2.2 Environmental Justice

(Source: http://oseda.missouri.edu/modot/planning)

The Relationship of Environmental Justice Populations to Key Socio-Economic Indicators in the Central District

Introduction

This narrative provides some insights into the quality of life in MoDOT's Central District by considering the relationships between a number of 2000 census variables. The census variables considered were selected based upon two criteria. First, their relevance to Environmental Justice and Title VI (of the Civil Rights Act of 1964) reporting requirements and second, their ability to both describe generally understood characteristics of quality of life and to be statistically testable. It should be noted that the statistical method used, structural equation modeling, provides preliminary analysis for neighborhoods and communities within a MoDOT Planning District. This analysis cannot be generalized to other districts or the state as a whole. It is important to keep in mind that the unit of analysis refers to the conditions within a census block group, and not to any single protected population. Thus, what is being measured by considering the interaction between variables is the social and economic environment of the communities and neighborhoods that comprise the planning district.

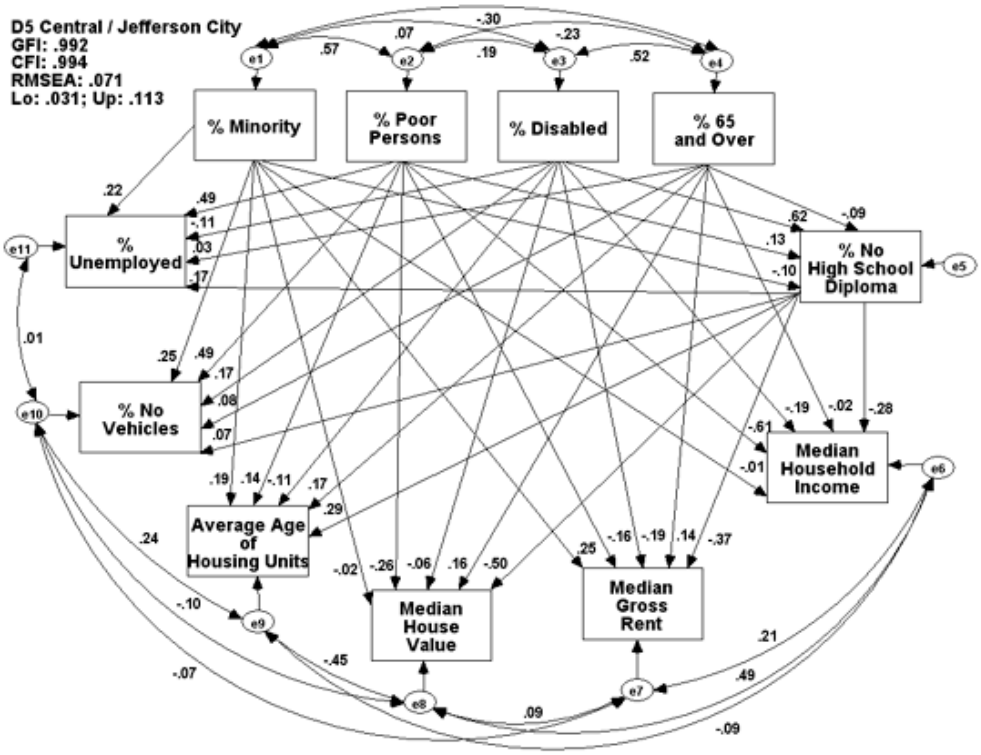
A Quality of Life (QOL) model was selected for two important reasons. First, the purpose of transportation planning is to ensure that all members of a community benefit from planning efforts and none experience disproportionate burden. Second, there is an established use in transportation planning of considering QOL. Forkenbrock (1999) advocated considering the impact of planning on low-income and minority communities to address environmental justice issues including federally funded transportation-related programs, policies, and activities having the potential to adversely affect human health or the environment. Purvis (2001) extended the environmental justice variables to include elderly and disabled populations based on proposed metropolitan and statewide planning regulations released in May of 2000. Purvis suggested the use of a 'discrimination assessment' to include a geographic and demographic profile that addressed these four populations in terms of the positive and negative impacts of transportation services available and planned.

While there is no definitive list of social and economic variables that best measure the quality of life for a geographic area, the Decennial Census of Population and Housing is an exceptional data source to explore this issue. Census 2000 variables used to construct the QOL models include both the populations of importance to MoDOT - low-income, disabled, minorities, and elderly and the variables educational attainment, income, housing, transportation and employment to measure quality of life.

Findings Summary

Preliminary findings reveal that for all but the elderly, the Central protected populations were more likely than the general population or other special populations to live in neighborhoods and communities with characteristics indicative of a lesser quality of life than the District in general. The analysis allows planners and other community decision-makers to understand the specific barriers to quality of life and, thus, to address them, as possible, within the context of the planning process.

