MONTANA LIVABLE PLACES CAMPAIGN

MONTANA'S INVISIBLE TRAFFIC VICTIMS

A PRELIMINARY REPORT ON PEDESTRIAN AND BICYCLIST INJURIES IN THE TREASURE STATE

ABSTRACT:

According to numerous studies, under-reporting is a serious problem for injury crashes involving bicyclists. This most likely occurs because the factors that drive the reporting of crashes between two motor vehicles—most notably the requirements for filing insurance claims—appear to be less of a consideration when one of the parties is a bicyclist. This is even more true if there is no motorist involved in the crash at all. The effect can be best seen in the difference between emergency room data and that contained in police records. Studies have shown that approximately 90 percent of those bicycle crashes that send someone to an emergency room never get reported to the police.

If these characteristics are applicable to Montana's injury crashes, then the effect on the statistics presented in the Montana Department of Transportation (MDT) *FY 1996-1997 Problem Identification Paper* may be significant. For example, while the Paper suggests that in 1995, there were 193 bicycle injury crashes, accounting for 2.8 percent of the total, it is quite possible that some 1930 crashes sent a bicyclist to the Emergency Room. If this were the case, bicycling injuries could represent nearly 23 percent of the total injury crashes.

While less information is available for pedestrian crashes, the pattern is reported to be similar, if perhaps less pronounced than that for bicyclists. Research currently under way for the National Highway Traffic Safety Administration appears to confirm this result.

Accounting for unreported pedestrian injury crashes might increase the percentage of non motorized injury crashes to between 20 percent and 30 percent of Montana's total. In order to determine the significance of the problem, the Montana Department of Transportation should revisit its techniques for tracking traffic injuries, particularly among modes for which under-reporting is a known problem.

Possible outcomes of such an approach could be, for example, the identification of problem locations with more than their share of crashes. Such locations could then be targeted for pedestrian- or bicycle-related improvements like traffic calming in neighborhoods, the installation of median refuges on arterial streets, the addition of sidewalks in key corridors where they are missing, or the reconfiguration of major intersections and their signals so that pedestrians and bicyclists can cross more safely.

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A PRELIMINARY REPORT ON PEDESTRIAN AND BICYCLIST INJURIES IN THE TREASURE STATE

The Montana Department of Transportation (MDT) *FY 1996-1997 Problem Identification Paper* provides a good overview of traffic-related problems in Montana. It also contains valuable information on such topics as seatbelt use, alcohol involvement in crashes, public perceptions of traffic safety, and other related subjects. However, in the brief sections on bicycle and pedestrian crashes, the report may well be inadequate and may present misleading information. If this assertion is true, bicycle and pedestrian safety issues may be significantly more important in Montana than is currently understood.

The numbers presented in the paper may be be seriously low for both bicycle injury crashes and pedestrian injury crashes. The numbers for bicycle and pedestrian fatalities are, in all likelihood, much more accurate, although they, too, may be somewhat low. For fatalities, the primary reason for under-reporting would be if the crash took place on a parking lot, driveway, or other private land.

Those deaths that took place off the public roadway would, according to the U.S. Department of Transportation, not be classified as "traffic deaths" and, as a result, may not be reported to state departments of transportation. As a result, they may not show up in state fatality data.

STATISTICS BASED ON POLICE TRAFFIC REPORTS MAY UNDERESTIMATE THE NUMBER OF BICYCLISTS KILLED BY EIGHT TO TEN PERCENT.

