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The Spatial Disconnect Between Resident and Job Locations in Maryland: Potential Demand for a Smart Growth Incentive Program

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Abstract: During the mid-1990s quality of life and urban sprawl became issues for politicians, as well as planners. As more and more green fields on the urban fringe fell under the subdivision developer's backhoe, existing residents felt they were losing their sense of place. Politicians from both parties recognized an issue that could solidify a suburban base, while supporting environmentalists as well as local business groups. In Maryland, Smart Growth became synonymous with the fight against sprawl, the revitalization of older neighborhoods, and the re-thinking of wasteful spending of taxpayer's dollars on roadway infrastructure that feeds the sprawl cycle. In this research paper, a Smart Growth initiative - Maryland's Live Near Your Work Program ("LNYW") - will be examined in terms of historical development, current participation levels and effectiveness in diminishing the ever widening spatial disconnect between home and work. The LNYW Program discussion analysis will include a spatial analysis showing different levels of disconnect between home and work for Maryland's commuters. This paper will demonstrate the potential impact of the LNYW program on the reduction of the spatial disconnect between home and work, if restrictive qualifications are removed.

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I. Introduction

Decentralized employment has made residential location theory more complex than ever. This is because the unique spatial reference point, the Central Business District (CBD) no longer exists in its original form (Simpson 1993).[1] A spatial disconnect arises where the changing form of the CBD, accompanied by urban sprawl, results in increased distance between resident and job locations. In Maryland, the spatial disconnect between resident and job locations is increasing. In Howard, Queen Anne's and Carroll counties alone over 100,000 workers travel outside their county of residence to employment in another Maryland county. Spatial disconnect in resident and job locations and the resulting travel time presents multiple challenges for individuals, employers, families, planners and policy makers. This paper will examine the spatial disconnect between resident and job locations in Maryland and analyze the Live Near Your Work Program, which is one tool planners and policy makers have created to address the growing spatial disconnect in Maryland.

Where people live and work, the mode of transportation used get to work and home, and the consequences of this choice are of great interest to employers, community planners, and employees themselves. Commuting patterns determine the labor market for employers and the allocation and budgeting of transportation resource decisions for planners. However, for workers and their families, commuting patterns and variables become important when residential location decisions must be made. Assuming an individual's or family's decision regarding where they live is a choice the variables they may consider include, housing and school system quality, travel time and distance to work, mode of transportation available, and job opportunities (Koslowsky et al 1995).

By reducing the distance of the home to work commute, adverse effects to individuals, families, and employers could be limited and possibly avoided altogether.

The work commute affects not only the individual and the organization or firm, but also the family, the community, and the society at large (Koslowsky et al 1995). Good health, physical and mental, is commonly associated to "quality of life" in many discussions involving citizens and planners. The relationship between life events, which lead to physiological responses, such as depression and anger, and the bodily reaction that ensues has been studied since 1973. Prior to that, the psychological reaction to military combat and the resulting physiological stress was investigated (Koslowsky et al 1995). Today, suburban combat may be considered the lengthening morning commute on congested roadways, and the inevitable lane changes that must be negotiated safely.

Each weekday morning tens of millions of citizens from every social stratum commute between home and work in the United States. Billions of person hours are involved in this ritual every year, which has far reaching implications for business productivity, as well as physical and psychological impacts for workers and their families (Koslowsky et al 1995). The suburban family averages ten car trips per day, with most family's required to own more than one automobile. When a commuter lives an hour away from his or her jobsite, they annually spend the equivalent of 12 workweeks, or 500 hours in their automobile. Nationally, it has been estimated that traffic delays cost the population 723 billion dollars in wasted fuel and productivity (Mitchell 2001).[2] These impacts add to the quest to reduce sprawl and the development of alternative ideas to improve quality of life.

Public transit systems are designed to alleviate some of these impacts; however, in many areas they struggle to compete with the private automobile. In 1995, just 1.8 percent of all personal trips were by transit, down 2.4 percent from 1977 and down 2.2 percent from 1983.[3] Following tens of billions of dollars invested in new rail systems in metropolitan areas, and the underwriting of more than 75 percent of their operating expenses, ridership figures for transit's most basic use, the work-trip, remained stagnant (Cervero 1998). However, suburbanization has not led to a decreased use of public transit everywhere. On October 31st, 2000, Washington, D.C.'s metro rail system recorded the highest monthly ridership in its history. Total ridership of 15.2 million was more than 12 percent higher than the previous October totals, and that week's weekday average was 610,116 trips.[4] Improving and expanding public transit systems is one of the common methods used to address commuting problems and the growing disconnect between resident and job locations. However, developing public transit systems, as well as improving road infrastructure are long term solutions requiring time for planning and redevelopment and offer only temporary solutions for citizens seeking to reduce the distance between home and work.

In the short term, a program such as Maryland's Live Near Your Work ("LNYW") is designed to meet the immediate needs of individual or families seeking assistance or incentive to reduce the distance between resident and job locations. Incentive programs are meant to influence behavior and stimulate public trends into alternative courses of action. In the case of LNYW, the State of Maryland implemented such an incentive program to encourage the reduction of the spatial disconnect and its negative impacts on residents and employers. Using U.S. Census Bureau data, this paper examines the spatial

disconnect between resident and job locations in Maryland and discusses the history and effectiveness of Maryland's Live Near Your Work Program demonstrating its potential impact on reducing the spatial disconnect between resident and job locations.

Section II outlines previous research which first began to look at distance measures between home and work, and identified a growing disconnect. The two data sets used in this paper are described in Section III. Section IV presents the problem -- the growing spatial disconnect between resident and job locations in Maryland -- through a temporal analysis and comparison of U.S. Census data. Section V introduces Maryland's LNYW Program. This section will include an examination of the Maryland legislation which brought about the program, and a review of the program to date. An overview of the program's historical development can be seen in Figure: 1 (p44). Section VI, demonstrates the potential LNYW Program demand, and presents further analysis of U.S. Census data. The conclusion to this paper can be found in Section VII.

II. Previous Research

Researchers have studied multiple aspects of the spatial disconnect including automobile dependency, family income, race and educational attainment. Urban planners have looked at spatial disconnect by means of special case studies for projection purposes, as well as the effect incentive programs have in changing behavior in general.

When suburban residents gather to discuss their community, inevitably the topic quickly turns to increased traffic. The perception of excess traffic, more than any other factor, causes citizens to scrutinize planning decisions, whether roadway improvement or public transit expansion (Duany et al 2000). This perception is generally warranted in

most American cities, because the worst traffic is not found downtown, but in surrounding suburbs where edge city highways, designed and built for lighter loads, become choked with traffic.[5] It is clear, new and wider roads do not relieve heavy traffic, and do enable sprawl when sufficient land use controls are not in place before final approval. According to a recent California traffic study (Hansen et al 1997), for every 1.0 percent increase in new roads, there is a 0.9 percent increase in local travel, reminding transportation planners and policy makers that we cannot build ourselves out of this problem.[6] In fact, when a cross sections of Americans were asked for the best long-term solution to reducing traffic, 75 percent responded by either improving public transit or developing less auto dependant communities. Only about 20 percent called for the building of new roads.[7] Unfortunately, relocating closer to work was not considered an option in the survey. One goal of this paper is to highlight relocation closer to work as an option for workers in light of the impact sprawl and the spatial disconnect between resident and job locations has on commuting variables.

Recently, researchers looked at auto dependency internationally by examining various transportation and environmental statistics for 47 cities (Kenworthy et al 1999). Table: 1 (p37) displays a temporal view of 11 of the 13 U.S. cites regarding average trip length to work from 1980 to 1990. The percent increase derived from the 11 city averages was 10.75 percent. However, this increase was tempered by New York City's 22.79 percent decrease. Overall, trip length or the spatial disconnect grew nationally over the study period.

In 1990, the Baltimore Region Council of Government's Transportation Planning Division produced a case study for Howard County that included projections on

percentage of work trip destinations of Howard County residents. These researchers estimated that only 33 percent of Howard County residents worked in Howard County in 1986. They went on to predict a slow but steady downward trend, with only 32 percent by 1995, and only 30 percent by 2010 (Gold 1990). However, by examining census data from 1990 and 2000, Howard County's predicted downward trend has not materialized. In 1990, 35.8 percent of Howard County residents worked in-county, and by 2000, 38.0 percent worked in-county, an upward trend of 2.2 percent. However, the number of Howard County workers increased by over 25,000 over the ten year period from 1990 to 2000, an increase of 18.6 percent. Over the same period over 11,000 of those 25,000 Howard County workers ended up working outside their county of residence. In 1990, Howard County had a worker to job deficit of over 20,000, and from 1990 to 2000 the number of Howard County drivers commuting solo to work rose nearly 20 percent to 110,546 commuters, 81.9 percent of the total Howard County workforce. However, Howard County planners should be encouraged because the three percent forecasted drop in in-county jobsite destinations from 1986 to 2010 has not been realized. It should be noted however, that Howard County was one of only four counties in the state that experienced this upward trend in in-county workers. The others being Baltimore, up 2.2 percent, St. Mary's, up 1.6 percent, and Montgomery, up 0.04 percent.

The willingness of commuters to travel long distances so they can live and work where they choose exists despite lengthy commuting time and distance. From 1983 to 1990, the average work trip increased from 8.6 miles to 10.98 miles, a 27 percent increase.[8] National transportation planners have looked at this behavior and have organized and displayed transportation statistics that relate to this phenomenon.

Respondents who traveled five or more miles to and from work were asked to state the reasons they lived so far from their jobs. The majority of respondents identified non-transportation issues or social factors as the primary reasons they lived so far from their jobs. Approximately 38 percent cited schools, 24 percent liked their house, 17 percent liked their neighborhood, and 10 percent said other family member's jobs were too far from their jobs.[9] This study suggests that education, housing and other non-transportation issues are driving the decisions that contribute to the spatial disconnect between resident and job locations.

Family income continues to be a significant socioeconomic factor contributing to the spatial disconnect between resident and job locations. For example, once income reaches $30,000, there is at least a 90.1 percent chance that automobile will be the primary mode to work (Meyers et al 2001).[10] Earlier research tested a hypothesis that families with higher incomes live closer to work than families with lower incomes. However, family income proved to be a complex variable and shared a high degree of colinearity with all of the other socioeconomic factors considered.[11] In other words, the distance to work was shorter for low income families, but not by much. Some of the empirical findings were that family income dominates the socioeconomic variables and accounts for much of the variance, and appears to have a direct association with the distance the head of household travels to work. Also, household heads with higher educational attainment tend to live farther from their jobs, males made substantially longer trips to work, and families with more autos had longer journeys to work. Race was not determined to be statistically significant although, nonwhites had a larger mean distance to work (Catanese 1972). These socioeconomic factors of commuting patterns

were found to be relevant indicators for how people behave and make residential location decisions in complex situations relating to urban or suburban life.

