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Research Proposal

Abstract

Traffic problems have always been a challenge for cities and urban areas. City planners have continually developed methods and strategies to cope with these problems by improving transportation systems. One of the strategies they have developed is to utilize transit-only lanes where it eliminates cars from riding in the bus lanes, thus allowing buses to run more smoothly without interruptions. However, in crowded areas such as San Francisco, do transit-only lanes really help traffic problems and reduce travel time? Are these transit-only lanes really helpful during peak hours where traffic problem is most prominent? My research question is to look at how riders perceive the effectiveness of our current transit-only lanes system in reducing traffic congestion problems in San Francisco. I conducted a survey with employees at my current company and asked for their views on the effectiveness of our current transit-only lanes. Analysis of data shows that there is a relationship/ no relationship between transit-only lanes and the reduction in transit travel time.

NEED TO ADD CONCLUSION from analysis!!! Results from this research will provide important implications on how transit-only lanes will help reduce traffic problems in other urban areas.

Introduction

Reliable and efficient mass transportation is important to every urban city and traffic problems have always been a challenge for cities and urban areas, therefore the efficiency of buses need to be examined. City planners have always developed methods and strategies to cope with traffic problems by improving transportation systems. One of the strategies they developed is the use of transit-only lanes where it eliminates cars from riding in bus lanes, thus allowing buses to run more smoothly. However, in crowded areas such as San Francisco, these bus only lanes may have limited effectiveness due to various factors. In my study, an effective transit-only lane is defined as one that allows riders to get to their destination faster, and that they experience a reduction in transit travel time from riding in a transit lane as opposed to riding in a mixed traffic lane. It is crucial that the current transit-only lanes are effective reducing in traffic

problems (at least to some degree) and that governmental fund are spent wisely as intended. I have hypothesized that transit-only lanes generally are not effective unless two critical factors are addressed/ improved; (1) if signs and street markings are updated and made consistent, and (2) if enforcement is enhanced. Currently there are two projects being studied in an attempt to improve traffic conditions on Van Ness Avenue and Geary Boulevard by implementing Bus Rapid Transit (BRT), where a dedicated corridor similar to the existing transit-only lanes in downtown, will be installed to prohibit private vehicles from riding in the corridor. The focus of my study, however, is only on transit-only lanes in the downtown area because these lanes affect many professionals and riders who rely on the public transit to get to work on time in the morning and get home sooner after a long day of work.

The null hypothesis is that transit-only lanes do not reduce travel time, thus they are not effective in reducing traffic problems. My research hypothesis is that transit-only lanes do reduce travel time and they effectively reduce traffic problems congestions if signs and street markings are updated and made consistent and if enforcement is enhanced. My objective is to use surveys from a convenience sample of bus riders to test against the null hypothesis that transit-only lanes are not effective in reducing travel time and traffic problems. Therefore, this study is designed to find out how riders view the effectiveness of our current transit-only lanes in reducing transportation problems in San Francisco.

Literature Review

Many studies discuss congestion problems as a big concern for urban areas, and different strategies and policies have been implemented to try to reduce traffic problems. However, most

of them have focused on expanding transportations systems such as building or improving "highways," or building train systems such as BART. These high cost projects such as BART are usually designed to help residents commute in suburban areas and do not help residents living in crowded cities like San Francisco (Merewitz, 2001). An interesting point Merewitz makes is, "if we are concerned with rush-hour traffic, why have large investments in facilities devoted 7 days per week, 24 hours per day, to solving a problems which exists only about 20 hours of a 168-hour week?"(2001). Traffic congestion is at its worst during peak hours and we need to have a transportation system that specifically targets traffic problems during those hours. Furthermore, "if anyone hoped for intra-city transportation via BART, they were to be disappointed….It is more like a commuter railroad than urban rapid transit. It serves neither Chinatown nor North Beach, two densely populated residential areas of the city" (Merewitz, 2001). The goal and the operation of BART have simply contributed little positive effects in helping congestion problems in the core downtown of San Francisco.

Little research has been done on analyzing how to resolve traffic and transportation problems within urban areas. Furthermore, policies have often used variables in their analysis that do not necessarily alleviate congestion problems. As Cao & Mokhtarian (2005) suggest, many transportation policies that we adopted have been "of limited effectiveness." For example, variables that reflect individuals' responses to travel-related strategies are rarely measured and incorporated into demand models (Cao & Mokhtarian, 2005). Thus, policy makers need to understand that "the role of such variables will improve our ability to design effective policies" in transportation problems (Cao & Mokhtarian, 2005). In the present study, understanding how riders feel about our current transit-only lanes and also examining critical components of transit-

only lanes will really help determine whether or not the strategy of utilizing transit-only lanes are effective in combating transportation problems.

