

PERSONAL SECURITY IN BUSES AND ITS EFFECTS ON RIDERSHIP IN MILWAUKEE

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This paper deals with the problem of personal security on bus transit vehicles and its effects on transit ridership. A survey was conducted in Milwaukee along a transit route that has a high degree of transit crime and vandalism. The route chosen traversed a cross section of land uses and neighborhoods of widely different socioeconomic levels. A sample of bus riders and a group of randomly selected households along the chosen corridor were asked to complete questionnaires. The survey results give an indication of the relationship between and the relative degrees of passenger perceptions of destructive and personally hostile acts as well as the actual occurrence of such acts. The survey results are analyzed according to the respondents' rates of use of transit service as well as their ages and sexes. The responses are evaluated separately for crime and vandalism. The responses about personal security are further examined in relation to the various service characteristics. The survey results are also analyzed according to the land use and socioeconomic characteristics of the identified zones. It is determined that the degree to which transit crime and vandalism affects transit patronage is related to land use and socioeconomic characteristics of the neighborhoods, but the problem of personal security is less important than such service factors as frequency of service, convenience of routes, fare level, and travel time.

●MILWAUKEE, like many metropolitan areas, is experiencing on-bus crime and vandalism. In 1971, the total reported incidents on buses on all routes of the Milwaukee transit system was about 1,700. The monetary loss associated with physical damage due to vandalism has been estimated at \$70,000 for that year. Although this monetary loss is not significant in terms of total expenses of about \$19 million, it is necessary to examine whether on-bus crime and vandalism do significantly affect transit ridership. If the extent and nature of the effects of on-bus crime and vandalism can be ascertained, proper measures can then be taken to alleviate this problem. Accordingly, a study was undertaken, under the sponsorship of the Urban Mass Transportation Administration and the American Transit Association, to investigate the effects of on-bus crime and vandalism on transit patronage in the Milwaukee area. For the purpose of the study a transit route with high incidence of crime and vandalism was chosen for both an on-bus survey of the riders and a survey among the residents along the route. The questionnaire survey was to obtain information concerning the effects of experience and of beliefs on both users and non-users of the bus route. The survey also attempted to determine user and non-user perception of crime and vandalism on buses. Survey results were analyzed according to the socioeconomic characteristics of the respondents' residence zone. The survey questionnaire was prepared as an attitudinal survey, and the questions related to personal security were accompanied by several other questions regarding service characteristics of the bus route. This indirect form was chosen to minimize any bias that might result if respondents were directly asked questions related to crime and vandalism. Although the survey conducted was only along one route of the transit system, the results obtained provide important and valid information about the overall problem of on-bus crime and vandalism.

SURVEY ROUTE

The route for the survey had to have a history of vandalism that was above average for routes in the transit system and had to traverse a cross section of land uses and serve neighborhoods of different socioeconomic backgrounds. A bus route that runs mostly along Burleigh Street was chosen for the final survey. It is an east-west route approximately 9 miles (14.5 km) long and is located about 1 mile (1.6 km) north of the center of the city. When all the reported incidents of vandalism on the 47 routes in the transit system are considered, the Burleigh Street line ranked seventh, with 85 reported incidents of vandalism in 1971.

The Burleigh Street route serves a variety of travel generators and basic land uses. At the western end of the route are a large industrial manufacturer, a large warehouse and retail outlet that has its own internal bus service, a regional shopping center, two junior high schools, and a large hospital. General development along the route varies from upper-income residential on the western end to middle-income, racially integrated, mixed residential, commercial-professional in the midwestern section to low-income, predominantly Black in the mideastern section to mixed residential, commercial-light manufacturing in the eastern section.

Before the actual survey was undertaken, a pretest was conducted to test the questionnaire, its acceptance, and the technique of administering the survey. The pretest survey was done along Capitol Drive. This route was chosen because of its similarity to the Burleigh Street route. A location map indicating the final and pretest survey routes is shown in Figure 1.

ZONE CHARACTERISTICS

For the analysis of the results the overall transit route was divided into four zones on the basis of housing value, stability of the neighborhood, and land use. Figure 2 shows the geographic delineation of the zones used in the study.

Zone 1 extended from North 76th Street to the west end of the route at North 121st Street. This segment of the route is composed of high-income, stable residential areas in the east to central section and large retail and industrial development on the west. Traffic generators served by the bus in Zone 1 are Wilbur Wright Junior High School, which has a predominantly White enrollment; Mount Mary College, an all-girl liberal arts school; the Mayfair Shopping Center, which is regional in scope; a Penney's warehouse and retail outlet; and a major manufacturing plant, the Briggs and Stratton Corporation.

Zone 2 extends from North Sherman Boulevard to North 76th Street. This part of the route is composed of middle-income residential development of stable character. St. Joseph's Hospital is a major traffic generator located in this zone.

Zone 3 extends from West Hopkins Street to North Sherman Boulevard. The Burleigh Street bus serves Peckham Junior High School, which has a predominantly Black enrollment. This section of the route is a primarily Black, low-income residential area that has some small commercial development.

Zone 4 extends from West Humboldt to West Hopkins Street. This segment of the route is predominantly Black, low-income residential with some light manufacturing on the eastern end.

The socioeconomic characteristics of the four zones were obtained from the 1970 census data and are given in Table 1.

