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Bicycle Traffic Volumes

CATHY A. BUCKLEY

This paper provides information on bicycle traffic volumes in the metropolitan Boston area. This information allows a better understanding of factors that affect this mode and their relative importance to the bicyclist. The data reported here were collected between 1974 and 1981. All bicycle counts were done manually, mainly during weekday peak periods. The volumes have grown at a 7.5 percent annual rate compounded over the past six years. Volumes varied significantly according to season of the year and weather. These two influences operated independently of each other to some extent. Twelve-hour counts indicated definite peaks in the morning and evening. The morning peak hours occurred in a narrower time band; the evening-peak-hour volumes were an average of 20 percent higher. Bicycle traffic increased by 300 percent on a day when transit was unexpectedly out of operation. During an evening-peak-period count, half of the cyclists used a bicycle path and half used three adjacent arterials. Average daily bicycle traffic volumes in the inner metropolitan area are presented for 1976. Possible correlations between volumes and the number of reported bicycle accidents are discussed.

This paper reports on bicycle traffic volumes collected in the metropolitan Boston area since 1974. Some implications of the data, including the need for further research, are discussed.

BICYCLE TRAFFIC DATA

A number of bicycle traffic counts have been conducted in the Boston area since 1974, most of them by the Central Transportation Planning Staff of the Boston metropolitan planning organization (MPO).

The majority of the counts have been done in Boston and Cambridge, just north of Boston. Counts have also been done in Brookline and Newton, west of Boston, and in Somerville, Arlington, Belmont, Lexington, and Bedford, north and northwest of Boston (see Figure 1).

The impetus for the collection of bicycle traffic volumes was the U.S. Environmental Protection Agency's transportation control plan for Boston. This 1975 document required that encouragement of bicycle use be included in the area's attempt to reduce pollution. Virtually no information was available on actual bicycle traffic volumes, so some was collected in 1975 and 1976. Data have continued to be collected since then to improve our understanding of the issues discussed in this paper.

Bicycle counts have been done at more than 50 locations in the Boston area. Most of the counts were on weekdays, during the morning or evening peak period. The emphasis was on commuter, not recreational, traffic. Unless otherwise noted, precipitation neither occurred on nor was forecast for the days of the counts.

All counts were done manually, included turning movements, and were calibrated in 15-min segments. All of the data reported here were collected by staff members or adult volunteers and are considered to be reliable.

GROWTH IN BICYCLE TRAFFIC

Bicycle volumes were collected at 11 intersections on Thursday, October 9, 1975, as part of the transportation control plan work. Bicycle volumes at 9 of the intersections were collected again exactly five years later, on Thursday, October 9, 1980. The weather was similar--temperatures were in the low 50°s at 7:00 a.m. and the wind was approximately 10 mph on both days; it was partly cloudy in 1975 and sunny in 1980.

The volumes for each day are shown in Figure 2. The evening-peak-hour volume was higher at all nine intersections in 1980; the increase varied from 5 to 60 percent. The total evening-peak-hour volume for the nine intersections was 1922 bicycles in 1980 40 percent higher than in 1975.

Volumes are compared in Figure 3 for four intersections at which counts were done on Wednesday, May 5, 1976, and five years later on Wednesday, May 13, 1981. The weather on these two dates was identical--at 7:00 a.m., temperature was 51°F, wind was 15 mph, and skies were mostly sunny.

The increases in the morning peak-hour volume at the four intersections varied from 35 to 236 percent. The total morning peak-hour volume for the four intersections was 575 bicycles in 1981, 57 percent higher than it was five years before.

The October 1975 and May 1976 volumes added together and compared with the total for October 1980 and May 1981 yield an average increase of 44 percent. This is an average annual compound increase of 7.5 percent. A 7.5 percent increase would be considered a high annual increase for automobile traffic. Because the bicycle's share of traffic is lower, a high annual increase is relatively less significant. For example, assume that the bicycle's share of commuter traffic was 1 percent in 1980. If a 7.5 percent annual compounded growth rate were to continue for 20 years, the bicycle's share would only be 4.2 percent by 2000. A 7.5 percent annual increase does suggest, however, that the bicycle is not just holding its share of the commuting market but steadily increasing it.

Figure 1. Bicycle count locations.

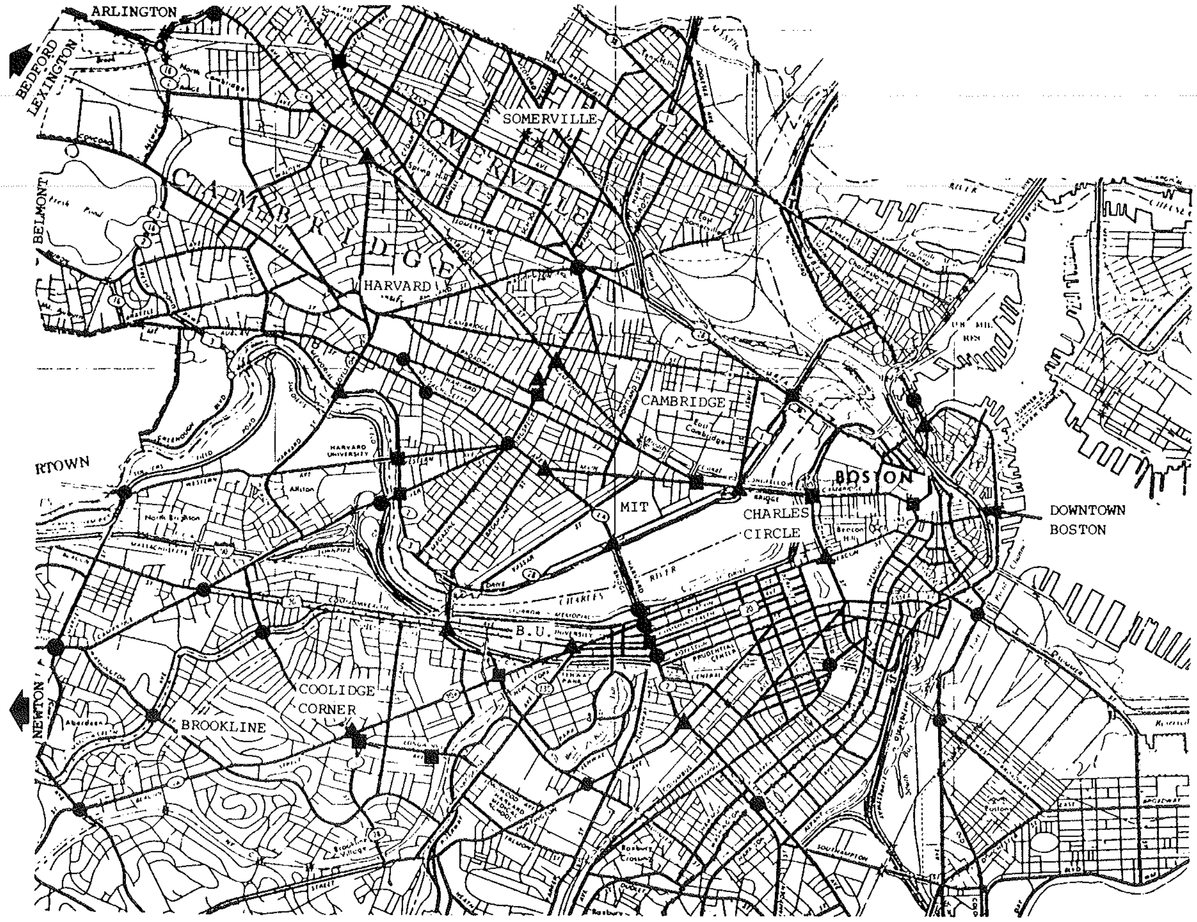


Figure 2. Growth in bicycle traffic, 1975-1980.

