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The Dangers of Automobile Travel

A Reconsideration

By ROGER ROOTS*

ABSTRACT. America's reliance on automobile transportation has attracted the scorn of academics for decades. Automobiles, it is said, are dangerous to life and limb, environmentally unfriendly, and wasteful of space and resources. Moreover, say the critics, automobiles produce inefficient individualistic social behavior that balkanizes communities and shatters the otherwise cohesive nature of American life.

This article examines the costs and benefits of U.S. automobile travel from a historic perspective. First, it compares the safety of automobile travel with the horse and steam-powered travel that preceded it. It then briefly addresses the changes wrought by American automobiles in terms of their impact on American life, economics, social mobility, and ecology. It concludes that the dangers of automobile use are substantially lower than the dangers posed by early horse-driven and steam-driven transportation methods, especially in terms of fatalities per mile. It finds that on a per-mile or per-trip basis, automobile travel is safer than virtually any other means of travel used popularly in U.S. history, and that the other contributions of automobile transportation have been seriously overlooked by transportation scholars.

I

Introduction

ECONOMISTS, SOCIOLOGISTS, AND OTHER ACADEMICS are quick to criticize America's love affair with the automobile as an extravagant luxury

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(Greene, Jones, and Delucchi 1997; Kay 1997; Transportation Research Board 1997; Buel 1972). They accuse the automobile of exacting a heavy toll on human life, as well as being ecologically costly and fostering inefficient and unsustainable suburban environments (Greene, Jones, and Delucchi 1997; Kay 1997). In June 1995, the Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation brought together a diverse group of academics and authorities to attempt to measure the “full social costs and benefits of transportation” (Greene, Jones, and Delucchi 1997: 2). Although the convocation produced a wide variety of well-researched papers on the subject, not a single paper found the present benefits of U.S. automobile use to be greater than its long-term costs (Greene, Jones, and Delucchi 1997). An overwhelming consensus favored massive public investments in commuter rail, subway, and bus systems to decrease traffic fatalities and other social costs associated with auto transportation.

This article offers little critique of this forward-looking evaluation; instead, it casts its examination back upon the roadway of history, examining the safety impacts of the automobile in relation to the transportation options it superceded. It concludes that, contrary to the academic consensus, the automobile has been a godsend in terms of safety and social benefits. Indeed, automobile transportation has actually saved many thousands of lives and added substantially to the U.S. economy since 1900.

II

The Social Construction of the Automobile as a Public Health Menace

FROM THE MOMENT THE FIRST HORSELESS CARRIAGE motored down an American roadway, policymakers expressed alarm at its potential for danger. Congressman Robert Cousins of Iowa admonished his fellow members of Congress in 1910 that “horrible and gruesome incidents are of almost daily occurrence,” and that the recklessness of auto drivers had “bespattered boulevards with blood” (*Congressional Record* 1910). Princeton University president (and future president of the United States) Woodrow Wilson stated in 1906 that “[o]f all the menaces of today, the worst is the reckless driving of automobiles” (McShane 1994: 179).

The death and destruction wrought by automobile use during the 20th century hardly needs to be restated. Legend holds that when the State of Missouri first harbored four automobiles, two of them collided on a St. Louis street with enough impact to injure both drivers (Moynihan 1969: 81). Today in the United States, motor-vehicle-related injuries are the leading cause of death from unintentional injury and the greatest killer of children and young adults (National Center for Injury Prevention and Control 1997: 3). At least 2.7 million Americans—about the equivalent of 1 percent of the present U.S. population—have been “sacrificed on the altar of automobility” during the automobile age (McShane 1994: 173).

