CHALLENGES OF MIXED-USE DEVELOPMENTS:AN ANALYSIS OF CURRENT MIXED-USE DEVELOPMENTS IN U.S.A

by

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ABSTRACT

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There are numerous urban problems that could not be addressed in single use development. Mixed use development as a new theory claims to have the solutions to the urban issues associated with single use development. However, mixed used developments have been criticized for also failing to address their purported claims. This research focuses on analyzing and evaluating the tenets of mixed-use development to determine whether claims of accommodating mixed-income residents, increased density, improved racial diversity, provision of affordable housing, and improved employment trends are achieved. In doing so,

632 single use Block Groups and 84 mixed-use development Block Groups that are located in majority of larger metropolitan areas of the US cities examined. The study employs a number of techniques including regression and other statistical analysis. The results were mixed. Density issues were not found to be different between single use areas and mixed use areas. On the other hand, affordability, employment and mixed-income issues were better accommodated in mixed use areas than in single use areas.

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CHAPTER 1

INTRODUCTION

1.1 Background

Euclidian zoning and segregated land use planning practices are challenged to address certain urban issues resulting in many critiques emerging against various core values of planning practices and planning paradigm (Charter of the New Urbanism, 2001; O'Neill et. al 2000, Kelbaugh, 2002; Duany and Plater-Zyberk, 1992). Existing planning theories and paradigms came to the point where they cannot produce additional viable alternative to solve the prevailing anomalies, as evidenced by the continued sprawling of cities among others issues. Anomalies such as urban sprawl, environmental sustainability and economical and social sustainability issues are among the concerns where the existing land use system has no viable solutions within its capacity. Urban sprawl is an urban development phenomenon where private auto dependence including high energy consumption rate and high labor cost are interrelated challenges to the existing planning practices (O'Neill et. al 2000;Charter of the New Urbanism, 2001).

Additionally, the existing land use planning with the premises of segregated land use and zoning is widely criticized for its low aesthetic quality buildings and low density development (Kelbaugh, 2002; Duany and Plater-

Zyberk,1992). Existing land use planning practice is prone to the over consumption of peripheral land while the cost of providing public services and infrastructures for the extended urbanized areas are too high for the public institutions to afford (Jacobs, 1961; Kelbaugh, 2002; Duany and Plater-Zyberk, 1992).Also, single-use land development is criticized for its destruction of large agricultural lands, natural forest, and the ecosystem of the surrounding habitat (Puentes and Orfield, 2000; Lucy and Phillips, 2000; Kelbaugh, 2002; Duany and Plater-Zyberk, 1992).

Moreover, existing planning practices are blamed for its incapability to address issues such as housing affordability and the provision of integrated housing types for the population (Darcy, 2010; M. Curley, 2010; C. Fraser and L. Kick, 2007). Meanwhile, it is criticized for its inability to address the issues of the ever increasing distances between affordable residential neighborhoods and employment centers where commuting cost and time is beyond the affordable income level (Puget Sound Regional Council, 1999; D. Frank et al. 2006).

On the other hand, there is an increased interest from the federal government and the public to provide affordable housing opportunities for the low-income families, in the form of mixed-use housing development, in order to ameliorate a concentrated urban poverty and central city decline (Immergluck et al., 2003; Fraser et al., 2007; Darcy, 2010; Oakley et al., 2009; Goetz, 2010; Curley, 2010).

New planning paradigms or competing planning theories have emerged during past decades that are aimed at solving the current social and planning problems. Mixed-use development emerged as an integral part of the Traditional Neighborhood Design and Transit Oriented Development (New Urbanism). Mixed-use development is focused on providing urban land use development with the assortment of retail, office, residential, recreation, and other functions concentrated into one location (Kelbaugh, 2002; Duany and Plater-Zyberk, 1992). This approach represents an environmental friendly response to urban ills such as concentrated urban poverty and sprawl. It is expected to maximize the efficient use of space in a neighborhood by providing pedestrian friendly access and mitigating traffic congestion. Also, mixed-use development is intended to offer many benefits to communities such as creating convenience of live-work-play options in a single location where the distances between residential areas and employment centers are diminished to the extent of walking distances (Kelbaugh, 2002; Duany and Plater-Zyberk, 1992).

Additionally, the concept behind the mixed-use development is that its intention to create compact cities where the surrounding environment and agricultural lands are preserved. Also, additional promises of mixed-use development are maintaining a balanced range of housing cost for different income levels and the housing opportunities in the form of mixed housing units such as condos, apartments, high-rise residential buildings, where all income residents are welcomed. Moreover, these zones should provide different

transportation options including public transportation, walking, hiking trails, and transit system. This will reduce traffic congestion, provide open spaces and parks, and preserve urban land in mixed-use developments.

1.1 Research Questions and Problem Statement:

Sprawl related social and urban planning problems such as segregated income and shortage of different housing types are among persisted problems under the single land use planning. These urban planning problems either caused or are correlated to other urban issues such as spatial mismatch, central city joblessness, personal preferences, and the decline of the central cities. Mixed-use development claims to address a number of these urban issues, including urban sprawl and spatial segregation. However, numerous critiques have indicated that this has not been achieved (Angotti, 2001). Criticisms are based on the fact that policies created to address urban social and economic issues have not accomplished the desired result. But most of the criticisms have been narrowly focused and mostly based on individual metropolitan data, which does not really give the broader picture of the success or failure of mixed-use land use. This research therefore aims at addressing the following questions:

1. Do mixed-use developments exhibit more mix of racially diverse population than the immediate neighboring areas?
2. Do mixed-use developments provide more density (population density and residential density) than the immediate neighboring areas?

3. Does mixed-use development experience more change in household income than the immediate neighboring areas?
4. Does the selected mixed-use developments (32 developments) that are developed before the year 2000 experience more change in minority group within the development when compared with the surrounding areas in the ten year (2000-2010) period?

Most suburban residential developments currently are low density developments with segregation by the income levels and they provide a very minimum housing type. Moreover, single land use type urban planning and development is criticized for the very reason that particularly it induced low density development and the segregated community along the income level (Darcy, 2010; M. Curley, 2010; C. Fraser and L. Kick, 2007;Kelbaugh, 2002; Duany and Plater-Zyberk, 1992). Further, sprawl is criticized on the basis that it is a primary cause of separation of homes and employment centers which has contributed to income segregation and disparity within a given residential neighborhood or community (C. Fraser and L. Kick, 2007; Kelbaugh, 2002; Duany and Plater-Zyberk, 1992).

Therefore, mixed-use planning and development emerged as a neutral alternative land use planning practice quite a few decades ago. At the time of its inception, it was widely believed that a mixed-use development provides diverse housing types and affordable housing developments along with the addition of office and retail uses. Accommodating mixed-income residents and affordable

residential developments were among the intended goals of mixed-use development (Kelbaugh, 2002; Duany and Plater-Zyberk, 1992). Presently, it has reached a stage where the goals that mixed developments were intended for needs to be revaluated.

Ameliorating the concentrated urban poverty, housing problems, and central city social problems gained a renewed support from US policy makers (Fraser et al., 2007; Darcy, 2010; Oakley et al., 2009; Goetz, 2010; Immergluck et al., 2003; Curley, 2010). Housing authorities, proponents of mixed-use development, and most US city governments embarked on displacement and dispersal of low income public housing residents into mixed-income developments where improved neighborhood conditions are expected to induce positive place based outcomes and people based outcomes.

Therefore, provision of mixed-income development and housing opportunity for low income people required different economic resources and priorities from different stakeholders including public, private and nonprofit organizations, and the affected community..

Debates over the diverse goal and conceptual controversies between the intended economic values and social gains from the mixed-use developments may hinder the expected outcomes. For instance, unequal interest toward physical neighborhood improvement and provision of improved social status of low income (impoverished) residents are one of the controversies under discussion.

1.2 Purpose:

This research study will analyze and evaluate the tenets of mixed-use development regarding increases in median household income, density, and racial diversity. Since the available data in terms of spatial unit is limiting the research census Block Groups as the smallest size; therefore, this research specifically is intended to examine whether:

a) Block Groups with a mixed-use development that are developed after the year 2000 (54 developments):

- Experience more change in household income than the immediate neighboring Block Groups,
- Exhibit more mix of racially diverse population than the immediate neighboring Block Groups,
- Provide more density than the immediate neighboring Block Groups, and

b) Block Groups with mixed-use developments that are developed before the year 2000 (32 developments):

- Experience more change in household income than the immediate neighboring Block Groups,
- Exhibit more change in mix of racially diverse population than the immediate neighboring Block Groups,
- Provide more density than the immediate neighboring Block Groups when compared with the surrounding Block Groups in the ten year (2000-2010) period.

- Household income and density in the Block Group between the years 2000 and 2010 (10 years) are increasing as expected.

c) Finally, the research will combine the data for the 53 developments and the 32 developments in order to examine the total effects of the mixed-use developments.

Generally, it is expected that mixed-use development comprises mixed-income affordable housing, higher residential density, and diverse racial (ethnic) mix within their development area. Additionally, the goal of this research is to determine whether the mixed-use development not only satisfies specific characteristics of an ideal neighborhood, but to determine whether progressive improvements have been made towards achieving these selected objectives of a mixed-use development.

Apart from revealing the basic characteristics of selected mixed-use developments in the US this study is expected to forward a policy prescription for addressing housing-related social and economic problems such as residential segregation, concentrated poverty, and central city joblessness.

Moreover, this research intends to incorporate a combination of empirical, geo-coding, mapping, and GIS techniques in order to depict whether the existing mixed-use developments have common geographical trends basic land use characteristics.

The study focuses on 53 mixed-use developments that are located within the major US metropolitan context and listed by ULI (Urban Land Institute) as award

winners because of their best mixed-use development practices. Each development under study offers a combination of retail, residential and office services to residents or the community.

To achieve the stated purpose data on census tracts and block groups, and geographic factors such as physical addresses and coordinates, and relevant socioeconomic variables that are identified for the research through the literature review were collected and prepared for the analysis, as will be described in the method section. Figure 2 shows the locations of the mixed-use developments along with the superimposed map of the USA and the geo-coded shape files of the mixed-use developments

Street City State

2200 Westlake Avenue Seattle Washington, ***Block Group 3, Census Tract 73, King County, Washington***

2120 Noisette Boulevard, North Charleston South Carolina

100 Cambridge Street, Boston Massachussets, ***Block Group 1, Census Tract 406, Suffolk County, Massachusetts***

100 Central Avenue Sarasota, Florida, ***Block Group 3, Census Tract 1.01, Sarasota County, Florida***

1400 16th Street Denver Colorado, ***Block Group 5, Census Tract 17.01, Denver County, Colorado***

731 Lexington Avenue New York, New York, ***Block Group 1, Census Tract 112.03, New York County, New York***

711 SE Grand Ave, Portland ,Oregon, ***Block Group 1, Census Tract 11.01, Multnomah County, Oregon***

224 Pontius Avenue North, Seattle, Washington, ***Block Group 1, Census Tract 73, King County, Washington***

101 West Wisconsin Avenue, Milwaukee, Wisconsin, ***Block Group 2, Census Tract 1863, Milwaukee County, Wisconsin***

101 West Wisconsin Avenue Milwaukee Wisconsin, ***Block Group 2, Census Tract 1863, Milwaukee County, Wisconsin***

5800 North Bay shore Drive Glendale Wisconsin

405 South Teller Street Lakewood, Colorado, ***Block Group 3, Census Tract 118.05, Jefferson County, Colorado***

16725 Birkdale Commons Parkway Huntersville North Carolina, ***Block Group 2, Census Tract 62.09, Mecklenburg County, North Carolina***

1120 NW Couch St Portland, Oregon, ***Block Group 1, Census Tract 21, Multnomah County, Oregon***

7499 France Avenue South ,Edina, Minnesota, ***Block Group 3, Census Tract 240.04, Hennepin County, Minnesota***

700 South Rosemary Avenue, West Palm Beach, Florida, ***Block Group 1, Census Tract 26, Palm Beach County, Florida***

Figure 1.1: Sample of Mixed-use developments before geo-coding

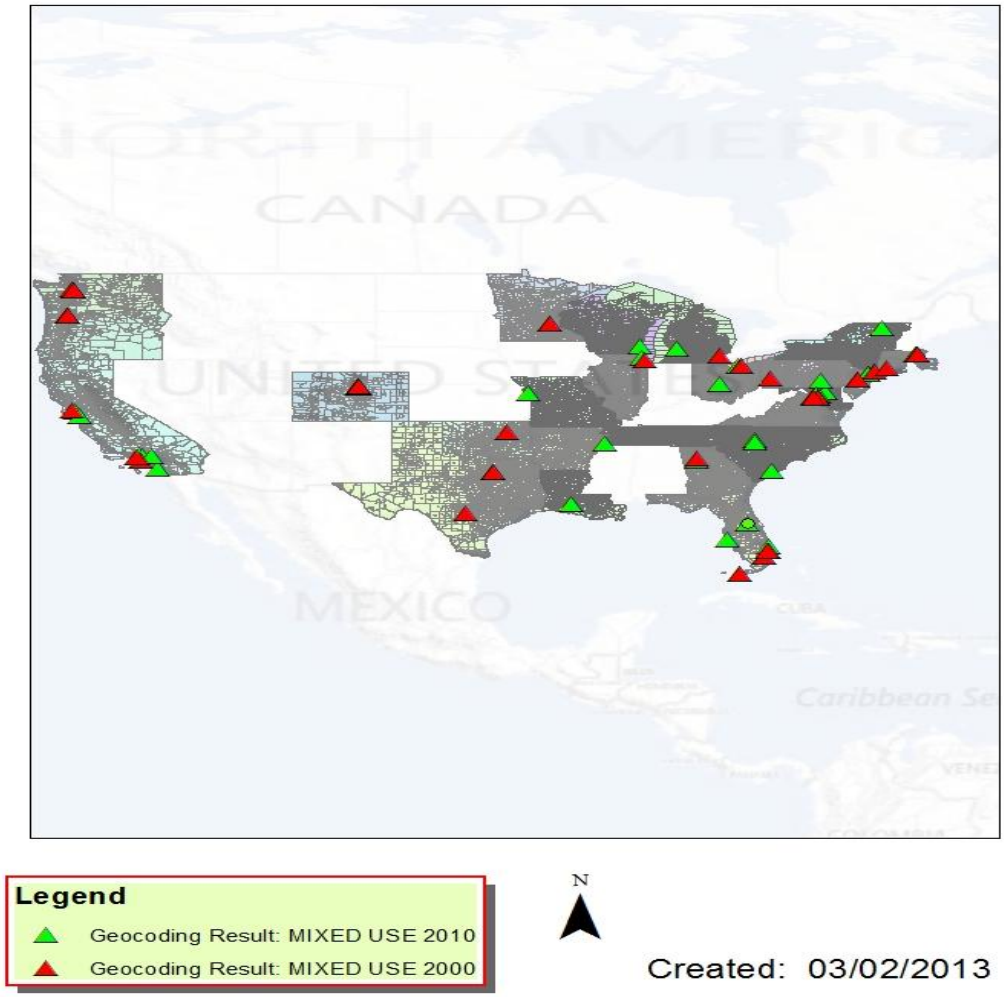


Figure 1.2: All selected mixed-use development

CHAPTER 2

LITERATURE REVIEW

2.1 Background and History

2.1.1 Early Critiques Against the Existing Urban Planning and Activity

In her book titled The *Death and Life of Great American Cities*, Jane Jacobs (1961) criticized the traditional trends and practices of city planning and urban renewal. She argued that most planning and administrative activities of the cities are the main factors in weakening the diversity of the community and these public activities need to consider social and economic factors in ameliorating the social problems created in US cities. She argues:

> *…In short, I shall be writing about how cities work in real life, because this is the only way to learn what principles of planning and what practices in rebuilding can promote social and economic vitality in cities, and what practices and principles will deaden these attributes (Jacobs, 1961, p.4).*

Also, emerging critique against existing land use planning activities argued that sidewalks are public in nature and provide an opportunity of communicative role in bringing the people together from different social and private lives (Jacobs, 1961; Kelbaugh, 2002; Duany and Plater-Zyberk, 1992). Also, Jacobs advocated

for an increased public communication and contact that are important in forming public diversity and identity. Public trust and respect for individual residents are a good resource in case of addressing neighborhood (public) or personal need.

As an early critique Jacobs advocated about the need to creating a diverse society with mixed-use developments by planning practices:

> *A mixture of uses, if it is to be sufficiently complex to sustain city safety, public contact and cross-use, needs an enormous diversity of ingredients. So the first question- and I think by far the most important question- about planning cities is this: How can cities generate enough mixture among uses enough diversity- throughout enough of their territories, to sustain their own civilization?(*1961*).*

In general, the social and economic vitality that early critique and articles advocated are mainly focused on consideration of comprehensive solutions including economic and social parameters in to the development of the existing urban planning practices.

2.2 Employment Related Urban Problem and Spatial Mismatch Theory

Spatial mismatch as a hypothesis first emerged after Kain (1968) explored and analyzed the reasons behind the vanishing of employment opportunities away from the poverty stricken areas of black ghettos (Bogart, 1998; O'Sullivan, 2007). This hypothesis states that the blacks' access to jobs is restricted and harder than their white counter parts because of the residential arrangement of the blacks that is further away from the work places. Even though the concept of spatial mismatch theory emerged first in 1968, the cause and root of

concentrated poverty and segregation can be traced back to the end of civil war in 1865(Massey and Denton, 1993).

In order to better understand the concepts behind the spatial mismatch hypothesis, it is important to note existing conceptual explanations by different scholars. According to Howell-Moroney (2005) scholars' interpretations are categorized into two different categories:

a. Those who argue that the main cause of joblessness and spatial mismatch is a racial segregation. These groups of scholars argue that racial segregation induces the central city (ghetto) neighborhood problems such as poverty, crime, joblessness, standard welfare dependence, low education and many other complex socio-economic disorders.
b. The other groups of scholars contend that the root cause of a high joblessness rate is caused by the deteriorated services of social institutions around residential areas. Whereas, the probability of individual success of minority workers is inter-related with a group behavior of black ghettos.

Information about job opportunity is severely disabled or is inaccessible for minority members because the availability of job information is only restricted to wealthy suburbs (Stuart, 2002). Furthermore, as distances between the residential areas of the minority group and the employment areas increase the commuting cost became increasingly unaffordable. It is noted that the commuting cost for minority groups is higher than the commuting cost for other peers.

Therefore, the economic benefit that minority ethnic groups earn from the same job is much less than the economic gain of the white coworkers (Stuart, 2002; Howell-Moroney, 2005).

2.3 Mixed-Use Development

Mixed-use planning and development is relatively a new urban development practice emerged as a solution for solving urban sprawl and the sprawl induced problems (Kelbaugh, 2002; Katz, 1994; Krieger, 1991; Grant, 2002). These sprawl induced problems are declining city centers, disinvestment, segregated society by race and income, degradation of environmental resources, diminishing open lands, and destruction of the wild habitat and ecosystem.

The charter of the New Urbanism (2001) defined a mixed-use development as a development that comprises various land uses where diverse population, diverse income, multiple transportation modes including walking, and environmental and social health is sustained.

Mixed-use development is rooted in New Urbanism movement where Andres Duany and Elizabeth Plater-Zyberk encouraged the traditional urban design concept as a Traditional Neighborhood Design (TND) and the concepts of Transit Oriented Development (TOD) is conceptualized by Peter Calthorpe (Hume, 1991; McInnes, 1992; Duany and Plater-Zyberk, 1992, 1996; Katz, 1994; Krieger, 1991).

On the other hand, Grant J (2002) asserted that mixing uses relies on three major concepts. The first level is that mixed-use development should

incorporate the high intensity of land development where, intensified land use is believed to provide an opportunity to mix housing types, different residential density districts, and an integrated social mix. Additionally, increased intensity of urban land use with a focus on increased range of residential (housing) choices and provision of opportunities for mix of forms and tenures can induce the desirable social mix (Vischer, 1984; Grant, 2002; O'Neill et.al., 2000, David, 2000). Moreover, it is believed that mixing housing types can bring different age groups and different income levels of the society together by creating a desirable social diversity.

The second stage of mixing focuses on allowing more diversified categories of land uses. Increasing the mixture of compatible land uses such as commercial, residential, office parks, and public buildings could provide increased employment opportunity, safe streets, enhanced market and business activities (Grant, 2002;O'Neill et. al 2000).

The third conceptual stage of mixing incorporates the integration of segregated and incompatible uses. Increased diversity within incompatible urban land uses may induce increased employment opportunities and decrease distances between homes and work centers. For instance Grant (2002) argued that the reduction of intra-jurisdictional barriers such as reducing buffer zones between incompatible uses through regulatory practices will help to increase employment opportunities and save more urban land.

Additionally, high density residential developments along with compatible and revenue generating commercial developments can create vibrant activity after work hours and attract additional business clusters in the area (O'Neill et.al., 2000; Calthorpe, 1993; Kelbaugh, 1999; Grant, 2002). Separation of different categories of uses such as the industrial zone and other major land uses required a buffer zone or green barriers in between the areas where the environmental externalities are the main concern. Moreover, mixed-use development could carefully integrate the compatible and fine grained use in order to enhance the compact development while minimizing the excess land consumption.

Kelbaugh (2002) asserted that the New Urbanism (neo-traditional) focused on reviving the earlier segregated land use development models. Also, it is intended to remedy shortage of affordable housing, economic problems, environmental, and social problems that are induced by sprawl (Kelbaugh 2002, Dear 1992, Hornblower 1988, Cark-Madison 1999, McMahon 1999, and Pendall 1999). According to New Urbanism theories mixed-use land development by mixing and keeping different housing types, increased density, varied building use, and varied aged residents can achieve assorted income groups, racially diversified, and socially sustainable community. He further noted that New Urbanism is a new paradigm intended to fill the social, economic, and environmental gap where it has been very difficult to ameliorate through the old segregated land use practices.

To the contrary, there is a widely prevailed opposition against a higher density housing income and mixed racial neighborhood (Kelbaugh1999, O'Neill et.al 2000). Due to the prevailing fear of the reduction of the property value, high income residents resist against low-income residents moving to their neighborhood. Experts believe that, mixed-use development is capable of solving these conflicting interests through collaborated efforts in finding solutions and seeking common grounds between the interested parties (stakeholders) (Kelbaugh 2000, Calthorpe 1993, O'Neill et. al 2000)

Additionally, O'Neill et al (2000) commented that the opposition against the mix of affordable housing and the provision of low income housing opportunity in the mixed-use development can be regulated by newer land use regulation and taxing policies. It can be concluded that for every mixed land use development to happen there should be compatible land use regulation. Opposing comments against mixed-use developments are raised along the issue related to negative outcomes from the existing mixed-use developments.

Controversial argument against mixed-use development raised complaints from residents about noxious odors, traffic congestion from trucks, noises pollution, and highly escalated (inflated) property value and rent. For instance, Angotti & Hanhardt (2001) commented that some of the existing mixed-use developments in New York such as Long Island City, Sunset Park, Red Hook, Hunts Point and Williamsburg experienced resident resistance and complaints against obnoxious activities from the mixed-use areas. Additionally, new issues

such as the unintended effects from the mixed-use development facilities that are related to the consequences from conversion of uses and escalating real-estate values have faced opposition from residents.

Moreover, the move toward building a racially integrated and diverse neighborhood is challenged by the economic segregation and racial segregation where a large number of minority population live in a concentrated poverty area (Wilson 1987; Jargowsky, 1996; Goetz, 2010).

Therefore, mixed-income and mixed-use development programs could face strong opposition from two intertwined social phenomenon: economic segregation and racial segregation. Achieving socially and economically diverse neighborhoods with mixed-income and mixed-use developments could mean or lead to solving the issues related to concentrated poverty, racial segregation, and economic segregation.

2.4 Relating Spatial Mismatch to Mixed-Use Developments

Among the issues associated with spatial mismatch theory is the separation between minorities and employment locations. Mixed-use developments are designed to alleviate some of the spatial mismatched issues. Minorities will then be able to live closer to their place of work. This has a number of implications in the mixed-use community. Among them is a reduction in commuting cost for minorities, increased employment opportunity, and a decrease in median household income in the mixed-use region will occur as minorities (low income) move in, etc. Additionally, mixed-use developments are

expected to enhance information about job opportunity for minority members where the accessibility and the availability of job information could be readily available in mixed-use development (Block Groups). Therefore, employment opportunity will be improved as distances between the residential areas of the minority group and the employment areas decrease. Because of the reduction in work related commuting distances the transportation cost will become increasingly affordable.

2.5 Mixed-Income Housing

Efforts to solve social problems related to urban housing such as provision of affordable housing and providing balanced housing stocks to the needy urban residents goes back to the industrial revolution era where a critical housing shortage occurred in most US cities following the huge number of workers who migrated from rural areas to occupy the massive jobs created in the cities (Martens, 2009). The imbalance between the housing demand and supply aggravated the problems related to housing affordability and inclusionary zoning in most central cities and metropolitan areas (Hartshorne, 1992; Martens, 2009).

Early efforts that are aimed to solve housing related problems are such as The New York Housing Act (1879) which aimed at providing healthy, safe, ventilated housing and control morally unaccepted conditions of the neighborhood such as crime and poverty (Janet, 2000; Martens, 2009). The US Shipping Act (1917) enabled and availed the housing fund for building homes for workers of ship building industries that are related to the WWI efforts and control

workers from striking and leaving their work (Martens, 2009). From these early housing policies alone one can observe two major outcomes: improving the shortage of housing and controlling the residents' behavior. The following table shows different housing related policies of the US as compiled from different sources.

Table 2.1: Summary of US housing related policies and acts

Year	Act	Objective	Remark
Prior to1800s	None	None	no spatial separation between the work place and residences
1917	US Shipping Act	Provide housing for the ship building workers, create a confined labor force, and stop workers movement and strike	Availed $100 million to build 16,000 homes for ship building workers
1920	Federal Housing Act,	Accelerating the economy and controlling the class	created Federal Home Loan Bank, and Federal Mortgage Association
1933	National Industrial Recovery Act	Created the Public Works Administration (PWA)	built 25,000 housing units
1936	Public Works Administration (modified)	Congress limited the scope of PWA only to families with very low income	Catherine Bauer (1934) criticized the housing program for the isolation of the poor from the mainstream neighborhood and the top-down
1937	Housing Act enacted Public Housing Program	Limited to slum clearance and rebuilding, limited cost, limited to low income families	Opposition from US chamber of commerce, National Board of Realtors, and Bankers
1949	US Housing Act	Decent home for every American, focused on slum clearance, down town development, increase property value, elevate tax revenue, more emphasis on quality rather than affordability	Allocated fund for the construction of 810,000 housing units over 6 years

Table 2.1: continued

Year	Act	Objective	Remark
1961	Housing Act enabled Section 202 program and 221(d)3	outlawed redlining and Enabled the housing program for elderly citizen	Section 202 housing program for elderly low income and 221(d) 3 is subsidy for rental housing program
1968	Fair Housing Act	Restricted discrimination within the housing market and mortgage; conversion of Fannie Mae to Government Sponsored Enterprise (GSE)	Created section 235 to support low and moderate income home buyers, section 236 low and moderate income housing renters
1969	Brooke Amendment	Limited public housing rent to the renter income, created long lasting financial problems on housing program	Criticized for its weak funding mechanism that crippled the public housing inventory
1970	Established Federal Home Loan Mortgage Corporation (Freddie Mac)	Increased monetary supply for the new home buyers and mortgage lending	
1974	Housing and Community Development Act	Created Section 8 and Community Development Block Grant	Halted section 235 and 236 programs
1975	Home Mortgage Disclosure Act (HMDA)	Enforced requirements for disclosure of information about home purchase and improvement	
1977	Community Reinvestment Act	the right to community group to intervene in to the approval of bank merger	
1986	Tax Reform Act	Established a tax credit for a low income housing program	
1987	McKinney Act	Creation of funding for homeless housing	
1988	amendment to Fair Housing Act	Strengthen the Fair Housing Act	

Table 2.1: continued

Year	Act	Objective	Remark
1989	Recovery and Enforcement Act	Federal control over the foreclosed properties	Financial institution reform
1990	National Affordable Housing Act	Established HOME	Entitlement of every American family to afford decent home and suitable environment
1993	HOPE VI Program	Focused on deconcentration of poverty and improvement of quality of life for the residents of public housing	Demolition of distressed public housing
1994	Homeownership and Equity Protection Act (HOEPA)	Regulated abusive or predatory mortgage lending	Controlled predatory mortgage lending within the subprime housing market
2008	National Housing Trust Fund	Aimed at increasing the supply of decent, affordable, and safe housing for the very low and extremely low income families	Brought into existence under the Housing and Economic Recovery Act

Despite the efforts of solving the housing shortage and housing affordability issues many institutions and researchers believe that the housing problem still continues to grow faster. If significant program and policy changes won't take place, the housing crisis in the US will be the worst it has ever been. The rising housing crisis is expected to affect those groups who have been left behind in the past: minorities, families with low income, central city dwellers, young residents, and new immigrants (Rypkema, 2002).

