

Bicycling is safe!

Laws, policies, roadway designs and facility designs should be informed by this important principle:

Despite claims to the contrary, ordinary bicycling is already a safe and beneficial activity. Unusual measures are not required to make cycling safe. Therefore, bicycling for transportation and recreation should be promoted, not discouraged or restricted.

Research studies and data clearly show that, in the current environment, **bicycling's benefits greatly outweigh its tiny risks.** We know of no studies that contradict this fact. To cite a selection of such data:

20:1 benefit: Mayer Hillman, "Cycling and the Promotion of Health," Policy Studies, Summer 1993, Vol. 14 (2) states that the years of life gained through cycling exceeds the years of life lost through cycling by "around 20 to one." This includes benefits to non-cyclists from reduced road and pollution hazards.

7:1 benefit: Jeroen J. de Hartog, "Do the Health Benefits of Cycling Outweigh the Risks?," Environmental Health Perspectives, 118(8), Aug. 2010 found a benefit to risk ratio of seven to one for just the cyclists themselves in Britain, and nine to one for cyclists in Holland.

77:1 benefit: David Rojas-Rueda, "The health risks and benefits of cycling in urban environments compared with car use", British Medical Journal 2011: 343: d4512 found 77 years of life gained to each one lost, for those who used Barcelona's bike share system instead of a car.

18:1 benefit: Ari Rabl, "Benefits of shift from car to active transport", Transport Policy 19 (2012) 121-131. Cycling was found to confer an average of 1310 Euros per year due to health gains, versus only 72 Euros detriments due to pollution exposure and crash risk. Benefits exceeded risks by 18 to one.

Note that those studies evaluated bicycling in ordinary urban environments. Only the Holland figure involved an unusual number of special bike facilities.

Contrary to common belief, cycling is safer than many other activities.

Relative safety or danger can be computed in various ways. Tables below compare bicycling with common hazards or other common activities, and demonstrate that cycling is quite safe.

Estimated U.S. fatalities per year: [Numbers are approximate; bicyclist data from NHTSA]

| | |
|------------------------------|-------------------------|
| Heart disease | 700,000 deaths per year |
| Cancer | 550,000 |
| Stroke | 160,000 |
| Chronic respiratory diseases | 123,000 |
| Accidents | 100,000 |
| Diabetes | 70,000 |

| | |
|--------------------------|--|
| Influenza & pneumonia | 60,000 |
| Riding in motor vehicles | 40,000 |
| Alzheimer's | 40,000 |
| Falls | 16,000 |
| Poisoning | 14,000 |
| Suffocation | 5,500 |
| Pedestrians | 4,800 |
| Motorcycling | 3,500 |
| Drowning | 3,000 |
| Fires | 2,600 |
| Bicycling | only 730! (the average from 1997 to 2007) |
| Falling out of bed | 600 |

In other words, there are roughly 1000 heart disease deaths for every bicycling death. Sedentary lifestyles and increasing obesity are poised to put more pressure on the American health care system, through the top four causes of death. But bicycling can be promoted as a very effective method of reducing heart disease and other major ills.

Risk of fatality per hour participation: Failure Analysis Associates (now Exponent Corp.) evaluated fatalities per million hours exposure for a wide variety of activities and situations. (Exponent is the U.S.'s largest risk consultation firm, serving the insurance industry.) In *Design News* magazine, October 4, 1993, their proprietary analysis procedures gave the following results:

| <u>Activity</u> | <u>Fatalities per million hrs participation</u> |
|------------------------------|---|
| Skydiving | 128.71 |
| General Aviation | 15.58 |
| On-road Motorcycling | 8.80 |
| Scuba Diving | 1.98 |
| Living (all causes of death) | 1.53 |
| Swimming | 1.07 |
| Snowmobiling | 0.88 |
| Passenger cars | 0.47 |
| Water skiing | 0.28 |
| Bicycling | 0.26 |
| Flying (domestic airlines) | 0.15 |
| Hunting | 0.08 |

According to this data, bicycling is roughly four times as safe as swimming, per hour exposure. Yet bicycling is frequently saddled with warnings of danger, while swimming enjoys an image of safe family fun!