Consider, for example, a comparison of two national tracking systems that identify transportation-related deaths. A recent analysis showed that the National Highway Traffic Safety Administration's Fatal Accident Reporting System (FARS) data, based on state police crash reports, under-reports actual bicycling deaths by approximately eight to ten percent when compared to the more extensive data from the National Center for Health Statistics (NCHS), which are based on death certificates.[1]

For non-fatal bicycle and pedestrian crashes, additional factors affect the potential for under-reporting. Perhaps the most significant is the reporting needs of motor vehicle insurance companies. For crashes involving two motor vehicles, for example, companies typically require the involved parties to report the incident to the police in order to process their claims.[2]

For crashes involving only one motor vehicle (e.g., when someone runs off the road and hits a tree, damaging a fender), the companies strongly urge their customers to report the incident as well but they may not require such action. Therefore, while there is some potential for under-reporting of motor vehicle crashes, the combination of mandatory insurance coverage and state requirements for reporting would likely reduce that potential significantly. By Montana state law, drivers must report crashes that result in death, injury or property damage in excess of $250.[3]

For injury crashes involving a bicycle and a motor vehicle, a pedestrian and a motor vehicle, bicyclists crashing, or pedestrians falling, the chances that the event will be reported to the police and, therefore, end up in MDT data, may be reduced by as much as 90 percent.[4] Even though drivers are required to report such incidents, if they are involved, pedestrians have no such requirement. And, while bicycles are "vehicles" according to Montana Code, the likelihood that a youngster crashing his bicycle into a curb will report the incident is relatively low. For whatever reason, anecdotal experience suggests there are many occasions when reports do not get filed for bicycle or pedestrian injury crashes.

Further, motor vehicle insurance companies do not necessarily require motorists to report incidents that do not involve another driver in order to process claims for either party's injuries. And medical insurance providers, hospitals, or emergency room personnel are under no such requirement to report crashes to the police either.

A bicyclist attempts to get from home to school.

BICYCLE INJURY CRASHES

Studies show that, for injury-producing bicycle crashes, under-reporting is a serious problem. As far back as the 1977 Cross-Fisher NHTSA study,[5] researchers have suggested that a majority of bicycle-related crashes that were serious enough to send someone to an emergency room (ER) went unreported.

The Highway Safety Research Center at the University of North Carolina at Chapel Hill, has similarly shown in several more recent emergency room studies, that only about 10 percent of the bicycle-related ER admissions ever make it into the police records.[6] An interesting question, then is this: What would be the result if this pattern of under-reporting of bicycle injury crashes is also true for Montana and how would it affect the numbers presented in the *Problem Identification Paper*?

ACCORDING TO NATIONAL RESEARCHERS ONLY ABOUT 10% OF THE BICYCLE-RELATED EMERGENCY ROOM ADMISSIONS EVER SHOW UP IN POLICE RECORDS.

Consider the results that a 90 percent level of under-reporting for bicycle injury crashes would have on Montana's data, for example. Table 1 compares the reported numbers for the years 1986 through 1995, as found in the MDT paper, with numbers based on an assumption that 90 percent of the injury crashes are unreported.

Typically, bicycle injury crashes in MDT's paper account for two to three percent of the total reported injury crash statistics. However, if bicycle injury crashes are being under-reported in the proportions suggested, this two to three percent could increase to over twenty percent.

LIKELY UNDER-REPORTING OF BICYCLE INJURY CRASHES IN MONTANA MAY MAKE THE PICTURE LOOK SIX TO SEVEN TIMES BETTER THAN IT IS.

Table 1: MT Bicycle Injury Crashes: Reported vs. Projected

MDT Data: Reported Injury Crashes		*MDT Data: Reported Injury Crashes Involving Bicycles*		*Projected Injury Crashes Involving bicycles**	
Year	*Number*				
1986	5528	151	2.7%	1,510	21.9%
1987	5572	176	3.2%	1,760	24.6%
1988	5500	145	3.2%	1,450	21.3%
1989	5749	160	2.8%	1,600	22.3%
1990	5520	161	2.9%	1,610	23.1%
1991	5514	139	2.5%	1,390	20.5%
1992	5903	165	2.8%	1,650	22.3%
1993	6144	142	2.3%	1,420	19.1%
1994	6568	199	3.0%	1,990	23.8%
1995	6807	193	2.8%	1,930	22.6%

*Based on 90% Under-Reporting

It could be argued that two or three percent of injury crashes is an insignificant problem. But if, in fact, bicycle injury crashes account for over twenty percent of the total, that would suggest the need for action.

