Effect of Freeway Corridor Attributes on Motorist Diversion Responses to Travel Time Information

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Two short telephone surveys were administered to a group of subjects who regularly travel the North Central Expressway in Dallas, Texas, for their daily home-to-work trip to the Dallas central business district. Subjects were presented with eight hypothetical traffic radio messages that varied three corridor attributes believed to affect motorist diversion decisions: the location where the traffic message recommended diverting from the expressway, the location where the traffic congestion on the expressway was said to exist (relative to the location where motorists were advised to divert), and the alternative route (a toll road or an arterial street) recommended in order to save time. Survey subjects were asked to indicate the time savings value that they would require to cause them to divert from the primary route. The results of the study suggested that motorist diversion decisions in response to a given time saved message vary dramatically, even for a group of motorists with the same origins and destinations making a morning work trip. Consequently, the widely differing attitudes and preferences of individual drivers concerning the characteristics of a corridor (i.e., what routes are available, where to divert, and the like) could not be systematically categorized on the basis of recommended route, diversion location, or congestion location.

As traffic demands in urban areas continue to grow, transportation agencies are looking for ways to better manage existing roadway facilities to minimize traffic congestion and maintain mobility within the region. One way agencies can better manage traffic is by providing motorists with information about current roadway conditions. Research indicates that motorists desire accurate and timely information about unusual roadway and traffic conditions and are willing to react to this information by altering their departure time, route, and, to a small degree, mode of travel (*1–3*).

Various technologies can be used to provide motorists with certain types of real-time information, including changeable message signs, highway advisory radio, telephone hotlines, and commercial radio and television traffic reports.

In the future, advanced traveler information systems, part of the intelligent vehicle-highway systems program, will provide drivers with traffic information and navigational assistance tailored to their needs.

Previous human factors research (*4,5*) has generated basic design guidelines for the traditional forms of real-time motorist information displays. This research has also shown that travel time information can have a significant influence on motorist diversion decisions. Real-time traffic information must be packaged and presented to motorists in the proper manner to facilitate quick, easy, and correct comprehension. Travel time information can be presented to motorists in a variety of formats, including the following:

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- Absolute travel time value between points on a given route,
- Delay to be encountered between two points,
- Time to be saved between two points by diverting to a specified alternative route,
- Delay to be avoided between two points by diverting to an alternative route, and
- Presentation of travel times for both the given route and one or more specified alternative routes.

In 1979, human factors studies conducted by Huchingson and Dudek showed that motorists were more likely to consider diverting because of a time savings value than to an identical delay time value (*6*). A time savings value explicitly compares the primary travel time to the alternative route, whereas delay values require the motorist to estimate how much longer it will take to bypass congestion via an alternative route and whether the increased travel time on the alternative route is offset by the delay expected on the primary route. From this study, the 50th-percentile motorist considered diverting if a delay of 15 to 20 min or greater were indicated or if a time saved value of 5 to 10 min or greater was displayed.

Research indicates that motorists do not always perceive a given delay or time saved value identically in all situations. In a 1984 study conducted by Huchingson et al. (*7*), the 50th-percentile motorist considered diverting if a message indicated 5 to 10 min or more of delay was present (as compared to the 15 to 20 min found for the 50th-percentile motorist in the earlier study). Several differences in the way the two surveys were administered could account for some of the differences in the results. However, it is apparent that motorist sensitivity to travel time information may not be identical for all driving situations. As summarized elsewhere (*8*), the findings of other studies indicate that diversion decisions are influenced by various alternative route characteristics, type of trips being made, and possibly demographic and socioeconomic characteristics of the driving population. It would seem logical that these factors might interact with the travel time information in affecting diversion decisions as well. In other words, motorist diversion decisions based on travel time information might vary depending on the alternative routes available in the corridor, the type of trip being made, the time of day, and so forth. These potential interactions were the focus of the surveys described in the remainder of this paper.

STUDY PROCEDURES

Study Objectives

Three corridor attributes were examined in this study by determining motorists' time saved threshold values for each of several hypo-

thetical traffic messages. A time saved threshold value represents the minimum amount of time savings a subject would require before considering diversion to the recommended alternative route. It was assumed that a subject would also consider diverting at any time saved value that was larger than the threshold value. Thus, the number of subjects that would consider diverting at a given time saved value would be the sum of those reporting that value as their threshold plus all subjects having a smaller threshold value. The objectives of this research were to

1. Determine whether motorist-reported time saved threshold values depend on the type of alternative route specified in a traffic message;
2. Determine whether the threshold values depend on the location in the corridor where motorists are told to divert; and
3. Determine whether the threshold values depend on how far upstream from the congestion on the primary route motorists are told to divert.

