OAKLAND'S SPEED HUMP PROGRAM: IS IT REALLY WORKING ?

A Review of "A Matched Case-Control Study Evaluating the Effectiveness of Speed Humps in Reducing Child Pedestrian Injuries", April 2004, *American Journal of Public Health*.

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I. THE OAKLAND SPEED HUMP PROGRAM

In the media publicity that accompanied the release of an *American Journal of Public Health* article on speed humps in Oakland (Source 1), advocates could not claim enough for the speed hump program in Oakland, California. "*Oakland has definitely seen a reduction in collisions involving kids, and the lion's share of the credit goes to speed humps*" (Source 2) said Zach Wald, a major figure in Oakland's program. The City officials running the program told the *Oakland Tribune* that between 1996 and 2000 pedestrian accidents in Oakland had slightly declined.

Yet the Oakland Pedestrian Safety Project and speed humps likely had little to do with the decline in pedestrian accidents. Pedestrian accidents actually declined more in cities without similar projects according to the California Highway Patrol's annual reports on traffic accidents (Source 3).

Most of Oakland's speed humps were installed between 1996 and 2000. Therefore, it is instructive to examine the change in pedestrian accidents between 1996 and 2001, and also between 1990 and 1995 before the speed hump program began. This is done in the rate of pedestrian accidents per capita, to adjust for population change. Between 1996 and 2001, per capita pedestrian accidents in Oakland fell 9.4%. Yet during this same period per capita pedestrian accidents fell more in other Bay Area cities: by 31.6% in San Jose, 24.0% in San Francisco, and 21.1% in Berkeley. They also fell elsewhere in California: by 14.3% in Los Angeles, 21.9% in Long Beach, 24.2% in Bakersfield, and 38.5% in Fresno (Source 3). Yet none of these other cities indulged in anything like the expensive "*speed hump binge*" that the *Oakland Tribune* credits Oakland with.

Statewide, per capita pedestrian accidents between 1996 and 2001 fell by 22.8%, two and a half times Oakland's rate. In fact, California's total of pedestrian accidents has fallen from 19,423 in 1990 to 15,195 in 2000 while the state's population has grown from 29.8 to 33.9 million, a per capita accident decline of 31.2% (Source 3).

Oakland experienced a much greater decline in pedestrian accidents before their speed hump program. Between 1990 and 1995, per capita pedestrian accidents in Oakland fell 25.0%. During this same period, by comparison, per capita pedestrian accidents fell 10.3% statewide, 10.2% in San Jose, 13.6% in Berkeley, and increased 3.1% in San Francisco (Source 3).

Pedestrian accidents have, in fact, been declining nationally on a per capita basis for decades. The reasons for this are better safety awareness, a smaller number of pedestrians and children in urban neighborhoods, and a shift of families to suburban and exurban homes with safer streets. The old city of auto-less families and row housing where children played in the streets is no longer the American norm.

Oakland and other older, densely populated cities have much higher per capita rates of pedestrian accidents than do suburban and newer urban communities. This is because they have much more pedestrian traffic crossing old, urban streets with poor sight distance and congested traffic. As of 2001, Oakland had a per capita rate of pedestrian accidents of 81.7 while Los Angeles had 80.1, Berkeley 102.3, and San Francisco 118.7. In contrast, suburban counties in the Bay Area had per capita pedestrian accident rates far lower: Contra Costa County 30.9, San Mateo

County 39.9, Santa Clara County 34.0, and Marin County 36.0. Even other California cities that are more suburban and auto-oriented in character had far lower per capita pedestrian accident rates: San Jose 41.8, Bakersfield 33.0, Anaheim 40.0, and Concord 27.4 (Source 3).

Oakland's meager decline in pedestrian accidents since the speed hump program began in 1996 may be due to its misinvestment in speed humps. As the City's own *Pedestrian Master Plan* points out, under four percent of all pedestrian accidents in Oakland from 1996 to 2000 could be attributed to "Unsafe Speed". Yet all that speed humps do is slightly lower traffic speeds. Moreover, the *Pedestrian Master Plan* tells us: "*Most pedestrian/vehicle collisions occur in downtown, in Chinatown, and along arterial streets*" (a statement that applies to nearly all California cities). Yet the speed humps are installed on local, residential streets, not arterials. The concentration of Oakland's pedestrian accidents along major arterial streets is well borne out in the dot map (Map 1) showing where 1996-2000 pedestrian accidents occurred in Oakland (Source 4).

This same concentration of pedestrian accidents along arterials is evident on similar maps for San Francisco and other cities. In fact, just ten arterial streets in Oakland accounted for 731 (40.5%) of the 1,807 1996-2000 pedestrian accidents. Map 2 of the *Pedestrian Master Plan*, which shows where all child pedestrian accidents occurred, also reveals a high proportion along arterial streets (Source 4).