Young bicyclists riding home from school must often share neighborhood roads with motorists thinking about work, dinner, and afternoon errands.

A mother walks to the supermarket despite the lack of sidewalks.

PEDESTRIAN INJURY CRASHES

For pedestrians, the picture is somewhat different than for bicyclists, although the likelihood of a relatively large number of unreported injury crashes is still significant. The Highway Safety Research Center (HSRC) is currently completing a study for the National Highway Traffic Safety Administration (NHTSA) regarding pedestrian crash under-reporting and preliminary results suggest that the problem is similar but perhaps slightly less acute than it is for bicycle crashes.[7]

In addition, HSRC suggests that, while many pedestrian-motor vehicle injury crashes and pedestrian falls do go unreported, there is an additional problem. Injuries that occur when a pedestrian trips on a curb or falls on an uneven sidewalk are difficult to separate from those injuries sustained at home. These data collection and interpretation difficulties make it harder yet to understand the true extent of the pedestrian injury problem.

For this reason, Table 2 presented below is based on a more conservative 80 percent under-reporting assumption. Until further data and analysis are available when the new NHTSA study is completed, this is probably the most reasonable approach to take.

Even so, the potential effect on MDT's data is worth considering. In every case, the results of this conservative approach put pedestrian injury crash numbers between 600 and 750 per year and injury crash percentages into the 10 to 13 percent range.

PEDESTRIAN INJURY CRASHES MAY BE FOUR TIMES AS COMMON AS MDT'S DATA SUGGESTS.

Table 2: MT Pedestrian Injury Crashes: Reported vs. Projected

MDT Data: Reported Injury Crashes		*MDT Data: Reported Injury Crashes Involving Pedestrians*		*Projected Injury Crashes Involving Pedestrians**	
Year	*Number*				
1986	5528	149	2.7%	745	12.2%
1987	5572	144	2.6%	720	11.7%
1988	5500	156	2.6%	780	12.7%
1989	5749	159	2.8%	795	12.5%
1990	5520	129	2.3%	645	10.7%
1991	5514	128	2.3%	640	10.6%
1992	5903	143	2.4%	715	11.0%
1993	6144	149	2.4%	745	11.1%
1994	6568	141	2.1%	705	9.9%
1995	6807	157	2.3%	785	10.6%

*Based on 80% Under-Reporting

A rural-type road near an elementary school can mean lots of kids sharing the space with high speed traffic.

OVERALL NON-MOTORIZED INJURY CRASHES

The percentages presented above for possible bicycle and pedestrian injury crashes were generated under independent under-reporting assumptions. If both bicycle and pedestrian injury crashes are significantly under-reported, as is likely, the results would be somewhat different than the result achieved by simply combining the totals or the percentages. This is so because the greater number of pedestrian injury crashes would result in a larger total for all injury

crashes and bicycle injury crashes would, therefore, be compared to a larger number. This would be equally true of the effect of the bicycle injury crashes on pedestrian injury crash percentages. Combining the bicycle and pedestrian injury crash numbers produces the results shown in Table 3.

Table 3: MT Pedestrian/Bicycle Injury Crashes

MDT Data: Total Reported Injury Crashes		*MDT Data: Reported Injury Crashes Involving Pedestrians & Bicycles*		*Projected Injury Crashes Involving Pedestrians & Bicycles**	
Year	*Number*				
1986	5528	300	5.4%	2,255	30.1%
1987	5572	320	5.7%	2,480	32.1%
1988	5500	301	5.7%	2,230	30.0%
1989	5749	319	5.5%	2,395	30.6%
1990	5520	290	5.3%	2,255	30.1%
1991	5514	267	4.8%	2,030	27.9%
1992	5903	308	5.2%	2,365	29.7%
1993	6144	291	4.7%	2,165	27.0%
1994	6568	340	5.2%	2,695	30.2%
1995	6807	350	5.1%	2,715	29.6%

*Based on 80% under-reporting for pedestrians and 90% under-reporting for bicycles

OVERALL, PEDESTRIAN AND BICYCLE INJURY CRASHES MAY ACCOUNT FOR BETWEEN 25% AND 30% OF THE TOTAL, RATHER THAN THE 5% TO 6% SUGGESTED IN MDT'S DATA.