FINAL SURVEY

The final survey was conducted in April 1972. A total of 539 questionnaires were returned in the on-bus survey, of which 408 were used after screening out the incomplete returns. Of these, 141 were returned by the mail-back option. The predominant reasons for using this option were a need for reading glasses, inability to write on the bus, and insufficient time because of a short ride.

The corridor survey was restricted to a corridor 4 blocks wide, centered on Burleigh Street (Fig. 2). The list of properties to which questionnaires were to be mailed was pre-

Figure 1. Location map of survey routes.

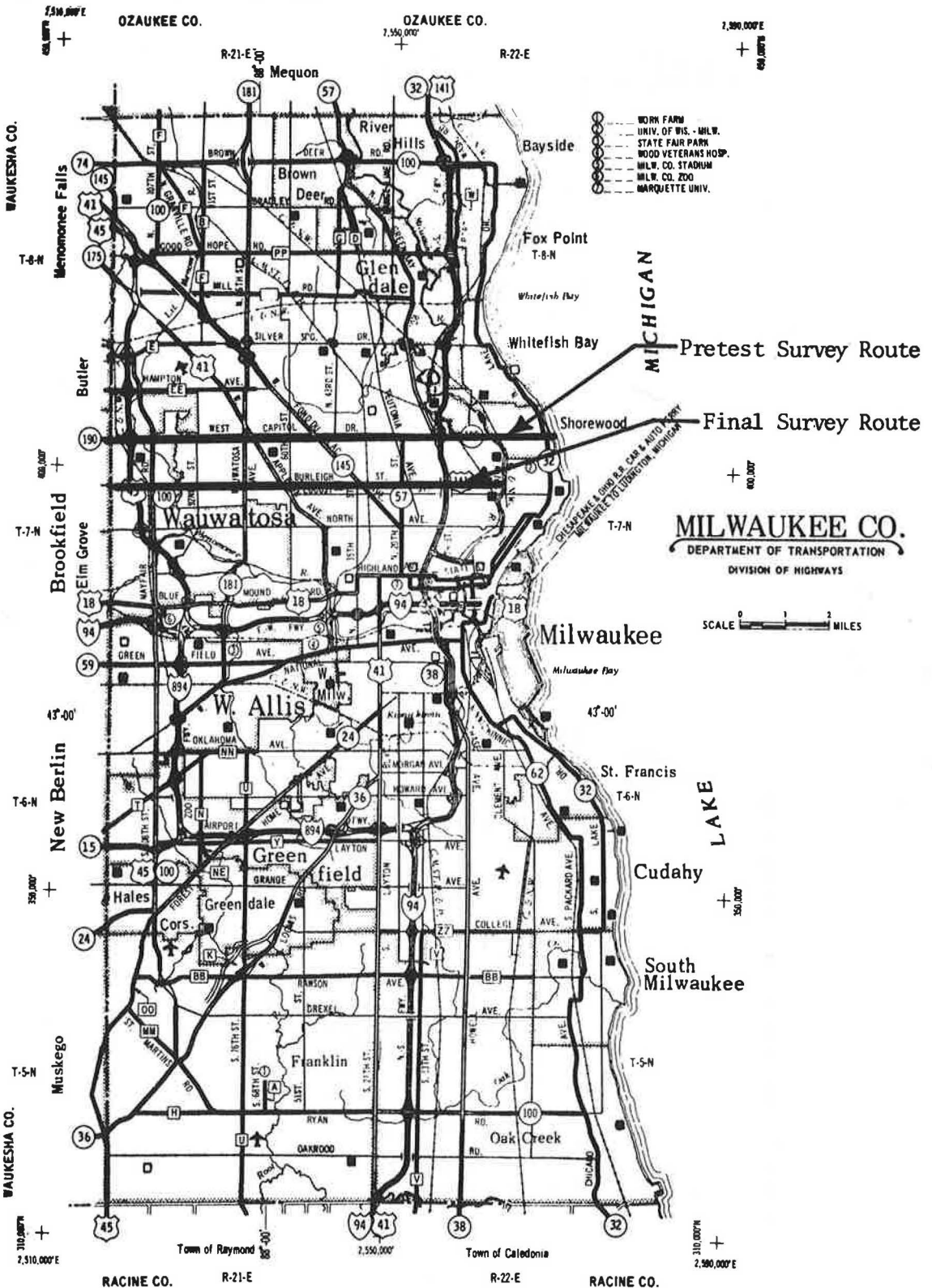
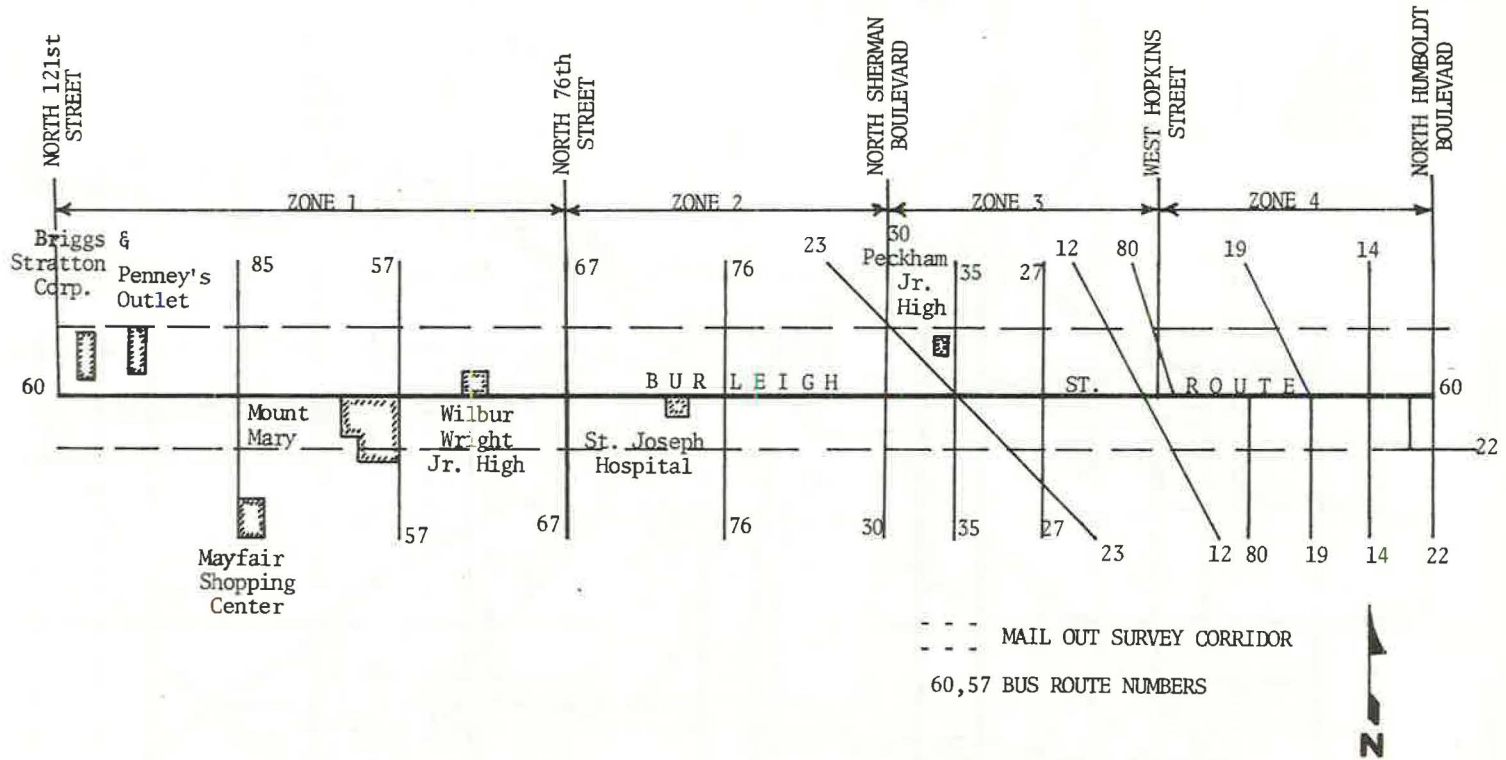


