Title
Trav Info Evaluation: The Target Study Phase 1 Results

Authors
Koo, Ronald
Yim, Younbin
Hall, Randolph

Publication Date
1998-09-01

CALIFORNIA PATH PROGRAM
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

TravInfo Evaluation: The Target Study Phase 1 Results

Ronald Koo, Youngbin Yim, Randolph Hall

California PATH Working Paper
UCB-ITS-PWP-98-24

This work was performed as part of the California PATH Program of the University of California, in cooperation with the State of California Business, Transportation, and Housing Agency, Department of Transportation; and the United States Department Transportation, Federal Highway Administration.

Report for RTA 65A0006

September 1998

ISSN 1055-1417

Target1.fin

TravInfo Evaluation:
The Target Study

Phase 1 Results

Ronald Koo

Youngbin Yim

Randolph Hall

January 1998
RTA0006

ACKNOWLEDGMENT

EOT Members

Michael Berman	Metropolitan Transportation Commission (MTC)
Frank Cechini	EOT Chair, Federal Highway Administration
Judy Chen	Caltrans District 4
Melanie Crotty	TravInfo Project Director, MTC
Ali Gord	Booz Allen/Battelle
David Henderson	Metro Traffic
Mary Anne Marubashi	California Highway Patrol
Roy Stehle	SRI International
Doug Sibley	Caltrans District 4
Bill Tournay	Evaluation Administrator, Caltrans New Technology
Emily Van Wagner	MTC

GLS Research

Gary Steiger

Aaron Perceful

ABSTRACT

This paper discusses how traffic information is obtained and how the congestion of a major freeway affects travel behavior. Immediately following two congestion-causing major highway incidents south of San Francisco, telephone surveys were conducted of commuters who utilize the affected corridor of highway. The incidents took place two weeks apart on the same corridor of US-101, the first affecting southbound traffic and the second affecting northbound traffic. The travel behavior of commuters before and during their commute at the time of each incident was determined, including how they obtained traffic information and how the information influenced changes in route, mode of travel and departure time. The results of both surveys suggest that traveler behavior is largely unaffected by individual incidents of congestion. Furthermore, although a fair portion of commuters listen to traffic reports, they do not often modify their travel behavior in response. These surveys are the first two of several that will collectively provide insight into how travel behavior changes over time and will allow us to assess the impact of the TravInfo Traveler Advisory Telephone System (TATS) in the San Francisco Bay Area.

Passwords: TravInfo traveler information commuter travel behavior

CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXCUTIVE SUMMARY

TravInfo is a federally sponsored Field Operational Test (FOT) aimed at the implementation of an advanced traveler information system in the San Francisco Bay Area. The four major test elements are institutional evaluation, technology assessment, traveler response and network performance. The traveler response evaluation has four coordinated studies; 1) Broad Area, 2) Target, 3) TravInfo Traveler Advisory Telephone Information System (TATS), and 4) Information Service Provider (ISP) Customer Studies. This working paper presents the preliminary results of the initial surveys of the Target Study, a case study of commuter response to traffic information on incidents along US-101 south of San Francisco. The purpose of the Target Study was to assess the impact of TravInfo on a selected corridor in the presence of incidents under which TravInfo impacts/benefits are likely to be greatest. The selected corridor is a 20-mile segment of US-101 on the San Francisco Peninsula between the interchange of US-101 and SR 92 to the south and the interchange of US-101 and I-280 to the north. This segment of US-101 was selected based on the characteristics of: 1) the presence of heavy traffic congestion and commuter traffic, 2) availability of alternate modes and routes, and 3) availability of aggregate traffic data.

A panel survey approach was chosen to assess changes in travel behavior over time. A panel was created of 563 southbound and 526 northbound commuters whose primary commute route includes the selected US-101 freeway segment during morning peak hours between 6 - 10 AM. Participants were identified through the Caltrans Origin and Destination license plate surveys of southbound and northbound traffic on US-101.

On July 10, 1997, a multiple-vehicle injury accident on southbound US-101 in San Mateo blocked the left two of four lanes, causing a backup of about five miles. Within three weeks of the southbound accident, on July 28, a jack-knifed semi-truck in South San Francisco blocked the number 5 lane and the South Airport Boulevard on-ramp. Both incidents took over 30

minutes to clear and had a significant effect on traffic conditions.

Beginning on the evening of the incidents and continuing for four days, telephone interviews were conducted with the panel participants. 107 interviews were completed with southbound commuters and 105 interviews with northbound commuters.

Descriptive statistical methods were used to determine distributional profiles and association between variables.

The following are the summary findings of the northbound and southbound traveler surveys.

- Over 95% of the survey participants were commuters traveling on US-101 to major employment centers, southbound to Silicon Valley and northbound to the San Francisco Central Business District. The majority of them apparently have flexible arrival times (58.7% northbound commuters, 72.6% southbound commuters).

- About half of the southbound (52.3%) and northbound participants (51.4%) recall hearing about the traffic problem on US-101, mostly from commercial radio broadcast. Approximately one third of the southbound (26.8%) and northbound (35.2%) respondents who heard about the traffic problem modified their travel behavior on the morning of the incident. As found in the Broad Area and TravInfo 817-1717 caller surveys, the incident reports had little influence on mode shift to mass transit from personal vehicle (Yim, et al, 1996 and 1998).

- Approximately 15% of the total sample population (14% of southbound and 16.4% of northbound commuters) actually modified their travel on the morning of each respective incident. Although 15% of trip alteration may result in significant improvement on link flow, its magnitude cannot be determined until the network performance study is

completed with field measurements of travel time on the US-101 corridor and alternate routes.

- Over two thirds of the participants reported that they encountered congestion on the morning of the incident. However, actually encountering the congestion had only a moderate effect on how commuters planned to obtain traffic information in the future. Over half of the commuters said they were no more likely to obtain traffic information before or during their commute as a consequence of the congestion encountered. 47.2% of southbound and 40.4% of northbound commuters were not even sure if the information they obtained actually saved them travel time, which might suggest a reason for why so many commuters did not plan to receive more traffic information in the future. However, bivariate analyses showed that no such correlation exists, at least within this panel.