It is interesting to note that in all cases, both the number of non-motorized crashes and the total percent of injury crashes involving bicycles and pedestrians increases five to six times over the level suggested in MDT's paper. This would make non-motorized injury crashes the one of largest categories of injury-producing traffic crashes.

Finally, it should be noted that exposure data forms one of the real missing keys in understanding the seriousness of the pedestrian and bicycle crash problem. Exposure data provides a yardstick against which to measure the relative hazard of an activity. And it provides an indication of whether an activity is becoming safer or becoming more dangerous over time.

An extremely popular activity that results in a small number of injuries should be looked at differently than an activity with few participants but with an equal number of injuries. While reasonable estimates are available for Vehicle Miles Traveled (VMT) for motorists, no such measures are available for either pedestrians or bicyclists. The importance of the lack of exposure data is shown by the following example.

A traditional-style sidewalk in a commercial district harbors street life and encourages walking. These kinds of places often have very high levels of walking

In a hypothetical "Community A" with 100,000 residents, 30 percent of the people walk to work or to school and 50 people get hurt in serious pedestrian injury crashes in the course of a year.

A modern arterial street lined with automobile-oriented businesses can make walking an unpleasant and sometimes dangerous undertaking. Places like this tend to have a relatively low level of walking.

In hypothetical "Community B," also with 100,000 residents, five percent of the people walk to work or to school but 50 of them get hurt as well. Without an exposure measure that compares the number of casualties to the amount of walking both communities would appear to be equally dangerous for pedestrians. In reality, Community B would be a more lethal place to walk.

This dark and gloomy pedestrian underpass forms the only walking connection between an older neighborhood and the community's downtown. Many potential pedestrians are afraid to use this facility.

In addition to their use in comparing different communities or states, exposure measures are also an important means to understand change over time. If, for example, the number of people who ride bicycles to work or to school drops by 30 percent but the number of bicycle injury crashes remains the same, that would suggest an increase in the risk of bicycling. Without an exposure measure, community leaders may mistakenly believe conditions are improving while they may well be deteriorating.

THE LACK OF "EXPOSURE" DATA ON WALKING AND BICYCLING MAKES IT IMPOSSIBLE TO TELL IF THINGS ARE GETTING SAFER OR MORE DANGEROUS.

Exposure measures' ability to put change over time into perspective is an important one for Montana. While, for instance, pedestrian injury crashes and fatal crashes have remained relatively stable since 1986, there is some indication that fewer people may be walking now than was previously the case. The possibility that walking in Montana is, therefore, getting more dangerous and, as a result, fewer are doing it is one worth considering.

In this light, it is worth considering a recent report from the Environmental Working Group which suggested Montana and its communities are relatively safe places to walk.[8] The communities that were at the top of the list for pedestrian dangers were fast growing cities and towns in Florida, California, and Texas. To the extent that Montana grows in similar ways, we can expect a worsening of the pedestrian safety picture as well.

AN ASIDE ON THE QUESTION OF AGE

An important question that is tangential to the main topic of this paper concerns age. Just how old are the Montanans who get hurt in these incidents? While this paper suggests a significant level of under-reporting of pedestrian and bicycle injury crashes overall, there is no evidence that the MDT data on different age groups are necessarily inaccurate. While such a possibility may exist, it is just as likely that MDT's paper is correct on that score.

Tables 4 and 5 present MDT's analysis of age groups of pedestrian and bicycle casualties (note that the term "casualties" includes injuries and fatalities). For clarity, percentages have been added to each of MDT's age categories.