So the accident reduction measures may not only be ineffective where applied but were applied where least needed. No detailed analysis of accidents on blocks with speed humps has been made to determine if the $3 million program (Source 5) has actually prevented any accidents at all.

Within the City of Oakland questions have been raised as to the efficacy of the speed hump program. One City memorandum noted that "*installing speed bumps on a street with (a) prevailing speed of less than 30 miles per hour may not have any meaningful benefit compared to the hampered emergency response that affect many residents*" (Source 5). As speed humps are only installed on local streets where speeds are usually 20-30 miles per hour there would be no "*meaningful benefit*" on the vast majority of blocks they have been installed on. Moreover, while it is unclear if a single accident has actually been prevented by the speed humps, the vast number sprinkled liberally over Oakland have clearly "*hampered emergency response*".

The memorandum also noted that: "*the Fire Department documented that each speed bump may delay emergency response by 10-15 seconds*" with about 1.6 humps on the average city block that have them (Source 5). This applies to delays to ambulances and police cars as well as to fire trucks. The *Pedestrian Master Plan* pointedly advocates many more speed humps and other delaying devices be installed on "crosstown bus routes". Also, all four-lane streets the planners decide don't need that space would be reduced to two lanes, with narrow lanes and "chokers" to further reduce speed and make passing impossible. This would impede emergency response time even more.

If that weren't enough, "*The bicycle community continues to oppose speed bumps*" because they cause "*loss of control and accidents*". And there have been "*numerous complaints and concern from people with disabilities*" over "*pain and injury experienced by people with disabilities as they travel over speed bumps*" with "*problems (that) are significant, ranging from short-term pain that discourages travel to long-lasting pain from injuries requiring medical treatment .... (leading) to permanent degeneration of existing disabling conditions*" (Source 5). So it's "*pain and injury .... from injuries requiring medical treatment .... (leading) to permanent degeneration*".

II. THE DUBIOUS "MATCHED CASE-CONTROL" STUDY

In its defense, the Oakland Pedestrian Safety Project is turning to the rather dubious study whose results were published in the April 2004 edition of the *American Journal of Public Health*. The article is titled "A Matched Case-Control

Study Evaluating the Effectiveness of Speed Humps in Reducing Child Pedestrian Injuries". The study uses no "before" and "after" data whatsoever, was conducted by people with no background in traffic safety studies, and was funded by the Oakland Pedestrian Safety Project. Let us then examine this study.

Traffic engineering studies on speed humps and similar devices have found that they typically lower average speeds on residential streets only slightly, say from 27 to 26 miles per hour. Is it reasonable to believe that driving slightly slower would cut child traffic injuries in half ? Well, that's what the authors of this article want us to believe.

The study was conducted entirely in Oakland, based on hospital records for injured children from the Childrens Hospital Oakland. The authors were Doctor June Tester, who "*conceived the study, performed all analyses, and led the writing of the article*", Zachary Wald, a traffic calming advocate influential in Oakland's speed bump craze, and Doctors George and Mary Rutherford, of Berkeley's School of Medicine and the Childrens Hospital Oakland, respectively (Source 1).

Understanding this article is not easy. Less than a fifth of the text and one tiny table actually contain the study results or discuss them. The rest of the article just goes on about their elaborate methodology and the many other studies they believe also make a case for traffic calming.

The authors state that:

> *The purpose of the study was to determine whether these children who had been struck by automobiles were any less likely to live near a speed hump than their peers who lived in the same city boundaries but visited the emergency room that day for a reason other than being hit by a car*.

The study claims much for speed humps:

> *Our findings suggest that speed humps make children's living environment safer .... In our observational study, we found that children who lived within a block of a speed hump had significantly lower odds of being struck and injured by an automobile in their neighborhood .... Children living within a block of a speed hump exhibited a 2.5-fold reduction in the odds of being injured on their street .... These results highlight the effectiveness of speed humps in reducing child pedestrian accidents*.
>
> *We found that speed humps were associated with a 53% to 60% reduction in the odds of injury or death among children struck by an automobile in their neighborhood*.

The *Oakland Tribune* story on this study summarizes their claims: "*Researcher finds that children living near devices half as likely .... to be hit by cars than kids living on streets where traffic was unimpeded*".

Half as likely ? There are many other things about this study that seem decidedly fishy.

First, it is not an objective study. The four authors seemed to begin with a premise of proving the efficacy of speed humps. They include one of the Bay Area's foremost advocates for such devices, Zach Wald, president of BayPeds. As Wald was instrumental in bringing about what the *Oakland Tribune* calls Oakland's "*speed hump binge*", he and his friends have a clear conflict of interest and can hardly be expected to conduct an open-minded analysis. The Oakland Pedestrian Safety Project, the city agency who put in the humps and in which Wald figures, paid for the study. It really is part of their promotional program.