Injuries per year:

In most cases, “injuries” quoted in statistics refer to presentations to hospital emergency rooms. Some selected sources of ER visits, and typical counts [source: Statistical Abstract of the U.S., 2003 and National Safety Council Accident Facts, 1997]

| | |
|-----------------|----------------|
| Stairs or steps | 1,050,000 |
| Floors | 1,030,000 |
| Basketball | 690,000 |
| Bicycles | 590,000 |
| Beds | 466,000 |
| Doors | 350,000 |

Often, the number of injuries due to bicycling is presented as being very large, and evidence of great danger. *But in a country the size of the U.S., all numbers are large.* If bicycling causes fewer injuries than beds plus doors, should it be treated as excessively dangerous? Furthermore, data show that the great majority of bicyclist injuries receiving ER treatment are minor, with the most common injury being abrasions or “road rash.”

Injuries per month:

Powell et. al., “Injury Rates from Walking, Gardening, Weightlifting, Outdoor Bicycling and Aerobics”, *Medicine & Science in Sports & Exercise*, 1998, Vol. 30 pp. 1246-9 polled over 5000 people who had chosen at least one of those activities for exercise. One question was whether the participant had incurred an injury during the previous month. The results:

| | |
|---------------------------|------------------------------|
| Weightlifting: | 2.4% of participants injured |
| Gardening or yard work: | 1.6% |
| Aerobic Dance: | 1.4% |
| Walking for exercise: | 1.4% |
| Outdoor bicycling: | 0.9% |

Yes, bicycling caused fewer injuries per participant than walking or gardening!

Sports Injuries per Participant:

By their nature, sports involve strenuous use of the body, pushing oneself to excel. But bicycling is much more than a sport; it is useful for gentle recreation plus transportation, and only a tiny percentage of bicyclists ever compete in races; yet bicycling sometimes appears in tables of sports causing injuries. Due to bicycling's huge recreation popularity, its injury numbers appear large. But comparison on a per-participant basis tells another tale.

The 1997 edition of National Safety Council's Accident Facts counts sports injuries, plus number of participants for 1995. From that, we can compute the injuries per million participants:

| <u>Sport</u> | <u>Participants</u> | <u>Injuries</u> | <u>Injuries per million participants</u> |
|------------------|---------------------|-----------------|--|
| Basketball | 30,100,000 | 692,396 | 23,000 |
| Football | 20,400,000 | 389,463 | 19,091 |
| Soccer | 12,000,000 | 156,960 | 13,080 |
| Bicycling | 72,500,000* | 586,808 | 8,094* |
| Ice skating | 7,100,000 | 37,532 | 5,786 |
| Roller skating | 37,500,000 | 175,295 | 4,674 |
| Volleyball | 18,000,000 | 86,551 | 4,808 |

*In assembling the above data, "participants" were defined as those who had engaged in the activity more than once per year, *except for bicycling*, which for unspecified reasons required participating at least six times per year! Clearly, if counted equally, bicycling's participant count would be much higher and injuries per participant correspondingly lower.

Lifetime odds of death:

How likely is it that an American will die while riding a bicycle? Extremely unlikely! The National Safety Council (<http://nsc.org>) has tabulated lifetime odds of death from over 125 specific activities or causes of death. Odds are expressed as "one chance out of xxx" with higher numbers representing greater safety. Here are some selected results:

| | |
|---------------------|-------------|
| Poisoning | 139 |
| Falls | 184 |
| Car occupant | 272 |
| Pedestrian | 623 |
| Motorcyclist | 802 |
| Drowning | 1073 |
| Fires in buildings | 1529 |
| Pedalcyclist | 4147 |

Note that bicycling, with only 1 in 4147 chance of causing death, has the best odds listed. And the National Safety Council also shows that an American has a 1 in 7 chance of dying from heart disease, which regular bicycling can help prevent!

Brain injuries:

Since the marketing of bike helmets began in the 1970s, bicycling has been portrayed as a great risk for serious brain injury. However, dispassionate examination of data shows this portrayal is false. For example, as shown below, **bicycling causes fewer than 1% of U.S. brain injury fatalities.**

The Centers for Disease Control & Prevention, in Victor G. Coronado et. al., “Surveillance for Traumatic Brain Injury Related Deaths, United States, 1997-2007” Surveillance Summaries May 6, 2011 / 60(SS05); 1-32

http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6005a1.htm?s_cid=ss6005a1_w shows, in table 10, that for 1997-2007 there were an average of just 325 bicyclist traumatic brain injury (TBI) fatalities per year. The total annual TBI fatalities from all causes averaged 53014.

| <u>Activity</u> | <u>Avg. TBI Fatalities/yr</u> | <u>Percent of total</u> |
|-------------------|-------------------------------|-------------------------|
| Motorists | 7955 | 15% |
| Pedestrians | 1825 | 3.4% |
| Motorcyclists | 1361 | 2.6% |
| Bicyclists | 325 | only 0.6% |

Also note from the above data that **only 44.5% of cyclist fatalities (325/730) were due to head injuries.** The occasional claim that 75% of fatally injured cyclists die of head injuries is false.