QOL Structural Equation Model for the Central District



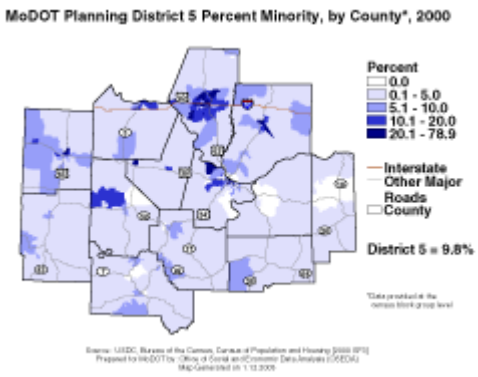
Understanding the Central District

The overall fit of the structural equation model for the Central District was statistically significant and indicated that, as a whole, the protected populations and the quality of life variables are related to each other. Further, the concern of multicollinearity, that the relationship of populations or quality of life indicators to each other might detract from the ability to measure the relationship between a single population and a quality of life variable, was not an issue. The following paragraphs first describe the relationships between each protected population and the quality of life variables and then describe important relationships between the quality of life indicators themselves.

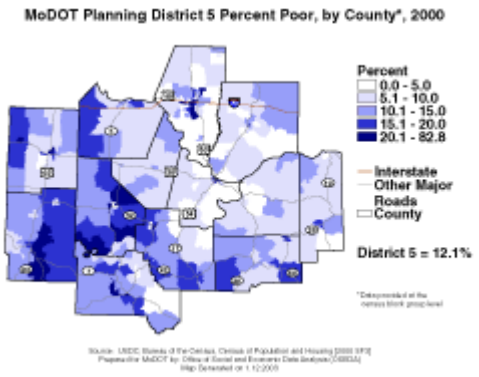
Minority Population

The quality of life indicators showing the strongest relationships to the minority population **(Map 1)** were the unemployment rate, no vehicles available and median gross rent. There was a low strength relationship between minority neighborhoods and the average age of housing units and no high school diploma variables. In the Central District minority populations are more likely to live in neighborhoods characterized by older housing units, with slightly higher rent costs, a higher percentage of persons unemployed, a higher percentage of households without access to a vehicle and a lower percentage of adults without a high school diploma. The neighborhoods where the minority population lives were not found to be any different in housing value or household income than those of the general population.

Map 1



Map 2



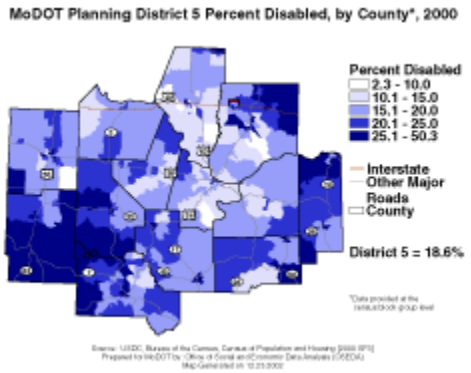
Poor Population

As anticipated, the model shows that the poor population **(Map 2)** tends to live in neighborhoods characterized by low median household incomes, high percent of persons unemployed and a high percent of households without a vehicle. Additionally, a weak relationship exists between the percent of persons poor and the percent of the adult population without a high school diploma and the average age of housing units. A low-strength inverse relationship exists between the percent poor and median house value and median gross rent variables. Thus, the poor population is more likely to live in neighborhoods characterized by lower house values and lower rent costs.

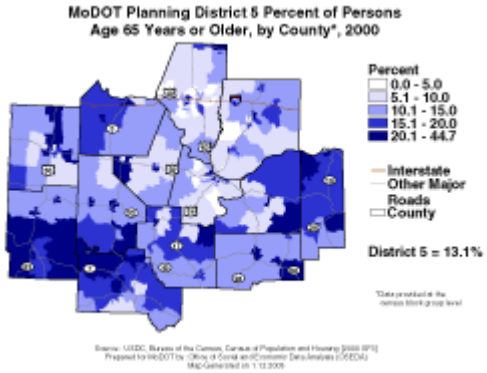
Disabled Population

The model indicates a moderately strong relationship between the percent of persons disabled **(Map 3)** and the percent of persons without a high school education. An inverse relationship exists between the percent of the population that is disabled and median household income and median house value. This finding indicates that the disabled populations are more likely to live in neighborhoods characterized by low household incomes and low house values. A weak relationship exists between the percent of the population that is disabled and quality of life indicators, no vehicles and average age of housing units. The relationship suggests that the disabled population lives in neighborhoods characterized by a greater percentage of households without vehicles and in older housing stock. The neighborhoods where the disabled population lives were not found to be any different in unemployment rates or rent costs than those of the general population.

Map 3



Map 4



65 Years Old and Over

The model reveals that in the Central District there is a weak relationship between the elderly population **(Map 4)** and the percent of households without an available vehicle. Something can be learned from examining the lack of relationship between protected populations and quality of life variables. For the elderly population of the Central District the lack of findings of significant strength indicates that they typically live in neighborhoods and communities that are no different from those of the general population.

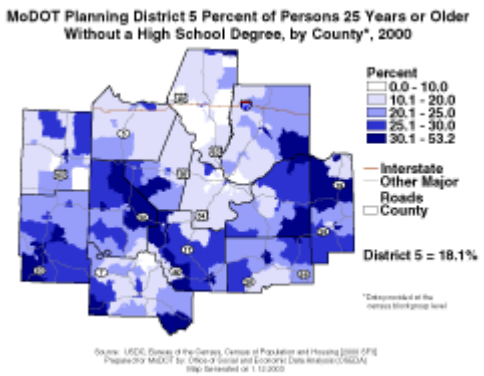
Relationship Between Dependent Variables

The model also offers the means with which to look at the relationship that exists between the percent of persons without a high school education **(Map 5)** and the quality of life indicators. Neighborhoods and communities that are occupied by a greater percentage of persons without a high school education are characterized by low incomes, low rent costs, low house values, older homes and higher unemployment rates.