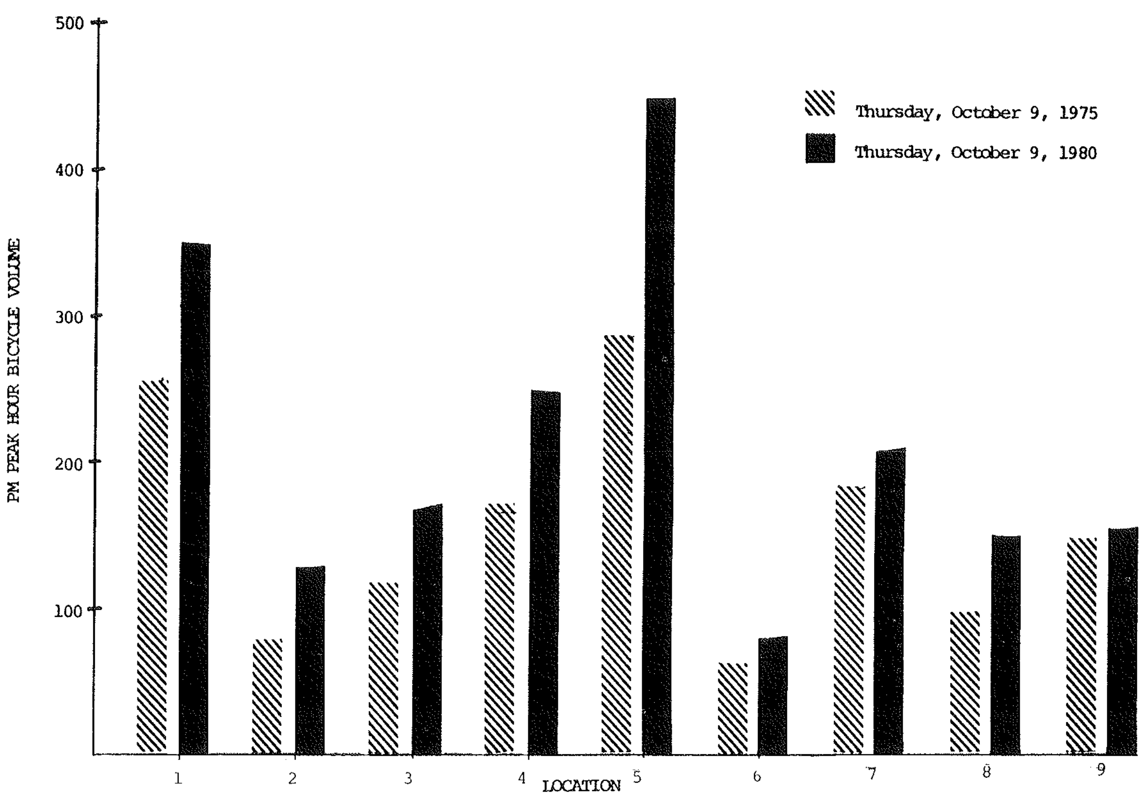
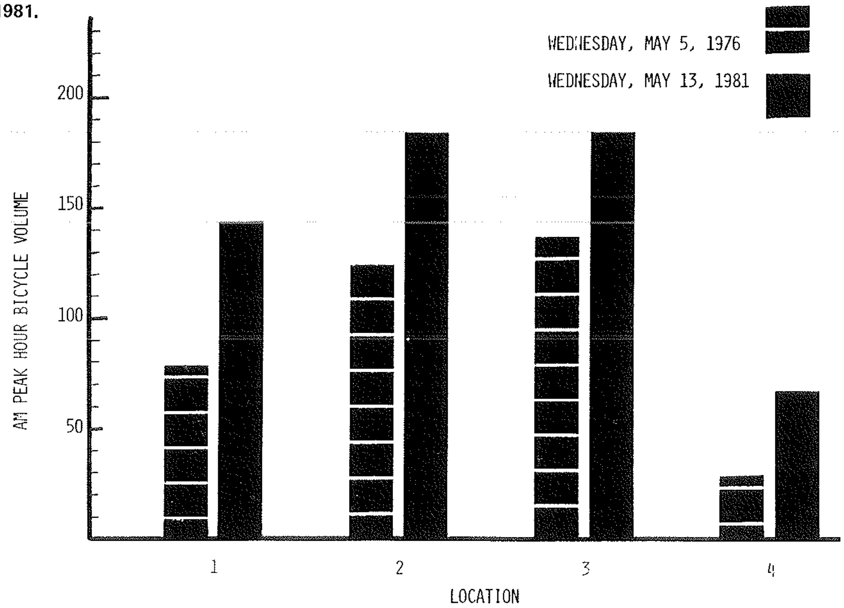


Figure 3. Growth in bicycle traffic, 1976-1981.



EFFECT OF OTHER MODES

Bicycle commuters prefer their mode for a variety of reasons. Some may cycle for health or simply because it is enjoyable. Others may cycle because it costs little or is convenient compared with the alternatives.

In the five-year period from October 1975 to October 1980, for example, the price of a gallon of regular, leaded gasoline rose from $0.59 to $1.19. The basic bus fare remained at $0.25 but the rapid-transit fare doubled in July 1980 to $0.50. These changes probably contributed to the 40 percent increase in peak-hour bicycle traffic during those five years.

Although cost is an important criterion in mode selection, availability is even more crucial. The disruption in fuel supplies in 1973 has received a great deal of the credit for the bicycle boom of that year.

An interruption of public transportation in Boston on Thursday, July 6, 1978, presented an opportunity to measure the effect of the unavailability of transit on bicycle use. Transit workers called a one-day wildcat strike, which completely shut down the system. Only the users who listened to the radio before heading to their buses or trains were aware of the strike.