Figure 2. Final survey route and mail-out survey corridor.



pared by selecting addresses from the Milwaukee City Directory. Properties excluded from this list were those where city directory entries showed a commercial or industrial building, a professional office, a vacant property, or no return, which indicated no information was given to the canvassers for city directory information. A total of 1,000 questionnaires were mailed out; this yielded 227 usable returns. A copy of the corridor survey questionnaire, which was basically the same as the on-bus survey questionnaire, is shown in Figure 3.

SURVEY RESULTS

User and Non-User Groupings

Responses to the on-bus and corridor survey questionnaires were grouped into user and non-user categories according to the respondent's frequency of riding the bus and by zones into which the survey corridor had been divided. This permitted investigation in greater depth of various reactions of transit patronage to crime, vandalism, and service characteristics.

Question 1 on the on-bus survey questionnaire contained the choices: frequently (six or more one-way trips a week), occasionally (one to five one-way trips a week) and seldom (few times a year). The responses to these choices were 259 frequently, 88 occasionally, and 37 seldom. The corridor survey questionnaire contained the additional choice never. The corridor survey responses to the choices to Question 1 were 63 frequently, 53 occasionally, 28 never, and 80 seldom. The respondents who checked frequently and occasionally were placed in the user group, and those who checked seldom and never were placed in the non-user group. This pairing classified 347 riders in the user group and only 37 riders in the non-user group for the on-bus survey. The corridor survey responses, influenced to a much lesser degree by peak-hour riders, yielded 116 users and 108 non-users.

Personal Security in Relation to Other Service Characteristics

Personal security as well as other service characteristics was ranked on the basis of the frequency of response to Question 5 of the on-bus and corridor surveys. The outcome of this ranking is given in Table 2.

Personal security ranked no better than sixth and fifth among the designated service characteristics for the on-bus and corridor surveys respectively. These results give evidence that personal security is of less concern to passengers than certain service characteristics, and, consequently, an increase in personal security on the Burleigh Street bus would probably have a smaller impact on improving patronage than would shorter bus headways and more bus routes.

Effects of On-Bus Crime

An evaluation of the overall effect of on-bus crime and vandalism on transit patronage was done through a statistical contingency test using the chi-square statistic and on the basis of the samples that reported having experience and no experience. The samples were obtained by abstracting the responses to combinations of Questions 4 and 9 of the corridor survey. Question 4 asked respondents to check whether their use of the Burleigh Street bus had decreased, remained the same, or increased. Question 9 asked what their experience with robbery and assault on the bus had been. The respondents' answers to each of these questions were grouped as given in Table 3.