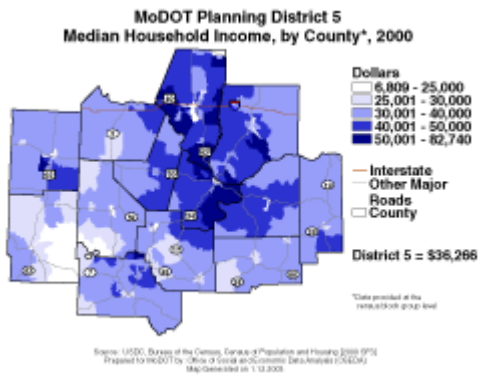
Indicator Selection Criteria

To measure the impact of education on quality of life, the variable of not having a high school education was used. Studies (Rumberger, 1987; Digest of Educational Statistics, 1998) have indicated that persons not completing a high school education are at an increased risk of not finding steady employment, living in less than adequate housing, and earning less when they do work.

Map 5

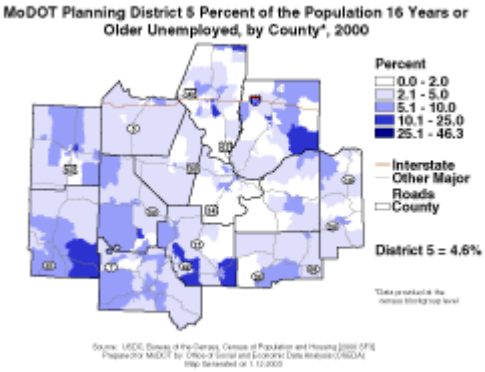


Map 6

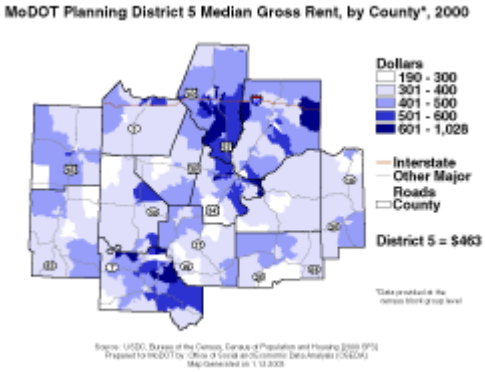


Median household income **(Map 6)** and unemployment status **(Map 7)** were chosen as indicators of economic well-being. Typically, the less income available to a household, the more difficult it is to acquire the goods and services indicative of a high quality of life. Unemployment status is a useful measure of economic opportunity as well as a predictor of concentrations of poverty within MoDOT districts.

Map 7

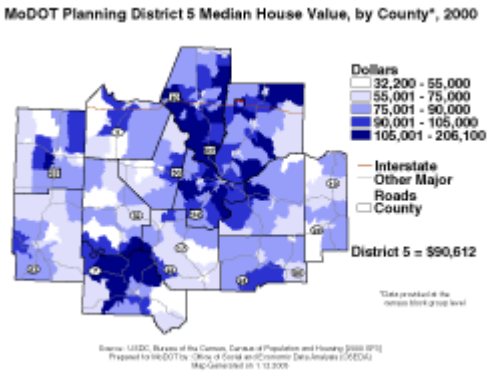


Map 8

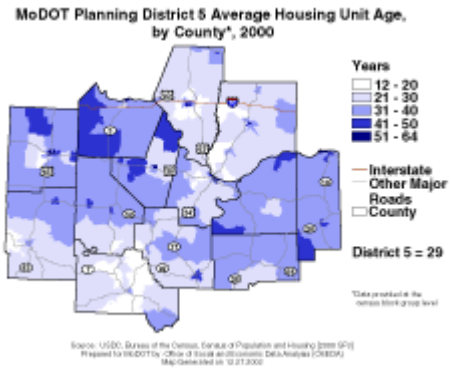


Median gross rent **(Map 8)**, median house value **(Map 9)** and the average age of the housing unit **(Map 10)** were used as measures of housing quality. Both median gross rent and median house value were included to capture the impact of quality of housing for both households that own and rent. Additionally, there is an established relationship between the market value of housing and the cost. Thus, it is a reasonable assumption that the higher these values the greater the quality of housing units. Because the populations of interest in this model are more likely to live in neighborhoods that are both older and poorer than the general population, the average age of the housing unit was used to complement the variables rent and housing value.

Map 9

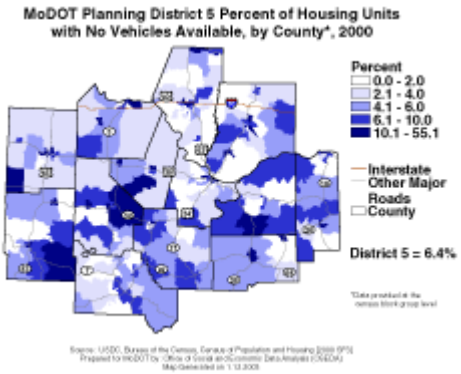


Map 10



To measure the impact of access to transportation on quality of life, the variable of not having a vehicle available **(Map 11)** was included. The availability of a vehicle is an important indicator of mobility affecting access to employment opportunities as well as the goods and services necessary to maintain an adequate quality of life. Additionally, districts that indicate a significant number of neighborhoods without access to a vehicle will require an increased need for public modes of transportation.

