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Case Study No. 11

Balancing Engineering, Education, Law Enforcement, and Encouragement

U.S. Department of Transportation
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National Bicycling And Walking Study

Foreword

This case study was prepared under contract for the Federal Highway Administration by John Williams and Kathleen McLaughlin of Bikecentennial Inc. and Andy Clarke of the Bicycle Federation of America.

Notice

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EXECUTIVE SUMMARY

When bicycle-pedestrian programs began in the late 1960s, the emphasis was strictly on providing facilities. As communities gained experience and began to identify other needs, the concept of the comprehensive "4-e" program emerged, combining the elements of engineering, education, enforcement, and encouragement.

The past 20 years have seen a great deal of growth and much creativity in the field. Some communities have excelled in education while others have implemented strong enforcement programs. Encouragement programs have thrived and engineering work has matured.

Today, with the Federal mandate for action contained in the recently passed Intermodal Surface Transportation Efficiency Act of 1991, there is a growing interest in bicycle and pedestrian transportation. Yet, few communities have the informational underpinnings for a successful program.

This report suggests a four-step process through which a community can implement a comprehensive "4-e" program to encourage non-motorized transportation. It includes suggestions for collecting basic data, setting program objectives, building an action plan, and evaluating results.

MIXING THE 4-E'S IN BICYCLE PEDESTRIAN PROGRAMS

Introduction

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 has given transportation officials a new mandate to consider alternatives to the single-occupant motor vehicle in their planning. Now because of growing concerns with environmental quality and traffic congestion, local agencies are encouraged to support the non-motorized modes: pedestrians and bicyclists. Section 217(d) of Title 23 of the U.S. Code now states that "Pedestrian walkways and bicycle transportation facilities to be constructed under this section shall be located and designed pursuant to an overall plan to be developed by each metropolitan planning organization and State and incorporated into their comprehensive annual long-range plans…."

Further, ISTEA makes available a wide range of funding opportunities for providing for bicycle and pedestrian transportation. Monies from the Surface Transportation Program, the Congestion Mitigation & Air Quality Program, the National Highway System, and the Federal Lands Highways Program may all be used for bicycle and pedestrian facilities.

Yet, what can and should be done for these modes? And what mixture of elements is needed in a community? While there are no definitive answers to these questions, the past 20 years have given some idea of how to proceed. In this study, the authors attempt to condense a wide range of literature and field experience in order to describe the process of determining the appropriate mix of engineering, education, enforcement, and encouragement in a local bicycle-pedestrian program. The purpose of such a program is to encourage safe non-motorized travel.

In the process of researching this Case Study, we have interviewed program staff from the communities of Boulder, Colorado; Dallas, Texas; Davis, California; Eugene, Oregon; Gainesville, Florida; Madison, Wisconsin; Missoula, Montana; New York City, New York; Palo Alto, California; and San Diego, California. Many of these communities are known for their high levels of walking and bicycling. We have also relied on our own experiences with such programs and an extensive review of the program literature.

This report contains project examples from the communities listed above. However, the basic steps suggested here for creating a mixed engineering/education/enforcement/encouragement pro-

gram were not derived from any of their approaches. These local programs have evolved during the formative years of the bicycle and pedestrian fields. While most of them originally reflected the state of the art and the approaches common to the 1970s, they have changed dramatically as the field has matured. To understand how they produced the mix of elements they now have requires an understanding of, among other things, local politics.

For example, it is not intuitively obvious why an engineering department's bicycle program would run one community's bike registration program and recovered bike room. However, the first of these elements became part of the program for survival reasons in the face of a hostile city council; the second was taken on as part of a growing and increasingly cooperative relationship with the police department. If one were setting up a new 4-Es program, such oddities of the political process would likely be undesirable additions to the mix.

This report is intended as a brief guide for communities interested in assembling such a program in order to solve their own problems, take advantage of their own opportunities, and further their non-motorized transportation goals.

Why it's important

Historically, providing for bicyclists meant providing bicycle facilities. This was the focus during the early phase of program development in the U.S. but by the late 1970s, it was replaced in some progressive communities like Boulder, Colorado, and Madison, Wisconsin, with a more comprehensive "4-E" approach which combined engineering and planning with enforcement, education, and encouragement.

By then it had become clear that simply providing a bicycle- and pedestrian-friendly road or trail environment, as important as it is, cannot solve all bicycle and pedestrian problems. Some safety problems, for example, may be more easily solved through programs than through facilities. In order to understand the importance of the other elements of a comprehensive program, consider the following two examples:

1. A person decides to ride her bicycle to work. Between home and the office, there is a road with bicycle-friendly design features (e.g., wide outside lanes, bicycle lanes, etc.). While riding, she barely misses a 10-year-old wrong-way rider coming at her, is almost cut off by a motorist turning left in front of her, and finally finds no place to securely park her bicycle at the office. She locks her bike to the leg of a newspaper rack and goes into the office. When she leaves work, the sun has gone down; she has no bike lights. She calls a taxi to take her and her bicycle home.

Analysis: While she was able to take advantage of one element of a comprehensive program (the on-road facilities), the lack of other elements caused her serious inconvenience and danger. Youngsters need to learn which side of the road to use and the traffic laws should be enforced; motorists should learn to watch for bicyclists and yield to them just as they would to other motorists.

These common bicyclist and motorist errors lead to many crashes and may be addressed through education, enforcement, and awareness programs. Secure and convenient bicycle parking should be provided at all popular destinations as a routine matter. In some communities, this is dealt with in the parking ordinance.

Adult bicyclists should learn about proper lighting equipment.

2. A person gets in his car on a sunny summer afternoon to drive to a nearby store. The store is less than a mile away and he is buying a quart of milk. There are sidewalks but he doesn't even think of walking. He drives there, buys his milk and drives home. In so doing, he contributes to air quality and congestion problems. And he wastes gasoline.

Analysis: While the existence of sidewalks or places to walk is important, it does not necessarily convince people to walk if they habitually take a car for every trip. The average American household generates ten auto trips per day and many of them are short distance errands. Breaking the driving habit requires effort and understanding.

