Mortality Risk Associated With Leaving Home: Recognizing the Relevance of the Built Environment

William H. Lucy, PhD

Objectives. I analyzed traffic fatalities and homicides related to leaving home for routine activities, and considered connections between these fatalities and the built environment.

Methods. I analyzed city, county, state, and federal data for traffic fatalities and homicides by strangers for 15 metropolitan areas, and classified deaths as occurring in the central city, in inner suburbs, or in outer suburbs (exurbs).

Results. Traffic fatality rates were highest in exurban areas. Combined traffic fatality and homicide-by-stranger rates were higher in some or all outer counties than in central cities or inner suburbs in all of the metropolitan areas studied.

Conclusions. Traffic fatalities are largely unrecognized as a danger to be factored into residential location decisions. Land use controls that deter sprawl along narrow exurban roads can reduce the mortality risks associated with leaving home. (*Am J Public Health.* 2003;93:1564–1569)

For many years, traffic accidents have ranked among the top 10 leading causes of death, standing at number 7 in 2000. Therefore, they have significant implications for desirable and undesirable patterns of the built environment. In a society in which transportation mobility is a prominent feature of everyday existence, dangers to health related to transportation are worth considering. When transportation dangers are conceptualized to include the danger of leaving home to conduct routine activities, additional implications of built environment patterns can be analyzed. Here I analyze the most numerous and measurable of deaths related to leaving home for routine activities—traffic fatalities and homicides—and consider connections between them and the built environment.

Traffic fatalities are by far the most important contributor to the danger of leaving home. In 2000, traffic fatalities[1(p15)] were 2.7 times more numerous than homicides (41 821 vs 15 517).[2] The ratio of traffic fatalities to homicides had increased considerably since 1991, when there were 41 508 traffic fatalities,[1(p15)] 1.7 times more fatalities than the 24 700 homicides.[2] The number of traffic fatalities has varied since 1991, from a low of 39 250 in 1992[1(p15)] to a high of 42 116 in 2001,[3(p4)] whereas the number of homicides decreased throughout the 1990s until 2000, when it increased slightly, to 15 980, between 2000 and 2001.[4]

I considered some but not all homicides in this analysis, because many homicides are related to dangers at residences and workplaces rather than to daily travel. Most homicides are committed by family members, other relatives, friends, acquaintances, and coworkers. In these instances, danger is associated more with being at home, at work, or at a friend's residence, rather than with routine daily mobility. In this analysis, I selected traffic fatalities and homicides by strangers as the best guides to dangers of leaving home. I then considered the circumstances under which these mortality risks are encountered in cities, inner suburban counties that border central cities, and outer suburban (exurban) counties that touch nonmetropolitan counties.[5] These findings have implications for citizens deciding where to live, developers deciding where to build, and public officials deciding which patterns of development to encourage and discourage.

METHODS

I studied the danger of leaving home, as represented by traffic fatalities and homicides by strangers, in 8 large metropolitan areas encompassing 60 counties and 9 central cities for varying periods from 1997 through 2000, and in 7 medium to small metropolitan areas in Virginia for 3 segments of 5 years each: 1993 through 1997, 1988 through 1992, and 1978 through 1982. The 8 large metropolitan areas were Baltimore, Chicago, Dallas, Houston, Milwaukee–Waukesha, Minneapolis–St. Paul, Philadelphia, and Pittsburgh. The 7 medium to small metropolitan areas in Virginia were Charlottesville, Danville, Lynchburg, Norfolk–Virginia Beach, Richmond, Roanoke, and the Virginia part of Washington, DC (comprising 13 cities and counties).

Homicide data included homicides and nonnegligent manslaughters. In calculating rates of homicides by strangers for the 8 large metropolitan areas, I applied state rates to corresponding metropolitan areas when they were available. For Dallas and Houston, stranger-perpetrated homicide data came from the Texas Department of Public Safety.[6] For Minneapolis–St. Paul, stranger homicide data came from the Criminal Justice Information System.[7] For Philadelphia, stranger homicide data came from the New Jersey State Police[8] and the Pennsylvania State Police.[9] For Pittsburgh, stranger homicide data came from the Pennsylvania State Police.[9] For Baltimore, Chicago, and Milwaukee–Waukesha, I used the national rate of homicides by strangers as calculated by the Federal Bureau of Investigation.[2] This figure varied from 20% to 23%. In the course of investigating homicides, police departments determine whether the perpetrator knew the victim. I excluded homicides for which the relationship of perpetrator and victim was not known.

