Pricing Comes to Minnesota: Attitudinal Evaluation of I-394 HOT Lane Project

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ABSTRACT

The I-394 MnPASS lanes opened in Minneapolis, Minnesota in May 2005. As High-Occupancy Toll (HOT) lanes such as these are relatively new to the United States, comprehensive evaluation data is scarce. Consequently, the Minnesota Department of Transportation, which operates the lanes, is sponsoring rigorous evaluation of this facility, including both technical and attitudinal evaluations. This paper discusses the methods and results of the latter, including a description of the development of the longitudinal panel survey methodology, and a summary of the results from the baseline wave.

INTRODUCTION

I-394 MnPASS Overview

In May 2005, Minnesota joined several other states by implementing High-Occupancy Toll (HOT) lanes on Interstate 394 from downtown Minneapolis through its western suburbs (*1*). Branded as the I-394 MnPASS lanes, they operate in a similar fashion to facilities in Southern California, where commuters purchase electronic transponders and drive through gantries, which automatically deduct the toll. Tolls are variable and determined not by the number of commuters in the general purpose lanes, but rather by the number of commuters in the HOT lanes. The more congested the lane becomes, the higher the toll. Electronic signs update commuters as toll prices fluctuate; however, the price paid on entry remains valid for the entire commute. Typical peak period tolls run $1 to $4, but can reach as high as $8 during periods of unusual congestion. The system runs 11 miles in length and is divided into two sections: west of highway 100, the MnPASS lanes are separated by a double white strip line barrier with multiple points of entry; and east of highway 100, the lanes are 2 barrier-separated reversible lanes, with access points only at each end. The toll revenue pays not only for the capital costs, but is also reinvested into the corridor. The goal of the system is to maintain the free flow nature of the managed lane and improve the overall effectiveness of corridor. By imposing a value on the amount of time saved, those with a high value of time (e.g. late for an airplane) pay for a guaranteed rate of travel, those that do not, benefit indirectly as fewer cars travel in the general-purpose lanes (*2*,*3*).

Need for Evaluation

Although other HOT lanes exist, they remain a new enough concept that there is little empirical information on their impacts for transportation planners and policy makers to use when making decisions about similar facilities. As the I-394 MnPASS lanes were the first of their type in Minnesota, the Minnesota Department of Transportation (MnDOT) had an interest in evaluating the effectiveness of this tool in achieving objectives for the corridor, and also for potential future variable-toll lanes. In conjunction with the State and Local Policy Program (SLPP) at the University of Minnesota's Humphrey Institute of Public Affairs, NuStats and Cambridge Systematics, a two-pronged approach was developed: on the one hand, to collect technical data to measure the performance of the lanes, and, on the other, to conduct a longitudinal attitudinal panel survey to measure how the public perceives its effectiveness. Of the evaluation efforts that had been done on other HOT lanes, none had been as strategic or comprehensive in this data collection process, particularly with respect to setting up data collection prior to implementation. This paper focuses on the design and results of the baseline attitudinal survey.

PROCESS FOR EVALUATING: SETTING THE BASELINE

Like value pricing, evaluation theory is a relatively new discipline, but the latter provides a useful method for discussing applications of the former. Scriven defines evaluation as "the process of determining the merit, worth, and value of things, (*4*)" providing a method of synthesizing data produced and collected by a project. However, Patton provides the basis for including evaluation as part of implementing a value-pricing project by emphasizing the importance of applying the results of an evaluation (*5*). "Program evaluation is the systematic collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future programming. Utilization-focused program evaluation (as opposed to program evaluation in general) is evaluation done for and with specific, intended primary users for specific, intended uses (*6*)." Patton stresses the importance of knowing for what purpose the evaluation is being performed. Evaluations are more than simply determining whether goals have been met. Patton's evaluation definition contains three interrelated components, a systematic collection of information, potentially broad range of

topics, and possibly multiple judgments and uses. A systematic collection of information involves carefully devised methodologies, which take into account multiple factors designed to yield results. To this end, the evaluation team worked to establish a process that would not only collect comprehensive, reliable data after the project opened, but also collect similar information beforehand, in a baseline survey.

Patton points out that everything from how the data will be collected to budgetary issues remains up in the air until the decision makers or stakeholders are established (*6*). The stakeholders then need to work through and develop a plan for the following six "personal factor" issues as a framework.