Cervero (2006) points out that recently, there is a "smart growth movement" in travel forecasting. Instead of focusing on big capital investments, focus has shifted in which it encourages people to "drive less, and walk, bike and ride transit more." Public transportation is not going to get better if more and more urban residents drive their own private vehicles in the city. Schwanen and Mokhtarian note that, "if public transit patronage remains below expectations, service may be limited, which may force true urbanites to shift back to private automobiles." Furthermore, "the uncontrolled growth of private vehicles is certainly at the cost of public transport and there is no viable option but to augment public transport services and simultaneously restrain car ownership" (Patankar et al.2007). This statement is very true except we simply cannot restrain car ownership as Patankar et al. suggest. However, we can make public transportation "more attractive and competitive with the automobile" by improving our current transportation system, such as achieving "time savings, make bus schedules more predictable and dependable, and in general redefined the image of bus transit" ("Annual Report," 2004).

Goral (2007) believes that we as residents, all have a "social responsibility" to find alternatives to "vehicle overpopulation and our dependency on oil." Goral studied congestion problems in colleges and universities and found mass transportation a great solution to vehicle overpopulation within many colleges and universities areas. This implication is applicable to urban cities where mass public transit can help reduce the number of vehicles on roads significantly. Meanwhile, MUNI serves about 700,000 passengers each day, so mass transportation has to be very efficient (San Francisco Examiner, 2008).

Geary Boulevard and Van Ness Avenue are two of the busiest and most heavily congested streets in San Francisco ("Executive Summary," 2005). It takes an average of 22 minutes to travel Van Ness Avenue from one end to the other and there are about 80,000 commuters riding along Van Ness Avenue each day (San Francisco Examiner, 2007). Meanwhile, Geary Boulevard is just as bad where the current "roadway layout and traffic signal infrastructure on Geary benefit motorists at the expense of transit riders and pedestrians" and that "the Geary expressway allows motorists to travel at relatively high speeds, while buses are channeled onto narrow and ineffectual service roads" (Executive Summary 2005). The average speed of private vehicles is 17 to 22 mph while transits only run at 7 to 10 mph. Clearly, transit speeds are 50 to 60% slower than the speed of private vehicles, meaning public transit takes about twice as long to get to your destination than it would in private vehicles. In some cases, the trip may even be longer due to bus delays. Bus delays are caused by "time spent loading and unloading passengers, waiting for green lights at signals, and the difficulty of getting back into traffic" ("Executive Summary," 2005).

As a strategy to alleviate the above mentioned traffic problems, the city approved Proposition K Expenditure Plan in 2003 and made Bus Rapid Transit, (BRT) one of the city's top priority projects. In 2004, San Francisco County Transportation Authority initiated technical studies on implementing BRT, bus lane corridors on Geary Boulevard and Van Ness Avenue and its goals are to promote the use of "dedicated lanes, traffic signal priority for busses and stations similar to those for light rail lines." The objective of BRT is to have "significant reductions in transit travel time, increased transit reliability, and improved passenger comfort" ("Executive Summary," 2005). Bus Rapid Transit is hoping to have a 15% to 30% reduction in total travel time and a 25%-50% increase in reliability. Executive Summary (2005) explains that a

"dedicated lane will eliminate the time the bus spends trying to merge back into traffic after it pulls over at the bus stop." Andrew Sullivan, chairman of the riders advocacy group Rescue Muni, says "if a bus driver can save even a minute by not having to maneuver out of the transit lane to get around a parked car or truck once or twice on each run, the time savings can add up over the course of the day" (SF Gate 2008). Sierra Club Yodeler (2006) tells us that "the central idea of BRT is to move buses nearly as fast on city streets as a subway would run underground." According to Sierra Club Yodeler (2006), "during peak hours a bus lane can move many more people than a lane of cars. The maximum for a car lane is about a thousand people per hour; just 10 loaded articulated buses can carry this many passengers" (Sierra Club Yodeler, 2006). Many riders view positively about the implementation of BRT and they believe that BRT lanes will effectively eliminate private cars from bus lanes and reduce travel time as a result (Examiner, 2007).

