



Death and the Car: On (Auto)Mobility, Violence, and Injustice

Gregg Culver

Institute of Geography, Heidelberg University
culver@uni-heidelberg.de

Abstract

Despite the incredible and highly socially unjust killing power of the car and its impacts on urban life, the relationship between (auto)mobility, violence, and justice has been neglected in much of human geography – critical or otherwise. Toward addressing this gap, I first suggest a basic framework for conceptualizing the general relationship between (auto)mobility and violence. Then, using the empirical example of the United States as a society dominated by automobility, I outline some of the injustices of vehicular violence (or the violence bound up with automobility), especially from the perspective of the city. In so doing, I have three main goals. First, I aim to contribute toward a discussion of transport justice within an emerging, more critical urban transport geography. Second, I hope to spark greater attention within critical geography to (auto)mobility in general, and to the relationship between (auto)mobility, violence, and justice in particular. Finally, I seek to make the case that vehicular violence should be an urgent target of action both within and outside of academia, and that it should be more widely addressed within broader struggles for the just, sustainable, and livable city.

Keywords

Automobility; vehicular violence; urban transport justice; transport geography; critical geography; traffic fatalities



Introduction

The car is responsible for more death, mayhem and violence than any other ubiquitous technology on the planet. Globally, about 1.25 million people are killed by cars each year, or about 3,500 each and every day – as of 2010, the number of global car deaths was equal to about three times the deaths caused by war and murder combined (Gresser, 2014). As such, automobility, or the regime of mobility predominant in most Western societies (and increasingly around the globe) that is characterized by the hegemony of the private automobile and its spaces, has constituted a slow and geographically diffuse, but steady, horrific, and expanding human-made catastrophe. Although the evidence of the deaths caused by automobility is by no means a secret, it is striking how little it is problematized, having been obscured through discourses of modernity, progress, and freedom. Even today there is a profound escapism embedded in the technocratic-utopian thinking that the self-driving car will usher in an era of fatality-free automobility. This is, at present, just another discourse which obscures the daily brutality of this vehicular violence, deferring the solution to this problem to some imagined perfect future. It will be many years before the self-driving car could be universal even in a wealthy country, and in the meantime, despite a modest decline in parts of the post-industrial West, automobility continues to grow globally (Wells and Xenias, 2015). Even if completely death-free automobility were to be accomplished someday, it is a virtual certainty that many, many millions more will die before that could happen.

Being manufactured risks, car deaths have always been in principle entirely preventable: cars could be banned, and the problem of car deaths would simply disappear. While the motorization of society was not an uncontested process, motorization has managed to continue its rapid expansion despite this, its greatest antagonism. One is therefore left to conclude that automobile-dependent societies have collectively decided that the “freedom” the car provides is worth the price paid not just in terms of massive infrastructure expenditures, CO² emissions, or the recurring conflicts over securing access to oil, but also quite literally with the blood and tears of the victims of this violence. As Paterson (2007, 41) has remarked, “there is no other area of social life where such constant attrition of human lives is tolerated.” On the face of it, we have collectively accepted the reality that cars could kill any of us – whether young or old, rich or poor – as a price we pay for automobility. However, the violence wrought by automobility is not simply random misfortune, but is in fact profoundly unjust, especially in cities.

Certainly, automobility is but one of many historically more recent, increasingly complex, and often spatio-temporally diffuse manufactured risks that have been brought about by the machine age, and which have forced society to reckon with the consequences of new types of risk and violence. With the help of the advent of statistics in the mid-1800s, combined with business and state interests’ in concealing some of the profound dangers of an emerging industrial system, such manufactured risks have largely been socially reconstructed as both increasingly expected and increasingly “normal” accidents (Cooter and Luckin,

1992). Within this larger context, the violence of automobility plainly constitutes a form of what Žižek (2006, 2) has referred to as “‘systemic’ violence, or the often catastrophic consequences of the smooth function of our economic and political systems” – it is “inherent to [the] ‘normal’ state of things” and serves as a “zero- level standard” to *other* instances of violence that we do in fact perceive as “perturb[ing] ... the ‘normal,’ peaceful state of things.” While it is but one such form of systemic violence, the violence of automobility, and the injustices characteristic of it, are deserving of greater attention in their own right. The automobile constitutes both the “quintessential *manufactured object*” and the “major item of *individual consumption*” of modern and postmodern capitalist societies – it is no coincidence, after all, that we refer to these with the labels Fordism, and Post-Fordism or Toyotatism (Sheller and Urry, 2000, 738, emphasis original). Moreover, it is difficult to overstate the degree to which automobility, as a complex sociotechnical system, has fundamentally restructured the spatio- temporalities of social life (Freund and Martin, 2007; Urry, 2004). Finally, considering both the magnitude of this violence and the relatively limited attention it receives, the violence of the car arguably constitutes something of a blind spot even within much of mobilities and transport scholarship (cf. Wells, 2007), let alone within much of the rest of human geographical scholarship, where the issue has been left largely unaddressed.