- Find people who need or care about the evaluation.
- Identify users of the program. Locate enthusiastic people who will remain committed.
- Decide the quantity, quality, and timing of contact with intended users. Sensitivity to their schedules and lives should be considered.
- Build and sustain interest in the project among users and evaluators.
- Implement a communication plan. Use evaluator's people skills to navigate conflicts and political quagmires.
- Include all stakeholders in the process. Some projects will have multiple levels of stakeholders who may only want to be involved to a limited degree. Tailor communication to accommodate them (*6*).

To ensure the survey design addressed stakeholder interests, an evaluation team was assembled that included representation not only from several offices within MnDOT, SLPP and NuStats, but also from the Federal Highway Administration, MetroTransit (the major transit operator in the area), the consultant team planning for the implementation of the project, the communications and marketing team that would oversee the actual marketing and sale of the toll transponders, and other researchers that may have an interest in the data. This team worked to settle on an 18 month evaluation that would operate in conjunction with the technical evaluation, sharing data when appropriate for comparison, and which would obtain data of interest to all stakeholders, to the extent financial resources allowed.

Other HOT Lane Projects

With the stakeholders and framework established, the team looked to evaluations of other HOT lane corridors for input regarding best practices, and opportunities for improving them, in setting up longitudinal panel surveys.

SR-91 Orange County

SR-91 opened in December 1995 as the first value-priced roadway in the nation. The 10-mile stretch connects the employment centers of Orange County and southern L.A. County through the addition of two "FasTrak" lanes in each direction. The lanes are separated from the general-purpose lanes by a "soft" barrier consisting of painted lines and pylons. Heavy commercial vehicles are not permitted on the route and carpools travel at a discounted rate. No tollbooths exist, only electronic gantries, users are required to purchase and display small electronic transponders called "FasTrak."

To implement this experiment, Orange County Transportation Authority (OCTA) turned to a private company, California Private Transportation Company (CPTC) for both funding and operation (*8*). The successes of CPTC encouraged OCTA to buy back the facility in January of 2003, thereby eliminating a non-compete clause and allowing an auxiliary lane to be built (*9*).

Edward Sullivan, from Cal Poly State University in San Luis Obispo, has studied the corridor extensively. The objective of Sullivan's nearly six years of research was "to develop information and insights for improved understanding of travelers' reactions to market-based road pricing and the other innovative features of this unique facility (*10*)." To accomplish this goal, Sullivan's team conducted telephone surveys of approximately 500 drivers whose license plates had been captured while traveling on SR-91 the previous week. They were asked a series of approval related questions in the fall of 1995 (prior to the opening) in regards to tolling. Approval rating for the tolling of roads came back at around 65 percent depending on the user groups. When asked about variable priced tolling, respondents were significantly less enthused with an approval of about 45 percent. Additionally, Sullivan investigated the average number of vehicles per day (AVD) using the roadway. He found that in December 1995 (just prior to opening) that AVD stood at 198,563 with an estimated rate of growth of 450 cars per month. However within 3 to 4 months of the HOT lanes opening, AVD had increased by 22,000. Following this explosive growth,

the rate of growth returned to about 450 cars monthly. Sullivan attributed this dramatic increase in usage largely to a shift from alternate routes.

Aside from the sheer number of vehicles traveling, Sullivan also examined shifts and changes in travel modes of the vehicles. Although a number of former SOV drivers converted to HOV, the number converting the opposite direction resulted in a net loss of 7 percent in HOV drivers from 1995 to 1996. These results were derived from 620 samples of which 110 reported a mode change. The highway users reported no shift toward transit, however the survey of transit users, specifically on Metrolink, the parallel commuter rail that opened in October of 1995, yielded noteworthy results. Ninety-five percent of riders were former highway users of which 30 percent were HOV, meaning that a disproportionate number of HOV users were removed from the system just prior to opening. A similar pattern was observed with bus riders (*8,10*).

Sullivan's evaluation was accomplished through a variety of opinion surveys, rather than maintaining a longitudinal panel throughout the study. The opinion survey conducted prior to the implementation of the SR-91 HOT lanes yielded results and a baseline from which to work, but it lacked the ability to track the change in an individual's perception of SR-91 road pricing over time. Later Sullivan's team attempted to rebuild the panel, but only 332 participants remained out of the original 500, leaving a panel supplemented with new participants and statistically susceptible (*10*). Additionally, no control group was included in Sullivan's survey.

