

A STUDY OF ADA PUBLIC RIGHTS-OF-WAY
ACCESSIBILITY GUIDELINE IMPACTS

A M.S. Thesis
presented to
the Faculty of the Graduate School
at the University of Missouri-Columbia

In Partial Fulfillment
of the Requirements for the Degree
Master of Sciences

by
PLOISONGSAENG INTARATIP
Dr. Carlos Sun, Academic Advisor

JULY 2013

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank Dr. Carlos Sun, my advisor, for teaching, advising, and providing me with the guidance and knowledge for this research. Also, I would like to thank Angel Nickolov for teaching me Statistical Analysis System (SAS) software and helping me with meta-analysis. I would like to thank Neal Albritton, ADA coordinator at Sacramento, CA, for providing me the ADA Transition Plan data for Sacramento, CA. I would like to thank Lee White, Engineer II at Department of Public Work at City of Columbia, MO, for providing me Columbia, MO ADA Transition Plan. Finally, I would like to thank my committees for advising me with the guidance for this research.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
LIST OF FIGURE	v
LIST OF TABLES	v
1. ABSTRACT	1
2. INTRODUCTION	2
3. BACKGROUND	5
3.1 AMERICANS WITH DISABILITIES ACT (ADA)	5
3.2 PUBLIC RIGHTS-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG)	8
3.3 ADA TRANSITION PLAN	9
3.3.1 Purpose	10
3.3.2 ADA Methodology	10
3.3.3 Compliance Steps	10
4. LITERATURE REVIEWS	14
4.1 DETECTABLE WARNING SURFACES	14
4.2 UNDULY BURDENSOME	17
4.3 META-ANALYSIS	19
5. METHODOLOGY	21
5.1 ANALYSIS OF ADA TRANSITION PLAN	23
5.2 CLASSIFICATION SCHEMES	25
5.3 DESCRIPTIVE STATISTICS	34
5.4 META-ANALYSIS	38
5.4.1 Set the Hypothesis	40
5.4.2 Criteria for Inclusion and Exclusion	40
5.4.3 Search strategy and Study Selection	41
5.4.4 Statistical Methods and Data Extraction	41
5.4.5 Result and Discussion	44
5.5 CITY BUDGETS AND REVENUES	46
5.6 PERCENT OF OVERALL COST TO COMPLETE ADA TRANSITION PLAN TO OVERALL CITY'S BUDGET/REVENUE	56

6. RESULT AND CONCLUSION	67
7. REFERENCES	69
8. APPENDIX A	75

LIST OF FIGURE

Figure 1: United States Map separated by regions (U.S. Census Bureau Regions 2013) 30

LIST OF TABLES

Table 1: 20 cities _____	23
Table 2: 20 cities with total cost of ADA Transition Plan _____	25
Table 3: Classification Schemes for 20 cities _____	27
Table 4: 20 cities with their classification _____	28
Table 5: 20 cities with classifications and regions _____	31
Table 6: 20 cities with population, population density, and land size _____	33
Table 7: Descriptive Statistic for population _____	35
Table 8: Descriptive Statistic for land size _____	36
Table 9: Descriptive Statistic for population density _____	37
Table 10: Four example cities data analysis _____	43
Table 11: ANOVA results from SAS software _____	44
Table 12: ANOVA results from SAS software _____	44
Table 13: Matrix table for 4 cities _____	45
Table 14: City's CAFR and Financial Report _____	47
Table 15: City's Total revenues for 20 cities _____	50
Table 16: Total expenses for 20 cities _____	52
Table 17: Total public work expenses for 20 cities _____	53
Table 18: Descriptive Statistic for total revenue FY2012 _____	54
Table 19: Descriptive Statistics for total expense for FY2012 _____	55
Table 20: Descriptive Statistics for Total public work expense FY2012 _____	56
Table 21: 20 cities with total cost of completing ADA Transition Plan _____	57
Table 22: Descriptive Statistic for total cost of completing ADA Transition Plan _____	58
Table 23: Percent of overall cost of completing ADA Transition Plan to overall revenue for three classifications _____	59
Table 24: Percent of overall cost of completing ADA Transition Plan to overall expense for three classifications _____	59
Table 25: Percent of overall cost of completing ADA Transition Plan to overall public work expense for three classifications _____	60
Table 26: Percent of overall cost of completing ADA Transition Plan to overall revenue for 20 cities _____	62
Table 27: Percent of overall cost of completing ADA Transition Plan to overall expense for 20 cities _____	64
Table 28: Percent of overall cost of completing ADA Transition Plan to overall public work expense for 20 cities _____	66

1. Abstract

The aim of this research is to improve safety and mobility for the disabled community by examining the impacts of the Public Rights-of-Way Accessibility Guidelines (PROWAG). Another aim is to identify the economic consequences for cities throughout United States for meeting PROWAG. The impacts of PROWAG were analyzed via the Americans with Disabilities Act (ADA) Transition Plans; namely, what are the impacts on cities to meet PROWAG guidelines, how are the land size, population, and differences of city characteristic in each classification contributing to the differences in cost of improving facilities, and how are the costs and revenues contributing to the unduly burdensome standard? Twenty cities examined in this research were chosen because of the availability of informative ADA Transition Plans. After analyzing the Transition Plans, a classification schemes based on U.S. Census Bureau classification schemes general concepts was applied. The scheme divided cities into small cities areas with the population of 50,000 or less, medium cities areas with the population between 50,000 to 250,000, and large cities areas with the population of 250,000 or more. The cities were classified into 7 small cities, 7 medium cities, and 6 large cities. The descriptive statistics were calculated by using population, land size, and population density as factors for describing and comparing the differences of city characteristic in each classification. The differences in city characteristics in each classification show the effect of the cost of improving facilities. Therefore, a meta-analysis was calculated to demonstrate the city characteristics differences that contribute to significant differences in facility improvement costs. The results showed that the characteristics of the cost of

improving facilities and PROWAG disproportionately affect different classification of cities. For instance, typical small cities required fewer facilities to be improved because of the small land size. While typical medium and large cities required more facilities to be improved because of the large land size. The percent of overall cost of improving facilities to the overall city's revenues/expenses were calculated by analyzing ADA Transition Plan and Comprehensive Annual Financial Reports. The results showed that small cities had the highest percent of overall cost of improving facilities to the overall city's revenue/expense compared to medium and large cities. In other words, small cities have the greatest financial impact to meet PROWAG guidelines. With limited revenue, the issue of unduly burdensome could be especially relevant in small cities. However, PROWAG has not been formally adopted and ADA Transition Plans are still developing. Therefore, the overall results of the research are preliminary due to the limitations of the data. Future research could involve another investigation after PROWAG is adopted and Transition Plans are more complete.

2. Introduction

The Americans with Disabilities Act (ADA) is a law that was enacted in 1990 to prohibit discrimination against people with disabilities in many areas, such as employment, public service, public accommodations and services operated by private entities, telecommunications, and other miscellaneous areas (United States Access Board 2008). Title II of ADA, as defined in 42 USC § 12131(1), has the strongest impact on this research because it specific addresses the accessibility of infrastructure under the public right-of-way, including sidewalks, crosswalks, pedestrian signals, curb ramps, pedestrian

paths, and any other feature related to pedestrian safety. Public Rights-of-Way Accessibility Guidelines (PROWAG) are required for the local jurisdictions and other entities covered by the ADA to make sure that the facilities they build are accessible for the disabled person. Therefore, cities in the United States are required to process and develop a Transition Plan for complying with the ADA under Title II of the ADA. The requirement was addressed to any state or local governments that have 50 or more employees, and they are obligated to conduct or update the previous Transition Plan under section 504 of the Rehabilitation Act (U.S. Department of Justice 2007). The purpose of the Transition Plan is to evaluate and review city services, programs, and activities to identify the accessibility of people with disabilities. Then, a grievance procedure is developed by state or local governments to provide people with disabilities with a way to make their complaints known to the city if they feel that they have been discriminated against.

In addition, facilities are ADA compliant when they meet the criteria from the U.S. Department of Justice's ADA Standards for Accessible Design and Revised Draft Guidelines for Accessible Public Rights-of-Way. The Department of Justice published the 2010 ADA Standards for Accessible Design to provide the technical and scope requirements for new construction and modifications in September 15, 2010 (Department of Justice 2010). The Department of Justice is responsible for the enforcement and rulemaking authority. The Revised Draft Guidelines for Accessible Public Rights-of-Way are also known as the Americans with Disabilities Act Accessibility Guidelines (ADAAG) are creating the minimum requirements for new construction and modification. However, the departments and agencies that are responsible for the

standards under ADA are the Department of Transportation (DOT) and the Department of Justice (DOJ). Moreover, public rights-of-way were not adopted as part of DOJ Standard for Accessible Design, but it does not mean that public rights-of-way are not covered by ADA. The public entities under ADA Title II were addressed to the construction, maintenance, or alteration of the public rights-of-way although there are no federal technical or scoping requirements that have been published specifically to public rights-of-way.

An ADA Transition Plan coordinates the placement of projects on a fiscal year basis in the city's Capital Improvement Plan (CIP). Capital Improvement Plan is a short-range plan, between four to ten years, that identifies the city, capital, or other entity projects, provides a planning schedule, and identifies the finances for the plan (City of Columbia 2013). It also describes the extent of the city projects that are necessary to implement the ADA Transition Plan under public right-of-way. However, the status of PROWAG is that it has not been formally adopted yet, and ADA Transition Plan is not universally played out which means many departments are in the beginning steps of developing their ADA Transition Plan.

Consequently, to support the increasing number of people with disabilities, the purpose of this research is to improve safety and mobility for the disabled community by examining the impacts of PROWAG and to identify the economic differences among cities throughout United States for meeting PROWAG. The research studied the ADA and PROWAG to determine what is the impact on a city is to meet PROWAG guidelines. The research also analyzed ADA Transition Plans to determine how are the land size, population, and differences of city characteristic in each classification affect the

differences in costs of improving city facilities and how are the costs and revenues contribute to the unduly burdensome standard i.e., the cost for accessibility improvements exceeding the city's overall budget.

3. Background

3.1 Americans with Disabilities Act (ADA)

U.S. Congress enacted the Americans with Disabilities Act (ADA) on January 26, 1990 and was signed by President George H. W. Bush. ADA defined disability as (42 USC § 12102(1)):

“A physical or mental impairment that substantially limits one or more major life activity of such individual; record of such impairment; or being regarded as having such an impairment.”

The ADA Amendments Act added more coverage of impairments in their major life activities which is went into effect in January 1, 2009. This law prohibits the discrimination against people with disabilities in many areas such as employment, communications, public accommodation, governmental activities, and transportation. It is also establishes requirement of the service for telecommunications. ADA was divided into five major titles such as employment, public service, public accommodations and services operated by private entities, telecommunications, and miscellaneous provisions. The regulation of the ADA law was effected one year after the enactment of the Act.

Americans with Disabilities Act Title I: Employment

Title I requires an equal employment opportunity that covers employer, employment agency, and labor organization. Title I discrimination rule is based on the language of 42 USC § 12112(a) which states:

“No covered entity shall discriminate against a qualified individual with a disabilities because of the disability of such individual in regard to job application procedures, the hiring, advancement, or discharge of employees, employee compensation, job training, and other terms, conditions, and privileges of employment.”

Americans with Disabilities Act Title II: Public Service

Title II requires equal opportunity for people with disabilities for services, activities, and programs of public entity. Public entity as defined in 42 USC § 12131(1) covers any state or local government; any department, agency, special purpose district, or other instrumentality of state or States or local government; and the National Railroad Passenger Corporation, and any commuter authority. Title II discrimination rule is based on the language of 42 USC § 12132 which states:

“No qualified individual with a disability shall, by reason of such disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of a public entity, or be subjected to discrimination by any such entity.”

ADA Title II is divided into two sections including prohibition against discrimination and other generally provisions and actions applicable to public transportation provided by public entities. The first section, based on the language of 42 USC § 12131-12132, states:

“Any state and local government, department, agency, special purpose district, or other instrumentality of state should remove the architectural, communication, or transportation barriers, or the provision of auxiliary aids and services or the participation in programs or activities for the full and equal services or participation in activities or programs provided by public entity for people with disabilities. Disabled person should not be excluded from the participation benefits of services, activities, or programs of public entity; otherwise it will be subjected to discrimination by any such entity.”

The second section, based on the language of 42 USC § 12141, states:

“Systems of providing designated public transportation which is not fixed route system including bus, rail, or any other conveyance.”

Americans with Disabilities Act Title III: Public Accommodations and Services Operated by Private Entities

Title III requires equal opportunity for people with disabilities for services, activities, and programs of commerce. The Title III discrimination rule is based on the language of 42 USC § 12182(a) and § 12184(a) which states:

“No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of any place of public accommodation by any person who owns, leases (or leases to), or operates a place of public accommodation; and specified public transportation services provided by a

private entity that is primarily engaged in the business of transporting people and whose operations affect commerce.”

Americans with Disabilities Act Title IV: Telecommunications

Title IV covers any common carrier engaged in interstate communication by wire or radio to access for hearing and speech for people with disabilities as defined in 47 USC § 225.

Americans with Disabilities Act Title V: Miscellaneous Provisions

Title V clarifies that both states and the Congress are covered by all provisions of the ADA as defined in 42 USC § 12201-12213.

This project focused on Title II, public service. This title has a big impact on this research because it addresses public transportation including services, programs, and activities. For instance, public services apply to having a good accessibility of infrastructure such as sidewalks and curb ramps, within the public right of way.

