

Linking Social Context with Transportation Planning and Funding

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INTRODUCTION

Recent changes in federal transportation policy have raised expectations that future infrastructure funding priorities will now be more closely linked to the demands of transportation consumers. In the few years since passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), transportation agencies have indeed begun to place greater emphasis on public involvement, environmental impacts and alternative strategies for alleviating congestion. Yet, there remains a definite tendency to utilize "traditional" highway criteria and standards for evaluating and selecting transportation infrastructure, at all levels of analysis.

The purpose of this paper is to explore the criteria currently used to evaluate and select transportation infrastructure projects and the major social and demographic patterns in which the projects occur. The paper begins with a brief overview of the social context in which transportation projects are being selected. This overview is not meant to be all encompassing, but rather to provide the necessary background in which to interpret the actualization of ISTEA's policies. The overview on social context is followed by a detailed discussion of the goals and objectives noted in ISTEA and a review of the criteria typically used to evaluate and select new transportation projects for funding. The paper then turns to a discussion of the interactions between social context and the criteria used to prioritize projects for funding. Finally, the paper concludes with a summary of recommendations for future research which identifies many of the links that must be forged between transportation users and project prioritization.

THE CONTEXT

HOUSEHOLD STRUCTURE

Increases in teen pregnancies, divorce, male mortality and economic hardship have all contributed to important changes in household structure, particularly minority household structure (Worobey and Angel 1990). There has been a dramatic increase in the number of female-headed households in all population groups (Speare and Rendall 1990). For example, in 1986, 13% of white households, 44% of African American households and 23% of Hispanic households were headed by women (Rosenbloom 1995). Roughly one-half of all poor households is female-headed and one-half of these are headed by a woman who divorced or separated (Maudlin 1991).

When women do divorce or separate, the majority experience a reduction in living standard (Maudlin 1990) and those women making the most pre-divorce money experience the biggest decrease in post-divorce living standards (Weitzman 1985; Weiss 1984). Women with children under six years of age are also far worse-off economically after divorce or separation than women with children over age six at the time of separation or divorce (Maudlin 1990). Households headed by women tend to be substantially poorer than households headed by men (Lugaila 1992); this is especially true for women, blacks and the oldest old (Meyer 1990, Wilson 1987). For example, in 1988 the median income for married elderly women was 43% of that for married elderly men.

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Changes in the living arrangements of older women, especially older minority women, have also been dramatic (Bianchi and Spain 1986; Mutchler and Frisbie 1990). Several researchers have noted the increase in the numbers of both black and white elderly women living alone. In just two decades, the percentage of black and white women living alone has increased by 67% and by 60% , respectively (Pampel 1983; Mutchler and Frisbie 1990). Mutchler and Frisbie also found that elderly white women were significantly more likely to live alone than elderly black women. Additionally, elderly Black women tended to experience poorer health, with little adjustment in living style, than white women. Worobey and Angel (1990) found that elderly non-Hispanic women in poor health have more living arrangement options than Black and Hispanic older women in poor health.

ORGANIZATION OF HOUSEHOLD ACTIVITIES

The results of both time-budget and travel activity pattern studies are consistent. Time budget studies show that women do the greatest share of household and family support activities (e.g., cooking, cleaning, yard work, child care, shopping and chauffeuring) (Blau and Ferber 1992, p. 52; Hersch and Stratton 1994; Hochschild 1989; Shelton and John 1993), even in two-earner households in which the woman is employed full-time (Hersch and Stratton 1994; Robinson 1988). Travel activity pattern studies tend to confirm time budget analyses: women tend to make more family and household support trips and spend more time in household and family support activities than men (Hanson and Hanson 1980; Hanson and Johnston 1985; Niemeier and Morita 1995; Rosenbloom 1987; Rosenbloom 1995a,b).

EMPLOYMENT

Part-time employment continues to grow (Tilly 1992). Roughly 40% of all new part-time jobs created in the 1980s were involuntary part-time as a result of slack work, plant down time, or the inability to find a job (Yang and Lester 1988). Furthermore, almost two-thirds of those employed part-time work in low skilled clerical or service occupations. Women are also 2.5 times more likely to work part-time than men (Yang and Lester 1988). The increasing numbers of employed women has also helped to generate new ways to increase job flexibility; 23% of full-time and 60% of part-time working women do not work traditional hours and greater numbers of women now work-share or voluntarily reduce work hours (Rosenbloom 1994a,b; Rosenbloom 1995; Axel 1988).