Also, it is widely believed that homeownership is one of the solutions to tackle the housing stock crisis and viewed as one of the major direction by which the American dream is fulfilled, by creating household wealth, create stable and sustainable neighborhoods, increase public interaction, improve property up keep

and revitalize the neighborhoods. But, research shows that trends of homeownership indicate otherwise where homeownership rate for the white household is 73.9 percent, the black homeownership rate is 47.8 percent, and Hispanic homeownership rate is 47.5 percent (Rypkema, 2002). Also, a geographic disparity in homeownership rate is noted as the suburban homeownership is 73.8 percent and central city homeownership rate is less than 50 percent (Rypkema, 2002). Additionally, the homeownership rate for residents with household income more than $120,000.00 per year is 92.3 percent while the homeownership rate for those families with household income less than $20,000.00 is 47.2 percent (HUD, 2000).

Also, mixed-income housing has been accepted as a major mechanism to solve multiple housing and social problems in US cities, major Western European cities, Australia, and New Zealand (Duke, 2009; Joseph, 2008). Proponents of mixed- income housing argue that the presence of a diverse household income in a given neighborhood could facilitate social interaction and communal control, while providing improved quality of life for residents (Joseph et. al, 2007; Fraser and Kick, 2007).

Fraser and Kick (2007) conceptualized place based-benefits and outcomes from mixed-income housing developments as those benefits relate to improved neighborhood infrastructure, increased housing stock, business development, enhanced communication networks, public utilities, and roads. According to their conceptualization, people-based benefits and outcomes from

the mixed-income housing developments improve individual and social capital where the community members take economic advantages from the development in the neighborhood such as man power development, job training, educational improvement, reduction of poverty, and increased homeownership.

Similarly, Graves (2011) and Joseph (2006) reviewed four main theoretical concepts that explained ways by which a mixed-income housing development exert positive impacts on to the community and the individual residents. The first theoretical concepts are related to the positive effect from the higher income residents by being a cultural and behavioral role model for the low income people (Wilson, 1987; Joseph, 2006; Graves, 2011). According to Wilson (1987), Joseph (2006),and Graves (201) exposing low-income families to main stream culture ameliorates the antisocial behaviors that decapacitated the upward mobility and well being of low-income families.

These scholars identified two main forms of role modeling: distal and proximal. Graves, (2011) argued that distal role modeling exerts positive outcome through distant individual relations (observations) where members of the low-income families observe and change their culture of lawlessness and antisocial behavior. Professionals noted that the practical implication of cultural and behavioral role modeling theorem is difficult to measure whether the effect is taking place or not (Joseph, 2006). On the other hand, another group discusses the upward mobility of mixed-income residents is also affected by macro-

structural barriers where interpersonal relationship alone has a weak effect (Kasarda, 1990; Wilson, 1987).

The second theorem institutional improvement, states that positive political pressure and motivational market demand that higher income residents exert upon local institutions and organizations in order to instigate compatible social services (such as policing service), infrastructural services, investments (public or private investments), and better schooling for both low income and higher income residents (Logan &Molotch, 1987; Joseph, 2006).

The third theorem states that strong informal social control is exerted by high income residents through the stable and working families which contribute increased social order and neighborhood safety (Wilson, 1987; Sampson, 2004). Also, this concept is related to what Jacobs (1961) referred as “eyes on the street.” Additionally, another group of scholars argued that property management activities along with joint efforts from residents bolstered the informal social control (Smith, 2002; Vale, 2002).

The fourth set of theorems is related to the positive gain from the social capital built through the interpersonal social relationship such as “weak ties” between residents of different income and race (Granovetter, 1973). Also, Briggs (1997) noted the positive impact that social connection produce as “bridging social capital” in which low-income residents benefit from distant interconnectedness with the higher income residents that produce weak ties where employment networks and resource sharing are improved. Also, he

associated the benefit from a bonding social capital (strong relationship) between individual residents to the extent it could establish a direct form of assistance in sharing resources from high-income residents to low-income residents.

Alternative theories and debate indicated that realities of mixed-income developments are different from the assumed theoretical benefits from mixed-income housing or are different from the above theorems. For instance, Fraser and Kick (2007) noted that vast number of contending literature about the capacities of mixed-income developments that may induce two separate outcomes. These contentious outcomes are:

1. Place-based outcome where physical neighborhood improvements that narrowly targeted the private sector's (stakeholder) goal related to capital investment, profit making, "neighborhood infrastructure, including housing stock, business development, telecommunications, water/sewer/electric and roadways" (Fraser and Kick, 2007), improved streetscapes, improved landscaping, and intensified land use in order to gain maximized private economic yield.
2. People-based outcomes related to improved public goods that build of individual and social economic gain such as manpower development, development of high skilled manpower, higher educational achievements, amelioration of economic problems (poverty), provide a positive externality (role model, positive imitations), and increase homeownership (Fraser and Kick, 2007;O'Sullivan, 2007).

Moreover, some scholars acknowledge the presence of physical improvements (place based outcome) after investigating existing mixed-income housings while they noted less evidences of people-based outcomes or no evidences of improved qualities of life and economic wellbeing of low income residents (Smith A., 2002;Popkinet al., 2004; Fraser, 2004).

Crane and Manville (2008) suggested the importance of balancing and maintain equal focus in reaching the common public-private goal for the very reason that both place-based and people-based problems are inseparable and distinct.

2.6 Relating Mixed-Income Housing to Mixed-Use Developments

As discussed earlier, the new urbanism (neo-traditional developments) focused on reviving the earlier segregated land use development models. Mixed-use developments are expected to redress the affordable housing and shortage of housing stock problems. Solving the housing issues in mixed-use developments could achieve diverse income residents, racially diversified community members, and socially sustainable community (Kelbaugh 2002, Dear 1992, Hornblower 1988, Cark-Madison 1999, McMahon 1999, and Pendall 1999). Additionally, maintaining diverse housing types and increased stock of housing units in mixed-use developments (Block Groups) could achieve a desirable density where compact and efficient land use is expected to maintain itself both environmentally and socially. According to new urbanism theories, mixed-use land development can incorporate and keep mixed and different

housing types have increased density and varied building use. Diverse aged residents can achieve diverse income groups, be racially diversified, and therefore socially sustainable community.

2.7 Median Housing Rent

Many factors that can affect urban residential land prices are competing bids (housing unit rent), proximity to employment centers, neighborhood composition, density (population size), and adjacent land use (Urban Land Research Analysis Corporation, 1967; Albritton, 1982; Appraisal Institute, 1992; Bogart, 1998; Hosack,2001; Schiller, 2001; O'sullivan, 2007).

Central place theory states that land areas (market areas) are hierarchically distinctive and the property value is a reflection of the attractiveness of the land where the location, bulk, and their position in relation to the center are factors that determine the hierarchy (Christaller, 1966; Berry, 1970; Hartshorn, 1992).

Due to commuting cost and other related factors to transportation, land use, land regulations and social amenities, people choose to live closer to the locations they frequently interact. These produce a competition among land consumers and affect the land value to vary from location to location. Anthony Downs (2005) asserted that the mixed-use developments (smart growth) reduces the probability of being subdivided for higher land prices at the city's outskirt areas while it tends to increase the probability of gaining land values from the increased density. Additionally, there are major contending beliefs about increased density due to the additional housing units in the neighborhood. These

controversial beliefs arose due to the fact that the existing residents decline to accept the low cost housing units because of the “widespread American view that it is undesirable for lower-income households to move near them for social, educational, and security reasons"(Downs, 2005). Also, Downs averred that high density residential areas could trigger traffic congestion, congested school, crowded public utilities, and services where these hostile neighborhood characteristics could reduce property values.

Contrarily, many theorists contended that Smart Growth policies do have a positive impact that can help increase the land value, prices of existing property, and increase the value of existing housing units and commercial developments contained within the mixed-use development neighborhood (Downs, 2005).

2.8 Relating Median Housing Rent to Mixed-Use Developments

Mixed-use developments (smart growth) are expected to reduce the probability of escalated property values from being subdivided for higher land prices. As the same time it is expected increase the probability of over inflated land values due to the increased density. Having these contentious and opposite goals within a mixed-use development needs to balance housing rent and the density within mixed-use developments. Additionally, balanced housing rent could enable to address the controversial activities from the existing residents that oppose to accept the low cost housing units to move to their existing neighborhoods. Therefore, balanced housing rent along with increased density

due to the additional housing units in the neighborhood is a desirable outcome and a challenge for the mixed-use development practices to achieve.

CHAPTER 3

METHODS AND TECHNIQUES

3.1 Data Sources and Data Analysis Techniques

Data was collected from various sources and will have multiple levels for Mixed-use developments before the year 2000, after the year 2000-2010 (years 2011 and 2012 excluded) and total mixed-use (before and after 2000). The various levels include Census Tract, Block Group, and Block level data. The number of mixed-use developments included in the analysis category of before the year 2000 contains 32 centers. The years after 2000 (2011 and 2012 excluded) contain53 centers, and the total mixed-use (mix of before and after 2000) contain85 centers. Figures 3.1, 3.3, and 3,6 show the identified mixed-use development with the super imposed map for verification and confidence purposes. This will help to make sure that the collected data, geo-spatial information, and census variables correctly match the mixed-use developments.

Figures 3.2 and 3.5 show the process of matching that utilized the architectural documents (site plans) included to increase the perfection of matching the information with the mixed-use developments

.

In order to analyze the data, the study will:

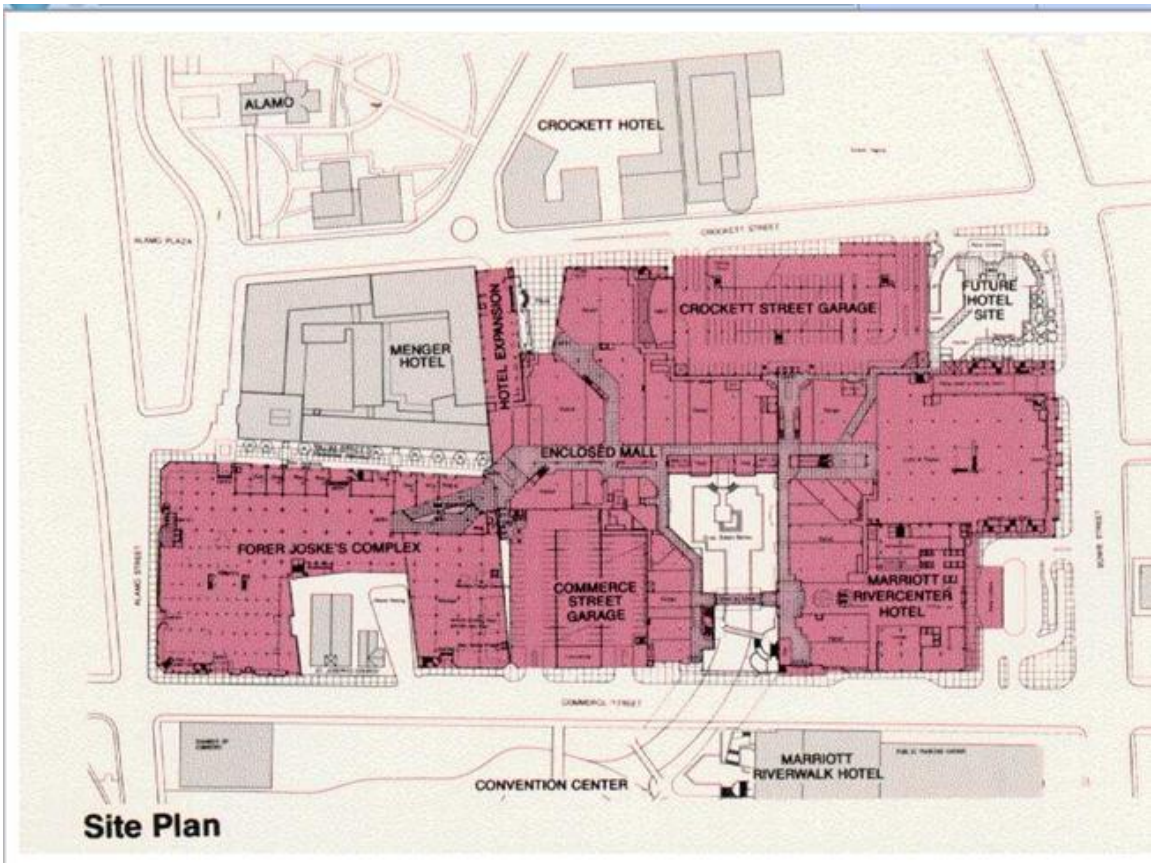
- Examine the income groups living at each neighborhood (Block Group) in order to determine whether the mixed-use development analyzed is catering to persons of different income levels. A comparison of the change of median household income will also be performed at each location in relation to other communities in the surrounding Block Group (expected to be more than 800 Block Groups) to determine income diversity. Furthermore, a comparison will be performed to determine the improvements or regressions that have taken place between the year2000 to the year 2010.
- Evaluate the current mixed-use development whether they exhibit high density residential units or high density neighborhoods. By evaluating the density trends the study will be able to determine if the mixed-use developments are suitable to sustain the commercial developments by providing enough number of consumers.
- Among other things the study will contrast the diversity of housing offered in the community to the number of housing types offered by the counter city development. In doing so, this research will examine whether the number of housing types available are adequate and better than the counterpart development (segregated land use development) offered within the same city.

In order to accomplish the stated research goals, the identified geographic information and multiple categories of data will be analyzed and summarized to display the following information:

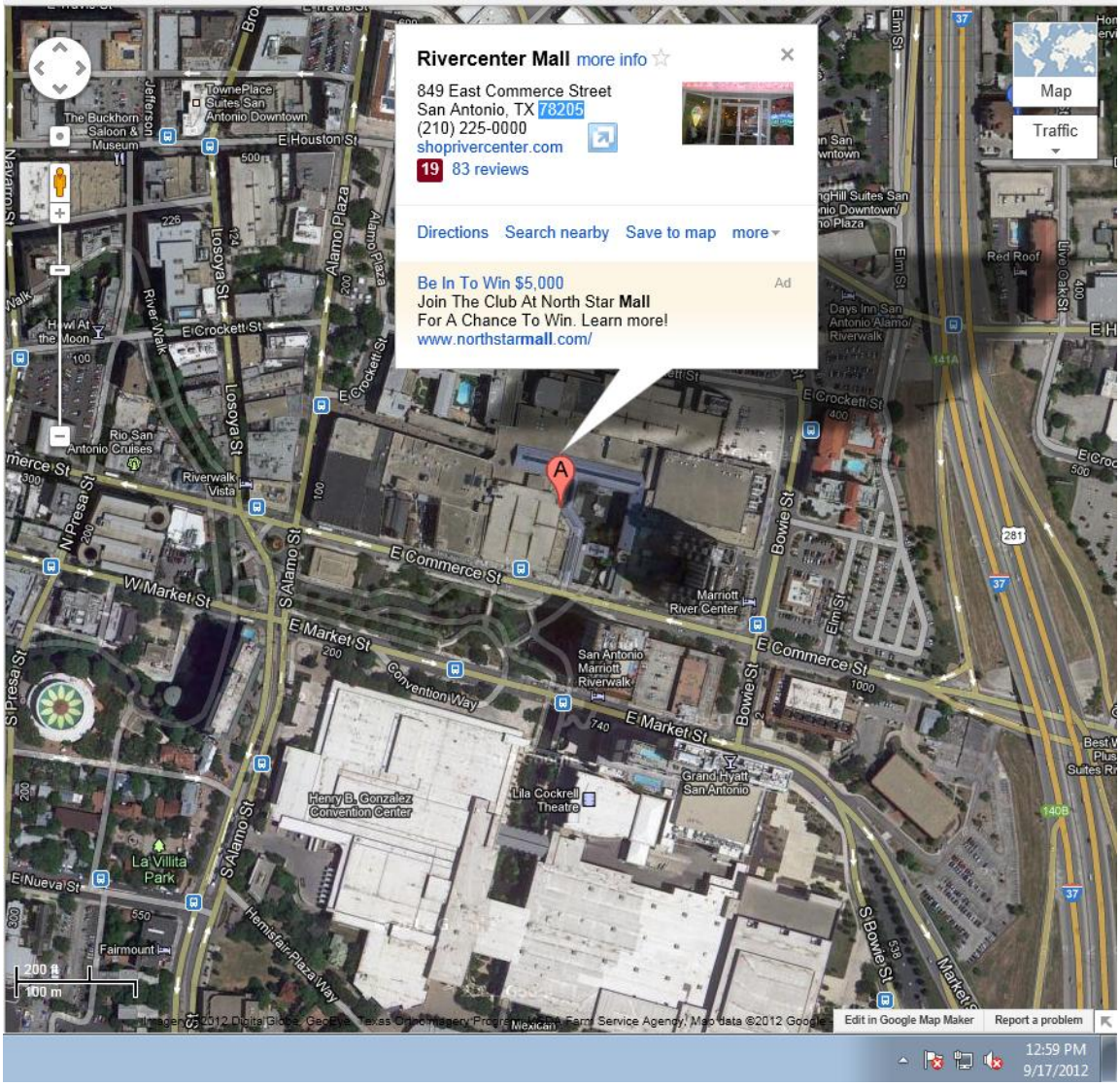
A. Each mixed-use development is identified and the location of the mixed-use development is collected from the Urban Land Institute case studies. Geo-coding activity of collecting data is primarily related to the identification of the physical address of the mixed-use development. The data for the physical address include information about the city, year the development is founded, the size of the site, housing type, and the state of the mixed-use developments, such as the type of the land use that are mixed with in the development. This data will allow for the required variables related to each fixed geographic point accurately.

Courtesy of Google Map

Figure 3.1 Princeton Forrestal Village**,** Plainsboro, New Jersey, USA

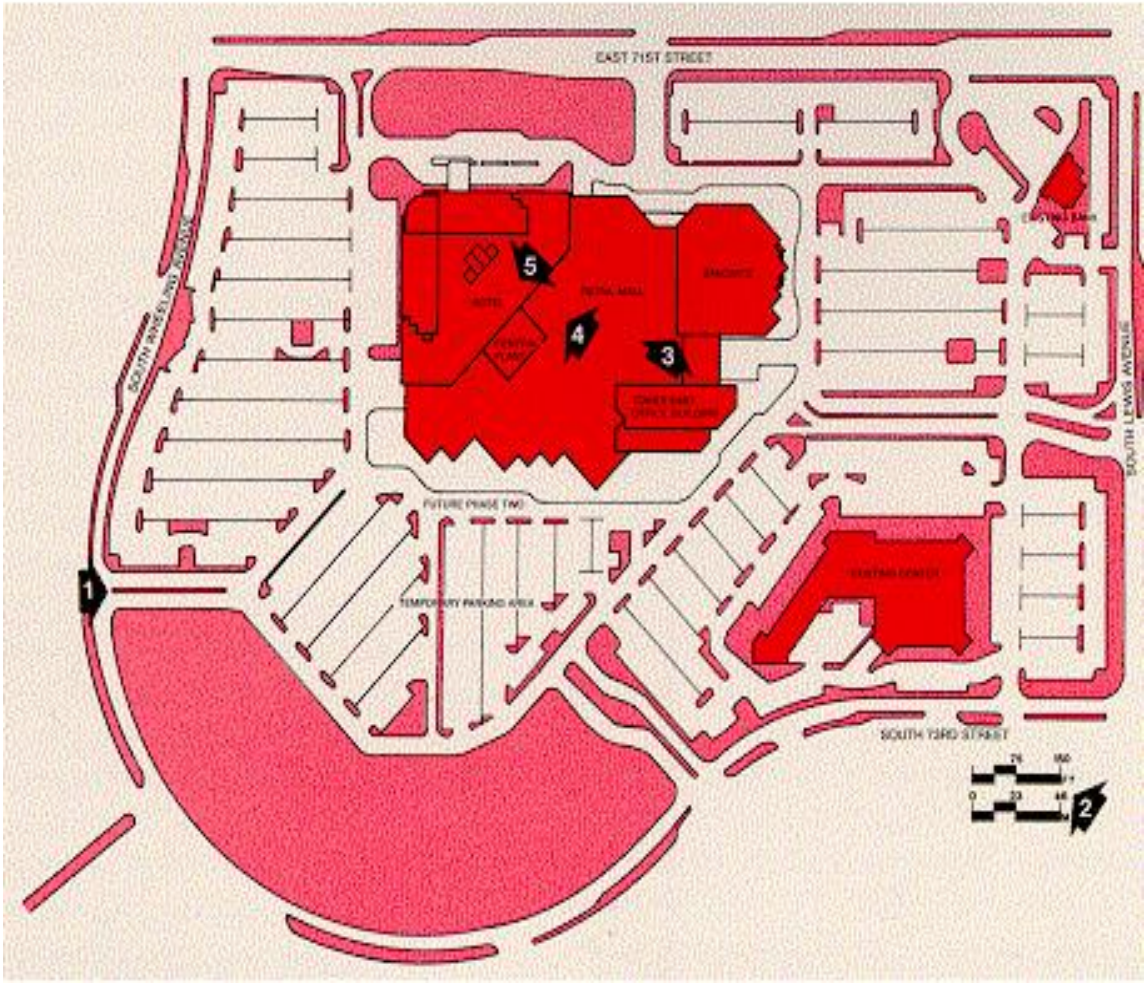


Source: Courtesy of ULI Development case studies
Figure 3.2 above: Rivercenter, 849 East Commerce Street, San Antonio, Texas 78205

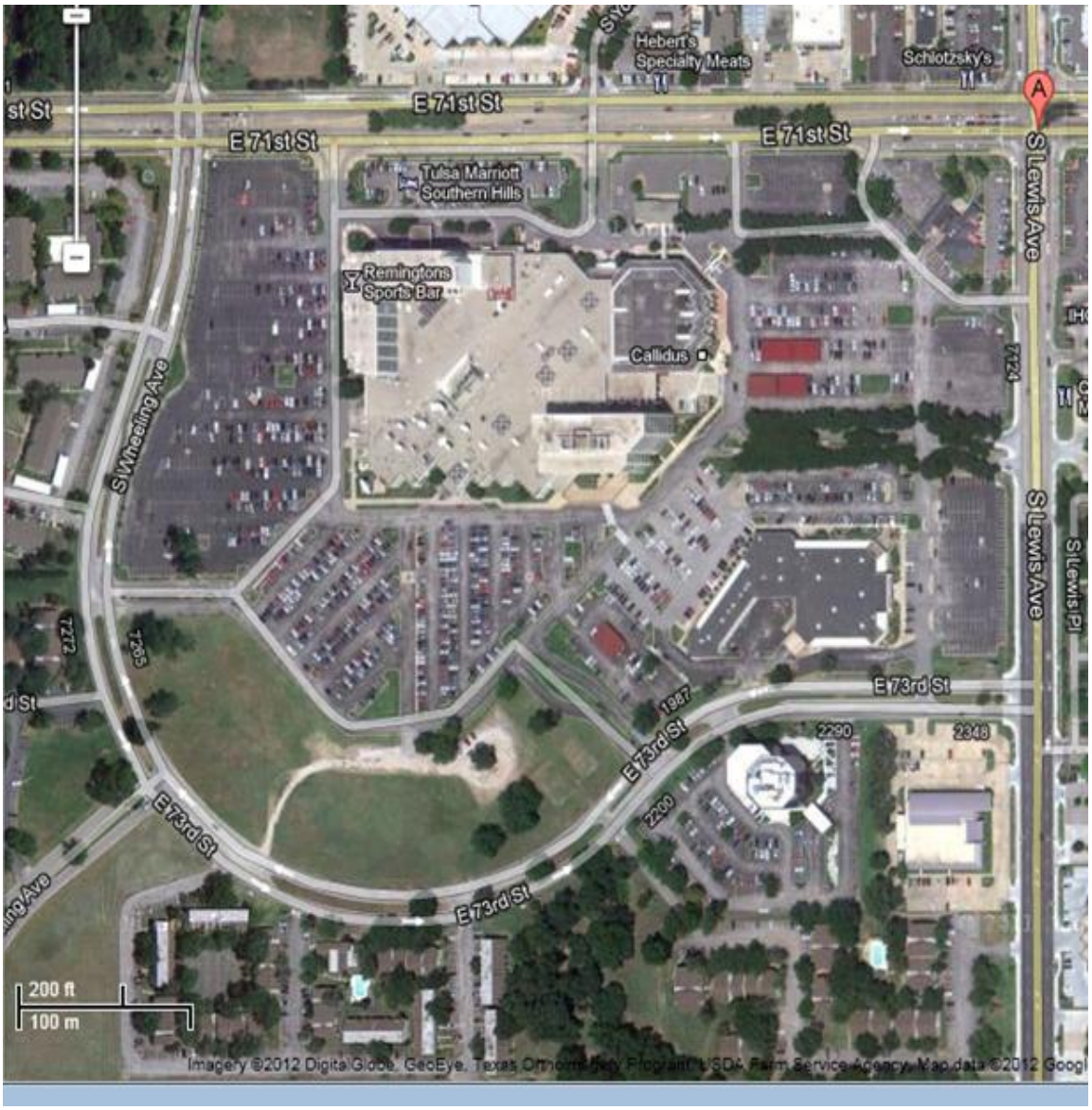


Courtesy of Google Map

Figure 3.3: above Rivercenter, 849 East Commerce Street, San Antonio, Texas 78205



Source: Courtesy of ULI Development case studies
Figure 3.4: Below: Kensington Galleria Tulsa, Oklahoma



Courtesy of Google Map
Figure.3.5: Kensington Galleria Tulsa, Oklahoma

B. Census Tract, Block Group, and Block geo-codes for mixed-use development locations are collected from the American Fact Finder, and Google Map, Minnesota Population Center, National Historical Geographic Information System, which allow users to identify geographic locations (addresses) of the mixed-use developments (businesses).The geo coding

process will match the geographic identities of the mixed-use developments to the geo ID's of the Census Tract, Block Group, and Block level.

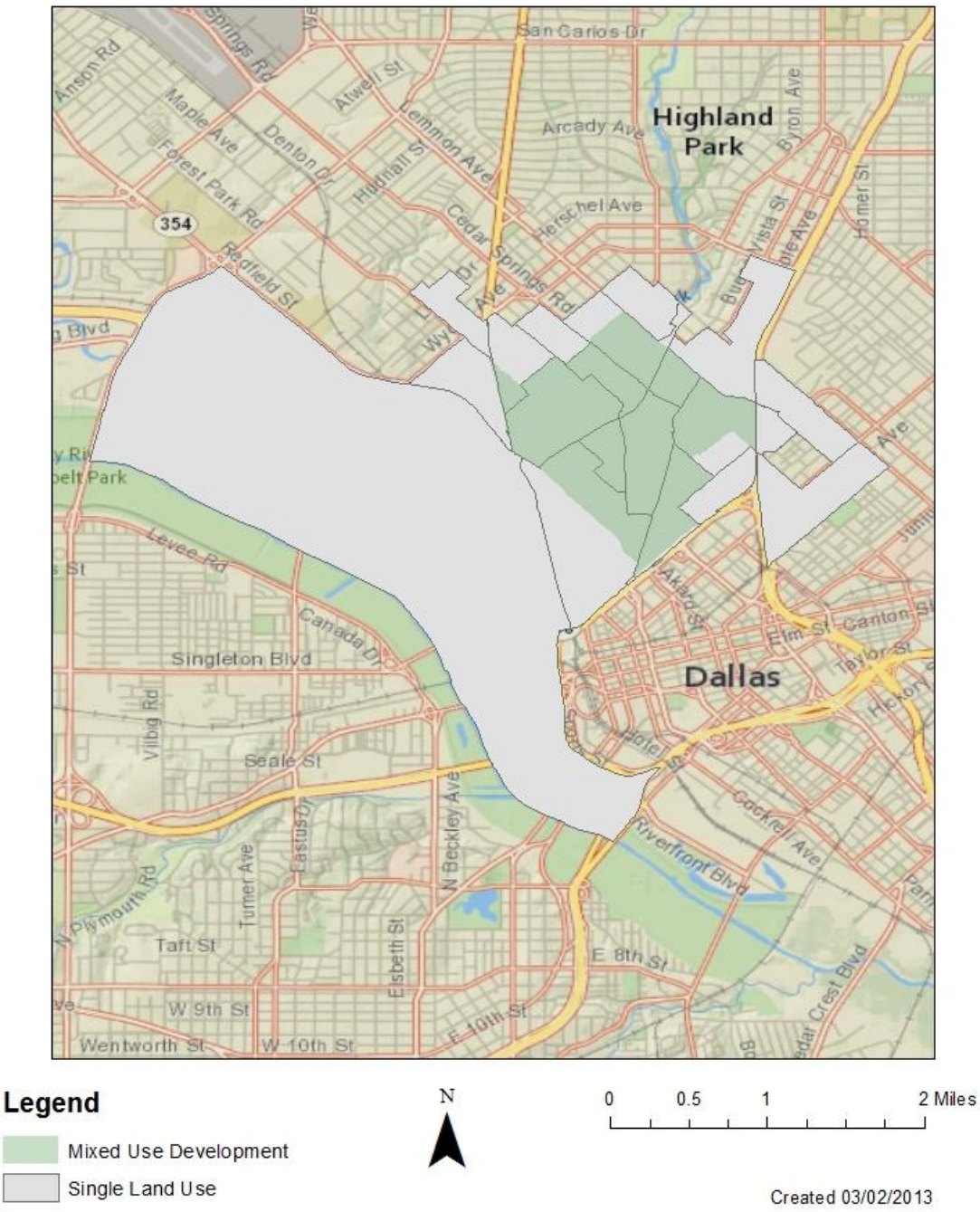
C. American Community Survey summarized data for the years 2006- 2010 and the five year summary as including the Census Block Group within Census Tract level are collected from the US Census Bureau web for the Data FERRETT. According to the U. S. Census Bureau's definition, Data FERRETT is an acronym for the Federated Electronic Research, Review, Extraction, and Tabulation Tool. All data variables that are specific to each mixed-use development will be downloaded. These data variables are as follows: Median Household Income (for the past 12 months with adjusted inflation), Total Population, White population, Black or African- American, Asian population, Total Higher Education attained, Male Bachelor Degree, Male Master's Degree, Male Professional School Degree, Male Doctorate Degree, Female Bachelor's Degree, Female Master's Degree, Female Professional School Degree, Female Doctorate Degree, Median Contract Rent, Employment, and number of housing units.