A good awareness campaign including media spots and other elements can help develop that understanding and encourage people to make the effort to walk for short trips. Walking takes little extra time compared to driving for very short distances. When one considers the costs (environmental, economic, personal health) of driving, and the exercise and health benefits of walking, walking is often preferable.

These two hypothetical examples point out the importance of going beyond the old focus on facilities alone to include other aspects as well. They suggest the potential roles that agencies such as the police department, the school district, and private parties like the local television station and newspaper can play in improving the bicycling and walking situation in a community.

It is important to keep in mind that some elements may not contribute directly to increased numbers of non-motorized travelers. However, these elements are important for other reasons, primarily safety.

How to mix the 4-e's

How, exactly, can a successful mix of engineering, enforcement, education, and encouragement be determined? The answer is that participants from a wide range of agencies and groups must get involved in the process. The Geelong, Australia, model is a good one to illustrate this point. The Geelong Bikeplan Team included members from the enforcement community, roads department, safety agencies, school system, and bicycling community. In assembling their comprehensive program, the project managers enlisted the help of those who would, ultimately, be responsible for implementing it.

This is the process suggested here. A "bike-pedestrian plan task force" should be assembled to mold and steer the program. The following structure is suggested for the task force. While the same department may be represented on several subcommittees, this would not necessarily require different individuals. Individual members should deal with those aspects within their areas of expertise.

Task force structure

Subcommittees:

Steering committee
- Physical environment
- Education and awareness
- Encouragement
- Data collection

Physical environment
- Public works (traffic engineering, streets)
- Planning (transportation, land use)
- Parks and recreation (parks planning)
- Cyclists and pedestrians
- College campus planning

Education and awareness
- Parks and recreation (programming)
- School district (elementary and jr. high)
- High school and college
- Health
- Cyclists and pedestrians

Enforcement
- Police (traffic)
- Cyclists and pedestrians

Encouragement
- Parks and recreation
- Transit (bus or commuter train)
- Local media
- Cyclists and pedestrians

Data collection
- Planning (transportation)
- Health
- Parks and recreation
- Cyclists and pedestrians

One task force for each mode or a combined task force

Whether to combine bicycle and pedestrian considerations under one group or keep them separate is an important decision. On the one hand, bicyclists and pedestrians share some important characteristics, the greatest of which is their general neglect in transportation planning. On the other hand, the differences in physical and operational characteristics of bicyclists and pedestrians make it imperative that each mode be considered separately.

The clearest example of this is the generally unsatisfactory experience communities have had with mixed-use sidewalk bikeways. The Guide for the Development of Bicycle Facilities (AASHTO, 1991) says that "providing a sidewalk bicycle path is unsatisfactory for a variety of reasons." Their reasons include pedestrian design speeds, fixed hazards, conflicts at intersections, and conflicts with pedestrians.

On balance, a combined bicycle-pedestrian task force can work but should take special care to analyze bicycle and pedestrian problems and conditions separately and develop separate sets of goals and objectives, as well as project priorities and programs.

Other important ingredients

Strong mandate: The task force must have a strong mandate for action. This mandate must come from the top and include a commitment to encouraging bicycling and walking as part of the overall transportation system.

This commitment may or may not require significant expenditures on specific projects, depending on local needs. However, Boulder's transportation plan contains a commitment to shift 15

percent of auto trips to alternative modes. This pledge is backed by $7.2 million in proposed pedestrian-related expenditures and $13.4 million in bicycle-related expenditures.

Staffed program: In addition to having a strong mandate, the task force can benefit from the support of a staffed city bicycle-pedestrian program. Such a program can work to integrate bicycle and pedestrian considerations into the governmental routine, research other communities' efforts, provide a public contact, and keep abreast of changes in the bicycle and pedestrian fields. In some of the most progressive bicycling communities, the bike-pedestrian program has provided a leadership role in creating program initiatives.

What does it take to create such a program? Typically, a bicycle-pedestrian program is one of the least expensive investments a community can make. The Dallas Bicycle Program, for example, has an annual operating budget of $50,000. This includes salaries and all program expenses. Gainesville, Florida's bicycle program budget totals approximately $46,000; this money is from the city's general fund. Missoula's program costs approximately $35,000 per year. In Madison, Wisconsin, the bicycle coordinator's salary, plus approximately $2,000, comprises the program's budget.

Public participation: An active public participation process is another key ingredient to a successful program. In most communities, this means, at the minimum, the appointment of a citizens' advisory committee. Seattle's committee is well-known for its high level of commitment and active participation. Candidates for membership are carefully scrutinized for their interest and expertise. Eugene, Oregon, also credits a significant amount of its success to an active committee, as does Gainesville, Florida.

Most cities surveyed also benefit from the input of active community groups. In Seattle, for example, the Cascade Bicycle Club has worked on advocacy issues for many years and is responsible for conducting much of the bicyclist education work done in that community. In Dallas, the Greater Dallas Bicyclists have worked to improve cycling conditions for years.

Determining the scope of a comprehensive program

Because so little is known about the bicycling and walking situations in most communities, it is difficult to predict in advance what level of expenditure and program activity will be needed to implement a comprehensive program. Until the needs have been identified and the problems assessed, the necessary scope of the program will likely remain unknown. However, the basic approach suggested here is to make bicycle and pedestrian considerations part of the normal process of governing. In many cases, this may require little extra expense.

For example, if a police officer stops a bicyclist for running a stop light, this should not be seen as a new or extra duty. It is simply part of traffic enforcement and it will pay the community back in terms of decreased crash rates. Similarly, adding pedestrian or bicycle-related questions to a transportation needs survey will not necessarily require large amounts of money. It allows transportation planners to do a better job of planning for the community's travel needs and can pay off in reduced motorized travel demand. Finally, changing from a dangerous drainage grate standard to a bicycle-safe design costs no more but can reduce an agency's potential liability.

There will be some projects (e.g., a new bicycle bridge) that require a significant expenditure of funds. However, if the need for a project is clearly documented through surveys and studies, it can take its place in the Transportation Improvement Program. In such an arena, its strengths and weaknesses can be weighed against those of other potential projects.

The steps in the process

There are four primary steps in the process of mixing the elements of engineering, education, enforcement, and encouragement to create a comprehensive bicycle-pedestrian program.