The effect of household family and support activities on women's employment is striking. Most research tends to confirm that affordability and availability of child care dramatically increases the probability of employment (Cleveland et al 1996). Women are also more likely to participate in the labor market when the family has only one child under age six; women are much less likely to be employed if they have more than one child under six or if they also have children between 6 and 10 (Cleveland et al 1996).

WOMEN'S TRAVEL TRENDS

In most research, gender continues to be identified as an important predictor of travel patterns (e.g., Turner and Niemeier 1997). Employed women tend to have shorter commute-to-work distances and times than employed men (Blumen, 1994; Hanson and Johnston, 1985; Hanson and Pratt, 1990; Madden, 1981; McLafferty and Preston, 1991); women tend to make more household and family support trips (Hanson and Hanson, 1980; Hanson and Johnston; Niemeier and Morita, 1995; Rosenbloom, 1987); women make fewer recreational trips (Hanson and Johnston) and, finally, in contrast to earlier research (Hanson and Hanson 1980; Hanson and Johnston), women's licensing rates and use of private vehicles is now comparable to men (Hanson and Pratt 1990; Rosenbloom 1993a,b).

The presence of children has been associated with shorter commute times for Black, Hispanic and White women (Preston et al 1993) although the effect of children on women's commute times may somewhat depend upon their occupational status. Fagnani (1987) found that unskilled employed women displayed commute times which inversely varied with the number of children in the household: the greater the number of children, the closer the proximity of workplace to home. In female-headed households, the number of children generally reduces the woman's commute distance (Madden 1981).

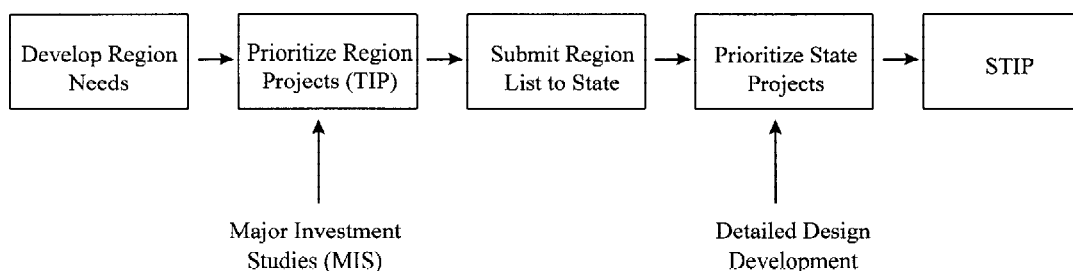
TRANSPORTATION PROJECT SELECTION AND PRIORITIZATION

The ISTEA created new opportunities for funding, which has historically been invested in highways, to be transferred and invested in other modes (e.g. additional transit service or new bike routes). Under ISTEA, each state initiates a statewide transportation planning process that includes all modes of travel and embraces a multi-modal approach to urban transportation planning by:

“... creating methodologies to continue to meet the nation's needs for safe, efficient, and environmentally sound movement of people and goods through more proficient use of the existing transportation infrastructure, while minimizing transportation-related fuel consumption and air pollution...” [ISTEA, 1991, p. 1955].

In accordance with ISTEA, state and regional transportation agencies cooperatively establish a regional Transportation Improvement Plan (TIP) and a State Transportation Improvement Plan (STIP). The STIP is a “spending plan” to allocate funds for transportation projects. By law, the STIP is constrained by the predicted funding levels, thus the number of transportation “needs” may actually be much greater than represented on the STIP. Each STIP and associated funding constraints are reviewed every two to three years depending on the state's funding cycle. The generic process of evaluating, prioritizing and selecting STIP projects is illustrated in Figure 1.

Figure 1.
Typical Planning Process



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Most regional and state transportation agencies begin by developing an areawide “needs” list. This list can include literally thousands of projects for urban areas such as Seattle, WA or Portland, OR. Each regional agency then prioritizes the projects on their particular region’s needs list. The criteria used in the regional prioritization may be developed entirely by the region or in concert with a state transportation agency, but should be directly associated with regional transportation goals and objectives. Conceptual alternatives are also generally developed at this time for the high priority problems identified on the needs lists; the preferred solutions form the basis for the regional TIP. The region may then submit, to the state transportation agency, those projects of statewide significance for inclusion on the STIP. Most state agencies also conduct detailed analysis of the design alternatives for high priority projects of statewide significance on the TIP.