The LNYW Program is an incentive program that addresses the socioeconomic factors of commuting patterns by promoting the proximity between home and work. In terms of research, which looked at the effectiveness of incentive programs that helped convince commuters to alter their commuting patterns, the Oregon Department of Transportation conducted a survey following an incentive program. The Oregon incentive program offered free bus passes and rewards to government employees using alternative transportation modes.[12] Participation was split, with 58 percent not participating, and of the 42 percent that did participate, 41 percent increased their use of alternative modes during the incentive period. In a follow-up survey, participants that altered their transportation mode were asked, "Did your use of alternative modes increase because of the incentives being offered?" 55 percent said, "Yes", 25 percent said, "No", and 20 percent said, "Partly". However, when respondents were asked if they were motivated by gifts and incentives, 19 percent said, "No", 16 percent said, "Yes", and 5 percent said, "Not sure" (Zvonkovic et al 2001).

III. Data Sets & Data Models

In this paper, two separate data sets were prepared using U.S. Census data. The first is used in Section IV to examine the growing spatial disconnect between home and work from 1990 to 2000, and the second, a more aggregated data set is used in Section VI to demonstrate potential demand for Maryland's LNYW Program if it were applied statewide. The units of analysis used in this paper's data sets are Maryland counties. The

county was chosen as the preferred unit of analysis for both data sets: (1) to reflect a greater spatial disconnect based on a unit to unit comparison; and (2) to exhibit consistency between Data Set 1 and Data Set 2. In this research paper, the U.S. Census Bureau definition of worker is being used, which describes workers as being at least 16 years of age.[13]

Place of Work: Data Set 1 This data set consists of U.S. Census "Place of Work" data from 1990 and 2000 for Maryland counties. Data Set 1 provides a comparison over time regarding various commuting patterns, which are explored further in Section IV. All attribute data was consistent over the ten year census period and only one or two attribute fields had to be recreated in the 1990 data set to create an exact match to the 2000 data set. Place of Work data at the county level forms the core of the data analyzed in Section IV of this paper, but other commuting data from Census 1990 and 2000 is included, such as means or mode, travel time, time leaving home, and vehicle occupancy.[14]

Maryland's "Place of Work" data consisted of 24 jurisdictions, 23 counties and Baltimore City. This data set was left intact in terms of the number of jurisdictions, normalized, and portions inserted in various tables for presentation. Also, it should be noted that Data Set 1 was normalized in the most conservative manner, and percentage increases reflect 1990 and 2000 differences divided by the larger 2000 totals, then multiplied by 100. Since 2000 totals are greater than 1990 totals, dividing by the 2000 totals produces a smaller percentage increase (i.e. a more conservative approach of data analysis). Alternatively, by dividing the differences by the 1990 totals, or the average of the 1990 and 2000 totals, a larger percentage increase or rate of growth would be

produced (i.e. a more liberal approach of data analysis). In summary, the most conservative method of producing a percentage increase is sufficient to demonstrate the growth in the spatial disconnect between 1990 and 2000.

Worker Flow: Data Set 2 The U.S. Census "Worker Flow" data, which forms the basis for Data Set 2, is aggregated by county and state, and is a special tabulation by the U.S. Census Bureau. The "Worker Flow" data used in this data set is part of a special tabulation the U.S. Census Bureau compiled from 1990 data for the U.S. Department of Transportation. This special tabulation will be repeated with 2000 data and will be available for public release in 2003. Although 2000 "Worker Flow" data is not available yet, the 1990 data used in Data Set 2 contributes to the analysis of the spatial disconnect between resident and job locations by demonstrating: (1) who can benefit the most from LNYW by showing which workers choose to commute through more than two counties to reach their jobs; (2) which counties produce jobs that attract workers from more than two counties away; (3) how demand estimates can be reinforce by the bi-directional nature of the data set; and (4) the worker flow patterns which produce the spatial disconnect itself. Data Set 2 will be applied primarily to the analysis of the LNYW Program to estimate potential demand.

The "Worker Flow" data in Data Set 2 is broken down into each individual county and county residents can be tracked to the exact county of their employment. This data aggregation allowed the creation of county-based regions, used in Section VI, and enabled the creation of *irregular buffers* to identify Maryland residents that have an extreme commute. An extreme commute consists of traveling to jobsites that are located

two or more counties away from a worker's residence. The *irregular buffer* will be discussed later in this section, in the sub-section titled Building the Worker Flow Models, and reviewed later in Section VI. More on buffering and the *irregular buffer* concept used in this research can be found in Notes 15 and 35.

While Data Set 1 was left intact in terms of the number of jurisdictions, the "Worker Flow" data used in Data Set 2 has been modified to consist of only 23 jurisdictions by combining Baltimore City and County. For example, in Data Set 1, Baltimore County out-of-county totals will include Baltimore City as an out-of-county location, while in Data Set 2, Baltimore County totals will include both city workers and jobs, and form a city-county zone in the county-based analysis, and later form a county-based region in the regional analysis. Essentially, travel to and from Baltimore City and Baltimore County for work was discounted, and Baltimore City residents had to travel through and out of Baltimore County to be recognized as out-of-county in Data Set 2.

Combining Baltimore City and County enables the purification of the Data Set 2 unit of analysis. Baltimore County and Baltimore City would have been combined in Data Set 1, but the "Place of Work" data was not aggregated by the U.S. Census Bureau in such a manner as to make this combination possible. Not only does this combination in Data Set 2 purify the unit of analysis, it prevents the contamination of future estimates or demand projections with a relatively short inter-county commute (e.g. Baltimore County into the City or vise versa).

Building "Worker Flow" Models Data Set 2 consists of a two part analysis, which is then broken down further into four models to demonstrate potential LNYW Program

demand, if the program was unrestricted statewide. Part 1 includes models one and two, while Part 2 includes models three and four. Models one and two describe workers traveling to jobsites. The first model is a county-based analysis of the in-county, out-of-county, and out-of-state commute. The second model is a regional-based analysis, or greater distance scenario. Models three and four describe jobs that attract workers. The third model is a county-based analysis of the in-county, out-of-county, and out-of-state commute. The forth model is another region-based analysis, or a greater distance scenario with a higher impact.

In the regional analysis in Models 2 & 4, regions are defined by a single core-county with all their adjacent counties serving as a transportation buffer, which increase working commute distances.[15] For instance, models two and four represent a more distant inter-county commute through a county-based region, or from a core-county, through a buffering adjacent county, into the rest of the state for work.[16] Essentially, this more distant commute is one that starts in a residential core-county, travels through an adjacent buffering county, ending in a county elsewhere in the state. All adjacent counties form an *irregular buffer* of the core-county. As stated, both parts will be examined bi-directionally, as county-based commuters leave home for work (Part 1), and as county-based jobs attract workers (Part 2). Part 1 is worker-based for two scenarios (county-based & region-based) and Part 2 is job-based for two scenarios (county-based & region-based). One of this paper's hypothesis is that the lesser impact, in terms of distance, is the inter-county commute, while the greater impact is the out-of-region commute. However it should be noted, the lesser impact involves more workers or jobs, while the greater impact involves fewer workers or jobs. In part, the Section VI analysis

involves placing a number on the group of Maryland residents that choose to live in one county and then travel to their job location two or more counties away.

IV. Maryland Commuting 1990 - 2000

To understand the growing spatial disconnect between resident and job locations from 1990 to 2000, percentage increases in people who live and work in different counties must be compared to percentage increases in each county's workforce. This is accomplished by analyzing Data Set 1. From 1990 to 2000 Maryland's total workforce grew by 109,208, or 4.21 percent.[17] Over the same period, out-of-county workers grew by 68,006, or 9.02 percent, and out-of-state workers grew by 18,545, or 4.12 percent.[18] Statewide, the out-of-county growth rate grew more than twice as fast as the total workforce growth rate over the length of the study. The individual statistical breakdowns, by county, can be observed in Table: 2 (p37), and graphic representations of out-of-county and out-of-state workers for 1990 and 2000 can be found in Figures 2 & 3 (p45). Besides Baltimore City, only three counties, Allegany, Howard, and St. Mary's, produce a workforce growth rate greater than an out-of-county growth rate. Five counties produce a workforce growth rate greater than an out-of-state growth rate, Calvert, Howard, Montgomery, St. Mary's, and Worchester. Baltimore City and Prince George's County produce negative growth rates in both total workforce and out-of-state workers. Five other counties, Anne Arundel, Caroline, Somerset, Talbot, Washington, produce a single digit workforce growth rate, and a double digit growth rate in both out-of-county and out-of-state workers.

Table: 3 (p38) analyzes of all 23 county jurisdictions for three commuting variables: solo drivers; car poolers; and average minutes to work. More than half of the jurisdictions have double digit increases in the number of solo drivers and average minutes to work. In contrast, the car pool statistics show many jurisdictions with double digit decreases. Here, average minutes to work alone may not prove a growing spatial disconnect due to other possible variables, but increased commute time suggests increased distance may be a contributing factor.

In addition, the percentage increases in the number of county-based workers who now claim it takes over one hour to get to work, range from a 23 percent increase in Washington County to a 65 percent increase in Worchester County from 1990 to 2000. Percentage increases for county-based workers who claim they leave for work before 5:00 a.m., range from a 10 percent increase in Anne Arundel County to nearly 35 percent in Cecil County. In Anne Arundel, Baltimore, Montgomery, and Prince George's counties there are double digit percent increases for workers who now must leave for work before 7:00 a.m. in order to reach their jobsites on time.[19] While, these early departure times may have other causes beside distance, such as potential heavy traffic, travel time is affected by distance as well as travel rate, route selection, and roadway condition or maintenance.

Recent U.S Census Bureau data compiled in Data Set 1 shows another disturbing trend. The percentage of commuters walking to work is down sharply. For instance, in Harford County the number of people who walk to work has decreased 132 percent, and in Anne Arundel, Caroline, Charles, Dorchester, and Talbot counties the same number is down over 50 percent. Again, this data suggests an increase in the spatial disconnect

between home and work if these workers are traveling to jobsite further than a reasonable walking distance.

In summary, Data Set 1 shows: (1) an increase in the time workers spend commuting; (2) a decrease in the number of residents who walk to work; and, most importantly, (3) an increase in the number of residents who live and work in different counties; thereby demonstrating the spatial disconnect between resident and job locations in Maryland.