First, it is important to develop an understanding of the local bicycling and walking situations. This means looking closely at non-motorized travel in the community, determining its limitations and potential, as well as current levels of use and safety problems. This understanding forms the base for the work that follows.

The second step is to set realistic goals and objectives. These should be based on data from the information-gathering step and they should be measurable and achievable.

Third, participants should address those goals and objectives through the development of an action plan. The plan should be a blueprint for the community's work in all the elements of the comprehensive program. It should include phasing and funding considerations.

Fourth, as work on the action plan progresses, it should be evaluated based on its effects on the goals and objectives. Without an evaluation process, it is impossible to determine the effects of one's work. With evaluation, one can judge and document success, correct errors, and fine tune the program.

STEP 1: UNDERSTAND THE BICYCLING AND WALKING SITUATION

In order to set a program's objectives and create a well-targeted action plan, it is vital to first look closely at the current situation. This is particularly important for the non-motorized modes because, in many communities, so little is known about them at the local level. It is the rare transportation survey that looks closely at where or how much people walk or ride bicycles. In looking at the bicycling and walking situation, the focus should be on the following seven topics.

1. Assess levels of actual and potential bicycling and walking.

Approach: Survey the public to determine their concerns, habits, desires, and attitudes with respect to non-motorized and motorized travel. Find out where they ride or walk, where they would like to ride or walk, what are the trip purposes for their walking or riding trips, what barriers keep them from walking or riding (or doing it more), and what concerns and ideas they have.

Result: A study of current use, problems, limitations, and projections of potential use to help set priorities for project ideas and give baseline data for evaluation purposes.

Examples: Davis, as part of their 1991 Transportation System Management Study conducted a survey which gave figures for bicycle commuting and measured the potential for increased utilitarian bicycling among employees of particular workplaces. Similar detailed studies have been done in San Francisco and Toronto.

2. Bike and pedestrian counts should be done on a routine basis.

Approach: Develop a list of locations of interest and work bicycle and pedestrian counts at those locations into the routine traffic count procedures. Counts can be done manually, by using video or stop action cameras, or by modifying standard traffic counting equipment.

Result: A list of bicycle and pedestrian volumes at key locations.

Examples: Eugene has installed loop detectors in key locations on its trail network. As a result, they gather data on an on-going basis. Madison has collected bicycle traffic count data at the same locations for years. As a

result, they have a good idea of changes in use at those particular sites. While preparing the case for a major improvement to a dilapidated independent bicycle-pedestrian bridge, the bicycle advisory committee conducted a 12-hour bicycle and pedestrian count. With over 2000 people crossing the bridge during that period, it was clear that the project was justified.

3. Identify major hazards and barriers on the road network.

Approach: Conduct a hazard and barrier inventory, focusing on relatively permanent problems. Identify high priority problems.

Result: A list of the barriers and hazards for bicyclists and pedestrians.

Examples: Missoula used a Federal bike map grant to survey the road system for hazards and barriers. In 1982, they identified major hazards like narrow bridges and tunnels and barriers like railroad yards and interstate highways. Currently, bicycle provisions for most of the problem locations identified are planned for elimination as part of the Transportation Improvement Program (TIP).

4. Analyze and quantify crashes that are reported to the police.

Approach: Assemble and analyze crash reports accumulated for at least several years. These should be categorized according to the crash classification systems developed for the National Highway Traffic Administration: **Pedestrian Safety: The Identification of Precipitating Factors and Possible Countermeasures** (1971, Snyder & Knoblauch) and **A Study of Bicycle-Motor Vehicle Accidents: Identification of Problem Types & Countermeasure Approaches** (1977, Cross & Fisher). While relatively few of the serious car/bike and car/ped crashes are reported, the reports can give a general picture of the community's problems.

By collecting all reports and providing analysis, the task force can help the police set priorities for selective enforcement, educators determine which problems to emphasize in their courses, and media specialists focus on important safety messages.

Result: A study showing the magnitude of the problem, a list of the most important types of car/bike and car/pedestrian crashes and a list of the critical factors for each crash type.

Examples: Gainesville has collected their crash statistics for a number of years. In the mid-1980s, for example, they based a series of college-student oriented comic strips on their most common adult bicycle/car crash problems.

Missoula began analyzing their car/bike crash records in 1981 and has kept records ever since. As a result, the local bike program has a good idea what crash problems are most common and what kinds of topics should be emphasized in education and awareness campaigns.

In 1973-4, Palo Alto's City Engineer conducted a study of bicycle/car crash frequency and bicycle use of a particular sidewalk facility. On the basis of the increase noted in the bicycle/motor vehicle crash rate, the facility was modified. More recently, a Palo Alto bicycling instructor has analyzed bike/car crash problems of middle school-aged students and developed an education program based on the results.

5. Identify crash problems that are important but not reported.

Approach: Hospital emergency rooms should be encouraged to collect data on bicyclist and pedestrian admissions and treatment. While detailed causation information is unlikely to come from such data, it will be useful in determining overall crash frequency and severity. This information, when combined with the data from police reports, can help the task force understand the community's bicycle and pedestrian safety problems.

Result: A list of other serious injury-producing bicycle and pedestrian crash types, along with other critical data on ages, location, etc.

Examples: Eugene did a hospital emergency room study as part of their bikeway plan evaluation in 1980. The study allowed the City to determine, among other things, the accident rates for their different types of facilities.

Seattle's Harborview Medical Center is a major source for many recent studies, particularly those relating bicycle helmet use and injury severity.

6. Identify bicycle theft problems.

Approach: Analyze bicycle theft reports gathered by the police department. Look at overall numbers per year, particularly popular theft locations, typical theft scenarios, types of bikes stolen, types of locks defeated, and typical values of bikes taken.

Result: A report on how theft happens and how serious a problem bike theft is in the community.

Examples: In 1982, Missoula studied its bicycle theft problem, identifying the main problems. The resulting media and information campaign, registration campaign, and a bike advisory committee-led "sting" project reduced the theft by 50 percent in one year.

7. Identify bicyclist and pedestrian assault problems.

Approach: Analyze police reports on assaults that involve pedestrians or bicyclists. Identify problem locations, typical assault techniques, and possible solutions.

Result: A report on how and where non-motorized traveler assaults happen and how serious a problem they are in the community.