This study assumed that motorists would place confidence in the accuracy of the diversion messages presented. However, as will be seen in the results that follow, some study subjects were reluctant to assume total accuracy. Instead, they appeared to balance the magnitude and likelihood of the travel time benefits being promised in the message against the repercussions they might endure if the information were wrong.

Description of the Study

The study was accomplished through two short telephone surveys of a group of 44 subjects known to travel the North Central Expressway in Dallas, Texas, to and from work. These subjects were assumed to be familiar with the routes and traffic characteristics of that corridor. Subjects were recruited with assistance of two major employers located in the Dallas central business district (CBD). Subject selection was designed to yield employees who drove their own automobiles to work daily, lived in a specific region of the Dallas metropolitan area, and normally used the North Central Expressway for their home-to-work trip. In this way, it was possible to limit the study sample to those having a common trip purpose and nearly identical origin-destination characteristics.

With approval of each of the employers, subjects were contacted on two weekday mornings to participate in a 5- to 10-min survey administered over the telephone. Subjects were called at work in the morning in order to facilitate their recall of travel conditions on the North Central Expressway during a normal trip to work. On each day, subjects were read a series of four traffic messages in random order, and asked to envision themselves receiving these messages over the radio as a traffic advisory broadcast. The subjects were asked how much time they would need to save (i.e., promised in the traffic message) to cause them to consider diverting. Afterward, subjects were questioned about their responses to gain insight into the reasons for any differences in time saved threshold values provided from one message to the next. No monetary incentives were provided to subjects participating in this survey.

North Central Expressway Corridor

The North Central Expressway (US-75) extends from the eastern side of the Dallas CBD through north Dallas. The expressway borders the small cities of Highland Park and University Park and passes through the satellite communities of Richardson and Plano farther to the north (see Figure 1). Built in the 1940s, the four-lane divided highway currently carries approximately 130,000 vehicles per day and experiences severe congestion during much of the day over the 14.9 km (9.3 mi) between the Lyndon Baines Johnson (LBJ) Freeway (I-635) and the CBD. It is currently undergoing major reconstruction; however, no lane closures are allowed on the freeway during the peak periods.

Two major interchanges are located on the expressway within the study corridor. On the northern end of the section is a fully directional freeway-to-freeway interchange with I-635. The design of the interchange is insufficient to accommodate certain traffic demands, and it usually causes congestion on the expressway. Approximately midway between LBJ Freeway and the CBD, a second interchange provides cloverleaf connections between the expressway and Northwest Highway (Loop 12). In the vicinity of the expressway, Northwest Highway is a six-lane divided arterial street with closely spaced traffic signals. Frontage roads that parallel the expressway are not continuous after the I-635 or the Northwest Highway interchanges.

Several north-south arterials parallel the expressway in this part of Dallas. Of these, Greenville Avenue is the most highly used arterial in the corridor (*9*). Its close proximity and easy access to the east side of the expressway (less than one-block separation in some locations) also make it a prime alternative route for expressway motorists during incident conditions. To the west, the Dallas North Tollway (a controlled-access toll facility) is located approximately 4.0 to 4.8 km (2.5 to 3 mi) from the expressway, providing the fastest means of north-south travel in the corridor during peak periods (*9*). It is also a viable alternative route to the expressway for some motorists in the north Dallas area.

Table 1 summarizes the morning peak period and peak hour travel times on the expressway, the tollway, and Greenville Avenue between LBJ Freeway and the CBD. As can be seen, the tollway provides the quickest trip downtown (13 min on the tollway, 18 min on the expressway, and 22 min on Greenville Avenue during the peak hour). However, there is a fee for using the toll facility, which discourages some motorists from using it and preserves its higher speed operation.

Description of Traffic Messages Evaluated

Eight traffic messages that varied the three corridor attributes evaluated in this study were developed. The three attributes studied were as follows:

- Alternative route recommended in the message in order to save time,
- Location where motorists were told to divert from the expressway, and
- Location where the problem was said to exist on the expressway.