3.2 Area weighted Spatial Join:

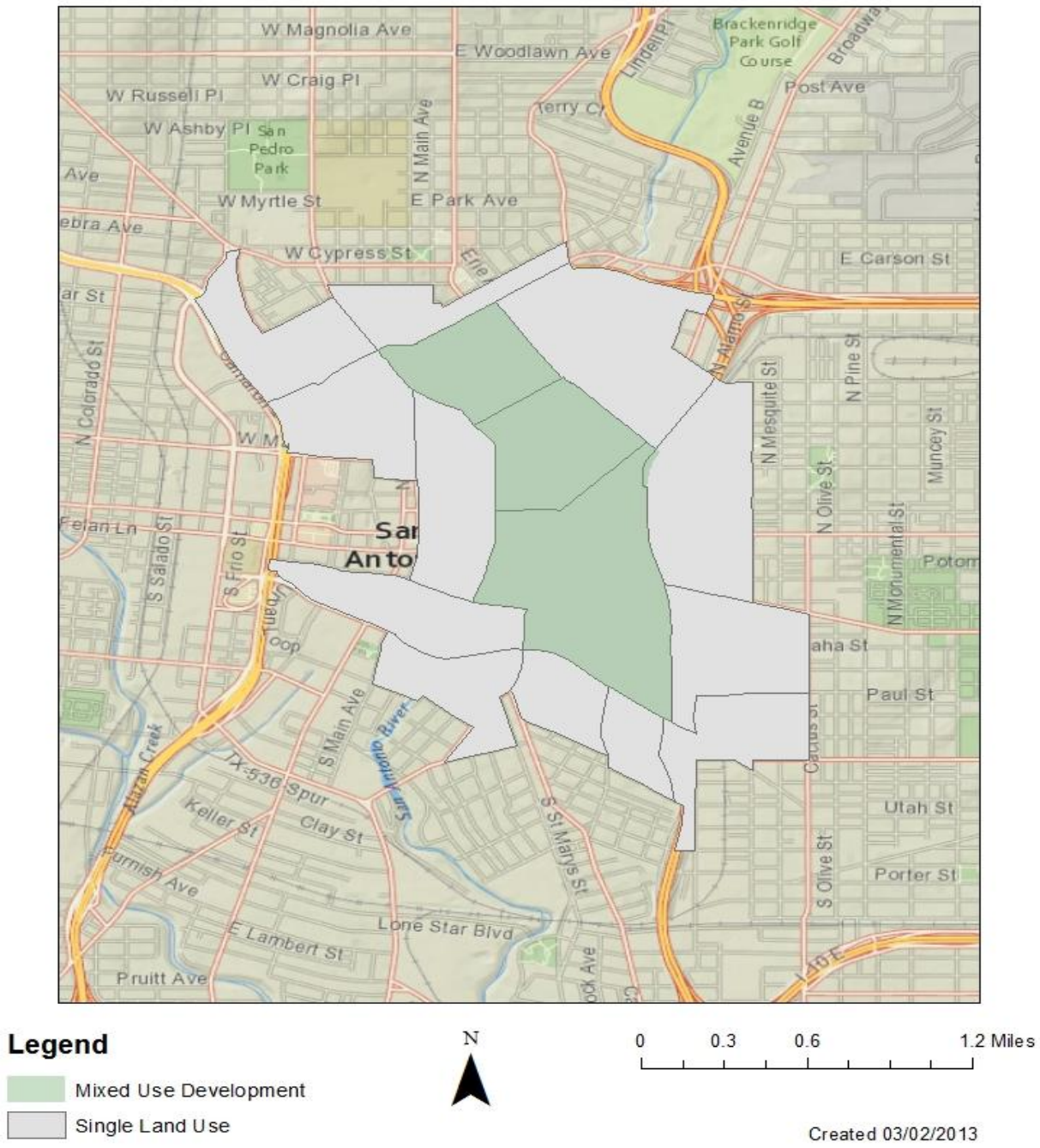
Area weighted spatial join, is a spatial data analysis that is built in Arc GIS, takes in to consideration the size of given Block Groups and calculates area weighted sum and the area weighted mean. Specifically, Area Weighted Sum will first calculate what percent of the 2000 Block Group shape contained inside the

2010 Block Group shape and add each contained areas all together. Secondly, it divides the area of 2000 Block Group to the area of the 2010 Block Group and calculates how much percent of the 2000 Block Group is contained within the 2010 Block Group where the result is used to find the congruent area of the shape file that might have been rerouted between the years 2000 to 2010. This spatial operation enables us to analyze spatial and related data for the same exact shape and area of the Block Group for the years 2000 and 2010.

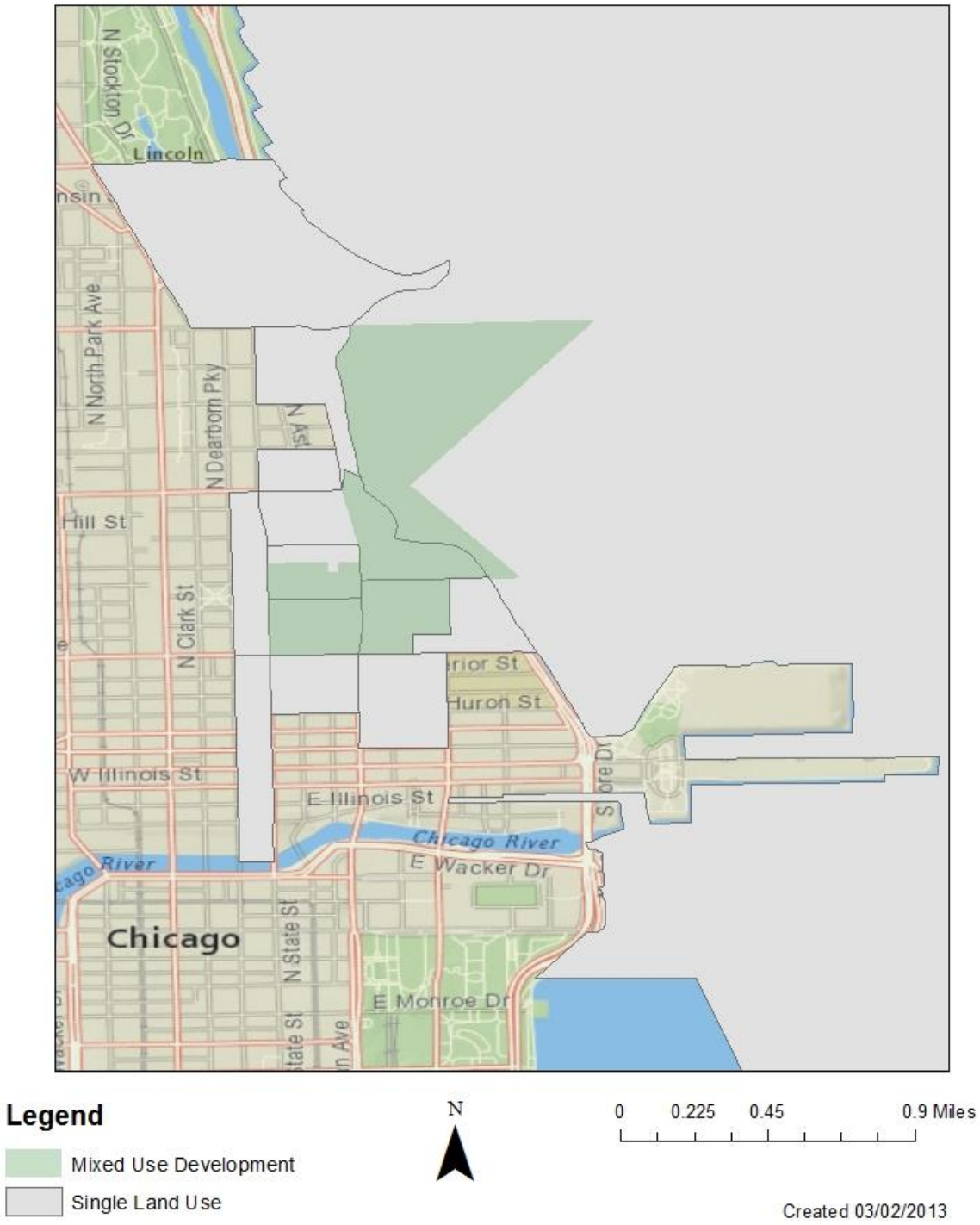
Figures 3.1- 3.6 show the samples of identified block groups of the mixed-use developments along with their neighboring single-use block groups. This enables us to fully understand which single-use block group has a common border with the mixed-use development.



Source: Courtesy of Google base map as an overlay
Figure 3.6: Mixed-use and surrounding areas Dallas, Texas

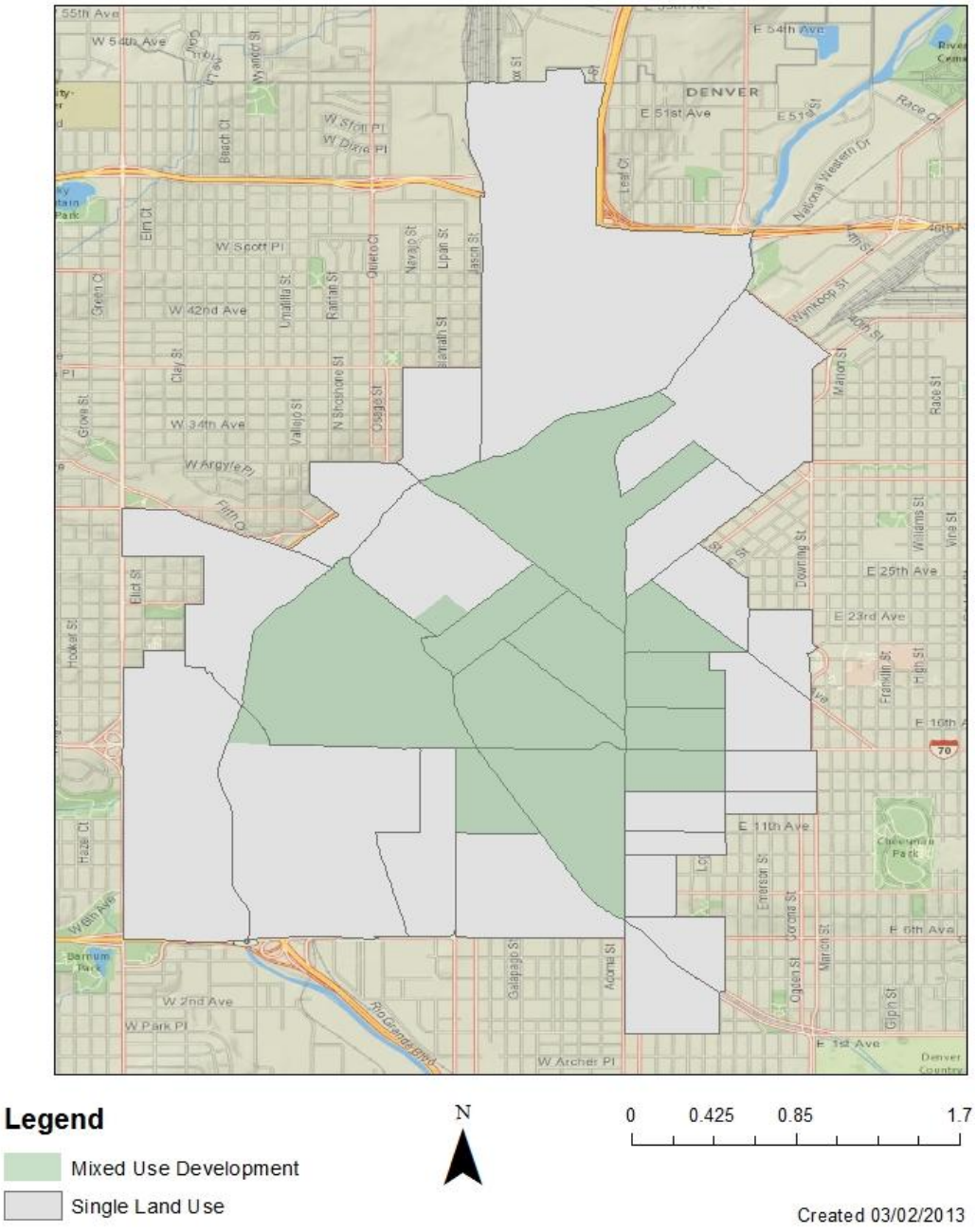


Source: Courtesy of Google base map as an overlay
Figure 3.7: Mixed-use and surrounding areas San Antonio, Texas



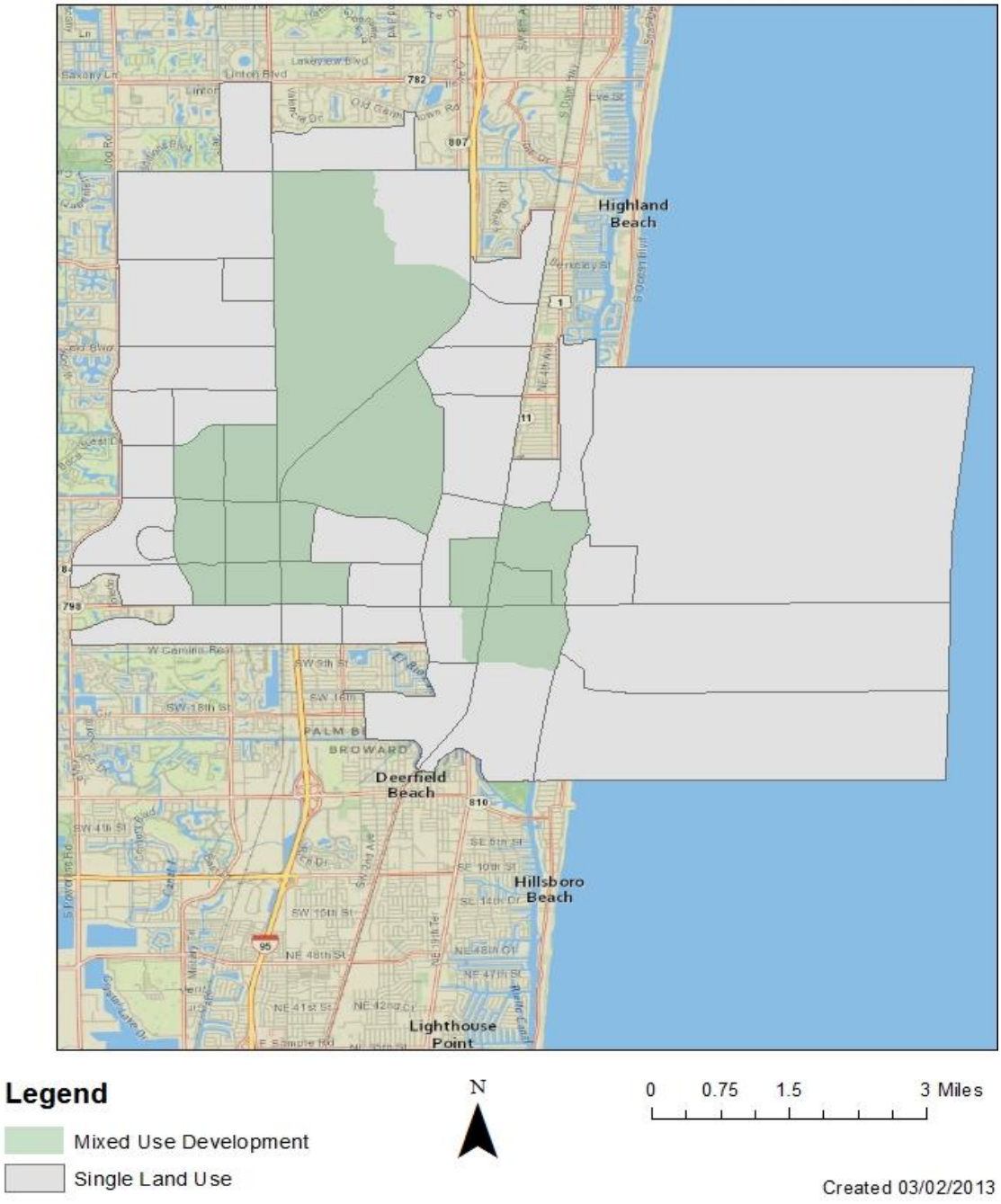
Source: Courtesy of Google base map as an overlay

Figure 3.8: Mixed-use and surrounding areas Chicago, Illinois

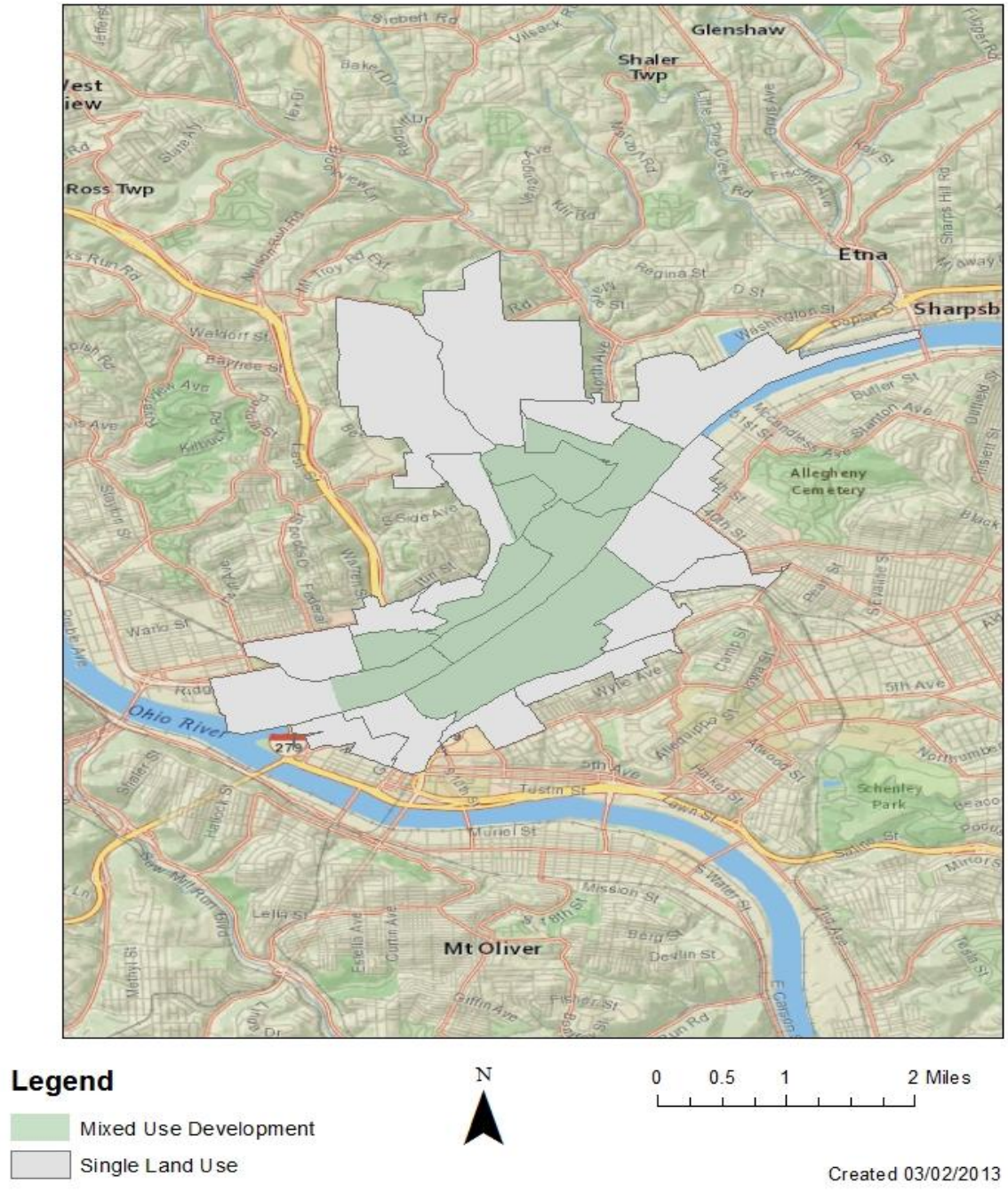


Source: Courtesy of Google base map as an overlay

Figure 3.9: Mixed-use and surrounding areas Denver, Colorado



Source: Courtesy of Google base map as an overlay
Figure 3.10: Mixed-use and surrounding areas Boca Raton, Florida



Source: Courtesy of Google base map as an overlay
Figure 3.11: Mixed-use and surrounding areas Pittsburgh, PA

3.3 Data Analysis

Numerous research studies measure urban sprawl using parameters such as mixed housing units, density (residential), and average employment per square mile. Similar units of measurement can be applied to mixed-use development when examining a neighborhood for density, diversity in income, population and land use. This is because mixed-use development is an approach used to remedy the issues associated with sprawl (Galster et al. 2001). This study utilized the aforementioned variables such the number of mixed housing units, density gradient, percent employed, and other variables such as median household income, percent of population with higher education, percent of white population, and percent of minority population.

After all variables and information that are necessary to evaluate current mixed-use developments are gathered, inferential statistical techniques are used in order to convey the characteristics of the selected mixed-use and alternate land uses that are being analyzed for this research topic. Inferential statistics is a quantitative technique used to generalize about the analyzed mixed-use developments to a population (all mixed-use developments in USA). It is one way to infer the social and economical characters all mixed-use developments exhibited, based on the sample (subset of the population) data. For instance, after the ratio of residential housing units to the square units of (area, acre) developed land use has been calculated for each mixed-use developments, then it will be possible to compute the mean, a population standard deviation, and the

standard error. The mean population indicates the average degree of mixture of the housing types. A standard deviation is the way of providing the calculated distances or an average deviation from the mean. It shows the variation of compactness of the mixed-use development when compared to the mean compact development as housing units are compacted per acre. A standard deviation and the standard error provide information about how much dispersion exists from the mean.

In using the measure of central tendency it will be possible to calculate the average data values such as household median income, mean-household median income, and income frequency for the mixed-use development at a Block Group level. Comparing these results with the existing corresponding neighborhood built under segregated land use will depict whether there will be advantages of the mixed-use developments over the segregated land use developments. In calculating the measure of dispersion the research will depict how much the data (such as observed densities) are clustered around the average densities of the mixed developments. This will avail the possibilities to draw a common trend of the mixed-use developments based on the required densities at a Block level.

Also, by finding the average deviations and standard deviation of the observed values of densities and income levels of the mixed-use development residents', it can be concluded whether the mixed-use development has

achieved its intended goals or has better sustainable planning practice than the old planning system.

3.4 Mixed Housing Units:

Mixed Housing Units are intended to be used in calculating the average density of housing units, where the calculation is based on a given housing developments' per acre over a number of a mix of different land uses that are different from residential land use's area (Massey and Denton, 1988; Galster et al, 2001). This method was first used by Massey and Denton as an exposure index (1988) and Galster et al (2001) as used to measure the degree of mix of different land uses. Conceptually, this method of measuring the relationship between the residential units and the developable land use analyzes the ratio of the average number of residential land units to the acre of developed land use.

3.5 Residential Density:

Density is a widely accepted parameter for measuring urban sprawl (Galster et al. 2001; Burschell et al. 1998; Orfield 1997). Residential density is the most valuable concept used in various planning and urban design activities in planning residential land uses, land use development regulations, and best factors in forming and determining basic land use characteristics of a neighborhood (Anderson, 2000; Forsyth, 2003). Residential density can be used in estimating the yield or the crowding of a piece of land by the number of houses or buildings. Also, residential density is the best useful tool to evaluate land use

alternatives in comparing the yields of one type of land use versus the alternative development (Anderson, 2000).

Residential densities in most cases are expressed in different ways depending on the level of analysis needed. It can depict the ratios of numbers of dwelling units to the total area such as single site area, neighborhood area, census tract area, regional area, city wide area, and metropolitan area (Anderson, 2000; Forsyth, 2003; Maryland's Smart Growth Models and Guidelines, 1997). The following table is a generalized approximation of residential density guide lines used by Anderson, (2000) where it serves as a comparing figure. Also, this study uses other comparisons from different city's' municipal regulatory practices.

Table 3.1: Typical Residential Densities (Below)

Residential Use	Lot Area (sq. ft./DU)	Net Residential Density (DU/acre)	Gross Residential Density (DU/ac)	Neighborhood Residential Density (DU/ac)
1-story apartments	2,400	18	13	10
3-story apartments	1,2000	36	25	20
6-story apartments	600	72	50	35
12-story apartments	300	145	100	60

Source: Larz T. Anderson (2000). Planning the Built Environment. American Planning Association.
DU = Dwelling Units (Housing Units); Ac = acre

In evaluating the residential density, this research will use gross neighborhood density or Gross Block Group Density because it is the most widely used type of density calculation method in measuring and evaluating residential densities. The findings of the evaluations will be compared to the generalized approximations of typical residential density guide lines used by Larz T. Anderson (2000).

Similarly, it is important to use residential density as a measurement to evaluate a mixed-use development in order to depict how compact the development is. The first form of density that will be used is the density that shows the ratio between the quantities of housing units and the total area of mixed-use development where the resulting density will be a neighborhood density. The second form of density indicates the population density in which the ratio between the numbers of population over the area of mixed-use development indicates the intensity of land use.

Table 3.2: Typical Densities of Select Housing Types (Courtesy of American Planning Association)

Housing Types	Typical Gross Density Range (Units/acre including streets)
Single family detached (generally 1- to 2- storey)	4 to 10
Single family row houses (2- to 3- story)	8 to 20
Three to six- family houses (3 to 4- story)	8 to 25
Multifamily row houses (3- to 4- story)	20-40
Low rise multifamily (2- to 5- story)	15 to 50
Lofts	25 to 50
Midrise multifamily	100 to 150
High-rise multistory	60 to 200+

Gross neighborhood density is more useful in evaluating the mixed-use developments than other types of density (Anderson, 2000; Forsyth, 2003). Gross neighborhood density or Gross Census Tract Density is expressed by finding the ratio of number of dwelling units per base land area where land used for local streets, shopping facilities, local parks, local schools, and local institutions serving the neighborhood population are included (Anderson, 2000; Forsyth, 2003).

3.6 Regression Analysis for Equation -3:

Research question 3: Do mixed-use development experience more change in household income than the immediate neighboring areas?

The following data variables and function are identified from different sources including scholarly articles as discussed in the literature review to test Research Question 1. Also, descriptive statistics will be used to analyze the differences in changes of median household income for the years 2000 and 2010 in the Block Groups with a mixed-use development with the rest of the surrounding Block Groups. To test the differences in median household incomes for mixed and other types of developments between the year 2000 and 2010 each surrounding corresponding Block Group data will be analyzed. Additionally, the median housing rent and the median household income data was transformed (inflation adjusted) to 2000 base year dollars. Block Group level data is the smallest geographical unit where information related to household income will be available. Followings are the identified variables for this part of the research.

- Change in median household income (%∆MedHIncme)
- Cost of housing (%∆median rent)
- Percentage change in minorities (%∆minor)
- Percent of employed persons (%∆employment)
- Percentage change in number of residents with higher education (%∆edu)
- Dummy-Mixed (Dummy variable representing mixed and single land uses)

Function-1:

$$\%\Delta \text{ MedHIncome} = f\ (\%\Delta\text{median rent} + \%\Delta\text{minor} + \%\Delta\text{employment} + \%\Delta\text{P-edu} + \text{Dummy-Mixed})$$

Where,

- %Δ MedHIncome (Change in median household income in the Block Group) is a dependent variable;

Followings are the independent variables:

- %ΔMedian rent (Cost of housing in the Block Groups)
- %Δminor (Percentage change in minorities in the Block Groups)
- %Δemployment (Percent of employed persons in the Block Groups)
- %Δedu (percentage change in residents with higher education in the Block Groups)
- Dummy-Mixed (Dummy variable representing mixed and single land uses)

The null hypothesis (H_o) in this analysis suggests that the median household income will not exhibit a significant relationship with the independent variables (%Δmedian rent, %Δminor, %Δemployment, %Δedu, and Dummy-Mixed).