Map 11



Appendix: Definition of Variables

Independent Variables

Percent Minority - The percent minority variable is a measure of the percent of all of the single race categories, other than white, that respondents could have chosen from the census questionnaire. These include: African American, American Indian, Asian and Pacific Islander, and Other Race as well as if they selected Hispanic. Overall, 44,190 people comprised the minority population, representing 9.8 percent of the total population.

Percent Disabled - The percent of individuals that were classified as having a disability if any of the following three conditions were true: (1) they were 5 years old and over and had a response of "yes" to a sensory, physical, mental or self-care disability; (2) they were 16 years old and over and had a response of "yes" to going outside the home disability; or (3) they were 16 to 64 years old and had a response of "yes" to employment disability. Overall, 76,227 people comprised the disabled population, or 18.6 percent of the total population for whom disability status could be determined.

Percent Poor - The percent poor variable is a measure of the percent of persons for whom poverty status was determined. The Census Bureau uses the federal government's official poverty definition. Assigning poverty status takes into account both the family size and total family income. Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old. The following link is the poverty threshold table for 1999: http://www.census.gov/hhes/poverty/threshld/thresh99.html. Overall, there are 51,900 people, 12.1 percent of the district's population, considered poor by federal guidelines.

Percent 65 and Over - The percent 65 and over variable is comprised of the percent of person's aged 65 years old and over. In total, 13.1 percent of the district's population is elderly (59,428 people).

Dependent Variables

Percent No High School Diploma - The percent no high school diploma variable is a measure of the persons aged 25 years or older who did not graduate high school and have

not received a GED. Overall, there were 52,621 people (18.1 percent of people aged 25 years or older) who had not received their high school diploma.

Median Household Income - The median household income variable is a measure of the median household income in 1999 dollars. Household income includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not. The median household income for the Central District was $36,266.

Average Age of Housing Units - The average age of housing units variable is a measure of when the unit was built. The average housing unit age for the Central District is 29 years.

Median Gross Rent - The median gross rent variable is measured in 1999 dollars. Gross rent is the contract rent plus the estimated average monthly cost of utilities and heating fuels if not included in the contract rent. The median gross rent for the Central District is $463.

Median House Value - The median house value variable is a measure of the median value of housing units in 1999 dollars. Housing units are defined as house and lot, mobile home and lot, or condominium unit. Housing value data were determined by asking a sample of respondents to estimate the value of their owner-occupied housing unit, any housing units that they were buying, or housing units they owned that were vacant and for sale. Value is the respondent's estimate of how much the property would sell for if it were for sale. If the house or mobile home was owned or being bought, but the land on which it sits was not, the respondent was asked to estimate the combined value of the housing unit and property. The median value of housing units in the Central District is $90,612.

Percent No Vehicles - The percent no vehicles variable is a measure of the percent of occupied housing units whose residents reported having no vehicle present. These data show the number of passenger cars, vans, and pickup or panel trucks of 1-ton capacity or less kept at home and available for the use of household members. Vehicles rented or leased for 1 month or more, company vehicles, and police and government vehicles are included if kept at home and used for nonbusiness purposes. Dismantled or immobile vehicles are excluded. Vehicles kept at home but used only for business purposes also are

excluded. Overall, there were 11,250 occupied housing units without a vehicle, or 6.4 percent of all occupied housing units.

Percent Unemployed - The percent unemployed variable measures the percent of persons eligible for work but who were not employed at the time they completed the census. All civilians 16 years old and over were classified as unemployed if they reported that they were neither "at work" nor "with a job but not at work" during the reference week. Also included as unemployed were those who reported that: they were looking for work during the last 4 weeks and were available to start a job, did not work at all during the reference week, were on temporary layoff from a job, had been informed that they would be recalled to work within the next 6 months or had been given a date to return to work, and were available to return to work during the reference week, except for temporary illness. Overall, there were 10,687 persons classified as unemployed, equaling 4.6 percent of the total population eligible to work.

Interpreting Structural Equation Modeling

A statistical method, structural equation modeling, was used to analyze the relationships between the census variables described above. The value of this statistical method is that it allows consideration of whether or not these variables have an effect on each other, and if they do, the strength of that effect. The responses to the variables were aggregated to the level of the census block group. In total, there are 349 block groups in the Central District, 347 of which were used in the analysis. If data were missing for any of the eleven variables to be considered in the statistical model, that block group was excluded from the analysis. (In order to better understand the mechanics of the SEM and the terminology associated with the analysis click on the following link: Interpreting the Structural Equation Model.

This statistical method allows interpretation of the relationship between variables in two different ways. First, it measures whether or not the variables included in the analysis, when considered as a group, show a statistically significant relationship to each other. This is called the overall 'goodness of fit'. It is important to keep in mind when interpreting this

method (and all other statistical methods that test the relationship between multiple variables) that there is a baseline standard measure that must be met for the overall relationship between variables to be considered significant. Typically this standard is either 90 or 95% agreement between variables. Once that baseline standard has been met, then the strength of the overall relationship of variables can be considered (for example, a .99 score shows a better fit than a .95 score).