For example, Greenville Avenue was specified as the alternative route in one-half of the messages, whereas the Dallas North Tollway was recommended in the remaining messages. Likewise, subjects were told to divert either at the LBJ Freeway interchange, or at the interchange of the expressway with Northwest Highway. Finally, the location of congestion in the messages was specified as either immediately downstream of the location where diversion to the alternative route was recommended, at a cross-street approximately

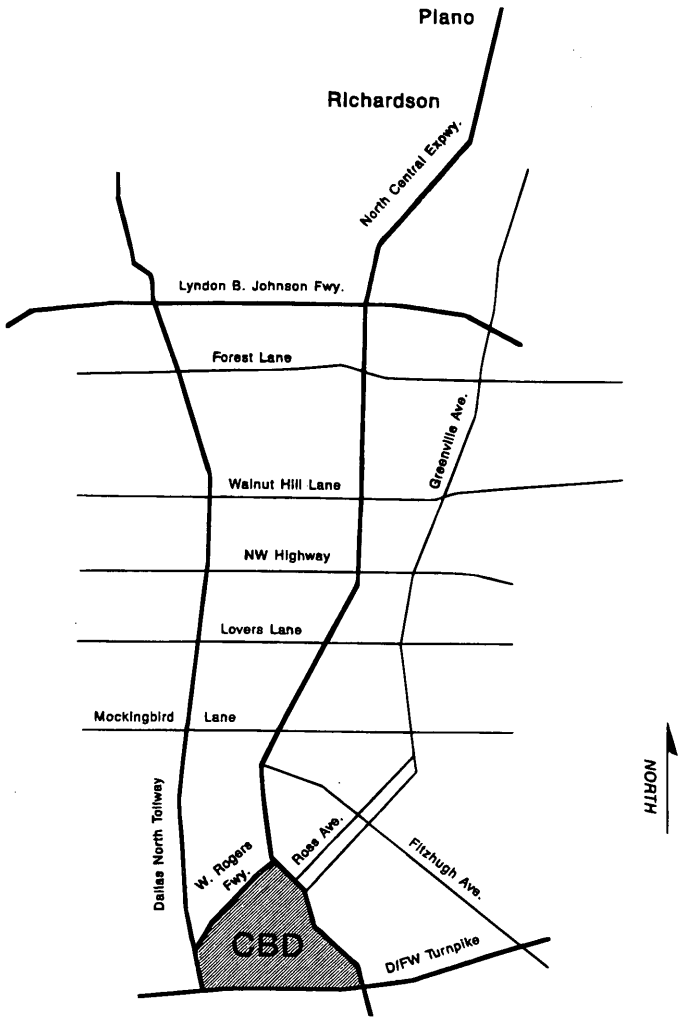


FIGURE 1 Schematic of North Central Expressway corridor in Dallas, Texas.

1.6 km (1 mi) downstream of the recommended point of diversion, or at a cross-street approximately 4.8 km (4 mi) downstream.

The remaining components of the traffic message were kept constant. The type of incident creating congestion was always specified as an accident. In addition, information about the length of congestion provided in the messages was kept constant at 1.6 km (1 mi), using major cross-streets as reference points. Table 2 summarizes the key features of each of the traffic messages used in the study. The study was conducted as two separate surveys on different days, with four messages evaluated on one day and the remaining four on the second day (it was believed that subjects would not have the time or motivation to provide high-quality evaluations of all eight messages during one study).

Data Collection Procedures

As part of each survey, researchers asked subjects to imagine themselves driving to work during their normal daily commute when they receive a traffic advisory alert over their automobile radio. The researcher would then recite one of the four traffic messages sched-

TABLE 1 North Central Expressway Corridor Travel Times (9)

Time Period	Average Travel Time from LBJ Freeway to Dallas CBD, Minutes		
	North Central Expressway	Dallas North Tollway	Greenville Avenue
AM Peak Period	14.3	12.5	21.4
AM Peak Hour	18.1	13.1	22.4