City traffic fatality data for Baltimore, Chicago, Dallas, Houston, Milwaukee–Wausheka, Philadelphia, and Pittsburgh came from the National Highway Traffic Safety Administration (NHTSA).[1] County traffic fatality data for Baltimore, Chicago, Dallas, Houston, Milwaukee–Waukesha, Philadelphia, and

Pittsburgh came from the Fatality Analysis Reporting System (FARS) Web site.[10] Wisconsin county traffic fatality data also came from the Wisconsin Department of Transportation Office of Transportation Safety.[11] City and county traffic fatality data for Minneapolis–St. Paul came from the Minnesota Department of Public Safety Office of Traffic Safety.[12] I used population data from the 2000 census[13] and acreage data from the 1990 and 2000 censuses for the larger metropolitan areas.[13,14]

For each city and county I calculated the rate of traffic fatalities and the rate of homicides by strangers per 10 000 residents and added them to arrive at a combined fatality rate. For the Virginia cities and counties, these were 5-year averages. For the 8 large metropolitan areas, they were 2- to 4-year averages, depending on data availability.

RESULTS

My findings were consistent in 3 spatial dimensions. First, counties with low residential density always had the most traffic fatalities and homicides by strangers in each metropolitan area and each time period and thus were more dangerous than their corresponding central cities. Second, 1 or more suburban counties contiguous to the central city were the least dangerous in each large metropolitan area. Third, in small metropolitan areas in Virginia (Charlottesville, Danville, Lynchburg, Roanoke), the county adjacent to the central city, which contains inner, middle, and outer suburbs, was more dangerous in each instance than the central city itself.

The relationship between low population density and danger becomes evident when all 49 metropolitan counties and cities in the state of Virginia are displayed (Table 1). For the 14 jurisdictions with the highest combined rates of traffic fatalities[15] and homicides by strangers,[16] the highest population density was 0.2 person per acre (143 persons or less per square mile). For the next 10 highest combined rates, only Washington, DC, and Petersburg had population densities higher than 0.6 person per acre (402 persons or less per square mile). Conversely, of the 15 safest cities and counties, only Lynchburg had a population density of less than 2.1 persons per acre. The jurisdiction with the highest population density, Alexandria, with 11.4 persons per acre, was the second safest jurisdiction in Virginia. For 27 counties with population densities from 0.1 to 0.9 person per acre, the mean rate of traffic fatalities and homicides by strangers was 5.2 per 10 000 residents (median = 4.9). For the 23 cities and counties with population densities of 1.0 to 11.4 persons per acre, the mean was 1.9 (median = 1.5).

Table 2 indicates that similar findings by studies of traffic fatalities and homicides by strangers in 60 counties and 9 cities in 8 metropolitan areas. The 15 most dangerous jurisdictions were exurban counties bordering nonmetropolitan counties with population densities of 0.1 to 0.4 person per acre. The city of Dallas, the 16th most dangerous jurisdiction, tied Houston as the lowest-density central city, with 5.7 persons per acre. In these 8 metropolitan areas, inner suburbs bordering the central city consistently had the fewest traffic fatalities and homicides by strangers. One or more exurban counties consistently had the most, with exurban areas being particularly dangerous compared with inner areas in the Dallas, Houston, Minneapolis–St. Paul, and Pittsburgh metropolitan areas. In the 39 counties with population densities of from 0.1 to 0.9 person per acre, the mean rate of traffic fatalities and homicides by strangers was 1.9 (median = 1.6), whereas for the 30 cities and counties with densities of from 1.0 to 19.9 persons per acre, the mean combined fatality rate was 1.3 (median = 1.0).