Patankar, Kumar & Tiwari (2007) conducted a study on BRT lanes using a micro simulation model and have found positive effects in traffic as a result of BRT lanes in India. Their simulation model compares the proposed BRT system with the current mixed traffic systems. They used traffic quality parameters such as traffic flows, speed, travel time, delay time, stop time, and fuel consumption in their model to see the effects of BRT lanes. They found that all the quality parameters, "travel time, delay time, and stop time has significantly decreased in the BRT system with respect to the present situation. Fuel consumption efficiency has improved for all modes of vehicles" (Patankar, et. al, 2007). Patankar, et al. (2007) say that the BRT corridor allow public transportation to run at its optimum speed and that it shows an overall improvement in speed by more than 100% over the existing mixed lane traffic system. According to their simulation model, travel time in the existing mixed lane traffic is 7 to 8

minutes per kilmoter while the average travel time is down to about 1 to 2 minutes per kilometer in the BRT system (Patankar, et al. 2007). As a result, Patankar, et al (2007) strongly believe that "commuter mobility will increase due to the increased speed of public transport, and will encourage people in large numbers to choose public transport." They are also confident that their findings will play a significant role in transportation systems of other congested cities in India.

BRT corridors may sound very enticing and may seem like a feasible manner to reduce congestion problems in San Francisco; unfortunately not many streets in the downtown area are wide enough to install these BRT corridors. While the Geary Boulevard and Van Ness Avenue projects target on relieving traffic problems for riders in Northern San Francisco, the current transit-only lanes were installed to achieve the same goals to serve riders in the core of downtown San Francisco. Currently, the "city has 19 streets with more than 14 miles of transit-only zones" (Examiner, 2008). They were intended to help buses run more smoothly without interruptions from other vehicles of the mixed traffic. Kiesling & Ridgway (2006), however, note some major problems with our existing transit-only lanes that hinder the successful operation of these lanes. They say that the "efficient operation of transit-only lanes often is compromised by non-transit vehicles violating the exclusive lane. The City has not received many of the transit service benefits it anticipated when it installed the transit-only lanes" (Kiesling & Ridgway, 2006). During a speech, Mayor Newsom says, "double parking a significant hindrance in the on-time performance of MUNI" (San Francisco Examiner, 2008). Kiesling & Ridgway (2006) point out that "more than one-quarter of vehicles violate the transit-only lane during the day; more than 60 percent of vehicles violate the outbound transit-only lane in the p.m. peak hour." Currently, enforcement of transit-only lanes is handled by the San

Francisco Police Department specifically assigned to MUNI. As of 2004, there were only 13 officers assigned to cover all MUNI enforcement which includes both fare evasion and transit lane violation (Kiesling and Ridgway 2006). Thirteen officers is truly not enough officers to handle so many violators on the roads. We definitely need to have better patrol and enforcement of these transit-only lanes to make them effective.

As a transit-only lanes enforcement control, the San Francisco Municipal Transportation Agency looked to the success of London's transit enforcement where "traffic violations in bus zones dropped 92 percent" after the installation of a camera system (SF Gate, 2008). London recognized that the "manual enforcement of bus-only lanes is costly and only partially effective, and that it would be prohibitively expensive to employ the number of enforcement officers necessary to patrol the extensive bus-only lane network. Instead, London turned to video enforcement" (Kiesling and Ridgway 2006). In January of this year, San Francisco took a similar approach and launched a "transit lane enforcement pilot project" where cameras are installed on buses to detect and penalize transit lanes violators. Officials from the Department of Parking and Traffic review the footage and issue citations based on video evidence and "mail $100 tickets to owners of vehicles" whom block buses (Assembly Bill 101). This pilot project is still in its early stage and they cameras have not generated much result. MUNI spokeswomen said "the agency is still streamlining the pilot program" results are yet to be determined (Examiner, 2008). According to SFMTA, "if the first 90 days are successful, officials will inform the state legislature and continue the pilot by installing cameras on other buses operating in transit-only lanes"(SFMTA, 2008).