I-15 San Diego

The successes on SR-91 contributed to the investigation of utilizing road-pricing solutions on the congestion-clogged I-15 (*11*). In December 1996 (one year after the opening on the SR-91 facility) a demonstration project began on an 8.5 mile stretch of I-15. The underutilized reversible "Express Lanes" were opened to SOV through a tolling system, transforming them into HOT lanes. The reversible lanes, which are separated from the general-purpose lanes by a barrier, allow inbound traffic in the morning hours and outbound traffic in the evening through one point-of-entry and one point-of-departure.

The first phase enabled SOV drivers to purchase monthly passes (dubbed ExpressPass) that permitted unlimited use of the facility, while carpools remained within the lanes without a charge. A little over a year later, in March 1998, the second phase introduced windshield-mounted transponders for automatic vehicle identification of SOV drivers wishing to use "FasTrak." The transponders allowed a change in the toll collection method from monthly permits to a per-trip fee that was based on congestion levels. When congestion appeared, variable tolls charged to SOVs rose to maintain free-flow conditions within the lanes. Carpools continued to travel free of charge (*12*).

Wilbur Smith Associates and Janusz Supernak, of San Diego State University, have been researching congestion pricing on Interstate 15 since conception. While Wilbur Smith Associates conducted the baseline market survey, Supernak and a host of other researchers have investigated the impacts and attitudes of those directly affected by the changes. In the fall of 1996, Wilbur Smith Associates' baseline survey targeted SOV and HOV drivers as well as transit/vanpool riders who use I-15 from Ted Williams Parkway to the SR-163 split. A random dial telephone survey of 400 homes, three focus groups, and 141 face-to-face interviews with transit riders were employed by the firm to extract the public's attitude prior to the implementation of the changes. Approximately 70 percent of those polled expressed at least "somewhat" favorable view of tolling. Opposition by carpoolers stood at over 70 percent expressing at least a "somewhat" opposed view of tolling (*13*). While the results yielded were statistically reliable, those surveyed were not contacted again, disallowing any possibility of observing changes of opinion within the same people.

That missing component contributed to Supernak and his team of researchers developing a panel study to assess changing public attitudes over a three-year period with five surveys. A control group was set up within the I-8 corridor to allow for identification of any regional changes and attempt to reduce outside influences, such as gas prices. The Wave 1 survey was administered to approximately 1,500 residents in fall 1997. Researchers concluded that the majority of non-ExpressPass I-15 drivers were unaware of the program. Among those that were aware, a majority believed that it was acceptable to control carpool lane congestion through pricing (*14,15*). During the second wave of the study, in spring 1998, following the switch to variable pricing and FasTrak, researchers replaced those who refused a second interview or could not be found or moved away with similar category users. Thirty-four

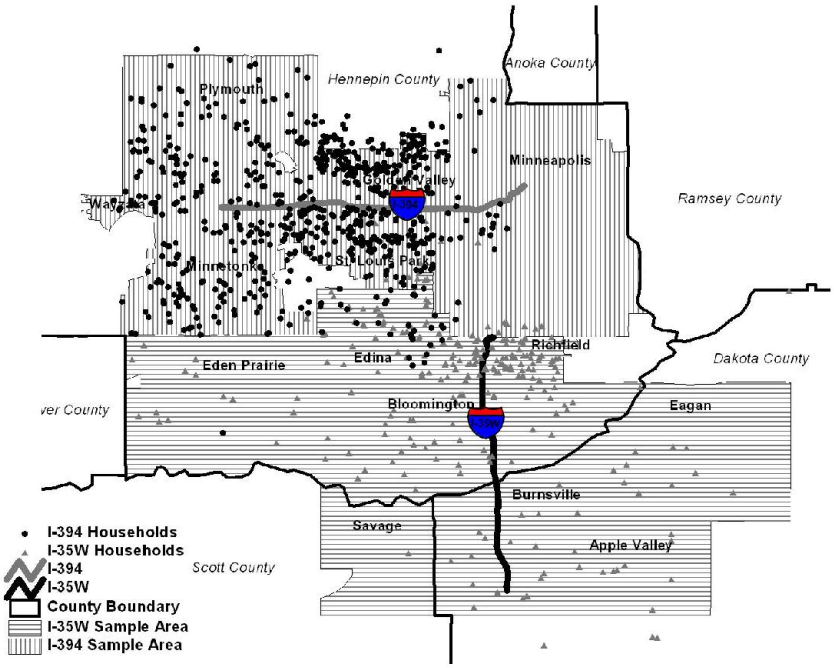
percent (516 of 1,501) of the participants had to be replaced for Wave 2; similar attrition took place between Waves 2 and 3. The transition from the ExpressPass to FasTrak obligated the researchers to change some of the questions, however, the goal of assessing public opinion remained the consistent. As a whole, commuters recognized a reduction in commute time. While carpooling remained fairly constant on the control interstate (I-8), the incidences of carpooling increased on I-15 (*16*).