- When evaluating travel behavior during the previous month, respondents said that departure time was the most frequently adjusted behavior. 45.3% of southbound and 39.4% of northbound participants said they changed their departure time once a week or more, 30.2% of southbound and 25.0% of northbound commuters said they changed their route once a week or more, and 14.2% of southbound and 6.7% of northbound commuters said they changed their mode of travel once a week or more.

- Most survey participants (91.5% of southbound and 84.6% of northbound) were unfamiliar with the TravInfo TATS service, and about 75% of those who were aware of the service had never called it. Considering only 10% of the participants were aware of the TravInfo TATS service, it was unlikely that TATS was able to influence travel decisions to a large extent.

Ultimately, the results of the survey suggest that individual incidents do not affect traveler behavior significantly. Even though a fair portion of commuters were aware of the traffic

problem on the morning of the incident, relatively few actually modified their trip. It does not seem to be the case that commuters do not care about being slowed down by traffic congestion; rather, the likely explanation for the lack of response to incident information is that commuters generally do not believe that changing their travel plans, in particular taking an alternate route, will result in shorter travel times. Taking available alternate routes may result in about the same or even longer travel time because of the longer travel distance or because of traffic signals on surface streets.

The network performance evaluation of the US-101 corridor on the morning of the incident will demonstrate whether the 15% of travel change will result in substantial improvement on the performance of the US-101 corridor. Field measurements of travel time on the US-101 corridor will also help to understand whether the perceived travel time delay accurately reflects the actual travel time delay.

Although changes over time in traveler behavior cannot be determined until subsequent studies are completed, these first two surveys establish the initial travel behavior tendencies of the selected survey panel. The surveys showed that most participants had relied on radio traffic reports. There is apparently room for improvement in obtaining real-time traffic information and, more importantly, in using it. The key, then, to persuading commuters to change their travel behavior in response to traffic information may lie in informing them of traffic information sources like TravInfo and of the potential benefits of alternative travel options.

1. INTRODUCTION

TravInfo is a Field Operational Test (FOT) of an open-access traveler information system for the San Francisco Bay Area. In operation since September 1996, TravInfo disseminates free, real-time traffic information to Bay Area travelers through a landline telephone system. Additional services are also available through a landline data system (LDS) to Information Service Providers (ISP). The TravInfo traffic information is drawn from multiple public and private sources (Metropolitan Transportation Commission, 1994). By dialing the TravInfo telephone number, 817-1717, callers can also access other multi-modal traveler information services, including transit and rideshare information. The TravInfo FOT objective is not only to provide benefits to traffic operations and Bay Area travelers but also to stimulate the deployment of privately offered advanced traveler information products and services. The TravInfo FOT is sponsored by the Federal Highway Administration (FHWA) and the California Department of Transportation (Caltrans).

The evaluation project as a whole includes four major test elements: 1) institutional evaluation, 2) technology assessment, 3) traveler response, and 4) network performance. The institutional element evaluates the value of public/private partnerships and related issues (Hall, et al, 1994). The technology element assesses the data collection, integration and dissemination at the Traveler Information Center (TIC), where TravInfo information is managed. The traveler response studies investigate changes in individual travel patterns that result from using TravInfo, and traveler acceptance of and preference for TravInfo technologies. The network performance evaluation investigates whether TravInfo results in measurable changes in network travel times and transportation conditions.

The Target Study is part of the traveler response element of the TravInfo evaluation. The traveler response evaluation has four coordinated studies; 1) Broad Area, 2) Target, 3) TravInfo Traveler Advisory Telephone Information System (TATS), and 4) Information

Service Provider (ISP) Customer Studies.

Within the work plan for the traveler response evaluation is a Target Study (a case study of a geographically targeted area) that will assess changes in traveler behavior and the impact of TravInfo on a selected corridor in the presence of incidents under which TravInfo impacts/benefits are likely to be greatest (Yim, et al, 1997). By repeatedly surveying a panel of corridor commuters, the Target Study evaluates the changes in their responses to improved travel information by TravInfo; thus we can calculate the consequent benefits in terms of travel time savings and other performance measures as well as determine profiles of the individuals who acquire traveler information through TravInfo. Traveler responses will then be tied to the network performance evaluation. This evaluation will rely on both the Target survey and field measurements of actual traffic conditions in the selected corridor to simulate the effects of real-life incidents. The simulations will provide aggregate delay estimates for various incidents after TravInfo. The Target surveys occurred immediately after the incidents which affected all drivers who participated in the surveys.

The Target Study is one of four traveler behavior evaluations - Broad Area, Target, ISP (previously called Value Added Resellers) customer and TravInfo Traveler Advisory Telephone System (TATS) studies - all of which employ a survey methodology. The Broad Area study assesses the impact of TravInfo on the travel behavior of the entire Bay Area population (Yim, et al, 1997); the ISP customer study assesses the impact of TravInfo on those who access traffic information through devices and services offered by ISPs; the TravInfo TATS caller study assesses the impact on 817-1717 callers who acquire traffic or transit information (Yim, et al, 1997). The results of the first two of six planned Target surveys are discussed in this paper.

The paper begins in Section 2 with the methodologies used for the survey and data analysis. The key findings of the survey are presented in Section 3 and the conclusions in Section 4.

2. METHODOLOGY

This section describes the criteria used for corridor selection and the methods used for survey administration and data analyses.

2.1 Corridor Selection

The selected corridor for the Target surveys is a 20-mile segment of the US-101 corridor between the interchange of US-101 and SR 92 to the south and the interchange of US-101 and I-280 to the north. This segment was selected because:

1. It offers strong transit alternatives: Caltrains and SamTrans.
2. There are alternate routes in the corridor that can serve as relievers in case of incidents: I-280 and parallel arterials.
3. Updated traffic data are now available: Caltrans District 4 recently completed installation of loop detectors.
4. This segment of the corridor is classified as one of the most congested and high accident corridors in the San Francisco Bay Area (JHK & Associates, 1990).
5. On and off ramps are easily identifiable for the network performance evaluation.
6. The Target Study can benefit by coordinating from a separate on-going Bay Area origin and destination (O & D) study (SYSTAN Inc, 1995).