Examples: Philadelphia found that pedestrians were being assaulted on the paths and rest areas in Fairmount Park. Since the early 1970s, they have put plain clothes police on bikes to patrol the park.

STEP 2: SET ACHIEVABLE GOALS AND OBJECTIVES

With a basic understanding of community problems, needs, and desires, it is possible to begin creating a clear set of goals and measurable objectives upon which all participants agree. The following relatively general statements are offered as a way to start the process.

It is expected that individual communities will produce sets of goals and objectives that are more specific, as well as more useful in measuring their own progress.

OVERALL GOAL:

Encourage safe travel by bicycle and on foot.

I Engineering and planning

1. Make the road network bicycle- and pedestrian-friendly

A. Consider bicycle and pedestrian needs in new construction.

Why: Roads that have not been built yet can be the easiest to get changed--if suggestions are offered early enough in the design process.

B. Retrofit bicycle and pedestrian improvements to existing roads.

Why: Existing roads form the basic network of travel in any community. While often harder to alter than roads contained in new construction, existing roads serve significantly more people.

C. Make "spot improvements" to eliminate small-scale problems.

Why: Small problems often combine to make bicycling and walking unpleasant and unsafe. Eliminating potholes near the right side of the roadway and adding time to the pedestrian phase of a traffic signal can help bicyclists and pedestrians get where they are going safely.

2. Provide non-motorized linkages to increase travel options

A. Break barriers to bicycle and pedestrian travel.

Why: Since, for most people, bicycling and walking tend to be short-distance (one to three miles) modes of travel, barriers that force a one- or two-mile detour can discourage many non-motorized trips.

B. Provide new bicycle and pedestrian alternative routes.

Why: Traffic congestion slows both motorized and non-motorized modes of travel. Providing better access for non-motorized travelers than for motorized travelers can encourage greater use of these modes.

C. Provide bicycle and pedestrian transit links.

Why: Use of mass transit is limited by the potential capture area of each route and its stations or stops. By making it easier for non-motorized travelers to get to and use transit, it is possible to increase the capture area and, as a result, to benefit both.

3. Provide a supportive environment for bicycling and walking

A. Modify land use policies to make short non-motorized trips more feasible and useful.

Why: Walking and bicycling will not attract many utilitarian users if distances are too great. Land use policies should allow mixing of uses (e.g., neighborhood stores and small compatible offices in residential neighborhoods) in order to keep trip distances short.

B. Consider bicycle parking at all existing "bicycleable" destinations, and showers and lockers at workplaces.

Why: Finding a place to park one's bicycle is an important aspect of each trip, particularly in communities with high theft rates. In addition, because non-motorized travelers are their own engines, they may need a shower or change of clothes when they get to work.

C. Modify zoning requirements to include bicycle parking and showers and lockers.

Why: It is generally easier to affect new construction than existing facilities. Zoning requirements help institutionalize bicycle and pedestrian considerations.

II Education

1. Educate key target groups in lawful, responsible bicycling, walking, and driving.

A. Teach important bicycling and walking skills to youngsters.

Why: Walking and riding are lifelong skills that can enhance a person's well-being and contribute to good health if done safely. Studies have shown that children's mistakes tend to involve a limited set of basic errors and that these errors can be addressed through education.

B. Teach important bicycling and walking skills to adults.

Why: Mistakes that adults make are often different from those made by children and they tend to ride in more demanding situations. Teaching advanced traffic skills to adults may reduce their chances of crashes and injuries and encourage greater reliance on non-motorized modes.

C. Teach drivers how to interact safely and courteously with bicyclists and pedestrians.

Why: Many bicycle/motor vehicle crashes result from mistakes made by motor vehicle drivers. Drivers need a better understanding of how to safely share the roads with the growing number of people who walk or ride bikes.

2. Make the public aware of key non-motorized safety issues.

A. Determine which subjects are most important for crash and injury reduction.

Why: Society at-large needs to better understand bicycling and walking in order to practice these skills more safely and to better share the roads with non-motorized travelers. Yet, with the vast number of messages being directed at the public, it is more important than ever to target those topics that are most important.

B. Publicize important safety messages through print and electronic media.

Why: The media can help target the many members of the public who cannot be easily reached through schools or organizations.

III Enforcement

1. Improve traffic laws that affect bicyclists and pedestrians.

A. Compare the traffic code with the Model Traffic Ordinance.

Why: City codes may contain outdated laws that unnecessarily restrict bicycle or pedestrian travel. For consistency's sake, traffic law should follow or improve upon the national models.

B. Compare State traffic laws with the Uniform Vehicle Code.

Why: State law may contain outdated non-motorized provisions. State law should follow the model established by the National Committee on Uniform Traffic Laws & Ordinances and local officials should suggest such changes to the State for consistency with local ordinances.

2. Enforce laws that impact non-motorized safety and security.

A. Base traffic enforcement priorities on the findings of crash studies.

Why: To reduce the incidence of bicycle/motor vehicle and pedestrian/motor vehicle crashes, it makes sense to focus on those violations most likely to have an effect. Typically, these involve basic errors like pedestrian dart-outs, bicycle ride-outs, or motorist failure to yield.

B. Review and, if necessary, modify procedures for handling youthful violators.

Why: For youngsters, bicycle/motor vehicle or pedestrian/motor vehicle crashes most often result from their violating some basic traffic law. But since they have not taken driver training, they seldom know how the traffic system works. As a result, ticketing young children is an unnecessarily harsh approach to handling their violations.

C. Review and, if necessary, modify procedures for handling bicycle theft and assault on non-motorized travelers.

Why: Non-motorized travelers fall prey to certain characteristic types of crime. Pedestrians and bicyclists often complain about being insulted or assaulted while traveling; yet few offending motorists are ever apprehended. Bike theft is common in some communities.

3. Consider adding non-motorized enforcement options to routine police department procedures.

A. Investigate establishment of a mountain bike police patrol.

Why: Police departments all over the country are learning the advantages of community-based enforcement efforts. Mountain bikes can be a key part of such an emphasis. They are fast and quiet, allowing new levels of success in drug enforcement, for example, and help officers keep fit. Such patrols are also very popular with the public.