Supernak's work examined the shifts in public attitude regarding the change from a monthly pass system, to one of value pricing. The problem, however, is that his survey did not begin early enough to capture the attitudinal shift prior to the implementation of tolling in general. With Wilbur Smith Associates' information supplementing, conclusions can be inferred, however, no hard data exists. Even Sullivan's work on SR-91 maintained just over 300 people between his panel surveys, leaving himself vulnerable to statiscal criticism.

I-394 BASELINE SURVEY METHOD

The attitudinal panel survey for the I-394 MnPASS evaluation was developed to build on the work of Sullivan and Supernak. It consists of three periods (or waves) of data collection, with the first wave taking place before implementation of the HOT lane. To assist in determining causality in future waves, a control samples were drawn simultaneously with the treatment sample. The treatment sample consisted of households selected from the I-394 travel shed, and the control sample consisted of households in the I-35W travel shed (See Figure 1). I-35W was selected as the control because it was the other highway in the region to have an HOV lane.

FIGURE 1: Location of Households for 1,000 Completed Interviews



The sample was not only defined geographically as shown in Figure 1, but also defined based on roadway usage. The I-394 stratum was comprised of persons who used I-394 between Highway (Hwy) 101 and I-94, or a parallel segment of Hwy 55, in the five weekdays prior to being interviewed. The I-35W stratum was comprised of persons who used I-35W between Hwy 62 and Hwy 13 or a parallel segment of Hwy 77, in the five weekdays prior to being interviewed. The allocation of sample across each of the waves attempted to optimize the number of interviews within the I-394 stratum. The baseline survey design assumed that 750 interviews (out of 1,000) would be completed with households in the I-394 stratum.

Developing Sample

Population of Inference

The population of inference (or population under study) consisted of those individuals 18 years of age or older, residing within the target travel sheds, who have traveled the target segments of I-394, Hwy 55, I-35W, or Hwy 77 between 6am and 9pm at least once in the five weekdays prior to the day of interview. To efficiently sample this population, specific areas within the I-394 and I-35W travel sheds were pre-identified as being the likely residential locations for I-394 or I-35w users based on empirical data provided by the Metropolitan Council. Origin and destination data from the Household Travel Diary Survey, conducted as one element of the Twin Cities Metropolitan Area Travel Behavior Inventory (TBI), were used to identify the areas that generated the highest proportions of target trips. Sample was then proportionally allocated to those areas. For example, the I-394 travel shed had a total of 62 separate areas of which six were sampled. The I-35W travel shed had a total of 28 separate areas of which seven were sampled. Table 1 provides information on the sampled areas, such as (A) the volume of trips as measured in the TBI, (B), the percent of all trips as measured in the TBI, (C) and the percent of all trips as measured in this baseline survey. (Column B does not total 100% because the sampled areas do not cover all areas contributing to the total trips).

TABLE 1: Sample Areas, I-394 & I-35W

AREA	TBI TRIP VOLUME (A)	PCT OF ALL TBI TRIPS (B)	PCT OF ALL BASELINE TRIPS C)
I-394 Strata			
Total (62 Separate Areas)	386,473		
Golden Valley	44,943	11.6	26.1
St Louis Park	69,000	17.9	26.0
Minnetonka	53,113	13.7	25.1
Plymouth	24,802	6.4	16.1
Wayzata	8,875	2.3	3.4
Minneapolis (Western Tracts)	17,389	4.5	3.1
I-35W Strata			
Total (28 Separate Areas)	295,734		
Apple Valley	17,258	5.8	6.4
Bloomington	68,106	23.0	17.8
Burnsville/Savage	24,985	6.8	7.4
Eagan	17,123	5.8	5.6
Eden Prairie	15,522	5.3	6.0
Edina	67,342	22.8	22.1
Richfield	39,383	13.3	34.7

Sample Objectives

The sample design implemented for the baseline study incorporated three explicit objectives. The first objective was to ensure that dialing productivity would be as efficient as possible given the random nature of travel incidence along I-394 and I-35W. This was achieved by analyzing those areas most likely to generate the highest incidence rates and fielding sample in those areas only (see Table 1).