3.2 Public Right-of-Way Accessibility Guidelines (PROWAG)

Public Rights-of-Way Accessibility Guidelines (PROWAG) are required for the local jurisdictions and other entities that are covered by ADA to make sure that their facilities are accessible for disabled persons. It is a guideline that focuses on public sidewalks, including curb ramps, sidewalks, accessible routes, and others. The U.S. Access Board specifies the minimum level of accessibility for new construction and modification projects to serve as standards by other agencies. PROWAG (United States Access Board 2011) guidelines for the state and local government facilities have been

published in December 21, 1992 by Public Rights-of-Way Access Advisory Committee (PROWAAC). The draft guidelines were released on June 17, 2002 and were available for public comments and questions until October 28, 2002. In the next three years, PROWAAC revised the draft guidelines and gathered all of the information for cost analysis. On July 26, 2011, the PROWAAC published the proposed guidelines to the public to gather comments for 120 days. Finally, they will finalize the guidelines based on the public comments. The final PROWAG is not yet officially adopted; however, cities and states have already started to address this new guideline.

3.3 ADA Transition Plan

An ADA Transition Plan is a document that will identify access barriers for interior and exterior areas of the city buildings, transportation, parks, commercial districts, and public facilities within the public right of way. The access barriers are indicated and identified by ADA Accessibility Guidelines (ADAAG) for the code sections and requirements of ADA in the ADA Transition Plan. In order to construct and design public facilities to meet the requirements of ADA; state, local government, agencies, and public entities need to evaluate their current public facilities by developing self-evaluations and Transition Plans. The goals for ADA Transition Plan are:

1. Identify physical obstacles that limit the accessibility of facilities to individuals with disabilities,
2. Describe the methods to be used to make the facilities accessible,
3. Develop a schedule achieving compliance,

4. Identify the public officials responsible for implementation of the Transition Plan,
5. Develop a grievance procedure to review complaints, and
6. Initiate public involvement and provide community awareness.” (Jacobs Engineering Group 2009)

3.3.1 Purpose

The purpose of ADA transition plans are to develop a plan to fix and modify items that are not meeting the requirements of ADA, generate the cost of the project for integrating accessibility, and develop a timeline for compliance. The ADA Transition Plan covers the public rights-of-way and buildings. However, this thesis focuses only on the public rights-of-way which are sidewalks, curb ramps, pedestrian paths, street and driveway crossings, crosswalks, pedestrian signal systems, and public transit stops.

3.3.2 ADA Methodology

ADA Transition Plan materials are based on the information from cities in the United States. This information was found by using websites, surveys, questionnaires, and telephone interviews with contacts or ADA coordinators as well as the information and guidance document comes from Federal Highway Administration (FHWA), US Access Board, and Department of Justice (DOJ). The ADA Transition Plan is a plan for developing the current facilities to meet ADA requirements.

3.3.3 Compliance Steps

In order to complete the ADA Transition Plan, every city is required to follow the ADA compliance steps. Baltimore, MD (Jacobs Engineering Group 2009) published a

guide listing best management practices for ADA Transition Plan by dividing the compliance into a step by step process. The compliance steps are:

Designating an ADA Coordinator

Each department needs to assign one employee to be the contact and coordinator for ADA compliance. This will benefit the public, since they will be able to easily find and talk to the right person that can help them regarding an ADA question or concern. The information regarding purported disability discrimination will be answered quickly and consistently. However, the person that takes responsibility of this position must be familiar with the ADA requirements and laws regarding discrimination. This person must also be familiar with the operation of the department, public, and local government.

Providing notice to help the public about ADA requirements

The department is responsible under ADA to give continued notice to the public. The Department of Justice (DOJ) gives a notice model that allows every department to follow. It is a one page document for the brief statements about “employment, effective communication, making reasonable modifications to policies and programs, not placing surcharges on modifications or auxiliary aids and services, and filing complaints. (Americans with Disabilities Act 2006)” However, the department can choose their own effective way to provide notice about ADA to public.

Establishing a grievance procedure

The DOJ requires an agency to publish a grievance procedure. The procedures will help to resolve the complaints of discrimination for disability that arises under Title

II of ADA in a fair way. However, it is not necessary to file complaints with court or federal agency because the DOJ provides a grievance procedure model and allows departments to follow their steps. The grievance procedure model is a checklist that is designed for the use of assessment of “the requirements and tasks of an ADA Coordinator, the government entity’s provision of the ADA notice, and the government entity’s ADA grievance procedures. (Americans with Disabilities Act 2006)”

Developing internal design standards, specifications, and details

The Access Board, also known as the Architectural and Transportation Barrier Compliance Board, developed guidelines of accessibility of public right-of-way for pedestrian facilities. The department requires following the accessibility guidelines and adopting the guidelines into their own way including design, specification, and standards to meet their local conditions. However, the developing of design standard and details need to be consistent in the ADA requirements for their new facilities.

Assigning personnel for the development of a Transition Plan

The ADA Transition Plan has six elements including self-evaluation, description of the methods, schedule and steps, responsible person for the implementation and record of the opportunity given for disabled and their community. For the self-evaluation, a department needs to list out the physical barriers inventory that limits accessibility to determine the level of compliance and the improvements needed. The self-evaluation then explains which barriers removal methods will be used to make the facilities accessible. U.S. Access Board determines the standards of the facilities to be followed when doing the self-evaluation. The inventory check list can be presented in many ways

such as aerial photos, marked up drawings, spreadsheet, database, or Geographic Information System (GIS). The update of the plan needs to be conducted to ensure ongoing ADA compliance.

Approving a schedule and budget for the Transition Plan

The schedule of improvements of facilities for accessibility is required in the ADA Transition Plan. Jacobs (2009) lists the following potential sources for accessibility improvements funding:

- Highway Safety Improvement Program,
- Congestion Mitigation/Air Quality Program,
- National Highway System Improvements Program,
- Railway-Highway Crossing program,
- Recreational Trail Program,
- Safe and Community Traffic Safety Program,
- Surface Transportation Program,
- Transportation Enhancement Activities Program
- Safe Routes to School Program.

The next step is to set the priority of the facility that needs to be improved such as transportation facilities, places of employment, and public areas.

Monitoring the progress on the implementation of the Transition Plan

ADA Transition Plan needs to be reviewed yearly in order to reflect changes in real world conditions and address any possible noncompliance. The updates of the plan will result in the effective monitoring of the priorities and compliance of the plan.

The ideal ADA Transition Plan process shows the steps of the Transition Plan by following PROWAG to increase accessibility of the facilities; however, it is not universally played out. This means many departments are in the beginning stages of the Transition Plan.

4. Literature Reviews

The literature reviews for this research were focused on three related areas of ADA: detectable warning surfaces, the unduly burdensome standard, and meta-analysis because it is related to the three problems of the research that were discussed earlier. The literature review is a combination of conference papers, journal articles, and government standards cover detectable warning surfaces, unduly burdensome, and meta-analysis for reviewing the critical points of current knowledge to apply in the research.

4.1 Detectable Warning Surfaces

Curb ramps, sidewalks, and pedestrian paths are the facilities that need to be improved under PROWAG and ADAAG to make those facilities accessible for persons with disabilities. There are no specific colors, surface materials, or dome patterns requirement in ADAAG for detectable warnings or dome surfaces. Therefore, several journals and articles were reviewed for the best detectable warning surfaces color, patterns, and safety features that are required to be installed on sidewalk curb ramps under PROWAG.

In the mid-1980's, safety and negotiability research of detectable warning surface was conducted (Bentzen, Nolin et al. 1994). The authors determined the effect of detectable warning surface from human factors data. They determined the safety and negotiability for each detectable warning surface for people with physical disabilities. Fifteen detectable surfaces were tested for persons with visual and physical impairment. Nine surfaces were tested on slopes and 15 surfaces were tested on a level platform. Three types of people with disabilities were surveyed: no aid, aids, and wheelchair. All participants rated with the rating scale of 1-5, 1 being best and 5 being worst. Safety and negotiability were measured subjectively. In addition, people with disabilities were videotaped while they were doing the experiments to let three reviewers rate their performances, also known as the objective measure. The results show that the factors that caused little or no effect to detectable warning surfaces are the resiliency of the surfaces, pattern of the dome surfaces, and texture of the elements to increase slip resistance.

The other way of testing safety and efficiency for detectable warning surfaces was testing the effect of materials and colors during the winter season (Landry, Ratelle et al. 2010). The authors researched on the safety and efficiency for people with visual impairment by testing the effect of materials and colors on detectable warning surfaces. There were eight detectable warning surfaces with four colors such as black, dark grey, yellow, and white, and two types of materials such as polymer and stainless steel. 24 people with visual impairment walked on eight different kinds of detectable warning surfaces and stopped when they detected the difference in the surfaces. After finishing the experiment, they were asked to rate the surfaces with a rating scale of 1-5, 1 being best

and 5 being worst. The results show that the polymer material with the light color was the best detectable warning surface in terms of safety and efficiency.

O'Leary et al. (1996) evaluated detectable warning surfaces for sidewalk curb ramps that were required to be installed under PROWAG to alert people with disabilities from potential dangers when walking or crossing the street. To follow the requirement, there is still a debate on whether people with disabilities need domes or detectable warning surfaces to install on ramps. The authors constructed seven detectable warning surfaces, five domes and two exposed aggregate, to evaluate detectability and maneuverability for the visually impaired and the mobility impaired. The results from 47 visually impaired subjects indicated that the domes are more detectable than exposed aggregate surfaces. Participants that were totally blind failed to detect exposed aggregate while participants with visual impairment did not like the feel of dome surfaces. In addition, mobility impaired subjects preferred exposed aggregate. The results show that there is a major trade-off between maneuverability and detectability. However, there are some issues about maintenance and installation problems for dome surfaces and exposed aggregate surfaces. The authors telephone surveyed the Virginia Department of Transportation and 21 other states to discover the characteristics of different surfaces on ramps. The survey results show that the dome surfaces cause some winter-maintenance damage and significant freeze-thaw. While exposed aggregate surfaces were not having any problems with maintenance damage, there were some installation and use problem. Therefore, the experiences demonstrated that there are some problems for the departments of transportation to select the best surface to install on curb ramp for all people with disabilities.

Color, contrast, and reflectance were one of the methods that can be tested and evaluated for safety of detectable warning surfaces (Bentzen, Nolin et al. 1994). Ten detectable warning surfaces were built and tested by 24 people with visually impaired. The researchers tested using the objective and subjective measures. Objective measures included response time and accuracy. Subjective measures included a rating scale for each surface for best and worst of the detectable warning surfaces. The objective results show the percent of contrast for each surface. If the percent of contrast was higher than 70% then it was highly detectable for people with low vision. The results of subjective show that yellow color was the most chosen by people with visually impaired to be the best color for easy to detect.

From overall journals and articles reviewed, detectable warning surfaces that need to be installed on sidewalk curb ramps under ADAAG to alert person with disabilities from potential dangers required light or bright colors. The factors that cause little or no effect of the detectable surfaces are the resiliency different of the surfaces, pattern of the domes surfaces, and texture of the elements increase slip resistance. However, the dome surfaces were having winter-maintenance damage and significant freeze-thaw. In addition, exposed aggregate surfaces were having a problem with some installation and use problems. Consequently, the literature review demonstrated that there are some difficulties for the departments of transportation to select the best surface for their areas to install on curb ramp for people with all types of disabilities.

4.2 Unduly Burdensome

One part of this research is to determine whether following PROWAG guidelines will contribute to the unduly burdensome standard. The definition of “unduly

burdensome” is explained as the proportion of the cost for improving accessibility compared to city’s overall budget. The discussion is based on 28 C.F.R. § 35.150(a)(3) which states:

“Require a public entity to take any action that it can demonstrate would result in a fundamental alteration in the nature of a service, program, or activity or in undue financial and administrative burdens. In those circumstances where personnel of the public entity believe that the proposed action would fundamentally alter the service, program, or activity or would result in undue financial and administrative burdens, a public entity has the burden of proving that compliance with §35.150(a) of this part would result in such alteration or burdens. The decision that compliance would result in such alteration or burdens must be made by the head of a public entity or his or her designee after considering all resources available for use in the funding and operation of the service, program, or activity, and must be accompanied by a written statement of the reasons for reaching that conclusion. If an action would result in such an alteration or such burdens, a public entity shall take any other action that would not result in such an alteration or such burdens but would nevertheless ensure that individuals with disabilities receive the benefits or services provided by the public entity.”

Greer v. Richardson is a case about unduly burdensome. The Richardson Independent School District (RISD) had argued that the Berkner B. Stadium already provided program

access, but RISD produced the evidence about budgeting process that used to allocate to improving to all school district facilities. RISD explained that the available funds had been used for student instruction facilities and other stadiums that serve more attendance and events. Greer v. Richardson shows that making an activity or program accessible under the ADA standard means that a “public entity shall operate each service, program, or activity so that the service, program, or activity, when viewed in its entirety, is readily accessible to and usable by individuals with disabilities.” 28 C.F.R. § 35.150(a)(1), (3) The ADA standard does not require the agency or public entity to make all existing facilities accessible to individual disabled person nor take an action that would be unduly burdensome. This case shows that there is a possibility for an ADA standard to be unduly burdensome to a public entity. This research tries to find how the costs and revenues contribute to the unduly burdensome standard.

4.3 Meta-Analysis

Meta-Analysis is a method to combine and analyze the result from different studies and to explain the variability treatment effects from identifying potential study moderators (Jain, Sharma et al. 2012). The authors identified and explained the strengths and limitations of meta-analysis. The strengths of meta-analysis are to help identify the few gaps in a specific field, provide estimate of effect size, and report confidence intervals for effect sizes. The limitations of meta-analysis are that the good results depend on the validity of the original data, the bias of studies can sway researchers, authors, publishers, and editors to manage studies with positive result from negative results, and that meta-analysis relies on subjectivity not objectivity because subjective decisions is the action at many stages. However, meta-analysis can be conducted by converting each

study treatment effect to the same measurement such as an effect size, or, standardized mean difference (Kim, Quinn et al. 2012).