V. The LNYW Program Introduced

The State of Maryland has developed a limited incentive program in combating the growing home-work spatial disconnect. Maryland's Live Near Your Work Program attempts to control sprawl with up front incentives provided through legislation, if local jurisdictions and employers choose to participate. It is a partnership between the homebuyer, Maryland Department of Housing and Community Development ("DHCD"), local governments, and businesses which is designed to discourage the spatial disconnect between resident location and jobs in the State of Maryland.[20]

The LNYW Program is a cash incentive based on proximity or distance to work.[21] Employees who work for participating employers and are willing to relocate into designated LNYW areas near their participating employer are eligible to receive a $3,000 incentive. This grant can be directly applied to the costs of purchasing a home, while future transportation cost savings will be realized due to reduced commute distances. The cost savings include both monetary as well as other intangible savings that relate directly to quality of life issues.

At its inception, program developers and the leaders of Maryland's Smart Growth initiative hoped the LNYW Program would become a integral part of overall Smart Growth strategies.[22] By strengthening neighborhoods through homeownership and promoting relations between businesses and communities, the LNYW Program developers intend the program benefits to include increased land values, revitalized neighborhoods, reduced commuting costs, and reduced employee turnover, recruitment, and training costs.[23]

The Maryland DHCD administers the program, providing technical assistance to local jurisdictions and promoting the program statewide.[24] The initial reports from DHCD have showed promising results in the first few years of LNYW implementation. Now, a higher level of participation should be required to realize the LNYW Program's true potential for diminishing the home-work disconnect.

LNYW Requirements On June 29, 1998, Maryland's LNYW Program legislation became effective under the Department of Housing and Community Development Home Ownership Program.[25] Objectives include homeownership in designated neighborhoods and partnerships between public and private sectors.[26] Also, the program is intended to support state transportation policy, the reduction of worker commute distances, and employer compliance of 1990 Federal Clean Air Act amendments.

LNYW has four major participants, the future homebuyer, his or her employer, the local jurisdiction where the new home is located, and the state. To join the partnership the homebuyer is expected to contribute $1,000. In turn, the homebuyer receives a total combined cash incentive of $3,000 to be applied to a home purchase.

Other partners include: (1) the homebuyer's employer; (2) the local jurisdiction; and (3) the State of Maryland via the Department of Housing and Community Development

The local jurisdictions administer and promote the program in their area with assistance from Maryland's DHCD. Local jurisdictions designate the LNYW areas, which are typically areas in need of revitalization, based on DHCD approval. Initially, limited income requirements applied and local jurisdictions could not impose higher income limits than the Secretary of Housing and Community Development. These limits were intended to target the incentive program at lower income families and were based on Maryland's DHCD guide lines for "families of limited income" which are designated by the Secretary of the DHCD. However, in the first few years of the program implementation these income requirements were set aside to allow for higher program participation levels. Currently, there are no limits on income or on home price.[27]

The legislation also defines eligible employers and employees. Eligible employers are those who; (1) complete the local application; (2) provide their portion of the cash incentive; (3) designate a LNYW area that coincides with the local jurisdiction's LNYW area; (4) coordinate with the local jurisdiction in its participation; and (5) comply with any restriction imposed by the local jurisdiction.[28] Employers, who decide to participate must provide their portion of the cash benefit, as well as promote the incentive program to their employees. To help promote employer participation, employers can set their own specialized eligibility requirements for their employees. However, when creating their own eligibility requirements, employers must not violate any applicable law, and their participation requirements must be approved by the Maryland DHCD and the local jurisdiction. For instance, employers may designate a smaller area for their

employee-homebuyers within the Neighborhood LNYW Areas to insure greater home proximity to the jobsite.

Homebuyers are required to respond to periodic program surveys, and cash incentives are limited to one per household. Participation requirements regarding resident location include: (1) the home must be the employee's primary residence; (2) it must be a single unit property; (3) it must be located in a designated area within a LNYW area boundary; and (4) the home's location must have a spatial relationship near the employer's location.[29] The question arises, "What is the definition of *near*?" A Maryland DHCD official said this has been left vague for flexibility, but it is intended that near constitutes less than five miles from home to work and must be sufficient to claim adherence to the program's principles.[30]

Analyzing DHCD's recent survey results on the program indicates initial levels of program success; however it also suggests that some of the initial or current requirements constrain participation in LNYW. For instance, current requirements that limit LNYW Program participation include: (1) voluntary jurisdictional and employer participation as opposed to mandatory participation; and (2) residence location within a designated Neighborhood LNYW Area as opposed to any location within the participating jurisdiction. The following section addresses the current status of LNYW and the constraints on its success.

The LNYW Program Today As of July 31, 2002, 807 homes have been purchased with help from the LNYW Program.[31] Three counties now participate, Montgomery, Prince George's, and Anne Arundel, while five cities participate, Baltimore, Hagerstown,

Westminster, Salisbury, and College Park. Even though College Park is located in Prince George's County, county-wide program participation is not assured when local jurisdictions can designate their own LNYW areas. According to Maryland's DHCD, Howard County is expected to join the program soon.[32] However, Baltimore County's participation ended in November 1998, due to lack of employer involvement and they have not rejoined the program as Maryland's DHCD expected.[33] Lack of local jurisdiction participation has constrained the positive effects of LNYW. Homebuyers are required to select a home that is located in a participating LNYW Program jurisdiction. This requirement alone eliminates 19 of the 23 overall counties in the state fully, and three others partially. Besides Baltimore City, who participates fully, three Maryland counties, Washington, Carroll, and Wicomico contain central cities that participate, while the rest of these counties falls outside a LNYW Program designated area. The participation rates for local jurisdictions are constrained by the costs a jurisdiction incurs for its portion of the $3,000 cash incentive, as well as general program administration costs.[34]

Until local jurisdiction and employer participation becomes mandatory, the initial success (suggested by the results of a program survey set forth in Appendix 1) and ultimate potential of LNYW is difficult to evaluate. However, mandatory participation could be politically difficult and program costs could be high. A cost estimate is provided in Section VI.

The LNYW Program evaluation method included in this research paper and described in Section VI, attempts to determine the potential demand this program could generate, if the program was implemented statewide with no restrictions on where homes

could be purchased, and if jurisdictions and employers were required to participate. Then existing participant totals could be compared with potential participant totals. If program participation is expected to grow, Maryland's jurisdictions, and employers must become fully involved.

VI. Potential LNYW Program Demand

This section discusses the potential demand under a revised and unrestricted LNYW Program that requires jurisdictions and employer participation. Potential demand is determined using Data Set 2. The analysis of Data Set 2 includes county residents and their jobsite location, whether in-county, out-of-county, or out-of-state. The difference between this data set and the data set used in Section IV, is that out-of-county locations are aggregated to specific county or state, giving Data Set 2 a directional flow aspect. The first half of Data Set 2 (Part 1: Models 1 & 2) describes workers and their job locations. The second half of this bi-directional data set (Part 2: Models 3 & 4) describes jobs that attract workers. Two degrees of spatial disconnect or impacts were created for Parts 1 & 2. The lesser impact being the county-based approach and the higher impact being the region-based approach. Four models are used to describe the spatial disconnect for: (1) resident location and jobs for both counties and regions (Models 1 & 2); and (2) jobs and resident location for both counties and regions (Models 3 & 4).

The *irregular buffer* concept, a regional analysis, is used in Models 2 & 4. This regional approach keeps the county or core-county as its unit of analysis. The *irregular buffer* approach involves the creation of 23 regions, by taking a core-county and buffering it with its adjacent counties, creating a county-based region.[35] This regional or

higher impact analysis describes commuters that start their commute in a core-county, and travel through a buffering county in order to reach their jobsite two or more counties away. Also, in the regional analysis (Models 2 & 4) Anne Arundel and Queen Anne's counties are considered adjacent counties, due to the existence of the Chesapeake Bay Bridge, which connects two counties located on different shores of the Chesapeake Bay.

The four models show potential LNYW Program demand as follows: (1) by showing Maryland workers that live in one county and work outside that county (Model 1); (2) by showing Maryland jobs that attract workers into a county from statewide locations (Model 3); (3) by showing Maryland workers that live in one county and work at least two counties away (Model 2); and (4) by showing Maryland jobs that attract workers from at least two counties away (Model 4). Here, each model stands alone as way to estimate potential demand, but Models 1 & 3 reinforce each other because each model shows a county-based analysis. Models 2 & 4 reinforce each other because each model shows a region-based analysis.

The potential LNYW Program demand shown in Models 1 - 4 can be compared to a possible unrestricted statewide potential need. This conservative approach is accomplished by reviewing the most severe spatial disconnects, core-county worker and jobs by region; by excluding Baltimore County to Baltimore City commutes; and by excluding inter-state commutes into the District of Columbia or in or around the Philadelphia area. These out-of-state employers cannot participate in the Maryland's LNYW Program as it is currently structured.

Data Display & Analysis Census data was collected in Data Set 2, reorganized, and analyzed using four models to show the spatial disconnect between resident and job locations and to estimate potential program demand. Data Set 2 was then organized for tabular display in Tables: 4 & 5 (normalized data) (p39) and in Tables: 6 & 7 (count data) (p40 & p41). Graphic representations of the four "Worker Flow" models can be found in Figures 4 thru 7 (p46 & p47).

The first model includes workers that reside in the county and commute to jobs: (1) within their county; (2) outside their county but in their state; and (3) outside their county into another state. A minimum of one boundary county boundary crossing represents the out-of-county worker. Table: 4 - Model 1 also shows three counties breaking the 50 percent barrier for commuting out-of-county, Howard at 53.50 percent, Carroll at 51.24 percent, and Queen Anne's at 50.40 percent, which shows the effect of the Chesapeake Bay Bridge. These three counties alone, when combined, have over 100,000 workers that leave their county of residence to pursue employment outside their county, but within the state.[36] Therefore, the LNYW Program applied in these counties would serve to decrease the spatial disconnect in this model.

The second model takes a regional approach by creating an *irregular buffer* around each core-county. In Table: 4 - Model 2, percentages for out-of-region workers are reduced significantly from Model 1 out-of-county workers, which suggests many workers are working only one county away from their home county. However, Carroll and Cecil counties still send over ten percent of their workers two or more counties away to work. Queen Anne's County shows sprawl effects by its connection to Anne Arundel County by means of the Chesapeake Bay Bridge. Over 34 percent of its workforce

travels at least two counties away in order to reach their jobsites. The Chesapeake Bay Bridge, in terms of Anne Arundel County and Annapolis jobs, has contributed to a sprawl effect in Queen Anne's County, but the economic benefit is substantial and is derived from linking Baltimore and Washington D.C. area jobs to Queen Anne's County workers. Queen Anne's County out-of-region worker percentage is more than double those of Cecil and Carroll Counties, as seen in Table 4 – Model 2. Even though the percentage of out-of-region workers for Model 2 is significantly less than the percentage of out-of-county workers in Model 1, there are still over 70,000 workers in Maryland that travel two counties or more to reach their jobsite as shown in Table: 6. Therefore, the workers shown in this model are prime candidates for the LNYW Program.