The second objective consisted of attempting to capture travel behavior on the I-394 corridor that reflected normal commuting patterns (i.e., travel from west to east in the morning and from east to west in the evening) to mirror the operational hours of the current HOV lanes. The baseline survey data indicated that approximately 90

percent of trips reported by respondents traveling on I-394 between 6-9am were in the west-to-east direction. For reported afternoon and evening trips, 60 percent from 3-6pm were traveling east to west, as were 54 percent from 6pm-9pm.

The third and final objective was to profile trips based on set proportions by time of day: 6am-8:59am; 9am-12:59pm; 1pm-2:59pm; 3pm-5:59pm; and 6pm-9pm. Desired proportions were to obtain 80 percent of trips in the peak periods and 20 percent in all other times. Overall, sample percentages were 75 percent in the peak periods and 25 percent in all other times.

Field Data Collection

Data collection for the baseline portion of the Attitudinal Panel Survey was completed between November 19th and December 17th, 2004. A total of 16 interviewers participated in data collection over this time period; dialing times ran from 4pm-9pm during weekdays and 11am-7pm on Saturdays and Sundays. Calls made outside of those times were done so in response to a respondent's request. No interviews were conducted during the Thanksgiving holidays (November 24 to 27); however, interviews were conducted immediately after so some reported travel might have happened during that time. The data included a date of interview; a date of travel was not captured.

A total of 1,030 respondents completed interviews, of which 1,000 were full completes, seven were partial completes, and 23 were disqualified after data editing. A response rate was calculated using American Association of Public Opinion (AAPOR). Using AAPOR's most conservative formulae (total completes / completes + eligible + percent of ineligible sample) a response rate of 38 percent was experienced. An alternative, widely used, method is to determine the percentage of respondents that complete interviews relative to numbers dialed in which an eligible household was contacted. Based on this calculation, our response rate would be 66 percent (68% in I-394 areas and 64% in I-35W areas).

Survey Materials Design

CATI Instrument

Most of the survey data was collected though the use of a computer-assisted telephone interview (CATI) questionnaire. The questionnaire was developed based upon the objectives and research questions identified by the attitudinal evaluation team described above. In addition, the Attitudinal Panel Survey questionnaire drew from questionnaire items included in instruments used to evaluate SR 91 and I-15. Using this foundation, NuStats and staff of the State and Local Policy Program at the Humphrey Institute of Public Affairs at the University of Minnesota developed the survey materials to track following information, among others, over time.

- Reported use of the I-394 corridor by mode, time of day, and purpose, and
- Attitudes and perceptions regarding:
    - The I-394 MnPASS project
    - Congestion in the corridor,
    - Toll rates, and
    - Travel time and travel time reliability.

The final questionnaire contained items to screen for eligibility; to capture attitudes and opinions; to assess awareness, knowledge, and acceptance of MnPASS; to collect both usual travel behavior and also detailed information about a reference trip; to identify the demographic and socio-demographic characteristics of respondents; and to recruit participants into the panel.

Stated Preference questions

An important section of this instrument was the stated preference (SP) questions that were developed to measure willingness to pay for use of the HOT lane. The SP measurements that were used in the Attitudinal Panel Survey were unique in that two different methods were used. The reasons for the two methods were: (1) to add confirmatory credibility to the baseline SP results, assuming similar estimates of demand resulted, and (2) to assess which of the two methods better estimated the demand as measured in the Wave 2 panel survey.
Both methods were introduced with the same text and used the same trade-off question formats, as shown below.

Now assume you're making the same trip in the future that you just told me about.
It's a trip on the same day, at the same time of day, for the same purpose, and you're under the same time pressures. You enter the freeway, I-394, and find out that you can make this trip using a toll lane and paying via electronic toll collection if you want to.

[Either VERSION 1]
If you were to use the general traffic lanes on I-394, your trip would take *TT+Y minutes* and be free. If you were to use the toll lane you would pay *$X* and your trip would take *TT minutes*, saving *Y minutes*. Now under these conditions, which would you choose to do?

Use the toll lane, pay $X and save Y minutes	001
Use the general lane for free	002

[or VERSION 2]
If you were to use the toll lane on I-394, you would pay *$X* and your trip would take *TT minutes.*
If you were to use the general lanes, your trip would take *TT+Y minutes, Y minutes* longer than the toll lane, but it would be free. Now under these conditions, which would you choose to do?