2.2 Survey Panel Selection

With the corridor selected, a panel survey methodology was employed to assess changes in travel behavior over time. A panel was created of people whose primary commute route includes the selected US-101 freeway segment during morning peak hours between 6 and 10 am. In September 1996, northbound and southbound morning commuters and frequent travelers on the selected corridor were recruited by Caltrans from the O & D survey of the US-101 corridor.

The Caltrans O & D survey employed a video assisted (license plate) method to create an address file from the California Department of Motor Vehicles. Six video cameras were placed over the Oyster Point overpass (south of 3Com Park), recording license plate numbers on the left three of four lanes in each direction on September 19, 1996 from 6 to 10 am. Using the address file, Caltrans sent out a mail-back survey questionnaire to 10,000 households of northbound travelers and 12,000 households of southbound travelers requesting participants for telephone interviews and/or focus group discussions about using the US-101 corridor. Of these, 563 southbound and 526 northbound commuters agreed to participate.

2.3 Incident Selection Criteria

The incidents to be used had to satisfy the following criteria:

1. Must be located within the corridor.
2. Must occur between 6 AM and 9 AM.
2. Must have an effect lasting at least 30 minutes to ensure that a reasonable percentage of the population using the corridor is affected. The clearance time will be determined by the California Highway Patrol.
3. Must have a significant effect on traffic conditions, blockage of at least one lane on US-101 in a bottleneck, at a location and time where traffic normally is close to saturation. Saturation is defined as the condition when the traffic has reached the highest level of congestion.
4. Must not be "catastrophic" (e.g., cannot block entire freeway for many hours).

The duration of the effect and the number of lanes being closed were determined based on historical data analyses of the accident and incident rates. According to the Caltrans' record between July 1, 1995 and June 30, 1996, at least three incidents meeting these criteria had occurred on each direction. Most of the incidents reported during this period took about 30 minutes to clear.

2.4 Survey Questions

The incident survey was designed to obtain the following information from the respondents:

Incident-related questions

- Source and content of traffic information received prior to and during commute (if any)
- How and why the traffic information did or did not affect respondent's departure time, mode of transportation and/or route
- Where congestion was encountered on US-101, if at all, and travel decisions made in response to congestion
- What alternate route was taken
- To what extent the incident has influenced respondent to obtain travel information before and/or during commute
- To what extent the traffic information obtained saved or cost time
- Respondent's perception of greatest benefits received from traffic information obtained

Respondent Behavior

- How frequently respondent typically changes departure time, mode of travel and/or route
- Respondent awareness and use of TravInfo
- How frequently respondent uses radio and television traffic reports before and during travel.

Demographic Profile

- Age
- Sex
- Race/ethnicity
- Occupation

- Whether or not working hours are flexible
- Education completed
- Household income
- How long respondent has lived in Bay Area
- Number of cars in household
- How many licensed drivers in household

2.5 Survey Data Analysis

The descriptive statistical method was used to determine distribution profiles of the sample. In some cases Chi-square and t-tests were used to compare means and proportions of responses.

2.6 The Incidents

Both southbound and northbound commuters were surveyed. US-101 southbound is the primary route to Silicon Valley, a major employment center of the electronic and computer industry. US-101 northbound is the primary route to the San Francisco Central Business District. Two alternate routes to US-101 are I-280 and El Camino Real, a major arterial connecting SR 92 to the south and I-280 to the north. El Camino Real is located in between US-101 and I-280. This section describes the incident locations and the nature of the accidents that occurred in July 1997 (Figure 1).

Figure 1. Selected segment of the US-101 corridor and the incident locations

The Southbound Incident

On July 10, 1997 an accident located on the selected corridor was reported on the Computer Aided Dispatch (CAD) at 7:39 AM, producing effects which satisfied the predetermined criteria. A multiple-vehicle injury accident on southbound US-101 in San Mateo blocked the left two of four lanes, causing a backup that stretched about five miles. The accident scene was

cleared by 8:17 am; however, a stalled semi-truck worsened the congestion situation for another 20 minutes.

Beginning on the evening of July 10, telephone interviews were conducted using the computer-aided telephone interview (CATI) method. Within three days of the accident, the interviews were completed. Since the O & D database of addresses and phone numbers was not gathered at the time of the accident, the survey was limited to include only those who traveled southbound on this stretch of US-101 at the time when the license plate survey was conducted in September 1996.

107 interviews were completed. Interviews were terminated after three days of the incident because it was believed that people may not clearly remember how they changed their behavior. Repeated calls were made up to five times. 36.9% of the sampling pool was unusable because 19.5% of the volunteers had disconnected phone numbers and 17.4% gave out business phone numbers. Work phone numbers were not used in the survey because people do not have time to participate in a telephone interview at work.

The call record of the southbound commuters is shown in Table 1. Considering only the people who answered the phone calls, a 53.5% response rate was obtained.
The interview took 14.5 minutes on average for the southbound survey.

Table 1. Call record of the southbound commuters (n = 563 volunteers)

Call category	**No of calls**	**Return rate**
Completed interviews	107	53.5 %
Refusal/not available/cannot reschedule	93	
Total qualified calls	**200**	
Business/government/fax numbers	98*	
No answer	816	
Busy signal	203	
Answering machine	2,709	

Disconnected phone numbers	110*	
Disqualified/not traveled on US-101	219	
Call back but terminated after 3 days	315	
Total disqualified calls	**4,470**	
Total attempts	**4,670**	

* unusable phone numbers

The Northbound Incident

On July 28, 1997 another incident meeting the criteria was reported at 6:47 AM. A jack-knifed semi-truck in south San Francisco blocked off the number 5 lane and the South Airport Boulevard on-ramp. The accident was cleared by 7:40 AM.

One hundred five telephone interviews were completed from July 29-31. Repeat calls were also made up to five times. Compared to the southbound sampling pool (36.9%), the drop out rate was considerably lower at 10.8% (4% business phone numbers, 6.8% disconnected phone numbers).

The call record of the northbound commuters is shown in Table 2. Again considering only those who answered the phone calls, a 77.2% response rate was obtained for the northbound survey. This response rate was significantly higher than the southbound survey. The interview took 12.6 minutes on average for the northbound participants.