The third model represents another way the potential LNYW Program demand can be analyzed. Model 3 looks at the total number of jobs a county produces in relation to the number of workers that are attracted to fill those jobs. The count data was normalized into percentages and displayed in Table: 5. In Table: 5 - Model 3, percent out-of-county jobs for Howard County is 53.47. In other words, Howard County attracts over 50 percent of its workers from one or more counties away. Three other counties attract over 30 percent of their workers from out-of-county: Prince George's; Anne Arundel; and Talbot counties. In summary, there are over 480,000 jobs in Maryland that attract workers from out-of-county, as seen in Table: 7. The potential impact of the LNYW Program incentive in bringing employees closer to their jobsite is great if the program were applied and used in the counties discussed in this model.

The fourth model represents the regional analysis of core-county jobs attracting workers from out-of-region through the transportation buffer. In Table: 5 - Model 4

(p39), the percent out-of-region jobs is below 10 percent for all 23 jurisdictions compared to the percent of out-of-county jobs in Model 3. However, there are over 60,000 jobs in Maryland that attract workers from two or more counties away, as seen in Table: 7. Again, the potential impact of the LNYW Program in reducing the spatial disconnect between resident and job locations is great if applied to the jobs discussed in this model.

Summary statistics from Table: 6 and Table: 7 were used to derive total potential LNYW Program demand and its associated cost. In Table: 8 (p42), count data is displayed for projection purposes. In general, out-of-county and out-of-region count data for workers and their place of work is slightly higher than for jobs and their attraction to workers. The differences shown in Table: 8 indicate sprawl characteristics, by suggesting that the spatial disconnect between resident and job locations is created by individual resident location rather than job selection. In other words, individuals inherently have little control on the number of jobs available in their counties, but fully control their resident location.

Potential Demand & Cost By comparing potential program demand and current participation, the models show how far the program must be expanded, in order to combat sprawl and the growing spatial disconnect between resident location and jobs in any significant way. To estimate potential LNYW Program demand and cost, count data for out-of-county and out-of-region was used, and analyzed for each part of Data Set 2, as seen in Tables: 6 & 7. Total Out-of-County and Out of-Region figures for each data set were placed in Table: 8 and formed the basis for potential statewide LNYW Program demand and cost projections.

In 1990, the State of Maryland had nearly one half million workers that did not work in the county which they resided. As seen in Table: 6, over 70,000 workers traveled out of the county they resided in, through a second county, into at least a third county to reach their jobsites. Assuming participation levels would never reach 100 percent, three projection percentages were included in Table: 8 to estimate program demand. Final projections were based on potential participation rates of 25, 50, and 75 percent. Each newly derived projected total was multiplied by $3,000 to represent the cost of the program's current cash incentive, one third paid by the employer, the local jurisdiction and the state. Table: 8 estimates potential program costs could range anywhere between one billion and 50 million dollars, depending on participation and the degree of impact the spatial disconnect represents (e.g. out-of-county or out-of-region). All three contributions to the cash incentive are reflected in cost estimates displayed in Table: 8, and are easily aggregated by division, as one-third is represented by each stakeholder except the homebuyer.

The vast range of these cost estimates may indicate the complexities in completely understanding this spatial disconnect. For example, the estimate is based on workers and their commuting habits, not on household commuting habits. According to Census 2000, their are 2,591,670 workers in Maryland compared to 1,980,859 households, or 1.31 workers per household. This ratio would immediately temper the cost estimates by 24.7 percent. In addition, some households with the greatest spatial disconnect may be perfectly located, if two workers within that household travel great distances in opposite directions on a daily basis. The four models were also unable to predict which workers travel short distance just over county boundaries to reach their

jobsites. The residents of these households also exhibit reasonable location in terms of their journey to work, and may have no need for a program that assists them in relocating closer to work. Attempting to understand the spatial disconnect's cost to individuals, families, and society itself, in terms of quality of life, while challenging, is critical for analyzing the success of LNYW.

The potential of the LNYW Program to address individual homebuyer concerns as they relate to the spatial disconnect between resident and job locations is undermined by the fact that the LNYW Program is being left for local jurisdictions and employers to adopt or reject. This paper's analysis of potential LNYW demand demonstrates that the program's greatest impact will occur once LNYW becomes available statewide.

VII. Conclusion

The phenomenon of spatial disconnect between resident location and jobs is not new and most likely has been occurring as long as there has been suburbanization and sprawl. Recently, U.S. Census Bureau data indicates workers tolerating longer commute distances, presumably so they can chose where to live and work. Diminishing job loyalty, the perceived inability for promotion within ones own organization, and the increasing ability for workers to justify firm to firm job transfer within a metropolitan region to obtain promotion may be contributing factors in a worker's willingness to take on a longer commute. In short, residential location near ones workplace has declined.

The Live Near Your Work Program is a relatively new, innovative attempt to address the problem of the growing spatial disconnect between resident and job locations with a cash incentive. Getting people to consider living in the same Maryland county

they work in will be difficult unless counties can provide jobs for their residents. By displaying worker and job statistics from Data Set 2, each Maryland County can be judged on its effectiveness in producing jobs for its residents. Table: 9 (p43) displays which counties rely heavily on jobs created in the major metropolitan centers in and around Maryland. One to one county job creation may seem unrealistic, but high quality jobs for suburban, semi-suburban, and rural residents could convince workers to reject the longer more stressful commute into and around major metropolitan areas. The LNYW Program, as now set up, suggests limited impact on the spatial disconnect between resident and job locations is possible; however the current program assumes voluntary participation will steadily increase on the part of jurisdictions and employers without mandatory requirements or stronger incentives. Significant participation by local jurisdictions has been constrained due to the cost local jurisdictions incur for their portion of the cash incentive and general program administration expenses. To take the fight against sprawl and the growing disconnect between resident and job locations to a higher level, political lines will need to be drawn and spending priorities reconsidered as Smart Growth is weighed against other state sponsored programs.

If the task of the American city planner is to predict the future pattern of land use rather than lay down edicts as to what that pattern must be, (Evans 1973) then this research paper attempts to predict an ever widening spatial disconnect between home and work. The Maryland's Live Near Your Work Program, and its cash incentive, is one tool available to citizens, employers, planners and policy makers seeking to decrease the spatial disconnect between resident and job locations.

Appendix: 1

Item: Live Near Your Work Program Survey Results

Written By: Maryland Department of Housing and Community Development

Release Date: Feb. 1, 2002

The following information on the Live Near Your Work (LNYW) Program, jointly administered by the Maryland Department of Housing and Community Development with eight counties and cities and over 70 employers for the last four and a half fiscal years, was compiled from 427 surveys completed by the homebuyers at or shortly after settlement. Effective November 15, 2001, State employees are eligible to purchase homes under the program.

Roughly 75% or 322 households are first-time homebuyers.

One-third or 143 households would not have bought their new home without the LNYW incentive.

Adjusted for multiple modes of travel, 64 or 15% of the new homebuyers switched from driving to walking, carpooling or taking the bus to work, thereby, decreasing their average commute from 13.5 to 1.5 miles.

Conversely, 143 or 33% of the homebuyers continued to drive to work, while 98 or 23% continued to walk, carpool or take the bus to work.

Overall, the reduction in average miles traveled dropped from 10 to 3.4 miles and the average commute time fell from 25 to 14 minutes.

Roughly 56% or 241 new homebuyers have annual household incomes of $50,000 or less, while 25% or 108 households earn $30,000 or less annually.

Nearly 70% or 301 households learned of the LNYW Program through their employer.
Homebuyer Characteristics The 427 survey respondents work for 54 different employers. In particular, employers located in Baltimore City, such as the University of Maryland, Johns Hopkins University and Health System, Kennedy Krieger Institute and Morgan State University, employ over 86 % of the respondents. Working primarily in the services sector, the occupations of the new homebuyers range from attorneys and software engineers to x-ray technicians, from registered nurses and librarians to associate professors. Thirty four percent of the new homebuyers are single and 67 % are under 40 years of age. Of the 125 homebuyers with children, 68 have school-age children, 33 have toddlers, 17 have toddlers and school-age children, and seven did not comment on their

children's ages. Roughly 48 % of the homebuyers paid $80,000 or less for their new homes, while 35 % paid $100,000 or more. Of the 185 or 43 % of the buyers that reported the need to renovate their houses, only 24 said they would do the repair work completely themselves.

Changes in Homebuyer Travel Habits A comparison of travel time, mileage, and methods before and after purchase of their homes indicates substantive changes. Prior to purchase, 135 of the new homebuyers had commute times of 30 minutes or more, now only 37 or 9% do. Likewise, 125 of the new buyers had travel times of 10 minutes or less prior to purchase; now 200 or 47 % of the homebuyers have such short travel times. The travel time and mileage for 76 of the 136 homebuyers, who continued to reside within the same zip code, remained the same. Numerous households even purchased homes they had previously rented. Similarly, prior to purchase of their homes, 117 of the buyers commuted 10 miles or more to work. After purchase of their homes, only 38 of the homebuyers now travel such a long distance. In comparison, 85 of the new homebuyers initially commuted one mile or less to work; but after purchase, 144 homebuyers now commute one mile or less to work. Overall, the reduction in average miles traveled dropped from 10 to 3.4 miles and the average commute time fell from 25 to 14 minutes.

Homebuyer Comments An overwhelming majority of the homebuyers (390 of 427) found the LNYW Program easy to use and would recommend it to others. The factors most frequently entering into the homebuyer's decision to purchase were the price or affordability of the home, its location or the neighborhood, and its condition, size, and amenities. The proximity to work and schools as well as the pride and equity derived from homeownership also were factors for many.

Notes

[1] Central Business District (CBD) symbolizes the socioeconomic vitality and strength of the city it represents, and is characterized by personal and professional interaction in a dynamic setting.

[2] Transportation statistics were obtained through the following referenced item: National Geographic, "Urban Sprawl: The American Dream" by John G. Mitchell.

[3] Transit statistics were obtained through the following referenced item: The Transit Metropolis: A Global Inquiry, by Robert Cervero via Urban Decision Making for Transit Investment: Portland's Light Rail Transit Line, by S. Edner et al.

[4] Transit statistics obtained through the Washington Metropolitan Area Transit Authority's Internet site.

[5] The edge city concept is derived from Chauncy Harris and Edward Ullman's Multiple Nuclei Model. It is based on the premise that land uses do not evolve around a single core, but around several nodes or focal points.

[6] California transportation elasticity, for the 1997 Hansen & Huang Study was obtained from a Robert Cervero presentation at the University of Maryland in the Fall of 2001. The 1997 Hansen & Huang Study is therefore not referenced.