Sometimes drivers are not driving in transit lanes intentionally; instead the existing lanes have problems themselves and should be blamed for. The inconsistent and outdated signs and

street markings of bus lanes have caused some drivers to accidentally ride in the transit-only lanes. For example, transit-only lanes are often marked with a diamond shape, which is commonly known as carpool lanes throughout California. This causes major confusions for many drivers who are not familiar with transit-only lanes system or they may be visitors from another town. On top of that, these transit-only lanes vary in type and hours of operation. Among the different types of bus lanes, some are peak-hour curbside lanes where the transit lane is only enforced during peak hours and allow street parking when lane is not in use; some are all-day or full-time curbside lanes where the lane reverts to mixed flow traffic in the evenings and at night; and the remainders are all-day or full-time **dedicated lanes??**. Some transit lanes even allow taxis to operate in the lanes with buses (Kiesling & Ridway 2006).

Curbside lanes are designed so that private vehicles must enter transit-only lanes in order to make right turns. As Federal Transit Administration (2006) explains, "it is hard to keep curbside lanes uncongested. Major problems to smooth curbside bus lane operation are (1) illegal parking and standing and (2) right turning vehicles waiting for pedestrains." These curbside lanes are ineffective and causes major delays for buses when they have to wait behind other vehicles that are making right turns and often times, these vehicles have to wait for large volumes of pedestrians that are crossing the road. In addition, bicyclists are usually permitted in the curbside lanes which sometimes block the traffic in bus lanes as well. Thus, these lanes have not been effective in reducing travel time for buses.

When hours of operation are not uniform among roads of downtown San Francisco; where some are enforced only during peak hours while others are enforced all day, many riders may inadvertently ride in the transit-only lanes. Kiesling & Ridgway (2006) say that the effectiveness of these transit-only lanes is hindered by "the lack of consistency in operating

hours and uneven signage guidelines. The inclusion of taxi operation in the existing lanes also is not uniform across the city." Transit-only lanes can only be effective if these signs and street markings are updated and made consistent throughout the downtown area. Kiesling & Ridgway (2006) say, "all these problems can be overcome, leading to efficient transit-only lanes and speeding MUNIs service in the city." Hopefully with enforcement enhanced and street signs standardized, travel time on buses can be reduced and the reliability of MUNI can be depended upon on.

Method

Research Method

The research method is a cross-sectional study using a survey to get riders' opinion about the current transit-only lanes system in San Francisco. Data was collected using convenience sampling where I designed a survey with both open-ended and close-ended questions to get opinions from San Francisco riders. Convenience sampling was used because this method did not require huge costs and manpower. However, one of the limitations to this method is that it is not fully random and results may be biased.

Participants

Sample size is 60 and it consists of workers and employees who ride MUNI in the downtown area. My target population is all San Francisco residents who ride the bus to work during peak hours. However, since it is impossible to survey all riders in the city of San Francisco, my study population is simply employees at my current employment who ride MUNI

in the downtown area during the peak hours between 7-10am and 4-7pm. The sample consists of designers and administrative employees at an interior design firm (BAMO, Inc.) located in SOMA, San Francisco. I distributed a copy of my survey to 50 employee in the month of February and received 24 back. So I have a 48% response rate. This response rate is good enough for the size of the company. This sample included both men and women and their age ranges from 22 to 50. Due to the nature of my interior design firm, most of the employees of this firm are female. Therefore, there is simply no significance to compare and analyze the difference between male and female ratings as males is clearly underrepresented.

Participants were asked to voluntarily participate in this survey and were to return it to me when they are completed. Of those who participated in my survey, only one participant does not live in San Francisco. This is a good sample because San Francisco residents may have a better understanding of how transit-only lanes operate.

After I collected all the surveys back from my sample, I entered the responses into SPSS for an analysis of relationships and descriptive statistics.

A table of descriptive statistics below: **TABLE**

Variables

The dependent variable is rider's perception of reduced transit travel time or time savings during bus rides and there are three independent variables; the use of transit-only lanes, enforcement, and consistent street signs. However, there are other independent variables such as weather, time of day, day of week, speed limit of bus lanes that may also affect transit travel time. I have to control and account for all these other independent variables. I wanted to find the key contributing factors that cause reduction in transit travel time. After an analysis / examination of the different factors from my survey, travel time is a function of transit-only

lanes, enforcement, consistent street signs, while holding weather and traffic conditions constant. I tried to minimize the number of independent variables (Betas) so the function would not be so complex. Yet at the same time I wanted the Adjust R Square to be as high as possible so I can be confident that these are the key contributing independent variables to my dependent variable of reduced transit travel time.