Meta-analysis is widely and often used for systematic review in the medical field. For instance, meta-analysis can combine clinical trials of medical treatment with the better understanding of how treatment works (Surkan, et al. 2011). The authors investigated the relationship between child growth and maternal depression in developing countries by using a systematic review procedure and meta-analysis. The authors used six databases to search for studies in developing countries that have published until 2010. There are 17 studies from 11 countries used in the research. Meta-analysis methods of odd ratios and the random effects model were calculated in all studies. The result was that most of the underweight children are from mothers with depression. However, mechanisms and causes are needed to identify from the prospective studies.

Another example of meta-analysis was about examining on the effects of using technology for reading achievement in K-12 classroom (Cheung, Slavin et al. 2011). The authors investigated and examined the relationship between study features and education technology. There were a total of 85 studies based on K-12 students used in the research. Effect sizes were used and computed for the differences between educational technology and traditional methods. The result and finding presented that education technology produced positive effect compare to traditional methods; especially the use of computer-assisted instruction programs that used for education technology for K-12 students in the past decades.

A last example of meta-analysis was the studies of the effect of cotrimoxazole on mortality in HIV-infected adults on antiretroviral therapy (Suthar, et al. 2012). The author determined whether adults with cotrimoxazole that receiving antiretroviral therapy (ART) for human immunodeficiency virus (HIV) infection will reduce mortality for the low and middle income countries by using meta-analysis and systematic review. The authors used 9 studies from the prospective and retrospective cohort studies to compare mortality in HIV for the aged of 13 and older on cotrimoxazole and ART and only ART. Egger's and Begg's test was assessed for the publication bias. The finding presented that there are significantly increased in survival in HIV infected adults with cotrimoxazole on antiretroviral therapy.

Overall, the used of meta-analysis for the above literature are related to this research because it showed that meta-analysis method is a method that used systematic review procedures for better analyzing and understanding how treatment works for difference studies.

5. Methodology

The methodology of this research is divided into six parts, including analyze ADA Transition Plans, determine the classification schemes, calculate the descriptive statistics, calculate meta-analysis, analyze city's budget and revenue, and calculate the percent of overall cost of completing ADA Transition Plan to overall city's revenue/budget. Before starting the method, the data of this research was determined. ADA Transition Plans and city's revenue and budget were used to be a data of this research to solve for the problem. ADA Transition Plans were used for this research,

because they provided the information of cost to improve city facilities. A city's revenue and budget were used to determine how the costs of improving facilities and city's revenue might contribute the unduly burdensome standard. The Google search engine was used to search for ADA Transition Plans on the web. Based on the keyword, Google pulls the relevant documents from their index and then use formulas and programs to find the best relevant documents. As will be discussed later, the data represented U.S. cities well in terms of geographical distribution, land size, population and population density. 20 ADA Transition Plans were found and selected with the similar costs data analysis. However, some of the ADA Transition Plans did not give full details. For instance, some cities provide a full report of ADA Transition Plan while some only provide a draft. Table 1 shows the 20 ADA Transition Plans from 12 states throughout the United States of America. The city's budget and revenue were determined from city document.

Table 1: 20 cities

No.	City	State	ADA Transition Plan
1	Ames	Iowa	(Iowa Department of Transportation 2012)
2	Austin	Texas	(Planning and Development Review Department 2012)
3	Aztec	New Mexico	(City of Aztec 2011)
4	Baltimore	Maryland	(Jacobs Engineering Group 2009)
5	Sioux Falls	South Dakota	(City of Sioux Falls 2008)
6	Tulsa	Oklahoma	(Kim-Hom and Associates INC. and Accessology 2011)
7	Colquitt	Georgia	(City of Colquitt 2012)
8	Columbus	Indiana	(City of Columbus 2012)
9	El Cerrito	California	(City of El Cerrito 2009)
10	Elkhart	Indiana	(City of Elkhart 2012)
11	Hyattsville	Maryland	(Mazz and Arnold and Arnold 2012)
12	St. Louis	Missouri	(City of St. Louis 2010)
13	Rancho Cordova	California	(Moore Iacofano Goltsman 2005)
14	Roseville	California	(City of Roseville 2011)
15	Sacramento	California	(Dowling Associates, Logan Hopper Associates et al. 2005)
16	San Francisco	California	(Department of Public Works 2007-2008)
17	Springfield	Illinois	(City of Springfield 2011)
18	Union City	Georgia	(The City of Union City 2012)
19	Windsor	California	(Castle Code Consulting 2007)
20	Tacoma	Washington	(City of Tacoma 2008)

5.1 Analysis of ADA Transition Plan

20 ADA Transition Plans from 20 cities were analyzed to investigate the cost of completing ADA Transition Plan and the number of public facilities that needed to be improved of each city. Different cities define a project differently. For instance, some of the cities define individual sidewalk and curb ramp as one project, some cities define the whole intersection including sidewalks and curb ramps as one project, and some cities define one area as one project. One area, such as downtown area or school area, included

many intersections that one intersection included many sidewalks and curb ramps. For the cost of completing ADA Transition Plan, some plans give the total cost of improving facilities while some of the plans give the cost of improving each facility. However, the total cost for completing ADA Transition plan information was not provided for each of the 20 cities. Table 2 shows the total cost of ADA Transition Plan and the number of facilities that needs to be improved. There is the total of 11 cities that provided full information about the total cost, while the rest of cities did not provided enough information of the total cost. For instance, St. Louis, Missouri, provides a draft of the ADA Transition Plan that includes the limitation of the plan, plan development, facilities priority, inventory maintenance, schedule, and public comments. In addition, the number of facility that needs to be improved under public right-of-way was investigated. There are 6 cities that provided full information of how many public right-of-way facilities need to be improved. Most of the cities provided in term of the area that needs to be improved. For instance, Austin, Texas, gives the lists of the area that the facilities need to be improved with the total cost instead of the number of facilities.

Table 2: 20 cities with total cost of ADA Transition Plan

City	State	N	Total cost of ADA (\$)
Colquitt	GA	-	-
Aztec	NM	-	-
Hyattsville	MD	5	97,250
Union City	GA	12	1,303,000
El Cerrito	CA	-	-
Windsor	CA	-	989,612
Columbus	IN	-	-
Elkhart	IN	3173	6,296,544
Ames	IA	-	-
Rancho Cordova	CA	1	80,300
Springfield	IL	-	-
Roseville	CA	13	1,111,248
Sioux Falls	SD	-	-
Tacoma	WA	-	2,864,885
St. Louis	MO	-	-
Tulsa	OK	-	8,081,000
Sacramento	CA	28	4,904,860
Baltimore	MD	-	-
San Francisco	CA	-	6,255,992
Austin	TX	-	15,000,000

Therefore, these are 11 cities with the cost of completing ADA Transition Plan that were used for further calculation in the research.

5.2 Classification Schemes

Classification scheme is a hierarchical arrangement of groups or classes of things. It is used for division or arrangement of the objects into groups or classes. The groups or classes are based on the objects characteristics, which the objects have in common. 20 cities were chosen to use in the research. The classifications of the city were determined and compared among the classifications. This research used the classification schemes from U.S. Census Bureau. The U.S. Census Bureau is a principal agency of the United

States Federal Statistical System (United States Census Bureau 2013). It is responsible for generating data about the economy and people of America. The mission and goal of the U.S. Census Bureau is to serve as a good and leading source of quality data for people and the economy, and to provide the best mix of relevancy, quality, cost and timeliness for data and services.

Based on the U.S. Census Bureau classification scheme, this research developed a city classification scheme by using the general concepts from U.S. Census Bureau for defining the small, medium, and large cities. The Geographic Areas Reference Manual (GARM) is used in this research for deriving the classification scheme (United States Census Bureau 2013). In GARM a primary threshold for a Metropolitan Statistical Area (MSA) is the presence of a city of 50,000 or more population. Thus a city with a population of 50,000 or less was considered as a rural area or small cities. Also in GARM, there is a threshold of 250,000 for a Level B area for classifying populations (Brown, Barram et al. 1994). Other thresholds in GARM, such as the areas of 100,000 to 249,999 for Level C or areas of 1 million or more for Level A were not used in this research because they would result in too small number of cities within those categories.

Consequently, Table 3 shows the classification schemes that this research developed. Any city that has population under 50,000 is considered small city. The city that has population between 50,000 and 250,000 is considered medium city and the city with the population of 250,000 or greater is considered large city.

Table 3: Classification Schemes for 20 cities

Classification	Population
Large city	>250,000
Medium city	50,000 - 250,000
Small city	<50,000

After applying the three classifications, Table 4 shows the 20 cities with their classification, micro or metro area, and population sizes from the smallest to largest population separated by colors. Yellow represents small cities, green represents medium cities, and blue represents large cities. There were a total of 7 small cities, 7 medium cities, and 6 large cities. Thus the 20 cities were divided almost equally among the three classifications. However, most of the cities are in the metro area while Colquitt, Georgia is only city that is micro area.

Table 4: 20 cities with their classification

City	State	Population	Classification	MPO Area
Colquitt	GA	1,992	Small city	Micro
Aztec	NM	6,378	Small city	Metro
Hyattsville	MD	17,557	Small city	Metro
Union City	GA	19,456	Small city	Metro
El Cerrito	CA	23,549	Small city	Metro
Windsor	CA	26,801	Small city	Metro
Columbus	IN	44,061	Small city	Metro
Elkhart	IN	50,949	Medium city	Metro
Ames	IA	59,042	Medium city	Metro
Rancho Cordova	CA	64,776	Medium city	Metro
Springfield	IL	116,250	Medium city	Metro
Roseville	CA	127,323	Medium city	Metro
Sioux Falls	SD	153,888	Medium city	Metro
Tacoma	WA	198,397	Medium city	Metro
St. Louis	MO	318,172	Large city	Metro
Tulsa	OK	396,466	Large city	Metro
Sacramento	CA	466,488	Large city	Metro
Baltimore	MD	621,342	Large city	Metro
San Francisco	CA	805,235	Large city	Metro
Austin	TX	820,611	Large city	Metro

Next, the regions for 20 cities were examined. The United States is often separated into four regions: West, Midwest, Northeast, and South. Figure 1 shows the United States map with the four regions. The west coast covers the 11 western states that are separate by the Mississippi River. Each state has a large land size, desert, forest, and mountain. This makes the western U.S. the largest region, because it is covering more than half of the land area in the United States. The most populous state in the west region is California. Midwest covers 12 states in the north central United States. The most popular state for Midwest is Illinois. Midwest states have areas with fewer mountains and no desert. It is a good area for agriculture. Midwest has many large cities including Chicago, Detroit and Milwaukee. Much industry is located in the Midwest. It is a central

location for transportation, railroads, autos, and air travel. The South has 16 states that located in the south central area of United States. It is known for culture, agriculture, and history. The South is the fastest growing areas in the United States with a higher poverty rate than the American average. Other important factors are the South has had a lower household income and lower cost of living than the rest of United States. Last, the Northeastern region covers 9 states. The Northeast has the lowest land areas in the United States. The Northeast is divided into two parts which is New England and Mid-Atlantic. New England covers Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Mid-Atlantic covers New Jersey, New York, and Pennsylvania. The Northeast covers much American history and takes a prominent role in early America. Because Maryland is a significant portion of the modern day Northeast corridor (D.C. to Boston), for the purposes of this research, it is classified as being in the Mid-Atlantic.

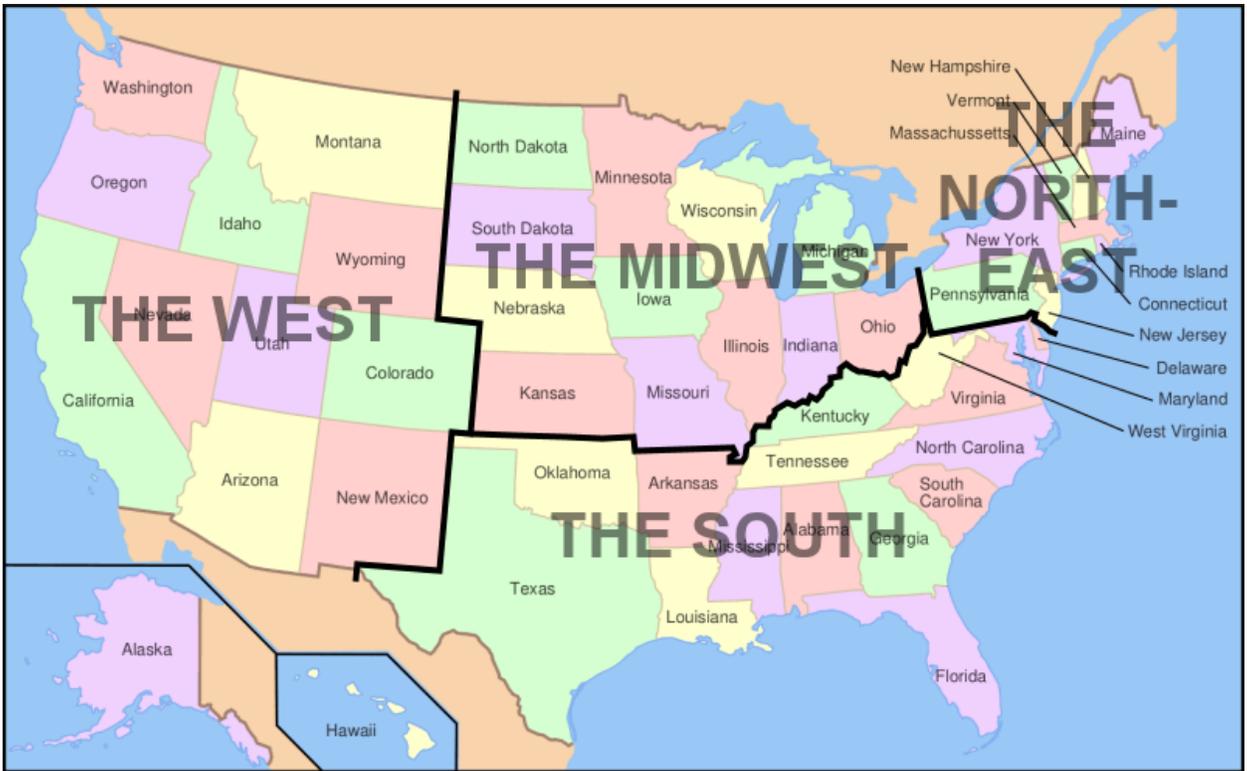


Figure 1: United States Map separated by regions (U.S. Census Bureau Regions 2013)

The 20 cities were assigned to each region as shown in Table 5. There are four in the South, eight in the West, six in the Midwest and two in the Northeast. Most of the cities are from West region because the West covers 11 states and each state has a large land size. The cities from the South and Midwest were about the same number. Unfortunately, the data was scarce for the Northeast.