Use the general lane for free	002
Use the toll lane, pay $X and save Y minutes	001

Method A

First, each person received four different scenarios, each with a different amount of time saving (Y = 5, 10, 15 or 20 minutes) and toll (X = 50 cents, $1, $2, $3, $4, $5, $6 or $7). The value TT used for the tolled lane was based on the respondent's estimate of their travel time with no congestion. Nine different sets of four scenarios were used across the sample, with each respondent assigned one of the nine sets at random. So, in total, 36 (9 x 4) different scenarios were used, each identifying a different time/cost tradeoff point. Also, to avoid bias due to ordering effects, the questions were asked in two different ways. Versions 1 and 2 above differ only in the order in which the toll and non-toll options are described to the respondent. Each respondent was assigned one of the two versions at random.

Method B

Next, the same type question was asked again, but this time using the "price meter" approach. Each respondent was assigned a level of time savings (S = 5, 10 or 15 minutes) at random. Then a random toll price point was chosen (P = 50 cents, $1, $2, $3, $4, $5, $6 or $7) and the same question from above was asked. If the person said that they would pay the toll, a higher price point was chosen at random, and if they said they would not pay the toll, a lower price point was chosen at random, and the question was asked again at the new toll level. This procedure was continued until the "switching point" was identified – e.g. the respondent would be willing to pay a toll of $2, but not $3.

BASELINE CATI SURVEY RESULTS

Public Acceptance of I-394 MnPASS Project

Respondents who were unaware of the I-394 MnPASS project were read a description (see box below). Then all respondents were asked two questions to examine their levels of acceptance of the project. These questions were whether it was a good idea or bad idea to (1) allow single driver to use carpool lanes by paying a toll and (2) to operate the toll lane program 24 / 7?

MnPass Project Description: Read to Unaware Respondents

The MnPass program will permit single drivers to pay a fee to use the carpool (diamond) lanes. Drivers who pay the fee can use the carpool lanes without being in a carpool. The fee will vary based on how congested the roadway is, but it will average about $2. The program is expected to start by summer of 2005.

As shown in Table 2, most respondents (63%) thought allowing single drivers to use carpool lanes by paying a toll was a good idea. There was no difference in the distribution of opinions by awareness – respondents who had originally said they were unaware of I-394 MnPASS answered it was a good idea at the same rate as those were aware.

TABLE 2: Opinions on Allowing Single Drivers to Use Carpool Lanes by Paying a Toll by Annual Household Income (N=1,000)

OPINION	LESS THAN $50,000	$50,000 - $99,999	$100,000 - $149,000	$150,000 OR MORE	REFUSED	TOTAL
GOOD IDEA	62%	64%	61%	63%	60%	63%
BAD IDEA	27%	26%	29%	28%	31%	27%
NO OPINION	11%	10%	10%	9%	9%	10%
TOTAL	100%	100%	100%	100%	100%	100%
	179 RESPONSES	380 RESPONSES	217 RESPONSES	136 RESPONSES	88 RESPONSES	1000 RESPONSES

Opinions about whether allowing single drivers to use carpool lanes by paying a toll were a good or bad idea were consistent across annual household income levels. Whereas 63 percent of persons in households with an annual household income over $150,000 thought this was a good idea, so did 62 percent of those with annual household income levels of less than $50,000. Support for the project did not vary across other socio-economic variables such as gender, education, or employment. Of persons living in the I-394 travel shed, supporters comprised 65 percent of those with household incomes of $50,000 or less as well as 65 percent of those with household incomes of $150,000 or more

People residing in the I-394 travel shed were slightly more likely to think I-394 MnPASS was a good idea relative to those residing in the I-35W travel shed (64% and 58%, respectively). At the same time, respondents in the I-35W travel shed were more likely to have "no opinion" on this question than those in the I-394 travel shed (15% and 8%, respectively).

Nearly two-thirds of all unprompted statements related to allowing single drivers to use carpool lanes by paying toll were positive (64%). The most frequently cited factors were that the I-394 MnPASS project was a better use of carpool lanes (23%), adds capacity to the roadway (18%), and provides that only users pay, not everyone (12%). It should be noted that these issues did not appear in the text of the prenotification letter sent to respondents nor in the statement that was read to "unaware" respondents. Negative comments were also captured – 8 percent said that it will only benefit the rich, 5 percent that it discourages carpooling, and 5 percent that carpool lanes should be free for all.