After controlling all the variables including weather, time of day, day of week, and speed limits, I found that consistent signs and street markings bus lanes combined with appropriate enforcement on the roads truly have a positive impact on time savings. Thus consistent signs/street markings and enforcement are effective operational measurements of an effective transit-only lane. Finally, travel time savings or reductions will be measured by the number of minutes actually saved riding in a transit-only lane as opposed to riding in a mixed traffic lane.

Bus Lanes and Time Savings: Results and Analysis

Closed-ended questions

I used various closed-ended questions to examine the critical components of transit-only lanes. I feel that proper enforcement of the transit-only lanes and consistent/uniform street markings/signs really determine the effectiveness of transit-only lanes. So my survey questions consist of variables measured at different levels of measurement, mainly at nominal and ordinal levels. I performed a Chi-Square test of independence to see if there is a relationship between riders' perceived time savings with the use of transit-only lanes, riders' perceived time savings with enforcement, and riders' perceived time savings with consistent street signs. Since traffic problems are such a major issue affecting many residents of San Francisco, the effectiveness of these transit-only lanes is very crucial. Therefore, I have selected an alpha level of .05, meaning I am willing to accept only 5% of risk.

1. Ordinal Data---rank objects/observations “strongly disagree, disagree….”
2. Nominal Data-cannot rank, or put them in order (sex, religion, race)
3. Interval Data—variables that can be measured on a numerical scale. Ex. Budget of an agency, # of clients assisted, amount of overtime hours.

In one particular survey question, I asked respondents to estimate how many minutes these transit-only lanes have saved their travel time. I have decided that a savings of more than 10 minutes is good and savings of 5 to 10 minutes is acceptable and that a savings of less than 5 minutes is inefficient. One of the problems with this question though is riders/participants do not travel the same distances to and from work. This measure of minutes saved may be biased. Distances traveled vary among respondents depending on the location of their residence. The only way to really test the minutes saved is to either do an experimental design or perform a simulation model similar to Pantar, et al.

On average, most respondents feel that the overall public transportation system is “a fair system” when I asked them “How do you feel about the public transportation?”
Out of the 20 respondents, 60% of them take public transportation to get to work and 20% of them drive to work.

Most respondents are not aware of how much time transit-only lanes save them or most of them see only slight/minor time saved resulting from these transit-only lanes (don’t see significant minutes saved).

One quite interesting phenomenon is that a majority (70%) of respondents answered that they “very often” see private automobiles riding in these transit-only lane, but yet when I asked them “do we need more enforcement?” many say, “No, what we have is enough.”

There is a direct relationship between patrols watching these transit-only lanes and the frequency of private vehicles riding in these lanes. As majority of respondents say they “never” see patrols watching transit-only lanes, most of them also say they “very often” see private

vehicles riding in transit-only lanes. In other words, more drivers will violate the traffic laws and ride in the transit-only lanes without any police supervision.

Qualitative Analysis- Open ended question.

To further examine how people really feel about the effectiveness of bus lanes and determine if there are any alternatives to bus lanes that may relieve traffic congestion, I incorporated one open-ended question at the end of the survey. I asked "do you have any suggestions on how to improve the current transit-only lanes system so that buses can run more smoothly? Briefly provide your suggestion." Some respondents left this space blank while others wrote extensively and made valuable suggestions. I read and typed all the respondent's responses to this open ended question and performed a content analysis. I examined the characteristics of each comment and put responses that share common characteristics together and assigned them into response categories.

Discussion

One of the limitations in this study is that due to budget and time, I was only able to get rider's opinion or their perception on the effectiveness of transit-only lanes. I would have to do an experiment and find two identical streets, one with transit lane and one without the transit lane, in order to really measure the true effectiveness of these transit lanes.

While most studies have focused on big transit projects that tend to alleviate transportation in suburban areas, little research has been done on mass transportation systems within urban areas, especially transit-only lanes. Therefore, I do not have too much secondary data to support my hypothesis. Nonetheless, based on my survey /research findings, I believe the transit-only lanes are/ are not effective in reducing transit travel time and the city should/should not continue to enforce/implement the use of transit-only lanes.

One of the limitations in this research is due to the fact that convenience sampling simply does not provide us a perfectly random sample and our small sample results may not reflect/ represent the true population. Due to lack of time and funding, the only feasible method is to get opinions from riders only in the downtown area. Therefore, a threat to our internal validity may be due to "selection," which might cause our dependent variable (reduction in travel time) to not truly and accurately reflect the outcome of our independent variable (transit-only lanes). My sample means may not be representative of the population mean. My sample may be biased and if my sample mean does resemble the population mean, it could just be by "chance."