If the overall model is determined to be significant, then the relationships of individual variables to one another are significant. What then becomes of importance is the strength of the relationship between variables. Negligible strength relationships between variables in a model that has passed tests of model fit are still not any good regardless if the model has a strong goodness of fit. Additionally, the model measures whether or not the variables are positively or negatively related to each other. For example, there is a strong positive relationship between higher levels of educational attainment and having a higher income. Conversely, there is a negative relationship between having a disability and being employed. However, it is important to remember that what is being measured is the strength of the relationship between the populations of interest and the measures of quality of life of the communities that they live in. So, also measured by the model is the impact of the relationship between populations on the relationship between any single population and a quality of life variable (multicollinearity). If the scores that measure the relationship between populations are too high (above .80), then the score that measures the relationship between individual populations and quality of life variables cannot be considered reliable. Fortunately, multicollinearity was not an issue for the populations of interest in the Central District.

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Forkenbrock, David J. and Lisa A. Schweitzer (1999). Environmental Justice in Transportation Planning. *Journal of the American Planning Association.* Vol. 65, No. 1

Purvis, Charles L. (2001). Data and Analysis Methods for Metropolitan-Level Environmental Justice Assessment. Transportation Research Record 1756, Paper No. 01-2907 Sustainability and Environmental Concerns in Transportation 2001

Rumberger, R. W. (1987). High School Dropouts: A Review of Issues and Evidence. *Review of Educational Research* 57:101-121.

Digest of Education Statistics (1998). Washington, D.C.: U.S. Dept. of Health, Education, and Welfare, Education Division, National Center for Education Statistics.

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Findings Summary

Preliminary findings reveal that for all but the elderly, the South Central District protected populations were more likely than the general population or other special populations to live in neighborhoods and communities with characteristics indicative of a lesser quality of life than the District in general. The analysis allows planners and other community decision-makers to understand the specific barriers to quality of life and, thus, to address them, as possible, within the context of the planning process.

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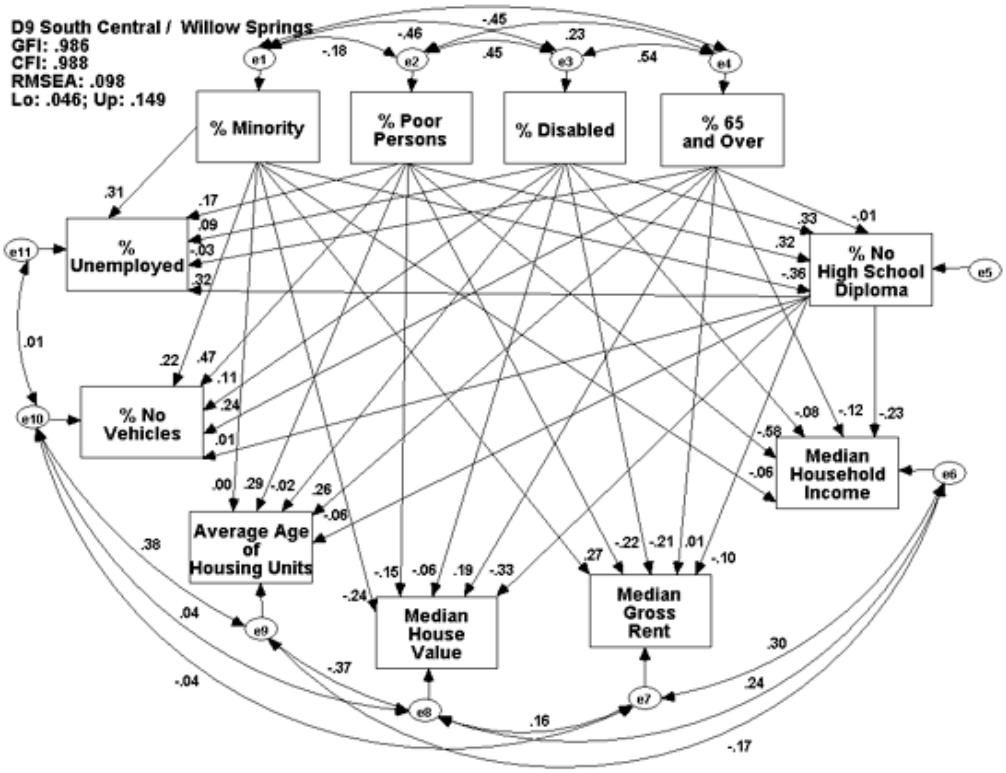

Understanding the South Central District

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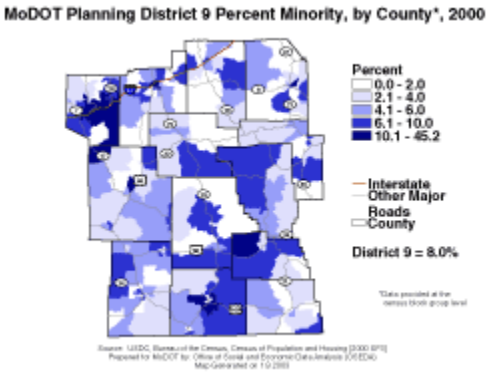
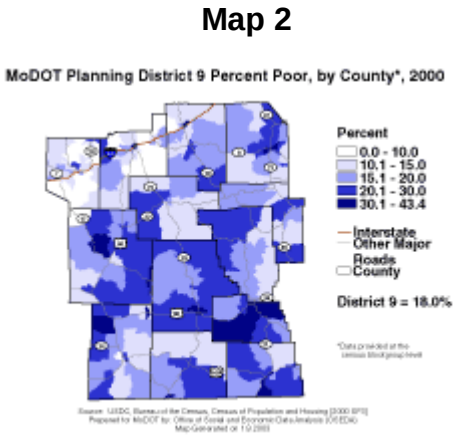
Minority Population