Toward addressing this gap, I suggest a basic conceptual framework on violence and (auto)mobility, arguing that the violence produced by automobility is especially problematic. Based on the empirical case of the United States as a society built around and for the car, I provide an overview of the sheer scale of this violence and examine some of the inequalities characteristic of it. In doing so, I pursue three main goals. I first aim to contribute toward recent discussions of urban transport justice in transport geography (Gössling, 2016; Pereira, Schwanen and Banister, 2017), and to further what could be viewed as an emerging, more critical urban transport geography (e.g. Culver, 2017; Cidell, 2015; Henderson, 2013; 2009, 2006; Minn, 2013; Prytherch and Daly, 2015; Revington, 2015; Stehlin, 2015; Walks, 2015). A second goal is to serve as a call for research within critical geography – both for greater attention to (auto)mobility in general, and for deeper engagement with violence and justice in (auto)mobility in particular. Contemporary critical geographers have much to offer in theorizing the significant impacts this violence has on cities and their most vulnerable populations, and in considering how resistance to such violence can be integrated into broader social justice concerns. A third goal is to serve as a call to action not only among established academics, but students, practitioners, and activists to address vehicular violence by integrating strategies to resist it in their struggles for a more socially just, sustainable, and livable city.

On Mobility Violence and Vehicular Violence: A Conceptual Framework

From physical harm, to psychological harm, the impact of pollution, the impacts of forced immobilization, and to the realm of symbolic violence, the limits of what constitutes “violence” in the realm of mobility are subject to debate and therefore difficult to clearly establish. Consequently, as a basic starting point toward a discussion of violence and (auto)mobility, I intentionally narrow the definition of violence to bodily physical harm, and I focus my analysis on an indisputable, egregious, and irreparable harm: death.

All mobile bodies, whether airplanes, trains, boats, cars, pedestrians with baby strollers, skateboarders, joggers, and so on, create a potential for violence through their movement, although both the severity of violence they produce and the susceptibility to this violence of the mobile bodies involved vary in the extreme. An object in motion possesses kinetic energy that is transformed into something else (such as heat, sound, potential energy, and so on) when that object slows down or is halted. In the case of a collision, the force of the kinetic energy is converted into other forms of energy, some of which is dissipated into the objects and bodies involved, causing varying degrees of deformation and physical harm. The physical harm produced through the physical act of movement, which I refer to as mobility violence, is thus an inherent aspect of physical mobility – one which can be mitigated but cannot be imagined away.

Numerous factors determine how much physical harm is produced in a collision, but three essential factors deserve special mention here.

- The first factor is the mass of the moving object, which is in a linear relationship with kinetic energy – doubling the mass of a moving object will double the kinetic energy. So, in simple terms and all else being equal, a 2000 kg car traveling at 20 km/h possesses double the kinetic energy as a 1000 kg car traveling at 20km/h.
- The second factor of velocity, however, is even more crucial because kinetic energy increases with the square of the velocity of the object. That is, a seemingly minor increase in speed can dramatically increase the amount of kinetic energy an object possesses. If the 2000 kg car is traveling at 20 km/h and the 1000 kg car is traveling at 30 km/h, then because of its greater velocity the lighter car already possesses 1.125 times the kinetic energy than the heavier car. If the lighter car speeds up a bit more to 40 km/h, it now possesses double the kinetic energy of the heavier but slower car.
- Third, the way this energy is absorbed in a collision is important for how much physical damage is done. For example, cars have bumpers that are designed to absorb shock in low-speed collisions and thereby protect both the car and motorist from damage. Pedestrians do not have bumpers and so absorb this shock directly with their bodies.

These basic variables can be better illustrated by using the three generic groups of pedestrians, bicycles (as a mode of transport, not sport), and automobiles. Due to their relatively small mass and slow speed, pedestrians in all but extraordinary circumstances produce negligible potential for mobility violence and thus little risk of harm toward others. The collision of two pedestrians on the sidewalk typically does so exceedingly little harm that we do not conceptually place it in the same realm as the traffic collision at all. In fact, colloquially, the notion of “bumping into someone” is not commonly understood as referring to a physically harmful event, but instead connotes a chance meeting. Cyclists can produce a greater potential for mobility violence than pedestrians, and this is largely due to cyclists’ higher speeds. In the case of a collision between a bicyclist and a pedestrian, pedestrians do on average suffer greater consequences of the two, and at least part of the reason for this is that cyclists may have some greater protection due to the front tire, handle bars, and frame absorbing some of the initial shock, while pedestrians’ bodies are often directly confronted with the energy of the collision (Chong et al., 2010).