[7] Survey results by Smart Growth America, a coalition of public interests groups. Survey question, "Which of the following proposals is the best long-term solution to reducing traffic in your state?" Possible answers, "Build new roads, improve public transportation, or develop communities where people do not have to drive long distance to work or shop."

[8] This commuting statistic was obtained through secondary reference. The primary reference, Anthony Down's Stuck in Traffic, obtained this statistic from the Federal Highway Administration's 1990 Nationwide Personal Transportation Study, p9.

[9] This commuting statistic was obtained through secondary reference. The primary reference, Anthony Down's Stuck in Traffic, obtained this statistic from William M. Rohe's 1980 survey, Travel to Work Patterns: A Preliminary Analysis of Selected Data from the Annual Housing Survey Travel-to-Work File, Department of City and Regional Planning, University of North Carolina, p145.

[10] Meyers et al credits a secondary source for these mode split by income statistics. (Pucher et al, 1998).

[11] Colinearity refers to the linear relationship between two independent variables. Perfect colinearity makes multivariate regression impossible. No independent variation between variables eliminates the chance of determining the effects on one after adjusting for the other.

[12] Oregon's Curb Your Car study area included government offices in the Eugene/Springfield region. Rewards included entries into a bicycle raffle and flowers for recognition.

[13] The U.S. Census Bureau has defined a worker as 16 years of age and over. Summary Table 3 data, the data used when compiling Data Set 1 is derived from the Census Bureau's Long Form. It is unclear how the Census Bureau stipulates data entry in terms of job type (e.g. full or part

time positions). This paper assumes Census Bureau Special Tabulations, the data used when compiling Data Set 2 defines workers in a consistent manner to other Census Bureau summary table data.

[14] Data in both the 1990 and 2000 Place of Work data sets are based on the 1990 and 2000 sample. The data are estimates of the actual data figures that would have been obtained from a complete count and a re subject to sampling and non-sampling errors. This is true for the other 1990 and 2000 data sets used to investigate commuting patterns in Section III such as Means of Transportation to Work, Travel Time to Work, Aggregate Travel Time to Work, Time Leaving Home to Go to Work, and Private Vehicle Occupancy. Download Date: August, 2002. www.census.gov (American Fact Finder).

[15] Buffers are commonly used in GIS spatial analysis, and are often established for use in environmental regulation by being constructed outward to protect some internal element. Adjacency considers shared common boundary, and inter-county commutes in adjacent counties involves simply crossing this boundary. In this application, an irregular buffer zone is created by using adjacent counties to a core-county to create a commuting zone that not only extends from the core-county's boundary, but to the farthest extent of each adjacent county. Here, travel from outside this region involves first traveling through the buffering county in order to reach the core-county, or requires commuters to start their commute in their core-county, travel through the buffering county in order to reach their destination at least two counties away.

[16] Core-counties represent a county-based region. In Data Set 2, Worker Flow and the regional analysis, the core-county is buffered by all adjacent counties to form a county-based region. The statistics for this county-based region represent data for the core-county only and not the area described as the transportation or irregular buffer. Workers described as in-region are those that workers that reside in the core-county and work in the core-county or in any of the core-county's adjacent counties. Jobs that are described as in-region as those that exist in the core-county and are filled by either workers from the core-county or workers from any adjacent county. Anne Arundel and Queen Anne's counties are considered adjacent counties in Models: 2 & 4, because they are connected by the Chesapeake Bay Bridge.

[17] Statewide workforce statistics are from Data Set 1, combined U.S. Census Bureau, Place of Work data for 1990 and 2000.

[18] Out-of-county and out-of-state workforce statistics are from Data Set 1, combined U.S. Census Bureau, Place of Work data for 1990 and 2000.

[19] These commuting based data are from 1990 and 2000 U.S. Census Bureau statistics, which has been included in Data Set 2. Besides Place of Work, Data Set 2 includes Means of Transportation to Work, Travel Time to Work, Aggregate Travel Time to Work, Time Leaving Home to Go to Work, and Private Vehicle Occupancy.

[20] Program partnership was defined in a Live Near Your Work Program Fact Sheet available through a Maryland Department of Housing and Community Development web site in Dec. 2001. www.dhcd.state.md.us/lnyw/lnyw.cfm

[21] Proximity or distance to work has been left undefined for program flexibility reasons according to a Maryland Department of Housing and Community Development Official.

[22] Perris Glendening, is finishing serving his final term as Maryland's Democratic Governor. He entered office in 1995, and his administration has been instrumental in creating the term Smart Growth and forwarding Smart Growth principles.

[23] Program benefits were defined in a Live Near Your Work Program Fact Sheet available through a Maryland Department of Housing and Community Development web site in Dec. 2001. www.dhcd.state.md.us/lnyw/lnyw.cmf

[24] Program administration was defined in a Live Near Your Work Program Fact Sheet available through a Maryland Department of Housing and Community Development web site in Dec. 2001. www.dhcd.state.md.us/lnyw/lnyw.cfm, and by legislative summary taken from the Annotated Code of Maryland. Title 05: Department of Housing and Community Development. Subtitle 03: Live Near Your Work Program. Authority: Article 83B, Sec.2-202. p112-39 thru 112-49.

[25] The LNYW Program legislative summary was taken from the Annotated Code of Maryland. Title 05: Department of Housing and Community Development. Subtitle 03: Live Near Your Work Program. Authority: Article 83B, Sec.2-202. p112-39 thru 112-49.

[26] Designated Neighborhoods, the current target areas of the LNYW Program, are neighborhoods designated by local governments for revitalization and must receive concurrence from Maryland's Department of Housing and Community Development as a program location requirement.

[27] Information regarding income and home price program limits is from a presentation by Special Projects Officer in the Division of Neighborhood Revitalization for the Maryland Department of Housing and Community Development , John Papagni, on Nov. 22, 2002. The presentation was part of the Metropolitan Washington Council of Governments Housing Conference, Building Communities: Planning for Housing in a Growing Region. The breakout session was titled "New Tools in the Affordable Housing Toolbox - Employer's Role in Housing".

[28] Employer eligibility can be found in the Annotated Code of Maryland. Title 05: Department of Housing and Community Development. Subtitle 03: Live Near Your Work Program. Authority: Article 83B, Sec.2-202. p112-45 thru 112-46.

[29] Employee eligibility can be found in the Annotated Code of Maryland. Title 05: Department of Housing and Community Development. Subtitle 03: Live Near Your Work Program. Authority: Article 83B, Sec.2-202. p112-47 and from the Maryland Department of Housing and Community Development's Live Near Your Work Program Fact Sheet.

[30] In this part of Section V, current facts were obtained during interviews with the Director of Research and Development for the Maryland Department of Housing and Community Development, John Papagni, on Dec. 7, 2001 and Sept. 23, 2002.

[31] In this section, The LNYW Program Today, current facts were obtained during an interview on Dec. 7, 2001 and on Sept. 23, 2002 with a Special Projects Officer in the Division of Neighborhood Revitalization for the Maryland Department of Housing and Community Development , John Papagni, and from a referenced item, Live Near Your Work Survey Results, unless otherwise noted.

[32] Expected Howard County participation in the program is from an interview with a Special Projects Officer in the Division of Neighborhood Revitalization for the Maryland Department of Housing and Community Development , John Papagni, on Sept. 23, 2002.

[33] Expected Baltimore County participation in the program is from an interview with a Special Projects Officer in the Division of Neighborhood Revitalization for the Maryland Department of Housing and Community Development , John Papagni, on Dec. 7, 2001. Their non-participatory status is from a check of the DHCD web site via the LNYW Program link on Oct. 23, 2002.

[34] Information regarding lack of participation by local jurisdictions is from a presentation by Montgomery County Official Mel Tull, on Nov. 22, 2002. The presentation was part of the Metropolitan Washington Council of Governments Housing Conference, Building Communities: Planning for Housing in a Growing Region. The breakout session was titled "New Tools in the Affordable Housing Toolbox - Employer's Role in Housing".

[35] In these two regional models, core-counties and their attributes were buffered by all adjacent counties, creating an irregular buffer for each core-county. These 23 regions, only describe the attributes of the core-county and what is happening to the core-county's workers and jobs. The county polygons are not buffered traditionally by a using a uniform distance creating a larger polygon, but by all adjacent polygons. The term irregular buffer has been designated to describe this type of original buffering concept.

[36] Statistics in this section, Data Display & Analysis, county-based and region-based commuting statistics for workers and jobs are from Data Set 2, U.S. Census Bureau, Work Flow statistics for 1990.

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Average Trip Length (kms)

City Region	1980 Journey to Work	1990 Journey to Work	Percent Increase
Boston	9.8	10.1	2.97
Chicago	12.6	15.1	16.56
Denver	11.1	13.8	19.57
Detroit	13.8	13.6	-1.47
Houston	14.7	19.1	23.04
Los Angeles	15.3	17.8	14.04
New York	16.7	13.6	-22.79
Phoenix	13.0	17.4	25.29
Portland	10.7	10.6	-0.94
San Francisco	12.2	15.4	20.78
Washington DC	13.5	14.2	4.93
	13.04a	14.61a	10.75pi

Table: 1 Average distance (kms) for the journey to work including educational trips where possible. All journeys over 200 kms were eliminated (Kenworthy et al 1999). Data Source: US Census Bureau & US DOT 1990. Percentage Increase = [(1990 - 1980) / 1990 X 100. (a = average of averages, pi = percent increase derived from two averages)

Place of Work Statistics for Maryland Counties (1990 & 2000)