Because the strike was unexpected, the bicycle count of Charles Circle that day had not been planned in advance and did not start until 8:45 a.m., well into the normal peak hour there. (Of nine morning peak-period counts at Charles Circle in 1980, five peak hours began at 8:00 a.m. and the other four at 8:15 a.m.) It is possible that the bicycle volumes prior to 8:45 a.m. were close to normal levels; many of those who improvised their bicycle trips because of the transit interruption probably got off to a late start.

Figure 4 compares bicycle volumes on the day of the strike with those of one week later. The 8:45-9:45 a.m. volume was more than 300 percent higher on the day of the strike. (On July 6 at 7:00 a.m. the temperature was 63°F, winds were 10 mph, and skies were partly cloudy. On July 13 at 7:00 a.m., the temperature was 70°F, winds were 7 mph, and skies were sunny.)

The most-striking aspect of these data is that a large number of commuters own bicycles, have quick access to them, and use them when their regular modes are unavailable. The counts also indicate that most of these one-day cyclists returned to their regular mode when service resumed. Finally, the data support inclusion of the bicycle in energy contingency planning.

SEASONAL VARIATIONS

Morning peak-hour volumes recorded throughout the year at one location are shown in Figure 5. The average volume for the three counts in March was 60 bicycles. The average of the two June counts was 198, which is 230 percent higher than the March average. The average of the two July counts was 235 bicycles, which is 290 percent higher than the March average. The volumes from the solitary counts in August, September, and October are, on the average, 25 percent lower than the July volumes.

Two 12-h counts were done at Coolidge Corner in Brookline, one in March 1974 and the other two months later. The total 12-h volume of May 8, 1974, was 100 percent higher than that of March 5, 1974 (959 bicycles were counted in May, 479 in March).

Although the above data are not sufficient to define seasonal factors, they demonstrate that most Boston bicycle commuters choose alternative modes in the winter. This is understandable, considering the colder temperatures and fewer daylight hours during late fall and winter. Other cold-weather circumstances that may discourage bicycle use are snow or ice, which make roadways slippery, and snowbanks, which decrease road space and visibility.

EFFECT OF WEATHER

Details of the three March 1980 counts cited in Figure 5 are presented in the table below. This information suggests the effect of weather within a given season.

	Conditions at 7:30 a.m.			Morning
Date	Wind (mph)	Sky	Temperature (°F)	Peak-Hour Volume
March 12, 1980, Wednesday	25	Clear	23	35
March 19, 1980, Wednesday	8	Clear	37	85
March 27, 1980, Thursday	13	Overcast	38	60

Figure 4. Effect of transit strike.

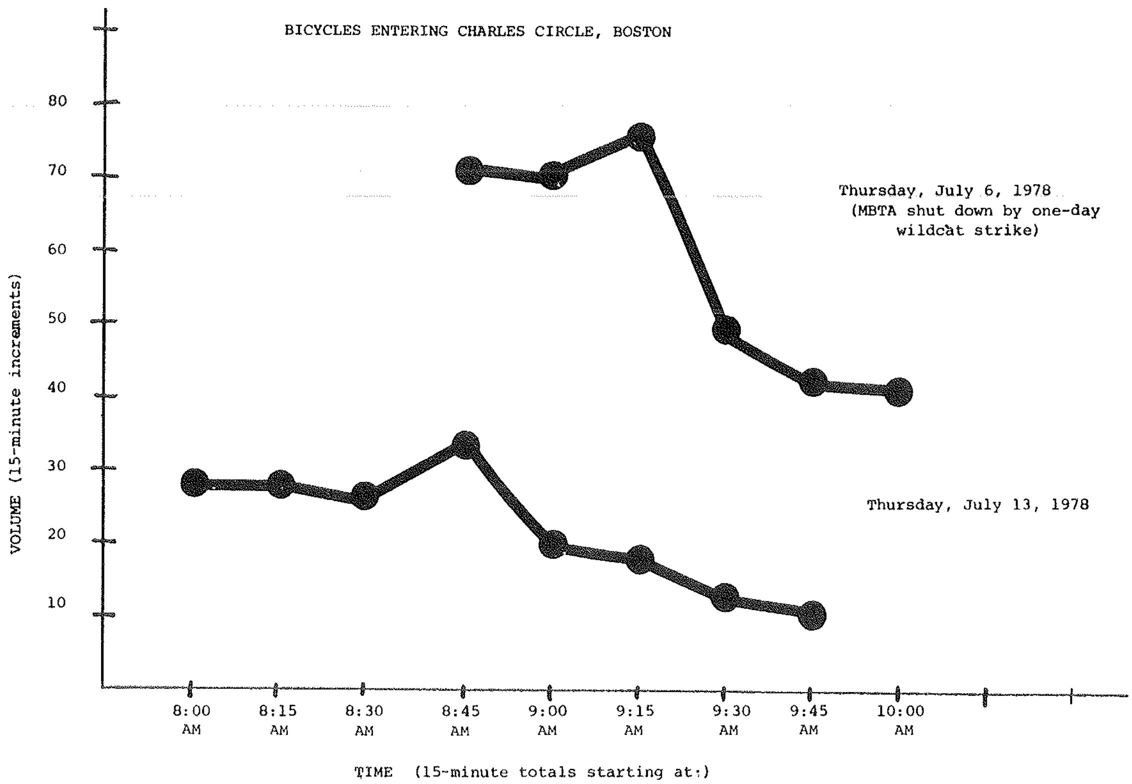
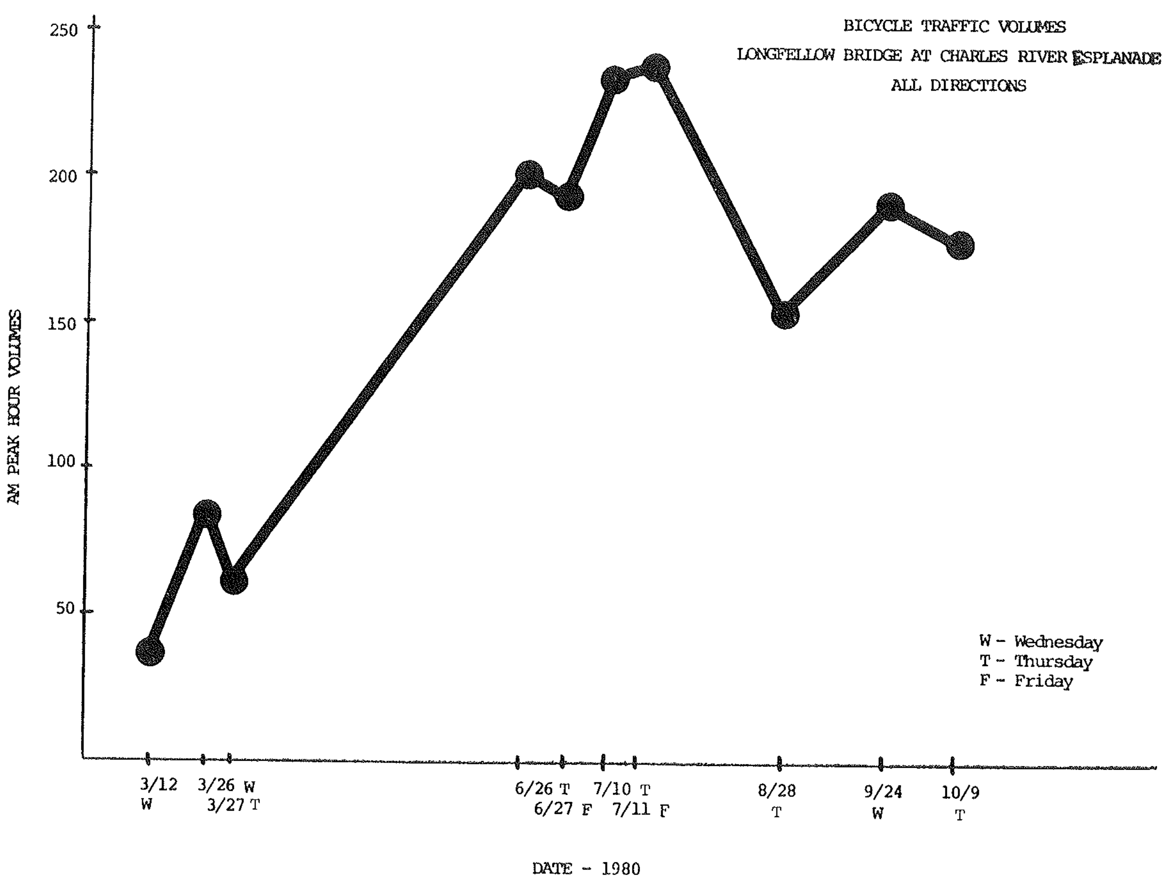