Because the value of $\chi^2_{0.01}$ with 2 degrees of freedom exceeds the computed value of χ^2 , the null hypothesis is accepted that the proportion of respondents in different categories of transit patronage does not significantly vary with the experience of on-bus crime. Therefore, at a 0.01 level of significance, transit passenger experience with on-bus crime does not have an appreciable numerical impact on transit usage. These results can be explained by realizing that crime on the Burleigh Street bus is a rare occurrence and that the long-term behavior of people is not significantly affected by a rare experience. If the survey had been taken immediately after an incident of crime, it could be expected that the responses would indicate an effect on transit patronage as a short-term phenomenon.

Figure 3. Corridor survey questionnaire.

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The results of this survey will be used to improve the bus service on Burleigh Street and bus service in general. Do your best to answer all the questions.

- I use the Burleigh Street bus: (Please check one)

<input type="checkbox"/> frequently (6 or more one-way trips a week)	<input type="checkbox"/> never
<input type="checkbox"/> occasionally (1 to 5 one-way trips a week)	<input type="checkbox"/> seldom (few times a year)
- My usual type of transportation is: (Please check one)

<input type="checkbox"/> auto (as driver)	<input type="checkbox"/> walking	<input type="checkbox"/> other (Please name it)
<input type="checkbox"/> auto (as passenger)	<input type="checkbox"/> taxi	<input type="checkbox"/> Burleigh St. bus
<input type="checkbox"/> another bus	<input type="checkbox"/> bicycle	

IF MY USUAL TYPE OF TRANSPORTATION IS NOT A BUS
- If my usual type of transportation was not available, I: (Please check one)

<input type="checkbox"/> would ride the Burleigh St. bus
<input type="checkbox"/> would not take the Burleigh St. bus

IF I WOULD NOT TAKE THE BURLEIGH ST. BUS
- 3a. I would not take the Burleigh St. bus because:

<input type="checkbox"/> transit route is not convenient	<input type="checkbox"/> prefer other method of travel
<input type="checkbox"/> schedule is not convenient	<input type="checkbox"/> service not satisfactory
- In recent years my usage of the Burleigh St. bus has generally: (Please check one)

<input type="checkbox"/> decreased a lot	<input type="checkbox"/> remained the same	<input type="checkbox"/> increased a lot
<input type="checkbox"/> decreased a little	<input type="checkbox"/> increased a little	
- If I were to take a Burleigh St. bus, the following points about the service would be most important to me: (Please check four)

<input type="checkbox"/> a. fare level	<input type="checkbox"/> e. clean, nice-looking buses
<input type="checkbox"/> b. frequency of service	<input type="checkbox"/> f. travel time
<input type="checkbox"/> c. comfortable ride	<input type="checkbox"/> g. personal safety
<input type="checkbox"/> d. accommodating driver	<input type="checkbox"/> h. convenience of routes
- I believe the following points of the Burleigh St. bus service are:

fare level	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
frequency	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
personal safety	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
convenient routes	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
comfortable ride	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
accommodating driver	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
clean, nice-looking buses	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
travel time	<input type="checkbox"/> satisfactory	<input type="checkbox"/> poor	<input type="checkbox"/> don't know
- The two most important reasons why I might use the Burleigh St. bus are:

<input type="checkbox"/> a. work	<input type="checkbox"/> c. social	<input type="checkbox"/> e. personal business
<input type="checkbox"/> b. shopping	<input type="checkbox"/> d. recreation	<input type="checkbox"/> f. school
- I have seen the following activity on the Burleigh St. buses:

		(once or twice a year)	(once or twice a month)	(once or twice a week)
pushing and shoving	<input type="checkbox"/> never	<input type="checkbox"/> seldom	<input type="checkbox"/> occasionally	<input type="checkbox"/> frequently
obscene language	<input type="checkbox"/> never	<input type="checkbox"/> seldom	<input type="checkbox"/> occasionally	<input type="checkbox"/> frequently
smoking	<input type="checkbox"/> never	<input type="checkbox"/> seldom	<input type="checkbox"/> occasionally	<input type="checkbox"/> frequently
verbal threats	<input type="checkbox"/> never	<input type="checkbox"/> seldom	<input type="checkbox"/> occasionally	<input type="checkbox"/> frequently
vandalism	<input type="checkbox"/> never	<input type="checkbox"/> seldom	<input type="checkbox"/> occasionally	<input type="checkbox"/> frequently

- I have had the following experience with robbery and assault on the Burleigh St. bus:

<input type="checkbox"/> been a victim	<input type="checkbox"/> heard of on radio/TV
<input type="checkbox"/> witnessed	<input type="checkbox"/> heard of from a friend
<input type="checkbox"/> read of in papers	<input type="checkbox"/> no experience
- There are times I prefer not to take a Burleigh St. bus because of personal security:

<input type="checkbox"/> yes	<input type="checkbox"/> no
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If yes, please check times below:

<input type="checkbox"/> 7:00 a.m. - 9:00 a.m.	<input type="checkbox"/> 4:00 p.m. - 7:00 p.m.
<input type="checkbox"/> 9:00 a.m. - 12:00 noon	<input type="checkbox"/> 7:00 p.m. - 10:00 p.m.
<input type="checkbox"/> 12:00 noon - 2:00 p.m.	<input type="checkbox"/> after 10:00 p.m.
<input type="checkbox"/> 2:00 p.m. - 4:00 p.m.	
- If benches were provided at bus stops and shelters at transfer points, I might increase my use of the Burleigh St. bus: (Please check one)