TABLE 2 Traffic Messages

Message Number	Corridor Characteristic			Message
	Alternative Route	Diversion Location	Congestion Location	
1	Greenville Avenue	LBJ Freeway	LBJ Freeway	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT WALNUT HILL LANE CONGESTION BEGINS AT LBJ FREEWAY EXIT LBJ FREEWAY EASTBOUND TAKE GREENVILLE AVENUE TO DOWNTOWN SAVE -- MINUTES
2	Dallas North Tollway	LBJ Freeway	LBJ Freeway	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT WALNUT HILL LANE CONGESTION BEGINS AT LBJ FREEWAY EXIT LBJ FREEWAY WESTBOUND TAKE DALLAS NORTH TOLLWAY TO DOWNTOWN SAVE -- MINUTES
3	Greenville Avenue	Northwest Highway	Northwest Highway	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT FITZHUGH AVENUE CONGESTION BEGINS AT NORTHWEST HWY EXIT NORTHWEST HIGHWAY EASTBOUND TAKE GREENVILLE AVENUE TO DOWNTOWN SAVE -- MINUTES
4	Dallas North Tollway	Northwest Highway	Northwest Highway	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT FITZHUGH AVENUE CONGESTION BEGINS AT NORTHWEST HWY EXIT NORTHWEST HIGHWAY WESTBOUND TAKE DALLAS NORTH TOLLWAY TO DOWNTOWN SAVE -- MINUTES
5	Dallas North Tollway	LBJ Freeway	Forest Lane	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT NORTHWEST HWY CONGESTION BEGINS AT FOREST LANE EXIT LBJ FREEWAY WESTBOUND TAKE DALLAS NORTH TOLLWAY TO DOWNTOWN SAVE -- MINUTES
6	Greenville Avenue	LBJ Freeway	Forest Lane	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT NORTHWEST HWY CONGESTION BEGINS AT FOREST LANE EXIT LBJ FREEWAY EASTBOUND TAKE GREENVILLE AVENUE TO DOWNTOWN SAVE -- MINUTES
7	Dallas North Tollway	LBJ Freeway	Northwest Highway	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT FITZHUGH AVENUE CONGESTION BEGINS AT NORTHWEST HWY EXIT LBJ FREEWAY WESTBOUND TAKE DALLAS NORTH TOLLWAY TO DOWNTOWN SAVE -- MINUTES
8	Greenville Avenue	LBJ Freeway	Northwest Highway	ATTENTION SOUTHBOUND TRAFFIC ACCIDENT AT FITZHUGH AVENUE CONGESTION BEGINS AT NORTHWEST HWY EXIT LBJ FREEWAY EASTBOUND TAKE GREENVILLE AVENUE TO DOWNTOWN SAVE -- MINUTES

uled for that day (depending on the order required by the statistical design). At the end of the message, the researcher asked the subject whether he or she would consider diverting in response to the message if the amount of time saved was said to be 5 min. If the subject said yes, the researcher moved to the next message. If the subject responded negatively, the researcher repeated the last part of the question, asking the subject if he or she would divert if the time saved value was said to be 10 min. Each time the subject said no, the time saved value was increased. Once the subject said yes, the researcher recorded that particular time saved value as that individual's threshold value to that message, then moved to the next traffic message and repeated the sequence. Subjects generally had no difficulties in understanding the survey administrator's instructions or in responding to the questions at the end of each traffic message.

Once threshold values to the different messages were obtained, subjects were asked to explain any differences in values they gave for the various messages. Study personnel used an open-ended question format in this phase of the survey. At the conclusion of the second survey, data were collected regarding each subject's normal work trip travel habits. These data included an estimate of their normal arrival time at work, the time they are expected to be at work, the level of importance the subject placed on arriving at work on time, and average trip duration under normal conditions. No attempt was made to counterbalance any of these data in the study design.

Subject Demographics

Table 3 summarizes the basic demographic characteristics of the subjects participating in the study. Males were slightly overrepresented in the sample (57 percent). Most subjects (93 percent) were between the ages of 25 and 54 years. Only 2 percent were younger than 25, and only 5 percent were older than 55. It should be remembered that subject selection was based on origin-destination patterns and expressway usage; no attempt was made to balance the demographics of the subject groups.

Data on the subjects' normal home-to-work trips are also presented in Table 3. As shown in the table, the majority of the subjects normally arrive at work between 7:00 and 8:30 a.m. However, approximately one-third (32 percent) indicated that they arrived before 7:00 a.m. Although not asked of the subjects directly, it became apparent through the surveys that at least one employer maintained a flextime policy for its employees.

