐	☐
Sanitation	☐	☐	☐	☐	☐	☐	☐	☐
Quality of Life	☐	☐	☐	☐	☐	☐	☐	☐
Water Quality	☐	☐	☐	☐	☐	☐	☐	☐
Community Health Indexes or Indicators (vulnerable populations, or medically underserved areas)	☐	☐	☐	☐	☐	☐	☐	☐
Future Transportation Plans	☐	☐	☐	☐	☐	☐	☐	☐
Demographic Forecasts	☐	☐	☐	☐	☐	☐	☐	☐
Infrastructure	☐	☐	☐	☐	☐	☐	☐	☐
Travel Demand	☐	☐	☐	☐	☐	☐	☐	☐
Air Quality	☐	☐	☐	☐	☐	☐	☐	☐
Natural Resources	☐	☐	☐	☐	☐	☐	☐	☐
Development Plans	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐

Please specify if you marked 'Other'

Data Survey

If you do not send data to public health or transportation planning organizations, why not? (Mark all that apply)

- ☐ Lack of time and resources
- ☐ Data is not requested
- ☐ Data formats are not compatible
- ☐ Data requested is not available
- ☐ Other (please specify)
- ☐ Data not viewed as relevant
- ☐ Data privacy concerns
- ☐ Not an organizational priority

Are privacy concerns a barrier for data sharing?

- ◯ Yes
- ◯ No

Please specify your privacy concerns with data sharing.

Please complete the matrix on technologies used for data sharing. Find technologies used in the left column and mark how they are applied. Please mark all that apply.

	To share with other agencies	To share within agency	To track communications	To create documents	To hold meetings	To model data	To visualize information	Other
E-mail	☐	☐	☐	☐	☐	☐	☐	☐
Websites	☐	☐	☐	☐	☐	☐	☐	☐
On-Line Downloads	☐	☐	☐	☐	☐	☐	☐	☐
Shared Databases	☐	☐	☐	☐	☐	☐	☐	☐
Cloud Networking	☐	☐	☐	☐	☐	☐	☐	☐
Community Management and Response Tools	☐	☐	☐	☐	☐	☐	☐	☐
Secure Communication Software (ex. ProjectSolve2)	☐	☐	☐	☐	☐	☐	☐	☐
Geographic Information Systems	☐	☐	☐	☐	☐	☐	☐	☐
Visualization Models (ex. MetroQuest, IPLACE3S)	☐	☐	☐	☐	☐	☐	☐	☐

Please specify if you marked 'Other'

Data Survey

Please list any other technologies used for data sharing and how they are used.

What types of public health data might be useful in transportation planning? (Mark all that apply)

- [ ] Health Behaviors (physical activity, eating behaviors)
- [ ] Health Outcomes (mortality rates, obesity rates)
- [ ] Disease Rates (diabetes, heart disease, asthma)
- [ ] Behavioral Risk Factor Surveillance System
- [ ] Hospital Records
- [ ] Health Care Costs
- [ ] Safety
- [ ] Sanitation
- [ ] Quality of Life
- [ ] Environmental Quality
- [ ] Community Health Indexes or Indicators (vulnerable populations, health professional shortage areas, or medically underserved areas)
- [ ] None
- [ ] Not sure (Don't know)
- [ ] Other (please specify)

Data Survey

What type(s) of transportation planning data might be useful to public health organizations? (Mark all that apply)

- [ ] Future Transportation Plans
- [ ] Demographic Forecasts
- [ ] Infrastructure
- [ ] Travel Demand
- [ ] Air Quality
- [ ] Natural Resources
- [ ] Development Plans
- [ ] None
- [ ] Not sure (Don't know)
- [ ] Other (please specify)

At what point(s) in the planning process are public health data used? (Mark all that apply)

- [ ] Visioning and Goal Setting
- [ ] Alternative Scenario Development
- [ ] Public Outreach and Involvement
- [ ] Transportation Modeling/Forecasting
- [ ] Evaluating Alternatives
- [ ] Costs-Benefits Analysis
- [ ] Environmental Analysis or Impact Statements
- [ ] Adopting and Implementing Plans
- [ ] Mitigation
- [ ] Reviewing and Monitoring Results
- [ ] Site Design Review
- [ ] Not Sure (Don't know)
- [ ] Public Health Data Not Used
- [ ] Other (please specify)

Data Survey

What barrier(s) prohibit data sharing between transportation planning and public health?