Riding in traffic:

Is riding in traffic, as opposed to bike trails, dangerous? Moritz, “Adult Bicyclists in the United States... 1996”, Transportation Research Record 1636, found **15,150 miles ridden between crashes on major roads without bike facilities.**

Hoffman, “Bicycle Commuter Injury Prevention”, Journal of Trauma, Vol. 69, no.5, Nov. 2010 studied commuters in Portland, OR and found **6667 miles ridden between even the smallest injuries, and 25,600 miles ridden between any injury receiving any medical attention at all,** even the briefest examination.

Aultman-Hall, “Toronto bicycle commuter safety rates”, Accident Analysis & Prevention, 1999 Nov;31(6):675-86, found **77,600 miles ridden between injuries requiring any medical attention.**

Kaplan, Jerrold, “Characteristics of the Regular Adult Bicycle User,” 1973, surveyed over 4000 adult members of a national cycling organization, the largest study of its type. These cyclists averaged 2,400 miles of riding per year; yet injuries of any kind were rare, and serious injuries much more rare. **Riders sought medical treatment for injury only once in 13,800 miles, or approximately once in 14 years of riding. Very serious injuries (those requiring extended medical treatment) averaged once every 132,000 miles, or once in 57 years.**

Pedestrians vs. Bicyclists:

Data from several sources has shown that on average, bicycling is at least as safe as walking! For example, John Pucher of Rutgers University has shown that American **cyclists suffer only 109 fatalities per billion kilometers of riding**, compared to 362 fatalities per billion kilometers for pedestrian travel. Thus, **cycling is over three times safer, per mile, than walking**. A later paper by Pucher puts cycling's estimate even better, at just 58 fatalities per billion kilometers. That means **10.7 million miles are ridden for each bike fatality**. See Pucher, J. "Making Walking & Cycling Safer: Lessons from Europe" *Transportation Quarterly*, Vol. 54, No. 3, summer 2000, and Pucher, J. "Making Cycling Irresistible" *Transport Reviews*, Vol. 28, 2008

As shown above, there is copious data showing that **Bicycling Is Safe**. There is no need for extreme measures, segregated facilities, garish protective equipment or super-human riding skills to make it sufficiently safe. It is already safe when compared with other common activities, even as it is done today.

Could bicycling be made even safer? Yes - but again, the path to increased safety is not "innovative" facilities that violate logical traffic patterns. Studies of bike crashes have shown that approximately 50% are simple falls, almost all of which are minor. Only 17% of crashes (or 26% of serious crashes) involve automobiles, but approximately 90% of cycling fatalities involve crashes with cars.

But in roughly half of car-bike crashes, it is the bicyclist who is at fault, often grossly at fault. Riding under the influence of alcohol, riding facing traffic, riding on sidewalks (a dangerous practice), riding in the dark without lights, riding out from driveways or stop signs in front of cars, are all significant contributions to serious bike crashes. **Bicyclists who obey fundamental traffic laws are roughly twice as safe as "average" cyclists**.

Finally, there is more to be learned. Once a cyclist attains the knowledge to obey the laws, techniques known as Vehicular Cycling add even more safety. These include the knowledge and skill to avoid inviting close passes, by riding centered in narrow lanes; to properly merge into appropriate lanes at intersections; to avoid doors of parked cars that could potentially open; and in general, to ride in confidence, using a cyclist's legal right to the road.

In summary, bicycling should not be portrayed as dangerous. Under current policies and laws, ordinary bicycling on ordinary roads in America is not only safe, but clearly beneficial. **Bicycling's benefits greatly exceed its risks.** Future policies and laws regarding bicycling should be informed by that fact, and by the realization that society is thus unlikely to benefit from restrictions placed on cycling.

- Frank Krygowski April 3, 2012