By law, the final STIP must be fiscally constrained and thus clearly cannot accommodate all the projects generally prioritized and submitted by the regions. For example, in Alaska over 1000 multi-modal projects might be submitted by the regions for the STIP and only about 50 can be funded each year. Consequently, some project prioritization must again occur at the state level during the preparation of the STIP. The prioritization criteria used to develop the STIP is, ideally, directly associated with the state transportation goals and objectives. Based on Figure 1, it can be seen that, in general, transportation improvement projects must be evaluated and prioritized first, at the regional level (which results in a TIP) and then again at the state level (which results in a fiscally constrained STIP).

The types of measures used to evaluate and prioritize projects often differ among regions within a state, between regions and the state and among the states themselves. However, the measures must reflect the 15 factors for metropolitan transportation planning (20 for statewide planning) that the ISTEA has established to help direct the development of future multimodal transportation systems. The 15 regional factors are shown in Table 1. For design alternative evaluations, the criteria evaluation is guided by the principles elaborated in the Major Investment Study (MIS) policies.

Table 1.
Summary of Regional Transportation Planning ISTEA Factors

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1. Preservation of existing transportation facilities
 2. Consistency between federal, state and local energy conservation programs
 3. Relieve and prevent congestion from occurring
 4. Transportation-land use interactions consistent
 5. Programming of enhancement activities
 6. All projects included in assessing the effects of improvements
 7. International borders and access to airports, ports etc. considered
 8. Improve connectivity
 9. Identify needs through the management systems
 10. Preserve right-of-way
 11. Enhance freight movement
 12. Use of life-cycle costs in design
 13. Consider the overall social, economic, energy, and environmental effects
 14. Enhance and expand transit services
 15. Include capital investment to increase transit security
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Table 2.
Transportation System Performance Measures

System Performance	No. Trips by Mode Vehicle Miles Travel Congestion Peak Hour Congestion Transit Boardings Highway Level of Service
Mobility	Mobility Options Improved Movement of People
Accessibility	% within 30 minutes Transit/Highway Speeds
System Dev, Coordination	Terminal Loadings System Development Regional Importance
Land Use	Compatibility with Land Use Plans Growth Inducements
Freight	Reduced Goods Movement Costs
Socio-Economic	Homes/Businesses Displaced Max. Economic Benefits Historical Impacts Construction Employment
Environmental	Air Quality Sensitive Areas Natural Env.
Energy	Consumption required for Construction/Operation
Safety	Annual Accidents by Mode Safety Ratings
Equity	Equity of Burden-Benefit
Costs	Capital Costs Operating Costs
Cost Effectiveness	Annualized Costs per Trip or Mile FTA Index
Financial Arrangements	Funds Required Funding Feasibility - Build/Operate Private/Public Sources
Institutional Factors	Ease of Staging and Expansion Non-implementing Agency Support

Source: Rutherford, G.S. (1994). *Multimodal Evaluation in Passenger Transportation Transportations, A Synthesis of Highway Practice*, Table 23, NCHRP Synthesis 201, Trans. Res. Board, Nat. Res. Council, Washington, D.C.

With the passage of ISTEA, the elaboration of new evaluation measures and prioritization methodologies has been an on-going process for both metropolitan and state transportation planning agencies. In 1991, a National Cooperative Highway Research Program (NCHRP) case study survey was conducted of the MIS, regional and state evaluation criteria used by transportation agencies. The purpose of this study was to assemble common measures and identify the areas in which additional research was needed. The results suggested that the state of multi-modal evaluation, and thus project selection, under ISTEA was still in the process of development (Rutherford, 1994). Table 2 presents the classification of evaluation criteria reviewed in the NCHRP case study.

The types of criteria reviewed in the NCHRP study ranged from very traditional measures such as vehicle miles traveled and highway level of service to relatively new additions such as air quality. However, as Rutherford notes, most of the 17 case studies reviewed relied on a very small subset of the measures noted in Table 2. Further, regional studies tended to emphasize integration and coordination more than individual project planning or evaluation studies; equity considerations were extremely rare and criteria associated with mobility, system coordination and integration, land use, freight, energy, safety, cost-effectiveness, equity, financial arrangements and institutional factors were left out more than they were included.