In each metropolitan area, some suburban and exurban counties had higher combined traffic fatality and stranger homicide rates

TABLE 1—Danger Ranking Based on Combined Fatality Rates[a] and Population Density[b] in 7 Metropolitan Areas in Virginia, 1988–1997

Rank From Most to Least Dangerous[c]	Counties and Cities	Combined Fatality Rate (1988–1997)	Population Density (1990)
1	Charles City	11.5	0.1
2	New Kent	9.9	0.1
3	Dinwiddie	8.1	0.1
4	Prince George	7.8	0.2
5	Botetourt	6.7	0.1
5	Fauquier	6.7	0.1
7	Goochland	6.4	0.1
7	Greene	6.4	0.1
9	Pittsylvania	6.3	0.1
10	Clarke	6.0	0.1
11	Suffolk	5.7	0.2
12	Frederick	5.3	0.2
13	Fluvanna	5.2	0.1
14	Spotsylvania	4.9	0.2
15	Powhatan	4.6	0.1
16	Hanover	4.5	0.2
16	Albemarle	4.5	0.1
18	Washington, DC	4.3	13.5
19	Amherst	4.1	0.1
20	Petersburg	4.0	2.6
21	Richmond	3.7	5.7
21	York	3.7	0.6
23	Stafford	3.6	0.1
24	Campbell	3.3	0.1
25	Danville	2.8	1.9
25	Norfolk	2.8	7.6
27	Gloucester	2.7	0.2
27	Loudoun	2.7	0.3
27	James City	2.7	0.4
30	Prince William	2.5	1.0
31	Chesapeake	2.3	0.7
32	Portsmouth	2.2	4.9
32	Lynchburg	2.2	2.1
34	Roanoke (county)	2.1	0.5
34	Newport News	2.1	3.9
36	Henrico	2.0	1.4
36	Chesterfield	2.0	0.8
38	Roanoke (city)	1.9	3.5
39	Hampton	1.5	4.0
39	Virginia Beach	1.5	2.5
39	Fairfax (county)	1.5	3.2
42	Charlottesville	1.3	6.1
42	Hopewell	1.3	3.5
44	Arlington	1.2	10.3
45	Falls Church	1.0	7.5
45	Colonial Heights	1.0	3.3
45	Manassas	1.0	4.4
45	Alexandria	1.0	11.4
49	Fairfax (city)	0.7	4.9
50	Manassas Park	0.0	5.8

[a]Combined traffic fatality and stranger homicide rates, per 10 000 residents.
[b]Persons per acre.
[c]Where ties occurred, the same number is applied to all counties and cities sharing that ranking.