No.	County Name	1990 Total Workers	2000 Total Workers	Percent Increase	1990 Out-of County	2000 Out-of County	Percent Increase	1990 Out-of State	2000 Out-of State	Percent Increase
01	Allegany	29052	29571	1.76	1742	1712	-1.75	2255	2740	16.61
02	Anne Arundel	234578	255858	7.51	1289	2027	36.41	18772	24281	20.72
03	Baltimore	360170	373496	3.57	171293	167647	-2.17	7040	8932	21.18
04	Calvert	26613	37556	29.14	10529	16394	35.78	4733	6367	25.66
05	Caroline	13035	14093	7.51	5466	6296	13.18	1251	1578	20.72
06	Carroll	65061	77592	16.15	33335	39915	16.49	2123	2873	26.11
07	Cecil	34700	42055	17.49	4701	6499	27.67	13063	17110	23.65
08	Charles	54026	61698	12.43	15794	19021	16.97	15470	17877	13.46
09	Dorchester	14186	13984	-1.44	2815	3980	29.27	501	613	18.27
10	Frederick	80850	102318	20.98	25631	32812	21.89	6565	9234	28.90
11	Garrett	11545	12943	10.80	1289	2027	36.41	1142	1489	23.30
12	Harford	97204	111704	12.98	42591	49941	14.72	2789	3790	26.41
13	Howard	109843	134992	18.63	58765	69923	15.96	11789	13814	14.66
14	Kent	8716	9062	3.82	1338	1451	7.79	968	1083	10.62
15	Montgomery	429700	455331	5.63	39858	45705	12.79	137893	142498	3.23
16	Prince George's	414918	397403	-4.41	61344	67523	9.15	186156	174290	-6.86
17	Queen Anne's	17278	20852	17.14	8708	10595	17.81	1251	1878	33.39
18	St Mary's	39080	43264	9.67	7713	7935	2.80	2974	3195	6.92
19	Somerset	8876	9100	2.46	3080	3467	11.16	258	370	30.27
20	Talbot	15607	16030	2.64	2666	3304	19.13	417	532	21.62
21	Washington	56103	60597	7.42	8846	10874	18.65	4704	5504	14.53
22	Wicomico	36559	41621	12.16	4413	5987	26.29	2479	3058	18.93
23	Worcester	17083	21177	19.33	2621	3876	32.38	1539	1838	16.27
24	Baltimore City	307679	249373	-23.38	98415	89183	-10.35	5877	5727	-2.62
	State Summary	2482462	2591670	4.21	685605	753611	9.02	432009	450554	4.12

Table: 2 Percentage increases in out-of-county and out-of-state workers generally out pace percentage increases in total workers by county over the ten year period. Data Source: US Census Bureau, Place of Work, August 2002. Percentage Increase = [(2000 - 1990) / 2000] X 100.

Other Commuting Statistics for Maryland Counties (1990 & 2000)

County Name	1990 Solo Drivers	2000 Solo Drivers	Percent Increase	1990 Car Poolers	2000 Car Poolers	Percent Increase	1990 To Work Minutes	2000 To Work Minutes	Percent Increase
Allegany	22189	23844	6.94	4244	3774	-12.45	17.5	22.3	21.52
Anne Arundel	180538	205415	12.11	31826	27302	-16.57	25.3	27.9	9.32
Baltimore	278509	297552	6.40	47472	40497	-17.22	23.7	26.9	11.90
Calvert	19482	29150	33.17	5571	6035	7.69	34.1	38.3	10.97
Caroline	9689	10854	10.73	2205	2071	-6.47	23.2	28.9	19.72
Carroll	51531	64443	20.04	9129	7620	-19.80	28.9	32.8	11.89
Cecil	27327	34982	21.88	5110	4517	-13.13	23.3	27.4	14.96
Charles	39369	47794	17.63	11474	9820	-16.84	34.4	38.2	9.95
Dorchester	10458	10759	2.80	2488	2094	-18.82	18.2	24.2	24.75
Frederick	58955	81092	27.30	13814	12665	-9.07	27.3	30.6	10.78
Garrett	8467	10005	15.37	1721	1769	2.71	18.1	23.5	22.98
Harford	75562	93142	18.87	13537	11626	-16.44	26.7	30.6	12.75
Howard	88901	110546	19.58	13084	12734	-2.75	26.8	28.9	7.27
Kent	5671	6658	14.82	1548	1031	-50.15	18.7	23.4	20.09
Montgomery	291140	313935	7.26	54943	49802	-10.32	28.3	31.2	9.29
Prince George's	264620	265309	0.26	77429	64325	-20.37	29.6	35.2	15.91
Queen Anne's	13198	16520	20.11	2955	2430	-21.60	28.4	31.8	10.69
St Mary's	6302	6895	8.60	1539	1294	-18.93	18.4	24.4	24.99
Somerset	29057	34520	15.83	6844	5398	-26.79	23.9	28.3	15.55
Talbot	11646	12657	7.99	2076	1620	-28.15	17.6	21.1	16.59
Washington	42511	48814	12.91	8725	7209	-21.03	21.4	24.2	11.57
Wicomico	27950	32808	14.81	5214	5173	-0.79	16.7	20.1	16.92
Worcester	13238	16845	21.41	1809	2183	17.13	17.4	22.2	21.62
Baltimore City	156527	136378	-14.77	51692	38003	-36.02	25.6	30.4	15.79
State Summary	1732837t	1910917t	9.32t	376449t	320992t	-17.28t	23.9a	28.0a	14.64pi

Table: 3 Percentage increases and decreases for solo commuting drivers, commuters in car pools, and average minutes used for the trip to work reveal a disturbing trend. While the focus of this research is not the analysis of traffic conjestion, the traveltime increases to work may be the result of increased commuting distances. Data Source: US Census Bureau, August 2002. Percentage Increase = [(2000 - 1990) / 2000] X 100. (t = total, a = average of averages, pi = percent increase derived from two averages)

Percent Workers Commuting To Work From Counties [Model: 1]

No.	County Name	In County	Out of County	Out of State
01	Allegany	86.24	6.00	7.76
02	Anne Arundel	60.64	31.35	8.01
03	Baltimore [w/City]	78.56	12.02	9.42
04	Calvert	42.65	39.56	17.78
05	Caroline	48.47	41.93	9.60
06	Carroll	45.50	51.24	3.26
07	Cecil	48.81	13.55	37.65
08	Charles	42.13	29.23	28.63
09	Dorchester	76.62	19.84	3.53
10	Frederick	60.18	31.70	8.12
11	Garrett	78.94	11.17	9.89
12	Harford	53.31	43.82	2.87
13	Howard	35.77	53.50	10.73
14	Kent	73.54	15.35	11.11
15	Montgomery	58.63	9.28	32.09
16	Prince George's	40.35	14.78	44.87
17	Queen Anne's	42.36	50.40	7.24
18	St Mary's	72.65	19.74	7.61
19	Somerset	62.39	34.70	2.91
20	Talbot	80.25	17.08	2.67
21	Washington	75.85	15.77	8.38
22	Wicomico	81.15	12.07	6.78
23	Worcester	75.65	15.34	9.01

Percent Workers Commuting To Work From Regions [Model: 2]

No.	Region Name	In Region	Out of Region	Out of State
01	Allegany	89.56	2.68	7.76
02	Anne Arundel	88.80	3.19	8.01
03	Baltimore [w/City]	88.55	2.03	9.42
04	Calvert	78.83	3.38	17.78
05	Caroline	82.47	7.93	9.60
06	Carroll	86.33	10.41	3.26
07	Cecil	49.61	12.74	37.65
08	Charles	68.04	3.33	28.63
09	Dorchester	94.05	2.42	3.53
10	Frederick	88.20	3.68	8.12
11	Garrett	88.42	1.69	9.89
12	Harford	92.96	4.17	2.87
13	Howard	88.85	0.42	10.73
14	Kent	84.14	4.75	11.11
15	Montgomery	66.33	1.58	32.09
16	Prince George's	54.03	1.10	44.87
17	Queen Anne's	58.54	34.22	7.24
18	St Mary's	84.72	7.67	7.61
19	Somerset	94.50	2.59	2.91
20	Talbot	90.72	6.61	2.67
21	Washington	85.26	6.36	8.38
22	Wicomico	91.16	2.06	6.78
23	Worcester	89.43	1.56	9.01

Table: 4 Maryland workers by county and region as they travel from their place of residence to work. Regions are defined by a core-county and all its adjacent counties. Anne Arundel and Queen Anne's counties are considered adjacent counties. Data represents statistics for the county and regional core-county only, and not the region's irregular buffer. Data Source: US Census Bureau, Worker Flow 1990.

Percent Jobs Attracting Workers From Counties [Model: 3]

No.	County Name	In County	Out of County	Out of State
01	Allegany	77.03	3.94	19.03
02	Anne Arundel	66.05	31.75	2.02
03	Baltimore [w/City]	82.32	15.25	2.44
04	Calvert	76.60	21.72	1.68
05	Caroline	70.17	20.39	9.44
06	Carroll	73.96	18.66	7.38
07	Cecil	75.91	10.44	13.65
08	Charles	71.62	23.47	4.91
09	Dorchester	79.62	16.03	4.35
10	Frederick	76.31	16.08	7.61
11	Garrett	79.06	5.04	15.90
12	Harford	78.99	16.62	4.39
13	Howard	44.15	53.47	2.38
14	Kent	70.79	25.95	3.26
15	Montgomery	64.25	22.39	13.36
16	Prince George's	56.73	32.89	10.39
17	Queen Anne's	70.46	27.01	2.52
18	St Mary's	90.08	8.54	1.39
19	Somerset	78.54	18.38	3.08
20	Talbot	67.33	30.67	2.00
21	Washington	75.45	3.99	20.56
22	Wicomico	77.58	14.20	8.22
23	Worcester	68.66	17.17	14.17

Percent Jobs Attracting Workers From Regions [Model: 4]

No.	Region Name	In Region	Out of Region	Out of State
01	Allegany	80.68	0.30	19.03
02	Anne Arundel	91.65	6.15	2.20
03	Baltimore [w/City]	96.93	0.64	2.44
04	Calvert	96.77	1.55	1.68
05	Caroline	86.25	4.31	9.44
06	Carroll	90.34	2.28	7.38
07	Cecil	83.60	2.76	13.65
08	Charles	92.35	2.74	4.91
09	Dorchester	93.16	2.49	4.35
10	Frederick	90.97	1.41	7.61
11	Garrett	78.89	5.20	15.90
12	Harford	93.25	2.36	4.39
13	Howard	88.85	1.89	2.38
14	Kent	92.35	4.40	3.26
15	Montgomery	82.18	4.46	13.36
16	Prince George's	84.88	4.73	10.39
17	Queen Anne's	88.53	8.94	2.52
18	St Mary's	96.96	1.66	1.39
19	Somerset	95.18	1.74	3.08
20	Talbot	95.60	2.40	2.00
21	Washington	78.35	1.09	20.56
22	Wicomico	90.18	1.60	8.22
23	Worcester	82.70	3.13	14.17

Table: 5 Maryland jobs by county and region as they attract workers from their place of residence. Regions are defined by a core-county and all its adjacent counties. Anne Arundel and Queen Anne's counties are considered adjacent counties. Data represents statistics for the county and regional core-county only, and not the region's irregular buffer. Data Source: US Census Bureau, Worker Flow 1990.