A second recently completed case study on Major Investment Studies (MIS) reveals much the same result as the earlier NCHRP report (Stokes and Niemeier 1996). The primary purpose of an MIS is to act as a project evaluation tool or process for major transportation investment strategies. Generally, the new MIS planning mission requires metropolitan planning organizations to use the following objectives, as a minimum, for developing and evaluating multi-modal transportation strategies:

- [Design] transportation system management and investment strategies to make the most efficient use of existing transportation facilities [ISTEA, 1991, p. 1963].
- [Make] transportation planning consistent with energy conservation programs, goals, and objectives [ISTEA, 1991, p. 1957].
- [Relieve] congestion and prevent congestion from occurring where it does not yet occur [ISTEA, 1991, p. 1957]; including accomplishing trip reductions through Travel Demand Management (TDM) programs [Comsis, 1993], "particularly single-occupant motor vehicle travel" [ISTEA, 1991, p. 1963].
- [Consider] the likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with short-range and long-range land use and development plans [ISTEA, 1991, p. 1957].
- [Identify] transportation needs resulting from the management systems (pavement, bridge, safety, congestion, public transportation, and intermodal transportation) [ISTEA, 1991, p. 1958].
- "[Develop] strategies for incorporating bicycle transportation facilities and pedestrian walkways in projects where appropriate throughout the State" [ISTEA, 1991, p. 1963].

- “[Consider] the overall social, economic, energy, and environmental effects of transportation decisions” [ISTEA, 1991, p. 1958].
- [Take into account] the feasibility to unify and connect existing transportation systems within the metropolitan area to reduce energy consumption and air pollution while promoting economic evolution [ISTEA, 1991, p. 1915].
- Specifically for Clean Air Act Amendments of 1990 (CAAA), transportation improvement programs must provide for attainment of the National Ambient Air Quality Standards (NAAQS) which is covered under a required State Implementation Plan (SIP is a plan to meet CAAA & NAAQS standards to achieve and maintain clean air status) [23 CFR 450.320, 1995, p.113].
- “[Define] methods to expand and enhance transit services and to increase the use of such services” [ISTEA, 1991, p. 1958].
- “[Bring] methods for integrating new technology and alternative modes, demand management / reduction, and other recent innovations in transportation planning into today’s existing infrastructure” [ISTEA, 1991, p. 1914].

The specific representation of each MIS objective, in terms of an actual evaluation measure, is generally left to the discretion of the individual transportation agencies. The results of the MIS case study suggest that most agencies conducting transportation investment analyses continue to rely on pre-ISTEA evaluation criteria. Consistent with Rutherford’s earlier NCHRP assessment, the Stokes and Niemeier MIS case study finds a plethora of evaluation criteria associated with system performance, financial costs and revenues, cost effectiveness, environment and financial arrangements while use of criteria reflecting accessibility/mobility, system development or coordination, land use, and freight or energy appears to pose a somewhat greater challenge.

A brief review of three states evaluation criteria helps to establish the basic structure of the state-level system evaluation and programming process. Referring to Figure 1, most states prioritize construction projects each biennium. To accomplish this prioritization under ISTEA, each state must develop a new set of state-level evaluation criteria sensitive to the factors noted in Table 2 and then, using the criteria, select a subset of projects identified on the STIP to fund. Three states have recently completed updates of the evaluation criteria used for selection of projects: Washington, Oregon and Ohio. Table 3 presents and contrasts the criteria used in each state for each funding cycle to set the fiscally constrained STIP.

Washington and Ohio also weight criteria to parallel the emphasis of the state transportation goals and objectives: Washington places well over 50% of the criteria weight on cost-efficiency while transportation efficiency can carry up to 55% of the total weight for Ohio. Washington’s cost efficiency criterion is essentially a representation of travel time benefits (which typically comprise 80% of transportation improvement benefits) weighted by project cost. The value of travel time savings is based on a statewide average. Ohio’s transportation efficiency measures are traditional highway related performance measures and are typically difficult to interpret in a multi-modal setting.

INTERACTIONS BETWEEN SOCIAL CONTEXT AND PRIORITIZATION

The performance of any transportation system should ideally be linked directly to the needs of the transportation consumers. As it stands, most transportation evaluators continue to use transportation performance criteria that do not reflect travel needs relative to contemporary ethnic, racial or gender social contexts; this clearly continues to promote historical infrastructure trends. In short, the needs of the consumers should be reflected in the criteria chosen to measure—or evaluate—the performance of transportation infrastructure.