TABLE 2—Traffic Fatality and Homicide Rates in 8 US Metropolitan Areas

Metropolitan Area	Population	Persons per Acre	Traffic Fatalities[a]	Total Homicides[a]	Homicides by Strangers[a]	Traffic Fatalities and Total Homicides[a]	Traffic Fatalities and Homicides by Strangers[a]
Baltimore PMSA (average 1997–1999)	2 552 994	. . .	. . .	. . .	. . .	. . .	. . .
Queen Anne's County	40 563	0.2	2.5	0.2	0.1	2.8	2.6
Carroll County	150 897	0.5	1.4	0.2	0.0	1.6	1.5
Harford County	218 590	0.8	1.2	0.3	0.1	1.5	1.2
Howard County	247 842	1.5	1.1	0.2	0.0	1.2	1.1
Anne Arundel County	489 656	1.8	1.1	0.2	0.0	1.3	1.1
Baltimore County	754 292	2.0	1.0	0.3	0.1	1.3	1.1
Baltimore (city)	651 154	12.6	0.7	4.8	1.0	5.5	1.7
Chicago PMSA (average 1997–2000)	8 272 768	. . .	. . .	. . .	. . .	. . .	. . .
Grundy County	37 535	0.1	3.3	0.1	0.0	3.4	3.3
DeKalb County	88 969	0.2	1.4	0.1	0.0	1.5	1.4
Kendall County	54 544	0.3	1.9	0.0	0.0	1.9	1.9
McHenry County	260 077	0.7	1.2	0.1	0.0	1.3	1.2
Will County	502 266	0.9	1.1	0.3	0.1	1.5	1.2
Kane County	404 119	1.2	0.9	0.6	0.1	1.5	1.1
Lake County	644 356	2.2	0.9	0.2	0.0	1.1	1.0
DuPage County	904 161	4.2	0.6	0.1	0.0	0.7	0.6
Cook County excluding Chicago	2 480 727	5.4	0.7	0.3	0.1	1.0	0.8
Cook County including Chicago	5 376 741	8.9	0.8	1.4	0.3	2.2	1.1
Chicago	2 896 016	19.9	0.9	2.4	0.5	3.2	1.4
Dallas PMSA[b] (average 1999–2000)	3 519 176	. . .	. . .	. . .	. . .	. . .	. . .
Henderson County	73 277	0.1	2.6	0.7	0.2	3.3	2.8
Kaufman County	71 313	0.1	4.4	0.7	0.2	5.1	4.6
Hunt County	76 596	0.1	3.7	0.5	0.1	4.1	3.8
Ellis County	111 360	0.2	2.6	0.4	0.1	3.1	2.7
Rockwall County	43 080	0.5	1.0	0.0	0.0	1.0	1.0
Denton County	432 976	0.8	0.9	0.1	0.0	1.0	0.9
Collin County	491 675	0.9	1.0	0.1	0.0	1.1	1.0
Dallas County	2 218 899	3.9	1.1	1.1	0.3	2.2	1.4
Dallas (city)	1 188 580	5.7	1.4	1.8	0.4	3.2	1.9
Dallas County excluding City of Dallas	1 097 768	. . .	0.8	0.3	0.1	1.1	0.8
Houston PMSA[c] (average 1999–2000)	4 177 646	. . .	. . .	. . .	. . .	. . .	. . .
Chambers County	26 031	0.1	4.2	0.4	0.1	4.6	4.3
Liberty County	70 154	0.1	3.0	0.4	0.1	3.4	3.1
Waller County	32 663	0.1	3.8	0.8	0.2	4.6	4.0
Montgomery County	293 768	0.4	2.3	0.4	0.1	2.7	2.4
Fort Bend County	354 452	0.6	0.8	0.3	0.1	1.1	0.9
Harris County	3 400 578	3.1	1.1	0.9	0.2	2.0	1.3
Houston	1 953 631	5.7	1.2	1.2	0.3	2.4	1.5
Harris County excluding Houston	1 480 789	. . .	1.0	0.4	0.1	1.3	1.1
Milwaukee–Waukesha PMSA (average 1997–1999)	1 500 741	. . .	. . .	. . .	. . .	. . .	. . .
Washington County	117 493	0.4	1.3	0.1	0.0	1.4	1.3
Ozaukee County	82 317	0.6	0.8	0.0	0.0	0.8	0.8
Waukesha County	360 767	1.0	0.8	0.0	0.0	0.8	0.8
Milwaukee County excluding City of Milwaukee	343 190	3.7	0.5	0.1	0.0	0.6	0.5
Milwaukee County including City of Milwaukee	940 164	6.1	0.5	1.3	0.3	1.8	0.8
Milwaukee (city)	596 974	9.7	0.6	2.0	0.4	2.5	1.0