Travel Behavior – Reference Trips

Travel behavior is a complex phenomenon that is influenced by socio-economic, household dynamic, and transportation infrastructure factors, among others. To gain an understanding of how respondents used the HOV lanes on I394 and I-35W before the I-394 MnPASS lanes were opened, they were asked about their most recent weekday trip in that corridor. Data collection goals were to ensure that the majority of reference trips took place during the peak periods and to obtain a fairly even distribution of reference trips across days of the week.

An additional dimension for the reference trip was to establish a purpose of the trip. This measure was an aggregation (i.e., trip type) based on the typical trip purposes used in travel demand forecasts. "Subsistence" trips are for work, work-related, or school. "Discretionary" trips are for visiting, recreation, or other purposes. "Maintenance" are shopping, medical or personal trips. The distributions by trip purpose and trip type between the I-

394 corridor and the I-35W control corridor are comparable and will work well for the post-implementation analyses.

The association between trip type and time of day was reflected in the trip purposes captured in the baseline survey. The majority of the reference trips are peak period trips. Respondents typically travel for subsistence purposes during the peak period so the majority of trips are subsistence trips.

Characteristics of Reference Trips

Respondents were asked if they were delayed by congestion on their reference trip. Fifty percent (50%) of I-35W users answered, "yes" compared to 40 percent of I-394 users, Congestion delays were most prevalent during peak periods.

In addition to congestion, making stops can increase travel time. Only 10 percent of respondents made stops while on their reference trip. Ten percent (10%) of I-394 users made stops. More than half of these respondents (59%) said that the stops were to take care of personal business like shopping. Another 31 percent said their stops were to drop off or pick up passengers. HOV and transit users were also asked if they stopped at a park-and-ride facility on their reference trip. Seven percent (7% or 18 persons) did use a park-n-ride facility while on their reference trip, and virtually all of them traveled on I-394.

Our baseline data indicated that approximately 75 percent of respondents traveled on their I-394 reference trip via SOV, 23 percent via HOV, and 2 percent via transit. Hwy 55 travelers had a similar travel mode distribution. An intriguing pattern became clear, not all HOV travelers used the carpool lanes for travel on I-394 during the peak period. The patterns of HOV versus general lane use differed by time of day.

BASELINE STATED PREFERENCE RESULTS

Stated preference (SP) questions were used to measure respondents' likelihood of using the I-394 HOT lane as a function of the toll level and time savings. Two methods (A and B, described in the Survey Materials Design section) were used to ask the SP questions, thus, increasing our ability to confirm and validate the results. The questions were asked of all 412 respondents whose reference trip was made as a solo driver on I-394.

The SP data were also analyzed by estimating logic discrete choice models, a maximum-likelihood statistical technique for inferring the importance of multiple choice factors based on choice responses. The resulting mean VOT of about $10/hour was in the range of values typically used for commute trips in mode choice forecasting models. After taking toll and time savings into account, there was a residual negative constant for the HOT lane, perhaps reflecting the inconvenience or reluctance to pay a toll at all, as well as the restricted ability to change lanes in the HOT lane versus the general lanes. The likelihood of choosing the toll option was somewhat less from Version 2 of the questions, where the toll option was described before the free option. This result indicated that a marginally significant order bias was present, and that it was useful to randomly present the question in both orders so that the overall data across both versions does not contain this bias. When the Method A and Method B data were combined, an extra HOT lane constant applied to Method B data only was not significant. This means that the two data sets were compatible in terms of predicting similar likelihood of using the HOT lane, and thus, were used together in further analysis.

Factors Influencing Willingness to Pay

Willingness to pay for use the I-394 MnPASS Express Lanes is not just about absolute travel time savings, but also about how important the travel time saved is to an individual. For this reason, further analyses (i.e., estimation runs) were done on the model to examine what other variables (both demographic, trip, and attitudinal) correlate with the willingness to use the I-394 MnPASS lanes. And, it was found that quite a few other variables (i.e., age, income, purpose for travel) are associated with willingness to pay. Significant non-linear effects were found for the toll variable, using a polynomial function with square and cube terms. The disutility rose most steeply at low toll levels, then flattened out somewhat, and finally become steeper again at high tolls. The inflection point was at about $4.

Demographic Factors

Income and age were both very strong variables; with the likelihood of paying the toll highest for those with high incomes, and lowest for those under age 25 or over age 60. (Income was also tested in combination with the toll variable and was significant, but the model fit is best when including income as a general variable for HOT lane independent of toll level). Gender and education level were also tested, but had very little influence on willingness to pay the toll.