The distribution of arrival times over the morning peak period resulted in a wider range of travel times than had originally been hoped for in the subject selection process. Table 3 also shows the average reported travel times for subjects arriving at work before 7:30 a.m. and at 7:30 a.m. or later. For the former group, average travel times were less than 26 min, whereas they were almost 49 min for the latter group (even though both groups traveled the same approximate distances). Thus, although the selection process did yield subjects with homogenous origin-destination patterns, there were some differences as to when during the peak period these subjects traveled each day and the traffic conditions they normally encountered when traveling at those times.

RESULTS

Average Time Saved Threshold Values

Table 4 summarizes the average time saved threshold value for each of the eight traffic messages examined in this study. Also shown are the standard deviations of the threshold values. Average time saved thresholds ranged from a low of 10.2 min for Message 5 to a high of 17.6 min for Message 2. Furthermore, substantial variation was evident in the threshold values from one subject to the next, as evidenced by the large standard deviations obtained for the different messages.

The similar averages for the different messages does not mean that all subjects provided identical threshold values for all messages. By grouping the subjects according to the messages for which they provided different time saved threshold values, it was possible to confirm that many subjects did indeed have specific preferences regarding where they would divert, which routes they would use, and so forth. For example, by placing all subjects who selected a lower threshold value for the message recommending Greenville Avenue (as compared to the message recommending the Dallas North Tollway) into one subgroup and those having a lower threshold value when the tollway was recommended in another subgroup, substantial differences among the subgroups were evident.

Table 5 summarizes the average values of these subgroups. For the subgroup with lower threshold values when Greenville was recommended (Messages 1,3,6,8), an additional 7 min (19 min – 12 min), on the average, was needed to get them to use the tollway if it was recommended (Messages 2,4,5,7). Conversely, subjects selecting lower threshold values when the tollway was recommended would require an average of 12 more min (21 min – 9 min) of time saving before they would consider diverting to Greenville Avenue.

TABLE 3 Subject Demographics and Travel Characteristics

Category	Value (n=44)
Gender Distribution:	
males	57%
females	43%
Age Distribution:	
less than 25	2%
25 to 39	43%
40 to 54	50%
greater than 54	5%
Work Arrival Time Distribution:	
before 6:30 am	16%
6:30 - 6:59 am	16%
7:00 - 7:29 am	23%
7:30 - 7:59 am	23%
8:00 - 8:29 am	18%
8:30 am or later	2%
flextime	2%
Required Work Start Time Distribution:	
before 6:30 am	5%
6:30 - 6:59 am	2%
7:00 - 7:29 am	27%
7:30 - 7:59 am	14%
8:00 - 8:29 am	48%
8:30 am or later	2%
flextime	2%
Average Work Trip Travel Time:	
those travelling before 7:30 am	25.8 min.
those travelling after 7:30 am	48.6 min.
those on flextime	50.0 min.

TABLE 4 Time Saved Threshold Values by Message

Message Number	Corridor Characteristic			Value, Minutes	
	Alternative Route	Diversion Location	Congestion Location	Average	S. Deviation
1	Greenville Avenue	LBJ Freeway	LBJ Freeway	13.9	8.9
2	Dallas North Tollway	LBJ Freeway	LBJ Freeway	17.6	9.4
3	Greenville Avenue	Northwest Highway	Northwest Highway	14.5	5.8
4	Dallas North Tollway	Northwest Highway	Northwest Highway	15.5	7.5
5	Dallas North Tollway	LBJ Freeway	Forest Lane	10.2	8.2
6	Greenville Avenue	LBJ Freeway	Forest Lane	12.5	9.0
7	Dallas North Tollway	LBJ Freeway	Northwest Highway	12.6	12.6
8	Greenville Avenue	LBJ Freeway	Northwest Highway	17.4	10.0

TABLE 5 Average Time Saved Threshold Values by Subgroup

Traffic Messages	Average Time Saved Threshold Value, Minutes	
	Subgroup with Lower Values for Greenville	Subgroup with Lower Values for DNT
Messages Recommending Use of Greenville	12	21
Messages Recommending Use of DNT	19	9
	Subgroup with Lower Values for LBJ Fwy	Subgroup with Lower Values for Northwest Hwy
Messages Recommending Diverting at LBJ Fwy	13	18
Messages Recommending Diverting at Northwest Hwy	23	12

DNT = Dallas North Tollway
LBJ Fwy = Lyndon B. Johnson Freeway (I-635)

A similar distinction can be made about the location where diversion was recommended. The subgroup with lower thresholds for diverting at LBJ Freeway would require 10 more min (23 min – 13 min) of time savings before considering diverting at Northwest Highway, whereas those selecting a lower threshold to divert at Northwest Highway would require an additional 6 min (18 min – 12 min) before diversion at LBJ Freeway would be considered. Because most subjects gave identical threshold values for the different congestion locations examined in Experiment 2, averages subgrouped by this variable were not included in Table 5.