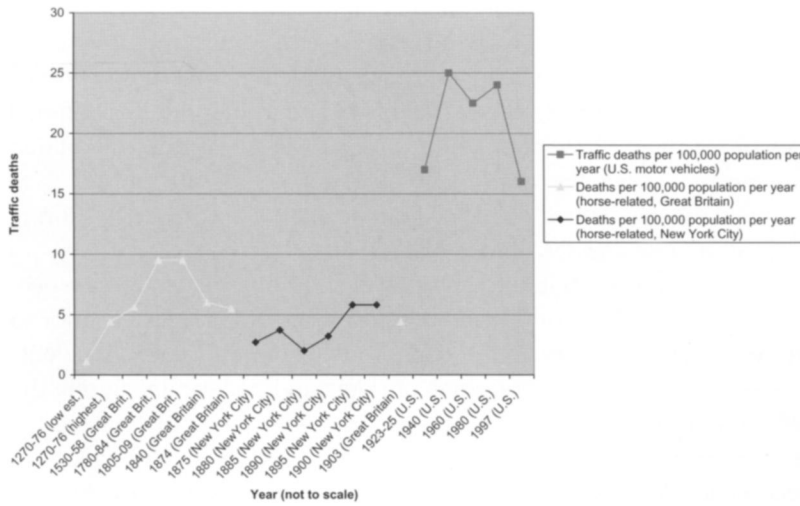
The mortality attributed to auto travel should be placed in perspective, however. The world of horses and wagons that existed prior to the motor age was also quite dangerous to life and limb. Accidents involving horses killed thousands of riders and pedestrians during the 19th century (Bettmann 1974: 23). At least two kings of England, as well as many other distinguished persons, lost their lives to horse-related accidents prior to the motor age (Hair 1971: 9). One famous early study found that 280 of the Prussian army’s finest horse cavalymen died from horse kicks in the 19-year period between 1875 and 1894 (Preece, Ross, and Kirby 1988).

The absence of consistent records makes it very difficult to reconstruct overall U.S. casualty rates from horse travel prior to the 20th century. There are relatively precise records from 19th-century Germany and the United Kingdom, however, and at least nine major American municipalities systematically collected data on traffic fatalities from as early as 1908 (Crum 1913). Reviewing British fatality rates from previous centuries, demographer P. E. H. Hair concluded in 1971 that the “supercession of the horse by the internal combustion engine was by no means the disaster in terms of travel safety it is often supposed to have been,” and suggested that between 1840 and 1900, accidents involving horses produced an average yearly mortality rate of about five per 100,000 population (Hair 1971: 8).

Figure 1 compares fatality rate estimates from horse-drawn transportation in England and New York City prior to the 1920s with U.S. auto fatality rates of the latter 20th century. It shows that modern rates

Figure 1

Highway deaths per capita, horses compared with autos, 1270–1997.



Sources: McShane (1994); Hair (1971).

of highway traffic fatalities are about three times higher per capita than the horse-powered travel of yesteryear.

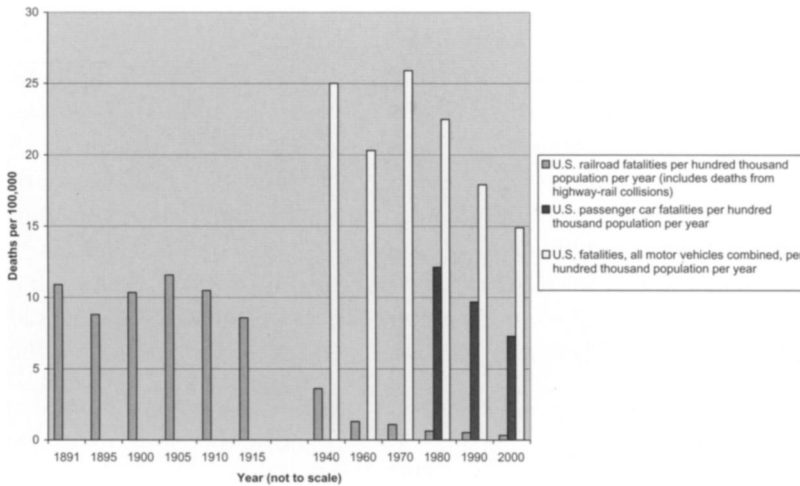
III

Steam Locomotive Versus Auto Fatality Rates

A PARAGRAPH OR TWO REGARDING THE DANGERS of 19th-century steam railroad travel might also be appropriate. Most contemporary transportation experts argue for increased use of public passenger rail transportation as a means of reducing motor vehicle fatalities, as well as for other reasons (see, e.g., Kay 1997). It is noteworthy, however, that the rail transportation of the late 1800s (when large numbers of Americans actually used rail transportation) was more deadly than modern car travel on a per capita basis. In 1891, for example, when the U.S. population was around 64.4 million, 7,029 U.S. railroad passengers and employees lost their lives in rail accidents (U.S.

Figure 2

Railroad fatalities, 1891–1915, compared to modern highway fatalities.



Source: U.S. Census Bureau (1961).