<input type="checkbox"/> not at all	<input type="checkbox"/> a little	<input type="checkbox"/> considerably
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- If more frequent bus service was provided on Burleigh Street, I might increase my use of this transit route: (Please check one)

<input type="checkbox"/> not at all	<input type="checkbox"/> a little	<input type="checkbox"/> considerably
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- If fares were lowered ten cents on the Burleigh St. bus route, I might increase my use: (Please check one)

<input type="checkbox"/> not at all	<input type="checkbox"/> a little	<input type="checkbox"/> considerably
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- If travel times were faster on the Burleigh St. bus, I might increase my use: (Please check one)

<input type="checkbox"/> not at all	<input type="checkbox"/> a little	<input type="checkbox"/> considerably
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- I am:

<input type="checkbox"/> female	<input type="checkbox"/> male
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- I am between the ages of: (Please check one)

<input type="checkbox"/> 11-15	<input type="checkbox"/> 35-44
<input type="checkbox"/> 16-19	<input type="checkbox"/> 45-54
<input type="checkbox"/> 20-24	<input type="checkbox"/> 55-64
<input type="checkbox"/> 25-34	<input type="checkbox"/> over 65

Please return the questionnaire by depositing it in any U.S. mailbox.

Thank you for your time and cooperation.

Table 1. 1970 census data by zone and tract.

Zone	Tract	No. of Blocks	Median Block Values				Owner Units	Renter Units	Average Home Value (dollars)
			Total Population	Percent Black	Percent Under 18	Percent 62 and Over			
1	57	17	1,266		19.5	21	21	4	23,000
1	903	7	441		40	6	13	8	40,400
1	56	12	892		22.5	20.5	23	3	22,100
1	54	14	1,175		30	12	25.5	4	19,400
1	53	16	1,206		22	22	23	3.5	19,550
1	902	14	641		24.5	8.5	15		39,650
1	55	12	689		22.5	18	19	2	28,900
2	49	15 ^a	1,775		22	25	22	25	18,550
2	50	26 ^a	2,450		22	24	22	16	18,100
2	58	23	2,511		19	30	24	14	19,600
2	49	16 ^b	1,867		17	34	24	20.5	21,600
2	50	17 ^b	1,283		15	35	20	11	22,600
3	65	8	1,766	78.5	48.5	7.5	26.5	27.5	10,950
3	64 ^a	16	3,551	71.5	46	8	30	30	10,100
3	66	4	443	91	50.5	6	12	23	7,900
3	63	14	1,819	43	43	13.5	19	18.5	11,800
3	64 ^b	7	1,314	74	45	8	24	32	11,450
3	48 ^a	12	1,403	1	27	24.5	26	14	16,250
3	48 ^b	17	1,682	3.5	21.5	25	20	17.5	13,450
4	71	18	2,697		29.5	16	25	28	9,000
4	72	9	1,672	2	24	15	24	23	18,400
4	69	8	840	66.5	44.5	6	9.5	13.5	10,500
4	70	30	5,113	74.5	44.5	9	15	28	8,100
4	67	12	3,025	96	47	7	27	41.5	10,100
4	68	13	1,668	96	44	4	13.5	20	10,450
4	66	31	5,862	95	46.5	6	18	29	9,350

^aSouth side of Burleigh Street.^bNorth side of Burleigh Street.

Table 2. Ranking of service characteristics by response.

Survey Characteristic	Rank		Total Responses	
	On-Bus Survey	Corridor Survey	On-Bus Survey	Corridor Survey
Convenience of routes	1	3	198	127
Frequency of service	2	1	197	177
Travel time	3	4	137	112
Accommodating driver	4	6	128	61
Fare level	5	2	118	132
Personal safety	6	5	103	73
Clean buses	7	7	77	51
Comfortable ride	8	8	70	28

Table 3. Effects of on-bus crime and vandalism on patronage.

Subject	Use of Transit (Question 4)			
	Decreased	Same	Increased	Total
Crime experience ^a				
(Question 9)				
Some	49	71	29	149
None	31	57	20	108
Total	80	128	49	257
Vandalism experience ^b				
(Question 8)				
Some	149	198	69	416
None	93	223	78	404
Total	242	421	147	820

^a $\chi^2_{\text{computed}} = 0.71$; $\chi^2_{0.01} = 9.21$ with 2 degrees of freedom.^b $\chi^2_{\text{computed}} = 16.18$; $\chi^2_{0.01} = 9.21$ with 2 degrees of freedom.

Effects of On-Bus Vandalism

Another set of statistical contingency tests was conducted to evaluate the effects of on-bus vandalism on the Burleigh Street bus. This was accomplished by simultaneously examining the responses to Questions 4 and 8. Question 4, as previously noted, asked respondents about frequency of their use of the bus. Question 8 asked what their experience with vandalism on the bus had been. Acts such as pushing and shoving, obscene language, smoking, and verbal threats were included in the vandalism category because it was believed that transit users react similarly to these types of behavior. The results of this test are given in Table 3.