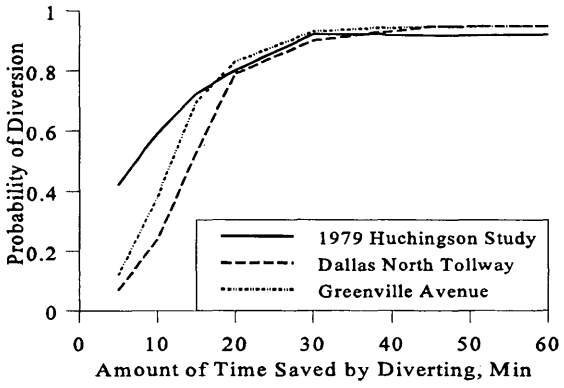
Statistical comparisons of the averages reported in Table 5 were not attempted because the time saved threshold distributions were found to be nonnormal. Instead, differences in the threshold values for the different messages were analyzed through comparison of the distributions of the time saved thresholds and through analysis-of-variance techniques. The results of those analyses are discussed in the following sections.

Cumulative Distributions of Time Saved Threshold Values

Figure 2 presents graphs showing the percent of subjects who would consider diverting when presented with time saved values ranging from 5 min to 2 hr. Also shown in the graphs are the results of the 1979 Huchingson and Dudek study of time saved messages (*6*). The top portion of Figure 2 illustrates subject responses when the messages instructed them to divert at the LBJ Freeway and to use Greenville Avenue or the Dallas North Tollway (Messages 1 and 2, respectively). The bottom portion of Figure 2 displays similar information when subjects were instructed to divert at Northwest Highway, again either to Greenville Avenue or to the Dallas North Tollway (Messages 3 and 4, respectively).

The percent of subjects indicating they would consider diverting to a given time saved value when Greenville Avenue was the recommended route was slightly greater than that when the Dallas North Tollway was recommended. Numerically, the lines diverge most at a time saved value of 15 min (by 17 to 19 percent). Because of the fairly small sample size available for this analysis, however, these differences were not statistically significant [based on a Kolmogorov-Smirnov goodness-of-fit test (*10*)]. Examination of the effect of the recommended diversion location for each of the recommended alternative routes (by comparing the Greenville and Dallas North Tollway lines from each graph) also showed no statistically significant effect.

The graphs in Figure 3 show the time saved distributions of subjects for Messages 5 through 8. In both graphs, the distributions again show that subjects tended to have slightly lower threshold values for Greenville Avenue as compared to the Dallas North Tollway, regardless of the reported location where congestion was



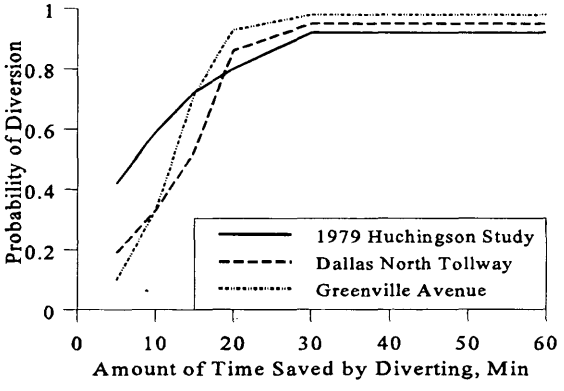
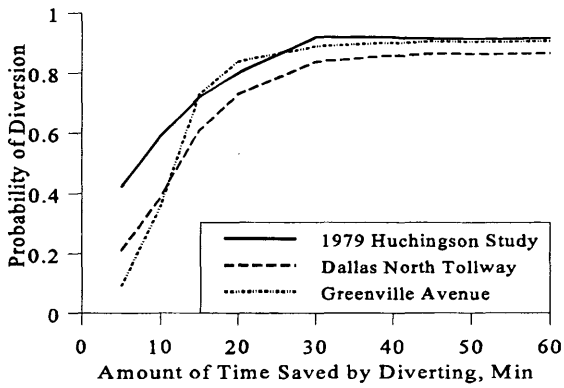


FIGURE 2 Effect of recommended route on percent of subjects considering diversion at a given time saved value for Messages 1 through 4.