Figure 5. Seasonal variations.



A small fraction of cyclists commute year-round; however, only a portion of those do so when the 7:30 a.m. temperature is 23°F and the wind is 25 mph, as occurred on March 12. The morning peak-hour volume was 140 percent higher two weeks later on March 26, a warmer and less windy day.

The March 27th volume is 30 percent lower than the March 26th volume. This is probably too large a difference to be due to daily variations. The only notable difference in weather between the two days is that the sky was clear on the 26th and overcast on the 27th. Although it was not raining on the morning of March 27 and no rain was forecast, the clouds might have discouraged some cyclists.

Bicycle counts at six intersections were arranged for Wednesday, May 6, 1981. Because of fog and a light rain, only two intersections were monitored that morning, and the full-scale count was postponed until the following Wednesday. Figure 6 indicates the effect of fog and rain on bicycle volumes at the two intersections that were monitored twice. The morning peak-hour volume at Charles Circle, Boston, was 39 percent lower in the fog and drizzle than on the partly sunny day one week later. At Coolidge Corner, Brookline, the volume was 52 percent lower in the rain.

When comparing volumes on different days, not only the time of year, but also weather conditions must be considered. Weather variations within a season are important. Nevertheless, seasonal variations in bicycle volumes seem to occur regardless of the weather. For example, as cited in the preceding section, a 12-h volume in May 1974 was twice as high as one in March 1974. Yet the 7:00 a.m. temperature was 56°F on the March day, 10° higher than on the May day. The overcast sky and winds of 25 mph in March must be taken into consideration--the May count occurred on a sunny day with winds of 16 mph. However, the large difference in volumes suggests that some people simply do not cycle during what they consider to be the off-season, even when good weather conditions prevail.

OCCURRENCE OF PEAK HOURS

Forty-nine locations have been counted during morning peak periods and 52 during evening peak periods since 1974. Note the time at which the morning and evening peak hours occurred. The temporal distribution of those peak hours is shown in Figure 7.

As can be seen, the morning peak hours are more clustered in time than are the evening hours. Eighty-six percent of the 49 morning peak hours began at either 8:00 or 8:15 a.m. Eight percent started at 7:45 a.m., 4 percent at 8:30 a.m., and 2 percent at 8:45 a.m.

The evening peak-hour distribution is more spread out--63 percent occurred at either 4:45 or 5:00 p.m. One began as early as 3:45 p.m. and two as late as 5:30 p.m.

Counts from 7:30 to 10:00 a.m. would have captured all morning peak hours with 15-min margins on each end. To capture all of the evening peak hours would require a counting period of 3:30 to 6:45 p.m.

A cyclist might stop or visit on the way home from work, leave early for an appointment, or stay late to finish a task. In the morning, such diversions are probably less likely. Evening peak-period traffic would also be more likely than morning traffic to include cyclists on shopping or recreational trips. These considerations might explain why the morning peak hours occur within a narrower time band than do the evening peak hours.

TWELVE-HOUR COUNTS

Two intersections, Coolidge Corner and Charles Circle, were monitored for 12-h periods, from 7:00 a.m. to 7:00 p.m. Coolidge Corner, Brookline, is a commercial area at the intersection of Beacon and

Figure 6. Effect of rain.

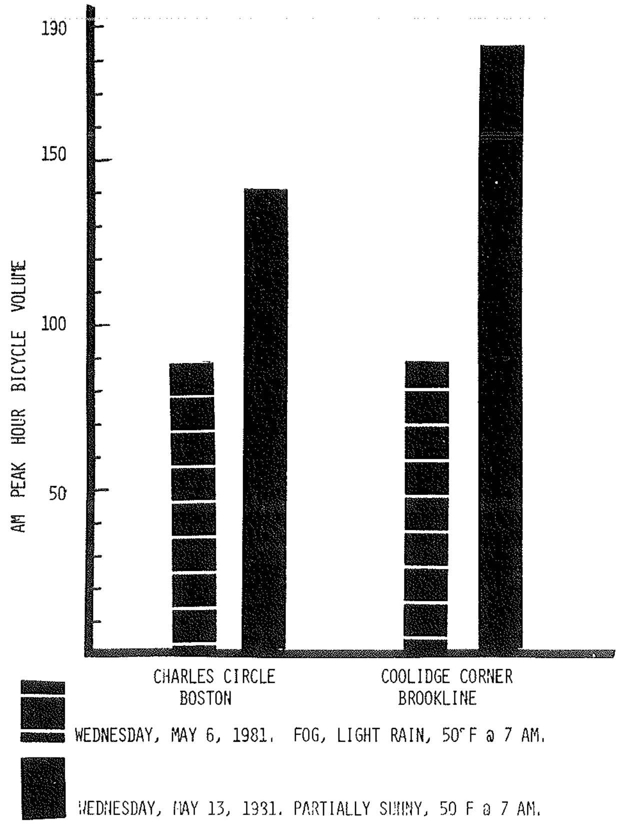
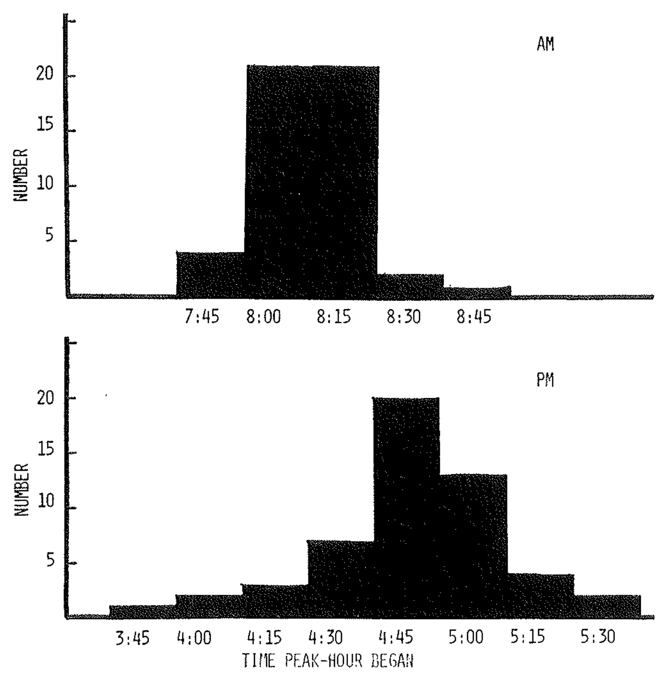