Several important points should be made with respect to age. Well over 30 percent of the pedestrians injured or killed in crashes are under 15 years of age. For bicyclists, over 50 percent are under the age of 15. Other age groups are involved as well but the high numbers among those too young to drive suggests an important dimension of the problem. Giving limited attention to pedestrian and bicycle safety issues impacts Montana's children more than anyone else.

OVER 30% OF PEDESTRIANS AND 50% OF BICYCLISTS INJURED OR KILLED IN MONTANA ARE CHILDREN UNDER THE AGE OF 15.

Table 4: MT Data on Pedestrian Casualties by Age Group

Year	*0-4*		*5-14*		*15-24*		*25-34*		*35-44*		*45-54*		*55-64*		*65+*		*total*
'86	12	7%	43	24%	33	18%	33	18%	21	12%	9	5%	8	4%	13	7%	182
'87	13	7%	57	32%	23	13%	20	11%	20	11%	6	3%	10	6%	23	13%	177
'88	10	5%	46	24%	46	24%	28	15%	19	10%	12	6%	12	6%	17	9%	192
'89	12	6%	48	24%	34	17%	28	14%	24	12%	12	6%	16	8%	22	11%	203
'90	12	8%	49	31%	18	11%	25	16%	19	12%	9	6%	9	6%	12	8%	158
'91	14	8%	51	29%	33	19%	21	12%	18	10%	9	5%	9	5%	15	9%	175
'92	11	6%	43	25%	33	19%	24	14%	19	11%	8	5%	10	6%	16	9%	171
'93	10	6%	46	27%	31	18%	21	12%	23	13%	12	7%	10	6%	15	9%	173
'94	9	5%	44	25%	37	21%	24	14%	20	11%	15	9%	4	2%	15	9%	176
'95	11	6%	58	30%	37	19%	17	9%	18	9%	17	9%	7	4%	23	12%	193
10 Year Average:																	
	11	6%	49	27%	33	18%	24	13%	20	11%	11	6%	10	5%	17	9%	180

Table 5: MDT Data on Bicyclist Casualties by Age Group

Year	*0-9*		*10-14*		*15-19*		*20-24*		*25-34*		*35-54*		*55+*		*total*
86	36	20%	64	35%	30	16%	20	11%	16	9%	10	5%	2	1%	182
87	46	23%	70	35%	33	16%	15	7%	12	6%	20	10%	3	1%	202
88	31	18%	70	40%	23	13%	13	8%	20	12%	11	6%	3	2%	173
89	44	27%	44	27%	28	17%	13	8%	18	11%	8	5%	6	4%	164
90	32	19%	61	36%	24	14%	22	13%	14	8%	8	5%	4	2%	168
91	38	25%	47	31%	24	16%	15	10%	13	8%	14	9%	2	1%	153
92	31	17%	61	33%	21	11%	15	8%	19	10%	24	13%	10	5%	184
93	37	23%	49	31%	15	9%	17	11%	19	12%	15	9%	1	1%	158
94	45	22%	59	29%	34	17%	16	8%	23	11%	18	9%	4	2%	204
95	41	20%	67	33%	30	15%	19	9%	20	10%	23	11%	4	2%	204
10 yr avg:															
	38	21%	59	33%	26	15%	17	9%	17	10%	15	8%	4	2%	179

A FEW CAUTIONS

Clearly, if the basic contention of this paper—that pedestrian and bicycle injury crashes are significantly under-reported—is true, then Montana has a significant "invisible" pedestrian and bicycle safety problem. It should, however, be pointed out again that these numbers and percentages are based on assumptions and "best guesses" rather than hard data.

Even so, there is a strong likelihood that these hypothetical results are closer to reality than are those presented in MDT's paper. There is simply too much evidence pointing to a significant under-reporting problem for bicycle and pedestrian injury crashes to suggest otherwise. Without further research, it is impossible to determine the precise magnitude of the problem. However, it is very unlikely that total bicycle and pedestrian injury crashes account for only four to six percent of the total.