The tabular value of $\chi^2_{0.01}$ with 2 degrees of freedom is 9.21 and is less than the computed value of $\chi^2 = 16.18$. Therefore, at a 0.01 level of significance, the null hypothesis that the proportion of respondents in the different categories of transit patronage is not significantly affected by on-bus vandalism can be rejected. This result is considered reasonable because the frequent incidence of vandalism gives transit riders a high level of exposure to this lack of regard for personal property and has the effect of posing a threat to personal security. This threat is generally disagreeable to many transit users.

Effect of Beliefs About Crime

The effect of beliefs about crime on the Burleigh Street bus was investigated by applying the contingency test to the responses of users and non-users to Questions 6-3 and 9. Question 6-3 asked respondents to check satisfactory, poor, or don't know according to their belief about personal safety on the bus. Question 9 was used to measure what experience respondents had had with robbery and assault on the bus. Respondents who checked no experience for this question were divided into user and non-user groups and their answers to Question 6-3 were recorded as given in Table 4.

As the computed value of χ^2 exceeds the value of $\chi^2_{0.01}$ with 2 degrees of freedom, it can be concluded that the responses in the three categories of personal safety on the bus vary significantly between users and non-users who reported having no experience with on-bus crime at a level of significance of 0.01. It is reasoned that the significant variation in the effect of beliefs of crime between users and non-users is because the frequent use of the bus with little or no exposure to on-bus crime reassures the rider about his personal safety. Although the observed cell frequencies are small in some categories of personal safety, it could be expected that a larger sample would only verify the rejection of the null hypothesis. Thus, the effect on patronage of beliefs about on-bus crime is very small because it primarily affects the non-user classification who ride the bus infrequently.

Effects of Beliefs About Vandalism

The effects of beliefs about vandalism on the bus were investigated by applying a contingency test to the responses of users and non-users to Questions 6-3 and 8. Question 6-3, as previously defined, asked respondents to check satisfactory, poor, or don't know according to their belief of personal safety on the bus. Question 8 asked what their experience had been with vandalism and similar antisocial behavior on the bus. Again respondents who checked no experience for this question were divided into user and non-user groups, and their answers to Question 6-3 were recorded as given in Table 4.

The value of χ^2 , as computed from the observed and expected cell frequencies, exceeds the tabular value of $\chi^2_{0.01}$ for 2 degrees of freedom. Therefore, it can be assumed that the responses in the three categories of personal safety vary significantly between users and non-users who reported having no experience with on-bus vandalism. It is believed that the large number of responses of peak-hour riders obtained from the on-bus survey influences the decision to reject the null hypothesis; however, again the effect of beliefs about on-bus vandalism is more apparent in the non-user classification. Because people in this classification seldom use the bus, there is little effect on total transit patronage.

Belief About Personal Security by Sex

The individual's attitude in relation to personal safety on the bus according to sex was investigated by applying a contingency test to the responses to Question 6-3 and Question 15 of both surveys. Question 15 asked the persons to indicate their sex. The results of this analysis are given in Table 5.

The computed value of χ^2 for the given sample data is less than the actual value of $\chi^2_{0.01}$ with 2 degrees of freedom. Therefore, the null hypothesis that the proportion of responses in various categories remains the same in both the male and female groups cannot be rejected; the sex of a respondent does not significantly affect the belief about personal security on the bus.

Although the contingency test showed no significant difference in belief about personal security among males and females, a comparison of the responses of females with those of males by zone revealed that in all four zones a greater percentage of the males than females indicated that they believed personal safety on the Burleigh Street bus was poor. For both the female and male groups, the percentage of those who responded poor is higher in Zones 3 and 4 than in Zones 1 and 2. An examination of the zones and census data in Table 1 reveals notable differences in socioeconomic characteristics of Zones 1 and 2 versus Zones 3 and 4.

Belief About Personal Security by Age

The responses to Question 6-3 obtained from both surveys were grouped by age and were considered jointly with the responses to Question 16 to find the variation in belief about personal security on the Burleigh Street bus with respect to the ages of the respondents. The results of this investigation, given in Table 6, indicate that the belief about personal security on buses does vary to some extent with age; a greater percentage of younger respondents tend to believe that personal security on the Burleigh Street bus is satisfactory. However, a contingency test conducted with the two age groups, 54 and less and 55 and above, did not show any significant difference in responses. This result contradicts the common belief that older people are more concerned with personal security on buses.

Belief About Personal Security by Zone

The responses obtained from the corridor survey were grouped by zones to investigate the effects of the variation in socioeconomic characteristics on the belief about personal security. The characteristics of the four zones were as follows:

1. In Zones 1 and 2 there were no Black residents, 23 percent of the residents were under 18, 21.3 percent were 62 years old or older, the median number of renter units per block was 9, and the average home value was \$24,450.

2. In Zones 3 and 4, 56.6 percent of the population was Black, 40.1 percent were under 18, 9.4 percent were 62 years old or older, the median number of renter units per block was 25, and the average home was valued at \$11,340.

The percentage of Black population in Zones 1 and 2 is less than 1 percent; therefore, a zero was recorded in the census data. Families are considerably younger in Zones 3 and 4 than in Zones 1 and 2. Neighborhoods that contain a larger percentage of older families tend to be more stable. Another indicator of neighborhood permanency is the lower number of renter units in Zones 1 and 2. Owners have less tendency to change location than people who rent. The wide family-income gap is reflected in the average value of dwelling units in Zones 1 and 2, which were appraised at 2.16 times more than units in Zones 3 and 4.