Table 2. Call record of the northbound commuters (n = 526 volunteers)

Call category	**No of calls**	**Return rate**
Completed interviews	105	77.2%
Refusal/not available/cannot reschedule	31	
Total qualified calls	**136**	
Business/government/fax numbers	21*	

No answer	277	
Busy signal	81	
Answering machine	541	
Disconnected phone numbers	36*	
Disqualified/not traveled on US-101	171	
Call back but terminated after 3 days	262	
Total disqualified calls	**1,389**	
Total attempts	1,525	

* unusable phone numbers

3. SURVEY RESULTS

The survey results are presented in four parts: 1) sample characteristics, 2) traveler response to incident information, 3) typical travel behavior of respondents, and 4) the use of the TravInfo service.

3.1 Sample Characteristics

The southbound survey participants were, on the whole, well-educated and financially well-off; all had high school diplomas, 75.5% were college graduates, 34.9% had gone to graduate school, 32.1% reported household incomes of at least $100,000. A likely explanation for these sample characteristics is that a large segment of commuters traveling southbound in the mornings on this stretch of US-101 are heading for work at relatively high-paid jobs in Silicon Valley. 94.3% of the panel was traveling to work that morning.

The northbound survey participants were characteristically similar to the southbound participants in many ways. Most notably, the northbound participants were similarly well-educated and financially well-off: 60.6% were college graduates, 30.8% had gone to graduate school, 36.5% reported household incomes of at least $100,000. In contrast to the southbound travelers, however, the northbound commuters were on average six years older and the northbound sample had a significantly larger Black/African-American representation (10.6% of

northbound respondents and 0.9% of southbound respondents were Black/African-American). The gender ratio was about the same in both samples: 38.5% women in the northbound sample, 37.7% in the southbound.

The sample compared with the Origin and Destination survey

Compared to the Caltrans' Origin and Destination (O & D) survey, the age group between 45 - 64 in the southbound sample and the age group under 30 in the northbound sample were under-represented (Tables 3 and 4). When the Target survey data were weighted by the age distribution of the O & D survey, a small variation, about 1-1.5%, was found between the weighted and unweighted samples. The results presented in this paper are based on the analysis of the unweighted samples because the sample sizes were fairly small and because a variation between the weighted and unweighted samples was less than 2%.

Table 3. Southbound sample compared with the age distribution of the O & D survey

Age	Target N=107 % of respondents	O & D N=1,524 % of respondents	t-test probability
> 20 years	0	0.3	0.968
20-29	18.9	24.3	0.827
30-44	44.3	51.2	0.833
45-64	34	21.9	0.989
65 or over	2.8	2.2	0.285

Table 4. Northbound sample compared with the age distribution of the O & D survey

Age	Target N=105 % of respondents	O & D N=1,234 % of respondents	t-test probability
> 20 years	0	0	-
20-29	1.9	9.8	0.999
30-44	51.9	46.5	0.710
45-64	37.5	38.6	0.176
65 or over	8.7	5.1	0.796

3.2 Responding to Traffic Information

Since the purpose of this Target survey was largely to analyze how traffic information affects traveler behavior under incidents, there are two non-exclusive categories by which the survey participants who listen to traffic information may be classified: those who received traffic information and heard about the congestion before leaving home and those who received traffic information and heard of the congestion while driving. Upon hearing of congestion before leaving home, a traveler can choose among any of three categories of travel change to try to avoid traffic: change in departure time, change in mode of travel and change in route. Those who heard of the congestion only after leaving home might have only the option of changing their route.

Pre-trip travel behavior

For the most part, the travel behaviors of the two samples, southbound and northbound participants, were remarkably similar. Apparently, traffic information has some influence on the travel behavior of those who receive it before leaving home.

52.3% of southbound survey participants recalled receiving a traffic report before leaving home the morning of their respective incidents, of which 46.4% (24.3% of the total sample) recalled hearing of congestion on US-101 during these pre-departure reports (Table 5). Similarly, 58.1% of northbound respondents recalled receiving a traffic report prior to departure, of which 53.3% (31.4% of the total sample) recalled hearing of congestion on US-101. Of those who heard about the incident, 69.2% of southbound and 60.6% of northbound commuters did not alter their travel in any way. (In other words, 30.8% of southbound and 39.4% of northbound travelers made decision to change their travel plan prior to departure.) Figures 2 and 3 show how the respondents changed their travel behavior as consequence of receiving the incident report.

Table 5. Obtaining and using traffic information prior to departure

	Southbound (N=107)	Northbound (N=105)
Obtained traffic report before leaving home:	52.3% (n=56)	58.1% (n=62)
Recalled hearing of congestion on US-101 in report:	24.3% (n=26)	31.4% (n=33)
Changed the travel plan as consequence of report:	7.5% (n=8)	12.4% (n=13)

Figure 2. Changes in travel plans as consequence of the incident report before departure Southbound Travelers (N=8)

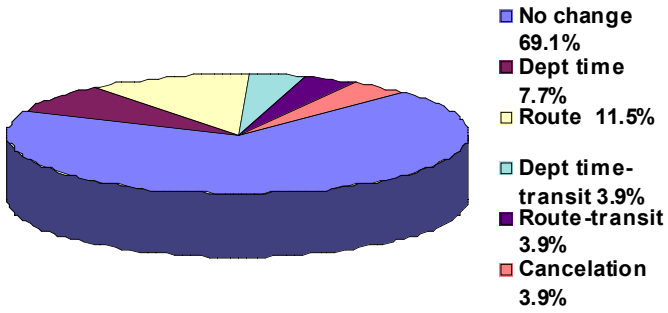
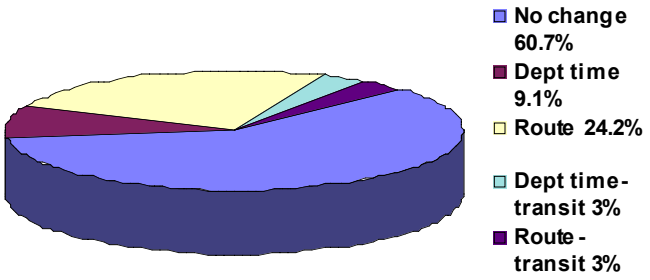


Figure 3. Changes in travel plans as consequence of the incident report before departure Northbound Travelers (N=13)



Departure time change based on the pre-trip incident report

Looking more closely at how commuters could have changed their travel plans, 11.5% of southbound and 12.1% of southbound commuters who heard of the congestion prior to leaving changed their departure time. In contrast, 50% of southbound and 45.5% northbound did not change their departure time because they did not believe it would help (Table 6). Two thirds of the southbound travelers who changed their departure time left later than originally planned while all of the northbound travelers left earlier than originally planned.