The agency's data suggest that between six and twelve percent of fatal traffic crashes involve pedestrians or bicyclists. It would make sense that the proportion of injury crashes would be higher, particularly since many of these crashes will occur on residential streets, where traffic speeds are lower than they are on highways.

What, then, are the implications of such numbers? If one out of four injury crashes in Montana involves a pedestrian or a bicyclist, how important is that? The problem's significance relates to several factors. First, as was suggested in the previous section, pedestrian and bicycle crashes seriously impact Montana's children. That alone, should suggest the importance of the problem

IF 1 OUT OF 4 INJURY CRASHES IN MONTANA INVOLVES A PEDESTRIAN OR BICYCLIST, HOW IMPORTANT IS THAT?

Second, if the numbers presented here are close, it would suggest Montana has an unrecognized traffic safety problem affecting the health and well-being of its citizens. If, instead of five or six percent of injury crashes, the reality is between 20 and 30 percent, that should be large enough for concern.

Another factor to consider is the severity of the injuries that may be missed by the current system. While it may be tempting to suggest unreported pedestrian and bicycle injuries are not "serious," this approach would be unwise. While it is likely that many of the most serious injuries show up in the MDT data, there is no guarantee. "Off system" crashes, like those that involve a parent backing over a toddler in the driveway or a bicycle being hit in a parking lot, as well as bicycle crashes or falls that involve a latent, but ultimately serious, head injury are but a few examples of how un-reported crashes may be serious.

The bottom line is that little is really known about the seriousness of the problem, either in terms of overall numbers or in terms of injury severity. Bringing this probability to light is one of the primary purposes of this paper.

FATAL CRASHES

As mentioned at the beginning of this report, the MDT Problem Identification Paper probably accounts for the vast majority of pedestrian and bicycle fatalities. However, the comparison discussed between FARS data and the NCHS figures suggest that traffic system-derived data tends to under-report non-motorized fatalities by eight to ten percent.

Table 6 compares MDT fatality data and a potential eight percent addition to the total. With such small numbers, this results in a small increase but seven to 14 percent of Montana's fatal crashes may involve walking or bicycling.

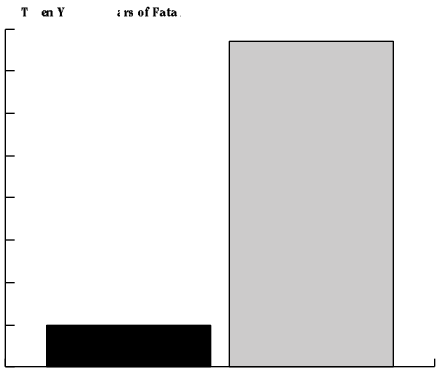
Table 4: MT Pedestrian/Bicycle Fatal Crashes

Year	*MDT Data: Fatal Crashes*	*Fatal Bike/Ped Crashes*		*Projected Data: Fatal Bike/Ped Crashes**	
1986	193	14	7.3%	15	7.8%
1987	198	20	10.1%	22	10.9%
1988	183	20	10.1%	22	11.8%
1989	163	20	12.3%	22	13.2%
1990	190	13	6.8%	14	7.4%
1991	172	13	7.6%	14	8.2%
1992	170	17	10.0%	18	10.8%
1993	166	12	7.2%	13	7.8%
1994	182	13	7.1%	14	7.7%
1995	186	12	6.5%	13	7.0%

* Based on an 8% under-reporting assumption

IN MONTANA THERE ARE 7 TIMES MORE FATAL BIKE & PEDESTRIAN CRASHES THAN FATAL CAR-TRAIN CRASHES

One interesting comparison is between pedestrian and bicycle fatal crashes and fatal motor vehicle-train crashes at grade-level railroad crossing. Many Montanans recognize the dangers of railroad crossings and there are substantial efforts to educate the public and improve the crossings. But such fatal crashes are much less frequent than those involving pedestrians and bicyclists. From 1986 through 1995, MDT reported 20 fatal motor vehicle-train crashes. During the same period, they reported 154 fatal pedestrian and bicycle crashes. These figures are particularly interesting considering the levels of funding dedicated to the former problem and the relative neglect of the latter.