Still, the violence in a bicyclist-pedestrian collision is likely to be minimal relative to situations involving a motor vehicle. For instance, overall in the United States, there has historically been a relatively “small number” of bicyclist- pedestrian collisions (many of which are likely never officially recorded), these incidents usually only have “minor consequences,” and though bicyclist-pedestrian collisions leading to a fatality do happen, they are quite rare (Graw and König, 2002, 241). So, while pedestrians on average are subject to greater injury in such cases, cyclists can sustain injury as well, usually by being thrown off of the bicycle. Because of their more direct exposure to mobility violence, though, pedestrians and cyclists alike quite literally “have skin in the game,” meaning that they are both vulnerable to the physical harm caused by a collision, even with other vulnerable users, and have an incentive to avoid that collision. Nevertheless, despite some potential for violence, due to their mass and speed, walking and cycling *in and of themselves* are not especially dangerous activities.

Pedestrians and cyclists are, however, extremely susceptible to the mobility violence produced by automobiles. As will be explored further below, the motor vehicle is a severe threat to these road users, a threat which is directly mediated not only by the mass of the car that hits them, but even more so by the speed at which they are hit. The likelihood that a pedestrian will be killed when hit by a car increases dramatically as the speed of the car increases, such that approximately¹ the following percentages of pedestrians are killed at the given speed of the motor vehicle striking them (Tefft, 2013):

- 10% of pedestrians that are struck at 40 km/h are killed

¹ These figures have been minimally rounded from the original figures for greater comprehensibility.

- 25% at 50 km/h
- 50% at 70 km/h
- 75% at 80 km/h
- 90% at 90 km/h
- and about 100% of pedestrians are killed when struck at and above 100 km/h

Like pedestrians, the injury outcome for cyclists is strongly related to the speed environment, with the exception that bicycle fatalities are “more spread out over the speed spectrum” (Kröyer, 2015, 61) than with pedestrians, meaning that proportionally more cyclists are killed at lower speeds than pedestrians, but more may also survive at higher speeds. This greater distribution along the speed spectrum likely has to do with the fact that cyclists are themselves traveling at higher speeds and are positioned at a greater height. This slightly more complicated relationship regarding cyclists notwithstanding, both cyclists and pedestrians are highly vulnerable to the potential for violence produced by motor vehicles, and this vulnerability increases dramatically with increases in motor vehicle speed.

In stark contrast to these vulnerable road users, automobiles, with their considerably larger mass and higher speeds, produce the greatest potential for violence through their own mobility among these three. Unlike walking and bicycling, driving is not only potentially extremely dangerous for those engaging in it, but also for automobility’s bystanders. However, motorists are also encased in a carefully crafted cage that has been continuously re-engineered and redesigned over the course of a century to protect them as much as possible by absorbing the energy transferred in the event of a collision. Vulnerable road users thus typically pose no substantial physical threat to motorists, while automobiles conversely present the single largest common threat to vulnerable users’ physical well-being (see also Gössling, 2016).

In the calculus of mobility violence, vulnerable users and motorists present strikingly different packages of threats and vulnerabilities, such that a collision between a motorist and a vulnerable road user can often mean death to the latter while leaving the former physically unharmed. As this suggests, while violence can be viewed as an inherent aspect of mobility through the basic laws of physics, *vehicular violence*, or the daily onslaught of systemic violence bound up with automobility, is an especially problematic form of mobility violence, and deserving of special attention. Irrespective of the socially constructed blame in a given situation, the term vehicular violence follows the violence to the source of its production – the mass and velocity of the motor vehicle and the physical damage caused when it collides with other bodies or objects. It is a wholly human-made, manufactured form of mobility violence produced along with automobility, and it is shockingly ubiquitous, constituting the largest threat of mobility violence to life and limb that most people in an automobility-based society experience on a daily basis (Featherstone, 2004; Virilio, 2007).

Toward fleshing out the concept of vehicular violence and the injustices characteristic of it, I now turn to the empirical case of the United States – a country that is dominated by automobility like virtually no other.