Another internal validity threat may be due to design contamination because some participants may alter their true opinions in the survey if they feel that their response might serve their own best interests. One's experience or history with the transportation system may cause them to bias in their responses to my survey. People who have had bad experiences with the public transit system may be more inclined to do the survey and express strong negative views towards transit-only lanes.

In addition, external validity is threatened due to our selection and causes a sample bias because our sample may not representative of the target population, which is all riders of San Francisco public transit. In addition, since my sample is composed of riders in the downtown area, I hope this sample can be somewhat representative because a majority of riders in downtown area do live and come to work from other parts of San Francisco. I hope analysis collected from riders of downtown San Francisco can be generalized to other crowded urban cities.

Unfortunately an experimental design would be extremely difficult to administer in this research because it requires me to find two streets with identical features to be my control and

experimental groups. Conducting such experiment is almost possible in downtown San Francisco as it requires me to time the speed of buses in two parallel streets, with the same traffic conditions, one with and one without transit-only lanes. Due to this limitation, a cross-sectional design simply allows me to use surveys to see riders' opinions about the effectiveness of the transit-only lanes.

Lastly, issues worth mentioning are that even if we implement the transit-only lane to its fullest potential as intended and having enforcement enhanced, there will always be violators on the road who just would not obey traffic regulations and continue to ride in transit-only lanes. Driver's riding behavior is an uncontrolled factor that is simply beyond our control. Therefore, time savings in the transit-only lanes will not be reduced if others do not cooperate with traffic regulations. Also, if bus schedules are not improved, buses will bunch up and block other buses that follow.

Despite all these limitations, I hope my research study will give others some insights about transit-only lanes and will inspire others to further study this topic some more.

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Appendices
Please read the following questions and check the appropriate answer.

1. How do you feel about the public transportation system in San Francisco?
   - It is a great system _____
   - It is a good system_____
   - It is a fair system_____
   - It is a poor system_____
   - It is a very poor system _____
   - Not applicable_____

2. Do you know what transit-only lanes are? Do you notice them in the city, especially in the downtown area?
   - Yes____
   - No_____ (If no, transit-only lanes are lanes that eliminate private cars from riding in them as a way to allow buses to run more smoothly)

3. How do you get to work? Do you take the public transportation or do you drive to work?
   - I take the public transportation_____(skip to question #5)
   - I drive to work_____ (skip questions 5 and 6)
   - I ride a bike to work_____(skip questions 4 to 6)
   - I walk to work_____(skip questions 4 to 6)

4. When you drive in the downtown area, how do you feel about transit-only lanes?
   - It is a great system_____
   - It is a good system_____
   - It is a fair system_____
   - It is a poor system_____
   - Not applicable_____

5. When you ride the bus to work, how effective are transit-only lanes in terms of reducing your travel time?
   - It reduces my travel time a lot_____
   - It reduces travel time somewhat____
   - It reduces travel time only a little_____
   - It does not reduce my travel time at all_____
   - Not sure_____

6. Approximately how many minutes do transit-only lanes save you when you ride buses in the downtown area?
   - 1 to 3 minutes_____
   - 5-8 minutes_____
   - 8-10 minutes_____
   - More than 10 minutes_____
   - Not sure_____

7. Do you find street signs and markings of transit-only lanes confusing?
   - Very confusing_____
   - Somewhat confusing_____
   - A little confusing_____
   - Not confusing at all _____
   - Not sure_____

8. Have you ever seen private vehicles or taxi cabs driving in the transit-only lanes?
   - Yes, very often_____
   - Often_____
   - Sometimes_____
   - Very rarely_____
   - Never_____

9. Do you see patrols and police watching these transit-only lanes often?
   Yes____
   No_____

10. Do you think we need more enforcement such as having more patrols watching the use of these lanes?
   Yes, definitely need a lot more_____
   Yes, we need more_____
   No, what we have is enough_____
   Not sure_____

11. When private vehicles drive in transit-only lanes, how do you think this might affect traffic for buses?
   Private vehicles affect transit-only lanes greatly____
   Private vehicles affect transit-only lanes to some degree____
   Private vehicles affect transit-only lanes a little bit_____
   Private vehicles do not affect transit-only lanes at all____

12. Do you think transit-only lanes are effective in reducing traffic congestions in the city?
   Very effective in reducing congestion problems____
   Somewhat effective ____
   Only a little bit_____
   No, not effective in reducing traffic problems at all_____

13. Do you think we need more transit-only lanes? (In other words, do you believe more transit-only lanes will help reduce traffic problems?)
   Definitely need a lot more_____
   We need some more____
   Yes, we need a little more_____
   No, we don't need anymore _____

14. If you answered "no" to questions # 12 or #13, do you have any suggestions on how to improve the current transit-only lanes system so that buses can run more smoothly, thus reducing their travel time and lessen traffic problems in San Francisco? (Briefly provide your suggestion in the space below).