ACTIONS AND IMPLICATIONS:

The numbers presented in this paper suggest that pedestrian and bicyclist injuries are probably a common problem in Montana, one that should be dealt with through a number of means. It would, of course, be helpful to conduct a serious study comparing at least a sampling of emergency room admissions with police reports and this is the first suggestion presented here. At the same time, it is also important to reduce the hazards facing pedestrians and bicyclists. The record suggests this is a relatively low priority in Montana.

While Montana has significantly improved its record of providing bicycle and pedestrian facilities during the 1990s, largely through the dedicated Transportation Enhancement Activities required under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the projects that result, while often important for other reasons, may or may not solve significant safety problems.

An indication of the low priority for pedestrian and bicycle safety improvements is seen in a recent national study of state spending on safety projects funded through the Federal Highway Administration's Surface Transportation Program (STP). This study found that, while nationwide approximately 15 percent of traffic deaths involve pedestrians, less than two percent of the STP Safety fund is spent solving pedestrian problems.

A RECENT NATIONAL STUDY SUGGESTED THAT MONTANA SPENDS NONE OF ITS STP SAFETY MONEY ON PEDESTRIAN PROJECTS.

For Montana, the report suggested the State spent none of the $7.8 million safety funds on pedestrian improvements. While there may have been a few pedestrian projects that this study did not identify, it is clear that MDT does not consider pedestrian safety a priority area for spending its STP Safety money. The second recommendation, therefore, is for MDT to consider pedestrian and bicycle safety problems more seriously in setting its safety priorities. It might, for example, be reasonable to spend five to seven times as much on pedestrian and bicycle safety projects as on railroad crossing projects.

To some extent, pedestrian and bicycle safety improvements can be targeted to locations known to be hazardous. For instance, a study produced through the National Cooperative Highway Research Program (NCHRP) suggested that "wide, undivided arterial highways and highways with two-way left-turn lanes pose particular hazards and inconveniences to pedestrian crossings."[10]

Therefore, such locations, like that shown at the top of the following page should be closely scrutinized for a history of pedestrian crashes or factors that could lead to such crashes, such as a large number of senior citizens or children living nearby, an "attractor" like a store, park, or other public place. Improvements such as the installation of raised medians with pedestrian refuges and/or "pedestrian half-signals" should be considered.

An elderly woman attempts to cross a 5-lane arterial street by waiting in the two-way left turn lane. Crossing facilities like these is particularly difficult for many pedestrians.

An older man attempts to tell whether the WALK signal is green or red. From this distance and with the glare of the afternoon sun on the face of the signal head, he is unable to tell.

Signalized intersections along major arterial streets also harbor hazards for pedestrians. For instance, large arterial streets are often so wide that pedestrians have difficulty seeing the WALK signal, as shown above. In addition, many signal systems provide inadequate crossing time for pedestrians, particularly the elderly and those with disabilities who tend to cross more slowly than the average speeds used in design. Increasing the timing of the WALK signal and/or reducing crossing time by either reducing the number of motor vehicle lanes or providing appropriate traffic islands should be routinely considered wherever pedestrians may be anticipated.

For bicyclists, providing space in the form of shoulders or bicycle lanes, depending on the situation, can vastly improve riding conditions. Similarly, small improvements like replacing dangerous storm drainage grates with "bicycle-safe" models, removing sight obstructions at residential intersections, improving current roadway sweeping practices, installing bicycle-sensitive traffic signals, fixing dangerous railroad crossings, and using non-slip thermoplastic pavement markings and lane striping can reduce the potential for bicycle crashes and injuries.