Table 5: 20 cities with classifications and regions

City	State	Pop.	Class.	Region
Colquitt	GA	1939	Small city	South
Aztec	NM	6378	Small city	West
Hyattsville	MD	17557	Small city	Northeast
Union City	GA	19456	Small city	South
El Cerrito	CA	23549	Small city	West
Windsor	CA	26801	Small city	West
Columbus	IN	44061	Small city	Midwest
Elkhart	IN	50949	Medium city	Midwest
Ames	IA	59042	Medium city	Midwest
Rancho Cordova	CA	64776	Medium city	West
Springfield	IL	116250	Medium city	Midwest
Roseville	CA	127323	Medium city	West
Sioux Falls	SD	153888	Medium city	Midwest
Tacoma	WA	198397	Medium city	West
St. Louis	MO	318172	Large city	Midwest
Tulsa	OK	396466	Large city	South
Sacramento	CA	466488	Large city	West
Baltimore	MD	621342	Large city	Northeast
San Francisco	CA	805235	Large city	West
Austin	TX	820611	Large city	South

As discussed earlier, the small cities have a small population. For instance, Hyattsville, Maryland has a 17,557 population and it is located in the Northeast region. While Baltimore, Maryland is a large city that has a 621,342 population and it is located in a Northeast region. The locations of the regions are not important to clarify whether the cities are small, medium, or large cities. However, the population density, land size, and number of population are important factor to describe the characteristic of the city in each classification.

Table 6 shows the population density and land area for each city. The data are found from the city official website. These data show the population density in each city.

For instance, Hyattsville, Maryland has a very small land area which is 2.67 square miles and 17,557 people. This makes the population density of this city very high, 6,575.7 per square miles compare to the other city in the same classification. Baltimore, Maryland, has a land area of 80.944 square miles and the population of 621,342. The population density for Baltimore is 7,671.5 per square miles, which is also high compared to the other cities in the same classification. By looking at this two cities, Hyattsville and Baltimore have about the same population density.

Table 6: 20 cities with population, population density, and land size

City	State	Pop.	Class.	Region	Land Area (sq. mi.)	Pop. Den. (per sq. mi.)
Colquitt	GA	1939	Small city	South	8.3	233.6
Aztec	NM	6378	Small city	West	9.7	655.7
Hyattsville	MD	17557	Small city	South	2.67	6575.7
Union City	GA	19456	Small city	South	19.1	1000
El Cerrito	CA	23549	Small city	West	3.688	6400
Windsor	CA	26801	Small city	West	7.268	3700
Columbus	IN	44061	Small city	Midwest	27.5	1602.2
Elkhart	IN	50949	Medium city	Midwest	23.45	2172.7
Ames	IA	59042	Medium city	Midwest	24.21	2435.6
Rancho Cordova	CA	64776	Medium city	West	33.507	1900
Springfield	IL	116250	Medium city	Midwest	59.48	2064
Roseville	CA	127323	Medium city	West	36.222	3500
Sioux Falls	SD	153888	Medium city	Midwest	72.96	2109.2
Tacoma	WA	198397	Medium city	West	49.72	3990.3
St. Louis	MO	318172	Large city	Midwest	61.9	5140.1
Tulsa	OK	396466	Large city	South	192.7	1991.9
Sacramento	CA	466488	Large city	West	97.915	4822.3
Baltimore	MD	621342	Large city	South	80.944	7671.5
San Francisco	CA	805235	Large city	West	46.87	17179.2
Austin	TX	820611	Large city	South	297	3262.86

Maryland cities have small land areas compare to the other 12 states. Maryland is located in the Mid-Atlantic near Northeast region that is an area where most of the cities have small land areas. However, the descriptive statistics will be calculated by using these factors for explaining the characteristic of each city classification.

5.3 Descriptive Statistics

Descriptive Statistics is quantitatively describing the main features of the data. Its aim is merely to summarize the sample and not to operate on the probability theory basis. The descriptive statistics was used in this research to describe the characteristic of each classification of the city by measuring the central tendency including average and median. The measures of variability including standard deviation, minimum, and maximum were also used to describe the data set. This is the one of many ways to describe city classifications characteristics.

First, the research calculated the descriptive statistic for the population for three classifications of cities as shown in Table 7. For instance, the average small cities population is 19,971, median is 19,456, and standard deviation is 12,839. Small city has the lowest number of average, median, and standard deviation compared to medium and large cities. The average of medium city population is about 10 times more than the small city. The average of large city population is about 50 times more than a small city. Minimum populations for small cities are about 2,000 and the maximum populations for small cities are about 44,061 while the maximum population for large city is 820,611. The city that has the smallest population is Colquitt, Georgia, and the city with largest population is Austin, Texas.

Table 7: Descriptive Statistic for population

	Small cities pop	Medium cities pop	Large cities pop
Average	19,971	110,089	571,386
Median	19,456	116,250	543,915
Std Dev	12839	51002	193654
Min	1,992	50,949	318,172
Max	44,061	198,397	820,611
Sum	139,794	770,625	3,428,314
Count	7	7	6

Second, the land sizes of three classifications were calculated as shown in Table 8. For instance, the average of small cities land size is 11.18 square miles, median is 8.3 square miles, and standard deviation is 8.31 square miles. Small city has the lowest number of average, median, and standard deviation for land size compare to the medium and large cities. The minimum for small cities land size is 2.67 while medium cities land size is 23.45 and large cities land size is 46.87. The maximum for small cities land size is 27.5 square miles, medium cities land size is 72.96 square miles, and large cities land size is 297 square miles. The city with largest land size is Austin, Texas and the smallest land size city is Hyattsville, Maryland. Out of 50 states in the U.S., Texas has the largest land size in the United States. However, some of the large cities might have a small land size. For instance, some of the cities from Northeast region are large cities with small land sizes such as Washington D.C., with about 60 square miles and 600,000 in population. Therefore, population density will be calculated to examine the differences among three classifications of the city.

Table 8: Descriptive Statistic for land size

	Small cities land size (sq. mi.)	Medium cities land size (sq. mi.)	Large cities land size (sq. mi.)
Average	11.18	42.79	129.55
Median	8.3	36.22	89.43
Std Dev	8.31	17.26	88.32
Min	2.67	23.45	46.87
Max	27.5	72.96	297
Sum	78	300	777
Count	7	7	6

Third, population density was calculated as shown in Table 9. The average of small cities population density, 2,882 per square miles, is higher than medium cities average population density, 2596 per square miles but not by much. While the median of small cities population density is lower than medium and large cities. The standard deviation for small cities population density is 2,502 per square miles, but the standard deviation for medium cities is 753 per square miles. It is very high compared to medium cities because of the variety of the population density that is between 240 per square miles and 6,575.7 per square miles. The minimum population density for medium cities is 1,990 per square miles and the maximum population density for medium cities is 3,990.3 per square miles. The maximum population density for small cities is 6,575.7 per square miles which are twice of medium cities maximum population density. This makes the number of average and standard deviation for small cities higher than medium cities, but still less than large cities. Large city has the highest in average, median, and standard deviation.

Table 9: Descriptive Statistic for population density

	Small cities pop density (per sq. mi.)	Medium cities pop density (per sq. mi.)	Large cities pop density (per sq. mi.)
Average	2,882	2,596	6,678
Median	1,602	2,172	4,981
Std Dev	2502	753	5012
Min	240	1,900	1,991.9
Max	6,575.7	3,990.3	17,179.2
Sum	20,174	18,172	40,068
Count	7	7	6

From the overall descriptive statistics including population, land size, and population density for three classifications of the city, the typical small city characteristic will have small land size and small number of population. Typical small city is an area that located outside of cities or towns with small land size and small settlements. The population density depends on the location of the city. For instance, Hyattsville, Maryland, is located in the Mid-Atlantic region near Northeast region where most of the state has small land size. In addition, the typical medium city characteristic is an area that is located in the cities or towns with high population, large land areas, and large settlements. Medium cities are the area that can be further developed and created by the process of urbanization. Last, typical large city characteristic is an area that is located in the big city with the largest population and large land areas. However, typical large city is an area that combines the urban contiguous built-up area.

5.4 Meta-Analysis

Meta-analysis is a statistical method that focuses on combining and contrasting the results from different studies, identifying patterns among the study results, or other relationships of multiple studies (Jain, Sharma et al. 2012). It is a systematic review that summarizes and combines the results from different studies. Systematic review is a critical evaluation on a specific topic for relevant studies. Meta means “something occurring later, more comprehensive, and is often used to name a discipline designated to deal critically with the original one.(Jain, Sharma et al. 2012)” Meta-analysis is also dealing with quantitative data synthesis which means that meta-analysis is good for summarizing large amount of data, increasing precision of studies, and establishing the magnitude of effect. The aim for good meta-analysis is the presence of heterogeneity and explores the strength of key finding. The clinical field is the most often used meta-analysis such as for measuring the effectiveness of healthcare intervention. However, the accuracy of meta-analysis will depends on the quality of the sample size or systematic review.

Meta-analysis divided into two models: fixed effect and random effect models. The fixed effect model is a model that observes variables that are not random. The fixed effect models can be calculated by group means, number of observations per group, total number of observations, treatment effect, total variance, error effect, and mean square. Random effect model is a hierarchical linear model that can consist of different variables and used to calculate and analyze the hierarchy when it is assumed that there is no fixed effect. It is efficient and can be used if the assumption and underlying model are believed to be satisfied. Fixed and random effect models can be test by Hausman specification test

to see if the test rejects, which means random effects is biased and the fixed effects will be corrected for estimating procedure (Kleinbaum, Kupper et al. 2008).

Meta-analysis has been selected to be one of the methods in this research other than other statistical methods because it is a method with the strength of combining the estimation of different assumptions and saves time by performing the quantitative synthesis that has all available evidence in a short time period. Meta-analysis is more precise in estimating the effect and explains the heterogeneity between individual study results. In this research, ADA Transition Plans were used to combine the estimation of cost from different Transition Plan and analyzed the overall cost to improve facilities.

Meta-analysis is a statistical method that has eight steps to examine the common hypothesis from different studies. The 8 steps of doing meta-analysis are as the following:

1. Set the domain and conduct a hypothesis of the research
2. Create a criteria for the studies to be included
3. Search strategy and study selection
4. Select the final studies which will be included in the research
5. Extract data for each study
6. Calculate and interpretations
7. Select and examine their relationships
8. Discuss meta-analysis results

The advantages of meta-analysis are the accuracy and precision of the estimates if more data is used, providing the closest estimation point of the sample and/or effect size to the population size, and help identifying the gaps in a specific field. However, there are some limitations of doing meta-analysis such as the good result will depend on the quality of original data.

5.4.1 Set the Hypothesis

There are three problems that were discussed earlier in the research, including how are the land size, population, and differences of city characteristic in each classification contribute the cost of improving facilities, what is the impact for cities to meet PROWAG guidelines, and how are the costs and revenues contribute to the unduly burdensome standard? Meta-analysis is only used for testing the differences in cost of improving facilities among cities to support the concept that the costs of improving facilities are different among three classifications. Before calculating the meta-analysis, the hypothesis was determined. The hypothesis in this research is to test whether there is a significant difference in the total cost of completing ADA Transition Plans among different cities.

5.4.2 Criteria for Inclusion and Exclusion

The criteria for this research are any ADA Transition Plans that provided a similar cost data. Full ADA Transition Plans that include the number of facilities and the total cost of each facility were selected. Any ADA Transition Plan other than the criteria will be excluded.

5.4.3 Search Strategy and Study Selection

Studies that are not relevant will be excluded by roughly reviewing the ADA Transition Plan. The remaining studies were read carefully and selected if it was within the criteria.

5.4.4 Statistical Methods and Data Extraction

To test differences in total cost of improving facilities among cities, One-Way Analysis of Variance (ANOVA) was used in the research. ANOVA is a “technique for assessing how several nominal independent variables affect a continuous dependent variables. (Kleinbaum, Kupper et al. 2008)” ANOVA is a technique to compare several population means. In other words, ANOVA is a comparison procedure equivalent to two-sample t test that requires the variance of each population assumption. The comparisons made by using the estimates of variance and the test of F statistics. Please note that population used in this context refers to the statistical population in contrast to the sample and does not refer to people.