Figure 7. Occurrence of peak-hour bicycle volumes.



Harvard streets (see Figure 1). Beacon Street is a popular commuting route to Boston from points west. Boston University is a mile northeast of Coolidge Corner.

Counts at Charles Circle, Boston, include traffic both from the Longfellow Bridge, used by commuters from Cambridge and other communities west and north of Boston, and from the bicycle path along the Charles River. Traffic generators close to Charles Circle include the Massachusetts General Hospital and Government Center (see Figure 1).

Twelve-hour counts were done at Coolidge Corner on March 5, 1974, May 8, 1974, and May 13, 1981, and at Charles Circle on May 5, 1976, and May 13, 1981.

As shown in Figures 8 and 9, the five 12-h counts follow similar patterns. There is a definite morning peak, which begins around 8:00 a.m. The volumes then drop by 10:00 a.m. and stay relatively low until noon or early afternoon. A gradual increase in volume usually begins around 1:00 p.m. and continues until the evening peak hour, which is from about 5:00 to 6:00 p.m.

Table 1 presents information on the 12-h counts, including data on the peak hours. The ratio of the morning peak-hour volume to the total 12-h volume varied from 0.11 to 0.14 and averaged 0.12. The same ratio for the evening peak hour varied from 0.13 to 0.18 and averaged 0.15. On the average, the evening peak-hour volumes were 20 percent higher than the morning peak-hour volumes.

Traffic during the morning and evening peak periods probably is predominantly commuters and

Figure 8. Twelve-hour volumes, Coolidge Corner.

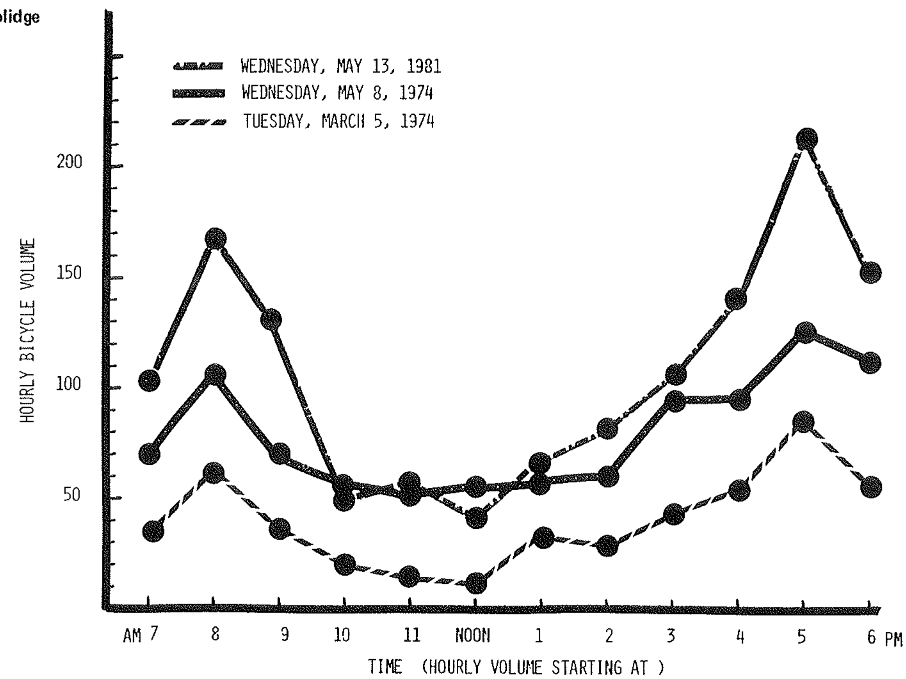


Figure 9. Twelve-hour volumes, Charles Circle.

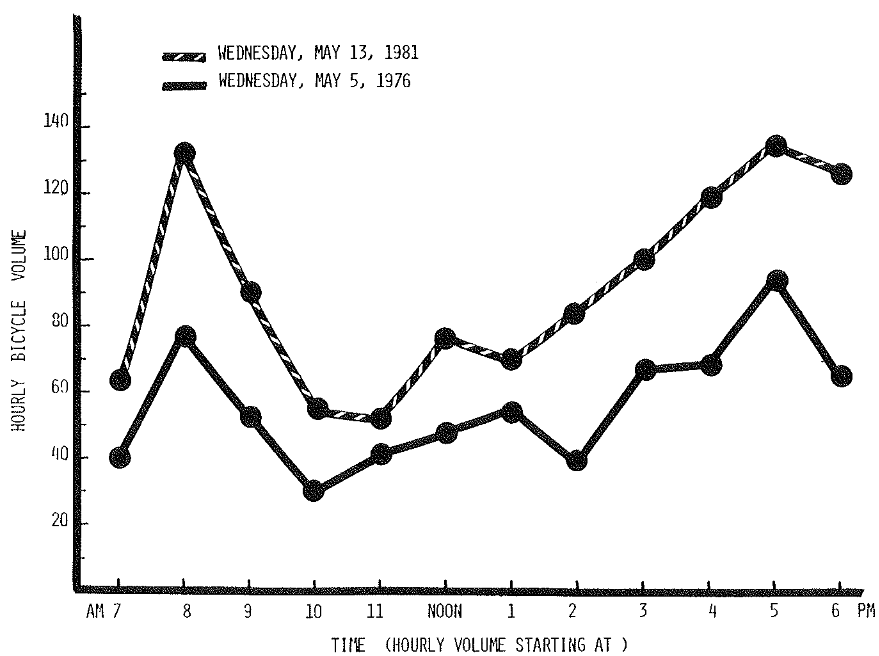


Table 1. Bicycle traffic counts, 7:00 a.m.-7:00 p.m.