Trip Factors

The likelihood of paying the toll tended to increase with trip distance/duration and with the frequency of making the trip. Those making commute or work-related trips were more likely to pay the toll than those traveling for other purposes. Interestingly, after other effects were taken into account, those traveling during the AM and PM peak periods would be less likely to pay the toll than those traveling off-peak. The reason for this difference was not obvious, perhaps respondents were not confident that the HOT lanes would actually provide the promised time savings during the peak. Those who actually adjusted their departure time to avoid congestion were more likely to pay the toll, while those with more flexible arrival times were less likely. Finally, those who rated congestion levels in the general lanes as high during their actual trip were more likely to say they would pay the toll. However, no significant effects were found related to the rating to overall enjoyment and satisfaction with the trip or with the rating of congestion in the carpool lane; indicating that such perceptions would not influence respondents' willingness to pay a fee to use the toll lane.

Attitudinal Factors

Even after accounting for respondent- and trip-specific variables, a number of respondent attitudes toward I-394 MNPASS were significantly related to the stated choice of the toll lane. As one would expect, positive statements about I-394 MNPASS and its related benefits were associated with a higher stated willingness to pay the toll. The only negative effect was for those who think that the current enforcement of the HOV lane is not strict enough. Other attitudinal variables were also tested but were not shown to have influence. These included the affect on noise levels and air quality, as well as whether or not the person had previously heard of I-394 MNPASS. This latter result suggested that people were almost as willing to choose the tolled option in the SP questions even if they were hearing about the idea for the first time.

KEY FINDINGS

Effectiveness of Method

The first wave of data collection for the Attitudinal Panel Survey was administered successfully with 1,000 completed interviews. Refusals to the survey were low (17%) with our response rate driven more by inability to contact respondents than by refusals. With ninety-eight percent (98%) of respondents agreeing to participate in the subsequent waves of data collection, the panel recruitment exceeded expectations.

The three sampling objectives were met. Iteratively sampling travel shed residents worked efficiently with highest eligibility rates within the I-394 sample strata for which the greatest numbers of completed interviews were needed. The data adequately captured the dynamics of travel behavior in the target corridors. One of the objectives was to measure the natural incidence of mode use on I-394 in the baseline survey to determine what level of oversampling may be necessary in subsequent waves to capture adequate samples of HOV and transit users. Our initial assessment indicates that sampling travel shed residents enabled us to adequately capture HOV users in the I-394 sample strata (i.e.170 for the reference trip mode). However, oversampling will be done in subsequent waves to increase both HOV and transit users (i.e., 15 for reference trip mode).

I-394 MnPASS Awareness and Acceptance

The proportion of respondents supporting the ideas of allowing single drivers to use carpool lanes by paying a toll on the I-394 MnPASS project is statistically the same as to Sullivan's findings from the survey he administered prior to the SR-91 opening (65% on SR91 to 63% on I-394). For supporters, the notions that it was a better use of the carpool lanes and that it added capacity to the roadway were important. Social equity issues were only surfaced by the minority of persons who thought allowing single drivers to use carpool lanes by paying a fee was a bad idea.

Managing Demand by Varying Toll

The strategy of managing demand for the HOT lane by varying price appears to be effective. The stated preference survey results indicated a wide distribution of willingness to pay that will facilitate the management of demand by varying the toll. Fifty-nine percent (59%) would pay $2 to save 20 minutes; 40 percent would pay this to save 15 minutes, and 23 percent to save 10 minutes. But 10 percent would be willing to pay $2 to save 5 minutes. The percent of SOV drivers who are willing to pay a fee to use the HOT drops significantly as the toll increases to $4 or more. Few (less than 10%) would be willing to pay $4 to save 15 minutes or less; although 30 percent would be willing to pay $4 to save 20 minutes. Virtually no one appeared willing to pay more than $6 for any amount of time savings.

NEXT STEPS

With this baseline data in place, the foundation is set for providing MnDOT with data regarding how attitudes and travel behavior change as a result of the implementation of the I-394 MnPASS lanes. The next wave will take place in the fall of 2005, with the third wave to follow several months after that. These waves will include significant oversampling of transit users and MnPASS subscribers, to compare their perceptions with those of the general public within the sample. Of particular interest for further analysis of all data will be changes in mode, perceptions of changes in travel time and level of congestion, and overall towards the effectiveness of the system. With 98% of participants agreeing to remain in the panel, and a significant number of participants in the control corridor, reliability of this data should be relatively high.

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