The quality of life indicator showing the strongest relationship to the minority population **(Map 1)** were the percent no high school and percent unemployed. Interestingly, the moderate-strength relationship between the minority population and the percent no high school indicator was a negative one, indicating that minorities are more likely to have completed high school than the overall population. However, there was a positive moderate-strength relationship between the percent minority variable and percent unemployed, indicating that minority neighborhoods are more likely to have a higher percent unemployed than in the overall South Central District. There was a low strength relationship between minority neighborhoods and the median gross rent, median house value, and households with no vehicle available. These relationships suggest that minority neighborhoods are more likely to pay more in gross rent costs, have housing values lower than the median, and have more households with no vehicle available. However, in the South Central District minority populations are only negligibly related to the indicators median household income and the average age of housing implying no difference between minority neighborhoods and all neighborhoods in the South Central District.

Map 1



Map 2



Poor Population

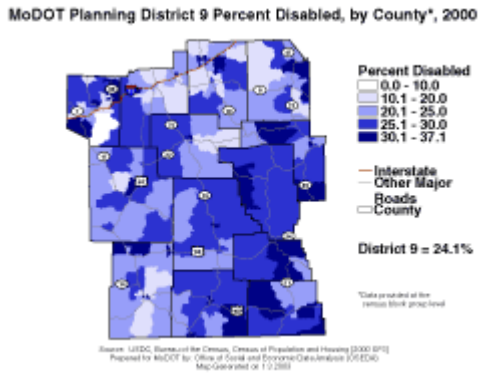
As anticipated, the model shows that the poor population **(Map 2)** tends to live in neighborhoods characterized by low median household incomes, households with no vehicle available and no high school diplomas. Additionally, a low-strength relationship exists between the percent of persons poor and neighborhoods with older than average housing, higher than the median gross rent, higher unemployment, and lower than the District's median housing value.

Disabled Population

The model indicates a moderate-strength relationship between the percent of persons disabled **(Map 3)** and the percent of persons without a high school education. A relationship also exists, but is fairly weak, between the percent of the population that is disabled and neighborhoods with lower than the median gross rent values and households with no vehicle available. A negligible relationship exists between the percent of the population that is disabled and quality of life indicators, unemployment, median household income, median house value, and average age of housing. This suggests that the percent of persons disabled are no more likely than the overall District to live in neighborhoods characterized by higher or lower unemployment, median household incomes, median house values, and older

or newer than the average age of housing.

Map 3



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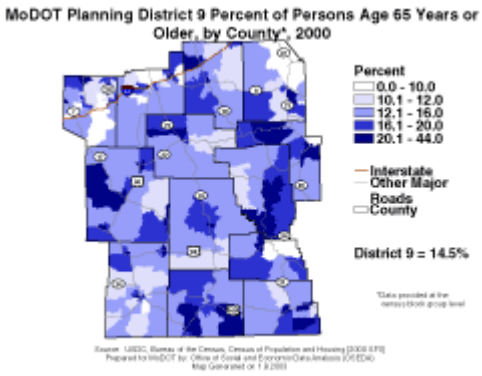


65 Years Old and Over

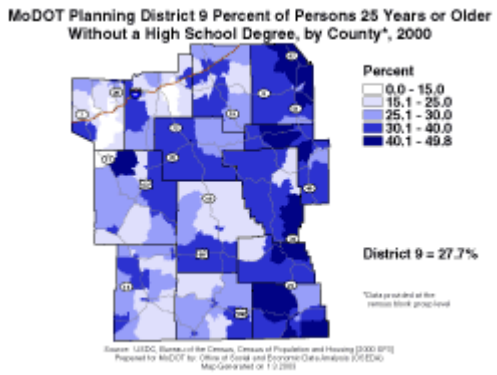
All relationships in the South Central District model between the elderly population and the quality of life indicators are weak. The model reveals that the elderly population **(Map 4)** is more likely to live in neighborhoods with an older than average age of housing, more households with no vehicles available, slightly higher than the median household values, and slightly lower than the median household incomes. No relationship exists between the elderly population and the percent of persons unemployed, median gross rent, and percent without a high school diploma. Something can be learned from examining the lack or near lack of relationships between protected populations and quality of life indicators. For the elderly population of the South Central District the lack of findings of significant strength indicates that they typically live in neighborhoods and communities that are no different from those of the general population.