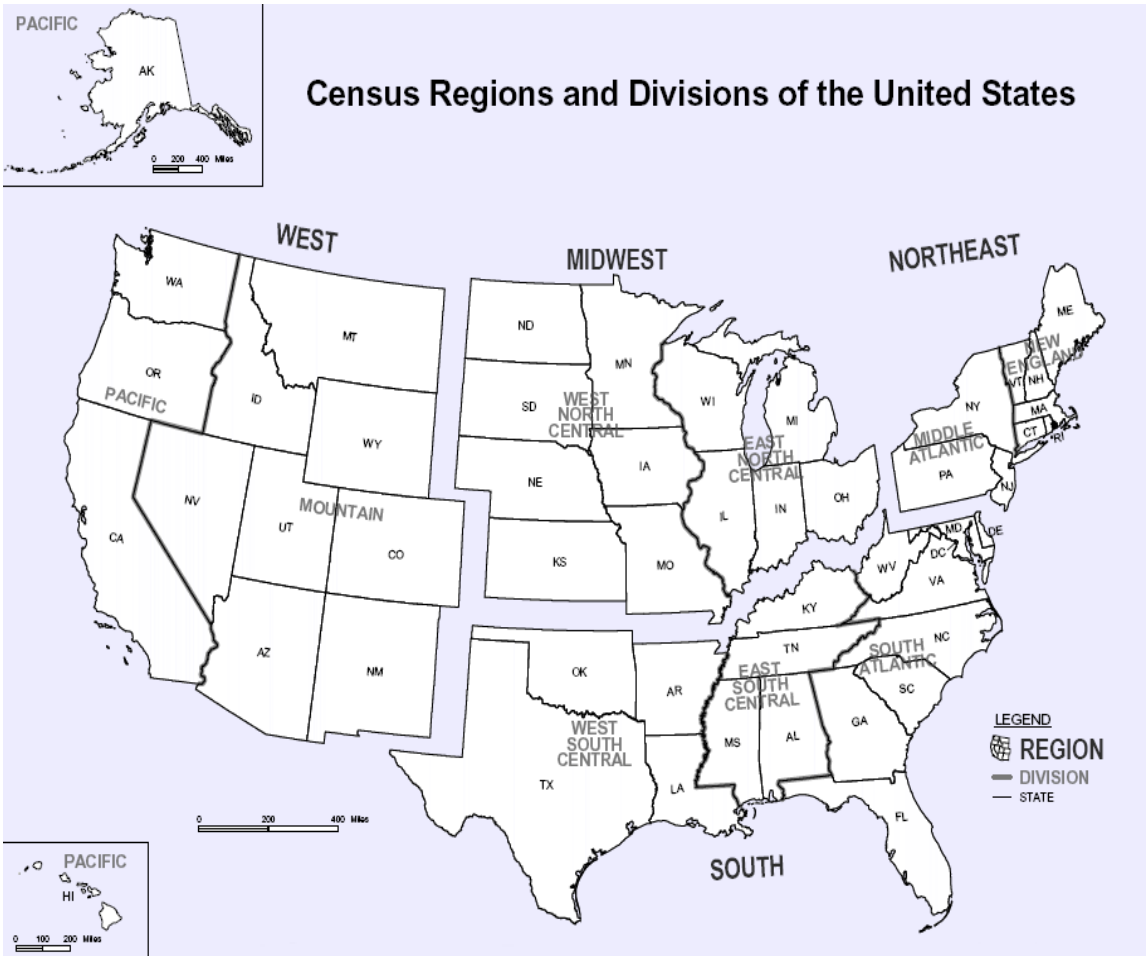
The dummy variables which represent both land use types in Block Groups will be introduced to capture the effect of mixed-use development on

change in median household income. Table 3.3 shows the values assigned to each land use type.

Table 3.3: Land use type dummy variables

	Dummy-Mixed
Mixed-use Block Group	1
Single Land Use Block Group	0

Also, additional dummy variables will be introduced to evaluate if the regional variations exist in mixed-use practices. These dummy variables are the four main census regions taken from the US Census Bureau which is West, Midwest, Northeast, and South.



Source: Courtesy of wikimedia.org
Figure 3.12: Census Regions of USA

Table 3.4: Dummy variables based on regional variations

		Dummy Variables		
		Dummy North East	Dummy West	Dummy South
Regions	North East	1	0	0
	West	0	1	0
	South	0	0	1
	Midwest	0	0	0

Hypotheses related to the introduced dummy variables that are based on regional variations are:

a) Research Question 1:

H_o : As the number of mixed-use areas in a region increases the median household income increase.

H_1 : As the number of mixed-use areas in the region increases the median household income doesn't increase

b) Research Questions 3 and 4:

$H_{o:}$ As the number of mixed-use areas in a region increases the minority population within the mixed-use areas increase.

$H_{1:}$ As the number of mixed-use areas in the region increases minority population within the mixed-use areas doesn't increase.

Where, H_o and H_1 are the null hypothesis and alternative hypothesis respectively.

3.7 Descriptive Statistics for Equation 1:

Research question 1: Do mixed-use developments exhibit more mix of racially diverse population than the immediate neighboring areas?

The following variables are identified from different sources including scholarly articles as discussed in the literature review. Additionally, the median housing rent and the median household income data was transformed (inflation adjusted) to 2000 base year dollars.

- Percentage change in minority (%∆minor)
- Percentage change in median household income (%∆MedHIncome)
- Percentage change in number of residents with higher education (%∆edu)
- Percentage change in employed persons in the mixed-use development block groups(%∆employment)
- Percentage change in median housing rent
- Dummy variable for mixed-use development
- Dummy variable for US regions

3.8. Descriptive Statistics for Density Calculations:

Research Question 2: Do mixed use developments provide more density (population density and residential density) than the immediate neighboring areas?

Density Calculation:

1. Density (N) = Total Housing Units ÷ Total area of the Block Group
2. Density (P) =Total Population ÷ Total area of the Block Group

Where,

- Density (N) is a gross neighborhood density
- Density (P) is population density
- Total Population within the given Block Groups
- Total area of the Block Group is the gross area of the Block Group

Table 3.5: List of dependent and independent variables

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
percentage change in median household income (%Δ MedHIncome) in the Block Group	• Cost of housing (%Δmedian rent)in the mixed-use development • Percentage change in minorities (%Δ minor)in the mixed-use development • Percent of employed persons (%Δemployment) • Percentage change in number of residents with higher education (%Δedu) • Dummy variable for mixed-use development • Dummy variable for US regions
Percentage change in minority population(%Δminor) in the mixed-use development	• Percentage change in median household income (%ΔMedHIncome)in the Block Group • Percentage change in number of residents with higher education (%ΔP-edu)in the mixed-use development • Percent of employed persons (%Δemployment) • Dummy variable for mixed-use development • Dummy variable for US regions

3.9 GIS Techniques:

This study will use GIS techniques such as getting the shape file of mixed-use developments, locating the blocks group of each development, relating it to the geo-codes of the locations, and isolating census data so it relates to a specific location.

CHAPTER 4

RESULTS AND DESCRIPTIONS

4.1. Introduction of Results and Description

This unit presents the results from the descriptive statistics and findings from the GIS spatial data analysis. Also, based on the results from the analysis this chapter provides a discussion on the following issues:

a) Whether the block groups with mixed-use development experience more change in median household income than the neighboring block groups with single land use developments.

b) Whether the block groups with mixed-use developments exhibit more mix of racially diverse population than the immediate neighboring block groups with single land use developments.

c) Whether the block groups with the mixed-use developments provide higher neighborhood density than the surrounding single land use neighborhoods

d) Whether the block groups with the mixed-use developments provide higher population density than the surrounding single land use neighborhoods.

4.2 Descriptive Statistics:

The descriptive statistics presented in this section showed the results as result of the descriptive analysis 1where it is intended to find an answer for research question 1 based on the:

a) Analysis of the percentage change in median household income for the mixed-use Block Groups and single-use Block Groups for the years 2000 and 2010. Results are showed in Table 7 and 8. Percentage change is calculated based on the following formulae.

$$\%\Delta = (N_2 - N_1)/ N_1 \text{ X } 100$$

Where:

$\%\Delta$ - is a percent change

N_2 - is a data amount in the year 2010 and

N_1 - is a data amount in the year 2000

b) Analyses of the median household income for the mixed-use Block Groups for the years 2000 and 2010 are conducted separately as a raw data without percentage change. Results are showed in Table 9 and 10.

c) Analysis of the median household income for the single-use Block Groups for the years 2000 and 2010 are conducted separately as a raw data without percentage change. Results are showed in Table 11 and 12.

4.3. Results of general Descriptive Analysis:

Tables 4.1 and 4.2 show a descriptive statistics for the analysis of the percentage change in mixed-use block groups and single-use block groups for the year 2000 and 2010.

Table 4.1: Descriptive Statistics for the 32 mixed-use developments (% change from 2000 to 2010)

	N	Minimum	Maximum	Mean	Std. Deviation
rent2010	32	-100.00	182.28	45.80	64.82
minority2010	32	-43.15	19.17	-4.51	13.88
employed2010	32	-22.88	36.04	4.93	12.36
edu2010	32	-23.57	25.82	5.92	13.03
income2010	32	-38.05	148.85	43.34	40.06
Valid N (list wise)	32				

Table 4.2: Descriptive statistics for other single use neighborhood (% change from 2000 to 2010

	N	Minimum	Maximum	Mean	Std. Deviation
rent2000	195	-100.00	1139.69	59.14	146.10
minority2000	199	-45.11	42.53	0.58	13.90
employed2000	199	-53.49	56.81	2.15	14.32
edu2000	199	-80.21	66.62	6.46	17.91
income2000	198	-100.00	1425.19	47.80	142.80
Valid N (list wise)	195				

1. Income: The results in Table 4.1 indicate that the percent change in median household income for the 32 mixed-use developments are 43.34% on average during the years 2000-2010. While The percent change in median household for single-use development as indicated in Table 4.2 is 47.80% on average during the years 2000-2010.

1.1. Employment: The results in Table 4.1 depict that the sample mean of percent change employed people for the mixed-use developments during the year 2000 - 2010 is 4.93%. Where, Table 4.2 shows 2.15% change employed people for other single land use developments during the years 2000 to 2010. Therefore, mixed-use developments experienced more employment trends than single land use by 2.78% during the years 2000 and 2010. This means that mixed-use developments exhibited more percent change in employment than single-use developments by about 3%. It can be concluded that employment rate is more in the mixed-use developments than the single land use developments.

Tables 4.3, 4.4, 4.5, and 4.6 show descriptive statistics for the analysis of income diversity in the mixed-use block groups and single-use block groups for the year 2000 and 2010. This analysis differs from the previous (Table 4.1 and 4.2) results in that it is intended to analyze variables in the form of regular (raw) descriptive statistics without considering the changes.

Table 4.3: Descriptive Statistics for the 32 mixed-use developments in 2010

	N	Minimum	Maximum	Mean	Std. Deviation
Pop2010	32	355.00	4292.00	1348.78	749.23
rent2010	32	0.00	2001.00	1089.53	581.25
minority2010	32	23.27	99.30	74.24	18.38
income2010	32	18526.00	222000.00	71861.41	40703.20
edu2010	32	20.94	86.97	62.99	18.81
housingunit2010	32	62.00	242.00	132.22	39.26
employed2010	32	38.69	91.51	63.14	12.24
Valid N (list wise)	32				

Table 4.4: Descriptive Statistics for the 32 mixed-use developments in 2000

	N	Minimum	Maximum	Mean	Std. Deviation
rent2000	32	316.68	2001.00	832.02	409.11
minority2000	32	44.37	98.59	78.76	14.33
employed2000	32	31.75	88.93	58.21	12.96
income2000	32	14750.00	200001.00	52348.62	33323.95
edu2000	32	19.60	85.64	57.07	17.61
pop2000	32	173.17	2456.94	1180.37	524.34
housingUnit2000	32	86.47	1659.20	760.74	348.47
Valid N (list wise)	32				

The sample mean of median household income for the 32 mixed-use developments (Table 4.4) increased from $52,348.62 to $71,861.41 (Table 4.3) over the periods of 10 years, between 2000 and 2010. Also, the maximum median household income during the year 2000 was $200,001.00 (Table 4.4) while it increased to $222,000.00 (Table 4.3) in the year 2010. Additionally, the minimum household income for the mixed-use developments in the year 2000 was $14,750.00 (Table 4.4) and it has increased to $18,526.00 (Table 4.3) in the year 2010.

Table 4.5: Descriptive Statistics for the other single-use neighborhoods surrounding the 32 mixed-use developments in 2010

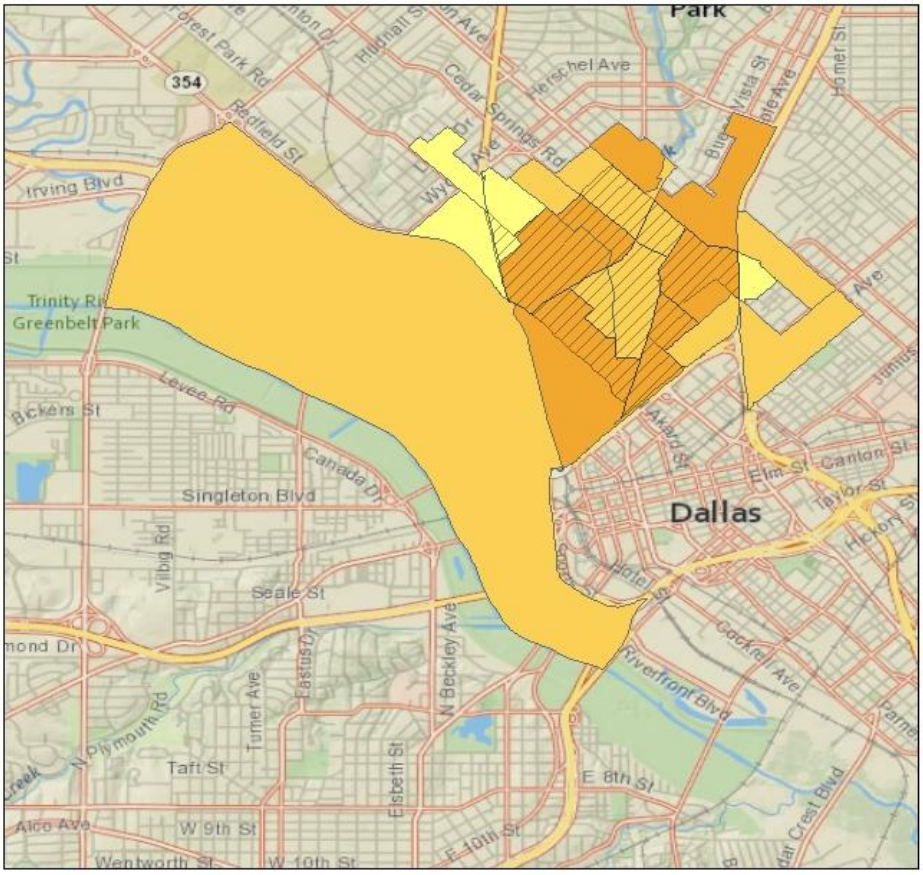
	N	Minimum	Maximum	Mean	Std. Deviation
Pop2010	199	0.0	4834.0	1283.960	702.6477
rent2010	199	0.0	2001.0	1026.095	563.1540
minority2010	199	0.58	100.00	75.99	19.40
employed2010	199	0.00	100.00	56.50	17.95
edu2010	199	0.00	100.00	59.80	24.21
income2010	199	0.00	250001.00	67792.33	44111.90
housingunit2010	199	20.00	195.00	112.74	38.20
Valid N (list wise)	199				

The result in Table 4.5 shows that the average median household income for the other single-use developments for the year 2010 is $67,792.33 (Table 4.5) per block group. Whereas Table 4.6 shows that the average median household income during the year 2000 for the other single-use neighborhoods is $52,242.06.

Table 4.6: Descriptive Statistics for the other single-use neighborhoods around the 32 mixed-use developments in 2000

	N	Minimum	Maximum	Mean	Std. Deviation
rent2000	199	0.00	2001.00	749.64	408.08
minority2000	199	15.90	99.87	75.41	17.40
employed2000	199	7.94	88.15	54.35	15.97
income2000	199	0.00	200001.00	52242.06	33517.70
edu2000	199	1.38	97.34	53.34	22.00
pop2000	199	37.84	26410.45	1417.55	2461.82
housingUnit2000	199	0.00	16324.19	757.19	1457.05
Valid N (list wise)	199				

This showed increased average median income from $52,242.06(in 2000) to $67,792.33 (2010). While the mixed-use developments (32 developments) during the years 2000-2010 increased from $52,348.62 to $71,861.41which is higher increase than the single land use neighborhood. Therefore, the results indicated that the mixed-use developments experienced more income change and economic improvement than the single-use developments. See Figures 4.1, 4.9, 4.10, 4.11, 4.13, 4.16, and 4.18 for the evaluation of Median Household Income with the superimposed Block Group boundaries.



Source: Courtesy of Google base map as an overlay

Figure 4.1: Median Household Income with the superimposed Block Group boundaries, Dallas, Texas

4.4 Results of general Descriptive Analysis for the year 2010:

Table 4.7, 4.8, 4.9, 4.10, 4.11, and 4.12 show descriptive statistics for the analysis of racial diversity in the mixed-use block groups and single-use block groups for the years 2000 and 2010.

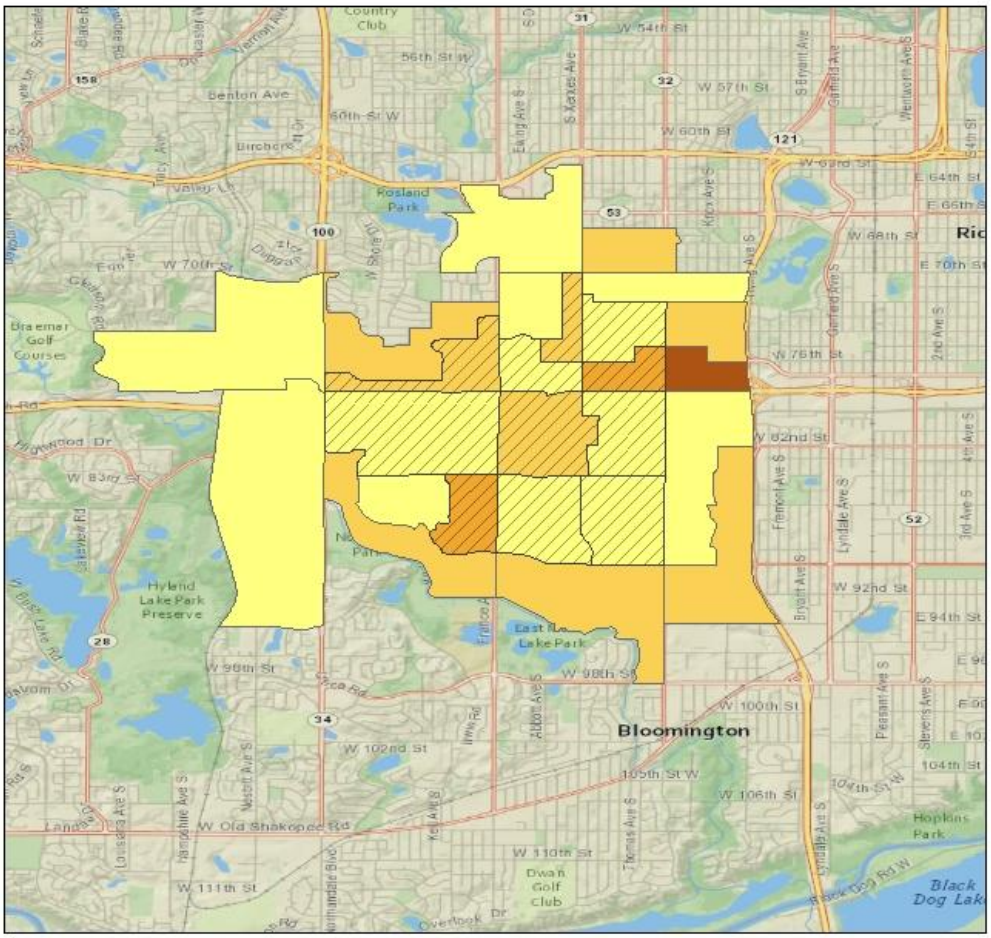
Table 4.7: Mixed land use-32 (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop2010	32	355.00	4292.00	1348.78	749.23
rent2010	32	0.00	2001.00	1089.53	581.25
minority2010	32	23.27	99.30	74.24	18.38
income2010	32	18526.00	222000.00	71861.41	40703.20
edu2010	32	20.94	86.97	62.99	18.81
housingunit2010	32	62.00	242.00	132.22	39.26
employed2010	32	38.69	91.51	63.14	12.24
Valid N (list wise)	32				

Table 4.8 Descriptive Statistics for 32 mixed-use developments (2000)

	N	Minimum	Maximum	Mean	Std. Deviation
rent2000	32	316.68	2,001.00	832.02	409.11
minority2000	32	44.37	98.59	78.76	14.33
employed2000	32	31.75	88.93	58.21	12.96
income2000	32	14,750.00	200,001.00	52,348.62	33,323.95
edu2000	32	19.60	85.64	57.07	17.61
pop2000	32	173.17	2456.94	1180.37	524.34
housingUnit2000	32	86.47	1,659.20	760.74	348.47
Valid N (list wise)	32				

Table 4.7 and 4.8 show that the average minority populations of the 32 mixed-use block groups is decreased in 2010 from the population of the mixed-use block groups in 2000. This has indicated that minority population has an average decrease from 78.76% to 74.4%, which is 4.36%. Additionally, minority population in the 32 mixed-use developments showed 78.76% (Table 4.8) average minority population in the year 2000 and 74.24% (Table 4.7) in the year 2010. But, results in Table 4.10 indicated an average size of 75.41% in the year 2000, and 75.99% average population size for the single- use neighborhoods (surrounding the 32 mixed-use block groups) in 2010. See Table 4.2 for the sample of minority population with the superimposed Block Group boundaries.



Source: Courtesy of Google base map as an overlay

Figure 4.2: Location of minority Population with the superimposed Block Group boundaries

Table 4.9: Descriptive Statistics for single land use neighborhoods (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop2010	199	0.0	4834.0	1,283.960	702.6477
rent2010	199	0.0	2001.0	1026.095	563.1540
%minority2010	199	0.58	100.00	75.99	19.40
%employed2010	199	0.00	100.00	56.50	17.95
%edu2010	199	0.00	100.00	59.80	24.21
income2010	199	0.00	25,0001.00	67,792.33	44,111.90
housingunit2010	199	20.00	195.00	112.74	38.20
Valid N (list wise)	199				

Table 4.10: Descriptive Statistics for single land use neighborhoods (2000)

	N	Minimum	Maximum	Mean	Std. Deviation
rent2000	199	0.00	2,001.00	749.64	408.08
%minority2000	199	15.90	99.87	75.41	17.40
%employed2000	199	7.94	88.15	54.35	15.97
income2000	199	0.00	20,0001.00	52,242.06	33,517.70
%edu2000	199	1.38	97.34	53.34	22.00
pop2000	199	37.84	26,410.45	1,417.55	2,461.82
HousingUnit2000	199	0.00	16,324.19	757.19	1457.05
Valid N (list wise)	199				

Table 4.11: Descriptive Statistics for 52 mixed-use neighborhoods (2010)

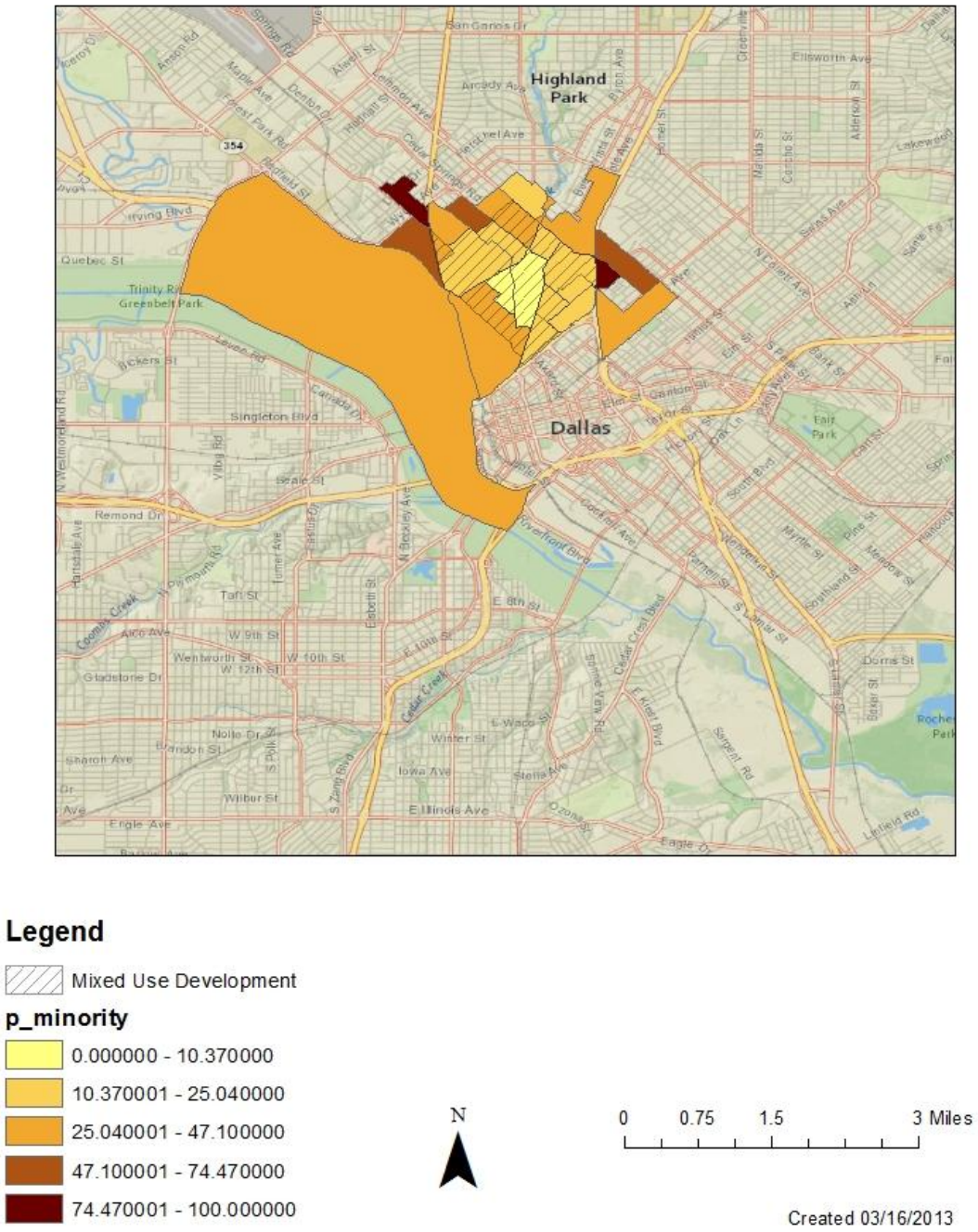
	N	Minimum	Maximum	Mean	Std. Deviation
Pop	52	24.00	7,022.00	1,550.02	1,199.95
rent	50	176.00	2,001.00	1,124.14	479.57
%employed	52	8.93	87.69	57.92	16.12
%edu	52	2.24	100.00	59.57	21.01
income	52	8,276.00	222,000.00	62,763.17	34,958.25
housing units2010	52	15.00	245.00	121.54	44.44
%minority	52	16.13	100.00	74.28	18.19
Valid N (list wise)	50				

Table 4.12: Descriptive Statistics for 435 single-use neighborhoods (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop	435	0.00	9,828.00	1,401.04	996.98
rent	411	99.00	2,001.00	1,020.11	438.54
%employed	432	0.00	100.00	54.96	17.11
%edu	432	0.00	100.00	54.00	22.96
income	430	3,309.00	250,001.00	63,966.94	37,918.68
Housing units	435	19.00	219.00	110.25	38.21
%minority	435	0.00	100.00	70.08	24.92
Valid N (list wise)	411				

Additionally, as noted from the results in Table 4.11 for the 52mixed-use Block Groups (2010), the minority population is 74.28% whereas the minority population in the neighboring single land use Block Groups is only 70.08%. This shows the mixed-use developments exhibited more minority populations than the single-use development by 4.2% on average. Refer to Map 4.3, 4.7, 4.9, 4.10, and 4.12 to see how the location of the minority population is distributed within the superimposed Block Group boundaries

Also, the results for 52 mixed-use Block Groups as shown in Table 4.11 exhibited 57.92% employed residents, while Table 18 exhibited 54. 96% employed residents in 432 single-use Block Groups in 2010. This indicated that the mixed-use Block Groups have a higher percentage of employed residents than the single-use neighborhoods. Additionally, mixed-use developments (Block Groups) provided more housing units than single-use neighborhoods (Block Groups). As shown in Table 4.11, 52 mixed-use Block Groups exhibited 121.54 housing units per Block Group while the 435 single land use Block Groups surrounding the 52 mixed-use Block Groups exhibited 110.25 housing units per Block Group on average. On the other hand, it is noted that the average rent is higher in mixed-use developments than single land use development neighborhoods.