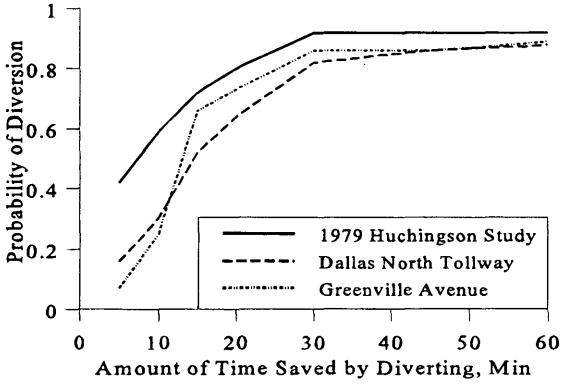


FIGURE 3 Effect of recommended route on percent of subjects considering diversion at a given time saved value for Messages 5 through 8.

said to begin (Forest Lane or Northwest Highway). However, the differences in distributions were not statistically significant. Likewise, comparing the Greenville Avenue and Dallas North Tollway distributions across the two graphs also suggested no significant difference due to the reported location of congestion.

Although the curves representing the current study data are not significantly different from each other, they are different from the results of the Huchingson and Dudek study (*6*). Subjects in the Huchingson study were sensitive to very small time saved values, with the 50th-percentile subject considering diversion when a time saved value between 5 and 10 min was presented. Conversely, data from the current study show that the 50th-percentile subject required 10 to 15 min of time savings before considering diversion. The results from this more recent study were statistically different from the previous Huchingson study, based on the Kolmogorov-Smirnov test at a 0.05 level of significance.

It should be noted that study techniques of the two studies were quite different. Huchingson brought subjects into a laboratory to participate, whereas the current study was conducted by telephone. Subjects in the Huchingson study were presented a driving scenario to a special event in a city in which they lived, but no attempts were made to control for how familiar subjects were with the specific roadways (both primary and alternative) used in the study, or how often they used these roadways. Conversely, the current study focused on peak period commuting trips by subjects who were presumed to be quite familiar with the roadways available in the freeway corridor. In fact, informal discussions with the subjects during this latest survey indicated that many actually experimented with the different routes in the corridor periodically.

Analysis-of-Variance Evaluation

Other research (*3*) has suggested that the numerous subgroups within the driving population can each have distinct attitudes, perceptions, and behavioral tendencies with respect to diversion. Despite the steps that were taken to select a uniform sample population for testing purposes, it was believed that the differences within the study sample with respect to age, gender, average travel time for the trip, and the like may have affected their sensitivity to travel time information in making diversion decisions. To investigate this possibility, the demographic and travel characteristic data collected from each subject were combined with the recommended route, diversion location, and point of congestion variables of the study design in an analysis-of-variance (ANOVA) evaluation. In this way, effects of the message variables on average time saved thresholds could be systematically assessed for different subgroups of the sample.

Because of the study design, separate ANOVA evaluations were performed on the data from each survey. Furthermore, because the study was not designed to completely counterbalance the subject demographic and travel characteristics, only one subject variable at a time was combined with the corridor characteristic variables in the analysis. Hence, the analysis for each experiment tested several three-factor models, all of which included (*a*) a subject variable (demographic or travel characteristic), (*b*) the recommended route variable, and (*c*) the recommended diversion location or the location of the beginning of congestion variable (representing Studies 1 or 2, respectively).

Subject variables explored in the ANOVA evaluations included the following:

- Age,
- Gender,
- Employer,
- Usual arrival time at work,
- Required work start time,
- Difference between the subject's reported time of arrival and required work start time (the arrival time cushion),
- Subject rating of the importance of arriving to work on time, and
- Normal home-to-work travel time.

Subject time saved thresholds values were modeled as a function of the recommended route, diversion location or congestion location, and one of the subject variables listed. Unfortunately, none of the models tested were found to be statistically significant at a 0.05 level of significance, and only two fell within a much less stringent 0.10 level of significance. Details concerning the ANOVA evaluation can be found elsewhere (*8,11*).