Continued

TABLE 2—*Continued*

Minneapolis–St Paul MSA (average 1997–2000[d])	2 968 806	…	…	…	…	…	…
Pierce County	36 804	0.1	1.6	0.1	0.0	1.7	1.6
Isanti County	31 287	0.1	1.8	0.1	0.0	1.8	1.8
St. Croix County	63 155	0.1	2.5	0.0	0.0	2.5	2.5
Chisago County	41 101	0.2	2.1	0.2	0.0	2.4	2.2
Wright County	89 986	0.2	1.7	0.1	0.0	1.8	1.7
Sherburne County	64 417	0.2	1.5	0.0	0.0	1.6	1.5
Carver County	70 205	0.3	1.6	0.1	0.0	1.7	1.6
Scott County	89 498	0.4	1.8	0.1	0.0	1.9	1.9
Washington County	201 130	0.8	0.6	0.0	0.0	0.7	0.6
Dakota County	355 904	1.0	0.8	0.1	0.0	0.8	0.8
Anoka County	298 084	1.1	0.8	0.2	0.0	1.0	0.8
Hennepin County excluding Minneapolis	733 582	2.3	0.5	0.1	0.0	0.6	0.5
Hennepin County including Minneapolis	1 116 200	3.1	0.5	0.5	0.1	1.0	0.6
Ramsey County excluding St Paul	223 884	3.4	0.6	0.1	0.0	0.7	0.6
Ramsey County including St Paul	511 035	5.1	0.6	0.5	0.1	1.0	0.7
St Paul	287 151	8.5	0.6	0.7	0.1	1.3	0.7
Minneapolis	382 618	10.9	0.5	1.4	0.3	1.9	0.8
Philadelphia PMSA (average 1997–1999)	5 100 931	…	…	…	…	…	…
Salem County	64 285	0.3	2.7	0.4	0.1	3.1	2.8
Burlington County	423 394	0.8	1.2	0.2	0.0	1.4	1.2
Chester County	433 501	0.9	1.2	0.2	0.0	1.4	1.2
Gloucester County	254 673	1.2	1.5	0.2	0.0	1.6	1.5
Bucks County	597 635	1.5	1.1	0.1	0.0	1.2	1.1
Montgomery County	750 097	2.4	0.8	0.2	0.0	1.0	0.8
Camden County	508 932	3.6	0.9	0.8	0.2	1.7	1.1
Delaware County	550 864	4.7	0.7	0.4	0.1	1.0	0.8
Philadelphia City/County	1 517 550	17.6	0.8	2.3	0.5	3.1	1.3
Pittsburgh MSA (average 1997–1999)	2 358 695	…	…	…	…	…	…
Fayette County	148 644	0.3	2.0	0.3	0.1	2.2	2.0
Butler County	174 083	0.3	1.4	0.2	0.0	1.5	1.4
Washington County	202 897	0.4	1.2	0.2	0.0	1.4	1.3
Westmoreland County	369 993	0.6	1.2	0.2	0.0	1.4	1.2
Beaver County	181 412	0.7	1.0	0.3	0.1	1.2	1.0
Allegheny County excluding Pittsburgh	947 103	2.2	0.6	0.2	0.0	0.8	0.6
Allegheny County including Pittsburgh	1 281 666	2.7	0.6	0.5	0.1	1.1	0.7
Pittsburgh	334 563	10.0	0.7	1.3	0.3	2.1	1.0

Note. PMSA = primary metropolitan statistical area; MSA = metropolitan statistical area.
Source. Adapted from Lucy and Rabalais.[16]
[a]Per 10 000 population.
[b]Although small portions of the city of Dallas lie within Collin, Denton, and Rockwall Counties, all homicides and traffic fatalities within the city of Dallas were attributed to the much larger portion of the city within Dallas County.
[c]Although small parts of Houston lie within Fort Bend and Montgomery Counties, homicides and traffic fatalities within the City of Houston were attributed to that part of the city within Harris County.
[d]Data were unavailable for some counties for 2000; average reflects 1997–1999 totals.

than did the central city. In the Chicago metropolitan area, for example, the combined death rate from traffic fatalities and homicides by strangers was higher (1997–2000) in DeKalb, Grundy, and Kendall counties than in the city of Chicago and was similar to rates in McHenry and Will counties. In the Dallas area, the traffic and stranger homicide death rate was higher (1999–2000) in Ellis, Henderson, Hunt, and Kaufman counties than in the city of Dallas. In the Houston area, the combined death rate was higher (1999–2000) in Chambers, Liberty, Montgomery, and Waller counties than in the city of Houston. In the Minneapolis–St. Paul metropolitan area, the combined rate was higher (1997–2000) in the counties of Carver, Chisago, Isanti, Pierce, Scott, Sherburne, St. Croix, and Wright than in the central cities. In the Pittsburgh metropolitan area, the combined rate was higher (1997–1999) in the counties

of Beaver, Butler, Fayette, Washington, and Westmoreland than in the central city.[17]

DISCUSSION

The exurbs are the most dangerous parts of metropolitan areas, because more cars move fast on 2-lane roads, where dangers of driver impairment, mistakes, and inattention compound the dangers. In 2000, for example, 28 544 out of 37 409 fatal crashes occurred on 2-lane roads, and 24 021 were on roads that were not divided.[1(p53)]

Risk of fatal accidents generally is associated with speed. Only 10.3% of fatal accidents occurring in 2000 were in speed zones of 30 miles per hour or less, compared with 52.7% of fatalities occurring in speed zones of 55 miles per hour or more.[1(p51)] Multiple factors contributing to fatal accidents are recorded by the NHTSA. More than half of those factors are related to speed, either excessive speed for the road conditions or mistakes in driving that were more likely owing to high speed.[1(p100)] Research has confirmed that people who drive farther, such as long-distance commuters, also drive faster.[18]