B. Investigate establishment of a foot patrol.

Why: Foot patrols put the police in touch with the community and allow casual interaction between officers and members of the public. The police can become seen as members of the community, rather than intruders.

IV Encouragement

1. Reduce or eliminate disincentives for bicycling and walking and incentives for driving single-occupant motor vehicles.

A. Add non-motorized options to agency motor pools.

Why: Often, it is as quick to get somewhere by bicycle or on foot as it is to check out an agency car and drive. And there are advantages, in terms of capital investment, public image, and employee health.

B. Review agency procedures that reimburse employees for use of their own vehicles.

Why: Many agencies reimburse employees for using their own private autos for official travel but there is nothing similar for non-motorized travelers. If the agency sees an advantage in encouraging non-motorized travel, some form of incentives should be considered.

C. Include non-motorized modes in local Transportation Demand Management programs and other efforts to reduce reliance on single-occupant motor vehicles.

Why: Non-motorized travel can be a key part of efforts to reduce the community's dependence on single-occupant motor vehicles, particularly when considering short-distance utilitarian trips.

2. Provide ways for non-participants to receive a casual introduction to bicycling and walking.

A. Include entry-level bicycling and walking activities in local recreation programming.

Why: Many people are afraid to try something new. A fun event for newcomers can give them the incentive and opportunity to try it with relatively little risk.

B. Offer detailed information on utilitarian non-motorized travel to key target audiences.

Why: "How-to" seminars and literature can help non-participants solve basic problems associated with non-motorized travel. For example, white collar bicycle commuters must learn how to look good at the office after riding to work.

3. Use electronic and print media to spread information about the benefits of non-motorized travel.

A. Develop and disseminate key pro-bicycling and pro-walking messages.

Why: Many people seem to believe that non-motorized travelers are a "problem" rather than part of the solution to problems created by motorized modes.

B. Publicize the experiences of current non-motorized travelers.

Why: One of the most effective ways to encourage new participants is to highlight the experiences of current ones. This also builds respect for a group that is often ignored.

STEP 3: DEVELOP AN ACTION PLAN

Once the objectives have been established, a set of project proposals and program initiatives can be identified for reaching those ends. The following tasks should form the basis of the Action Plan.

TASKS:

I Engineering and planning

A. Develop a master plan of bicycle and pedestrian considerations and adopt it as an element of the transportation plan.

1. Map current and potential non-motorized destinations.

Approach: Using information from the surveys, work with the planning department to compile a list of destinations important to pedestrians and bicyclists. Identify those residents most likely to travel on foot or on bike to each, given typical pedestrian and bicyclist trip distances, and establish the resulting desire lines.

Result: A map of important destinations, combined with those residential areas most logically associated with each, and the resulting desire lines between them.

Examples: Eugene's bicycle plan, completed in the early 1970s, identified important bicycling travel needs and potential corridors for improving access.

2. Identify necessary bike- and pedestrian-related improvements for existing roads.

Approach: Using the information gathered in the user surveys and hazard studies, work with the public works department to identify existing roadways that most need bicycle and pedestrian improvements in light of the desire lines identified in the previous step. Compare the list to the Transportation Improvement Program (TIP) list of projects. Identify already-planned projects that can, possibly with modification, satisfy the bicycle or pedestrian needs identified. Identify new project needs for insertion in the TIP.

Result: A list of projects for insertion in the TIP list; a second list of suggested bike- and pedestrian-related modifications for other planned projects.

Examples: Boulder's Pedestrian System Plan for the year 2010 includes a close look at sidewalk condition, the presence of handicap curb cuts, and a snow removal element. Davis' TIP includes many bicycle-related projects. Between 1991 and 2011, the City plans to spend over $20 million on bicycle facilities.

3. Target major bicycle and pedestrian barriers for removal.

Approach: Using the results of the user survey and the hazard and barrier inventories, work with the planning and public works departments to determine which are the most important in terms of their effects on bicycling and walking, particularly given the destination information. In determining which hazards and barriers are highest priority, also consider the potential impact of projects already planned, which may help eliminate the problems.

Result: A prioritized list of independent barrier-removal projects and modifications to already-planned projects for inclusion in the TIP.

Examples: Boulder's pedestrian plan proposes a total of $7.2 million in projects, including $1.1 million for pedestrian overpasses on major roads and $2,700,000 to provide missing sidewalks. Over 20 years ago, Seattle's bicycling community identified the proposed Interstate 90 bridge project as an opportunity to break a major water barrier previously identified. Recently, the I-90 bicycle path was completed including two bridges and one tunnel, linking the communities of Seattle and Bellevue.

4. Provide new bicycle and pedestrian by-pass routes.

Approach: Using the results of the user survey and an analysis of desire lines and potential improvements to existing roads, work with the public works and planning departments to identify by-pass routes (e.g., independent trails, connections through residential neighborhoods, etc.) that may provide a higher level of service than the available roadways.

Result: A prioritized list of trail and by-pass projects for inclusion in the TIP.

Example: When the first section of the American River Trail System in Sacramento was built in the early 1970s, it

provided speedy non-motorized access from the north end of town, which has many residential areas, to the heart of town, where many governmental offices are located. Because the trail is located on the river's floodplain, it has very few at-grade intersections. For example, in the six miles from Cal Expo (in the north end of town) to Discover Park (near Old Town), there is one at-grade intersection.

5. Provide bicycle and pedestrian transit links.

Approach: Using information from the user surveys, as well as studies of local transit system usage, work with the local transit authorities to identify potential locations for bike "park and ride" facilities, as well as transit stop access needs for both pedestrians and bicyclists. Also consider bus routes that may be good candidates for bike-on-bus pilot projects and look at the potential for allowing bikes on light rail and other commuter trains.

Result: A prioritized list of transit-related projects for inclusion in the transit system's budget priorities; and a prioritized list of access improvement projects for inclusion in the local TIP.

Examples: Seattle provides bike racks on buses on selected routes, as do other communities like Phoenix, Arizona, and San Diego, California. Palo Alto, California, and Tacoma, Washington, allow bikes to be brought on the buses themselves, Palo Alto provides secure bicycle parking at commuter train stations for those going into San Francisco.