Reasons for Individual Differences in Time Saved Thresholds by Message

The reasons some subjects selected a higher time saved threshold value for one route or diversion location over the other are provided in Table 6. Several subjects cited anticipated congestion on the roadways used to access the Dallas North Tollway (via either LBJ Freeway or Northwest Highway) as a reason why they would require a greater time savings to divert to the tollway than to Greenville Avenue. Reasons that were originally expected to be significant in their decisions regarding the use of the tollway, such as the greater distance from the North Central Expressway or the cost for using it, were cited only a few times. On the other hand, the most common reason cited by those subjects requiring a greater time savings before diverting to Greenville was the presence of traffic lights and stop signs and poor past experiences with using that route. Judging from these reasons, it appears that the subjects were basing their time saved thresholds on how much they disliked one or the other of the recommended routes (and not on which route they preferred).

Conditions on the access roads to the alternative route were another factor that caused subject thresholds to differ depending the recommended diversion location. For those subjects selecting lower time saved thresholds to divert at LBJ Freeway, the reason cited most frequently was that they perceived access to either Greenville Avenue or the tollway to be more difficult via Northwest Highway. Another common reason cited was that the network south of Northwest Highway did not allow for an easy return to the expressway beyond the point of congestion. Thus, some subjects said they needed a bigger incentive before attempting to follow any recommended diversion advice at Northwest Highway.

For subjects selecting lower time saved thresholds for diverting at Northwest Highway, the most common reason was that in diverting so far away from their destination (at LBJ Freeway) they were more likely to encounter a problem on the alternative route and be delayed anyway. Another common reason cited was the poor travel conditions on LBJ Freeway, which made it difficult to access the alternative routes at that point.

Taken together, the various reasons cited for different time saved threshold values suggest a lack of confidence in the information provided in the traffic messages being tested. In essence, subjects balanced the benefits of diversion (as defined in the traffic message) against the risk of acting on inaccurate information.

TABLE 6 Reasons Given for Selecting Different Time Saved Threshold Values

Reasons	Percent[a]
For Higher Threshold Values to Divert to the DNT:	
• Roads accessing DNT (LBJ Freeway, Northwest Hwy) are too congested	75
• The Tollway is farther away from the Expressway	8
• It is difficult to return to the Expressway once at the Tollway	8
• The Tollway requires a fee to use	9
For Higher Threshold Values to Divert to Greenville:	
• Too many traffic lights, stop signs on Greenville	58
• Had poor experience with Greenville in the past	42
For Higher Threshold Values to Divert at LBJ Freeway:	
• Diverting farther away from destination increases risk of encountering problems	50
• Had poor experience with LBJ Freeway congestion in the past	31
For Higher Threshold Values to Divert at Northwest Hwy:	
• More difficult to access alternative routes at Northwest Hwy	36
• Hard to return to the Expressway from alternative route south of Northwest Hwy	14

[a] Some subjects gave multiple reasons, so percentages do not necessarily add to 100

SUMMARY

This paper has presented the results of telephone surveys conducted to assess the effects of selected corridor attributes on motorist time saved threshold values. The corridor attributes evaluated in this research were the type of recommended alternative route, the location where motorists were advised to divert to the recommended alternative route, and the location where congestion was said to begin relative to the location where motorists were advised to divert. The surveys used subjects who regularly drove on the North Central Expressway in Dallas, Texas, for their daily home-to-work trip to the Dallas CBD. The major results of the study are as follows:

- The cumulative distribution of subjects' time saved threshold values were not statistically significant as a function of the recommended route, diversion location, or location where congestion was said to begin. However, many subjects did select different threshold values for one or more messages.
- Although the cumulative percentages for the different messages were not found to differ significantly from one another, all were found to differ significantly from those obtained from Huchingson and Dudek in 1979. Whereas the 50th percentile subject in the Huchingson study considered diversion if the time saved value was between 5 and 10 min, the 50th percentile subject in this study required a nearly 15-min time savings before he or she would consider diverting.
- ANOVA procedures used to examine the effect of the corridor features on motorist time saved threshold values failed to detect any consistent differences in time saved thresholds for several different demographic or trip-related subgroups.
- Explanations provided by the subjects suggest that the different threshold values provided by subjects are generally due to an aversion to one or the other of the alternatives instead of any specific preference for one of the alternatives.

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