15. Do you live in San Francisco?
   Yes_____
   No_____

16. What is your gender?
   Male_____
   Female_____

You have just completed the survey. Thank you for your time and participation!

Transit-only Lanes Codebook

This codebook provides information on the variable names and values found in the dataset. Variable names are in bold followed by their level of measurement to the right in parenthesis. Values to each question are listed underneath. This information is essential when you analyze the data from the Transit-only Lanes Survey.

PUBTRAN (Level of Measurement: Ordinal **)**
How do you feel about the public transportation system in San Francisco?

1 It is a great system
2 It is a good system
3 It is a fair system
4 It is a poor system
5 It is a very poor system
9 Not applicable

BUSONLY (Level of Measurement: Nominal **)**
Do you know what transit-only lanes are? Do you notice them in the city, especially in the downtown area?

1 Yes
0 No

TOWORK (Level of Measurement: Nominal **)**
How do you get to work? Do you take the public transportation or do you drive to work?

1 I take the public transportation
2 I drive to work
3 I ride a bike to work
4 I walk to work

DRIVEDTW (Level of Measurement: Ordinal **)**
When you drive in the downtown area, how do you feel about transit-only lanes?

1 It is a great system
2 It is a good system
3 It is a fair system
4 It is a poor system
9 Not applicable

REDTIME (Level of Measurement: Ordinal **)**
When you ride the bus to work, how effective are transit-only lanes in terms of reducing your travel time?

1 It reduces my travel time a lot
2 It reduces travel time somewhat
3 It reduces travel time only a little
4 It does not reduce my travel time at all
99 Not sure

MINSAVE (Level of Measurement: Ordinal **)**

Approximately how many minutes do transit-only lanes save you when you ride buses in the downtown area?

1 1 to 3 minutes
2 5-8 minutes
3 8-10 minutes
4 More than 10 minutes
99 Not sure

MARKINGS (Level of Measurement: Ordinal **)**
Do you find street signs and markings of transit-only lanes confusing?

1 Very confusing
2 Somewhat confusing
3 A little confusing
4 Not confusing at all
99 Not sure

VEHBUS (Level of Measurement: Ordinal **)**
Have you ever seen private vehicles or taxi cabs driving in the transit-only lanes?

1 Yes, very often
2 Often
3 Sometimes
4 Very rarely
5 Never

PATWATCH (Level of Measurement: Nominal **)**
Do you see patrols and police watching these transit-only lanes often?

1 Yes
0 No

ENFORCE (Level of Measurement: Ordinal **)**
Do you think we need more enforcement such as having more patrols watching the use of these lanes?

1 Yes, definitely need a lot more
2 Yes, we need more
3 No, what we have is enough
99 Not sure

EFFONBUS (Level of Measurement: Ordinal **)**
When private vehicles drive in transit-only lanes, how do you think this might affect traffic for buses?

1 Private vehicles affect transit-only lanes greatly
2 Private vehicles affect transit-only lanes to some degree
3 Private vehicles affect transit-only lanes a little bit
4 Private vehicles do not affect transit-only lanes at all

REDCONG (Level of Measurement: Ordinal **)**

Do you think transit-only lanes are effective in reducing traffic congestions in the city?

1 Very effective in reducing congestion problems
2 Somewhat effective
3 Only a little bit
4 Not effective in reducing traffic problems at all

MOREBUS (Level of Measurement: Ordinal **)**

Do you think we need more transit-only lanes? (In other words, do you believe more transit-only lanes will help reduce traffic problems?)

1 Definitely need a lot more
2 We need some more
3 Yes, we need a little more
4 No, we don't need anymore

SFRES (Level of Measurement: Nominal **)**

Do you live in San Francisco?

1 Yes
0 No

SEX (Level of Measurement: Nominal **)**

What is your gender?

1 Male
2 Female