A safe railroad crossing that includes a rubberized surface and striping that encourages bicyclists to approach at a safe angle.

A "Diagonal Quadrupole" traffic signal loop detector that can detect bicycles.

On residential streets, such measures as "traffic calming" can reduce traffic speeds and, as a result, reduce the number of crashes of all types, not simply those involving pedestrians and bicyclists. Communities where these strategies have been tried often report 30 to 40 percent reductions in residential street crashes.[11] In addition, it is well-known that lower traffic speeds translate into a lower likelihood of death for pedestrians or bicyclists who are involved in a crash.

A program of installing residential street traffic circles can help slow motorists and reduce neighborhood crashes. Some communities report a 30 to 40 percent reduction in neighborhood crashes after a well-planned installation program is instituted.

Projects may include such things as residential street traffic circles, like that shown above; partial or full diverters; speed humps like that shown below; median diverters like that shown at top right; speed tables; squeeze points like that shown at bottom, and other measures designed to change how residential streets work. The basic concept is to change the priority for residential streets

A speed hump on a neighborhood collector helps reduce the speeds of passing motor vehicles. Humps are very different from the "speed bumps" typically installed in parking lots or drive-in movies and work much better.

A median diverter combined with bicycle lanes helps slow motorists on a neighborhood collector street.

from the movement of automobiles to the accommodation of residents. As evidence of the increasing popularity of traffic calming measures, the Institute of Transportation Engineers recently held a national conference in Florida devoted to the topic.

Finally, there is a role for safety information and instruction. Pedestrians, bicyclists, and motorists all need to better understand how to share the public travel ways. However, such approaches should not be substituted for improvements to the environment. Far too many "pedestrian safety" or "bicycle safety" programs approach the subject from an unrealistic and unhelpful point of view. For example, programs routinely exhort pedestrians to use sidewalks and walk facing traffic if they must walk on the road. However, such programs ignore the realities that many pedestrians face daily, such as discontinuous sidewalks that end abruptly, unenforced sidewalk shoveling laws, or the use of sidewalk space as supplementary parking. For bicyclists, the admonition to "stop for red lights and go on the green" is similarly difficult to obey when "demand-actuated" traffic signals do not turn green for bicyclists.

Therefore, simply telling pedestrians or bicyclists to "obey the law" does not protect them from the many obstacles presented by our current system. Realistic programs, like the elementary level bicyclist training program developed in the early 1980s for the Montana Office of Public Instruction, must be combined with efforts to eliminate the hazards facing vulnerable travelers.

END NOTES:

1. Unpublished draft NHTSA report, Stutts, HSRC, 1997.
2. Personal communication, Toole & Easter Insurance, Missoula MT
3. See *Montana Code Annotated,* 61-7-108
4. Personal communication., Jane Stutts, Highway Safety Research Center/UNC-Chapel Hill
5. *A Study of Bicycle/Motor Vehicle Accidents: Identification of Problem Types and Countermeasure Approaches;* Kenneth Cross & Gary Fisher; NHTSA; 1977
6. See, for example, *An Analysis of Bicycle Accident Data from Ten North Carolina Hospital Emergency Rooms;* Stutts; HSRC/NCDOT; 1986
7. Personal communication, Jane Stutts, HSRC
8. *Mean Streets;* Environmental Working Group; 1997
9. *Mean Streets: Montana;* Environmental Working Group; 1997
10. *Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas;* Report 294 A&B; NHCRP; 1994.
11. The literature on traffic calming is growing daily. See, for instance, the U.S. D.O.T.'s *National Bicycling & Walking Study's* Case Study Number 19: *Traffic Calming, Auto Restricted Zones, and Other Traffic Management Techniques: Their Effect on Bicyclists and Pedestrians;* Clarke & Dornefeld; USDOT; 1993

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The purpose of the Montana Livable Places Campaign is to encourage the development of people-friendly communities where transportation systems work for the benefit all.