6. Consider bicycle parking at all existing "bicycleable" destinations and showers and lockers at workplaces.

Approach: Based on the user surveys and desire line studies, consider the quality and quantity of available bicycle parking at popular destinations. Working with the public works department and redevelopment agencies to prepare a prioritized plan for addressing those needs that may be satisfied on public property. Help organize a campaign for improving private sector parking provisions. Also, consider providing showers and lockers at public workplaces as a pilot project to encourage other employers to follow suit.

Result: A plan for public bicycle parking installation, suggestions for private sector parking, and a pilot project on public workplace locker and shower provision.

Examples: Each year, the Missoula Redevelopment Agency, in cooperation with the City Engineering Department, installs approximately 50 new bicycle racks downtown. Racks are built to City standard and are installed on sidewalks according to a set of location guidelines.

B. Set up standard procedures for dealing with on-going pedestrian and bicycle needs.

1. Adopt bicycle- and pedestrian-friendly roadway design standards.

Approach: In cooperation with the public works, streets, and parks departments, review local standards for such things as drain grates (type and installation), signal timing, sidewalk widths, curb cuts, traffic lane widths, crosswalk designs, trail widths, and other bicycle and pedestrian considerations. Use manuals and reports like the AASHTO Guide to the Development of Bicycle Facilities, AASHTO's Policy on Geometric Design of Highways & Streets, and other similar sources for this review. Modify local standards and adopt the changes.

Result: An official set of bicycle- and pedestrian-friendly design standards covering roadways, sidewalks, roadside design, and independent paths.

Examples: Seattle specifies a vane-design drainage grate for bicycle safety reasons. San Diego uses bicycle-sensitive loop detectors (e.g., quadrupole and modified quadrupole loops) for traffic signal systems on their roadways.

2. Eliminate small problems through a "bicycle/pedestrian spot improvement" program.

Approach: Small barriers (like missing sections of sidewalk or short stretches of narrow roadway) or hazards (like lack of pedestrian signal controls or dangerous drainage grates) should be located and eliminated on a routine basis. Work with the maintenance department to set up existing procedures for finding and fixing small barriers and hazards. Identify needs for additional procedures to eliminate those barriers and hazards that such procedures will likely miss.

Result: A procedure for eliminating minor hazards and barriers as a routine part of the public works process.

Examples: Boulder's pedestrian system plan includes $425,000 to repair deteriorated sidewalks. The Seattle bicycle-pedestrian program has a special budget for pedestrian and bicycle "spot improvements." The program distributes spot improvement postcards to bike shops and other sites; local cyclists and pedestrians use the postcards to alert staff to problems and the program sends the necessary work orders to the street department.

3. Modify land use policies and plans and zoning ordinances to make short non-motorized trips more feasible and useful.

Approach: In cooperation with local planning officials, review land use plans and zoning ordinances, along with their assumptions, and compare to non-motorized travel needs identified in user surveys. In particular, consider the impacts of practices that exclude small-scale commercial development in residential areas on utilitarian bicycling and walking.

Result: Proposed changes to the land use plan and zoning ordinance.

Examples: Gainesville has created higher housing density requirements for housing areas near their university in order to facilitate bicycle and pedestrian transportation to and from the campus. Davis uses developer dedication and special dwelling unit equivalent fees to build many of their facilities.

4. Modify zoning requirements to include bicycle parking and showers and lockers.

Approach: Work with local zoning officials to review current development regulations and compare to those found in well-known bicycle-friendly communities. Prepare a revised version of the regulations for adoption.

Result: Suggested modifications to the parking ordinance and other relevant aspects of the local zoning regulations.

Examples: Palo Alto requires new commercial developments to include showers, lockers, and secure bicycle parking in their plans. Madison, Gainesville, Boulder, and Seattle, among other communities, also have bicycle parking requirements in their parking ordinances.

II Education

A. Provide instruction in lawful, responsible behavior among bicyclists, pedestrians, and motorists.

1. Teach important bicycling and walking skills to youngsters.

Approach: Using information gathered from the user studies, as well as the crash studies, work with school administrators and teachers to identify target ages for key educational messages. Review course options and identify opportunities for implementing bicycling and walking curricula for the target ages.

Result: A program of instruction that effectively reaches the target audience.

Examples: Missoula's school district has included bicyclist education in its core curriculum since 1980; the program is taught by physical education instructors. Boulder's bicycle-pedestrian program staff includes a full-time education person in charge of implementing curricula in cooperation with the local school system. Madison's program works with the local schools to do the same.

2. Teach important bicycling and walking skills to adults.

Approach: Using information gathered from the user studies, as well as the crash studies, work with college and high school administrators and teachers to identify key educational messages. Review course options and identify opportunities for implementing bicycling and walking curricula for the target ages.

Result: A program of instruction that effectively reaches the target audience.

Examples: Effective Cycling instructors in Seattle and Tucson, Arizona, among other communities, have offered adult courses through the local junior colleges. Missoula and several other communities have offered cycling classes to traffic law violators through the local municipal court systems.

3. Include bike and pedestrian information in driver training.

Approach: Using information from the crash studies, work with local driver training instructors and violators' classes to identify key messages for delivering to new drivers, as well as those required to take remedial driving

courses. Assemble a model curriculum unit and deliver to all local instructors.

Result: A model curriculum and delivery mechanism for reaching drivers during training.

Examples: The Gainesville Bicycle Coordinator taught 14- and 15-year-old drivers' education students how to share the road with bicycles. The coordinator brought copies of bicycle/automobile crash reports to illustrate her points. She then divided the class into groups, each with an accident report. Groups analyzed how the crashes happened and how they could have been avoided.

B. Deliver important safety messages through various print and electronic media.

1. Determine which safety messages are most important for which audiences.

Approach: Using information gathered from the crash studies, identify important messages for the whole range of target audiences.

Result: A prioritized list of messages identified with their target audiences.

Examples: The Gainesville program determined that one of the audiences most in need of attention was the college student population. Key safety messages that these bicyclists needed to get were identified.

2. Create a process for effectively delivering those messages.

Approach: Work with the local media and other groups to determine how best to reach the audiences identified above, given the resources available.

Result: A long-term strategy for delivering selected messages to key target audiences.