Table 6. Reasons for not changing departure time for traveling on US-101

Heard about the incident Changed departure time based on the traffic report	Southbound(N=26) 11.5%	Northbound(N=33) 12.1%
Main reason for not changing departure time:		
Did not take US-101 (took an alternate route)	15.4%	27.3%
Did not believe it would help to change	50.0	45.5
Took care of errands on the way	3.8	-
Believed traffic would clear shortly	7.7	12.1
Did not trust traffic report	3.8	3.0
Stayed home	3.8	-
Not sure	4.o	-

Mode change based on the pre-trip incident report

Only 7.7% of southbound and 6.1% of northbound travelers who heard of the congestion before leaving decided to change their method of travel (Table 7). Reasons for not changing their method of travel differed between northbound and southbound respondents: among southbound travelers who heard of the congestion prior to departure, 26.9% cited that mass transit was too

inconvenient and 36.4% said there was no other possible mode (transit or rideshare), while among their northbound counterparts, only 6.1% said mass transit was too inconvenient and 23.1% said there was no other possible mode, citing instead that they believed the traffic would clear shortly (30.3%) and that mass transit would not save any time (23.1%).

Table 7. Reasons for not changing mode of travel

Heard about the incident Changed to transit & departure time/route based on the traffic report	**Southbound**(n=26) 7.7%	**Northbound** (n=33) 6.1%
Main reason for not changing method of travel:		
Mass transit is too inconvenient	26.9	6.1
Believed traffic would clear shortly	11.5	30.3
Did not trust traffic report	7.7	6.1
Did not believe mass transit would save time	3.9	23.1
No other mode possible	34.6	23.1
Other	7.7	5.2

Route change based on the pre-trip incident report

Of those who heard of the congestion before leaving home, only 15.4% of southbound and 27.3% of northbound commuters avoided US-101 to any extent (Table 8). One-third of southbound and half of northbound commuters who did not change their routes did not believe an alternate route would be faster.

Table 8. Changing route due to traffic report heard prior to departure

Avoided Highway 101 because of report of congestion heard prior to departure:	**Southbound**(n=26) 15.4%	**Northbound** (n=33) 27.3%
Main reason for not changing route:	**(n=22)**	**(n=24)**
Thought alternate route would not be faster	27.3%	50.0%
Believed traffic would clear shortly	22.7	16.7
Did not trust traffic report	14.6	8.3
Were not familiar with any alternate route	14.6	12.5
Didn't need to/congestion cleared	20.8	-
Other	-	12.5

En Route Travel Behavior

Only 25.9% of southbound and 27.9% of northbound commuters who received traffic reports before leaving home did not continue to receive them while commuting. 57.4% of southbound and 65.1% of northbound survey participants obtained traffic reports after starting their trips.

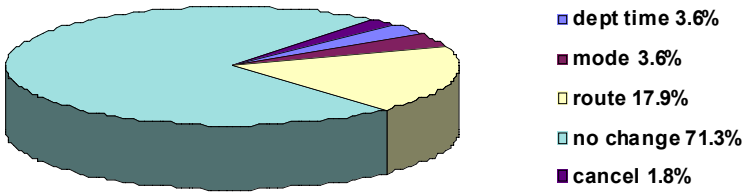
Route change based on the en route incident report

23.3% of southbound and 19.5% of northbound commuters who recalled hearing of congestion on US-101 while commuting decided to take alternate routes, and of those who actually encountered congestion, 9% of southbound and 6.7% of northbound commuters switched to an alternate route as a result.

Overall impact of incident reports on travel behavior

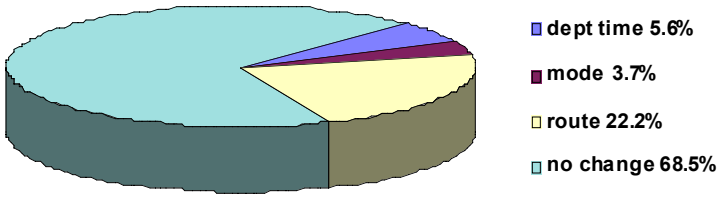
The overall impact of the incident reports on morning commuters was not that significant. Only 14% of southbound and 16.4% of northbound commuters actually modified their travel on the morning of each respective incident. However, the effects of incident reports on travel changes are rather significant. 28.7% of southbound commuters and 32.1% of northbound commuters who heard about the incident altered their trip. Figures 4 and 5 show the travel changes based on the US-101 incident information.

Figure 4. Travel changes of southbound commuters based on the incident report
(n = 56, total number of people who heard about the congestion)



Eight of the 26 southbound commuters who received the incident report changed their travel plan prior to departure. One canceled the trip and stayed home; one took transit but left home at the usual time; one took transit and left earlier than the usual time; two left later than originally planned and three took an alternate route but left home at the usual time. Seven of the 30 people who heard about the incident after leaving home took an alternate route in order to avoid congestion.