One-way ANOVA is a statistical method used in this research, which is to compare means among groups. It is dealing with single factor on single variance (Kleinbaum, Kupper et al. 2008). However, when one factor is a fixed factor, one-way ANOVA will be involved in a comparison of several population means. The problem is to determine whether the mean of population are equal or not. If the population means are not equal, the next problem is to find out the differences. There are four assumption of the one-way ANOVA including random sampling, specified dependent variables were recorded for each test sample, dependent variable is distributed in each population, and variance of dependent variable in each population is the same. The assumption did not

mention fixed-effects one-way ANOVA situations. However, the fixed-effects one-way ANOVA can be applied if the assumption is not violated. Therefore, fixed effects one-way ANOVA model is a model used in this research to test for significant result at 95% confidence level as shown in the following:

$$Y_{ij} = \mu_i + e_{ij}$$

Where, $i = 1, \dots, k$ (# of factor level)

$j = 1, \dots, n$ (n is a sample size group i)

$e_{ij} = N(0, \sigma^2)$

$\mu_i = \text{cell mean (group mean)}$

From the 20 cities, only 11 cities were having similar cost data analysis. For instance, those 11 cities have total cost of improving ADA Transition Plan. In addition, there are only 6 cities that provide full information of number of facilities that need to be improved. In order to calculate one-way ANOVA fixed effects model, the number of facilities, average cost, and standard deviation were determined. Only 4 cities were selected after data extraction because they provided full information of the number of facilities that need to be improved and cost of each facility. The number of facilities, average cost, and standard deviation of improving facilities were computed. Most of the ADA Transition Plans provided a total cost of improving facilities thus the standard deviation could not be derived. The improvement cost per facility under public right-of-way was found for only 4 ADA Transition Plans. Table 10 shows the four cities with the number of facilities that need to be improved, average cost of improving facilities, and

standard deviation. The average and standard deviation for each group was recorded and used to determine the differences in cost.

Table 10: Four example cities data analysis

City	No. of facilities	Average	Standard Deviation
Hyattsville, MD	5	19450	4704
Roseville, CA	13	42740	27356
Union City, GA	12	108583	133573
Sacramento, CA	28	1802454	2135396

Statistical Analysis System (SAS) software was used to calculate one-way ANOVA in this research because it is the software that can perform the statistical analysis. It can also deal with large amount of data. SAS is a program that uses writing a macro language in order to solve and compute statistical problem (SAS Institute Inc. 2012). The SAS outputs are shown in the form of Output Delivery System (ODS) graphics and PDF. SAS programming language required less effort on the technical details.

As shown in Appendix A, the SAS code use in this project was the General Linear Mixed Models (GLM) procedure to determine the significant different means among groups. GLM procedure is a model that uses the method of likelihood to estimate the parameter and allows the independent variables to be any type of variables (Kleinbaum, Kupper et al. 2008). GLM procedure also used least square for the linear models including regression, multivariate analysis of variance, partial correlation, analysis of variance, and analysis of covariance. It is a model that handles one or several independent variables to one or several dependent variables.

Finally, the hypothesis test of overall cost of improving facilities was calculated by comparing p-value with the alpha=0.05 or 95% confidence level to test the significant difference in the total cost of completing ADA Transition Plan.

5.4.5 Result and Discussion

One-way ANOVA was calculated by using SAS software to test the hypothesis that there is a significant different in mean cost to complete ADA Transition Plan among 4 cities. Table 11 and 12 show the overall results for testing the total cost of completing ADA Transition Plans for all 4 cities. The highlight numbers are the results that show the F value = 6.39, p-value = 0.0009, and R² = 0.261859. This research used 95% confidence level for testing the significant of result. The p-value = 0.0009 < alpha = 0.05, means that the hypothesis was rejected. There are significant differences in the mean cost of completing ADA Transition Plans among cities.

Table 11: ANOVA results from SAS software

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	4.37E+13	1.46E+13	6.39	0.0009
Error	54	1.23E+14	2.28E+12		
Corrected Total	57	1.67E+14			

Table 12: ANOVA results from SAS software

R-Square	Coeff Var	Root MSE	cost Mean
0.261859	167.1931	1511212	903872

Table 13 shows the matrix of least squares means for each city interaction. This matrix is showing the interactions between cities and the significance if compare between two cities instead of comparing among all 4 cities. The highlighted numbers are showing

the significant differences between cities. For instance, city 1 and city 2 have significant differences in mean with $p\text{-value} = 0.002 < 0.05$ which can be explained as the cost of improving facilities for city 1 is significantly different than the cost of improving facilities for city 2. City 1 is Union City, Georgia and city 2 is Sacramento, California. From the previous discussion, Sacramento is large city with a high population and large land size while Union City is small city with small population and small land size. The population in Sacramento is about 200 times more than the population at Union City. The classifications for both cities were different which make the cost of improving facilities different too.

Table 13: Matrix table for 4 cities

Least Squares Means for Effect treat t for H0: LSMean(i)=LSMean(j) / Pr > t Dependent Variable: cost				
Dependent Variable: cost				
i/j	Union City	Sacramento	Hyattsville	Roseville
Union City		-3.24859	0.108837	0.110806
		0.002	0.9137	0.9122
Sacramento	3.248589		3.469569	2.430156
	0.002		0.001	0.0184
Hyattsville	-0.10884	-3.46957		0.029286
	0.9137	0.001		0.9767
Roseville	-0.11081	-2.43016	-0.02929	
	0.9122	0.0184	0.9767	

Meta-analysis result demonstrated that the population and the size of the city were factors that make significant differences in the cost of improving facilities. This shows that the classification of the city affects the cost of improving facilities. For instance, the typical small city has small population and small land size will have fewer facilities to improve while typical medium city and typical large city have a large population and

large land size will have more facilities to improve. The cost of improving facilities for small city is cheaper compare to medium city. However, the effects of improving facilities are to increase more safety for people with disabilities.

5.5 City Budgets and Revenues

City budgets and revenues were determined and analyzed by using Comprehensive Annual Financial Report (CAFR) or Financial Report of each city for the fiscal years of 2010 through 2012. City budgets and revenues were analyzed, because they are used to determine the factors that contribute to the unduly burdensome standard. CAFR is the U.S. government financial statements report for state, municipal, and other entity with the accounting requirement by Government Standards Board (GASB), the board that provides standard content of CAFR. There were three sections used including introduction, financial, and statistical. Financial section covers management's analysis and discussion, fund financial statements, required supplementary information, notes to the financial statements, government-wide financial statements, and combined financial statements. The statistical section covers economic, demographic information, and additional financial. (Office of Financial Management 2012) CAFR is different than the general budget because the general budget is a plan for fiscal period year showing where the income is to be allocated. While CAFR covers the results of the current year with the previous year accumulations. CAFR covers all financial accounting, including a section that provides a comparison between budget and actual expense, and gives details of investment accounts by category. Financial Report is a report that provides the city's formal financial record of the financial activities of person, business, or other entity. It is very similar to Comprehensive Annual Financial Report. Table 14 shows the 20 cities

with their CAFR or Financial Report for the year of 2012 through 2012. After determining the total revenues and budgets, the city's revenues and budgets were analyzed for further calculation.

Table 14: City's CAFR and Financial Report

No.	City	State	CAFR or Financial Report
1	Ames	IA	(Accounting and Auditing Division of the Department of Finance 2011) and (Department of Finance Accounting Division 2012)
2	Austin	TX	(Financial and Administrative Services Department 2011) and (Financial and Administrative Services Department 2012)
3	Aztec	NM	(City of Aztec 2011) and (City of Aztec 2012)
4	Baltimore	MD	(Department of Finance 2011) and (Department of Finance 2012)
5	Sioux Falls	SD	(The Finance Department 2011) and (The Finance Department 2012)
6	Tulsa	OK	(Bartlett, Kier et al. 2011) and (Bartlett, Kier et al. 2012)
7	Colquitt	GA	(City of Colquitt 2012)
8	Columbus	IN	(Curtin 2011) and (City of Columbus 2012)
9	El Cerrito	CA	(Finance Department 2011) and (Finance Department 2012)
10	Elkhart	IN	(City of Elkhart 2011) and (City of Elkhart 2012)
11	Hyattsville	MD	(Johnson 2011) and (City of Hyattsville 2012)
12	St. Louis	MO	(Office of the Comptroller 2011) and (Office of the Comptroller 2012)
13	Rancho Cordova	CA	(Finance Department 2011) and (Finance Department 2012)
14	Roseville	CA	(Finance Department 2011) and (Finance Department 2012)
15	Sacramento	CA	(Department of Finance and Accounting Division 2011) and (Department of Finance and Accounting Division 2012)
16	San Francisco	CA	(Office of the Controller 2011) and (Office of the Controller 2012)
17	Springfield	IL	(Crutcher 2010) and (McCarty 2012)
18	Union City	GA	(Union City Finance Department 2011) and (Union City Finance Department 2012)
19	Windsor	CA	(Town of Windsor 2011) and (Town of Windsor 2012)
20	Tacoma	WA	(Department of Finance 2011) and (Cherullo 2012)

Revenue is an income that a city receives from funding normal business activities, taxes, or other services. Sale revenue is revenue received from selling services or goods in a period of time. Tax revenue is revenue that government received from taxpayers. Revenue divided into two categories including government activities and business activities. Government activities are city's basic services. For instance, police, transportation, fire, park, recreation, general government, taxes, state and federal grants, and community development. Business activities are the services that provided by city such as utility services, off-street parking services, and convention center. Total revenue for each city was used to compare with the city's overall cost of completing ADA Transition Plan and showed that the cost will not exceed the city overall revenue to cause unduly burdensome.

Table 15 shows city total revenues for 20 cities from the fiscal years of 2010 through 2012. The total revenue for small city is the lowest follow by medium and large city. As mentioned earlier, the total revenue is received from taxpayer and selling service or goods. It will take a city with a high population to have high total revenue. For instance, San Francisco, California is a city with the population of 805,235 with the total revenue of about \$6 billion. Austin, Texas is a city with the population of 820,611 with the total revenue of about \$2 billion. San Francisco has much higher revenue than Austin even though San Francisco has less population than Austin. It is because San Francisco, California, is one a city with high tourism and diverse economic activities. The highlight city, Colquitt, Georgia, is a city that did not make the CAFR or Financial Report available. The total revenue for Colquitt, Georgia was gathered from the University of North Carolina at Chapel Hill School of Government. UNC provides the total revenue for

the year 2005. The research used future value formula to calculate the revenues and expenses for 2010 through 2012. The future value equation is shown in the following:

$$FV = PV(1 + i)^t$$

Where, $FV = \text{future value}$

$PV = \text{present value}$

$i = \text{discount rate}$

$t = \text{year}$

The research used the basic concepts and methodologies of user benefit analysis for highways from American Association of State Highway and Transportation Officials (AASHTO) to determine the discount rate (American Association of State Highway and Transportation Officials September 2010). Based on AASHTO, the revenues and expenses for Colquitt, Georgia for 2010 through 2012 were determined.

Table 15: City's Total revenues for 20 cities

City	State	FY2010 (\$)	FY2011 (\$)	FY2012 (\$)
Colquitt	GA	41,156,548	42,391,245	43,662,982
Aztec	NM	25,681,799	21,043,449	19,627,355
Hyattsville	MD	17,775,050	21,695,831	17,067,845
Union City	GA	23,651,836	22,963,873	26,459,293
El Cerrito	CA	36,854,168	39,705,584	41,142,711
Windsor	CA	22,404,604	18,934,389	21,563,937
Columbus	IN	17,034,743	27,107,164	19,941,957
Elkhart	IN	57,199,700	52,753,801	53,049,848
Ames	IA	300,416,837	327,172,832	326,296,008
Rancho Cordova	CA	61,247,130	69,950,777	69,233,037
Springfield	IL	387,538,000	405,896,000	400,560,000
Roseville	CA	145,500,000	126,100,000	126,600,000
Sioux Falls	SD	246,939,280	274,316,164	307,098,874
Tacoma	WA	922,950,000	985,808,000	1,013,581,000
St. Louis	MO	966,000,000	981,500,000	1,000,000,000
Tulsa	OK	476,135,000	468,341,000	529,772,000
Sacramento	CA	808,604,000	785,182,000	824,963,000
Baltimore	MD	2,237,342,000	2,425,828,000	2,204,493,000
San Francisco	CA	6,596,598,000	7,143,581,000	7,572,492,000
Austin	TX	2,693,536,000	2,918,834,000	2,900,970,000

Next, city budgets were determine and analyzed. In this research, total expenses were used instead of total budget because a total expense is the outflow of money to another group or person to pay for services or items. In contrast, the total budget is the predicted expense in a period of time. Total expense was used to calculate the percent of overall cost of completing ADA Transition Plan to overall expense to meet ADA standards. Expense or expenditure is a money that city pay for an items or services. Expense is divided into two categories: government activities and business activities, same as revenue. The total expense divided into many subcategories, including public

safety, public work, general government, park and recreation, tourism, health and welfare, water and sewer, community development.

Table 16 shows the city's total expenses for all 20 cities for the fiscal year of 2010 through 2012. Again, the total expense for small city is the lowest followed by medium and large city. Total expenses are the money that city used to pay for services or items. For instance, San Francisco is a tourism city that has highest revenue. In the other hand, San Francisco needs to pay the highest total expense compare to other city. The general concept of total revenue and total expense for all three classifications of the city were similar. The typical small city has lowest revenue and expense while typical medium and typical large city have highest revenue and expense. Again, the highlighted city, Colquitt, Georgia, is a city that did not make the CAFR or Financial Report available. The total expenses for 2010 through 2012 were determined by using the same equation and concept as discussed earlier.