A large proportion of traffic fatalities occur in rural areas. In 2000, 21 521 fatal crashes were in rural areas, 14 667 were in urban areas, and 1221 were in unassigned locations.[1(p52)] In 2000, the highest statewide traffic fatality rates were in low-density Southern and Western states—Mississippi, Montana, Louisiana, South Carolina, and Arkansas. And the lowest rates were in what are for the most part highly urbanized Northeastern states—Massachusetts, Rhode Island, New Hampshire, New York, Connecticut, and New Jersey.[1(p178)] Their death rates were 2 to 3 times lower than rates in the low-density states with high traffic fatality rates. A study of effects of low-density suburban sprawl in 83 metropolitan areas found that traffic fatality rates were 50% higher in the 10 most sprawling than in the 10 least sprawling metropolitan areas—a rate of 36 fatalities, compared with 23, per 100 000 residents.[19]

Obstacles to emergency care also make exurban and rural areas more dangerous. According to NHTSA data, of 9274 fatal crashes for which emergency vehicle trip duration was identified, deaths occurred in only 747 instances in which the victim arrived at the hospital within 20 minutes or less of the time of the crash.[1(p48)] However, the median emergency vehicle travel time to hospitals in fatal rural crashes was nearly 50 minutes.[1(p48)] In 2000, the time from crash to hospital arrival was more than 40 minutes in 68.7% of fatal rural crashes, whereas the time from crash to hospital arrival exceeded 40 minutes in 29.7% of fatal urban crashes.[1(p48)]

The method of analysis used here may understate dangers in exurban counties. Traffic fatalities are recorded for the county or city where the accident occurred, not where the victim lived. Commuting and other travel is greater from outer counties to inner counties and central cities than the reverse. Therefore, it is more likely that victims in inner suburbs and central cities are residents of outer counties than that victims in outer counties are residents of central cities and inner counties. Daily travel patterns would increase the recorded traffic fatality rate in inner suburbs and central cities.

One puzzling question about traffic fatalities is why the totals remained around 40 000 per year during the 1990s,[1(p15)] when air bags became standard equipment on automobiles, driving-under-the-influence laws were strengthened across the nation, and seat belt use reached high levels. The fatality rate dropped substantially with respect to population from 1973 (25.5 fatalities per 100 000 population) through 1992 (15.4 per 100 000 population). It increased to 15.9 per 100 000 in 1995 and 1996 and then decreased to 15.2 per 100 000 by 2000.[1(p15)]

Seat belt use by drivers in fatal crashes increased rapidly, from 6% in 1984 to 40% in 1991, then slowly to 55.5% in 2000.[1(p39)] Seat belt use by passengers in fatal crashes also continued to increase, from 24% in 1991 to 36% in 2000.[1(p40)] Seat belt use by occupants who were injured was 81% in 2000, up from 64% in 1991.[1(p40)] These differences in seat belt use between occupants in fatal and injury accidents are consistent with the goal of recommending or requiring seat belt use to prevent death and reduce injuries. At the same time, the fact that seat belts were used by 55.5% of drivers who died in motor vehicle accidents[1(p39)] clearly indicates that restraints are not sufficient protection. One possible explanation for the stable, rather than decreasing, fatality rate despite greater use of seat belts is that an increase in exurban population has put more drivers in harm's way and increased the number of drivers who are driving fast as a response to traffic delays and are stressed from spending too much time in motor vehicles.

Sprawl settlement patterns result in housing construction in dangerous exurban settings. This outcome is curious, because safety is widely believed to be a prominent determinant of residential location decisions. In a 1999 survey by the National Association of Home Builders,[20] neighborhood crime rate was by far the most frequently cited neighborhood influence on residential location decisions—more than 80% of respondents rated it as very important. By contrast, only 5% to 33% of respondents cited neighborhood factors, such as public transportation, highway access, and shopping locations, as important influences on residential location decisions. In the 25- to 44-year age group, more than 50% of respondents said that the school district was very important.