For example, *accessibility*—in those state and regional programming frameworks where it is evaluated at all—is often defined in terms of employment (i.e., the number of workers within x travel time of work). The emphasis of this criterion is based on the concept of decreasing the distance between work and home. For women and poor minorities, *accessibility* to household and family support activities such as affordable child care and community support structures is at least as important as accessibility to jobs. Moreover, for female-headed households, accessibility to job training centers and post-secondary education facilities is also critical if we wish to increase the probability of this cohort's long-term economic success. Ignoring these aspects of accessibility creates an inherent, mostly gender, bias in the use of the measure and identifies a gap between the use of *accessibility* by transportation planners and its importance to the certain segments of consumers.

Further, Table 2 suggests that there may be trade-off's to be considered in terms of representative evaluation criteria. Recent legal tangles in New York and Los Angeles suggests that the transit performance criteria requires modification—or perhaps elaboration. For example, using the peak period number of trips per mode and transit boardings as measures of transit efficiency (See Table 2) is misleading unless the actual user is identified. It has been demonstrated numerous times that minority travel patterns differ markedly from non-minority travel patterns; transit travel tends to be conducted more in the off-peak period and be of shorter length for minorities (Taylor et al 1995; James and Niemeier 1996).

Linking the infrastructure evaluation and selection criteria to context requires a deeper understanding of the complete system in which these communities of women and minorities function. By far, the easiest parameter to re-examine is the traditional conceptualization of “work.” The economic “work” benefits accrued as a result of improved transportation system performance are usually represented through savings in travel time. The idea of valuing travel time savings has traditionally been discussed in terms of added time for engaging in market production or leisure (Hensher, 1995). In other words, the opportunity costs of travel time is lost wages. Stating this in a more relevant context for women requires inquiring about the use—and value—of travel time savings for conducting additional household and family support activities (which is unpaid labor in the economic sense), or in the case of African-American women, Latina's and other women of color, unpaid or low paid community-based employment (Naples, 1992). For women, the opportunity costs of travel may actually be the value placed on household and family activities (which might exceed lost wages).

The criteria missing, or minimally considered, in Table 2 are almost as important as the criteria represented. It is insightful to note that both equity and energy measures are missing from Table 2. The energy component is important because it raises issues of measurement; how do we adjust for poorer single auto households, which tend to make fewer overall trips but drive less efficient autos. Further, how are benefits for less energy consumption to be assigned to those households having zero autos? If women make more trips than men, because of household and family support activities, should they be assigned poorer energy consumption values?

Equity drives many of the trade-off's in these types of analyses and yet the criterion is infrequently, if at all, represented. The current implicit reliance on the “fairness principal” (i.e., tax burdens equal

benefits), forces the transportation system to, by definition, provide more services for the rich than the poor and more services for men than for women. It is unclear that this equity measure, appearing in many transportation alternative analyses, is actually contextually useful (Niemeier and James, 1996). For those few circumstances in which equity is defined in terms of economic principles (i.e., income transfers), there is little follow-up to ensure that transfers, as a result of transportation infrastructure improvements, actually occur between high and low income groups.

Although ISTEA is clearly motivating changes in the planning process itself (Meyer 1992), the criteria used throughout the process has actually changed very little. Perhaps an alternative way to think about evaluation criteria is examine social context. Table 4 presents one possible organizational framework for linking the major demographic and activity patterns in a relevant context. The purpose of this table is not to define a strict typology but rather to elucidate the social constructs which may, in turn, guide the development of future transportation efficiency evaluation criteria.

CONCLUSION

The criteria currently used to select and evaluate transportation infrastructure may work well for an average traditional nuclear family; the incompatibility lies in the fact that these families are fewer in number than ever before. The dramatic changes occurring in demographic and travel patterns are a reflection of greater numbers of female-headed households, more migration of ethnic groups and greater access to automobiles. Current transportation project evaluation and selection criteria simply do not account for these “new” populations. In short, most of the transportation evaluation and selection criteria do not reflect the types of performance standards necessary for those individuals on the “travel margin”—predominantly women and minorities.