Source: Courtesy of Google base map as an overlay
Figure 4.3: Minority Population with the superimposed Block Group boundaries, Dallas, Texas

4.5 Pearson Correlation Test for 32 Mixed-use developments (2010):

Table 4.13 shows the Pearson product moment correlation coefficient (coefficient of correlation) which provided a quantitative degree of the strength of the association (linear relationship) between the dependent variable (Median household income) and each independent variable (housing rent, percent employed, percent educated and percent minority). Multicollinearity in the model did not exist, because the model showed that the correlation between the dependent and independent variables exceeded the correlation values among the independent variables. As indicated in Table 4.13, the correlation coefficients show that the independent variables are not correlated with each other. This also supports the argument that multicollinearity among the independent variables is not likely to be a problem.

On the other hand, the table shows moderate correlation between the independent variables and the dependent variable. The combined strength of the independent variables on median household income will be better observed in the regression.

Table 4.13 Pearson's correlation coefficient mixed-use 32 (2000-2010)

		%ΔRent 2010	%Δminority 2010	%Δemployed2010	%Δedu 2010	%Δincome2010
%Δrent2010	Pearson Correlation	1				
	N	32				
%Δminority 2010	Pearson Correlation	0.287^{ns}	1			
	N	32	32			
%Δemployed2010	Pearson Correlation	0.258 ^{ns}	-0.093 ^{ns}	1		
	N	32	32	32		
%Δedu2010	Pearson Correlation	0.309 ^{ns}	-0.114 ^{ns}	0.433*	1	
	N	32	32	32	32	
%Δincome 2010	Pearson Correlation	0.499**	-0.053 ^{ns}	0.491**	0.579**	1
	N	32	32	32	32	32

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

^{ns} .Not significant

N. Number of observations (mixed-use developments)

4.6 Pearson's Correlation Test for the 199 Single Land Use Developments (2000-2010)

Also, Table 4.14 shows the Pearson product moment correlation coefficient (coefficient of correlation) which provided a quantitative degree of the strength of the association (linear relationship) between the dependent variable (Median household income) and each independent variable (housing rent, percent employed, percent educated and percent minority). The strength of the association can be assigned using guidelines that are indicated by Cohen (1988, 1992). Cohen's guide lines indicate strength of association as follows:

- -0.3 to 0.3 indicates small correlation
- -0.5 to -0.3 or 0.3 to 0.5 indicates moderate correlation
- / *r* / > 0.5 indicates strong association.

Based on the results showed in Table 4.14 associations between the %∆income 2000 and %∆rent2000 is strong and positive, $r = 0.658$ ($p < 0.01$) for the single use areas. Whereas, the result included in Table 4.13 showed associations between the %∆income 2000 and %∆rent 2000 is moderate and positive, $r = 0.499$ ($p < 0.01$) for the mixed-use areas. Also, the results showed in Table 4.14 associations between the %∆income 2000 and %∆edu2000 is moderate and positive, $r = 0.490$ ($p < 0.01$) for the single use areas while the association in mixed-use areas are strong positive correlations, $r = 0.579$ ($p < 0.01$). The level of *p*-value (statistical significance) in this model indicates that the correlation coefficient is statistically dissimilar from zero and significant.

Multicollinearity (intercorrelation) is undesirable due to the correlation between the independent variables which may affect the standard errors where the Beta coefficients and standard errors do not vary from zero or are wrongly affected by it. Multicollinearity (inter-correlation) problem in the model is not significant, because the model showed that the correlation between the dependent and independent variables exceeded the correlation values among the independent variables.

Table 4.14: Pearson's correlation coefficient for single-use (2000-2010)

		%Δrent 2000	%Δ minority 2000	%Δemployed 2000	%Δp_edu 2000	%Δincome2000
%Δrent 2000	Pearson Correlation	1				
	N	195				
%Δminority2000	Pearson Correlation	-0.023 ns	1			
	N	195	199			
%Δemployed2000	Pearson Correlation	0.40**	0.045	1		
	N	195	199	199		
%Δedu2000	Pearson Correlation	0.361**	0.015 ns	0.512**	1	
	N	195	199	199	199	
%Δincome 2000	Pearson Correlation	0.658**	-0.090	0.482**	0.490**	1
	N	195	198	198	198	198

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
ns . Non significant
N. number of observations (single-use Block Groups)

4.7 Testing for Variance Inflation Factors (VIF) for 32 Mixed-use Developments:

Values of the independent variables provided in the variance inflation factors (VIF) as noted in Table 4.15 are all less than 5.That means no two independent variables in this model are linearly correlated.

Figure 4.15: Variance Inflation Factors (VIF) for the models of 32 mixed-use developments (2000 - 2010)

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	rent2010	0.776	1.289
	minority2010	0.863	1.159
	employed2010	0.787	1.271
	edu2010	0.749	1.335

a. Dependent Variable: income2010

Table 4.16: Variance Inflation Factors (VIF) for the models of 199 single-use development (2000 - 2010)

Model		Collinearity Statistics	
		Tolerance	VIF
	(Constant)		
	%∆rent2000	0.573	1.745
	%∆minority2000	0.892	1.121
	%∆employed2000	0.646	1.548
	%∆edu2000	0.425	2.351

a. Dependent Variable: Income 2000

4.8 Testing for Variance Inflation Factors (VIF) for 199 single use Developments:

Additionally, values of the independent variables provided in the variance inflation factors (VIF) as noted in Table 4.16 are all less than 5 meaning no Multicollinearity problems exist in the model.

4.9 Test for Normality:

Testing for normality will enable us to check whether the variables in the model come from normally distributed samples and are representatives of the population. Also, assumption is made for dependent variable and all independent variables that they are normally distributed for each category of model. Normality test can be done using two major methods; statistical (numerical) and Graphical method. This study will utilize both numerical (statistical) and Normal Q-Q Plot (graphical) method to test for normality. Therefore, normality test for each data

variables (rent, income, education, employment, and minority) is conducted using both statistical and graphical methods.

4.10 Testing for Normality: Statistical (Numerical) Method:

Table 4.17 shows the parametric test result from the numeric (statistical) test for normality. The datasets that are entered in the model are rent, Minor, employed, income, and edu. The result depicted that all variables are normally distributed. Therefore, it can be accepted that the scores of the variables are normally distributed and is sufficient for the normality test and proceed to conduct the graphical method.

Table 4.17: Results of test for normality using statistical method

Model Name		MOD_1
Series or Sequence	1	**rent**
	2	**Minor**
	3	**employed**
	4	**income**
	5	**edu**
Transformation		None
Non-Seasonal Differencing		0
Seasonal Differencing		0
Length of Seasonal Period		No periodicity
Standardization		Not applied
Distribution	**Type**	**Normal**
	Location	estimated
	Scale	estimated
Fractional Rank Estimation Method		Blom's
Rank Assigned to Ties		Mean rank of tied values
Applying the model specifications from MOD_1		

Table 4.18: Processing Summary

Case Processing Summary						
		rent	Minor	employed	income	edu
Series or Sequence Length		32	32	32	32	32
Number of Missing Values in the Plot	User-Missing	0	0	0	0	0
	System-Missing	0	0	0	0	0

The cases are unweighted

Table 4.19: Estimated Distribution Parameters

		rent	Minor	employed	income	edu
Normal Distribution	Location	0.57659	-28.33750	17.91625	1.80100	31.50906
	Scale	1.426703	29.355598	19.024047	2.804851	30.320054

The cases are unweighted.

4.11 Testing for Normality: Graphical Method:

One of the best preferred graphical method for testing for normality is the Q-Q Plot. The method conducts comparisons of the distribution of datasets with the Normal Q-Q Plot (diagonal line).The circular dots represent score (data) points of each variable where slight variations are acceptable. An ideal and perfect normal distribution will be positioned exactly on the line. Tables 4.20, 4.21, 4.22, 4.23, and 4.24 shows the parametric test result from the Normal Q-Q Plot as assessed for normality. The datasets that are entered in the model are rent, Minor, employed, income, and edu. The results depicted that all variables are normally distributed and the assumption of normality for all variables was satisfied.

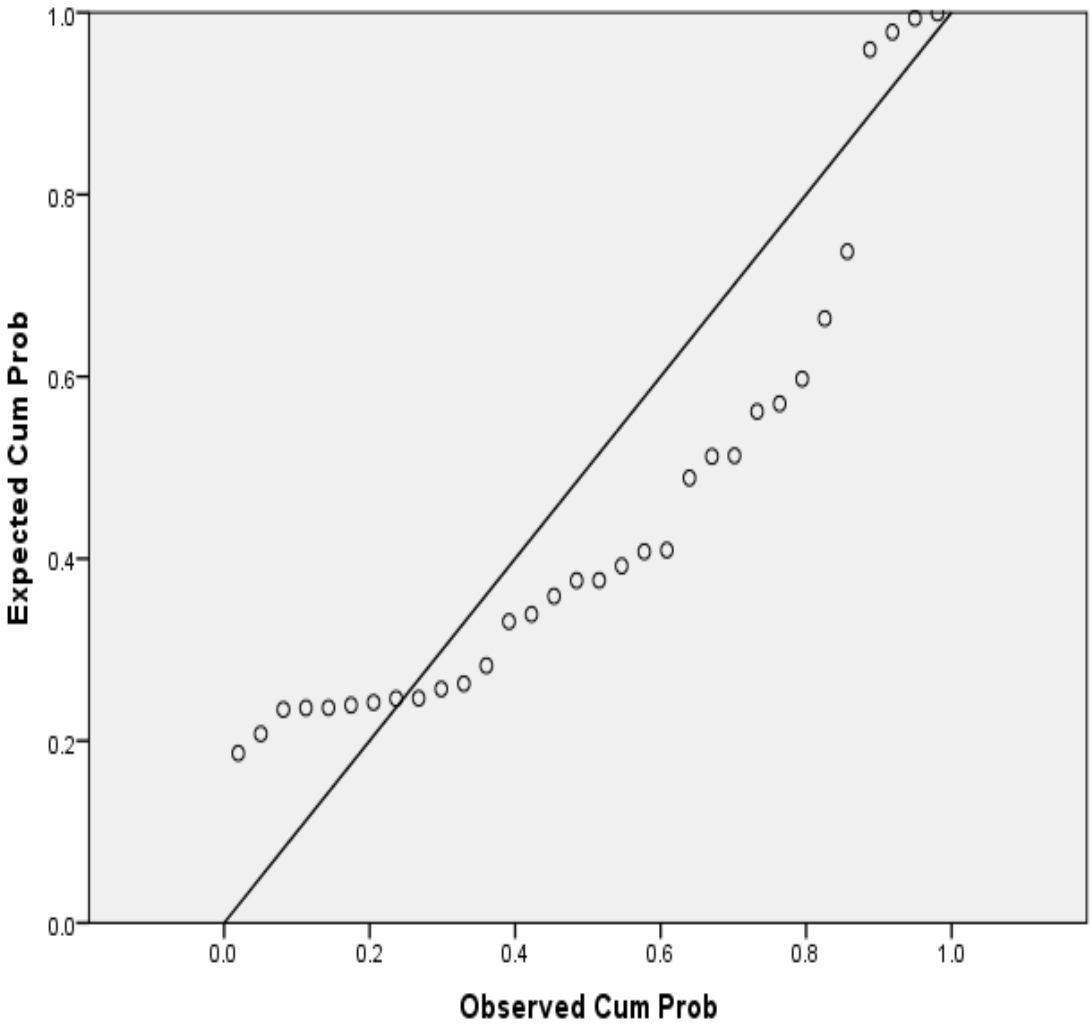


Figure 4.4 Normal Q-Q Plot of percent rent

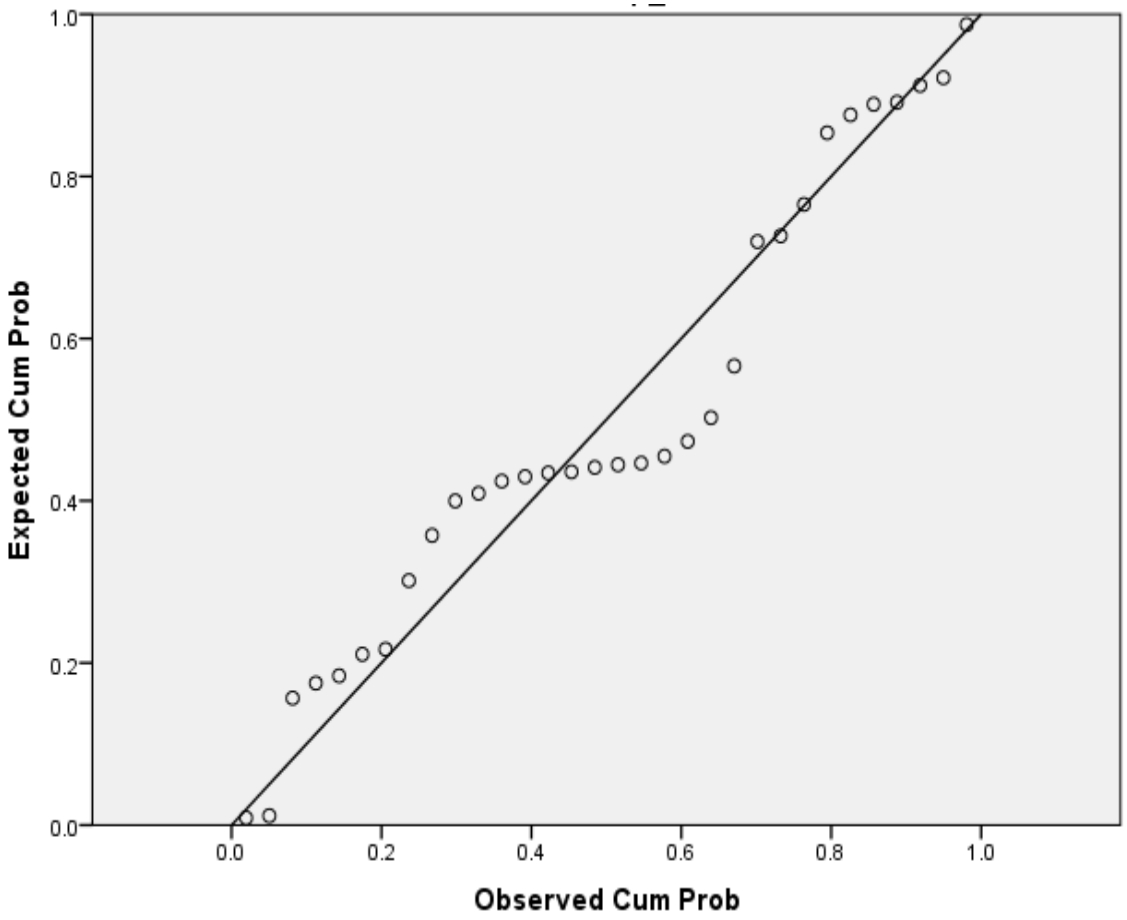


Figure 4.5 Normal Q-Q Plot of minor

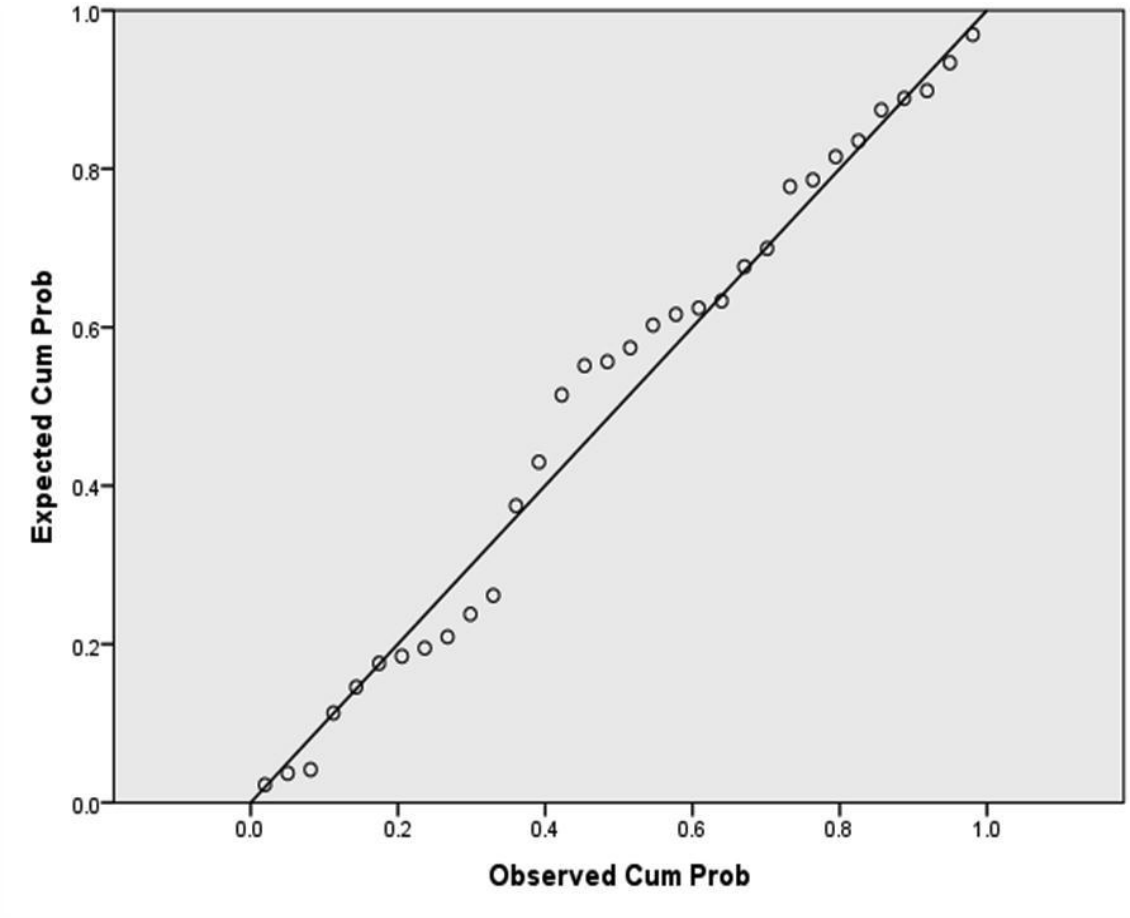


Figure 4.6: Normal Q-Q Plot of Percent employed

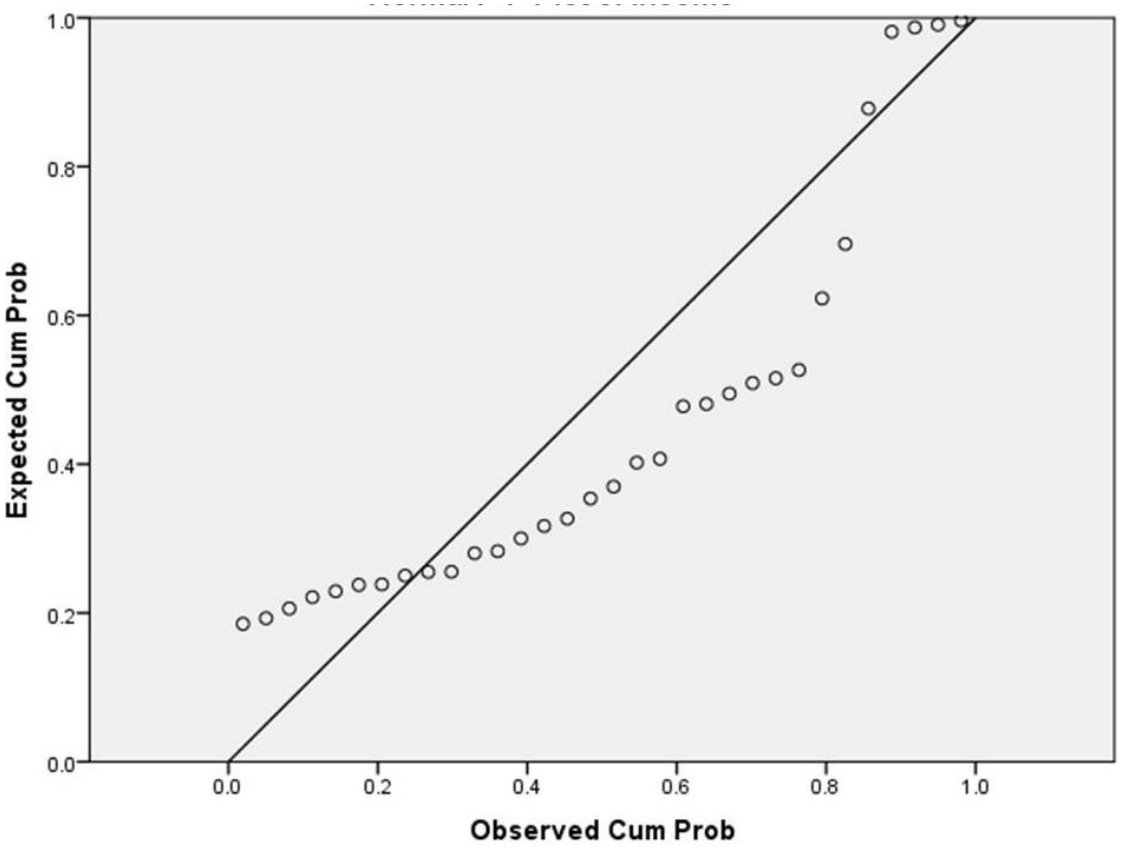


Figure 4.7: Normal Q-Q Plot of percent median household income

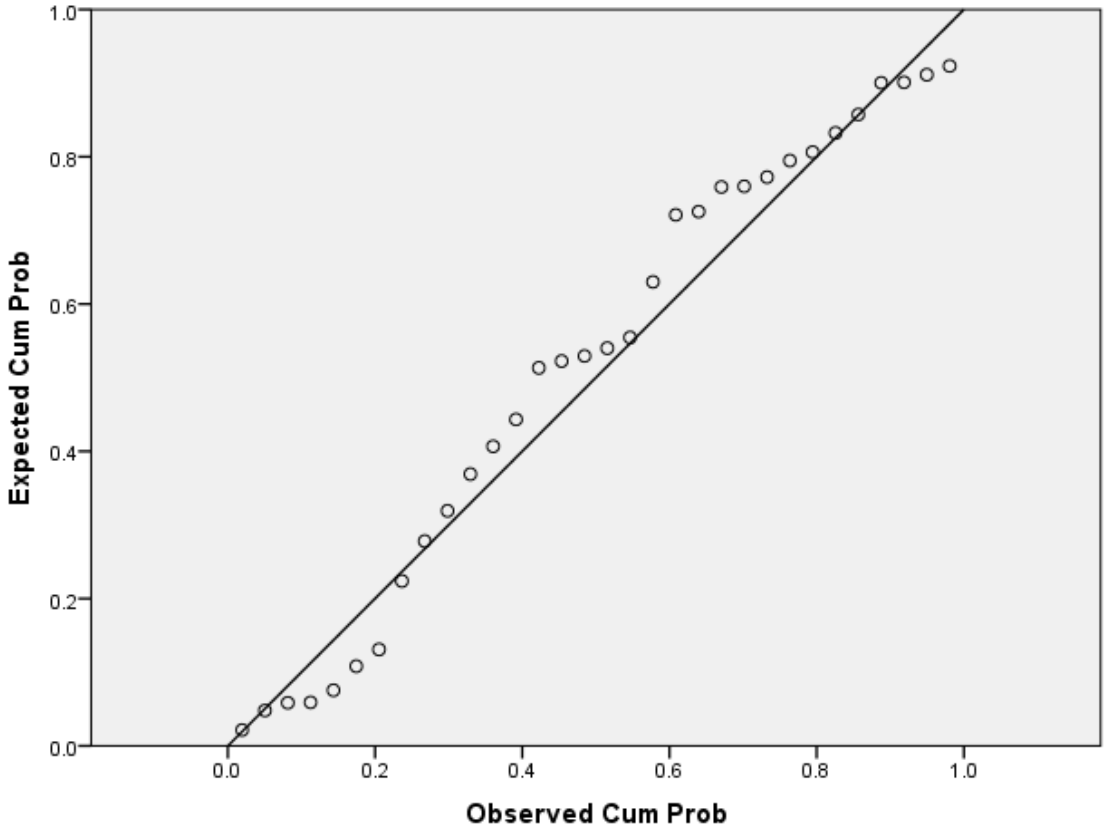


Figure 4.8: Normal Q-Q Plot of percent educated residents (edu)

4.12 Descriptive statistics for Equation 2**:**

Research question 2: Do mixed-use developments provide more density (population density and residential density) than the immediate neighboring areas?

Function 3:

a. Density (N) = Total Housing Units ÷ Total area of the Block Group (acre)

b. Density (P) =Total Population ÷ Total area of the Block Group (acre)

Where,

- Density (N) is a gross neighborhood density per acre
- Density (P) is population density per acre
- P = Total Population within the given Block Groups
- N = Total area of the Block Group (Neighborhood) is the gross area of the Block Group

4.13 Density calculation Results for 32 Mixed-use Developments (2000):

The following Tables show the results of density calculation results for the 32 Mixed-use developments for the year 2000.

Table 4.20: Descriptive Statistics of density for mixed land use developments - Density (2000)

	N	Minimum	Maximum	Mean	Std. Deviation
pop2000	32	173.17	2,456.94	1,180.37	524.34
DENSITY(P)	32	0.30	138.48	15.14	25.15
DENSITY(N)	32	0.24	96.67	10.06	17.40
Valid N (list wise)	32				

4.14 Density calculation Results for 199 Single Use Developments (2000):

The following Tables show the results of density calculation results for the 199 single use developments for the year 2000.

Table 4.21: Descriptive Statistics of Density for single land use neighborhood Density (2000)

	N	Minimum	Maximum	Mean	Std. Deviation
pop2000	199	37.84	26,410.45	1,417.55	2,461.82
DENSITY(P)	199	0.00	138.48	15.02	21.86
DENSITY(N)	199	0.00	96.68	8.96	14.74
Valid N (list wise)	199				

a) Population Density: The population density in 32 mixed-use developments (Table 4.20) in 2000 is 15.14 persons per acre while the population density in other neighboring single land use neighborhoods is 15.02 (Table 4.21) persons per acre. This result is in agreement with the mixed-use development ideals where it superseded the density of single land use developments. In this case the

mixed-use developments exceeded the single land use neighborhood slightly by 0.12 persons per acre.

b) Gross Neighborhood Density: The results from the analysis (Table 4.21) of 199 single-use block groups around the mixed-use development block groups showed 8.96 dwelling (residential) units per acre. Whereas, the results from the analysis (Table 4.20) of 32 mixed-use developments showed 10.06 dwelling (residential) units per acre. Therefore, the mixed-use developments exceeded the single-use neighborhood in providing higher gross neighborhood density by 1.1 dwelling (residential) units per acre.

c) Average population size for the 32 mixed-use developments in Table 4.20 is about 1,180.37per Block Group. Whereas, the average population size for the 199 single land use neighborhoods surrounding the 32 mixed-use developments (Table 4.21) is 1417.55 persons per Block Group. This means the single land use neighborhood block groups exceeded the mixed land use neighborhood in average population size by 237.18 persons per Block Group.

4.15 Density calculation Results for 32 Mixed-use Developments (2010):

The following Tables show the results of density calculation results for the 32 mixed-use developments for the year 2010.

Table 4.22: Descriptive Statistics for 32 mixed-use developments- Density (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop2010	32	355.0	4,292.0	1348.78	749.23
DENSITY(P)	32	0.60	106.12	16.49	21.36
DENSITY(N)	32	0.04	17.25	1.86	3.09
Valid N (list wise)	32				

4.16 Density calculation Results for 199 Single Use Developments (2010):

The following Tables show the results of density calculation results for the 199 single use developments for the year 2010.

Table 4.23: Descriptive Statistics of Density for single land use neighborhood - Density (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop2010	199	0.0	4834.0	1283.96	702.65
DENSITY(P)	199	0.00	225.25	17.59	25.03
DENSITY(N)	199	0.00	41.24	1.98	3.79
Valid N (list wise)	199				

d) Population Density: The population density in 32 mixed-use developments (Table 4.22) in 2010 is 16.49 persons per acre while the population density in other neighboring single land use neighborhoods is 17.59 (Table 4.23) persons per acre. This result is contrary to the mixed-use development ideals where it supposed to supersede the density of single land use development (Block

Groups). In this case the single-use developments exceeded the mixed-use developments by 1.1 persons per acre.

e) Gross Neighborhood Density: The results from the analysis (Table 4.23) of 199 single-use block groups around the mixed-use development Block Groups showed 1.98 dwelling (residential) units per acre. Whereas the results from the analysis (Table 4.22) of 32 mixed-use developments showed 1.86 dwelling (residential) units per acre. This shows that single land use neighborhoods provided more compact neighborhood density than single land use developments by 0.12 dwelling units per acre.

f) Average population size for the 32 mixed-use developments in Table 4.22 is about 1,349 persons per block group. Whereas the average population size as noted in Table 4.24 for the 199 single land use neighborhoods surrounding the 32 mixed-use developments (Block Groups) is 1284 persons per block group. This means the mixed-use development block groups exceeded the single-use neighborhood in average population size by 64 persons per block.