Item	Coolidge Corner			Charles Circle		
	Tuesday, March 5, 1974	Wednesday, May 8, 1974	Wednesday, May 13, 1981	Wednesday, May 5, 1976	Wednesday, May 13, 1981	Avg
Weather conditions at 7 a.m.						
Temperature (°F)	56	46	50	51	50	
Wind velocity (mph)	25	16	14	15	14	
Sky	Overcast	Sunny	Partly sunny	Sunny	Partly sunny	
Volumes						
12-h total	479	959	1317	685	1110	
Morning peak hour						
Volume	62	106	184	78	141	
Time	8:00-9:00 a.m.	8:00-9:00 a.m.	8:15-9:15 a.m.	8:00-9:00 a.m.	8:15-9:15 a.m.	
Ratio to 12-h total (%)	13	11	14	11	13	12
Evening peak hour						
Volume	86	127	215	96	144	
Time	5:00-6:00 p.m.	5:00-6:00 p.m.	5:00-6:00 p.m.	5:00-6:00 p.m.	4:45-5:45 p.m.	
Ratio to 12-h total (%)	18	13	16	14	13	15
Ratio of evening to morning peak-hour volume	1.39	1.20	1.17	1.23	1.02	1.20

students. The direction of traffic flows during those periods suggests this. The midday trip might be utilitarian trips (shopping, going to lunch or meetings, making deliveries) or school trips (students attending late classes).

That the evening peak-period volumes are higher than those in the morning could be explained by the convergence of a greater variety of trip purposes later in the day. That is, commuters and full-time students are more or less alone in the morning but, in the late afternoon, they are joined by recreational cyclists and cyclists going shopping or to restaurants, night school, or meetings. In addition, some full-time students leave for school after the morning peak period but return home during the evening peak period.

NIGHT VOLUMES

No bicycle counts have been done in the Boston area between 7:00 p.m. and 7:00 a.m. We hoped that estimates of night volumes could be derived from the frequency of reported bicycle accidents by time of day. Therefore, the correlation of accident frequency and volumes was tested by using daytime bicycle volumes.

Bicycle accidents, as shown in Figure 10, do not correlate closely with bicycle volumes during the evening peak period, as shown in Figures 8 and 9. Although the 12-h bicycle counts indicate that evening peak-hour volumes are approximately 20 percent higher than morning peak-hour volumes, the accident reports suggest an evening accident rate 300 percent higher. There are several possible explanations for this. First, 35 percent of the accidents shown in Figure 10 involved bicyclists 14 years of age or younger. They presumably do much of their cycling after school and, therefore, are probably more likely to be involved in accidents during the afternoon and evening. At the same time, they presumably ride less often than does the average cyclist on major arterial streets, where the 12-h counts were done and, therefore, were not reflected in the volume figures being compared with the accident figures. Another explanation of the higher accident rate in the afternoon and early evening is the higher automobile volumes, also shown in Figure 10. In addition, darkness sets in before 7:00 p.m. during most of the year in Boston.

Bicycle volumes from 7:00 p.m. to 7:00 a.m. are probably lower than the number of reported bicycle accidents might suggest. Darkness would be one reason, especially because many cyclists are not well illuminated. More accidents that involve drunk drivers occur in the evening and early morning hours. Finally, because fewer cyclists are out at night, motorists may be less likely to expect them.

AVERAGE DAILY TRAFFIC

Peak-period bicycle counts done in 1975 and 1976 were used to develop average daily traffic (ADT) volumes for 1976. The counts were done on arterials where major bicycle traffic flows were judged to occur. The counts were spread out geographically so that volumes throughout the inner metropolitan area could be compared (see Figure 1). The peak-period counts were expanded by using accident records by hour of the day, day of the week, and month of the year.

Just as bicycle accident frequency and bicycle volumes did not correlate closely by time of day, they may not correlate by day of the week and month of the year either. However, accident data can be used to develop an approximate estimate of ADT. The errors inherent in this method are applied to all locations, so comparisons between locations should be valid.

It is impossible to determine from the data available how much error results from assuming a correlation between accident frequency and volumes by day of the week and month of the year. As shown in Figure 11, the weekday accident rates do not vary a great deal; Monday and Friday have the two highest rates. The Saturday rate is slightly lower than the weekday average but twice that of Sunday.

The proportion of inexperienced cyclists may be larger on weekends, and they may suffer higher accident rates. This may distort the correlation between accident frequency and volumes. Any such distortion may not be reflected in the data, however. These cyclists may stay away from motor vehicles, and accidents that do not involve motor vehicles are less likely to be reported.

Also shown in Figure 11 are accidents by month of the year. The general outline of the graph seems valid; it suggests that volumes increase from March through the summer and then decrease through February. The hazards associated with winter cycling suggest that the number of accidents might be higher in proportion to volumes then. On the other hand, only experienced cyclists, those presumably less likely to have accidents, are likely to be out in the off-season.

The 1976 ADTs estimated for selected routes in the inner metropolitan area are shown in Figure 12. The largest volumes occur near major schools: 1200 near Boston University, 1150 near Massachusetts Institute of Technology (see Figure 1 for assistance in identifying locales). There are also large volumes near Harvard Square, Cambridge, a commercial and office area adjacent to Harvard University. Several arterials that lead to the downtown Boston area have ADTs of around 400.

Remember that only selected arterials were counted, so not all bicycle volumes are shown. Also remember that these are average daily volumes. The volumes are therefore much higher than those in January and much lower than those in June.

USE OF A BICYCLE PATH

Counts were done on Thursday, May 21, 1981, to ascertain the relative use of three arterials and a nearby bicycle path. The path is in Boston, on the south side of the Charles River. The arterials are further south and parallel to the path. The evening-peak-period counts were done at the intersections of the path and the arterials with Massachusetts Avenue, which passes over the path but is at grade with the streets.

The 12-ft-wide path is totally separated from motor vehicle traffic for about 1 mile east and 2 miles west of Massachusetts Avenue. On each arterial, there are seven intersections between Massachusetts Avenue and a point 1 mile east. The grid street system does not continue west of Massachusetts Avenue, so the three arterials have different numbers of intersections in that direction. All of the arterials have parking.

Figure 13 shows westbound, evening-peak-period counts for the path and arterials. Only westbound volumes are shown because the predominant evening movement is westbound and because two of the arte-

Figure 10. Automobile volumes and bicycle accidents versus time of day.