Crime was the lead indicator of danger to respondents in the 1999 survey.[20] But homicides are not nearly so great a danger as traffic fatalities. Injuries from motor vehicle crashes and aggravated assaults are additional evidence for comparing the relative risks of crime and traffic. In 2000, there were 3 189 000 traffic injuries stemming from 2 070 000 injury crashes,[1(p2)] compared with 910 774 aggravated assaults,[2(p34)] a more than 3-to-1 ratio. It is reasonable to assume that locations of serious traffic injuries are closely associated with locations of traffic fatalities.

Three factors may account for the limited focus on traffic fatalities as a source of danger factored into residential location decisions. First, elements of traffic dangers—fatalities, injuries, accidents, and costs—are not publicized consistently for cities and counties. Whereas the Federal Bureau of Investigation's annual *Uniform Crime Reports* produce wide publicity about violent crime rates for hundreds of local government jurisdictions, no comparable report is publicized for traffic fatalities. Second, awareness by residents of traffic dangers in outlying areas does not mean that residents

will conclude their specific locations are dangerous. Traffic deaths do not accumulate near most residences; rather, their locations are strung along numerous roads and highways so that their connection to residential locations may be obscure. Third, traffic fatalities and injuries are accidental, lacking a deliberate perpetrator, so that personal care and skill alone may seem an adequate defense against them. The flaw in this belief is revealed in the fact that 56% of fatal crashes (21 052 of 37 409) occurred in single-vehicle accidents in 2000; 56% of the fatal single-vehicle crashes (11 696 of 21 052) involved the vehicle leaving the road.[1(p49)]

How to comprehend the risk associated with such high rates of violent traffic deaths? By comparing the rates of traffic fatalities to 2 emotional periods and settings for violent death—the October 2002 sniper killings in the Washington, DC, metropolitan area and the 2003 war in Iraq. Ten people died in the Washington, DC, sniper attacks during a 3-week period.[21] Applying a national average traffic death rate of about 42 000[3(p4)] to a metropolitan area of 5 million (such as Washington, DC) would produce about 40 deaths during a typical 3-week period. The deliberate nature of the sniper shootings was crucial to the fear and panic that affected residents. But the actual statistical risk of being killed by the sniper was far less than that for daily travelers in motor vehicles in the United States. In the second setting, the 2003 war in Iraq, 138 soldiers died through April 30, when the main war ended,[22] roughly equivalent to 1 day's worth of traffic deaths in the United States (about 115 deaths).

Crime involves feelings of greater vulnerability than does traveling in motor vehicles. Crime is purposeful, not accidental. Proximity to potential perpetrators, therefore, is feared. Potential locations of crime are more likely to be discussed. Often, fears are associated with stereotypes, especially when residential location decisions are made regarding a move to a metropolitan area from outside it, such as that portraying central cities dangerous and suburbs safe.[23] This common perception was captured by a nonrandom survey conducted in 2002 by the *Atlanta Journal–Constitution,* which asked "which area do you consider safest?" Nearly half of the respondents—46%—said rural, 21% said city, and 33% said suburbs.[24]

If perceptions of motor vehicle accident dangers are to increase substantially, improved research must be disseminated effectively. Reports on the conditions analyzed here should be repeated for the more than 300 metropolitan areas in the United States. Multiyear reports on traffic fatalities by central cities and metropolitan counties should be distributed annually by the NHTSA. Additional information should include risks for vehicle occupants who wear seat belts and who do not drink and drive.

Settlement patterns contribute to traffic dangers. Land use controls that establish clean edges around metropolitan areas, rather than extensive sprawl along narrow exurban roads, can reduce the dangers of leaving home. With more than 80% of daily trips occurring for purposes other than commuting to work, mixed-use settings for shopping, entertainment, school, and civic gatherings also are needed. A lower danger of leaving home can be achieved by less motor vehicle driving and more walking, biking, and public transportation, as well as more prevention related to motor vehicle features, driver and passenger behaviors, and road configurations. ■

About the Author

William H. Lucy is with the School of Architecture, University of Virginia, Charlottesville.

Requests for reprints should be sent to William H. Lucy, PhD, School of Architecture, University of Virginia, PO Box 400122, Charlottesville, VA 22903 (e-mail: whl@virginia.edu).