Maryland Workers and Their Place of Work [Models: 1 & 2]

County or Region Name	Total Workers	In County	Out of County	Out of State	In Region	Out of Region
Allegany	29052	25055	1742	2255	26018	779
Anne Arundel	234578	142254	73536	18788	208309	7481
Baltimore [w/City]	667849	524681	80251	62917	591397	13535
Calvert	26613	11351	10529	4733	20980	900
Caroline	13035	6318	5466	1251	10750	1034
Carroll	65061	29603	33335	2123	56166	6772
Cecil	34700	16936	4701	13063	17215	4422
Charles	54026	22762	15794	15470	36758	1798
Dorchester	14186	10870	2815	501	13342	343
Frederick	80850	48654	25631	6565	71309	2976
Garrett	11545	9114	1289	1142	10208	195
Harford	97204	51824	42591	2789	90359	4056
Howard	109843	39289	58765	11789	97595	459
Kent	8716	6410	1338	968	7334	414
Montgomery	429700	251949	39858	137893	285024	6783
Prince George's	414918	167418	61344	186156	224183	4579
Queen Anne's	17278	7319	8708	1251	10114	5913
St Mary's	39080	28393	7713	2974	33108	2998
Somerset	8876	5538	3080	258	8388	230
Talbot	15607	12524	2666	417	14159	1031
Washington	56103	42553	8846	4704	47833	3566
Wicomico	36559	29667	4413	2479	33327	753
Worcester	17083	12923	2621	1539	15278	266
State Summary	2482462	1503405	497032	482025	1929154	71283

Table: 6 Maryland residents traveling to their place of work. Regions are defined by a core-county and all its adjacent counties. Anne Arundel and Queen Anne's counties are considered adjacent counties. Numeric totals represent statistics for counties and regional core-counties only, and not the region's irregular buffer. Data Source: US Census Bureau, Worker Flow 1990.

Maryland Jobs and Their Attraction to Workers [Models: 3 & 4]

County or Region Name	Total Jobs	In County	Out of County	Out of State	In Region	Out of Region
Allegany	32525	25055	1281	6189	26240	96
Anne Arundel	215377	142254	68376	4747	197384	13246
Baltimore [w/City]	715037	588611	109011	17415	693050	4572
Calvert	14818	11351	3218	249	14340	229
Caroline	9004	6318	1836	850	7766	388
Carroll	40025	29603	7469	2953	36159	913
Cecil	22311	16936	2330	3045	18651	615
Charles	31782	22762	7459	1561	29350	871
Dorchester	13652	10870	2188	594	12718	340
Frederick	63760	48654	10252	4854	58004	902
Garrett	11528	9114	581	1833	9095	600
Harford	65609	51824	10906	2879	61182	1548
Howard	88995	39289	47584	2122	85193	1680
Kent	9055	6410	2350	295	8362	398
Montgomery	392158	251949	87822	52387	322284	17487
Prince George's	295132	167418	97055	30659	250510	13963
Queen Anne's	10387	7319	2806	262	9196	929
St Mary's	31521	28393	2691	437	30562	522
Somerset	7051	5538	1296	217	6711	123
Talbot	18600	12524	5704	372	17782	446
Washington	56398	42553	2250	11595	44190	613
Wicomico	38241	29667	5431	3143	34486	612
Worcester	18821	12923	3232	2666	15565	590
State Summary	2201787	1567335	483128	151324	1988780	61683

Table: 7 Maryland jobs attracting workers from their place of residence. Regions are defined by a core-county and all its adjacent counties. Anne Arundel and Queen Anne's counties are considered adjacent counties. Numeric totals represent statistics for counties or regional core-counties only, and not the region's irregular buffer. Data Source: US Census Bureau, Worker Flow 1990.

		Total Maryland Workers	Out of County	% Out of County	Out of Region	% Out of Region
Workers & Their Place of Work		2,482,462	497,032	20.0	71,283	2.9
				Cost T X $3,000		**Cost T X $3,000**
	75 Percent	372,774	$1,118,000,000	53,462	$160,000,000	
	50 percent	248,516	$745,000,000	35,641	$106,000,000	
	25 Percent	124,258	$372,000,000	17,820	$53,000,000	

		Total Maryland Jobs	Out of County	% Out of County	Out of Region	% Out of Region
Jobs & Their Attraction to Workers		2,201,787	483,128	21.9	61,683	2.8
				Cost T X $3,000		**Cost T X $3,000**
	75 Percent	362,346	$1,087,000,000	46,262	$138,000,000	
	50 percent	241,564	$724,000,000	30,841	$92,000,000	
	25 Percent	120,782	$362,000,000	15,420	$46,000,000	

Table: 8 Potential "Live Near Your Work" program demand and cost. Potential participation is estimated at three levels, 25%, 50% and 75%. The segment of the workforce where their impact is the greatest is the out-of-region worker, where daily commutes take them out of their home county and completely through an adjacent county in order to reach their jobsite. These estimates are for a program that is unrestricted and offered statewide. Each estimate includes the full $3,000 incentive provided equally by the employer, the local jurisdiction, and the state. Data Source: US Census Bureau, Worker Flow 1990.

Comparing Jobs to Workers

County Name	Total Jobs	Total Workers	Difference
Allegany	32525	29052	+3473
Anne Arundel	215377	234578	-19201
Baltimore [w/City]	715037	667849	+47188
Calvert	14818	26613	-11795
Caroline	9004	13035	-4031
Carroll	40025	65061	-25036
Cecil	22311	34700	-12389
Charles	31782	54026	-22244
Dorchester	13652	14186	-534
Frederick	63760	80850	-17090
Garrett	11528	11545	-17
Harford	65609	97204	-31595
Howard	88995	109843	-20848
Kent	9055	8716	+339
Montgomery	392158	429700	-37542
Prince George's	295132	414918	-119786
Queen Anne's	10387	17278	-6891
St Mary's	31521	39080	-7559
Somerset	7051	8876	-1825
Talbot	18600	15607	+2993
Washington	56398	56103	+295
Wicomico	38241	36559	+1682
Worcester	18821	17083	+1738
State Summary	2201787	2482462	-280675

Table: 9 Maryland relies heavily on the jobs that are produced in Washington, DC., especially Prince George's County. In 1990, only seven counties produced enough jobs to meet the needs of their workers. Data Source: US Census Bureau, Worker Flow 1990.

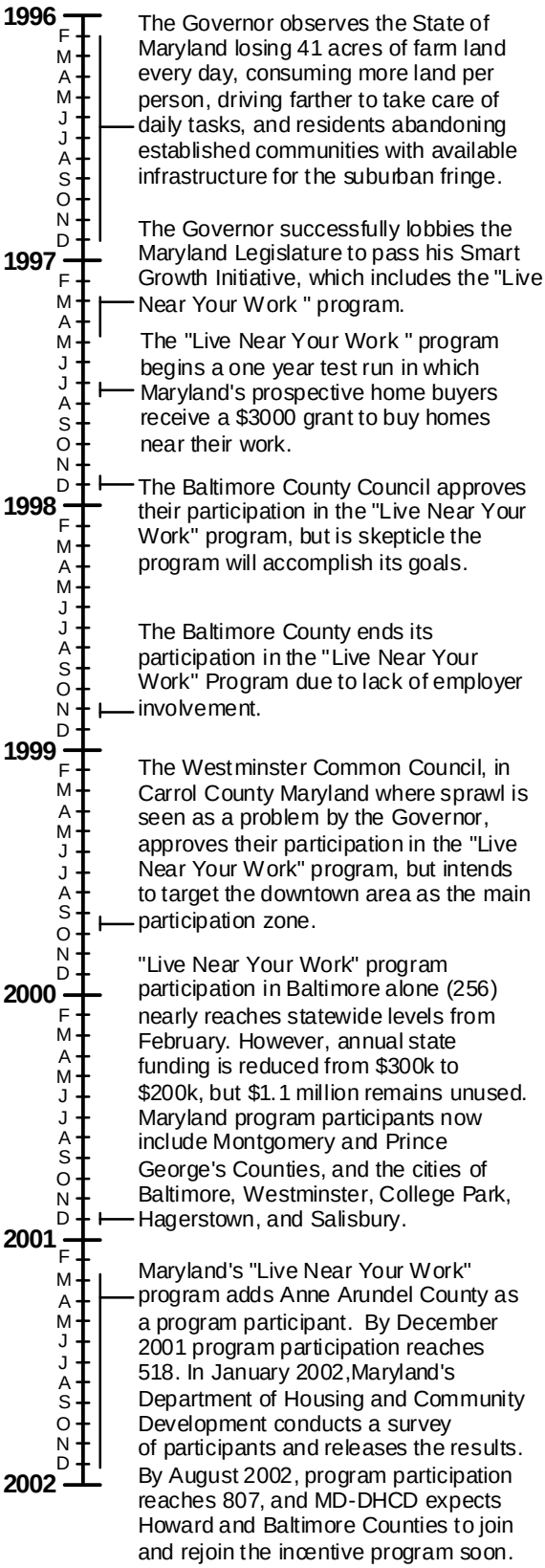

Figure: 1 The historical development of Maryland's "Live Near Your Work" program.

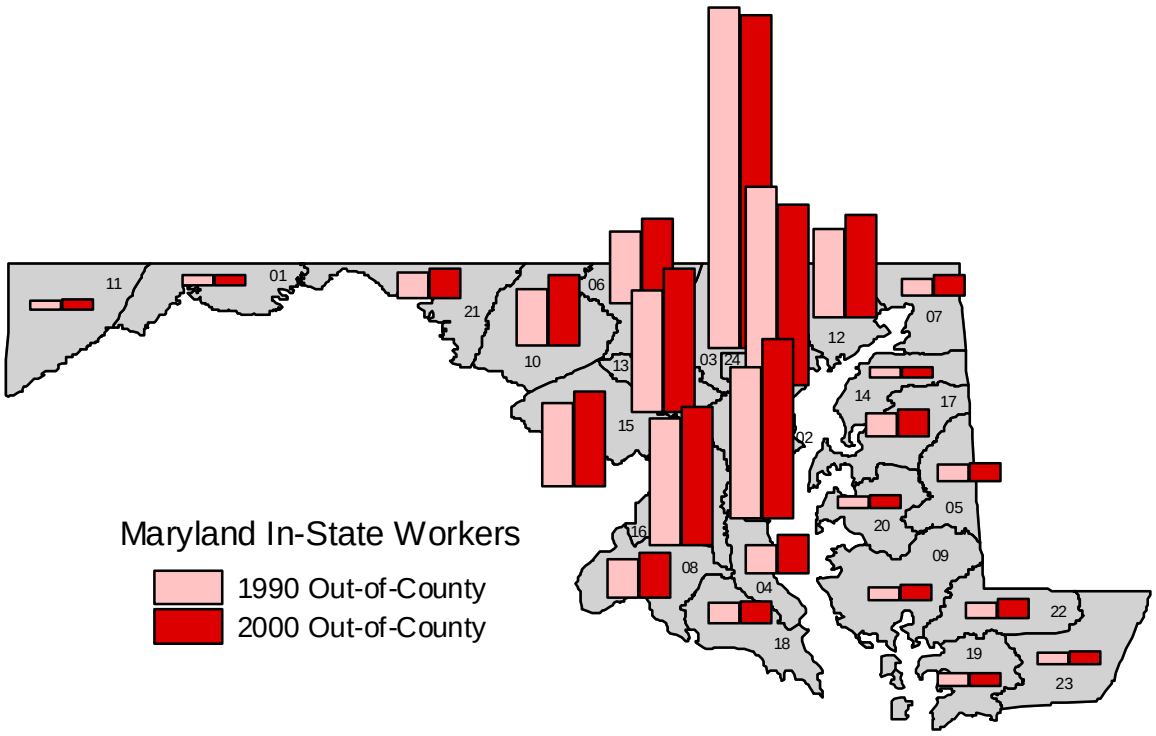

Figure: 2 Maryland in-state workers that do not work in the county they reside in. General increases throughout the state over the ten year period. Exact out-of-county worker totals and percentage increases can be referenced using Table 2. Data Source: US Census Bureau, Place of Work, August 2002.