Bureau of the Census 1961: Table Q 141-152), the statistical equivalent of 1.4 times the current fatality rate for U.S. passenger car travel (U.S. Bureau of Transportation Statistics 2001: Table 2-1).

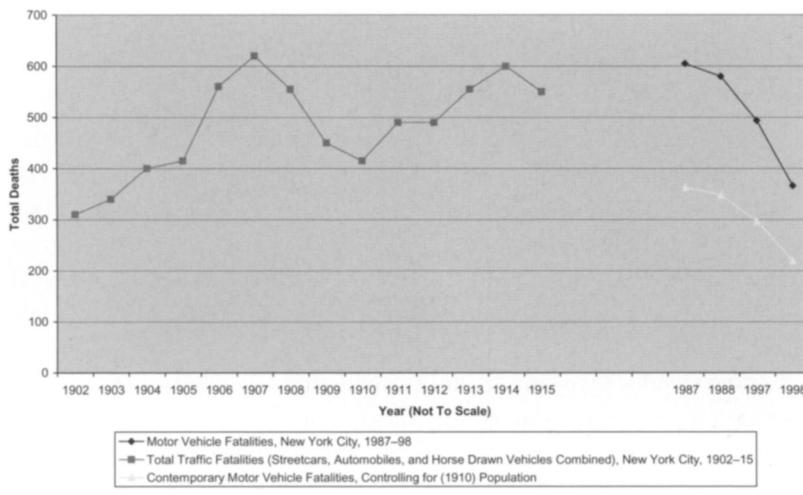
Railroad fatalities peaked in 1907, when 11,839 Americans died in rail accidents (U.S. Bureau of the Census 1961: Table Q 141-152). After 1918, railroad fatalities plummeted along with the numbers of passengers using rail transportation, and since 1960 less than 3,000 persons have died annually from railway travel (U.S. Bureau of Transportation Statistics 2001: Table 2-1). Figure 2 illustrates railroad fatality rates compared to contemporary highway and passenger car fatality rates.

Further details regarding traffic mortality trends could be obtained by breaking down contemporary auto fatalities in relation to early streetcar fatalities, ox cart fatalities, and so on. But to place the comparative mortality from modern automobiles in proper perspective, it must be juxtaposed against *overall* mortality rates from the entire gamut of

transportation methods commonly used before 1910—not merely rates from one transportation mode or another. Americans have, after all, switched from a multimode transportation system (relying on a combination of horse-drawn, steam train, and streetcar transportation, as well as other means), to near universal reliance on motor vehicles for intermediate-distance travel (Kay 1997). Today, motor vehicle traffic accounts for more than 88 percent of all passenger miles (U.S. Bureau of Transportation Statistics 2001: Table 1-31) and 99 percent of all vehicle miles traveled (U.S. Bureau of Transportation Statistics 2001: Table 1-29). When modern mortality rates are compared to rates from the complete combination of streetcar, horse-drawn, and early automobile travel in major cities at the turn of the 20th century, the lethality of latter-20th-century automobile travel appears quite mild (McShane 1994: 175). Figure 3 shows that the full distribution of traffic

Figure 3

New York City traffic fatalities: Comparing modern motor vehicle mortality (1987–1998) with mortality from streetcars, horse-drawn, and horseless vehicles (1902–1915).



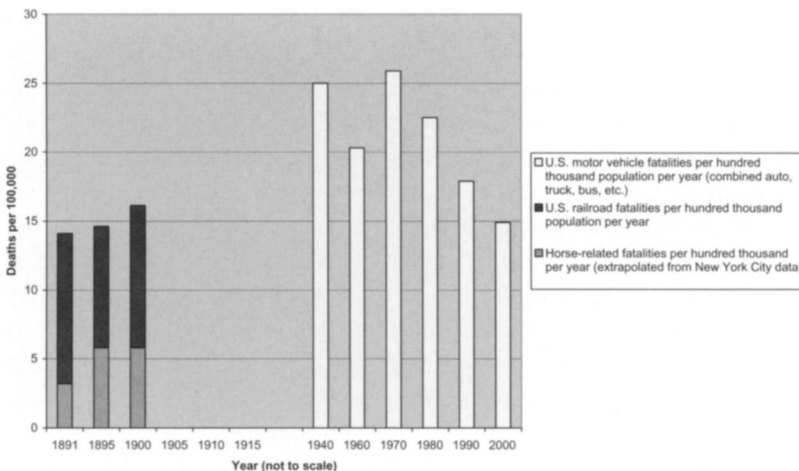
Sources: McShane (1994); Crum (1913).

deaths in New York City between 1902 and 1915 was as great or greater than the total motor vehicle fatalities in New York City from automobiles alone in the late 1980s and 1990s. Interestingly, New York City's annual number of street fatalities has now decreased to levels not seen since before 1904. When one considers that its population increased from around 4.8 million in 1910 to more than 8 million in 2000, the greater relative safety of the automobile becomes clear.