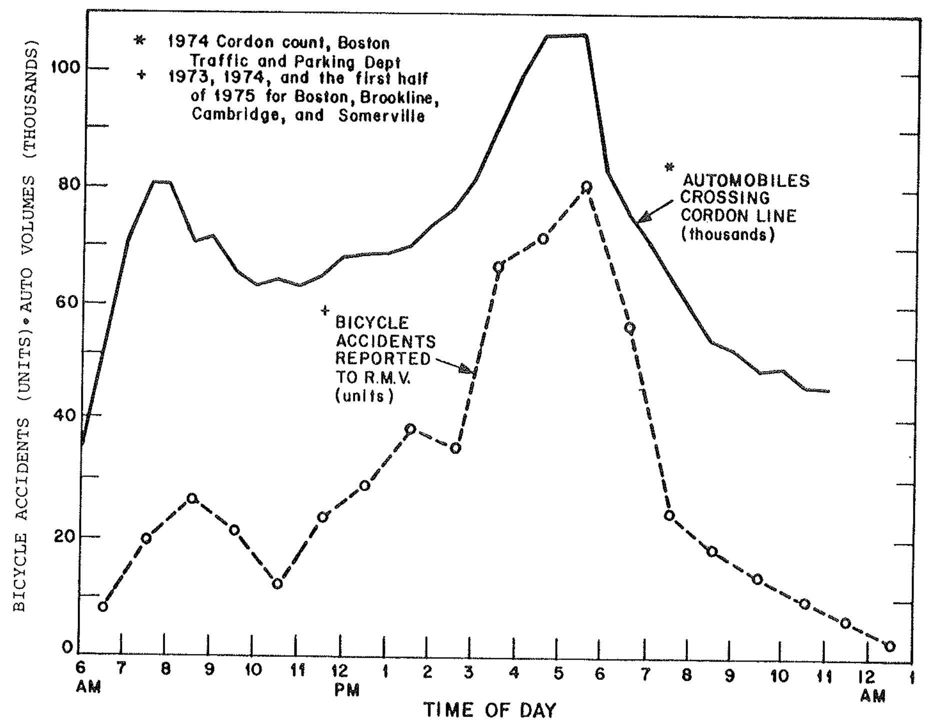
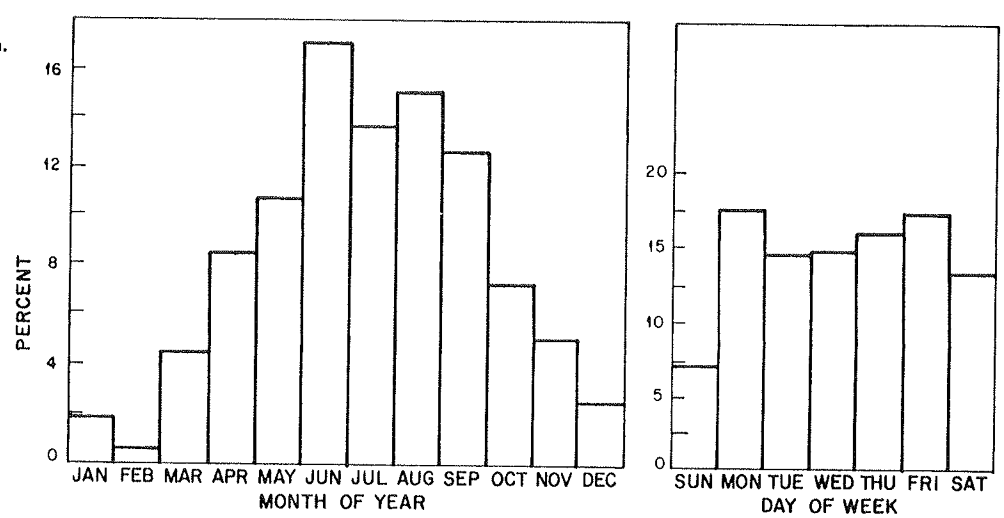


Figure 11. Reported bicycle accidents in metropolitan Boston.



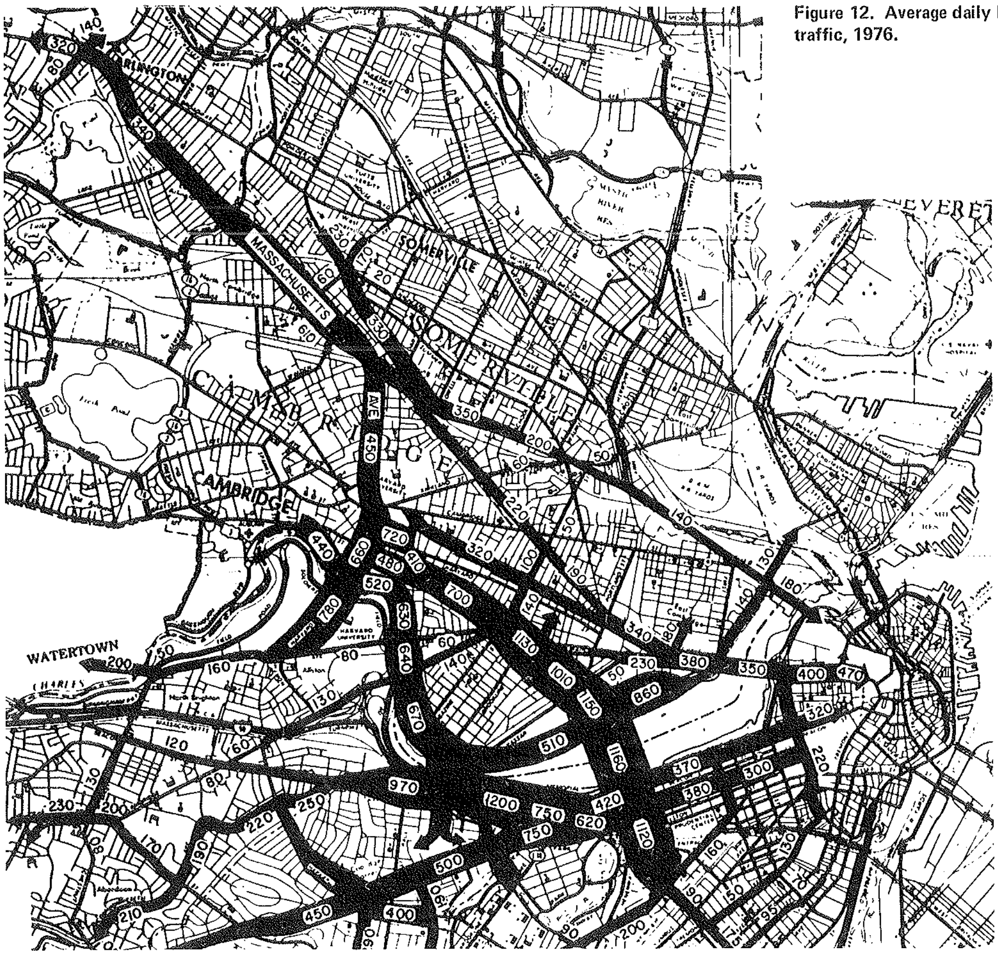
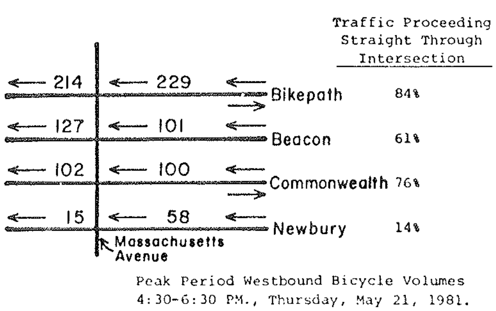


Figure 12. Average daily bicycle traffic, 1976.