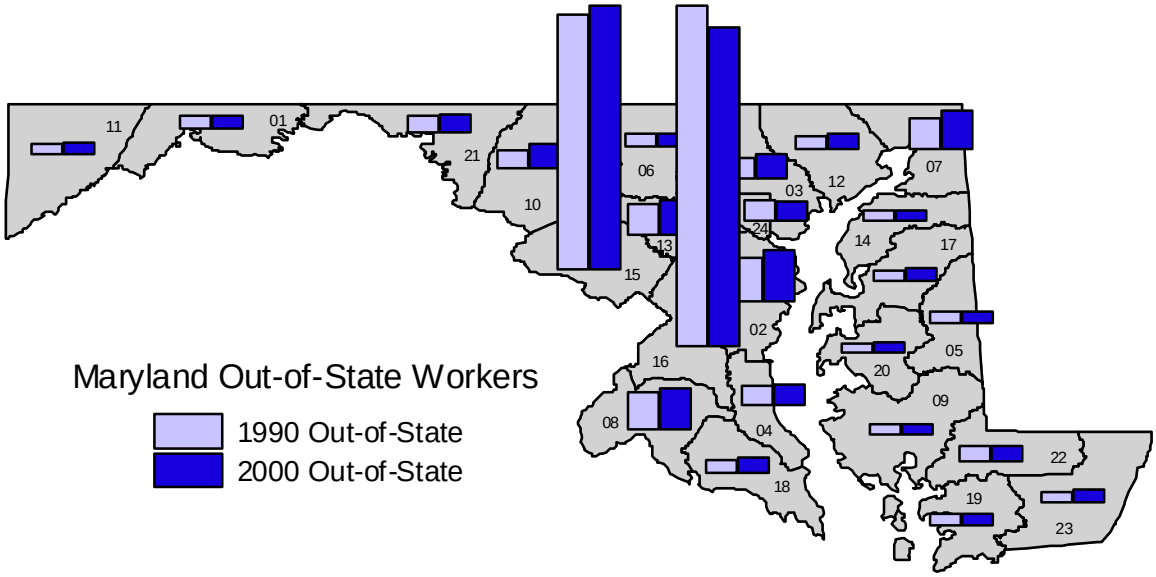

Figure: 3 Maryland workers that do not work in the State they reside in. General increases in the central section of the state over the ten year period. Exact out-of state totals and percentage increases can be referenced using Table 2. Data Source: US Census Bureau, Place of Work, August 2002.

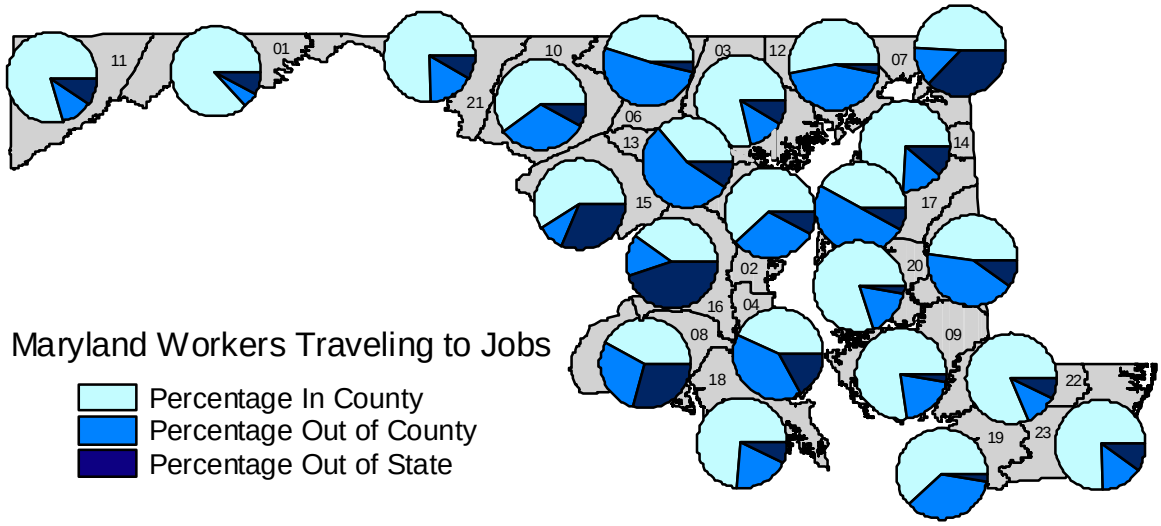

Figure: 4: The area of interest is the middle value, Percentage Out of County. All entries are normalized by total county workers [1990]. Exact county percentages can be referenced using the reference number [See Table 4 - Model 1]. Data Source: US Census Bureau, Worker Flow 1990.

Figure: 5 The area of interest is the middle value, Percentage Out of Region. Regions are defined by a core-county and all its adjacent counties. Anne Arundel and Queen Anne's counties are considered adjacent counties. Exact county percentages can be referenced using the reference number [See Table 4 - Model 2]. The percentage represents workers traveling to a job; (1) within the region; (2) outside the region through the buffering counties; or (3) out-of-state, from the core-county. Data Source: US Census Bureu, Worker Flow 1990.

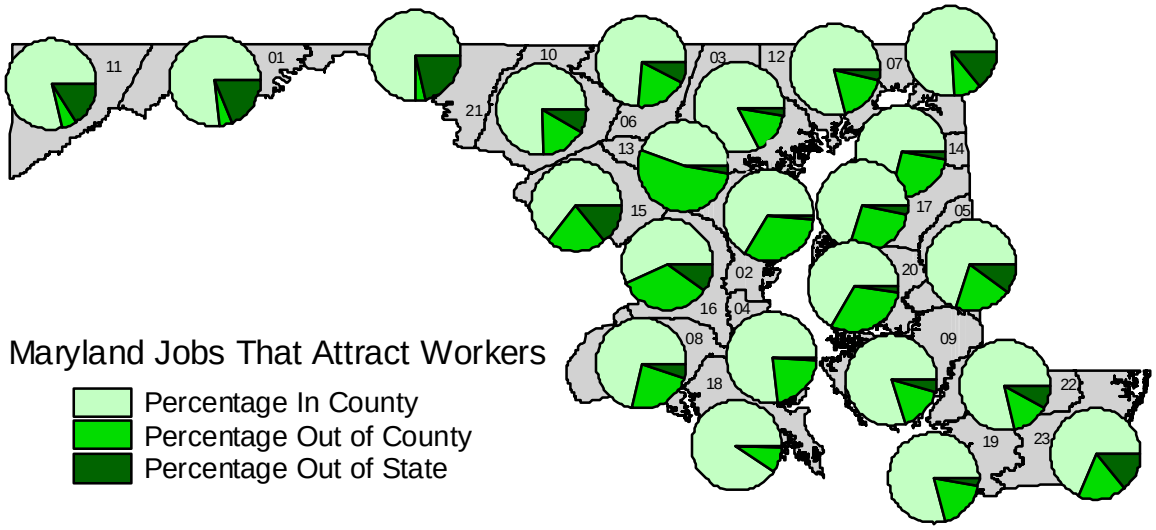

Figure: 6 The area of interest is the middle value, Percentage Out of County. All entries are normalized by total county workers [1990]. Exact county percentages can be referenced using the reference number [See Table 5 - Model 3]. Data Source: US Census Bureau, Worker Flow 1990.

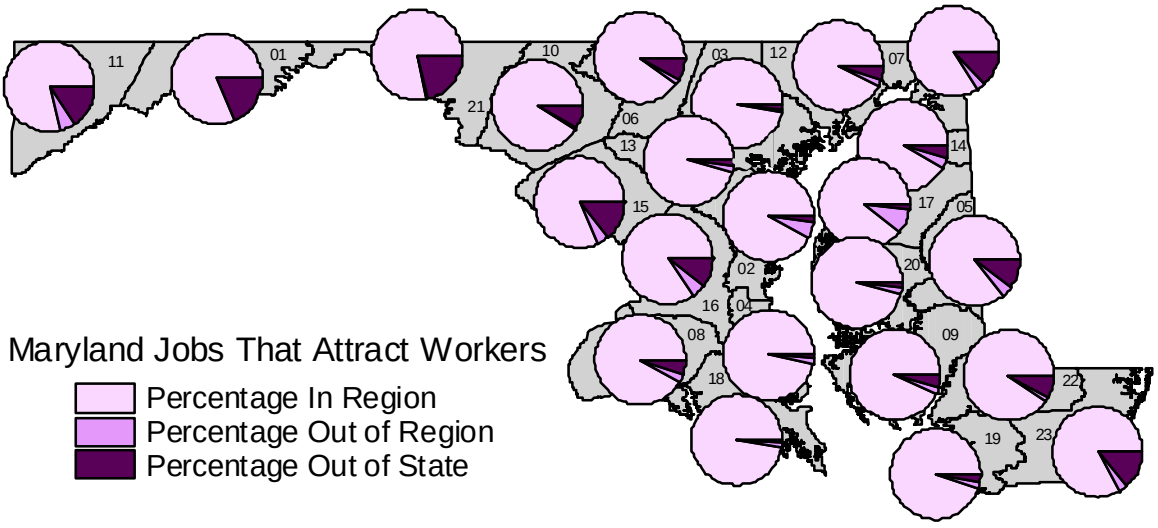

Figure: 7 The area of interest is the middle value, Percentage Out of Region. Regions are defined by a core-county and all its adjacent counties. Anne Arundel and Queen Anne's counties are considered adjacent counties. Exact county percentages can be referenced using the reference number [See Table 5 - Model 4]. The percentage represents jobs that attacts workers from: (1) within the region; (2) outside the region through the buffering counties; or (3) out-of-state, into the core-county. Data Source: US Census Bureu, Worker Flow 1990.