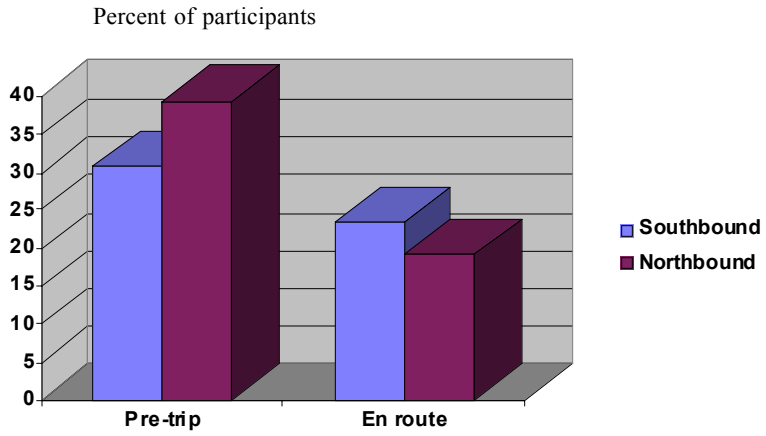
Figure 5. Travel changes of northbound commuters based on the incident report (n = 54, total number of people who heard about the congestion)



Thirteen of the 33 northbound commuters who heard of the incident prior to departure altered their travel plans. One left home earlier than originally planned and took transit; one left home as originally planned but took transit; three left earlier than originally planned and eight took an alternate route. Four of the 30 participants who heard about the incident en route took an alternate route.

Proportionally more people tend to modify their travel with pre-trip information than do those with en route information even though more people tend to listen to en route traffic reports than to pre-trip reports (Figure 6). 30.8% of the southbound commuters who heard about the incident prior to departure decided to change their plan while only 23.3% who heard of the incident after departure did the same. Likewise, 39.4% of the northbound commuters changed their behavior with pre-trip information while 19.1% did the same.

Figure 6. Pre-trip and en route travel decisions



3.3 Recalling the Cause of Congestion

Of those who obtained traffic information and heard of the congestion on US-101, either before or during their commute, less than half of those heading south and less than one-third of those heading north could accurately recall the main cause of the congestion.

3.4 Travel Time

The average morning commute normally takes 45 minutes for southbound respondents and 33.7

minutes for northbound respondents; during the morning of each incident, on average, southbound respondents said their July 10th commute took 9.8 minutes longer than normal and northbound respondents said their July 28th morning commute took 5.6 minutes longer than normal. Despite the slowdown, two-thirds of northbound and southbound respondents who encountered congestion that morning said they were no more likely to obtain travel information prior to departing as a direct consequence of the traffic. 50% of southbound and 58.5% of northbound commuters said they were no more likely to obtain travel information during their commute either (Table 9). Analysis through cross-tabulations suggests that there is no significant correlation between demographic characteristics and the likelihood of obtaining traffic information. More specifically, age, income and education did not seem to correlate to how much more likely respondents were to obtain traffic information as a consequence of the congestion.

Table 9. Likelihood of obtaining travel information in the future as a consequence of the congestion encountered

Likelihood of obtaining information prior to leaving	**Southbound** (n=70)	**Northbound** (n=53)
Much more likely	18.6%	18.9%
Somewhat more likely	12.9	11.3
No more likely	65.7	67.9
Not sure	2.9	1.9
Likelihood of obtaining information while traveling	**Southbound** (n=70)	**Northbound** (n=53)
Much more likely	24.3%	26.4%
Somewhat more likely	24.3	11.3
No more likely	50.0	58.5
Not sure	1.4	3.8

Interestingly, 47.2% of southbound and 40.4% of northbound commuters who obtained traffic reports were unsure as to whether or not the information they received saved them travel time (Table 10). 39.3% of southbound, 44.9% of northbound said the reports saved them time and 12.4% of southbound and 9.0% of northbound commuters said they felt the information actually cost them time.

Approximately two thirds of the participants perceived to have the benefits of traffic information (Table 11). Among the benefits cited by the respondents were being able to make informed decisions, reduction in stress and savings of travel time. Less than one fifth of the respondents felt that traffic information resulted in travel time savings. Statistical analysis indicated that there is no significant correlation between how respondents who encountered congestion perceived their benefits from obtaining traffic information and the likelihood that they would obtain information in the future. In other words, whether or not traffic information benefited them that morning did not seem to significantly influence whether or not they would obtain traffic information in the future.

Table 10. Perceptions of efficacy and benefits of traffic information

Traffic information saved or cost time:	**Southbound** (n=89)	**Northbound** (n=89)
Saved time	39.3%	44.9%
Cost time	12.4	9.0
Not sure	47.2	40.4
Refused/NA	1.1	5.6

Table 11. Benefits of traffic information at the time of incident

Single greatest benefit received from obtaining traffic information at time of incident:	**Southbound** (n=106)	**Northbound** (n=104)
• Saved travel time	**17.0%**	**19.2%**
• Reduced stress/anxiety	**26.3**	**21.1**
• Helped with making informed travel decisions	**22.7**	**32.7**
- Changed departure time	6.6	8.7
- Changed to take mass transit	1.9	1.9
- Changed to take an alternate route	12.3	16.3
- Enabled to inform someone about being late	1.9	5.8
• Uncertain of benefits	**34.0**	**27.0**
- No benefit	17.0	15.4
- Not sure	6.6	10.6
- No answer	10.4	1.0

3.5 Typical Respondent Behavior

The typical travel behavior tendencies of the participants was determined by asking about how frequently they changed their departure time, mode of travel and route during the month prior to the interview. Departure time change seemed to be the most frequently adjusted behavior among both the southbound and the northbound survey participants (Figure 7). 45.3% of southbound and 39.4% of northbound respondents said they changed their departure time once a week or more, while 29.2% of southbound and another 39.4% of northbound respondents said they changed less than once a month. A hypothesis was that departure time change might be correlated with flex working hours. The statistical analysis, however, suggests that no strong correlation exists between departure time change and the flexibility in work starting time. The surveys showed that the majority of commuters in the US-101 corridor have flexible work starting times (72.6% southbound, 58.7% northbound).

30.2% of southbound and 25.0% of northbound respondents said they changed their route once a week or more, while another 30.2% of southbound and 39.4% of northbound respondents said they changed their route less than once a month (Figure 8). Mode of travel was the least frequently changed behavior. About two thirds of the respondents (65.2% of southbound and 70.2% of northbound) said that they changed their mode of travel less than once a month (Figure 9). Behavioral changes stated during the last month might include changes made due to other reasons than traffic congestion. However, the majority of the travel changes made during that month were related to traffic problems.