New York City is used as an illustration merely because it maintained records of horse-related fatalities during the late 19th century, data not recorded for the nation generally. If national figures were available, a similar picture would likely emerge for the United States as a whole. Figure 4 shows annual U.S. fatality rates from railroad travel (data kept by the U.S. Census Bureau since 1891) combined with horse-related fatality rates extrapolated from the New York City data.¹ Note that the combined death rate from these two common preautomobile travel methods is slightly higher for the year 1900 than

Figure 4

Contemporary U.S. motor vehicle fatalities compared to combined horse and steam-train fatalities, 1891–1900.



Source: U.S. Bureau of the Census (1961).

the total U.S. highway fatality rate for the year 2000. Also note that Figure 4 does not include fatalities from early streetcar transportation (as did Figure 3) because streetcar use was generally confined to urban environments at the turn of the 20th century.

IV

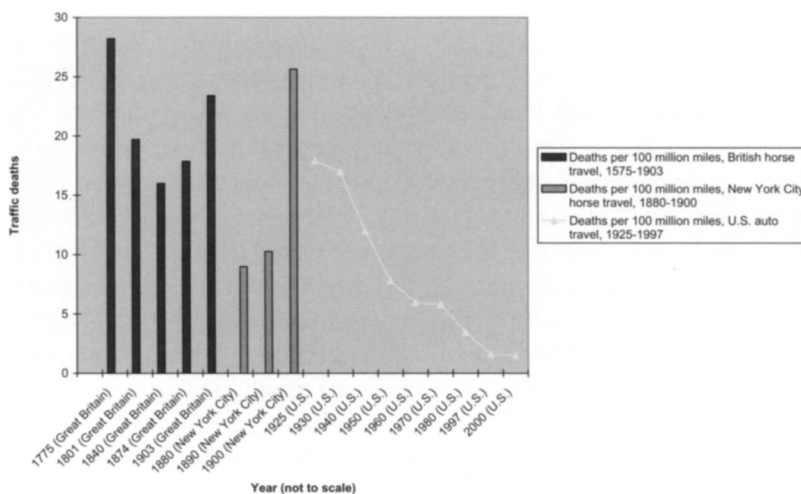
Auto Safety by the Mile

MORTALITY RELATIVE TO POPULATION FIGURES tells only a small part of the story. Americans are much more mobile than they were in 1900, in large part due to their reliance on personal motor vehicles. Americans now regularly travel substantial distances as a matter of their culture and livelihood (Horrath 1974). Thus, fatalities per unit of travel (e.g., per mile or per trip rather than per capita) are the most accurate way of describing the real risks of use. When the longer distances traveled by modern Americans are accounted for, we see that motor vehicle fatalities have been steadily declining since the 1920s. Rates of death from auto accidents are now *less than 2 per 100 million miles* of travel annually (Figure 5).

In Figure 5 we see that the automobile, relative to the horse-drawn transportation of 1900 and before, is generally much safer per mileage unit. Indeed, fatality rates from horse-powered transportation occurred at a rate more than 15 times greater per mile in 1775 than from motor vehicles in 2000 (even using very conservative estimates for per-mile horse-related fatalities).² While much of this great decrease in per-mile fatalities may be attributed to improvements in infrastructure and medical care of trauma victims, it must be conceded that modern car driving is a substantially safer means of locomotion over distances than its preindustrial counterparts. It is noteworthy that horse-riding accidents continue to cause high rates of injury, even though horse riding has become increasingly rare in the United States. The Centers for Disease Control estimate that the rate of serious injury per number of riding hours continues to be higher for horseback riders than for motorcyclists and competitive automobile racers (National Center for Injury Prevention and Control 1996: 162).

Figure 5

Deaths per mile: Horses compared with automobiles.



Sources: McShane (1994); Hair (1971); author's calculations.