Table 16: Total expenses for 20 cities

City	State	FY2010 (\$)	FY2011 (\$)	FY2012 (\$)
Colquitt	GA	28,981,852	29,851,307	30,746,847
Aztec	NM	22,226,318	16,691,084	17,638,859
Hyattsville	MD	14,221,236	22,876,257	21,333,451
Union City	GA	28,680,741	28,978,721	28,423,750
El Cerrito	CA	39,228,398	39,722,258	39,407,453
Windsor	CA	23,687,653	22,721,937	26,906,775
Columbus	IN	12,715,110	12,873,806	12,797,058
Elkhart	IN	54,925,072	55,437,729	52,811,710
Ames	IA	259,243,191	273,090,889	283,544,257
Rancho Cordova	CA	52,660,202	59,271,585	61,091,662
Springfield	IL	369,560,000	399,528,000	419,018,000
Roseville	CA	180,300,000	160,100,000	166,300,000
Sioux Falls	SD	214,389,342	222,391,439	242,229,358
Tacoma	WA	895,392,000	985,953,000	969,703,000
St. Louis	MO	1,007,300,000	997,100,000	1,007,600,000
Tulsa	OK	423,960,000	397,089,000	433,774,000
Sacramento	CA	789,010,000	801,018,000	791,840,000
Baltimore	MD	2,320,496,000	2,226,969,000	2,418,780,000
San Francisco	CA	6,693,068,000	6,809,707,000	7,247,099,000
Austin	TX	2,704,828,000	2,853,428,000	2,962,255,000

Last, the total public works expense was determined and analyzed. Public works expense is one of the overall expense categories that address infrastructure projects that are constructed and financed by the government for health, safety, employment, and recreational uses in the community. Public works expense includes public building, transportation infrastructure, public services, and public spaces. It is related to the research because any PROWAG expenditure typically comes out of the public works expense category.

Table 17 shows the 20 cities total public work expense for the fiscal year of 2010 through 2012. The highlighted cities in red are the cities that did not have enough

information. In this case, total public work expense for Colquitt, Georgia cannot be found. Also the total public work expense for Columbus, Indiana, for the year of 2010 and 2011 cannot be found because the city did not provide the full information of their financial statement.

Table 17: Total public work expenses for 20 cities

City	State	FY2010 (\$)	FY2011 (\$)	FY2012 (\$)
Colquitt	GA	-	-	-
Aztec	NM	3,755,435	1,370,015	2,196,404
Hyattsville	MD	3,398,942	8,734,175	6,804,835
Union City	GA	3,034,056	4,906,720	2,818,491
El Cerrito	CA	5,162,256	6,411,539	6,185,638
Windsor	CA	2,038,043	2,331,074	2,217,777
Columbus	IN	-	-	2,294,254
Elkhart	IN	4,108,923	4,058,166	3,934,022
Ames	IA	13,780,841	16,339,571	14,938,688
Rancho Cordova	CA	5,781,813	4,955,151	9,911,194
Springfield	IL	18,286,000	20,357,000	20,647,000
Roseville	CA	33,100,000	30,900,000	32,500,000
Sioux Falls	SD	38,319,417	36,280,119	43,039,557
Tacoma	WA	19,609,000	75,692,000	52,424,000
St. Louis	MO	66,200,000	67,000,000	70,400,000
Tulsa	OK	83,295,000	58,636,000	61,139,000
Sacramento	CA	89,358,000	97,350,000	98,384,000
Baltimore	MD	191,536,000	140,309,000	150,606,000
San Francisco	CA	225,589,000	239,230,000	210,415,000
Austin	TX	65,565,000	74,835,000	64,247,000

These data including total revenue, total expense, and total public work expense were used to calculate the descriptive statistics to show the big picture of each classification of the city and their manner.

The descriptive statistic for total revenue, total expense, and total public work expense were calculated for three classifications. Table 18 shows the result of three

classifications of the total revenue for the fiscal year of 2012. The research used 2012 revenue and expense for calculating the descriptive statistic and other calculation because it is the most current data. The result shows that the average, median, and standard deviation of small city was the lowest follow by medium and large city. There is a big difference among the three classifications for average, median, and standard deviation. For instance, the small cities average has total revenue of \$27,066,583 while medium cities has about 100 times total revenue more than small cities, and about 1000 times total revenue more for large cities. The minimum for small cities is \$17,067,845 and the maximum for small cities is \$41,142,711. The maximum for small cities is still lower than the minimum revenue for medium cities which is \$53,049,848. The result shows that small cities have low revenue compare to medium and large cities.

Table 18: Descriptive Statistic for total revenue FY2012

	Total Revenue FY12		
	Small cities	Medium cities	Large cities
Avg	27,066,583	328,059,824	2,505,448,333
Median	21,563,937	307,098,874	1,602,246,500
Std Dev	10073324	306791200	2412317200
Min	17,067,845	53,049,848	529,772,000
Max	23,662,982	1,013,581,000	7,572,492,000
Sum	189,466,080	2,296,418,767	15,032,690,000
Count	7	7	6

Next, the descriptive statistic result of total expense for fiscal year of 2012 was determined. Table 19 shows result for three classifications. Again, the average, median, and standard deviation for small cities is lowest follow by medium and large cities. Small cities average total expense was \$25,322,028. Medium cities have about 100 times more expense than small cities. Large cities have about 1000 times more expense compare to

small cities. The minimum expense for small cities is \$12,797,058 and the maximum expense for small cities is \$39,407,453. The maximum expense for small cities is less than the minimum expense for medium cities which is \$52,811,710. The typical small cities will has small revenue and small expense compare to medium and large cities.

Table 19: Descriptive Statistics for total expense for FY2012

	Total Expenses FY12		
	Small cities	Medium cities	Large cities
Avg	25,322,028	313,528,284	2,476,891,333
Median	26,906,775	242,229,358	1,713,190,000
Std Dev	8209529.8	293025953.1	2315396995
Min	12,797,058	52,811,710	433,774,000
Max	39,407,453	969,703,000	7,247,099,000
Sum	177,254,193	2,194,697,987	14,861,348,000
Count	7	7	6

Last, the descriptive statistic for total public work expense for the fiscal year of 2012 was calculated. Table 20 shows the result of total public work expense for all three classifications. The result shows that the average, median, and standard deviation for small cities public work expense were the lowest compare to medium and large cities. Small cities average public work expense was \$3,752,900, while medium cities has about 10 times more than small cities and large cities has about 100 times more than small cities. The minimum public work expense for small cities is \$2,196,404 and the maximum is \$6,804,835. This time the maximum for small cities is higher than the minimum public work expense for medium cities which is \$3,934,022. However, the result still gives a significant difference among three classifications of the city because of the similar concept with total revenue and total expense that typical small cities have low revenue/expense while typical medium and large cities have high revenue/expense.

Table 20: Descriptive Statistics for Total public work expense FY2012

Total Public Work Expenses FY12			
	Small cities	Medium cities	Large cities
Avg	3,752,900	25,342,066	109,198,500
Median	2,556,373	20,647,000	84,392,000
Std Dev	1958425.055	16581221.9	54638189.99
Min	2,196,404	3,934,022	61,139,000
Max	6,804,835	52,424,000	210,415,000
Sum	22,517,399	177,394,461	655,191,000
Count	6	7	6

Finally, the descriptive statistic result of total revenue, total expense, and total public work expense for three classifications of the city showed that typical small cities characteristic has small revenues and expenses compare to medium and large cities. It is obvious because typical small city has a small land size and small number of population which makes the total revenue and total expense smaller than typical medium city and typical large city.

5.6 Percent of overall cost to complete ADA Transition Plan to overall city's budget/revenue

After analyzing the city revenue and expense, the percent of overall cost to complete ADA Transition Plan to overall city revenue/expense was calculated to shows what is the impact on a city in each classification to meet PROWAG guidelines and how the costs and revenues contribute to the unduly burdensome standard. For instance, what percent of city's revenue/expense that small, medium, or large cities need to expend in order to follow PROWAG guidelines.

Table 21 shows the total cost to complete ADA Transition Plan for 20 cities and the cost of improving facilities per population. There are only 11 cities that provided full

information of cost data while the rest of the cities did not provided enough information due to the ability of city. As shown in Table 21, small cities, such as Union City and Windsor, have highest cost of improving facilities compare to medium and large cities because of the small number of population. However, the cost of improving facilities per population based on the number of population in the cities and how many facilities they need to be improved. If the city is small but required many facilities to be improved which makes the cost of improving facilities per population higher.

Table 21: 20 cities with total cost of completing ADA Transition Plan

City	State	Pop.	Class.	N	Total cost of ADA (\$)	Cost of improving facilities per pop. (\$)
Colquitt	GA	1939	Small city	-	-	-
Aztec	NM	6378	Small city	-	-	-
Hyattsville	MD	17557	Small city	5	97,250	6
Union City	GA	19456	Small city	12	1,303,000	67
El Cerrito	CA	23549	Small city	-	-	-
Windsor	CA	26801	Small city	-	989,612	37
Columbus	IN	44061	Small city	-	-	-
Elkhart	IN	50949	Medium city	3173	6,296,544	124
Ames	IA	59042	Medium city	-	-	-
Rancho Cordova	CA	64776	Medium city	1	80,300	1
Springfield	IL	116250	Medium city	-	-	-
Roseville	CA	127323	Medium city	13	1,111,248	9
Sioux Falls	SD	153888	Medium city	-	-	-
Tacoma	WA	198397	Medium city	-	2,864,885	14
St. Louis	MO	318172	Large city	-	-	-
Tulsa	OK	396466	Large city	-	8,081,000	20
Sacramento	CA	466488	Large city	-	4,904,860	11
Baltimore	MD	621342	Large city	-	-	-
San Francisco	CA	805235	Large city	-	6,255,992	8
Austin	TX	820611	Large city	-	15,000,000	18

The total costs to complete ADA Transition Plan were used to calculate the descriptive statistic to show the characteristic for each classification of the city. Table 22 shows the descriptive statistic result. From the result, small city has a lowest cost of completing ADA Transition Plan for average, median, and standard deviation follow by medium and large cities. The average and median cost of completing ADA Transition Plan for small cities is small compare to medium and large cities. The results give a big different among three classifications of the city. It is obvious because typical small city has a small land area as discussed earlier. Small land area has small number of facilities that need to be improve compare to large land areas with many number of facilities that need to be improve.

Table 22: Descriptive Statistic for total cost of completing ADA Transition Plan

	Total Cost for completing ADA Transition Plan(\$)		
	Small cities	Medium cities	Large cities
Avg	796,621	2,588,244	8,560,463
Median	989,612	1,988,067	7,168,496
Std Dev	510811	2361108	3884956
Min	97,250	80,300	4,904,860
Max	1,303,000	6,296,544	15,000,000
Sum	2,389,862	10,352,977	34,241,852
Count	3	4	4

Next, the percent of overall cost to complete ADA Transition Plan to overall revenue was calculated for each classification of the city. The research used the sum of cost of completing ADA Transition Plan and the sum of city's budget/revenue for each classification to calculate the percent ratio. Table 23 shows the percent ratio for all three classifications. As shown, small city has the highest percent follow by medium and large cities. Small city used about 4% of their revenue in order to meet PROWAG guidelines

while medium city used 1% and large city used 0.3%. 4% is very significant number that might cause great financial impacts for small cities with their limited revenues to meet PROWAG guidelines.

Table 23: Percent of overall cost of completing ADA Transition Plan to overall revenue for three classifications

Classification	Total cost of ADA (\$)	Total Revenue FY12 (\$)	Percent
Small cities	2,389,862	63,594,093	4%
Medium cities	10,352,977	1,234,612,578	1%
Large cities	34,241,852	11,315,938,000	0.3%

Second, the percent of overall cost to complete ADA Transition Plan to overall city's expense was calculated. Table 24 shows the result for all three classifications. The result shows that small city has the highest percent among three classifications. Small city used about 3% of their expense to follow PROWAG guideline while medium city used 1% and large city used 0.3%. This is the same idea and concept as percent of overall cost to complete ADA Transition Plan to overall city's revenue.

Table 24: Percent of overall cost of completing ADA Transition Plan to overall expense for three classifications

Classification	Total cost of ADA (\$)	Total Expense FY12 (\$)	Percent
Small cities	2,389,862	76,663,976	3%
Medium cities	10,352,977	1,249,906,372	1%
Large cities	34,241,852	11,434,968,000	0.3%

Last, the percent of overall cost of completing ADA Transition Plan to overall public work expense was calculated. The public work is one of the total expenses categories that cover infrastructure projects as discussed earlier. Table 25 shows the

result of all three classifications. From the result, small city has the highest percent follow by medium and large cities. Small city used about 20% of the public work expense to follow PROWAG guideline. Medium city used 10% and large city used 8%. Again, the result explained that the typical small cities impact more than medium and large cities to complete ADA Transition Plan with their limit of revenue and expense.

Table 25: Percent of overall cost of completing ADA Transition Plan to overall public work expense for three classifications

Classification	Total cost of ADA (\$)	Total Public Work Expense FY12 (\$)	Percent
Small cities	2,389,862	11,841,103	20%
Medium cities	10,352,977	98,769,216	10%
Large cities	34,241,852	434,185,000	8%

From the three classifications of city, small city impact the most. As discussed earlier, typical small city has small land size, small population number, and low revenue. However, small city used the highest percent of their total revenue/expense to complete ADA Transition Plan. The above result shows that small cities used about two or more times of their revenue/expense to follow PROWAG guidelines compare to medium and large cities. This result explained that the typical small cities might have a great financial impact to follow PROWAG guidelines with their limit revenue and this might contribute unduly burdensome.