If our project evaluation and selection criteria do not adequately reflect the needs of the major consumers, then perhaps not only refinement of existing criteria is needed but also greater elaboration of regional and state transportation goals and objectives. For example, Rosenbloom’s research provides clear evidence that current TSM/TDM federal objectives conflict with women’s most basic travel requirements (1993a). Other conflicts may include unreasonable expectations of transit service to low density areas and too much emphasis on reducing congestion without linking it to social context.

New research is needed to interpret how social context is affected by, and affects, current transportation infrastructure evaluation and selection criteria. Does vehicles miles of travel represent an improvement in mobility or a reduction when specific cohorts are taken into account? How can the conflicts between criteria be minimized? Research is also needed to develop new transportation selection and evaluation criteria that adequately reflects contemporary context, especially for women and minorities.

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Table 3.
STIP Prioritization Criteria: Washington, Oregon and Ohio

Evaluation Category <i>Actual Criteria</i>	Factor Values ¹		
	WA	OH	OR
Transportation Efficiency			
<i>Average Daily Traffic</i>		0-20	
<i>Volume to Capacity Ratio</i>		0-20	
<i>Highway Level of Importance</i>		0-5	
<i>Corridor Completion</i>		0-10	
Safety			
<i>Accident Rate</i>	<i>Incl Cost-Eff.</i>	0-15	<i>Incl Cost-Eff.</i>
Economic Development			
<i>No. of Non-Retail Jobs Created</i>		0-10	
<i>Evidence of Job Retention</i>		0-5	
<i>Economic Distress - Severity of Unemployment</i>		0-5	State Rank
<i>Ratio of Jobs Created: Project Cost</i>		0-5	
<i>Level of Private Sector Capital Attracted</i>		0-5	
Financial Arrangements			
<i>Private/Local Participation</i>	<i>Incl Cost-Eff.</i>	0-20 ²	<i>Incl Cost-Eff.</i>
Multi-Modal Connections			
<i>Multi-modal or Regional Feature</i>	0-10	0-5 ²	
<i>No. Multi-Modal Connections</i>			CM ⁴
Cost-Efficiency			
<i>Benefit-Cost Analysis</i>	B/C ³		NPV/C ³
System Integration			
<i>Connectivity</i>	0-10		
Community Support			
<i>Community Project Rank</i>			CM ⁴
Environment			
<i>Most Natural Resources</i>	CM ⁴		CM ⁴
<i>Most Cultural Resources</i>	CM ⁴		CM ⁴
Accessibility			
<i>Minimum tolerable levels of service (MLOS)</i>			0-1 ⁵
Land Use			
<i>Compatibility</i>	0-19		-6 to 6

¹. Point ranges are given for qualitative factors; actual values are used for quantitative factors.

². Used in assignment of bonus points.

³. Present Value Benefit to Cost Ratio (B/C), Net Present Value to Cost Ratio (NPV/C). For both states, cost categories include preliminary engineering, right-of-way, operations and maintenance and construction and are reduced for private contributions; benefit categories include travel time and accident reductions savings.

⁴. One or more Quantitative Composite Measures

⁵. Based on whether a project helps bring a facility to the published MLOS.

Table 4.
One Possible Context-Activity Typology

Traditional Nuclear Family	<p><i>Demographic</i> High rates of separation and divorce, especially among minority women Women are more likely to be employed in part-time labor Men are increasingly likely to participate in involuntary part-time labor The majority of married women with children under 6 in workforce More likely to live in the suburbs Women’s licensing rates are comparable to men’s Model family for most retirement age programs</p> <p><i>Activities</i> Women conduct most of the household and family support activities Men spend more time than women engaged in work travel Women with children tend to spend less time in the work commute</p>
Female-Headed Households	<p><i>Demographic</i> More likely to be poor, elderly and/or African-American, Hispanic More likely to live in the urban area Employment linked to affordability and availability of childcare Postsecondary training increases likelihood of employment for low income women Job training increases per capita income after divorce Those remaining in poverty are more likely to experience health problems Most women experience a lack of economic security without a spouse Increasing proportion of elderly women-headed households</p> <p><i>Activities</i> Women conduct most of the household and family support activities African-American women also tend to engage heavily in community-work activities The number of children and travel time are inversely related</p>
Poor Households	<p><i>Demographic</i> More likely to be female, elderly and/or African-American, Hispanic More likely to live in the urban area</p> <p><i>Activities</i> Lowest access to automobiles Fewer trips overall</p>

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