4.17 Density Calculation Results for 52 Mixed-use Developments (2010):

The following Tables show the results of density calculation results for the 52 mixed-use developments for the year 2010.

Table 4.24: Descriptive Statistics of Density for 52 mixed land use neighborhoods (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop	52	24.0	7022.0	1550.019	1199.9470
DENSITY(P)	52	0.16	89.22	13.28	17.10
DENSITY(N)	52	0.03	12.85	1.36	2.17
Valid N (list wise)	52				

4.18 Density Calculation Results for 433 Single Use Developments (2010):

The following Tables show the results of density calculation results for the 433 single use developments for the year 2010.

Table 4.25: Descriptive Statistics of Density for 433 single land use neighborhoods (2010)

	N	Minimum	Maximum	Mean	Std. Deviation
Pop	435	0.0	9828.0	1401.041	996.9810
DENSITY(P)	433	0.00	258.05	17.68	28.88
DENSITY(N)	433	0.01	34.10	1.85	3.45
Valid N (list wise)	433				

a) Population Density: The population density in 52 mixed-use developments (Table 4.24) in 2010 is 13.28 persons per acre while the population density in other neighboring single land use neighborhood is 17.68 (Table 4.25) persons per acre. This result is contrary to the mixed-use development ideals where it is supposed to supersede the density of single land

use developments. In this case the single-use developments exceeded the mixed-use developments by 4.4 persons per acre.

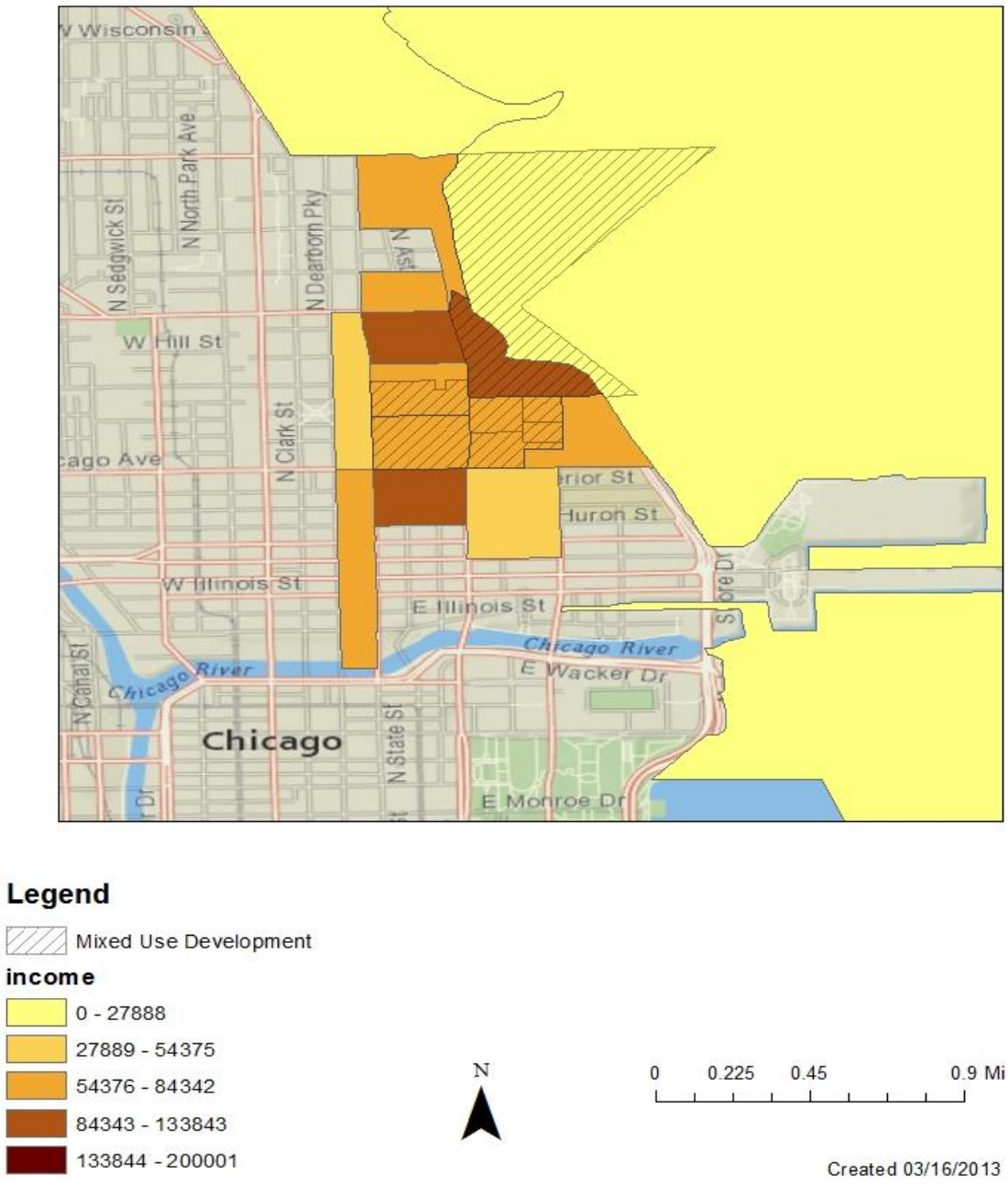
b) Gross Neighborhood Density: The results from the analysis (Table 4.25) of 433 single-use block groups around the mixed-use development Block Groups showed 1.85 dwelling (residential) units per acre. Whereas the results from the analysis (Table 4.24) of 52 mixed-use developments Block Groups showed 1.36 dwelling (residential) units per acre. This shows that single land use neighborhoods provided more gross-neighborhood density than single land use developments by 0.49 dwelling units per acre.

c) Average population size for the 52 mixed-use developments in Table 4.25 is about 1,550.019 per block group. Whereas the average population size as noted in Table 4.25 for the single land use neighborhoods surrounding the 52 mixed-use development Block Groups is 1401.041 persons per block group. This means the mixed-use development block groups exceeded the single-use neighborhood in average population size by 148.978 (about 149) persons per block group.

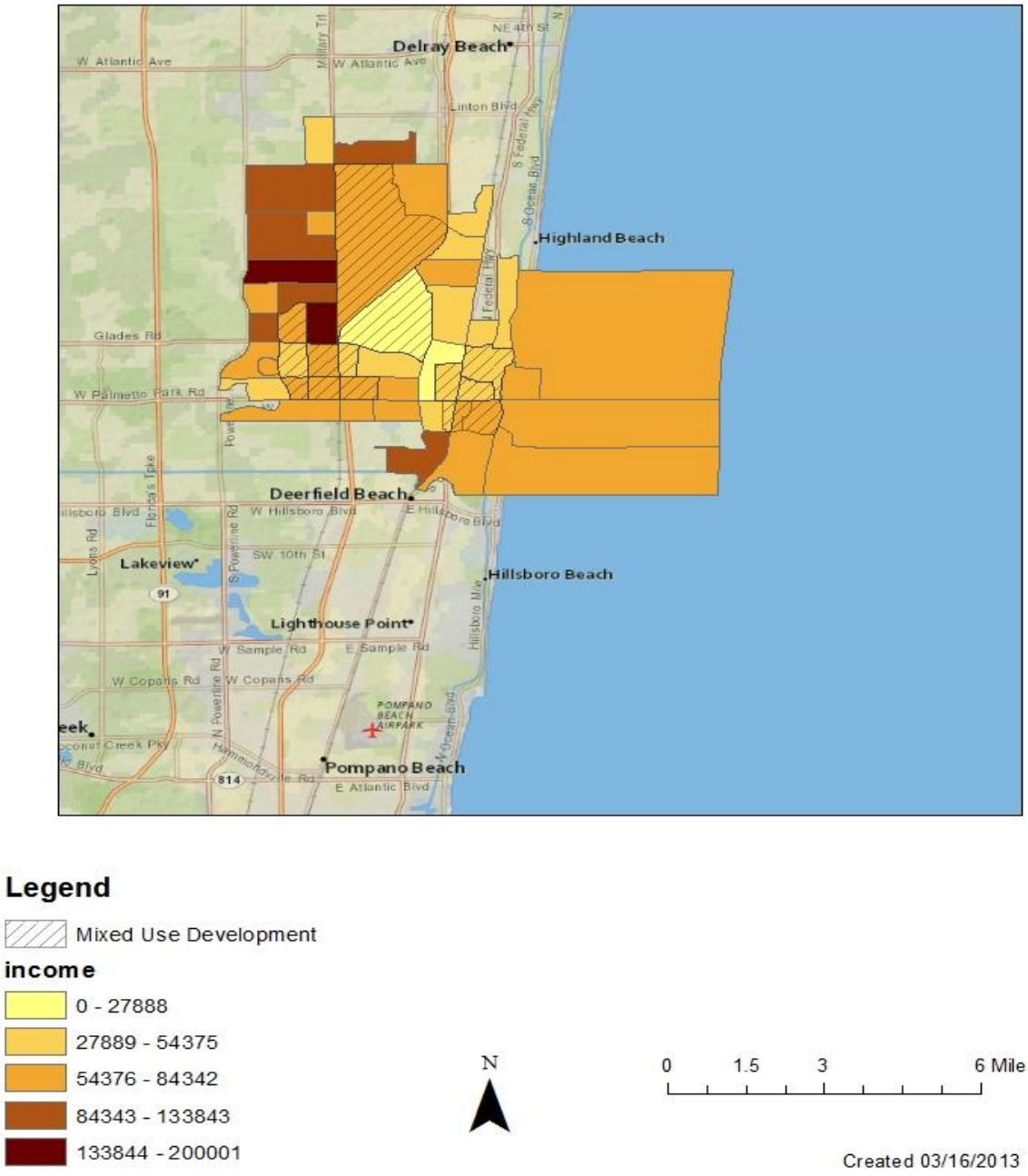
Figures 4.12, 4.14, 4.15, and 4.17 show the location of minority population, location of mixed-use development, and single use development areas. These maps depict a visual clue for that help understand where the concentration of minority population is in relation to both land uses.

Figures 4.9, 4.10, 4.11, 4.13, 4.16, and 4.18 show the relative positions and locations of mixed-use development areas and single use development

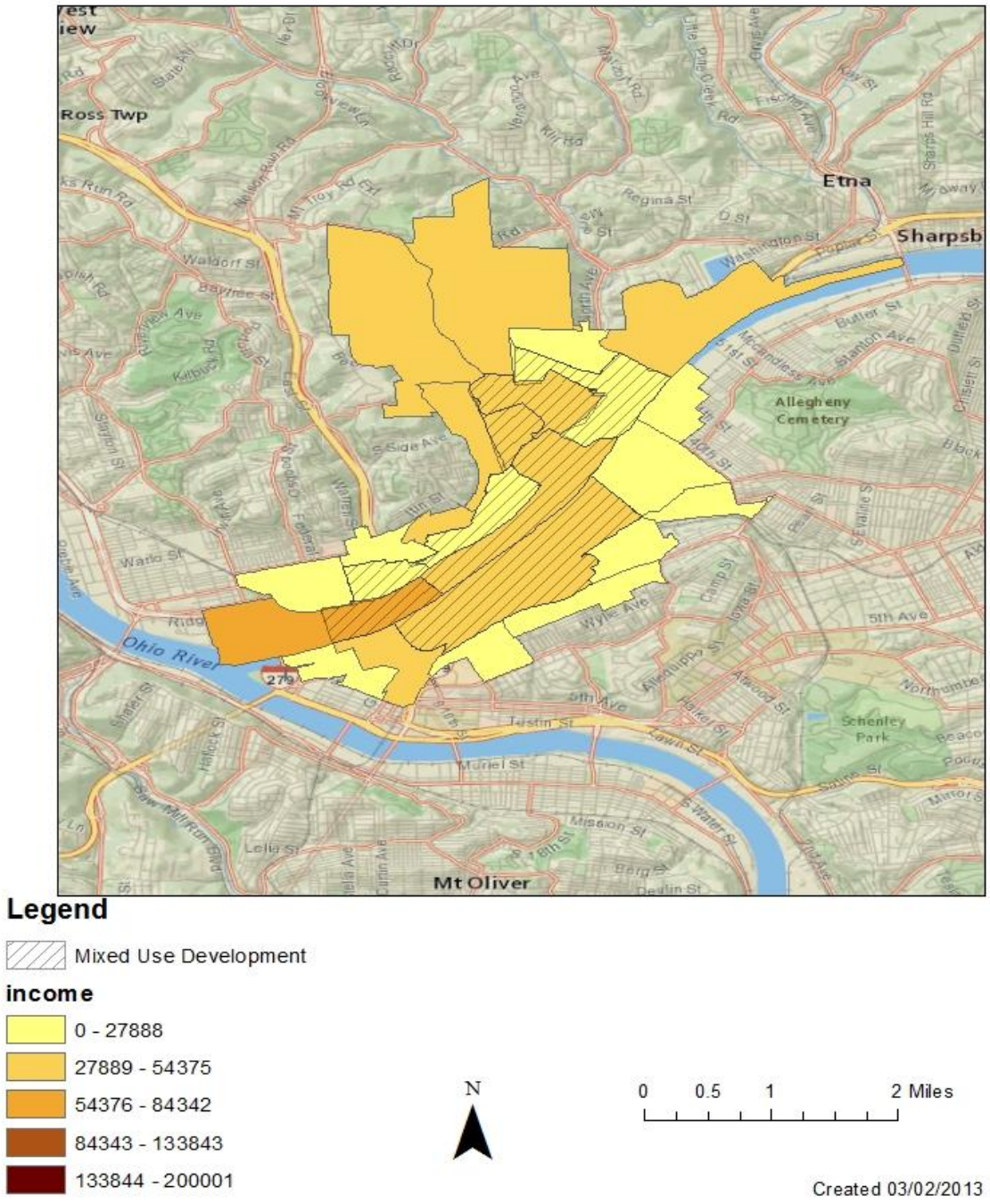
areas with a superimposed income distribution. These maps jointly or separately depict the income distribution of the population while contrasting the mixed-use developments with the single use developments.



Source: Courtesy of Google base map as an overlay
Figure 4.9: Median Household Income with the superimposed Block Group boundaries, Chicago, Illinois

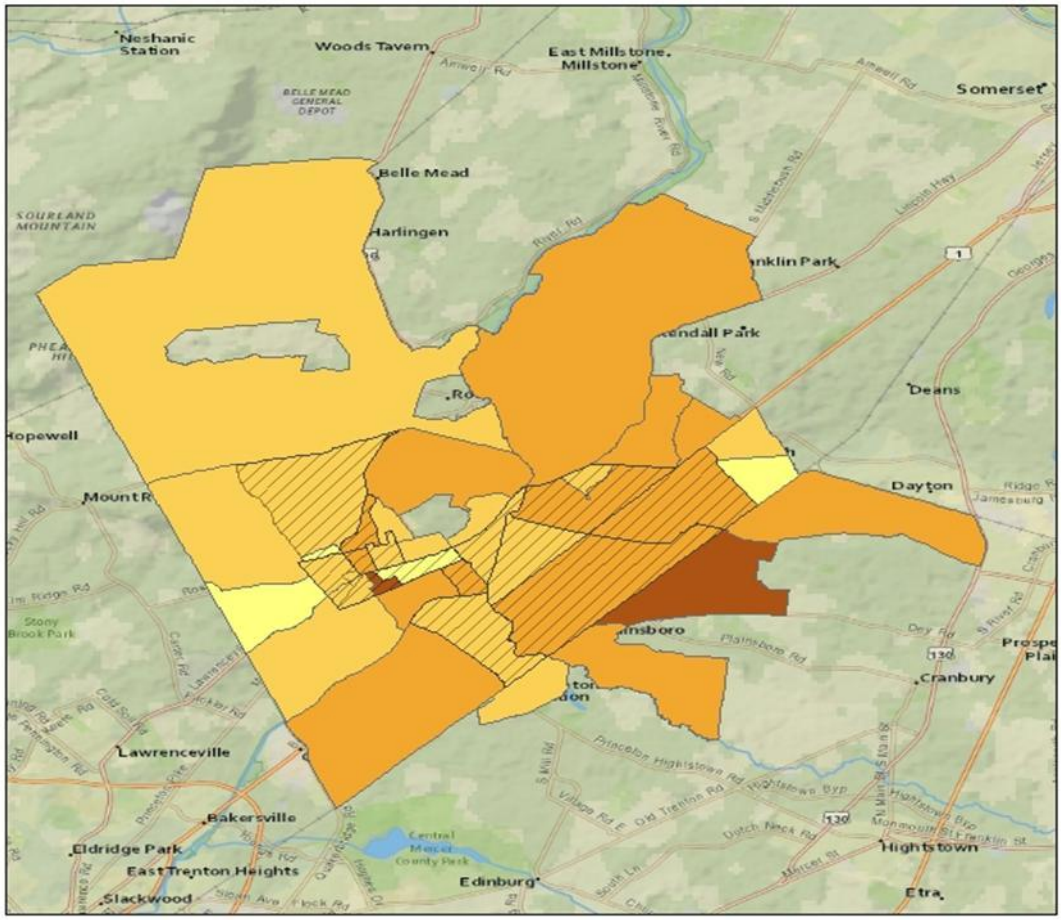


Source: Courtesy of Google base map as an overlay
Figure 4.10: Median Household Income with the superimposed Block Group boundaries, Boca Raton, Florida



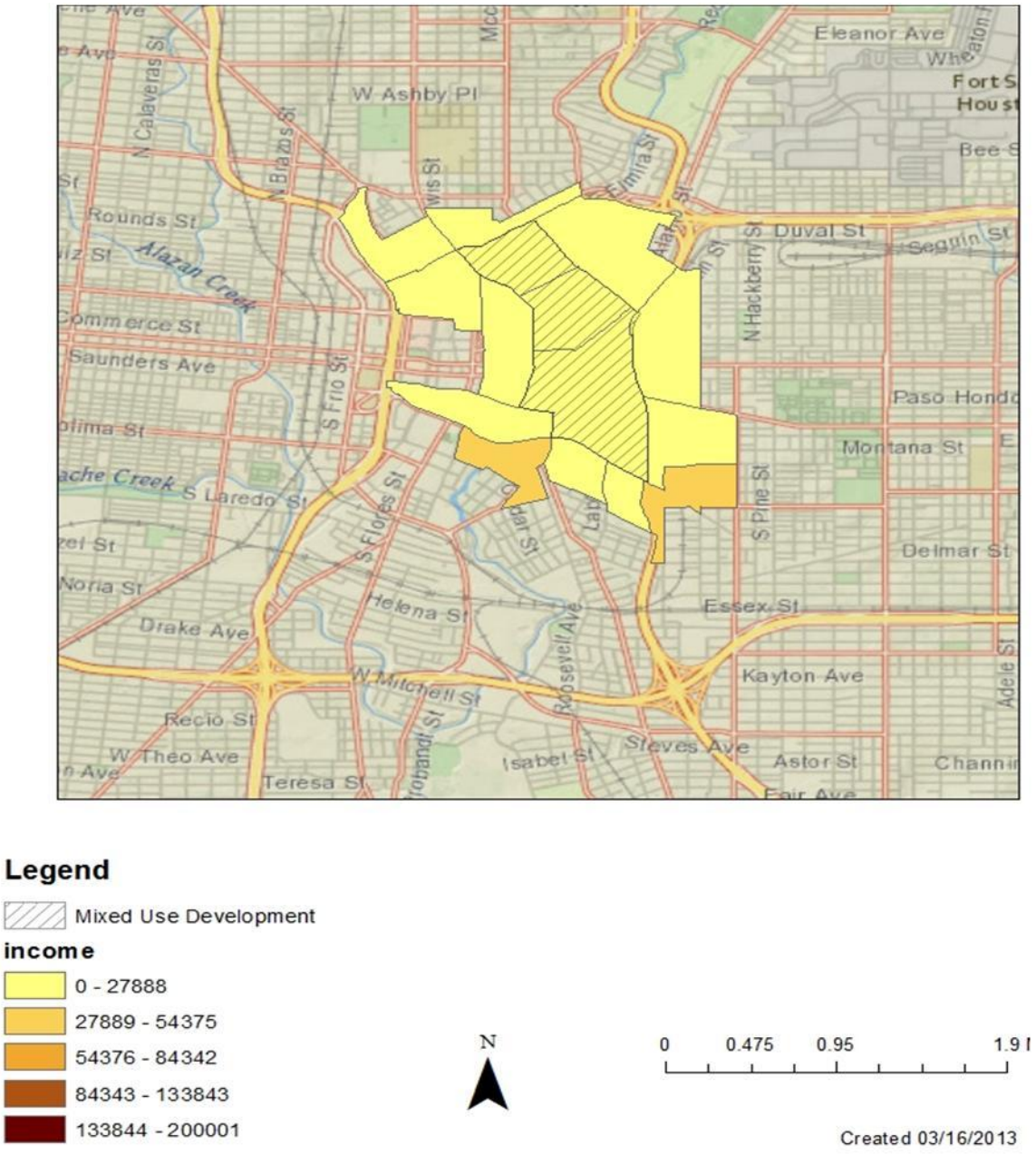
Source: Courtesy of Google base map as an overlay

Figure 4.11: Median Household Income with the superimposed Block Group boundaries, Pittsburgh, PA

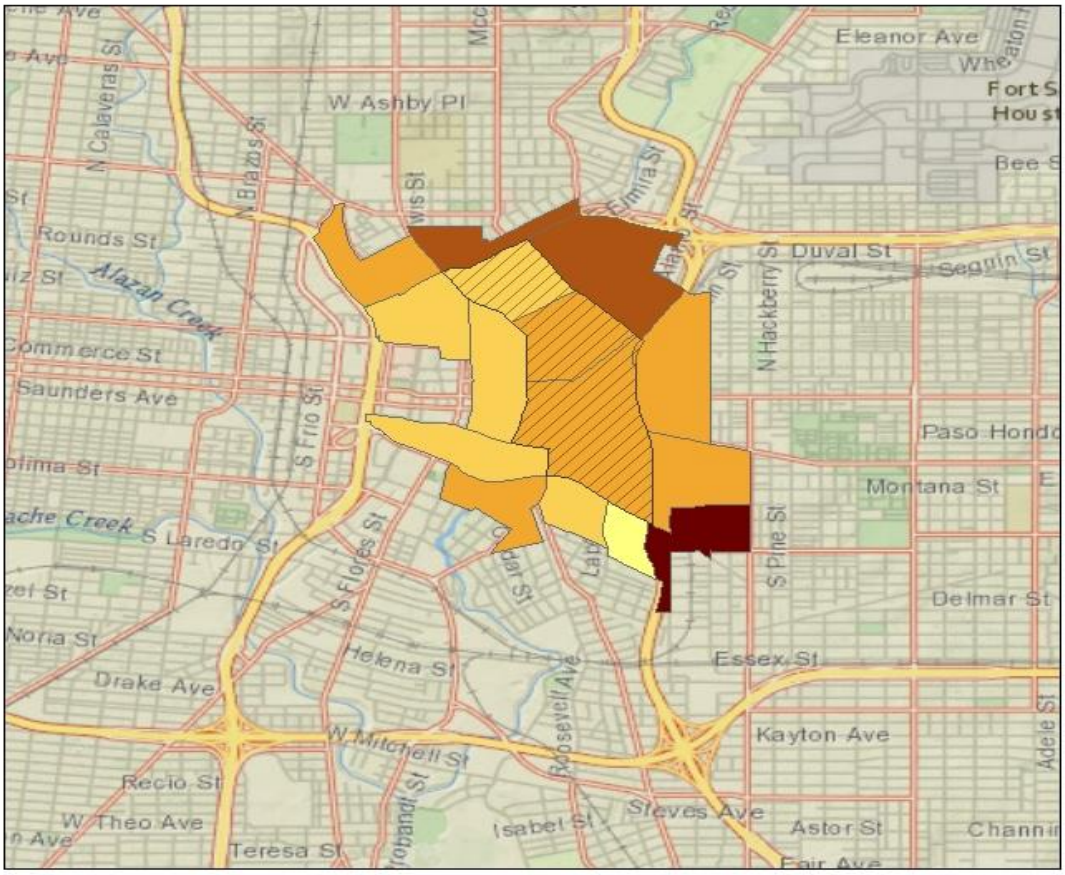


Source: Courtesy of Google base map as an overlay

Figure 4.12: Minority Population with the superimposed Block Group boundaries, Princeton, New Jersey

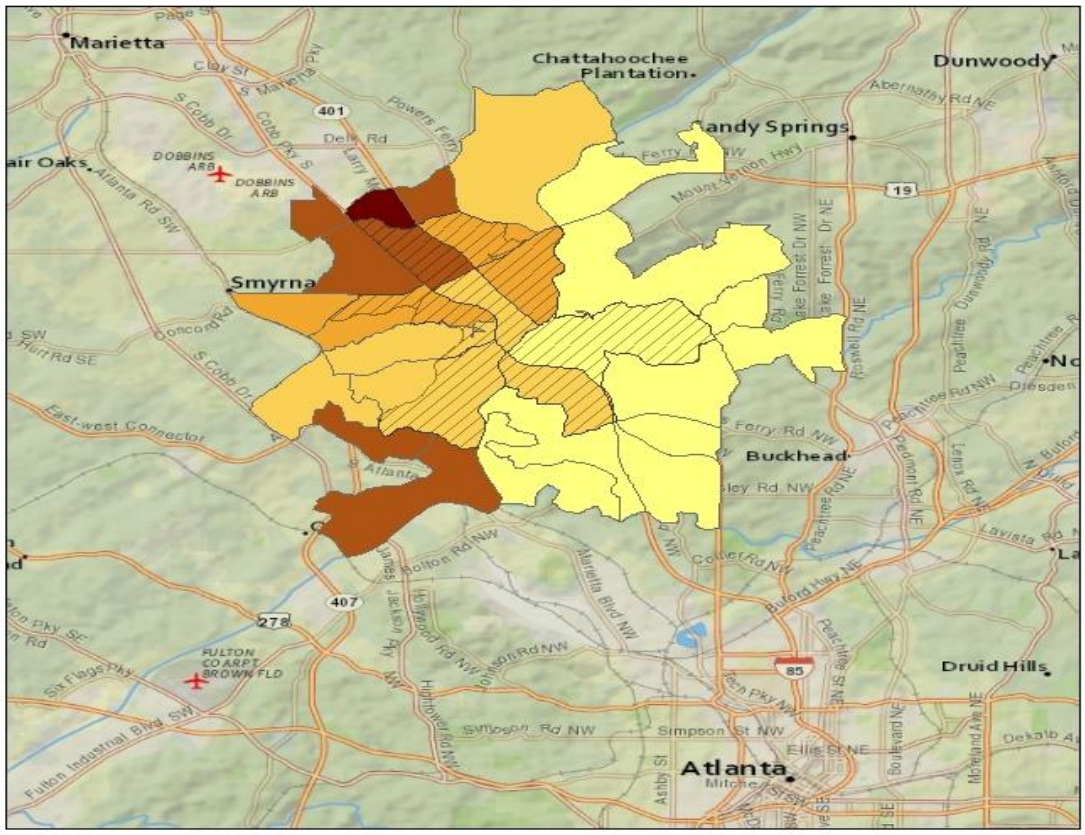


Source: Courtesy of Google base map as an overlay
Figure 4.13: Median Household Income with the superimposed Block Group boundaries, San Antonio, Texas