Figure 7. Frequency of changing departure time during last month
Southbound (N=106) Northbound (N=104)

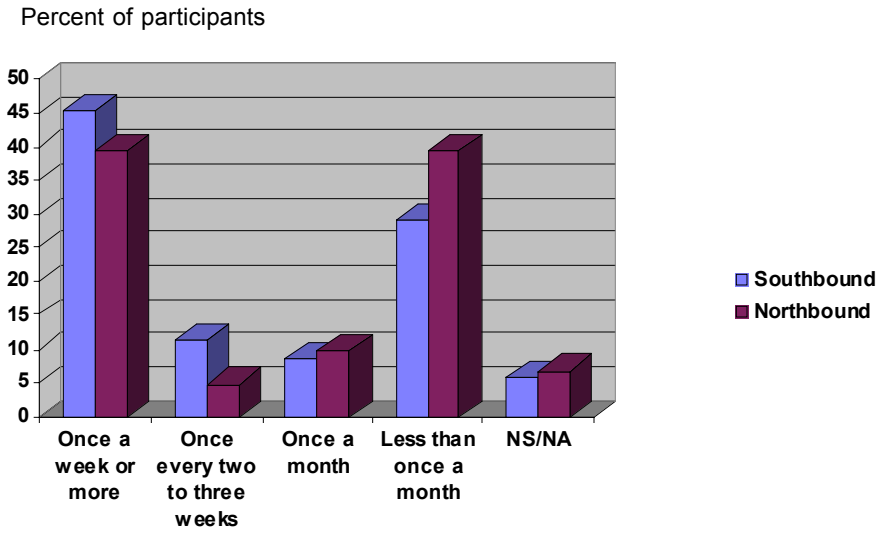


Figure 8. Frequency of changing route during last month
Southbound (N=106) Northbound (N=104)

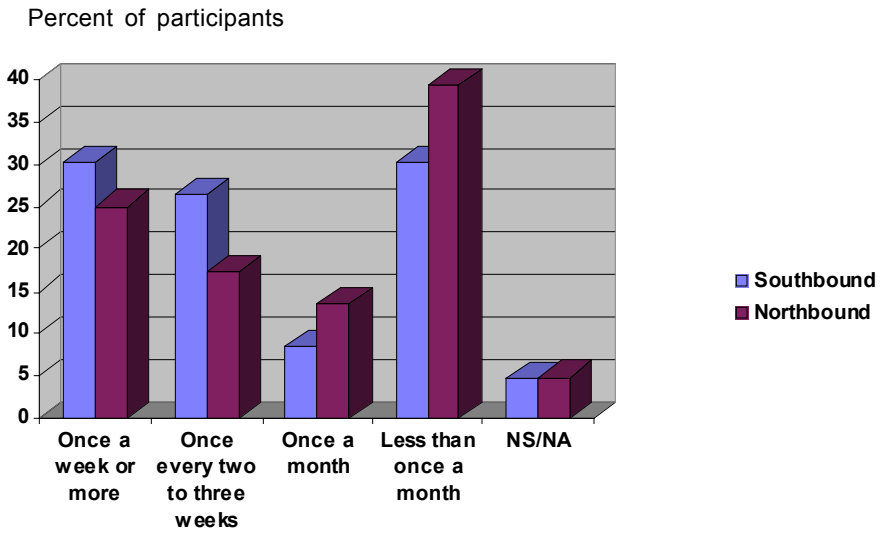
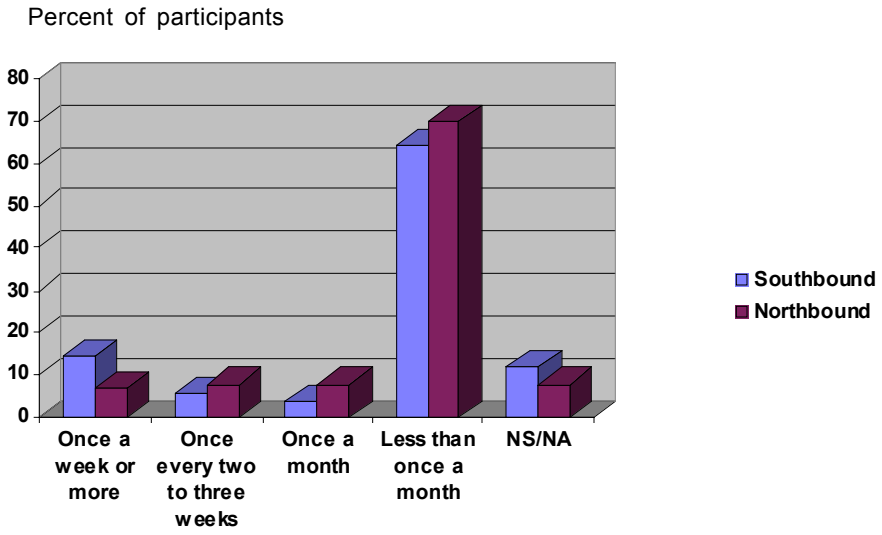


Figure 9. Frequency of changing mode of travel during last month
Southbound (N=106) Northbound (N=104)



This all suggests that, on the whole, the northbound commuters were more likely to modify their travel plans before leaving home, and this suggestion is somewhat consistent with their relative behaviors during the morning of each incident. Interestingly, the northbound commuters were more likely to obtain traffic information on a frequent basis, and proportionately more northbound commuters obtained traffic information during the morning of July 28th than did southbound commuters on the morning of July 10th (southbound commuters: 52.3% pre-trip, 57.4% en route; northbound commuters: 58.1% pre-trip, 65.1% en route). For example, while 34.9% of southbound commuters listened to radio reports five or more times a week before leaving, 45.2% of northbound commuters did the same. 9.4% of southbound commuters tuned into television traffic reports five or more times a week, but 17.3% of northbound commuters did the same (t-test). This may be due in part to the fact that northbound commuters have better transit options to the Central Business District in San Francisco and there are fewer options available to southbound commuters.

3.6 Source of traffic information

The surveys showed that the majority of the participants obtained traffic information from commercial radio on the morning of the incident and that radio broadcast was the primary means of receiving traffic information both before departing and while en route (Table 12 and 13).