Second, they may not have really known which injuries occurred on blocks with speed humps and which didn't. The March 31, 2004 *Oakland Tribune* story states "*Oakland has been on a speed hump binge since the early 1990s*" and that "*half the city's 3,000 humps*" were installed between 1996 and 2000. That 3,000 may be an exaggeration but the City installed at least 125 speed humps on 80 blocks prior to 1994 (Source 5). Yet the study claims to have classified injuries into only two groups: 1) injuries occurring on over 1,000 blocks where some 1,600 speed humps

were installed between 1995 and 2000; and 2) all other blocks, which they presume lack speed humps.

They take no account of where the other 125-1,400 speed humps are, some of them clearly installed before 1995:

> *Over the 5-year period 1995-2000, Oakland installed about 1,600 speed humps on residential streets .... We used data from the Department of Traffic Engineering in Oakland to determine the exact locations and dates of installation of speed humps (Department of Traffic Engineering, unpublished data, 1995-2000).*

So if a block contained a speed hump or similar device that had been installed before 1995 it would have been classified as an "unprotected" block. The researchers therefore may have had inaccurate data as to how many of the injuries occurred on blocks with or without speed humps. It would have been a good idea to go to each of the 100 injury sites and see whether there was a speed hump within a block of it.

In addition, how accurate would one researcher with no relevant background be in correctly matching which blocks had or didn't have the 1,600 speed humps ? Matching street addresses and blocks from hospital records to hump sites allows much opportunity for error.

Third, all the study's claims about "*a 2.5-fold reduction*" in injuries have no valid or logical basis. In order to determine that you've "reduced" anything you first have to quantify what it was before it was "reduced". Yet no "before and after" examination was made of the rate of injuries on humped versus humpless streets at all. Therefore, they can't know whether the speed humps reduced anything.

With over 300 pedestrian accidents every year, in what the *Oakland Tribune* calls "*the speed hump capital of the country*", there is all the data one needs to conduct a comprehensive "before and after" study, comparing humped streets to non-humped ones. One could quantify exactly what the impact of speed humps has been on pedestrian safety and how much the pedestrian accident rate has changed on streets with and without speed humps. It would be useful if some neutral party with the technical competence undertook such a task.

Fourth, it's not really that much of a "control" study at all. The authors did not compare the percent of Oakland children injured by traffic living within one block of a speed hump to the citywide percent of children living within one block of a speed hump. The examined 100 childhood traffic injuries treated at Childrens Hospital from 1996 to 2000. Their "control" appears to be 200 randomly chosen child non-traffic injury patients at the hospital during the same period.

The article is so cryptic in its explanation that the only things really clear to me is that of the 100 children injured, 49 were hit "*in front of their home*". It looks like 14 of the 100 were on blocks with speed humps as were 6 of the 49. Now, if 14% of those hit were within a block of a speed hump, and the humps reduce the odds of getting hit by 53-60%, then 30-35% of all Oakland children must live within a block of a speed hump. If not, their claims aren't true. As they were supplied with records as to where the speed humps are, and have Census data for each block, they could have determined this. But they didn't.

Fifth, their math is badly explained and depicted. The core of their entire "analysis" is summarized on Table 2. Yet Table 2 is muddled and mismatched to the text. One reader in ten could properly understand what they mean. It shows 14 to 14% of 100 yet 6 they show as 12% of 100; they show 46 to be 23% of 200 yet somehow 24 is supposed to be 24% of 200. No clear explanation is given as to just what the 14, 6, 46, or 23 are.

Sixth, they have no valid basis for determining the "Odds of Pedestrian Injury" they claim. Without knowing the change in "before and after" injury rates on the collective sets of humped versus humpless streets there is no way they can make any conclusions as to "Odds". What it looks like to me is that all they know is that more children were injured on blocks without speed humps. Well, maybe that's because the vast majority of

Oakland children live on blocks that don't have speed humps.

If they had checked their sample of 100 they would also have found that the great majority of children injured are right-handed. They could then "conclude" that left-handed children are far safer as the "incidence" of injuries among the left-handed is smaller so we should re-train everyone to be southpaws.

Seventh, their data, even if accurate, proves very little. Even if their data is 100% correct and that there is a lower incidence of traffic injuries on the streets with speed humps. What can we conclude from that ?

Nothing. A lower incidence of traffic injuries on the streets with speed humps (if it's there at all) may have been prevalent on those same blocks long before the humps were ever put in. That lower incidence, in fact, may have nothing to do with speed humps but may be due entirely to the population and roadway characteristics of those blocks.