Consequently, the percent of overall cost for completing ADA Transition Plan to overall revenue/expense for each city were calculated to show the potential impact of each city to meet PROWAG guidelines and how it might relate to the unduly burdensome standard. There are a total of 11 cities out of 20 cities that provided the full information

of total cost to complete ADA Transition Plan. The total cost of completing ADA Transition Plan are the cost of improving city's facilities such as sidewalks, curb ramps, crosswalks, intersection signalization, and pedestrian paths. However, this research concentrated only on PROWAG, including sidewalk, curb ramp, and crosswalk.

Table 26 shows the percent of overall cost for completing ADA Transition Plan to overall revenue. The highlight in red is the city with highest percent of cost of improving facilities to follow PROWAG guidelines. As shown, Union City, Georgia, Windsor, California, and Elkhart, Indiana, have a highest percent for improving city's facilities compare to the other cities while Rancho Cordova, California, and San Francisco, California, have a lowest percent. Recall from the previous discussion, Windsor, California, has population of 26801, land size of 7.268 square miles, and 3700 square miles for population density. Windsor, California, used 5% of their revenue to improve city facilities. Union City, Georgia, has a 1000 square miles for population density, 19.10 square miles land size, and 19,456 population. Union City, Georgia, used 6% of the city's total revenue to improving 12 facilities including sidewalk and curb ramps. Union City, Georgia, has higher cost of improving facilities with a higher revenue compare to Windsor, California, which makes the percent of overall cost of completing ADA Transition Plan to overall city's revenue higher than Windsor, California. This is evidence that PROWAG has a significant impact to the small city because of the limitation of their revenues. While PROWAG has less of an impact to medium and large cities. However, Elkhart, Indiana, is a medium city that has a population of 50949, land size of 23.45 square miles, and 2172.7 square miles of population density. Elkhart used about 12% of the city's revenue to improve 3173 facilities including sidewalk and curb

ramps. This is the highest percent compare to other cities in the table and the number of facilities that need to be improved is very high too. It shows that the numbers of facilities that need to be improved are one of the factors that can impact the city in following PROWAG guidelines other than the cost of improving facilities. The high cost/expense ratio of completing ADA Transition Plan may contribute to the unduly burdensome standard.

Table 26: Percent of overall cost of completing ADA Transition Plan to overall revenue for 20 cities

City	State	N	Total cost of ADA (\$)	Classification	Total Revenue FY12 (\$)	Percent
Colquitt	GA	-	-	Small city	43,662,982	-
Aztec	NM	-	-	Small city	21,043,449	-
Hyattsville	MD	5	97,250	Small city	21,695,831	0.4%
Union City	GA	12	1,303,000	Small city	22,963,873	6%
El Cerrito	CA	-	-	Small city	39,705,584	-
Windsor	CA	-	989,612	Small city	18,934,389	5%
Columbus	IN	-	-	Small city	27,107,164	-
Elkhart	IN	3173	6,296,544	Medium city	52,753,801	12%
Ames	IA	-	-	Medium city	327,172,832	-
Rancho Cordova	CA	18	80,300	Medium city	69,950,777	0.1%
Springfield	IL	-	-	Medium city	405,896,000	-
Roseville	CA	13	1,111,248	Medium city	126,100,000	0.9%
Sioux Falls	SD	-	-	Medium city	274,316,164	-
Tacoma	WA	-	2,864,885	Medium city	985,808,000	0.3%
St. Louis	MO	-	-	Large city	981,500,000	-
Tulsa	OK	-	8,081,000	Large city	468,341,000	2%
Sacramento	CA	28	4,904,860	Large city	785,182,000	0.6%
Baltimore	MD	-	-	Large city	2,425,828,000	-
San Francisco	CA	-	6,255,992	Large city	7,143,581,000	0.1%
Austin	TX	-	15,000,000	Large city	2,918,834,000	0.5%

However, when looking back into the population, land size, and population density. Improving existing facilities for the city with high population density will benefit

more pedestrians with disabilities. On the other hand, the city with large land areas will have more facilities to be improved.

Table 27 shows the percent for overall cost of improving facilities to overall expenses. The highlight in red is the city that might has an impact to meet PROWAG guidelines. For this table, the percent for Union City and Windsor are a little bit changed. Union City, Georgia, used 5% of city's expense to improving their facilities and Windsor, California, used 4% of city's expense to improving facilities. However, Elkhart, Indiana, used 12% of city's expense to improving their facilities. It is about the same amount of percent ratio for revenue. Again, the result shows that the typical small city might has an impact to follow PROWAG guidelines while the numbers of facilities is another important factors that impact the city to meet PROWAG guidelines. Both of the factors can contribute unduly burdensome to the city with their limit of revenue.

Table 27: Percent of overall cost of completing ADA Transition Plan to overall expense for 20 cities

City	State	N	Total cost of ADA (\$)	Classification	Total Expense FY12 (\$)	Percent
Colquitt	GA	-	-	Small city	30,746,847	-
Aztec	NM	-	-	Small city	17,638,859	-
Hyattsville	MD	5	97,250	Small city	21,333,451	0.5%
Union City	GA	12	1,303,000	Small city	28,423,750	5%
El Cerrito	CA	-	-	Small city	39,407,453	-
Windsor	CA	-	989,612	Small city	26,906,775	4%
Columbus	IN	-	-	Small city	12,797,058	-
Elkhart	IN	3173	6,296,544	Medium city	52,811,710	12%
Ames	IA	-	-	Medium city	283,544,257	-
Rancho Cordova	CA	18	80,300	Medium city	61,091,662	0.1%
Springfield	IL	-	-	Medium city	419,018,000	-
Roseville	CA	13	1,111,248	Medium city	166,300,000	1%
Sioux Falls	SD	-	-	Medium city	242,229,358	-
Tacoma	WA	-	2,864,885	Medium city	969,703,000	0.3%
St. Louis	MO	-	-	Large city	1,007,600,000	-
Tulsa	OK	-	8,081,000	Large city	433,774,000	2%
Sacramento	CA	28	4,904,860	Large city	791,840,000	1%
Baltimore	MD	-	-	Large city	2,418,780,000	-
San Francisco	CA	-	6,255,992	Large city	7,247,099,000	0.1%
Austin	TX	-	15,000,000	Large city	2,962,255,000	1%

Last, the percent of overall cost to complete ADA Transition Plan to overall public work expense was calculated. Public work is divided into many categories as mentioned earlier and one of the categories is transportation infrastructure. To determine how significant of improving city's facilities to overall public work expense, the percent is calculated. Table 28 shows the result for the percent of overall cost to complete ADA Transition Plan to overall public work expense. Again, the highlight in red is the city that might have an impact to meet PROWAG guidelines. As shown, Union City, Georgia, used 46% and Windsor, California, used 45% of public work expense to follow PROWAG

guidelines. This is a significant impact for Union City and Windsor to follow PROWAG guidelines. Elkhart, Indiana, used 160% of city's public work expense to meet PROWAG guidelines. This is exceeding their public work expense to improving 3,173 facilities in the city. By looking more carefully at the Elkhart ADA Transition Plan, it is assuming that the ADA Transition Plan with this number of facilities and total cost of improvement are planned to be completed in a single year. This assumption was made to make comparisons easier among the various cities. However, cities will not make improvements over the same time periods. From the background chapter, the ADA Capital Implementation Plan is described to the extent of the city projects that are necessary to implement the ADA Transition Plan under public right-of-way. Capital Implementation Plan or Capital Improvement Plan (CIP) is a short-range plan between four to ten years that identifies the city, capital, or other entity projects; provides a planning schedule; and identifies the financials for the plan. The reader is cautioned to not consider the percent of cost over expense as being implemented in a single year.

In addition, Austin, Texas, used 23% and Tulsa, Oklahoma, used 13% of overall public work expense to improving their facilities. This is a very high percent of cost to complete ADA Transition Plan too, but Austin, Texas, used only 0.5% and Tulsa, Oklahoma, used only 2% of overall revenue to complete ADA Transition Plan which is different to Union City, Windsor, and Elkhart that used very high number of percent of their revenue to complete ADA Transition Plan. Therefore the result is showing that there is a significant impact of small city to follow PROWAG guidelines with their limit of revenue and it might cause unduly burdensome.

Table 28: Percent of overall cost of completing ADA Transition Plan to overall public work expense for 20 cities

City	State	N	Total cost of ADA (\$)	Classification	Total Public Work Expense FY12 (\$)	Percent
Colquitt	GA	-	-	Small city	-	-
Aztec	NM	-	-	Small city	2,196,404	-
Hyattsville	MD	5	97,250	Small city	6,804,835	1%
Union City	GA	12	1,303,000	Small city	2,818,491	46%
El Cerrito	CA	-	-	Small city	6,185,638	-
Windsor	CA	-	989,612	Small city	2,217,777	45%
Columbus	IN	-	-	Small city	2,294,254	-
Elkhart	IN	3173	6,296,544	Medium city	3,934,022	160%
Ames	IA	-	-	Medium city	14,938,688	-
Rancho Cordova	CA	18	80,300	Medium city	9,911,194	1%
Springfield	IL	-	-	Medium city	20,647,000	-
Roseville	CA	13	1,111,248	Medium city	32,500,000	3%
Sioux Falls	SD	-	-	Medium city	43,039,557	-
Tacoma	WA	-	2,864,885	Medium city	52,424,000	5%
St. Louis	MO	-	-	Large city	70,400,000	-
Tulsa	OK	-	8,081,000	Large city	61,139,000	13%
Sacramento	CA	28	4,904,860	Large city	98,384,000	5%
Baltimore	MD	-	-	Large city	150,606,000	-
San Francisco	CA	-	6,255,992	Large city	210,415,000	3%
Austin	TX	-	15,000,000	Large city	64,247,000	23%

The percent of overall cost to complete ADA Transition Plan to percent of overall city's revenue/expense shows that the greatest financial impact to meet PROWAG is in small cities. The typical small city with a small population, small land size, and low income used about 5% of city's revenue to improving facilities while most of the medium and large city used less than 1% of their revenue to improving facilities. Except for Elkhart, which used 12% of their revenue to improved 3,173 facilities. This shows that the number of facilities that need to be improved can be one of the factors that impact cities in meeting PROWAG guidelines other than the cost of improving facilities.

However, the city's ADA Transition Plan is a plan for 5-10 years development. The result changes if the research calculated the percent of overall cost to complete ADA Transition Plan to overall cost of revenue/expense for 5-10 years.

6. Result and Conclusion

From the overall result, it is very important that the size of cities and classification of the city, whether the city is small, medium, or large, affect the cost of improving facilities. The classification scheme for this research was used for the division or arrangement of the objects into groups or classes. The groups, or classes, are based on the objects' characteristics. In this case, the classification scheme was divided into three classifications: small, medium, or large by population size. Descriptive statistics was used to calculate and show city characteristics in each classification by using population, land size, and population density. The result shows that typical small cities have small land size and small population size while typical medium cities and typical large cities have large land size and large population size. It shows that the geographical differences among three classifications, the classification differences of the city, and characteristic of each classification are important factors to define the effect of cost of improving facilities.

Meta-analysis proved that there is a significant difference in the cost of improving facilities among city classifications by using one-way ANOVA method. The overall result shows PROWAG disproportionately affects the different classifications of cities. For instance, the numbers of facilities that need to be improved for small cities are less than medium cities and large cities because small city has smaller land sizes compare to

medium and large cities. It makes the cost of improving facilities for typical small city with small population and small land size significantly different than the cost of improving facilities for typical medium city and typical large city with large population and large land sizes. In other words, the city characteristics and classifications are related to the cost of improving facilities. However, the city with a high population density will benefit more number of people with disabilities.

The revenues and expenses for each city were determined. Small cities have the highest impact to meet PROWAG guidelines by the percent of overall cost to improve facilities to overall revenue/expense. It is obvious because small cities have low revenues to fund PROWAG improvements while medium and large cities have higher revenues. Therefore, the overall cost of improving facilities to overall revenue/expenses for small cities is higher than medium and large cities. The decision of whether compliances are unduly burdensome is made by official designee or head of public agency. The research suggests that the policy should be flexible to support and help the small cities that have the strongest impact to follow PROWAG guidelines. One way is to coordinate with local disabled population or to survey the local disabled population to see what they need. For example, improving city could choose to improve facilities for the area that is used frequently by the disabled population used such as hospitals and school districts instead of improving facilities for every area in the city.

Since, ADA Transition Plan is not universally played out which means many departments are in the beginning process of the Transition Plan. Some of the ADA Transition Plans did not provide full data. Capital Improvement Plans is short-range plan between four to ten years. For instance, Elkhart, Indiana, used 160% of public work

expense to follow PROWAG. It might make a big financial impact to the cities to follow PROWAG guidelines if the total cost of improving facilities is for one year. However, the total cost of improving facilities for Elkhart, Indiana, is given in terms of 4 year plan. It does not make sense to compare one year revenue to 4 years total cost of improving facilities, but this is the preliminary result based on the data and information that available in the ADA Transition Plan. As mentioned earlier, ADA Transition Plan is still in the developing process and PROWAG has not been formally adopted yet. Therefore, it is recommended for future research to investigation more data after PROWAG is adopted and Transition Plans are more complete.

7. References

Accounting and Auditing Division of the Department of Finance (2011). Comprehensive Annual Financial Report of the City of Ames, Iowa. Ames, IA.

American Association of State Highway and Transportation Officials (September 2010). User and Non-User Benefit Analysis for Highways. Washington, D.C., American Association of State Highway and Transportation Officials.