A contingency test was performed on the basis of the responses to Question 6-3 that asked people to indicate their beliefs about personal security on the bus. The responses obtained from the zones were combined into two groups. The results that are given in Table 7, support the conclusion that the proportion of responses in different categories of belief about personal security does not vary between Zones 1 and 2 and Zones 3 and 4 at the level of significance of 0.01. This analysis indicates that there is no substantial

Table 4. Effects of beliefs about crime and vandalism on patronage.

Subject	Personal Safety on Bus (Question 6-3)			
	Satisfactory	Poor	Don't Know	Total
Crime experience ^a (Question 9)				
User	157	8	10	175
Non-user	30	8	26	64
Total	187	16	36	239
Vandalism experience ^b (Question 8)				
User	560	47	27	634
Non-user	145	30	87	262
Total	705	77	114	896

^a $\chi^2_{\text{computed}} = 53.47; \chi^2_{0.01} = 9.21$ with 2 degrees of freedom.

^b $\chi^2_{\text{computed}} = 151.19; \chi^2_{0.01} = 9.21$ with 2 degrees of freedom.

Table 5. Belief about personal safety by sex.

Sex of Respondent ^a (Question 15)	Personal Safety on Bus (Question 6-3)			
	Satisfactory	Poor	Don't Know	Total
Female	212	37	35	284
Male	93	29	19	141
Total	305	66	54	425

^a $\chi^2_{\text{computed}} = 4.54; \chi^2_{0.01} = 9.21$ with 2 degrees of freedom.

Table 6. Belief about personal safety by age.

Age Groups (Question 16), Years	Personal Safety on Bus (Question 6-3)			
	Satisfactory		Poor	Don't Know
	No. of Respondents	Percent		
11-15	18	75	4	2
16-19	56	88	4	4
20-24	46	77	6	8
25-34	34	63	8	12
35-44	29	56	17	6
45-54	68	79	10	8
55-64	42	69	12	7
> 65	24	71	5	5

Table 7. Belief about personal safety by zone.

Zone	Personal Safety on Bus ^a (Question 6-3)			
	Satisfactory	Poor	Don't Know	Total
1 and 2	65	17	20	102
3 and 4	33	17	9	59
Total	98	34	29	161

^a $\chi^2_{\text{computed}} = 3.38; \chi^2_{0.01} = 9.21$ with 2 degrees of freedom.

Table 8. Effect of belief about personal safety on transit use.

Prefer Not to Ride Bus ^a (Question 10), Zones	Personal Safety on Bus ^a (Question 6-3)			
	Satisfactory	Poor	Don't Know	Total
1 and 2	54	32	7	93
3 and 4	26	40	15	81
Total	80	72	22	174

^a $\chi^2_{\text{computed}} = 12.9; \chi^2_{0.01} = 9.21$ with 2 degrees of freedom.

Table 9. Perception of on-bus crime.

Crime Experience ^a (Question 9)	Zones				
	1	2	3	4	Total
Some	51	37	38	28	154
None	29	42	20	26	117
Total	80	79	58	54	271

Table 10. Perception of on-bus vandalism.

Vandalism Experience ^a (Question 8)	Zones									
	1	2	1 and 2 Combined	Percent	3	4	3 and 4 Combined	Percent	Total	
Some	120	119	239	43.6	79	99	178	54	417	
None	117	168	285	54.4	82	70	152	46	437	
Total	237	287	524		161	169	330		854	

^a $\chi^2_{\text{computed}} = 12.88; \chi^2_{0.01} = 11.34$ with 3 degrees of freedom.

effect on personal belief about security on buses that results from the variation in socioeconomic characteristics of the residence zone.

Effect of Belief About Personal Security

An investigation of the effect of the belief about personal security on the bus was made by jointly considering the responses to Question 6-3 and Question 10, which asked whether the respondent preferred not to take the Burleigh Street bus at certain times because of personal security. The responses were grouped by zone and are given in Table 8.

The computed value of χ^2 from the contingency table is 12.9 and exceeds the tabular value of $\chi_{0.01}^2$ with 2 degrees of freedom. This indicates that the null hypothesis that there are no significant differences between the proportions in the two zone groupings should be rejected. Although there is no significant difference in the belief about personal security as related to zonal variations in socioeconomic characteristics, there is a significant difference in the effect of the belief about personal security according to socioeconomic characteristics. When the geographic layout of the zones as shown in Figure 2 is considered, it can be stated that, as the central city is approached along the Burleigh Street bus route and socioeconomic characteristics of the abutting neighborhoods decline, transit users are more inclined to restrict their use of the bus because of their belief about personal security.

It cannot be precisely ascertained whether or not the observed effect on use of the Burleigh Street bus is entirely due to the belief about personal security on buses. The information from the questionnaires did not establish that the respondent's fear for his personal security is derived from riding on the bus or going to and from the bus stop.

Perception of On-Bus Crime

An investigation of the individual's perception of on-bus crime was attempted by constructing a contingency table that listed the responses to Question 9 by zone. Those who checked no experience were in the no experience group, and those who checked any other category (victim, witnessed, read in papers, heard on radio or TV, or heard of it from friend) were in the some experience group. The results are given in Table 9.