Examples: In 1986, Madison's bicycle program created an ambitious bicycle helmet campaign, working with local bicycling groups and the media. They did before and after studies of both helmet wearing rates and their success in delivering their messages. In Gainesville, officials commissioned a safety specialist to create college student-oriented bicycling comic strips for publication in the campus newspaper and for printing as brochures.

III Enforcement

A. Improve existing traffic laws, as well as their enforcement.

1. Review and, if necessary, modify laws that affect bicyclists and pedestrians.

Approach: In cooperation with the police department and city attorney, review local and state bicycle and pedestrian laws and compare with the current version of the Uniform Vehicle Code and Model Traffic Ordinance. Focus, in particular, on those regulations that may unnecessarily restrict bicycle or pedestrian traffic or that seem out-of-date when compared to the national models.

Result: A report listing suggested changes to local and state traffic laws.

Examples: Palo Alto, after reviewing potential crash problems and liability concerns, decided to allow bicycle traffic on a key expressway. In so doing, they opened a new route for fast across-town travel.

2. Enforce laws that impact bicycle and pedestrian safety.

Approach: Using information from the crash studies, determine which traffic violations are implicated in the most common serious car/bike and car/pedestrian crashes. Working with the police department, traffic court, and city attorney, develop a plan for enforcing the key laws.

Result: A plan for equitable enforcement of bicycle, pedestrian, and motor vehicle traffic laws.

Examples: Since the mid-1980s, Madison's police department has used a "bicycle monitor" program, staffed by specially-deputized university students, to enforce bicycle traffic laws. Seattle's department aggressively polices crosswalks and routinely gives motorists tickets for violating pedestrian right of way. Missoula's bicycle patrol routinely gives tickets to motorists who violate the law.

3. Review and, if necessary, modify procedures for handling youthful violators.

Approach: In cooperation with the police department, develop procedures for handling young bicycle and pedestrian law violators.

Result: A set of procedures for dealing with young bicyclists and pedestrians.

Examples: For years, Dallas operated a youth court for young bicyclists caught violating traffic laws. The City of Santa Barbara, California, a pioneer in bicycle enforcement, developed a campaign which included special tickets for youngsters, a publicity campaign, and a training film for officers. Missoula has a special warning ticket for youngsters: one copy goes to the violator, one is mailed to the parents, and one is kept at the police station.

B. Reduce the incidence of serious crimes against non-motorized travelers.

1. Develop a strategy for reducing the number of bikes stolen and increasing the proportion of recovered bikes returned.

Approach: Based on the police department's bike theft study develop a strategy for reducing the impact of bike theft rings and other sophisticated thieves. Also consider means to inform the public of simple steps they can take to keep their bikes from being stolen.

Result: A plan for reducing bike theft in the community.

Examples: Missoula used their 1982 bicycle theft study as the basis for TV spots, appearances on news shows, news releases, brochures and posters, all of which promoted using high security locks. They also developed a computerized bicycle registration procedure which has helped identify and return many licensed bikes to their owners.

2. Develop a strategy for reducing assaults on bicyclists and pedestrians.

Approach: Based on the study of bicyclist and pedestrian harassment and assault, develop a standard procedure for dealing seriously with these complaints.

Result: Policies and procedures for dealing with bicyclist and pedestrian assault and harassment.

Examples: For years, the Missoula bicycle program has worked with the city attorney's office on a case-by-case basis to resolve complaints of bicyclist harassment. Their efforts resulted in irresponsible motorists receiving numerous warnings and citations.

Use non-motorized modes to help accomplish other unrelated departmental goals.

1. Implement non-motorized patrols in appropriate areas.

Approach: Based on the experiences of other communities, determine the need and potential of non-motorized patrols in the community and develop an implementation plan.

Result: A plan for funding and creating non-motorized police patrols in the community.

Examples: Seattle has pioneered the mountain bike patrol as a way of dealing with street crime. After starting in 1987, the patrol has grown to over 100 officers and the founders have given training seminars to police departments all over the country. Each year, hundreds of mountain bike officers gather for a national conference sponsored by the League of American Wheelmen; many also attend the annual "Beat the Streets" patrol competition hosted by Seattle.

IV Encouragement

A. Reduce or eliminate disincentives for bicycling and walking and incentives for driving single-occupant motor vehicles.

1. Add non-motorized options to agency motor pools.

Approach: Identify all agency motor pools and determine which can be modified to include bicycles. In addition, consider which trips can be efficiently taken on foot. Create a plan of action for adding non-motorized options where possible. Promote the approach as a model for other local employment centers.

Result: A plan for using non-motorized modes in satisfying agency transportation needs.

Examples: For years, Eugene has done bike path maintenance using a bicycle-mounted crew. They tow a bicycle trailer which holds their tools. The City of Seattle recently created a "non-motorized pool," adding bicycles to the motor vehicles available for employee use. The bikes are proving extremely popular.

2. Require companies and agencies to produce balanced transportation plans for their workforce's commuting needs.

Approach: Review city policies and practices, as well as those of private companies and other large employers, that reward driving private automobiles or discourage walking or

bicycling. Work with all appropriate agencies and companies to modify those provisions.

Result: A set of proposed options (policies, ordinances, programs) that address institutional biases against bicycling and walking.

Examples: In Palo Alto, a transportation plan for Stanford University suggested helping staff purchase bicycles if they would use them for commuting to work. The City reimburses those who use their bicycles for work-related trips. The University campus in Davis has for many years severely restricted motor vehicle parking. This has been identified as one of the major factors in encouraging students and faculty to ride bikes to the campus.

B. Provide ways for non-participants to receive a casual introduction to bicycling and walking.

1. Include entry-level bicycling and walking activities in local recreation programming.

Approach: Identify existing programs or groups that could become sponsors for introductory-level bicycling and walking activities. Based on user studies create a list of potential activities and match them with groups willing to offer sponsorship.

Result: A schedule of introductory-level non-motorized recreational activities.

Examples: Eugene's recreation department sponsored a variety of recreational rides and workshops for novice adult riders through their network of parks. The Chesterfield County Parks Department in Richmond, Virginia, sponsors an annual "Peanut Ride" which visits peanut farms in the area, allowing participants to learn more about local agriculture while getting good exercise.