Figure 13. Relative use of path and arterials.



rials, Newbury and Beacon, are one-way westbound. Commonwealth Avenue is two-way.

Of all the westbound bicycle traffic approaching Massachusetts Avenue, 47 percent was on the path and 53 percent on the three arterials combined. The right-hand column in Figure 13 indicates the percentage of the westbound cyclists who proceeded straight at Massachusetts Avenue. Of all westbound cyclists who did not turn at Massachusetts Avenue, 57 percent used the bicycle path and 43 percent used one of the three arterials. Cyclists on the path who wish to reach Massachusetts Avenue must carry their bicycles up a long flight of stairs. This helps to explain why, of all the westbound cyclists who turn at Massachusetts Avenue, only 25 percent used the path.

Cyclists must use ramps or stairs to get to the bicycle path, which is separated from the city by the limited-access, high-speed Storrow Drive. That virtually half of the cyclists counted did this suggests a preference to share the path with roller skaters and joggers than to share the arterials with parked and moving motor vehicles. If access to the path were more convenient, particularly at Massachusetts Avenue, its use would probably be markedly higher.

It should not be forgotten, however, that slightly more than half of the cyclists did not use the path. A survey would be necessary to find out why. Two reasons are probable: The arterials are more direct and the path is not designed for high speeds.

Bicycle volumes on the path on a holiday, presumably composed mainly of recreational cyclists, were even higher. A count was done on Memorial Day (Monday, May 25, 1981), four days after the count cited above. At the intersection of the bicycle path and Massachusetts Avenue, 675 cyclists were counted between 2:30 and 3:30 p.m. This volume is 60 percent higher than the evening peak-hour volume measured on the workday four days earlier.

FUTURE DIRECTIONS

This paper has presented information on bicycle traffic volumes in Boston. More information is needed, both to corroborate these findings and to ascertain how universal they are. The degree of use of a path or roadway, for example, is influenced by design standards and accessibility: How much do volumes actually vary with variations in these characteristics? How much do they vary with climate? Are the effects of weather similar in different regions? Are cyclists in Seattle as discouraged by light rain as those in Boston? Is the rate of increase of commuter cycling in Boston applicable nationally or dependent on such local factors as present cycling volumes, transit fares, and highway congestion?

A particular and important question is, What are the relationships between bicycle volumes and accident frequency by time of day, day of the week, and month of the year? Information on this would both improve our understanding of the causes of accidents and expand the usefulness of the data on bicycle-traffic volumes that have been and will be collected.

ACKNOWLEDGMENT

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Acceptance of Policies to Encourage Cycling

WERNER BRÖG

Research in the Federal Republic of Germany has rarely dealt with nonmotorized traffic. This applies to the collection of reliable behavioral data as well as to the application of these data in suitable planning models to forecast possible behavioral changes. Too little is known about the population's acceptance of such planning policies. Due to this lack of information, we can only guess about the effect of specific policies. But more important, since so little information is available, it is impossible to gear such policies to the needs, wishes, and interests of the persons affected by the policies. Thus, in order to encourage bicycle use in communities that have a medium or small population, many integrated measures must be used, and there are major differences of opinion concerning the concrete individual parts of such a bundle of measures and the effect of each specific measure. Frequently, attempts to solve this problem apply those instruments used by public opinion researchers. This paper wishes to demonstrate that this demoscopic approach is not suitable to deal with the topic discussed here. The paper presents an alternative approach to solve the problem—an approach that has the advantage of combining model design with estimates regarding the acceptance of different measures and deals with both in one concept—the situational approach. It can be shown that a whole series of measures must be integrated in planning if we wish that policies that encourage cycling be accepted so that more persons change to bicycles. Construction or extension of the bicycle infrastructure is of secondary importance, although important to stabilize those persons who have changed to the use of bicycles.

The bicycle is the healthiest and most ecologically oriented mode of transportation. However, although a number of cities in the Federal Republic of Germany have taken steps to encourage bicycle travel, the situation for cyclists is generally not particularly favorable. Therefore, the Federal Environmental Office decided to sponsor a model project called A Town for Cyclists (1) for towns that have a population of 30 000-100 000.

The model project will be concerned with the construction of a cycling infrastructure for all travel with person-powered vehicles (2). All cities included in the project will be involved in an intensive exchange of information. Planning seminars will be held to pass on knowledge and to share experiences with other participants. When the project is completed, the results will be evaluated and guidelines for planning will be made available to other cities (3).

Information concerning the quantity and quality of nonmotorized travel and measures to encourage such travel can be greatly improved by this model project; however, present knowledge concerning the acceptance of such measures by the populace is still limited. A more-precise analysis of a study on potential that has just been completed (4) can be of help here.

CONCEPT OF THE STUDY ON POTENTIAL

The study on potential was done in communities that had a population of 80 000 or less. Data were collected for three areas in the Federal Republic of Germany--one had a good, one a medium, and one a poor cycling infrastructure (5). The survey was done in two steps. In the first step, present travel behavior was determined on a specific sampling day in the spring of 1980 for the population surveyed. Of all trips made on this day, 16.4 percent were by bicycle. The percentage of individualized modes of transportation, which was 55 percent in the survey on potential, was extraordinarily high. As a result, the percentage of persons who use public transit was only 6 percent. This was due to the size of the communities selected to be included in the survey. Also note that, in selecting persons for inclusion in the survey, middle-aged persons were given preference and immobile persons were partly excluded. This survey was a pilot study and dealt primarily with persons who might use bicycles rather than with persons (e.g., elderly or immobile persons) who are unlikely to use bicycles. The second part of the survey dealt with the 84 percent of the trips that had not been made by bicycle on the day of sampling. The reasons why bicycles were not used were studied in intensive interviews in which all of the household members were present. Interactive measurement methods were used (6).

As a first step in the analysis, all those trips made with other modes were excluded if the one-way distance to the destination was more than 15 km. For these trips (a total of 24 percent), cycling would be a feasible alternative only in borderline cases. Given the conditions on the day of sampling, only 3 percent of the trips made could have been made by bicycle. Two-thirds of the trips made on the sampling day were restricted to the mode actually used on that day; due to constraints, it would have been impossible to use a bicycle (7).

The size of this group that has the option of