Relationship Between Dependent Variables

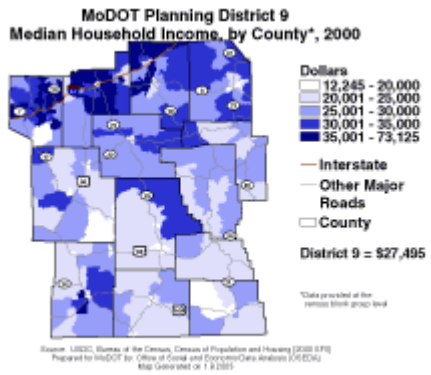
The model also offers the means with which to look at the relationship that exists between the percent of persons without a high school education **(Map 5)** and the quality of life indicators. Neighborhoods that are occupied by a greater percentage of persons without a

high school education are characterized by lower median housing values, higher unemployment, and lower incomes. A relationship exists, but is quite weak, indicating that the percent of persons without a high school diploma are more likely to live in neighborhoods with lower rent costs. There is no relationship between the percent of persons without a high school diploma and the average age of housing and households with no vehicle available.

Map 5



Map 6



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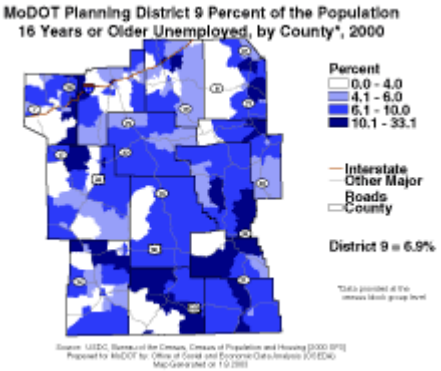
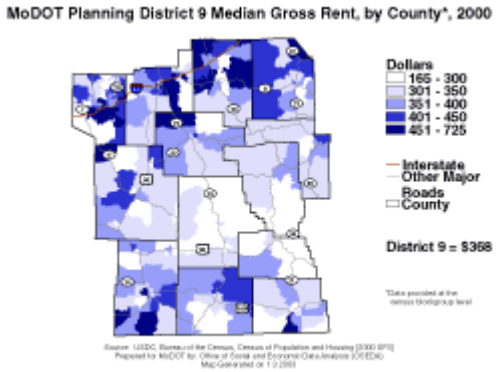
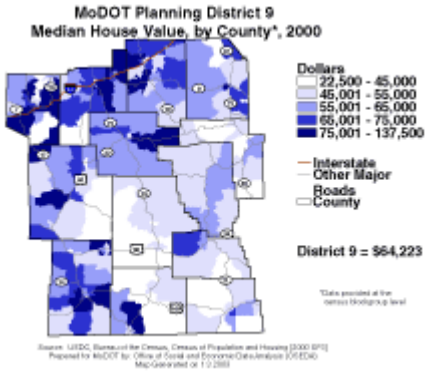


Map 8

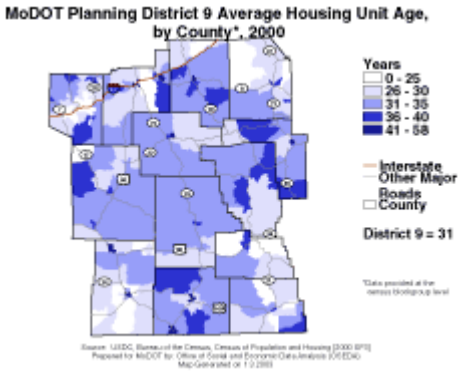


Median gross rent **(Map 8)**, median house value **(Map 9)** and the average age of the housing unit **(Map 10)** were used as measures of housing quality. Both median gross rent and median house value were included to capture the impact of quality of housing for both households that own and rent. Additionally, there is an established relationship between the market value of housing and the cost. Thus, it is a reasonable assumption that the higher these values the greater the quality of housing units. Because the populations of interest in this model are more likely to live in neighborhoods that are both older and poorer than the general population, the average age of the housing unit was used to complement the variables rent and housing value.

Map 9

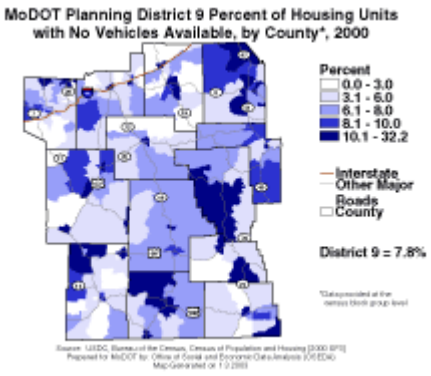


Map 10



To measure the impact of access to transportation on quality of life, the variable of not having a vehicle available **(Map 11)** was included. The availability of a vehicle is an important indicator of mobility affecting access to employment opportunities as well as the goods and services necessary to maintain an adequate quality of life. Additionally, districts that indicate a significant number of neighborhoods without access to a vehicle will require an increased need for public modes of transportation.

Map 11



Appendix: Definition of Variables

Independent Variables

Percent Minority - The percent minority variable is a measure of the percent of all of the single race categories, other than white, that respondents could have chosen from the census questionnaire. These include: African American, American Indian, Asian and Pacific Islander, and Other Race as well as if they selected Hispanic. Overall, 20,586 people comprised the minority population, representing 8.0 percent of the total population.

Percent Disabled - The percent of individuals that were classified as having a disability if any of the following three conditions were true: (1) they were 5 years old and over and had a response of "yes" to a sensory, physical, mental or self-care disability; (2) they were 16

years old and over and had a response of "yes" to going outside the home disability; or (3) they were 16 to 64 years old and had a response of "yes" to employment disability. Overall, 55,031 people comprised the disabled population, or 24.1 percent of the total population for whom disability status could be determined.