This per-mile comparison between modern auto travel and horse-powered travel is possible because the automobile virtually displaced the horse between 1900 and 1925. The relationship between modern auto travel and the steam-rail travel of 1880 to 1920 is not nearly so clear. Although Americans did slowly abandon their reliance upon interstate locomotive passenger travel as automobiles came into popular use, they have continued using railways for some of their long-distance transportation needs through the present day. The 20th century's explosion in auto use, however, has made trips by train account for less than 1 percent of all passenger trips, even though some 5 million Americans continue to travel by train annually (U.S. Bureau of Transportation Statistics 2001: Table 1-33). Although railroads have greatly improved the safety of their passenger delivery since 1918, railroad transportation continues to be more than twice as deadly per mile of travel as auto travel (Table 22-32). In any case, it is likely that the tens of thousands of annual railroad fatalities caused

by train accidents prior to and during the early auto age were largely displaced by the nation's popular movement to auto transportation.

Taking only the per-mile safety comparison between modern cars and 19th-century horses into account, it is likely that the switch to motor vehicles in the early 20th century saved many thousands of lives by the end of the century. Averaging the U.S. and British per-mile horse-related fatalities estimated for the years registered in Figure 5, we obtain the average fatality rate of 18.8 per 100 million miles of horse travel. In contrast, the rate for the motor vehicle years between 1925 and 2000 is 8.1 deaths per 100 million miles. Were we to assume that Americans never adapted to automobile use but nonetheless traveled modern distances (about 2.75 trillion miles annually (U.S. Bureau of Transportation Statistics 2001: Table 1-29)) by horse-drawn vehicles, we would expect 517,000 deaths annually. Even if modern medical treatment could save the lives of half of these casualties, horse-related injuries would cost at least 200,000 lives more than the current average annual fatalities from motor vehicle travel. According to such conjecture, the automobile may be responsible for saving the lives of at least 10 million Americans since 1950.

Contrary to the car's negative press (both today and at the end of the horse age) auto driving is among the safest of all means of moving from point A to point B ever invented by mankind. Data compiled by the British Royal Society for the Prevention of Accidents indicate that cars cause fewer fatalities per trip than boat, bicycle, or even *foot* transportation (Fasten Your Safety Belts 1997). Interestingly, passenger car travel is also substantially safer per mile than either transit bus or commuter rail travel, which many urban sociologists tout as safe alternatives (Victoria Transport Policy Institute: Table 6). Commutes behind the wheel of an automobile are probably also safer in terms of protection from crime and violence while traveling (Chasin 1997: 82).³ In addition, costs per crash are lower for passenger cars than for any other type of vehicle (Victoria Transport Policy Institute: Table 2). The automobile is also safer than the airplane in terms of both per-hour and per-trip fatalities (Greenspun 2002), although air travel is much safer per mile (Honstein 2002).

V

The Automobile's Economic Contributions

THE AUTOMOBILE HAS CONTRIBUTED GREATLY to the U.S. national economy and possibly national health and welfare. The International Chamber of Commerce (1925: 3) reported that individual automotive transportation had already added "billions of dollars of wealth to the nation's resources" by 1925. The report also found that the automobile had greatly reduced transit time and cut in half the actual cost of highway transportation (1925: 4). By 1930, national income had tripled, and the country's real gross private domestic product was more than 150 percent of the figure in 1910 (U.S. Bureau of the Census 1961: Table 1-11, Table W 1-11). By the end of the 20th century, it is safe to say that motor vehicle transportation had transformed the nation into a dynamic economic power, fueling a mobile society accustomed to a diversity of tastes and products from throughout the nation and world.

VI

Environmental Impacts

THE ECOLOGICAL COSTS OF AUTOMOBILES (which are quite high)⁴ need also to be placed in perspective. At the turn of the 20th century, farmers dedicated more than one-third of the cropland in the United States to raising hay to fuel the nation's horses (McShane 1994: 45). Horses used in heavy transportation collapsed to the ground an average of once every 96 miles traveled and had an average life expectancy of only four years (McShane 1994: 45, 48). Urban environments were choked with their detritus. New York City had to remove 15,000 horse carcasses from the streets annually (McShane 1994: 48-49).