Americans with Disabilities Act. (2006). "Chapter 2 ADA Coordinator, Notice and Grievance Procedure: Administration Requirements Under Title II of the ADA." Retrieved May 20, 2013, from <http://www.ada.gov/pcatoolkit/chap2toolkit.htm>.

Americans with Disabilities Act. (2006). "Chapter 2 Addendum: Title II Checklist." Retrieved May 20, 2013, from <http://www.ada.gov/pcatoolkit/noticetoolkit.pdf>.

Bartlett, D. F., M. P. Kier and D. W. Bryant (2011). Comprehensive Annual Financial Report of the City of Tulsa, Oklahoma. Tulsa, OK.

Bartlett, D. F., M. P. Kier and D. W. Bryant (2012). Comprehensive Annual Financial Report of the City of Tulsa, Oklahoma. Tulsa, OK.

Bentzen, B., T. Nolin and R. Easton (1994). Detectable Warning Surfaces: Color, Contrast and Reflectance.

Bentzen, B. L., T. L. Nolin, R. D. Easton, L. Desmarais and P. A. Mitchell (1994). "Detectable Warnings: Detectability by Individuals with Visual Impairments, and Safety and Negotiability on Slopes for Persons with Physical Impairments."

Brown, R. H., D. J. Barram, E. M. Ehrlich and H. A. Scarr (1994). Geographic Areas Reference Manual.

Castle Code Consulting (2007). 2007 Town of Windsor Americans with Disabilities Act (ADA) Survey update to the ADA Self-Evaluation and Transition Plan. Windsor, CA.

Cherullo, A. (2012). 2012 Comprehensive Annual Financial Report of the City of Tacoma, Washington. Tacoma, WA.

Cheung, A. C. K., R. E. Slavin and E. Center for Data-Driven Reform in (2011). The Effectiveness of Educational Technology Applications for Enhancing Mathematics Achievement in K-12 Classrooms: A Meta-Analysis. Best Evidence Encyclopedia (BEE), Center for Data-Driven Reform in Education.

City of Aztec (2011). ADA Public Right-of-Way Transition Plan 2011. Aztec, NM.

City of Aztec (2011). Comprehensive Annual Financial Report City of Aztec, New Mexico 2011. Aztec, NM.

City of Aztec (2012). Comprehensive Annual Financial Report City of Aztec, New Mexico 2012. Aztec, NM.

City of Colquitt (2012). Americans with Disabilities Act Transition Plan 2012. Colquitt, GA.

City of Columbia, M. (2013). Capital Improvement Program - Overview - City of Columbia, Missouri. Columbia, MO.

City of Columbus (2012). The 2012 Annual Report of the city of columbus - Redevelopment Commission. Columbus, IN.

City of Columbus (2012). Americans with Disabilities Act Transition Plan 2012. Columbus, IN.

City of El Cerrito (2009). City of El Cerrito ADA Transition Plan. El Cerrito, CA.

City of Elkhart (2011). Financial Report 2011. Elkhart, IN.

City of Elkhart (2012). Americans with Disabilities Act Transition Plan: Pedestrian Facilities in the Public Right-of-Way. Elkhart, IN.

City of Elkhart (2012). Financial Report 2012. Elkhart, IN.

City of Hyattsville (2012). City of Hyattsville Annual Budget 2012. Hyattsville, MD.

City of Roseville (2011). 2011 ADA Transition Plan. Roseville, CA.

City of Sioux Falls (2008). ADA Transition Plan. Sioux Falls, SD.

City of Springfield (2011). City of Springfield Americans with Disabilities Transition Plan 2011. Springfield, IL.

City of St. Louis (2010). Missouri Department of Transportation Transition Plan Update in Compliance with the Americans with Disabilities Act, Title II Requirements. St. Louis, MO.

City of Tacoma (2008). City of Tacoma Americans with Disabilities Act Self-Evaluation and Transition Plan. Tacoma, WA.

Crutcher, K. (2010). City of Springfield, Illinois Comprehensive Annual Financial Report. Springfield, IL.

Curtin, C. E. (2011). The 2011 Annual Report Columbus Redevelopment Commission. Columbus, IN.

Department of Finance (2011). Comprehensive Annual Financial Report of the City of Baltimore, Maryland. Baltimore, MD.

Department of Finance (2011). Comprehensive Annual Financial Report of the City of Tacoma, Washington. Tacoma, WA.

Department of Finance (2012). Comprehensive Annual Financial Report of the City of Baltimore, Maryland. Baltimore, MD.

Department of Finance Accounting Division (2012). City of Ames, Iowa Comprehensive Annual Financial Report 2012. Ames, IA.

Department of Finance and Accounting Division (2011). Comprehensive Annual Financial Report of the City of Sacramento, California. Sacramento, CA.

Department of Finance and Accounting Division (2012). Comprehensive Annual Financial Report of the City of Sacramento, California. Sacramento, CA.

Department of Justice. (2010). "2010 ADA Standards for Accessible Design." Retrieved June 15, 2013, from <http://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm>.

Department of Public Works (2007-2008). Americans with Disabilities Act Transition Plan for Curb Ramps and Sidewalks. San Francisco, CA.

Dowling Associates, I., Logan Hopper Associates and I. Moore Iacofano Goltsman (2005). Americans with Disabilities Act Transition Plan. Sacramento, CA.

Finance Department (2011). Comprehensive Annual Financial Report of the City of El Cerrito, California. El Cerrito, CA.

Finance Department (2011). Comprehensive Annual Financial Report of the City of Rancho Cordova, California. Rancho Cordova, CA.

Finance Department (2011). Comprehensive Annual Financial Report of the City of Roseville, California. Roseville, CA.

Finance Department (2012). Comprehensive Annual Financial Report of the City of El Cerrito, California. El Cerrito, CA.

Finance Department (2012). Comprehensive Annual Financial Report of the City of Rancho Cordova, California. Rancho Cordova, CA.

Finance Department (2012). Comprehensive Annual Financial Report of the City of Roseville, California. Roseville, CA.

Financial and Administrative Services Department (2011). Comprehensive Annual Financial Report of the City of Austin, Texas. Austin, TX.

Financial and Administrative Services Department (2012). Comprehensive Annual Financial Report of the City of Austin, Texas. Austin, TX.

Iowa Department of Transportation (2012). Americans with Disabilities Act Transition Plan. Ames, Iowa.

Jacobs Engineering Group (2009). ADA Transition Plans: A Guide to Best Management Practices. Baltimore, MD.

Jain, V., R. Sharma and S. Singh (2012). "Doing meta-analysis in research: A systematic approach." Indian Journal of Dermatology, Venereology & Leprology 78(3): 242-250.

Johnson, L. B. (2011). City of Hyattsville Budget 2011. Hyattsville, MD.

Kim-Hom and Associates INC. and Accessology (2011). City of Tulsa ADA Self-evaluation and Transition Plan. Tulsa, OK.

Kim, J. S., D. M. Quinn and E. Society for Research on Educational (2012). A Meta-Analysis of K-8 Summer Reading Interventions: The Role of Socioeconomic Status in Explaining Variation in Treatment Effects, Society for Research on Educational Effectiveness.

Kleinbaum, D. G., L. L. Kupper, A. Nizam and K. E. Muller (2008). Applied Regression Analysis and Other Multivariable Methods. Belmont, CA, Thomson Brooks/Cole.

Landry, J., A. Ratelle and O. Overbury (2010). Efficiency and Safety Evaluation of Detectable Warning Surfaces in Winter Conditions: Effects of Color and Material. Hong Kong, The 12th International Conference on Mobility and Transport for Elderly and Disabled Persons (TRANSED).

Mazz, M. J. and Arnold and Arnold (2012). Hyattsville ADA Transition Plan. Hyattsville, MD.

McCarty, W. D. (2012). City of Springfield, Illinois Comprehensive Annual Financial Report 2012. Springfield, IL.

Moore Iacofano Goltsman (2005). City of Rancho Cordova Americans with Disabilities Act Transition Plan. Rancho Cordova, CA.

O'Leary, A., P. Lockwood and R. Taylor (1996). "Evaluation of Detectable Warning Surfaces for Sidewalk Curb Ramps." Transportation Research Record: Journal of the Transportation Research Board 1538(-1): 47-53.

Office of Financial Management. (2012). "Comprehensive Annual Financial Report." Retrieved May 30, 2013, from <http://www.ofm.wa.gov/cafr/>.

Office of the Comptroller (2011). Comprehensive Annual Financial Report of the City of St. Louis, Missouri. St. Louis, MO.

Office of the Comptroller (2012). Comprehensive Annual Financial Report of the City of St. Louis, Missouri. St. Louis, MO.

Office of the Controller (2011). Comprehensive Annual Financial Report of the City of San Francisco, California. San Francisco, CA.

Office of the Controller (2012). Comprehensive Annual Financial Report of the City of San Francisco, California. San Francisco, CA.

Planning and Development Review Department (2012). Planning and Development Austin, TX.

SAS Institute Inc. (2012). "SAS/STAT(R) 9.2 User's Guide." Retrieved 11, 2012, from http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug_glimmix_sect008.htm.

Surkan, P. J., C. E. Kennedy, K. M. Hurley and M. M. Black (2011). "Maternal depression and early childhood growth in developing countries: systematic review and

meta-analysis." Depresión materna y crecimiento durante la primera infancia en los países en vías de desarrollo: revisión sistemática y metaanálisis. 89(8): 607-615D.

Suthar, A. B., R. Granich, J. Mermin and A. Van Rie (2012). "Effect of cotrimoxazole on mortality in HIV-infected adults on antiretroviral therapy: a systematic review and meta-analysis." Efecto de cotrimoxazol en la mortalidad de adultos infectados por el VIH que reciben tratamiento antirretrovírico: examen sistemático y metaanálisis. 90(2): 128-138C.

The City of Union City (2012). Americans with Disabilities Act Transition Plan. Union City, GA.

The Finance Department (2011). Comprehensive Annual Financial Report of the City of Sioux Falls, South Dakota. Sioux Falls, SD.

The Finance Department (2012). Comprehensive Annual Financial Report of the City of Sioux Falls, South Dakota. Sioux Falls, SD.

Town of Windsor (2011). Town of Windsor Annual Financial Report 2011. Windsor, CA.

Town of Windsor (2012). Town of Windsor Annual Financial Report 2012. Windsor, CA.

U.S. Census Bureau Regions. (2013). "U.S. Census Bureau Regions: West, Midwest, South and Northeast." Retrieved May 2, 2013, from <http://thomaslegion.net/uscensusbureauregionsthewestthemidwestthesouthandthertheast.html>.

U.S. Department of Justice. (2007). "Americans with Disabilities Act: ADA Guide for Small Towns." Retrieved June 15, 2013, from <http://www.ada.gov/smtown.htm#anchor23530>.

Union City Finance Department (2011). Comprehensive Annual Financial Report of the City of Union City, Georgia. Union City, GA.

Union City Finance Department (2012). Comprehensive Annual Financial Report of the City of Union City, Georgia. Union City, GA.

United States Access Board. (2008). "The ADA Amendments Act of 2008." Retrieved April 21, 2013, from <http://www.access-board.gov/about/laws/ada-amendments.htm>.

United States Access Board. (2011). "Public Rights-of-Way: Background." Retrieved April 21, 2013, from <http://www.access-board.gov/prowac/status.htm>.

United States Census Bureau. (2013). "Geographic Areas Reference Manual." Retrieved June 14, 2013, from <http://www.census.gov/geo/reference/garm.html>.

8. Appendix A

```
options ls=78 ps=65 nodate nonumber;

ods pdf file='Intaratip_ADA Transition Plan Meta-Analysis.pdf';
ods trace on;
ods graphics on;

%macro sum_glm(version,

  /****** REQUIRED parameters
  *****/
  N=      , /* Name of the variable containing the frequency counts */
          /* of the individual groups. */
  Mean=   , /* Name of the variable containing the means of the */
          /* individual groups. */
  StdDev= , /* Name of variable containing the standard deviations */
          /* of the individual groups. */
  Group=  , /* Name of the classification (grouping) variable. */

  /****** OPTIONAL parameter
  *****/
  Data=_last_ , /* Name of the SAS data set containing the summary */
               /* statistics. If this parameter is not specified, */
               /* the last created dataset will be used. */
  LSopts =   , /* Any option(s) that are desired on the LSMEANS */
               /* statement. */
  By =      /* By variable(s). */
);

%if &version ne %then %put SUM_GLM macro Version 1.1;

%let opts = _last_=%sysfunc(getoption(_last_));
%if &data=_last_ %then %let data=&syslast;

title 'SUM_GLM Macro: Analysis of Variance on Summary Statistics';

/* Create data based on summary statistics */
data _ADATransitionPlan;
set &data;
```

```

Xis = &Mean + sqrt((&StdDev**2)/&N);
Xns = &N*&Mean - (&N-1)*Xis;
y=Xis; Freq=&N-1; output;
y=Xns; Freq=1; output;
run;

proc glm data=_ADATransitionPlan;
  by &By;
  class &Group;
  freq Freq;
  model y = &Group;
  lsmeans &Group / &LSopts;
run;
quit;

options &opts;
title;
%mend;

data summary;
  length treat $ 8;
  input treat $ means std count bygroup;
datalines;
SD_CR_MD 19450 4704 5 1
SD_CR_CA 42740 27356 13 1
SD_CR_GA 108583 133573 12 1
SD_CR_CA_2 1802454 2135396 28 1
;
proc sort data=summary;
  by bygroup;
run;

%sum_glm(Data=summary,
  N=count,
  Mean=means,
  StdDev=std,
  LSopts=%str(stderr e tdiff),
  By=bygroup,
  Group=Treat)

run;

ods pdf close;
ods trace off;
ods graphics off;

```