2. Promote utilitarian non-motorized transportation through introductory fun events.

Approach: Through a combination of promotional events and media publicity, encourage citizens to walk or ride in place of driving.

Result: An annual series of promotions supporting non-motorized travel.

Examples: Boulder's annual Bike Week has become a major event over the years, encompassing a schedule of senior citizen rides, bike polo, business challenges, bicycle parades, and non-polluter commuter races. During their Bike to Work Day in 1992, approximately 7000 people rode bicycles to work.

3. Offer key target audiences detailed information on utilitarian non-motorized travel.

Approach: Based on the user studies, determine which audiences are most likely to bicycle or walk; further determine their detailed informational needs and create a plan for getting that information to the audiences.

Result: A plan for giving detailed useful information to key target audiences.

Examples: The Ann Arbor, Michigan, program has run seminars at local hospitals and other employment centers, helping participants learn how bicycle commuting might work for them. In Los Angeles, the El Segundo Employers Association, in cooperation with the Southern California Association of Governments, has produced maps, pamphlets, and seminars to promote non-motorized transportation among their workers.

C. Use electronic and print media to spread information on the benefits of non-motorized travel.

1. Develop and disseminate a limited set of simple but important pro-bicycling and pro-walking messages.

Approach: Based on the user studies, determine the educational needs of bicyclists and walkers, assemble a list of the most important messages, and create a media campaign to get them across. Include the experiences of current non-motorized travelers as a way of personalizing the messages and lending added credibility.

Result: A media campaign promoting the benefits of bicycling and walking directed at key target audiences.

Examples: San Diego has used bus-mounted advertising to promote the benefits of non-motorized travel. Seattle, in cooperation with a local TV station, has created a series of local promotional television spots.

STEP 4: EVALUATE THE WORK

In order to determine the on-going success of the task force's work and to set future priorities, it is important to include an evaluation of the relative importance of program elements. The following list of measures can help guide a program and answer questions like whether encouragement initiatives affect bicycling and walking rates or whether safety efforts reduce crashes and injuries.

Outcome measures

Outcome measures show how successful a program is at meeting its bottom-line goals and objectives. They measure the effect the program has on the situation it was designed to change. The following are suggested areas for conducting outcome evaluation processes. These measures should be compiled on a regular basis.

1. Regularly re-assess levels of bicycling and walking and user needs.

Approach: Every 1 to 5 years, re-survey users to determine changes in bicycling and walking habits, use of transit, as well as emerging behaviors, attitudes, and concerns. On a routine basis, count bicyclists and pedestrians at the same locations used during initial research. Annually, produce a report of changes along with potential implications for program work.

2. Regularly monitor safety statistics.

Approach: On an on-going basis, collect police accident reports. On an on-going basis, collect hospital data on bicyclist and pedestrian admissions and treatment. On a regular basis, keep track of of assaults that involve pedestrians or bicyclists. Identify changes in safety problems, as well as potential implications for programs.

3. Monitor changes in bicycle theft problems.

Approach: On an annual basis, repeat the study of theft problems. Look at changes and consider alterations to the program as a result.

Process measures

Process measures tell how well a program's delivery system works. While they do not give a good indication of the worth of a program, they do help keep track of what has been accomplished. On a regular basis, compile these measures to show the results and to give a baseline for gauging future work levels.

1. Monitor progress in roadway and trail improvements.

Approach: Keep a record of large and small bike- and pedestrian-related hazards and barriers eliminated, and roadway and trail projects implemented during the course of each year.

On an annual basis, update the list of proposed projects for consideration in the TIP. Consider changes to the list as conditions change.

2. Monitor provision of transit links and trip end facilities.

Approach: Keep track of transit linkages implemented. Determine future needs based on new transit developments and the success of the program. Review public bike parking provisions. Keep an updated map of parking installation and note any problems for future correction.

3. Evaluate standards, policies and regulations regularly.

Approach: Review roadway, sidewalk, and trail design standards on a continuing basis, in light of new research and local experience. Modify those that need updating.

Routinely review parking requirements to determine whether changes may be needed to assure the provision of high quality parking. Monitor the implementation of shower and locker regulations as well. Review traffic laws when new versions of the Uniform Vehicle Code and Model Traffic Ordinance come out, or when problems arise.

During future reviews of local plans and relevant ordinances, consider the impacts on utilitarian bicycling and walking. Suggest modifications as needed.

4. Monitor delivery of educational messages.

Approach: Keep a continuing record of the number of bicyclists and drivers reached through education programs and the extent of the contact. Keep track of the delivery of

public service messages through various media (newspaper, TV, radio, pamphlets, etc.).
Make note of any problems encountered, along with suggestions for changes to program approaches, target ages or groups, or messages.

5. Monitor results of enforcement program.

Approach: Keep track of the number of tickets and warnings issued, as well as common violations. Compare the results to crash data for possible modification. Also keep track of efforts to curb bike theft and assaults against non-motorized travelers.

6. Monitor company and agency efforts to balance their work-force's commuting needs.

Approach: Keep records on which companies and agencies are working on the problem, as well as the specifics of their programs. Publicize innovative efforts.

7. Monitor non-motorized transportation events and publicity.

Approach: Keep track of numbers of participants, types of events and publicity, as well as problems and solutions. Prepare an annual report summarizing efforts.

CONCLUSION

A comprehensive bicycle-pedestrian program directed toward the goal of increasing safe travel by non-motorized modes must combine the efforts of many people. No one office can do it all. Officials in public works, planning, enforcement, education, recreation agencies all have a role and must work together to achieve the desired end.

In order to determine success, it is important to first determine current conditions. Since non-motorized travel is so seldom measured, we know little about it. With data on use, user attitudes and behavior, safety, and security problems, it is possible to begin assembling an achievable set of goals and objectives. These goals and objectives should be used to guide the development and implementation of an action plan. The plan should include physical elements like roadway improvements and trail systems, as well as non-physical elements like enforcement and education programs.

Evaluating the elements of the action plan is a critical step in determining future direction and past success. Success should be measured both in terms of services delivered and effects achieved. Evaluation must be seen as a key ingredient to implementation, rather than as an extra duty to be performed if there is time or money.

Combining these steps into a comprehensive program will allow a community to achieve and measure success.

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