Table 12. Sources of traffic information before departing

Frequency of tuning in to a radio traffic report before departing:	**Southbound** (n=106)	**Northbound** (n=104)
Five or more times a week	34.9%	45.2%
Three to four times a week	10.4	12.5
One to two times a week	12.3	7.7
Less than once a week	7.5	7.7
Never	34.9	26.9
Frequency of tuning in to a television traffic report before departing:	**Southbound** (n=106)	**Northbound** (n=104)
Five or more times a week	9.4%	17.3%
Three to four times a week	5.7	11.5
One to two times a week	6.6	10.6
Less than once a week	7.5	9.6
Never	70.8	51.0

Table 13. Source of traffic information en route

Frequency of tuning in to a radio traffic report while driving:	**Southbound** (n=106)	**Northbound** (n=104)
Five or more times a week	63.2%	68.3%
Three to four times a week	17.0	10.6
One to two times a week	7.5	6.7
Less than once a week	4.7	4.8
Never	7.5	8.7
Not sure	-	1.0

TravInfo was unfamiliar to most respondents, and of the few who had heard of TravInfo, almost none utilized it with any substantial frequency (Tables 14 and 15). Only 7.5% of southbound and 15.4% of northbound respondents had heard of TravInfo. Three-fourths of those who recognized TravInfo never used it at all. A possible explanation is that travelers are

not aware of the benefits that can be gained from calling TravInfo.

Table 14. Use and awareness of TravInfo

Heard of TravInfo:	**Southbound** (n=105)	**Northbound** (n=104)
Yes	7.5%	15.4%
No	91.5	84.6
How first learned of TravInfo:	**Southbound** (n=8)	**Northbound** (n=16)
Television	12.5%	6.3%
Radio	37.5	31.3
Billboard	25.0	25.0
Word-of-mouth	12.5	12.5
Newspaper	12.5	18.8
Not sure	-	6.3

Table 15. Frequency of calling TravInfo

How frequently called TravInfo (southbound and northbound combined)**:**	**Before leaving home** (n=24)	**While driving** (n=13)
Five or more times a week	4.2%	7.7%
One to three times a month	12.5	7.7
Less than once a month	8.3	7.7
Never	75.0	76.9

4. CONCLUSION

Although changes over time in traveler behavior, as well as increased awareness and use of TravInfo, cannot be determined until subsequent studies are completed, these first two surveys establish the initial travel behavior tendencies of the selected survey panel. Despite the benefits of obtaining travel information, only 51.4% of northbound and 58.7% of southbound respondents obtained information prior to leaving for their commutes, and of those who heard of the congestion, 70.8% of southbound and 84.4% of northbound commuters did not alter their departure time, mode or route. Actually encountering the congestion had only a moderate effect on how commuters planned to obtain traffic information in the future: over half of the

commuters said they were no more likely to obtain traffic information before or during their commute as a consequence of the congestion encountered. 47.2% of southbound and 40.4% of northbound commuters were not even sure if the information they obtained actually saved them travel time, which might suggest a reason for why so many commuters did not plan to receive more traffic information in the future. However, statistical analysis indicates that no such correlation (between perceived benefits of changing behavior and obtaining traffic information) exists, at least within this panel.

When evaluating their typical travel behavior, respondents said departure time was the most frequently adjusted variable. 45.3% of southbound and 39.4% of northbound commuters said they changed their departure time once a week or more, 30.2% of southbound and 25.0% of northbound commuters said they changed their route once a week or more, and 14.2% of southbound and 6.7% of northbound commuters said they changed their mode of travel once a week or more.

Most survey participants were unfamiliar with TravInfo, and about 75% of those who were aware of the service had never called it. TravInfo most likely has an insubstantial effect on traveler behavior in this corridor at the present time. A possible explanation for people never having tried TravInfo is that they were not able to assess the benefits of calling TravInfo. Awareness of a product or service is an essential part of marketing. However, awareness alone does not guarantee that people will use a product or service. Consumers will have to have a chance to try it first in order to determine whether they like it or not. The benefits of TravInfo must be recognized before it is used.

Ultimately, the results of the survey suggest that individual incidents do not affect traveler behavior significantly, and that although a fair proportion of commuters obtains traffic information, few actually utilize it. It does not seem to be the case that commuters do not care about being slowed down by traffic congestion; rather, the likely explanation for the lack of

response to information is that commuters generally do not believe that changing their travel plans will result in shorter travel times. The key, then, to persuading commuters to change their travel behavior in response to traffic information may lie in informing them of traffic information sources like TravInfo and of the potential benefits of alternative travel options.

REFERENCES

1. Metropolitan Transportation Commission, *TravInfo Field Operational Test, Project Description*, 1994.
2. Hall, Randolph, Youngbin Yim, Asad Khattack, Mark Miller, Stein Weissenberger, *TravInfo Field Operational Test Evaluation Plan,* University of California, Berkeley, PATH Working Paper, UCB-ITS-PWP-95-4, November 1994.
3. Yim, Y.B., Randolph Hall, Alex Skabardonis, Robert Tam, Stein Weissenberger, *TravInfo Field Operational Test: Work Plan for the Target, Network, and Value Added Reseller Customer Studies,* PATH Working Paper, UCB-ITS-PWP-97-14, 1997.
4. Yim, Youngbin, Randolph Hall, and Stein Weissenberger, *TravInfo Evaluation: Traveler Response Element, Broad Area Study,* PATH Working Paper UCB-ITS-PWP-97-9, March 1997.
5. Loukakos, Dimitri, Randolph Hall, Stein Weissenberger and Youngbin Yim, *TravInfo Evaluation:Institutional Element, Value Added Reseller Study,* PATH Working Paper UCB-ITS-PWP, 1996.
6. Yim, Youngbin, Randolph Hall, Ronald Koo and Mark Miller, *TravInfo Evaluation: Traveler Response Element, TravInfo User Study,* PATH Working Paper, October 1997.
7. JHK & Associates, *SMART Corridor Statewide Study, Final Report*, June 1990
8. SYSTAN Inc., *Origin and Destination Surveys in Six Bay Area Corridors*, March 1995.