Percent Poor - The percent poor variable is a measure of the percent of persons for whom poverty status was determined. The Census Bureau uses the federal government's official poverty definition. Assigning poverty status takes into account both the family size and total family income. Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old. The following link is the poverty threshold table for 1999: http://www.census.gov/hhes/poverty/threshld/thresh99.html. Overall, there are 44,393 people, 18.0 percent of the district's population, considered poor by federal guidelines.

Percent 65 and Over - The percent 65 and over variable is comprised of the percent of person's aged 65 years old and over. In total, 14.5 percent of the district's population is elderly (37,442 people).

Dependent Variables

Percent No High School Diploma - The percent no high school diploma variable is a measure of the persons aged 25 years or older who did not graduate high school and have not received a GED. Overall, there were 45,862 people (27.7 percent of people aged 25 years or older) who had not received their high school diploma.

Median Household Income - The median household income variable is a measure of the median household income in 1999 dollars. Household income includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not. The median household income for the South Central District is $27,495.

Average Age of Housing Units - The average age of housing units variable is a measure of when the unit was built. The average housing unit age for the South Central District is 31 years.

Median Gross Rent - The median gross rent variable is measured in 1999 dollars. Gross rent is the contract rent plus the estimated average monthly cost of utilities and heating fuels if not included in the contract rent. The median gross rent for the South Central District is $368.

Median House Value - The median house value variable is a measure of the median value of housing units in 1999 dollars. Housing units are defined as house and lot, mobile home and lot, or condominium unit. Housing value data were determined by asking a sample of respondents to estimate the value of their owner-occupied housing unit, any housing units that they were buying, or housing units they owned that were vacant and for sale. Value is the respondent's estimate of how much the property would sell for if it were for sale. If the house or mobile home was owned or being bought, but the land on which it sits was not, the respondent was asked to estimate the combined value of the housing unit and property. The median value of housing units in the South Central District is $64,223.

Percent No Vehicles - The percent no vehicles variable is a measure of the percent of occupied housing units whose residents reported having no vehicle present. These data show the number of passenger cars, vans, and pickup or panel trucks of 1-ton capacity or less kept at home and available for the use of household members. Vehicles rented or leased for 1 month or more, company vehicles, and police and government vehicles are included if kept at home and used for nonbusiness purposes. Dismantled or immobile vehicles are excluded. Vehicles kept at home but used only for business purposes also are excluded. Overall, there were 7,727 occupied housing units without a vehicle, or 7.8 percent of all occupied housing units.

Percent Unemployed - The percent unemployed variable measures the percent of persons eligible for work but who were not employed at the time they completed the census. All civilians 16 years old and over were classified as unemployed if they reported that they were

neither "at work" nor "with a job but not at work" during the reference week. Also included as unemployed were those who reported that: they were looking for work during the last 4 weeks and were available to start a job, did not work at all during the reference week, were on temporary layoff from a job, had been informed that they would be recalled to work within the next 6 months or had been given a date to return to work, and were available to return to work during the reference week, except for temporary illness. Overall, there were 7,442 persons classified as unemployed, equaling 6.9 percent of the total population eligible to work.

Interpreting Structural Equation Modeling - A statistical method, structural equation modeling, was used to analyze the relationships between the census variables described above. The value of this statistical method is that it allows consideration of whether or not these variables have an effect on each other, and if they do, the strength of that effect. The responses to the variables were aggregated to the level of the census block group. In total, there are 222 block groups in the South Central District District, 220 of which were used in the analysis. If data were missing for any of the eleven variables to be considered in the statistical model, that block group was excluded from the analysis. (In order to better understand the mechanics of the SEM and the terminology associated with the analysis click on the following link: Interpreting the Structural Equation Model.

This statistical method allows interpretation of the relationship between variables in two different ways. First, it measures whether or not the variables included in the analysis, when considered as a group, show a statistically significant relationship to each other. This is called the overall 'goodness of fit'. It is important to keep in mind when interpreting this method (and all other statistical methods that test the relationship between multiple variables) that there is a baseline standard measure that must be met for the overall relationship between variables to be considered significant. Typically this standard is either 90 or 95% agreement between variables. Once that baseline standard has been met, then the strength of the overall relationship of variables can be considered (for example, a .99 score shows a better fit than a .95 score).

If the overall model is determined to be significant, then the relationships of individual

variables to one another are significant. What then becomes of importance is the strength of the relationship between variables. Negligible strength relationships between variables in a model that has passed tests of model fit are still not any good regardless if the model has a strong goodness of fit. Additionally, the model measures whether or not the variables are positively or negatively related to each other. For example, there is a strong positive relationship between higher levels of educational attainment and having a higher income. Conversely, there is a negative relationship between having a disability and being employed. However, it is important to remember that what is being measured is the strength of the relationship between the populations of interest and the measures of quality of life of the communities that they live in. So, also measured by the model is the impact of the relationship between populations on the relationship between any single population and a quality of life variable (multicollinearity). If the scores that measure the relationship between populations are too high (above .80), then the score that measures the relationship between individual populations and quality of life variables cannot be considered reliable. Fortunately, multicollinearity was not an issue for the populations of interest in the South Central District.

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