Speed humps and similar devices are typically installed where the political demand for them is strongest. This tends to be in middle to upper middle class neighborhoods. It also tends to be where the adjoining street "looks" dangerous: along the straighter and longer residential streets with higher levels of traffic (collector streets or the more significant local ones). But children don't tend to play on those streets. Injury rates may be low on straight, long higher volume residential streets.

If the incidence of child traffic injuries is lower on residential streets with speed humps it may well be because those streets tend to be on straight, long streets in middle class areas. The incidence would be lower with or without speed humps. Had the authors had conducted a "before and after" analysis of child traffic injuries they might well have found that the streets with speed humps had lower accident rates long before the humps went in. They didn't.

Along these lines it is odd that the survey was limited to Oakland. The Childrens Hospital Oakland "*receives all pediatric ambulance transports from the city of Oakland*". But is not the same true for several suburban cities located cheek-by-jowl with Oakland including Piedmont, Emeryville, Alameda, and San Leandro ? The inclusion of those four would have boosted the population base of the study by 30%, leaving a larger sample size of child injuries. Those other cities are even more residential in nature and have many more streets appropriate for this type of analysis. Yet they are middle class suburbs which may have safer habits. Were they excluded because data from those cities would have altered the results ?

Their data might also be correct yet their conclusions nonsense for many other reasons. Consider what speed humps actually do. The only observable change is that they slightly slow traffic, at least very near the humps. If they really do work to make streets safer it may be more a matter of their message to the driver that there is something about the street requiring greater caution. How then do the researchers know that other cautionary treatments that don't slow down emergency vehicles work as well ?

They don't. No cross-checking was done to compare potential injury reduction with more subtle, alternative devices such as transverse painted lines across the pavement, transverse rumble strips, or short street sections covered the old-fashioned way: with paving stones. These devices may also caution drivers just as effectively yet they would not add to delay for emergency vehicles, have much less jarring effect on disabled passengers and bicyclists, and would cost considerably less than speed humps, which cost $1,800 a pop in Oakland (Source 5).

Another unexamined point was that speed humps themselves generate child injuries, many not traffic-related. They encourage skate boarding and other activities around the humps and generally act to draw children into the street to play. What if the streets with humps actually have a greater incidence of child injuries of all kinds ? That would fit in perfectly with the study's findings that a much higher percent of all non-traffic injuries occur on blocks with speed humps than of traffic injuries. Yet the study's methodology would count

that as an indication of greater safety. After all, if you generate 30-35% of all injuries but only 14% of traffic injuries you must be safer -- unless of course you're only 25% of the population.

One tragedy of this study is that, while few can understand it and no one will probably verify the data it's based on, the study will be seized upon as credible proof that blanketing residential streets with speed humps will eliminate most child traffic injuries. Yet they don't. Moreover, a far greater number of pedestrian injuries occur on major collector and arterial streets -- utterly ignored in this study. This will cause a wasteful diversion of resources which will do little to solve a small problem while allowing a much bigger one to continue.

The greater tragedy is that a close examination of the records for injured children at the Childrens Hospital Oakland could have yielded very valuable data indeed. A wholistic study approach would have examined not only child injuries due to traffic accidents but child injuries and aggravated conditions due to delays incurred by fire, police, and ambulance vehicles traveling over speed humps in responding to emergency calls. Statistically, there are far more of the latter than the former. A use of such data could have established whether the added damage to children caused by speed hump delays outweighs any benefits.

Omitted from the article are other observations the study found that may be useful. For instance, the *Oakland Tribune* story on this study quotes June Tester as saying something that appears no where in her article: "*Most often children are struck by cars when they run into the street from between two parked cars*". Of course. Yet for years Traffic Calmers and New Urbanists have been insisting on curbside parking. Peter Calthorpe, a leading urban design exponent, is on record in word and print that curbside parking enhances pedestrian safety as it creates a safety "buffer" between traffic and pedestrians. The people who have been trying to reduce curb parking for decades have been traffic engineers.

REFERENCES

Source 1: "A Matched Case-Control Study Evaluating the Effectiveness of Speed Humps in Reducing Child Pedestrian Injuries", *American Journal of Public Health*, April 2004.

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Source 3: Department of California Highway Patrol, "Statewide Integrated Traffic Records System", 1994-2001.

Source 4: *Oakland Pedestrian Master Plan*, City of Oakland, 2002.

Source 5: City of Oakland Memorandum, Claudette R. Ford, Director, Public Works Agency to Robert C. Bobb, Office of the City Manager, *Informational Report on the Development of a Comprehensive Speed Bump Plan for the City of Oakland With Specific Reference to Fire Safety Access Issues in the City*, October 30, 2001.

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