Each of New York City's 150,000 horses produced between 20 and 25 pounds of manure per day, attracting swarms of flies and creating a powerful stench (Bettmann 1974: 3). The pounding hoof traffic crushed the manure to dust during dry spells, which hovered in the city air and covered clothes, hair, and furniture (1974: 3). By 1900, commentators envisioned that American cities would disappear like ancient Pompeii, only under layers of manure rather than ashes (1974: 3). In

contrast, the automobile left “no filth in the streets” and was “the most sanitary vehicle that travel[ed] on the public ways” (Huddy 1909: 35).

The arrival of the automobile saved American cities from the endless need of keeping large street cleaning crews and actually led people to hope that the age of dusty and polluted air was coming to an end (Bettmann 1974: 3; Horrath 1974). Although modern critics decry cars’ foul fumes and smoke, there is some question of whether the automobile has not actually cleaned the air of major cities substantially. The death rate from lung-related ailments declined markedly as motor cars ended the environmental hazard brought on by airborne horse dung particulates (McShane 1994: 52). Ironically, the auto may have even eased traffic congestion in many cities because it required less space than the horse-drawn vehicles that preceded it (Huddy 1909: 35). Horse-drawn wagons often jammed up traffic for miles, leaving thirsty and malnourished equestrians to die while harnessed in the streets (McShane 1994: 48–50).

VII

The Automobile’s Contributions to American Dynamism

THE PERSONAL AUTONOMY FOSTERED BY PRIVATE AUTOMOBILE USE, according to Lomansky (1997), is itself a valuable public good that accounts for much of American inventiveness, dynamism, and entrepreneurial drive today (1997: 7–8). Because of their cars, Americans can choose where they live and work more than any other people in world history (1997: 15), and can “more easily avail [themselves] of near and distant pleasures, at a schedule tailored to individual preference” (1997: 15). Americans can also choose their friends and associates without constraints of geographical proximity and depend less on the concurrence of others in their principal life choices (1997: 15).

Automobiles shattered the grip of railroad “robber barons” like no act of Congress ever could, completely destroying the profitability of some rail routes entirely (Goddard 1994).⁵ In a classic example of price responses to competition, rail and streetcar rates were forced dramatically lower for much of the United States (Goddard 1994: 86). Railroads were also forced to become more efficient, doubling their output per man-hour between 1916 and 1941 (U.S. Bureau of the

Census 1961: Table W 39-47). Renewed interest was paid by railroad operators in improving their equipment and infrastructure, a source of considerable mortality during the second half of the 19th century (Dornstein 1998: 219–222; U.S. Bureau of the Census, 1961: Table Q 106-116).⁶

In many ways, the automobile enriched the inner cities as much as the suburbs, bringing the “choicest perishable fruits and vegetables” into the city from distant truck farms for the first time (Walsh 1902). Motor cars forced down food prices for neighborhood consumers while simultaneously bringing farmers in contact with higher-paying distant markets, destroying the historic isolation of the farm and bringing “town and country into closer touch” (International Chamber of Commerce 1925: 4). Access to hospitals, medicine, and books also improved as a matter of course (1925: 4).

Moreover, auto production brought great benefits even to the auto workers themselves. “Most of the employees [were] skilled, most of them work[ed] in modern, wholesome factories, and all [were] well paid,” wrote one observer in 1902 (Towle [1902] 1989: 235). According to Lomansky (1997), nothing approaches the automobile as a means of social and economic emancipation (1997: 16). “[W]idespread automobile ownership dramatically extended the geographical radius of possible employment venues” (1997: 17). Thus, the horrors decried by Karl Marx and other critics of industrialization in the late 19th century—entrapment into dead-end positions in company towns and virtual enslavement to entrenched business interests—were defeated or at least undermined by greater scope of occupational choices for individuals. “Detroit has done more for the liberation and dignity of labor than all the Socialist Internationals combined” (1997: 17).

VIII

Conclusion

THE ADVENT OF AUTOMOBILE USE in the early 20th century brought about a measurable rise in total numbers of highway deaths and injuries (Figures 1 and 2). However, the automobile’s toll on human life and limb was probably not extravagantly greater than the toll exacted by the combination of steam- and horse-driven travel methods it

displaced. This is especially true when the dangers of automobile travel are compared to those of horse and steam-train travel on per-trip or per-mile bases. When considering the great speeds and distances attained by modern auto travelers, the automobile's reputation for danger seems to have been greatly overstated. In fact, automobile driving has probably saved the lives of thousands, if not millions, of Americans.