The contingency test was conducted to test the hypothesis that there is no significant difference between the proportions of perception of crime by zones in the two experience classifications. Because the computed value of χ^2 is 7.07 and is less than the tabular value of $\chi_{0.01}^2$ with 3 degrees of freedom, 11.34, the null hypothesis is accepted, and it is concluded that perception of on-bus crime does not vary significantly between zones for the some experience and no experience classifications. This result can be explained by the fact that on-bus crime is a rare occurrence and the perception of such an event is not affected by socioeconomic characteristics.

Perception of On-Bus Vandalism

Perception of on-bus vandalism was investigated by means of another contingency table. According to their responses to Question 8, those who never observed vandalism were listed in the no experience classification. Respondents who indicated that they had observed some form of vandalism, either seldom, occasionally, or frequently, were grouped in the some experience classification. Table 10 gives the observed cell frequencies.

The results of the contingency test indicate rejection of the null hypothesis that there is no difference between the proportions of perception of vandalism by zone in the some experience and no experience classifications at the 0.01 level of significance. The greater incidence of vandalism in general is believed to be the primary reason for this result. Grouping the observed cell frequencies for Zones 1 and 2 and Zones 3 and 4 yields the results given in Table 10.

The grouping of the observed cell frequencies reveals that a greater percentage of vandalism is experienced in Zones 3 and 4 than in Zones 1 and 2. This reinforces the conclusion reached in the contingency test on the effect of belief about personal security:

namely, that an increase in the observed frequency of vandalism as the central city is approached contributes to an increase in the effect of the belief about a loss of personal security.

COST EFFECTIVENESS OF PREVENTIVE MEASURES

The cost of any program to combat on-bus crime and vandalism should be compared to the savings expected. Justification for undertaking any program that involves the expenditure of money must be established in light of diminishing revenues and the rising costs of operation. Moreover, the inability to quantify precisely the impact of on-bus crime and vandalism on patronage requires that assumptions be made that are based on subjective deduction from known facts.

The effect of on-bus crime, as measured by the reported decrease in patronage, on users who had experienced crime was not significantly greater than on the users who had no experience with crime. Furthermore, the overall decrease in patronage in the user group was almost neutralized by a reported increase in use from other respondents in this group. The net loss of patronage in the user group was thereby largely neutralized. The user group by definition is composed of people who ride the bus on one or more one-way trips a week.

The effect of on-bus crime on the non-user group was a substantial 17 percent. A reported 18.9 percent decrease in the non-user group who had no experience with vandalism aggravated this effect. Because the non-user group only uses the bus a few times a year, one can conclude that the number of annual rides lost is small and that this group is quite likely the most fertile area from which increased patronage will come.

The effect of on-bus vandalism on users who had experienced it was not significantly greater than on the users who had not experienced vandalism. There was a reported net increase in patronage in the user group that overshadowed the decrease in patronage due to vandalism. In the non-user group, the effect of vandalism was significant and was supplemented by a substantial reported loss in patronage.

The estimated financial loss to the Milwaukee and Suburban Transport Corporation in 1971 for repairing the physical damage to buses due to vandalism was \$70,000. If a program could be undertaken that would result in the elimination of the losses due to equipment damage from vandalism and also increase the number of paid fares by 1,000 daily on the average throughout the entire system, one could anticipate a yearly increase in income of \$253,500. This expected increase in income would amount to somewhat less than \$480 per bus for the 530-bus fleet of the transport company. Such a small amount would limit a program to a modest investment in bus appointments with the objective of reducing vandalism. If the expected increase in income was applied selectively to certain routes at certain times of the day and only to certain buses, the expected income could be concentrated at the expense of complicated bus assignments and the reduced possibility of increasing ridership. It appears that the expected monetary benefits alone would not justify a meaningful program; however, social aspects of combating on-bus crime and vandalism could enter into a final decision in any given area.

CONCLUSIONS

The important points of the study on crime and vandalism on the Burleigh Street bus can be summarized as follows:

1. Personal security is not considered by the respondents to be a critical factor among service characteristics of the bus service. It was consistently ranked lower than such factors as frequency of service, fare level, travel time, and convenience of route.
2. The effect of beliefs about on-bus crime and vandalism on transit users and non-users of the Burleigh Street bus route is more important in the reduction of transit passenger use than the effect of experience.
3. On the basis of the collected data, it was observed that the sex of a respondent does not significantly affect the belief about personal safety. However, the belief about

personal security on buses varies to some extent with age; a greater percentage of younger respondents tends to believe that personal security on the bus is satisfactory.

4. Survey results analyzed according to land use and socioeconomic characteristics of zones show that belief about personal security on buses is not affected by the socioeconomic background of the respondents. However, as the central city is approached along the bus route and the socioeconomic characteristics of the abutting neighborhoods decline, transit users are more inclined to restrict their use of the bus because of their beliefs about personal security.

5. The preference for not riding the bus after dark may well be caused by fear of crime and vandalism that may occur while a user is en route to and from the bus.

6. With regard to perception of on-bus crime and vandalism as measured by users who had some experience (personal, hearsay, or radio-TV or newspaper) as opposed to users who had no experience, it was observed that there is no significant difference in the perception of crime by zone. However, there is a significant difference between the proportions of perception of vandalism by zone. The greater incidence of vandalism in general is believed to be the primary reason for this result.

7. The overall problem of on-bus crime and vandalism on the Burleigh Street bus route does not result in loss of a significant amount of transit patronage.

8. More detailed information is needed to derive an appropriate relationship between the effect of on-bus crime and vandalism and passenger use.

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