	Strong Barrier	Barrier	Not a Barrier	Don't Know
Incompatible data scales	◯	◯	◯	◯
Incompatible data formats	◯	◯	◯	◯
Lack of relevant data	◯	◯	◯	◯
Lack of interest in data sharing	◯	◯	◯	◯
Lack of staff expertise to use data	◯	◯	◯	◯
Lack of time	◯	◯	◯	◯
Lack of funding	◯	◯	◯	◯
HIPPA	◯	◯	◯	◯
Privacy requirements	◯	◯	◯	◯

Other (please specify)

Job Title

Age Range

Employer

Years of experience in current position

Field of study in bachelor's program

Field of study in advanced degree programs

How important do you feel it is for transportation planning to consider public health?

- ◯ Very Important
- ◯ Important
- ◯ Neutral/No Opinion
- ◯ A Little Important
- ◯ Not at all Important

Data Survey

Would you be willing to share your professional contact information with others to promote data sharing and collaboration?

- ◯ Yes
- ◯ No
- ◯ It depends (please specify)

Thank you for your time and participation.

APPENDIX B

GLOSSARY

APA – American Planning Association
APHA – American Public Health Association
ASCII – American Standard Code for Information Interchange
BMI – Body Mass Index
BRFSS – Behavioral risk factor Surveillance System
BTS – Bureau of transportation Statistics
CALTRANS – California Department of Transportation
CCHAPS – Community-wide Children's Health Assessment and Planning Survey
CDC- Center for Disease Control
CHSI – Community Health Status Indicators,
DFW – Dallas-Fort Worth
DHHS – Department of Health and Human Services
DOT – Department of Transportation
DSHS – Texas Department of State Health Services
EA – Environmental Analysis
EIS – Environmental Impact Study
EPA – Environmental Protection Agency
FHWA – federal highway Administration
GIS – Geographic Information Systems
HIA – Health Impact Analysis
HPSA Health Professional Shortage Areas
ISTEA – Intermodal Surface Transportation Efficiency Act
MAPP – Mobilizing for Action through Planning and Partnerships
MPO – Metropolitan Planning Organization
MUA – Medically Underserved Areas
NACCHO – National Association of County and City Health Officials
NCTCOG – North Central Texas Council of Governments
NHANES – National Health and Nutrition Examination Survey,
NHDR – national healthcare Disparities Report
NHIS – National Health Interview Survey,
NHTSA - National Highway traffic safety Administration
NO2 – Nitrogen Dioxide
PACE-EH – Protocol for Assessing Community Excellence in Environmental Health
REF – Regional Eco-system Framework
SAFETEA-LU – Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SAS – Statistical Analysis System
SPSS – Statistical Package for the Social Sciences
TAZ – Traffic Analysis Zones
TRB – Transportation Research Board
TRI – Toxic Release Inventory
TXDOT – Texas Department of Transportation
US – United States
VMT – Vehicle Miles Traveled

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BIOGRAPHICAL INFORMATION

Michele Berry obtained a Bachelor's in Geography from Clark University in Worcester MA in 2007, graduating with honors. She then spent time in AmeriCorps, serving low-income older adults in Saint Louis and Boston before returning to school to study City and Regional Planning. Her interest lie in transportation planning and her goal is to obtain employment as a transportation planner. During her Master's program Michele received honors as an Outstanding Scholar and served as the President of the Student Planning Association. She worked as a graduate research assistant for Dr Li throughout the program. For a brief period she also worked for the Institute of Urban Studies as a graduate research assistant. She has interned at the City of Kennedale and City of Rowlett planning department to gain planning experience as she completes her academic studies.