The final determination of the automobile's costs and benefits has yet to be made. But popular renunciations of the auto appear to have been premature. America's switch from horse and steam-train transportation in the 19th century to auto transportation in the 20th century almost certainly lifted American economic fortunes and contributed in the nation's rise to superpower status by midcentury.

Notes

1. It is conceded that New York City horse-related fatality rates may not accurately reflect overall horse-related death rates for the United States as a whole. However, the inclusion of British rates (which are slightly higher than New York City rates on average) is meant to add some small semblance of validity to this extrapolation. Readers should be warned that this estimation is a rough one only, intended merely as part of a thought experiment.

2. Calculations are as follows. Approximately 1.5 million horses probably existed in the British Isles at the turn of the 20th century (Hair 1971: 7 n.19). Horse-drawn carts and wagons generally traveled at a pace of two miles per hour, the speed at which it was cheapest to operate horse-drawn vehicles, and "above which costs rapidly increased" (Gerhold 1993: 188). Average distances traveled daily by these 1 million horses probably ranged from 10 miles when hauling freight (International Chamber of Commerce 1925: 4) to 30 miles when carrying riders (Earl 1989: 473). For the purposes of this analysis I assume that all 1.5 million British horses were in use 5 days per week, 52 weeks per year (260 days per year) at 20 miles per day (no doubt an extreme overestimation). According to this liberal estimate, Britain produced some 7.8 billion total miles of horse travel per year at around that time.

Dividing the number of British horse-related fatalities in Great Britain in 1901 (1,824) by this figure yields 23.38 deaths per 100 million annual horse miles. This is a wildly conservative fatality rate, but substantially higher than the highest rates per mile ever recorded for auto travel. Extrapolating from Hair's (1971) national and regional estimates of British horse populations and horse-related fatality rates for the years 1874, 1840, 1805, 1775, and 1575 along with Walford's (1881) population estimates, I arrive at 1,300 deaths

among a horse population of 1.4 million in 1874, 1,000 deaths among a horse population of around 1.2 million in 1840, 1,026 deaths among a horse population of 1 million in 1805, and 1,321 deaths among about 900,000 horses in 1775. According to these estimates, horse-related accidents produced approximately 17.86, 16, 19.7, and 28.2 deaths per 100 million miles of travel for the respective years 1874, 1840, 1805, and 1775.

New York City harbored 150,00 horses around 1900 (Bettman 1974: 3). Assuming its horse population in 1900 was not extravagantly different from the same population in 1875, 1880, 1885, and so on, I calculate a citywide annual mileage of 780 million miles. With approximately 200 deaths related to horse travel in 1900, New York City produced a rate of 25.64 deaths per 100 million horse-powered miles. It also had 80 such deaths in 1890 and 70.3 in 1880, corresponding to deaths per 100 million horse miles of 10.26 and 9, respectively.

3. Commuters who boarded horse-drawn streetcars in the 1800s were warned to leave their purses and watches behind and “carry bowie knives and derringers” for protection (Bettmann 1974: 20). As Chasin (1997) points out, bus stops and subway stations continue to be places of danger for many modern commuters, especially women and the poor.

4. Goddard (1994) cites research showing that the cost that motor vehicle pollution inflicts on American society is at least six cents from every gallon of gasoline and may be substantially higher (1994: 251). He notes that the American Lung Association “estimates that Americans’ breathing of gas fumes costs forty to fifty cents per gallon in medical expenditures” (1994: 251). These estimated costs from the 350 million tons of carbon released into the atmosphere annually from motor vehicle travel are in addition to the costs of disposing of 200 million tires, 8 million junked vehicles, and 138,000 tons of battery lead each year (1994: 251).

5. According to the U.S. Census Bureau, the ratio of operating expenses to operating revenues for U.S. railroads increased from 64.65 in 1900 to 94.36 in 1920 (Table Q 106-116). This latter figure means that for every dollar earned by American railroad firms in 1920, some 94 cents were invested, an all-time low profit margin for the industry.

6. Nineteenth-century rail companies built their bridges and trestles out “the worst materials available” (mostly cheap lumber) (Dornstein 1998: 221), contributing to an average of more than 10,000 deaths annually between 1904 and 1916 (Table Q 141-152). By 1950, however, this annual death toll fell to less than 3,500 victims and by the 1990s, less than 1,000.

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