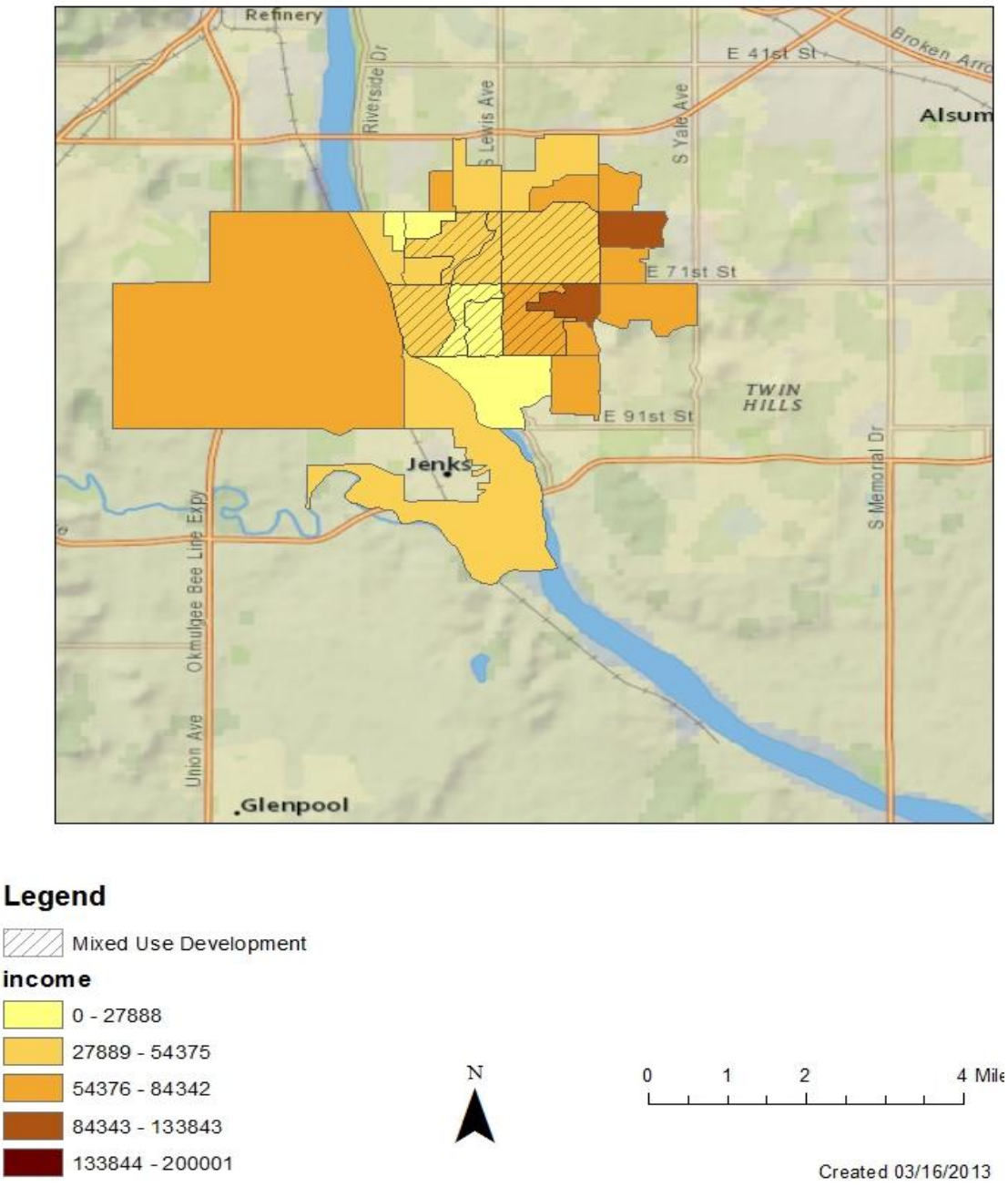


Source: Courtesy of Google base map as an overlay

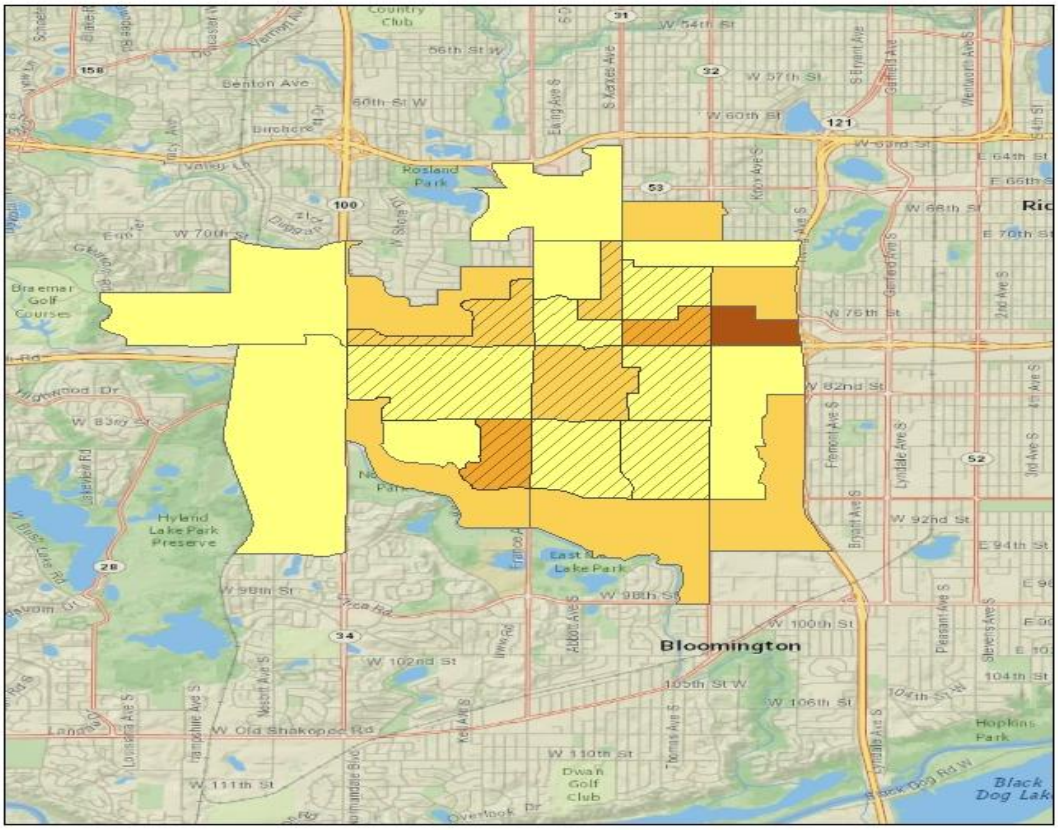
Figure 4.14: Minority Population with the superimposed Block Group boundaries, San Antonio, Texas



Source: Courtesy of Google base map as an overlay
Figure 4.15: Minority Population with the superimposed Block Group boundaries, Tulsa, Oklahoma

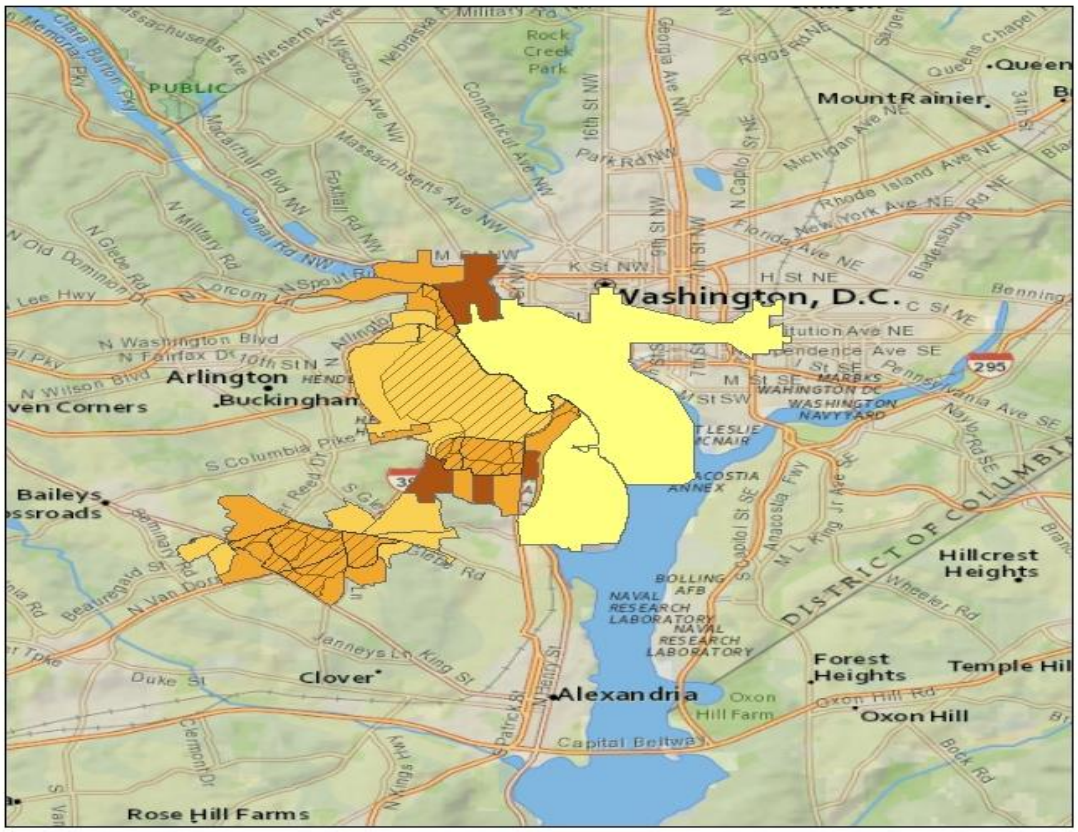


Source: Courtesy of Google base map as an overlay
Figure 4.16: Median Household Income with the superimposed Block Group boundaries in Tulsa, Oklahoma



Source: Courtesy of Google base map as an overlay

Figure 4.17: Minority Population with the superimposed Block Group boundaries, Edina, Minnesota



Source: Courtesy of Google base map as an overlay
Figure 4.18: Median Household Income with the superimposed Block Group boundaries, Washington, D.C.

4.19 Descriptive Analysis for the Research Questions:

Research Question 1: Do mixed-use developments exhibit more mix of racially diverse population than the immediate neighboring areas?

In order to evaluate the relationship between the two sample means of both different land uses regarding the ethnic composure of the areas the two independent sample means are tested through the independent sample t-test.

4.20 Results of analysis for percent change in minority population test of means:

The hypotheses for percent change in minority population are as follows:

H_0 = the means of percent minority population in Block Groups of the mixed-use developments and single use developments are equal (i.e. $\mu_1 = \mu_2$)

H_A = the means of percent minority population in Block Groups of the mixed-use developments and single use developments are not equal (i.e. $\mu_1 \neq \mu_2$)

The two independent samples t-test enable us to test whether two independent means of percent minority populations of the mixed-use developments and single use developments represented by samples are significantly different in terms of percent minority population.

The results are summarized and showed in Table 4.32: as follows:

Table 4.26: Summary of independent sample t-test (group statistics) for the percent minority population

Land Use Type/Year	P-MINORITY			Sig. (2-tailed)
	MIXED-USE	SINGLE USE	t	
	MEAN	MEAN		
2000	78.76 (32)	75.41 (199)	1.03	0.30
2010	74.24 (32)	75.99 (199)	-0.47	0.64
2010	74.28 (52)	70.08 (433)	1.18	0.24

Based on the findings from the analysis of the test of means for percent change in minority population we fail to reject the null hypothesis that the means of the percent change in minority population in Block Groups of the mixed-use developments and single use developments are equal.

Research Question 2: Do mixed-use developments provide more density (population density and residential density) than the immediate neighboring areas?

4.21 Results of analysis for population density test of means:

The hypotheses for population density are as follows:

H_0 = the means of population density in Block Groups of the mixed-use developments and single use developments are equal (i.e. $\mu_1 = \mu_2$)

H_A = the means of population density in Block Groups of the mixed-use developments and single use developments are not equal (i.e. $\mu_1 \neq \mu_2$)

The two independent samples t-test enable us to test whether two independent means of population density of the mixed-use developments and

single use developments represented by samples are significantly different in terms of population density.

Table 4.27: Summary of independent sample t-test (group statistics) for the population density

Land Use Type/Year	P_DENSITY			Sig. (2-tailed)
	MIXED-USE	SINGLE USE	t	
	MEAN	MEAN		
2000	15.14 (32)	15.10 (199)	0.01	0.99
2010	16.49 (32)	17.67 (199)	-0.25	0.80
2010	13.28 (52)	17.68 (433)	-1.07	0.28

Based on the findings from the analysis of the test of means for population density we fail to reject the null hypothesis that the means of population density in Block Groups of the mixed-use developments and single use developments are equal.

4.22 Results of analysis for residential density test of means:

The hypotheses for residential density are as follows:

H_0 = the means of residential density in Block Groups of the mixed-use developments and single use developments are equal (i.e. $\mu_1 = \mu_2$)

H_A = the means of residential density in Block Groups of the mixed-use developments and single use developments are not equal (i.e. $\mu_1 \neq \mu_2$)

The two independent samples t-test enable us to test whether two independent means of residential density of the mixed-use developments and single use developments represented by samples are significantly different in terms of residential density.

Table 4.28: Summary of independent sample t-test (group statistics) for the residential (neighborhood) density

	N_DENSITY			
	MIXED-USE	SINGLE USE	t	
Year	MEAN	MEAN		Sig. (2-tailed)
2000	10.06 (32)	9.00 (199)	0.37	0.71
2010	11.68 (32)	11.47 (199)	0.057	0.95
2010	9.41 (52)	10.95 (435)	-0.51	0.61

Based on the findings from the analysis of the test of means for residential density we fail to reject the null hypothesis that the means of residential density in Block Groups of the mixed-use developments and single use developments are equal.

Table 4.29: Summary of independent sample t-test for percent change of the residential (neighborhood) density between mixed-use and single use developments

YEAR	LANDUSE	MEAN	t	Sig. (2-tailed)
2000 to 2010	MIXED	470%	-0.587	0.558
	SINGLE	1065%		

Additionally, the independent sample t-test was done for the percent change in mean residential density of both land uses. The analysis of the mean of percent change in residential density in the Table 4.29 (above) indicated that there was not statistically significant difference between the percentage change of means in residential (neighborhood) density of mixed-use and single use development Block Groups.

CHAPTER 5

REGRESSIONS AND RESULTS

This chapter presents the results from the linear regression data analysis along with various datasets. Also, this chapter provides theoretical reasons and expectations behind the relationships between the dependent variables (%Δ MedHIncome and %Δ minor) and the independent variables (%Δ median rent, %Δ minor, %Δemployment, and %Δ edu) as indicated in the results. Data (for 2000 to 2010) regarding dependent variables are converted to the percent change so that it represent the percent change in median household income and percent change in minority population for the 32 mixed-use development Block Groups and 199 single land use Block Groups.

The independent variable represents percent change in median house rent, percent change in minority population, percent change in employed residents, and percent change in educated (higher education attainment as associate college degree and above) residents for the 32 mixed-use development Block Groups and 199 single land use Block Groups during the years 2000 and 2010. Percent change in median house hold income will be considered as independent variable while the percent change in minority population will be analyzed as dependent variable and vise versa.

The regression outputs to be discussed are Model Summary output table, ANOVA table, and table of coefficients. Model summary shows the statistic measure of goodness of fit and coefficients of determination represented by R Square. R Square values range from 0.00 to 1.00 indicating how much the line of regression fits the points where 1.00 indicates the perfect fit. Therefore, higher R Square value shows better regression model. Table of ANOVA shows whether the regression model is significant and determines its significance level of the regression model. The table of coefficient shows the slopes of the independent variables and the constant (intercept).

5.1 Regression Analysis and results for Research Question 3:

Research Question 3 is: Do Mixed-use development experience more change in household income than the immediate neighboring areas?

A regression analysis will be run first a combined model of both mixed-use developments (32 mixed-use) and single use developments (199 single use) with the data of 2000-2010. Next dummy variables will be included for testing regional differences (variations).

The next equation is formulated to test the research question 3 as follows:

$\%\Delta$ MedHIncome = f ($\%\Delta$ median rent, $\%\Delta$ minor, $\%\Delta$ employment, $\%\Delta$P-edu, Dummy-mixed)

Where,

- %Δ MedHIncome (Change in median household income in the Block Group) is a dependent variable;

Followings are the independent variables:

- %ΔMedian rent (Cost of housing in the Block Groups)
- %Δminor (Percentage change in minorities in the Block Groups)
- %Δemployment (Percent of employed persons in the Block Groups)
- %Δedu (percentage change in resident's with higher education in the Block Groups)
- Dummy Mixed (Dummy variable for land use type)

5.2 Regression Analysis results for Percent Change in Median Household income with Dummy-mixed Use Variable:

Dummy variable for mixed-use development Block Groups is included in this equation. Table 5.1 shows the coding of data for this dummy variable. The Linear Regression Model presented the percent change in median household income as a dependent variable. Independent variables are Dummy- mixed use, %Δrent, %Δminor, %Δemployed, and %Δedu.

Table 5.1: Dummy variables

	Dummy-Mixed
Mixed-use Block Group	1
Single Land Use Block Group	0

The regression results are presented in the following Tables. Table 5.2 shows the Model Summary where the statistic measure of goodness of fit and coefficients of determination represented by R Square. Table 5.3 shows Table of ANOVA which indicates whether the regression model is significant and indicating the significance level of the regression model. **The 10% (0.10), 5% (0.05), and 1% (0.01) significance levels are represented by one star (*), two stars (**) and three stars (***), respectively for all tables.** Table 5.4 shows the table of coefficient where the result shows the values of slopes of the independent variables, the Beta coefficients, and the constant (intercept).

Table 5.2: The Model Summary table

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.742[a]	0.550	0.540	1.1876

a. Predictors: (Constant), Dummy-Mixed, %∆rent, %∆Minor, %∆employed, %∆edu

Table 5.3: Table of ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	381.167	5	76.233	54.049	.000[b]
	Residual	311.709	221	1.410		
	Total	692.877	226			

a. Dependent Variable: %∆income
b. Predictors: (Constant), Dummy-Mixed, % ∆rent, %∆Minor, %∆employed, %∆edu

Table 5.4: Table of coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.105	0.091		1.150	0.251
	%∆rent	0.545	0.061	0.452	8.976	0.000***
	%∆Minor	-0.013	0.005	-0.150	-2.839	0.005***
	%∆employed	0.021	0.006	0.196	3.470	0.001***
	%∆edu	0.039	0.008	0.348	5.119	0.000***
	Dummy-Mixed	-0.604	0.352	-0.120	-1.713	0.088**

a. Dependent Variable: %∆MedHIncome; The 10% (.10), 5% (.05), and 1% (.01) significance levels are represented by one star (*), two stars (**) and three stars (***) respectively.

The model in Table 5.4 suggests that at the 95% significant level, 1% change in rent is associated with 0.545% change in median household income. Change in minority population is associated with change in median household income. A change of 1% in minority population is associated with a decrease of 0.013 percent change in median household income. The model also indicates that 1% change in employed population is associated with an increase of 0.021%

in median household income. The results further suggest that a percent change in population with higher education has a positive relationship with household income. A 1% increase in the percentage of population with higher education is associated with an increase of 0.039% median household income. Dummy-Mixed variable is significant and the coefficient indicates that the mixed-use Block Groups are associated with a 0.604 decrease in percent change of median household income, ceteris paribus (all other variables held constant). The coefficient of dummy-Mixed variable is in line with the mixed-use development ideals where it shows a negative correlation between growth in mixed-use development and median household income. As more low income persons move into the mixed-use block groups, the median income is lowered.

The final analysis of Block Groups with mixed-use developments (Dummy-Mixed) shows as follows:

$$\%\Delta \text{ MedHIncome} = 0.105 + 0.545(\%\Delta \text{ median rent}) - 0.013(\%\Delta \text{ minor}) + \\ + 0.021(\%\Delta \text{ employment}) + 0.039(\%\Delta \text{ edu}) - 0.604(\text{Dummy-Mixed}).$$

5.3 Regression Results Adding Dummy Variables for Regional Variations:

The effects of regional variations on the results were analyzed by introducing dummy variables. The regions are based on the US Census Bureau classification of United States regions (see Fig.8). Our results indicated that at the 95% significant level, 1% change in rent is associated with 0.547% change in median household income. This is a relatively significant change (0.062) in Unstandardized Coefficient on the outcome when region is considered. Though

rent is significant in both models when the dummy variable is factored (See Table 5.8)

Table 5.5: List of variables considered in regional variation analysis

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Dummy Mixed, Northeast, %∆rent, West, %∆Minor, %∆employed, %∆edu, South[b]		Enter

a. Dependent Variable: income

b. All requested variables entered.

Table 5.6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746[a]	.556	.540	1.19

a. Predictors: (Constant), Dummy Mixed, Northeast, %∆rent, West, %∆Minor, %∆employed, %∆edu, South

Table 5.7: Analysis of Variance (ANOVA)- Regression analysis for regional variation

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	385.296	8	48.162	34.135	.000[b]
	Residual	307.581	218	1.411		
	Total	692.877	226			

a. Dependent Variable: %∆income

b. Predictors: (Constant), Dummy Mixed, Northeast, %∆rent, West, %∆Minor, %∆employed, %∆edu, South

Table 5.8: Table of coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	.350	.228		1.535	.126
	%Δrent	.547	.062	.454	8.867	.000***
	%Δemployed	.020	.006	.184	3.226	.001***
	%ΔMinor	-.013	.005	-.146	-2.734	.007***
	%Δedu	.040	.008	.361	5.238	.000***
	Dummy Northeast	-.438	.281	-.103	-1.560	.120
	Dummy South	-.286	.259	-.079	-1.104	.271
	Dummy West	-.157	.268	-.041	-.584	.560
	Dummy Mixed	-.617	.355	-.123	-1.736	.084*

The 10% (.10), 5% (.05), and 1% (.01) significance levels are represented by one star (*), two stars (**) and three stars (***) respectively.

Tables 5.5, 5.6, 5.7, and 5.8 show the analysis of the model after the regional dummy variable is introduced. The introduction of the dummy variable into the model also indicates a negative correlation of minority population and median household income. A change of 1% in minority population correlates with a decrease of 0.13 percent change in median household income. Again, when region is factored in the association between the two variables though significant is diminished.

The introduction of the dummy variable also indicated a positive association between percent changes in employed with percentage change in median household income. A change of 1% in employment correlates with an increase of 0.020 percent change in median household income. If the dummy

variable is withdrawn the results showed a significant relationship between the two variables.

The results also showed a significance when other variables were introduced, indicating that regional variations are not significant determinants. The final analysis of Block Groups with dummy regional variations in mixed-use developments shows as follows:

%Δ MedHIncome = 0.350 + 0.547(%Δ median rent) -0.13(%Δ minor) +

+ 0.020(%Δ employment) + 0.040(%Δedu) - 0.438(Dummy Northeast) -

- 0.286(Dummy South) - 0.157(Dummy West) - 0.617(Dummy Mixed)

5.4 Results of the Regression Analysis of 32 Mixed-use Developments (2000-2010):

The next tables (Table 5.9, 5.10, and 5.11) show the percentage change in 32 mixed-use developments (Block Groups) from 2000 to 2010. The model has an R-Square of 0.504 (Table 5.9). The R-Square is not very high and indicates that the model does a moderate job in explaining median household income. This is supported by the F-statistic of 6.87 (Table 5.10), which suggests that overall the variables in the model is reasonable in explaining the movements in median household income. Rent and education are statistically significant at the 95% level. The other two variables, percent minority and percent employed are not statistically significant.

Table 5.9: Model Summary- Regression equation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.710[a]	0.504	0.431	30.22

a. Predictors: (Constant), %Δedu00-10, %Δminority00-10, %Δemployed00-10, %Δ rent00-10

Table 5.10: Analysis of Variance (ANOVA)- Regression equation 3

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25084.965	4	6,271.241	6.865	.001[b]
	Residual	24664.348	27	913.494		
	Total	49749.314	31			

a. Dependent Variable: %Δincome00-10

b. Predictors: (Constant), %Δedu00-10, %Δminority00-10, %Δemployed00-10,%Δrent00-10

Table 5.11: Coefficients and Significance- Regression equation 3

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	21.860	7.273		3.006	.006
	%ΔRent00-10	.219	.095	.354	2.302	.029**
	%Δminority00-10	-.264	.421	-.091	-.627	.536
	%Δemployed00-10	.769	.495	.237	1.552	.132
	%Δedu00-10	1.095	.481	.356	2.275	.031**

a. Dependent Variable: %Δ income00-10; The 10% (.10), 5% (.05), and 1% (.01) significance levels are represented by one star (*), two stars (**) and three stars (***) respectively.

The model (Table 5.11) suggests that at the 95% significance level, 1% change in rent is associated with 0.22% change in median household income. Change in minority population is associated with change in median household income. A change of 1% in minority population is associated with a decrease of 0.26 percentage change in median household income. The model also indicates that 1% change in employed population is associated with an increase of 0.77% in median household income. The results further suggest that a percentage change in population with higher education has a positive relationship household income. A one unit increase in the percentage of population with higher education is associated with an increase of 1.1% median household income.

The final analysis of Block Groups with mixed-use developments shows as follows:

%Δ MedHIncome = 21.860 + 0.219(%Δ median rent) -0.264(%Δ minor) + .

+ 0.769(%Δ employment) + 1.095(%Δedu).

a) *Rent:* Shows a positive correlation between Rent and income in mixed-use developments. This is contrary to the ideals of mixed-use development which are supposed to have diverse income residents. A possible explanation is that mixed-use development attracts high income population who has disposable income on the shopping facilities that are part of mixed-use developments. These results are congruent with critics of mixed-use developments. For example, some article contained in the literature review indicated that Smart Growth policies do have an impact to increase the land value, prices of existing property, and increase the value(rent) of existing housing (Downs, 2005).

b) *Minority*: The results also showed a significant negative correlation between minority and income. This supports the available literature that associates mixed-use development with high income population which often does not include minority. A possible explanation is that low incomes amongst minorities cannot afford to reside in the higher rent housing due to high unemployment/ underemployment among this population group (Massey and Denton, 1993; Massey and Denton, 1988).

c) *Employment*: The results showed a moderately significant positive association between higher employment rate and residents of mixed-use developments.

d) *Education*: The results also indicated a strong significant positive correlation between education and income of residents who live in mixed-use development. This is consistent with the argument that mixed-use development tend to attract a relatively educated population. This is explained further by the fact that higher rent values are affordable to residents with higher education and people of higher income bracket.

5.5 Results of the Regression Analysis of 199 Single Land Use Block Groups (2000-2010):

The result in Table 5.12 models the change for single land use neighborhood (Block Groups) from 2000 to 2010. The model has an R-Square of 0.53. The R-square indicates that the model does a moderate job in explaining median household income. This is supported by the F-statistic of 53.338, which suggests that overall the variables in the model is reasonable in explaining the movements in median household income. Rent and education are statistically significant at the 95% level.

Additionally, the results for other single land use in 2000 slightly different from the 2000 and 2010 results where the direction of associations between the income and minority became positive association. Also, the result depicted that percent employed population is positively correlated to income.

Table 5.12: Model Summary- Regression equation 3 other 199 single land use areas

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.727[a]	0.529	0.519	99.74

a. Predictors: (Constant), %∆edu00-10, %∆Pminority00-10, %∆rent00-10, %∆employed00-10

Table 5.13: Analysis of Variance (ANOVA)- Regression equation 3 other 199 single land use areas

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2,122,451.185	4	53,0612.80	53.338	0.000[b]
	Residual	1890157.970	190	9,948.200		
	Total	4012609.156	194			

a. Dependent Variable: %∆ income 00 - 10

b. Predictors: (Constant), %∆edu00 -10, %∆minority00-10, %∆rent00-10, %∆p-employed00-10

Table 5.14: Coefficients and Significance- Regression equation 3 other 199 single land use areas

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.425	8.071		0.300	0.764
	%∆rent2000	0.508	0.054	0.516	9.336	0.00***
	%∆minority2000	-0.981	0.515	-0.095	-1.906	0.058**
	%∆employed2000	1.523	0.635	0.151	2.399	0.017**
	%∆edu2000	1.867	0.526	0.220	3.547	0.00***

a. Dependent Variable: %∆income00-10; The 10%, 5%, and 1% significance levels are represented by one star (*), two stars (**) and three stars (***) respectively.

The model (Table 5.14) suggests that a one percent change in rent causes a change of 0.508 units in the percent median household income. A one percent change in minority causes median household income to change by -0.981percent. The percent employed variable indicates that a one unit increase in the percent of persons employed causes median household income to increase by 1.523 units. Percent education has the largest coefficient in this model and suggests a positive correlation between education and income. A one unit increase in the percent education variables results in a 1.867 increase in percent median income.

The final analysis for the single-use neighborhood shows as follows:

$$\Delta\ \%\text{MedHIncome} = 2.425 + 0.508\ (\Delta\%\text{median rent}) - 0.981\ (\Delta\%\text{minor}) +$$

$$+ 1.523\ (\Delta\ \%\text{employment}) + 1.867(\Delta\%\text{edu})$$

a) *Rent*: The model in Table 5.14 indicated a positive correlation between Rent and income in single land use neighborhood. This being supplemental to the result of the analysis of the year 2000 having a positive association which is stronger than the mixed-use counterpart. A possible explanation is that single land use developments are not mixed-income housing where mixed-use developments are relatively a place for mixed-income housing.

b) *Minority*: The results (Table 5.14) also showed a significant negative association between minority and income. This supports the available literature that associates single land use developments with higher income segregation

than mixed-use development (Galster et al, 2001; Howell-Moroney, M., 2005; Massey and Denton, 1993; 1988).

c) Employment: The results (Table 5.14) showed a significantly positive correlation between higher employment rate and income in the single-use developments.

d) *Education*: The results (Table 5.14) also, indicated a significant positive correlation between education and income of residents who live in single land use neighborhood.

5.6 Comparison of Results of the Regression Analysis of 32 Mixed-use Developments (2000-2010) and Results of the Regression Analysis of 199 Single Land Use Block Groups (2000-2010):

5.7 Comparison of Results in Terms of Significance:

For single use development with the dependent variable being median household income, three of the independent variables are statistically significant. These variables are Rent, Employment and Education. The other variables are not statistically significant.

5.8 Comparisons of results in terms of Unstandardized Coefficients:

When examining the impacts of the independent variables on the dependent variable for mixed use development, in comparison to the other development the following results were found. First a one percent change in Rent for mixed use development is aligned with 0.219 percent change in median household income,

compared to a one percent change in Rent for single use development is related to a 0.508 percent change in median household income.