This article was accepted May 10, 2003.

Acknowledgments

The work of my graduate assistant, Raphael Rabalais, was essential to this inquiry.

Human Participant Protection

There were no human participants in this study.

References

1. National Highway Traffic Safety Administration. *Traffic Safety Facts 2000: A Compilation of Motor Vehicle Crash Data From the Fatality Analysis Reporting System and the General Estimates System.* Washington, DC: US Dept of Transportation, National Highway Traffic Safety Administration; 2001.

2. Federal Bureau of Investigation. *Crime in the United States 2000: Uniform Crime Reports.* Washington, DC: US Dept of Justice, Federal Bureau of Investigation; 2001.

3. National Highway Traffic Safety Administration, National Center for Statistics and Analysis. *Motor Vehicle Traffic Crash Fatality and Injury Estimates: 2002 Early Assessment.* Washington, DC: US Dept of Transportation, National Highway Traffic Safety Administration; May 2003. Technical report DOT HS 809 586.

4. Federal Bureau of Investigation. *Crime in the United States 2001: Uniform Crime Reports.* Washington, DC: US Dept of Justice, Federal Bureau of Investigation; 2002.

5. Nelson A. Characterizing exurbia. *J Plann Lit.* 1992;6:350–368.

6. Texas Dept of Public Safety crime reports Web site. Available at: http://www.txdps.state.tx.us/crimereports. Accessed June 7, 2003.

7. Minnesota Dept of Public Safety, Bureau of Criminal Apprehension Web site. Available at: http://www.dps.state.mn.us/bca. Accessed June 7, 2003.

8. New Jersey State Police Web site. Available at: http://www.njsp.org. Accessed June 7, 2003.

9. Pennsylvania State Police Web site. Available at: http://www.psp.state.pa.us. Accessed June 7, 2003.

10. National Center for Statistics and Analysis. Fatality Analysis Reporting System (FARS) Web-Based Encyclopedia. Available at: http://www-fars.nhtsa.dot.gov. Accessed June 7, 2003.

11. Wisconsin Dept of Transportation Web site. Available at: http://www.dot.state.wi.us. Accessed June 7, 2003.

12. Minnesota Dept of Public Safety, Office of Traffic Safety Web site. Available at: http://www.dps.state.mn.us/ots. Accessed June 7, 2003.

13. US Census Bureau. *Census 2000 Summary File 1 (SF 1)* [detailed tables]. Available at: http://factfinder.census.gov. Accessed June 7, 2003.

14. US Census Bureau. *1990 Summary File 1 (STF 1)* [detailed tables]. Available at: http://factfinder.census.gov. Accessed June 7, 2003.

15. Virginia Dept of Motor Vehicles. *Virginia Traffic Crash Facts.* Richmond: Virginia Dept of Motor Vehicles; 1989–1998.

16. Uniform Crime Reporting Section. *Crime in Virginia.* Richmond, Va: Dept of State Police; 1989–1998.

17. Lucy WH, Rabalais R. Traffic fatalities and homicides by strangers: danger of leaving home in cities, inner suburbs, and outer suburbs. April 29, 2002. Available at: http://arch.virginia.edu/exurbia/death-in-exurbia.pdf. Accessed June 7, 2003.

18. Davis JS, Nelson AC, Dueker KJ. The new 'burbs: the exurbs and their implications for planning policy. *J Am Plann Assoc.* 1994;60(1):45–59.

19. Ewing R, Pendall R, Chen D. *Measuring Sprawl and Its Impact.* Washington, DC: Smart Growth America; 2002.

20. Myers D, Gearin E. Current preferences and future demand for denser residential environments. *Housing Policy Debate.* 2001;12(4):633–659.

21. Mosk M. Moose quits as chief in ethics flap. *The Washington Post.* June 19, 2003:A01.

22. Shanker T, Sanger DE. Bush addresses dangers faced by GIs in Iraq. *The New York Times.* June 22, 2003:A1.

23. Spain D. Why higher income households move to central cities. *J Urban Aff.* 1989;11:283–299.

24. Poe J. Fatality risk rated highest in exurbs: closer-in areas safer, study says. *Atlanta Journal–Constitution.* June 17, 2002:E1.