Secondly, a one percent change in employed population for mixed use development is aligned with 0.769 percent change in median household income, compared to a one percent change in employment for single use development is related to a 1.523 percent change in median household income.

Thirdly, a one percent change in educated population for mixed use development is aligned with 1.095 percent change in median household income, compared to a one percent change in employment for single use development is related to a 1.867 percent change in median household income.

Finally, a one percent change in minority population for mixed use development is aligned with -0.264 percent change in median household income, compared to a one percent change in minority population for single use development is related to a -0.981percent change in median household income.

5.6. Comparisons of Results in Terms of Standardized Beta Coefficients:

The results show that Standardized Beta Coefficients measured how strong influences each independent variable exerted on the dependent variable. Also, Standardized Beta Coefficients indicates and help us to identify and compare which independent variable makes stronger relationship with the dependent variable.

The results for the 32 mixed-use development showed that percent change in education has a strongest (0.356) relationship with a percent change

in median household income compared to other participant predictor (independent) variables. But, results for 199 single use areas showed that the percent change in rent has a strongest (0.516) relationship with a percent change in median household income when compared to other participating predictor (independent) variables. Therefore, rent is the most important variable in predicting changes in median household income in the 199 single use areas. Contrarily, education is the most important variable in predicting changes in median household income in the 32 mixed-use areas.

5.9 Regression Analysis and Results for Research Question 4: Percent Change in Minority Population:

Research question 4 is: Does the selected mixed-use developments (32 developments) that are developed before the year 2000 experience more change in minority group within the development when compared with the surrounding areas in the ten year (2000-2010) period?

Variables that are used in the next section are as follows:

- Percentage change in minority population (%∆minor)
- Cost of housing in the Block Groups (%∆Median rent)
- Percentage change in median household income (%∆ MedHIncome)

- Percentage change in number of residents with higher education (%∆edu)
- Percent of employed persons in the mixed-use development (%∆ employment)
- Dummy-Mixed use

Function 4: Regression Analysis Results for %∆ Minority population

%∆ minor = f (%∆Median rent, %∆ MedHIncome, %∆ edu, %∆ employment, Dummy- Mixed)

Where,

- percentage change in minority population within the Block Groups (%∆minor) is a dependent variable

Followings are the independent variables:

- percentage change in median household income in the Block Group (%∆ MedHIncome)
- percentage change in residents with higher education in the Block Groups (%∆ edu)
- Percent of employed persons in the Block Groups(%∆employment)
- Cost of housing in the Block Groups (%∆Median rent)
- Dummy variable for the mixed land use (Dummy-Mixed)

The null hypothesis (H^o) will be that the racial diversity contained within the mixed-use development will not exhibit a significant relationship with

independent variables (%Δ edu, %Δ MedHIncome, %ΔMedian rent, Dummy-Mixed, and %Δ employment).

Table 5.15: Table of the Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.545[a]	0.297	0.281	16.663

Table 5.16: Table of ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25972.424	5	5194.485	18.708	.000[b]
	Residual	61362.975	221	277.661		
	Total	87335.399	226			

a. Dependent Variable: %Δ Minor

b. Predictors: (Constant), Dummy-Mixed, rent, %Δ employed, %ΔMedHIncome, %Δedu

Table 5.17: Table of Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.319	1.280		1.030	.304
%∆rent	0.218	0.994	0.016	0.219	.827
%∆employed	0.138	0.089	0.112	1.561	.120
%∆MedHIncome	-2.632	0.927	-0.234	-2.839	.005***
%∆edu	0.160	0.112	.128	1.427	.155
Dummy-Mixed	-32.552	4.470	0.578	-7.283	.000***

The result in Table 5.15 models the change for single land use neighborhood (Block Groups) from 2000 to 2010. The model has an R-Square of 0.297. The R-square indicates that the model does a moderately low job in explaining the percent change in minority population. This is supported by the F-statistic of 18.71, which suggests that overall the variables in the model is reasonable in explaining the movements in minority population. Median Household Income and Dummy-Mixed variables are statistically significant at the 95% level.

The model (Table 5.17) suggests that a percent change in rent is associated with a percent change in minority population at an insignificant level. On the other hand, the model suggests that at a 95% significance level a percent change in median household income is negatively associated with a percent change in minority population. A change of 1% in median household income is associated with a decrease of 2.632 percentage change in minority population.

The model also indicates that 1% change in employed population is associated with an increase of 0.138% change in minority population at an 88% significance (insignificant) level.

The results further suggest that a percentage change in population with higher education has a positive insignificant (85.5% confident interval) relationship with the percent change in minority population. A 1% increase in the percentage of population with higher education is associated with an increase of 0.160% change in minority population.

At a 95% significance level the model indicated that a 1% increase in the Dummy-Mixed variable (Mixed-use development) associated with a change in minority population to decrease by 32.552%, ceteris paribus. The coefficient of dummy variable is in contradiction with the mixed-use development ideals where it shows a negative correlation between growth in mixed-use development and minority population. As more mixed-use developments expand within the Block Groups, the minority populations move out of the mixed-use block groups.

The final analysis of Block Groups with a mixed-use developments (Dummy-Mixed) shows as follows:

$$\%\Delta \text{ minor} = 1.319 + 0.218(\%\Delta \text{ median rent}) - 2.632(\%\Delta \text{ MedHIncome}) + \\ + 0.138(\%\Delta \text{ employment}) + 0.160(\%\Delta \text{ edu}) - 32.552(\text{Dummy-Mixed}).$$

5.11 One last equation: Regression Analysis and Results for housing rent:

In research question 3, analysis of percent change in median household income, the intention was to analyze the contributing factors to the percentage change in income in the mixed-use and single use developments. While this analysis was done an idea came about that having the data in place it would be interesting also to research the factors that may have correlation or contribution to changes in the housing rent between mixed-use and single use developments. To this end a regression analysis was applied to the equation below:

$\%\Delta$ Rent = f ($\%\Delta$Minor, $\%\Delta$ MedHIncome, $\%\Delta$ edu, $\%\Delta$ employment, Dummy-Mixed)

Variables that are used in the next section are as follows:

- Percentage change in minority population ($\%\Delta$minor)
- Cost of housing in the Block Groups ($\%\Delta$Median rent)
- Percentage change in median household income ($\%\Delta$ MedHIncome)
- Percentage change in number of residents with higher education ($\%\Delta$edu)
- Percent of employed persons in the mixed-use development ($\%\Delta$ employment)
- Dummy-Mixed use

It looks that the mixed-use developments are in alignment with their intended goal. The result showed that

Table 5.18: Results of Regression Analysis for the Mixed-use Development with Median Rent as Dependent variable

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.773[a]	.597	.480	1.03

a. Predictors: (Constant), West, p_Minor, p_employed, Northeast, income, South, p_edu

Table 5.19: Results Model summary with Median Rent as Dependent variable

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	195.824	7	27.975	23.969	.000[b]
	Residual	218.251	187	1.167		
	Total	414.075	194			

a. Dependent Variable: rent2010

b. Predictors: (Constant), West, p_edu2010, Pminority2010, Northeast, p_employed2010, income2010, South

The interesting finding from this last regression was that in the mixed-use development the percentage change in rent between 2000 and 2010 would be 0.56% lower than the single use development.

Table 5.20: Table of Coefficients where Rent is a Dependent variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	.318	.084		3.780	.000
	p_Minor	.001	.005	.013	.219	.827
	p_employed	.018	.006	.197	3.042	.003
	income	.491	.055	.591	8.976	.000
	p_edu	-.011	.008	-.123	-1.501	.135
	Dummy Mixed	-.560	.335	-.134	-1.675	.095

a. Dependent Variable: rent

CHAPTER 6

CONCLUSION AND POLICY IMPLICATIONS

This research study analyzed and evaluated the tenets of mixed-use development regarding increases in median household income, density, and racial diversity in the United States. This research is based on block group level data. Block groups represent the smallest spatial unit in which the census data is available. All block groups in the entire US were downloaded, then filtered to select random samples. The research also examined single use areas that borders the mixed use regions, applying similar techniques and spatial units with those utilized for mixed use development. This research provided different techniques of spatial and data analysis including GIS, descriptive and other statistical analysis, and regression analysis.

To accomplish the goal of the study this research specifically examined and tested the following research questions:

- Do mixed-use developments exhibit more mix of racially diverse population than the immediate neighboring areas?
- Do mixed-use developments provide more density (population density and residential density) than the immediate neighboring areas?

- Does mixed-use development experience more change in household income than the immediate neighboring areas?

- Does the selected mixed-use developments (32 developments) that are developed before the year 2000 experience more change in minority group within the development when compared with the surrounding areas in the ten year (2000-2010) period?

6.1 Findings for Research Question 1

Research Question 1: Do mixed-use development experience more change in household income than the immediate neighboring areas?

6.1.1 Findings from the descriptive analysis:

The statistical descriptive analysis indicated that:

- Percent change in median household income: the percent change in median household income for the 32 mixed-use developments are 43.34% on average during the years 2000-2010. While The percent change in median household for single-use development is 47.80% on average during the years 2000-2010.
- Percent change in Employment: mixed-use developments experienced 2.78% more employment increase than single land use during the years 2000 and 2010. This means that mixed-use developments exhibited close to 3% percent change in employment than single-use developments. It is indicative

that employment rate experienced a larger increase in the mixed-use developments than the single land use developments.

- Percent change in population: percentage change in minority population in mixed-use development areas experienced a decrease in minority population during the 2000 to 2010 period, while the single use development areas increased in minority population over the same period.

2. Findings from Regression Analysis (2000 - 2010)

a) Findings from the analysis of percent changes for 32 Mixed-use developments (2000 - 2010)

- *Rent:* Shows a positive correlation between house rent and income levels in mixed-use developments. As rent increases it becomes less affordable for low income residents to live in the area. A likely impact is that low income residents will move out of the mixed use development. Since there will be a larger percentage of persons in the higher income brackets who remain in the mixed use developments the income level will be positively correlated with rent. This is consistent with the minority variable in the descriptive statistics. Over the period 2000-2010, the minority population decreased by 4.51% with an increase in rent, while in the single use development, minority population increased by 0.58% over the same period. This is contrary to the ideals of mixed-use development since mixed use development are intended to generate a diverse income residents. The impact of rent appears to be having the opposite effect.

- *Minority*: The results also showed a significant negative correlation between minority and income. This supports the available literature on mixed-use development that as more minorities move into mixed use development areas the income levels decrease.
- *Employment*: The results showed a positive association between higher employment rate and income of mixed-use developments. As discussed in the literature mixed use developments are supposed to provide employment opportunity to its residents in the same area.
- *Education*: The results also indicated a strong significant positive correlation between education and income of residents who live in mixed-use development. This is consistent with the argument that mixed-use development tend to attract a relatively educated population.

b) Findings from the analysis of percent changes for 199 single use developments (2000 - 2010)

- *Rent*: The analysis showed a positive correlation between rent and income in single land use neighborhood. This being supplemental to the result of the analysis of the mixed-use. Single use developments have a positive association which is stronger than the mixed-use counterpart. A possible explanation is that single land use developments are not mixed-income housing where mixed-use developments are relatively a place for mixed-income housing.
- *Minority*: The results also showed a significant negative association between minority and income. This supports the available literature that associates

single land use developments with higher income segregation than mixed-use development (Galster et al, 2001; Howell-Moroney, M., 2005; Massey and Denton, 1993; 1988).

- *Employment*: The results showed a significantly positive correlation between higher employment rate and income in the single-use developments.
- *Education*: The results also, indicated a significant positive correlation between education and income of residents who live in single land use neighborhood.

c) Findings from the analysis of regional variations (regional dummy variables) while factoring percent changes for both 32 mixed-use and 199 single use developments (2000 - 2010)

    - *Rent*: Our results indicated that at the 95% significant level, 1% change in rent is associated with 0.79% change in median household income. This is a relatively significant on the outcome when region is considered. Though rent is significant in both models when the dummy variable is factored.
    - *Minority:* The introduction of the dummy variable into the model also indicates a negative correlation of minority population and median household income.
    - *Employment:* The introduction of the dummy variable also indicated a positive association between percent changes in employed with percentage change in median household income. A change of 1% in

employment correlates with an increase of 0.02 percent change in median household income. If the dummy variable is withdrawn the results showed a significant relationship between the two variables.

- *Education*: The results also, indicated a significant positive correlation between education and income of residents who live in single land use neighborhood.

d) Findings from the analysis of land use variations (dummy-mixed variables) while factoring percent changes for both 32 mixed-use and 199 single use developments (2000 - 2010)

- Dummy-Mixed variable is significant. The coefficient of dummy-Mixed variable is in line with the mixed-use development ideals where it shows a negative correlation between growth in mixed-use development and median household income. As more low income persons move into the mixed-use block groups, the median income is lowered.
- *Rent:* rent has a positive association with income and is significant in both land use models when the dummy variable is factored.
- *Minority:* An increase of percent change in minority population is negatively associated with a percent change in median household income.

- *Employment:* The model also indicates that 1% change in employed population is associated with an increase of 0.02% in median household income showing positive association.
- *Education*: The results further suggest that a percent change in population with higher education has a positive relationship with percent change in median household income.

6.2 Findings for Research Question 2

Research Question 2: Do mixed-use developments exhibit more mix of racially diverse population than the immediate neighboring areas?

1. Findings from the analysis of descriptive statistics:
   - Minority population in the 32 mixed-use developments exhibited 78.76% average minority population in the year 2000 and 74.24% in the year 2010. Compared to single use development neighborhoods(surrounding the 32 mixed-use block groups) minority population increased from 75.41% in the year 2000, and 75.99% in 2010.
   - In the 52 mixed-use Block Groups (2010), the minority population is 74.28% whereas the minority population in the neighboring single land use Block Groups for the same year is only 70.08%. This shows that the mixed-use developments exhibited more minority populations than the single-use development by 4.2% on average.
   - The 52 mixed-use Block Groups exhibited 57.92% employed residents, while single-use Block Groups exhibited 54. 96% employed residents in

432 Block Groups in 2010. This indicated that the mixed-use Block Groups have a higher percentage of employed residents than the single-use neighborhoods.

- Mixed-use developments (Block Groups) provided more housing units than single-use neighborhoods (Block Groups). As shown in 52 mixed-use Block Groups exhibited 121.54 housing units per Block Group while the 435 single land use Block Groups surrounding the 52 mixed-use Block Groups exhibited 110.25 housing units per Block Group on average.
- It is noted that the average rent is higher in mixed-use developments than single land use development neighborhoods.

6.3 Findings for Research Question 3

Research Question 3: Do mixed-use developments provide more density (population density and residential density) than the immediate neighboring areas?

2. Density variables (2000):

a) Findings from the Analysis of Mixed-use Areas and Single use areas in 2000:

- *Population Density*: The average population density in 32 mixed-use developments in 2000 exceeded the single land use neighborhood slightly by 0.12 persons per acre.

- *Gross Neighborhood Density*: mixed-use developments exceeded the single-use neighborhood in providing higher average gross neighborhood density by 1.1 dwelling (residential) units per acre.

b) Findings from the Analysis of 52 Mixed-use Areas and 435 Single use areas in 2010:

    - *Population Density*: The average population density in 52 mixed-use developments in 2010 is less than the single land use neighborhood slightly by 4.4 persons per acre.
    - *Gross Neighborhood Density*: mixed-use developments is less than the single-use neighborhood in providing gross neighborhood density by 0.49 dwelling (residential) units per acre .

As the results depicted the mixed-use development areas exhibited no significant differences from the single use development areas in terms of density and provided a mixed results without clear and major differences. This is a failure for the mixed-use development principles in achieving their intended goal in which they supposed to provide high density development.

6.4 Findings for Research Question 4

Research Question 4: Does the selected mixed-use developments (32 developments) that are developed before the year 2000 experience more change in minority group within the development when compared with the surrounding areas in the ten year (2000-2010) period?

1. Findings from the regression analysis related to racial composure of mixed-use development areas and single land use areas (2000 - 2010)

- *Rent:* Despite the variable was not found to be significant, the regression shows that a one percent change in rent causes a 0.21 change in minority .
- *Median household income:* a percent change in median household income is negatively associated with minorities. A one percent change in minority population is associated with a decrease of 2.632 percentage change in minority population
- *Employment:* A one percent increase in employed population is associated with an increase of 0.138% change in minority population at an 88% confidence level.
- *Education:* change in population with higher education has a positive insignificant relationship with the percent change in minority population
- *Dummy-Mixed variable (Mixed-use development):* is associated with a change in minority population to decrease by 32.552%, ceteris paribus. The coefficient of dummy variable is in contradiction with the mixed-use development ideals where it shows a negative correlation between growth in mixed-use development and minority population. As more mixed-use developments expand within the Block Groups the minority population move out of the mixed-use block groups.

6.5 Policy Implications

New Urbanism and sustainable development theories suggest that mixed use developments provide mixed-income, racially diverse, and compact development (high density development). Also, the findings in this research indicated that mixed-use developments exceedingly registered better amenities than single use development areas. Further, improvements in employment trends, higher cultural capital, provision of mixed-income housing, and the level of densities are observed in both land use systems. Social activists such as Jacobs (1961), urban sociologists (Freeman, 2001; Kivisto, 2005), and planning practitioners such as Duany et al., (2000) touted the importance of mixed-use development and compact development practices in ameliorating concentrated poverty, planning related environmental problems, and weakened social ties in the community.

Additionally, in all research models and results showed a positive association between house rent and income at a statistically significant level in mixed-use developments. As rent increases it becomes less affordable for low income residents to live in the area. A likely impact is that low income residents will move out of the mixed use development where a decrease in minority population has observed. This could be related to outmigration of minority population from the mixed-use developments.

An outmigration of minority population could negatively affect the diversity of the racial composition of the mixed-use developments. Also, results showed an increase in rent within mixed-use development that has coupled with an increase in minority population in the single use development which could minority population increased by 0.58% over the same period. This is contrary to the ideals of mixed-use development since mixed use development are intended to provide a residential facilities for diverse income group and a racially diverse population. Therefore, more attention and accommodation for moderate increase in housing rent is needed.

Compact developments have two opposite ends that triggered opposing perceptions and planning concepts. First, classical sociological theories and planning theories held account the high density developments for its crowding effect in which urban life is stressful, decapacitated social tie, and negative psychological withdrawal. Secondly, from Jacobs (1961) to present New Urbanism theories supported continuously the compact development trends along with heightened densities as a solution to sustainability issues and environmental problems. Therefore, mixed use developments must demonstrate an optimum size of compactness so that they satisfy both side requirements.

Findings from this research indicated that the intended size of population density and neighborhood density in almost all mixed-use developments are not high enough as expected. Moreover, the results indicated that there are no differences in mean density (population and residential) between mixed-use

development Block Groups and single use Block Groups. Additionally, the analysis of percent change in residential density indicated that there was not statistically significant difference between the percentage change of means in residential (neighborhood) density of mixed-use and single use development Block Groups.

For employment and education achievement trends in mixed-use development it appears to be attaining its goals. It is recommended that it continue to do what it is already doing where maintaining future requirements or challenges are an assignment to be left for public and private sector.

APPENDIX A

32 MIXED-USE DEVELOPMENTS

List of 32 mixed-use developments

Name	YEAR POSTED	Street	CITY	STATE
John Hancock Center	1999	875 North Michigan Avenue	Chicago	Illinois
Albina Corner	1997	711 SE Grand Ave	Portland	Oregon
Washington's Landing	1997	700 Waterfront Drive	Pittsburgh	Pennsylvania
The Heritage on The Garden	196	300 Boylston Street	Boston	Massachusetts
Truman Annex	1995	201 Front St	Key West	Florida
Pine Square	1995	245 Pine Avenue	Long Beach	California
Denver Dry Goods Building	1994	1555 California Street	Denver	Colorado
Tower City Center	1994	230 W. Huron Road	Cleveland	Ohio
Miami Lakes Town Center	1993	6843 Main Street	Miami Lakes	Florida
Delancey Street Embarcadero Triangle	1992	600 Embarcadero	San Francisco	California
Mizner Park	1992	327 Plaza Real	Boca Raton	Florida
The Mill At Glenville	1992	243 Glenville Rd	Greenwich	Connecticut
Janss Court (Promenade Gateway)	1991	1453 Third Street Promenade	Santa Monica	California
Reston Town Center	1991	11900 Market st.	Reston	Virginia
Fishermen's Terminal	1990	3919 18th avenue West	Seattle	Washington
Palmer Square	1990	10 Palmer Square	Princeton	New Jersey
Pentagon City	1990	801 15th st. South	Arlington	Virginia
Audubon Court	1989	Audubon Ct	New Haven	Connecticut
The Village at Shirlington	1989	4220 Campbell Avenue	Arlington	Virginia
Crocker Center	1988	5050 Town Center Circle	Boca Raton	Florida

List of 32 mixed-use developments (cont'd)

Fair Lakes	1988	12500 Fair Lakes Circle	Fairfax	Virginia
Princeton Forrestal Village	1988	206 Rockingham Row	Plainsboro	New Jersey
Rivercenter	1988	849 East Commerce Street	San Antonio	Texas
Riverplace	1988	1510 Southwest Harbor Way	Portland	Oregon
Rowes Wharf	1988	30 Rowes Wharf	Boston	Massachusetts
Edinborough	1987	3330 Edinborough Way	Minneapolis	Minnesota
Tabor Center	1987	1672 Lawrence Street	Denver	Colorado
The Crescent	1987	400 Crescent Ct	Dallas	Texas
Robert L. Millender Center	1986	555 Brush street	Detroit	Michigan
The Galleria	1986	2 Galleria Parkway Southeast	Atlanta	Georgia
Kensington Galleria	1985	1902 East 71st Street	Tulsa	Oklahoma
Waterfront Place	1985	1107 1st Avenue	Seattle	Washington

Source: Courtesy of ULI

APPENDIX B

53 MIXED-USE DEVELOPMENTS

Appendix B: List of 53 mixed-use developments

Name	Street Address	City	State
2200	2200 Westlake Avenue	Seattle	Washington
100 Cambridge Street (DCS)	100 Cambridge Street,	Boston	Massachusetts
100 Central	100 Central Avenue	Sarasota	Florida
16 Market Square	1400 16th Street	Denver	Colorado
731 Lexington Avenue/One Beacon Court	731 Lexington Avenue	New York	New York
Albina Corner	711 SE Grand Ave	Portland	Oregon
Alley24	224 Pontius Avenue North	Seattle	Washington
ASQ Center	101 West Wisconsin Avenue	Milwaukee	Wisconsin
ASQ Center (DCS)	101 West Wisconsin Avenue	Milwaukee	Wisconsin
Belmar (Book CS)	405 South Teller Street	Lakewood	Colorado
Birkdale Village	16725 Birkdale Commons Parkway	Huntersville	North Carolina
Brewery Blocks	1120 NW Couch St	Portland	Oregon
Centennial Lakes	7499 France Avenue South	Edina	Minnesota
CityPlace	700 South Rosemary Avenue	West Palm Beach	Florida
Clayton Lane (DCS)	205 Clayton Street	Denver	Colorado
Clipper Mill	1760 Union Avenue	Baltimore	Maryland
Crocker Park	159 Crocker Park Boulevard	Westlake	Ohio
Daniel Island	101 River Landing Drive,	Charleston	South Carolina
Denver Dry Goods Building	1555 California Street	Denver	Colorado
Downtown Silver Spring (DCS)	908 Ellsworth Drive,	Silver Spring	Maryland
Fairfax Corner	4100 Monument Corner Drive	Fairfax	Virginia,
Fruitvale Village I	3301 East 12th Street	Oakland	California
Harbor Steps (DCS)	1221 First Avenue	Seattle	Washington

Appendix B: Continued

International Place/International House	29 South Third Street	Harrisburg,	Pennsylvania
Lowry	200 Quebec Street	Denver	Colorado
Media Village	260 East Magnolia Boulevard	Burbank	California
Miami Lakes Town Center	6843 Main Street	Miami Lakes	Florida
Mizner Park	327 Plaza Real	Boca Raton	Florida
Mockingbird Station (DCS)	5307 E. Mockingbird Lane,	Dallas	Texas
One Arts Plaza	1722 Ruth Street	Dallas	Texas
Paseo Colorado (DCS)	280 East Colorado Boulevard	Pasadena	California
Peabody Place	150 Peabody Place (Third Street and Peabody Place)	Memphis	Tennessee
Pine Square	245 Pine Avenue	Long Beach	California
Prudential Center Redevelopment	800 Boylston St	Boston	Massachusetts
River Ranch Town Center	605 Silverstone Rd	Lafayette	Louisiana
Rockville Town Square	200 East Middle Lane	Rockville	MD
San Elijo Hills Town Center	1215 Elfin Forest Rd	San Marcos	California
Santana Row (DCS)	378 Santana Row	San Jose	California
South Campus Gateway	1534 N High St.	Columbus	Ohio
Southborough	332 Magnolia Avenue	Charlotte	North Carolina
Technology Square	74 Fifth St NW	Atlanta	Georgia
The Collective	4620 Kalamazoo Avenue SE	Kentwood	Michigan
The Glen Town Center	1370 Shermer Road	Glenview	Illinois
The Heritage on The Garden	300 Boylston Street	Boston	Massachusetts

Appendix B: Continued

The Market Common, Clarendon	2800 Clarendon Blvd	Arlington	Virginia
The Mill At Glenville	243 Glenville Rd	Greenwich	Connecticut
Time Warner Center	10 Columbus Circle	New York	New York
Tower City Center	230 W. Huron Road	Cleveland	Ohio
Truman Annex	201 Front St	Key West	Florida
University Park at MIT (DCS)	38 Sidney Street	Cambridge	MA 02139-4169
Victoria Gardens (DCS)	12505 North Mainstreet,	Rancho Cucamonga	California
Washingtonian Center	209 Boardwalk Place	Gaithersburg	Maryland
Winooski Falls	25 Winooski Falls Way	Winooski	Vermont
Winter Park Village	400 North Orlando Avenue	Winter Park	Florida
Zona Rosa	8640 North Dixson Avenue	Kansas City	Missouri

APPENDIX C

REGRESSION ANALYSIS FOR MIXED-USE DEVELOPMENTS WITH RENT AS DEPENDENT VARIABLE

Appendix C: Results of Regression Analysis for the Mixed-use Development with Median Rent as Dependent variable

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.773[a]	.597	.480	1.03

a. Predictors: (Constant), West, p_Minor, p_employed, Northeast, income, South, p_edu

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.700	7	5.386	5.089	.001[b]
	Residual	25.400	24	1.058		
	Total	63.100	31			

a. Dependent Variable: rent

b. Predictors: (Constant), West, p_Minor, p_employed, Northeast, income, South, p_edu

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.948	.649		-1.460	.157
	p_Minor	-.009	.007	-.195	-1.320	.199
	p_employed	.040	.016	.539	2.517	.019
	income	.184	.091	.361	2.010	.056
	p_edu	.000	.011	-.006	-.025	.981
	Northeast	.285	.707	.084	.403	.691
	South	-.289	.618	-.100	-.468	.644
	West	.909	.655	.291	1.388	.178

a. Dependent Variable: rent

APPENDIX D

REGRESSION ANALYSIS FOR SINGLE USE DEVELOPMENTS WITH RENT AS DEPENDENT VARIABLE

Appendix D: Results of Regression Analysis for the 199 single use development with Median Rent as dependent variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.688[a]	.473	.453	1.08

a. Predictors: (Constant), West, p_edu2010, Pminority2010, Northeast, p_employed2010, income2010, South

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	195.824	7	27.975	23.969	.000[b]
	Residual	218.251	187	1.167		
	Total	414.075	194			

a. Dependent Variable: rent2010

b. Predictors: (Constant), West, p_edu2010, Pminority2010, Northeast, p_employed2010, income2010, South

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.087	.226		.387	.699
	Pminority2010	.003	.006	.033	.602	.548
	p_employed2010	.009	.006	.090	1.455	.147
	income2010	.579	.070	.570	8.330	.000
	p_edu2010	.088	.054	.109	1.646	.101
	Northeast	.591	.279	.167	2.114	.036
	South	.050	.258	.016	.193	.847
	West	.071	.264	.022	.271	.787

a. Dependent Variable: rent2010

APPENDIX E

REGRESSION ANALYSIS FOR MEDIAN RENT AS DEPENDENT VARIABLE WITH INTRODUCED DUMMY VARIABLE

Appendix E: Results of Regression Analysis for the Combined 32 mixed-use and 199 single use development with Median Rent as dependent variable

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.642[a]	.412	.398	1.13

a. Predictors: (Constant), DummyMixed, income, p_Minor, p_employed, p_edu

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	196.463	5	39.293	30.934	.000[b]
	Residual	280.717	221	1.270		
	Total	477.180	226			

a. Dependent Variable: rent

b. Predictors: (Constant), Dummy Mixed, income, p_Minor, p_employed, p_edu

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.318	.084		3.780	.000
	p_Minor	.001	.005	.013	.219	.827
	p_employed	.018	.006	.197	3.042	.003
	income	.491	.055	.591	8.976	.000
	p_edu	-.011	.008	-.123	-1.501	.135
	Dummy Mixed	-.560	.335	-.134	-1.675	.095

a. Dependent Variable: rent

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