Vehicular Violence in the United States

In 1899, the first recorded motor vehicle fatality in the United States was the death of Henry H. Bliss, who was hit by a car while stepping out of a streetcar in New York City – an entirely new type of fatal incident that was front page news at the time (Citystreets.org, 2013; *New York Times*, 1899). As the motor vehicle became more commonplace in the early 1900s, the number of the dead began climbing at an increasing rate (see Figure 1). The wave of death accelerated with the advent of the Ford Model T, the first mass-produced car, and the subsequent beginning of mass motorization around 1920. Over the course of the 1920s alone, over 200,000² people in the United States were killed by the car, or nearly four times as many American battle deaths in World War I (Department of Veterans Affairs, 2015). As Norton (2008) established in his account of the social reconstruction of the city street as auto-space in the United States, far from a “love affair” with the car, during the early decades of the 20th century city dwellers often viewed the car as an unwelcome interloper in urban street space and as a technology of death. After all, of those tens of thousands killed by the motor vehicle during the 1920s, impacted most were urban residents, the overwhelming majority of which were pedestrians, and about one-half of total car deaths were children.

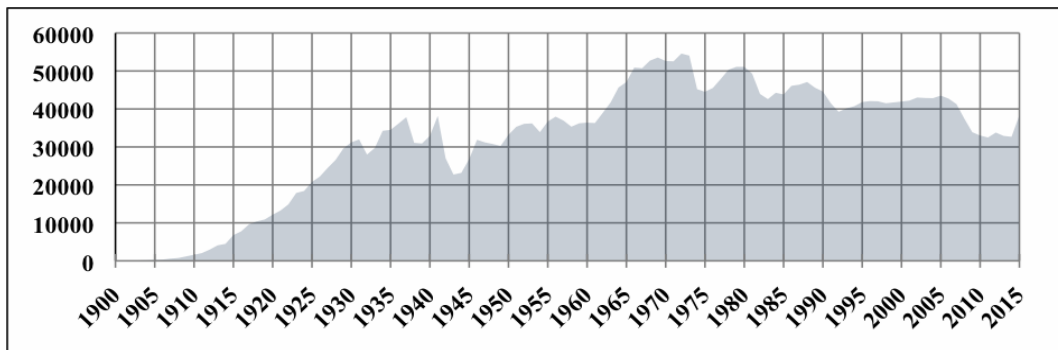


Figure 1: Total US traffic fatalities, 1900 - 2015 (Sources: FARS, 2016; NSC, 2016; NHTSA, 2010)

The automobile quickly constituted a plague on urban life, but the solution to the problem of vehicular violence was neither to do away with the invention that created it in the first place, nor was it to tame automobility and hold motorists accountable for vehicular violence, as is the case with other “dangerous instrumentalities” (Jain, 2004). Instead, with the rise of mass motorization over the

² Unless otherwise noted, all figures on annual national traffic fatalities in this section are based on data from the National Highway Traffic Safety Administration (FARS, 2016; NHTSA, 2010).

course of the 1920s, what changed was society's perspective toward the violence wrought by the automobile. This shift in perspective was heavily driven by the interests of "motordom" (Norton, 2008), as traffic engineering science, the insurance industry, and the automotive industry engaged in efforts with the ostensible purpose of improving safety – efforts which in fact have historically had "merely one social function – to allow for ever more [auto]mobility" (Beckmann 2004, 97).

A newly emerging traffic engineering science transformed transportation into an ostensibly objective, apolitical science, wherein the purpose of the street itself was socially reconstructed as a space of high-speed automobile flow, and physically materialized as such through the creation of new laws and societal norms privileging the needs of motor vehicles over those of vulnerable bodies in these spaces (Culver, 2015; Blomley, 2007; Jain, 2004; Norton, 2008; Prytherch and Daly, 2015). At the same time, as Packer (2008) has outlined, the insurance industry played a crucial role in (re)shaping the discourse on traffic safety. Far from attempting to eradicate vehicular violence, the continued existence of the real (and/or perceived) threats of automobility was crucial for the existence of the insurance industry. That is, the insurance industry must negotiate between two contradictory logics: the desire to sell insurance to as many customers as possible, for which stoking fears and constantly inventing new risks (from hot-rodding and hitchhikers to road rage) is necessary; and the desire to minimize insurance payouts, for which encouraging safer driving through "safety crusades" is necessary. Consequently, the insurance industry has had to "make it appear that the problem was continually at its worst, but that they were doing much to eliminate automobile fatalities and damage" (Packer, 2008, 51-52). Meanwhile, while the automotive industry did have an incentive to improve the safety of their automobiles, the primary goal has never been to eliminate traffic fatalities *at any cost* – the obvious solution to that problem would have been to eliminate automobility itself. Rather, the basic logic motivating the automotive industry's safety efforts has been to improve the real (and/or perceived) safety of those inside the automobile so that, quite simply, people will continue to buy cars.

In contrast, the motordom-based, status quo perspective on safety for pedestrians was focused not on engineering, infrastructure, or policy that would protect the vulnerable, but instead on individual pedestrian behavior, grounded on "the underlying assumption that pedestrians must be trained to acclimate to a car-dominated culture" (Short and Pinet-Peralta, 2010, 50). Perhaps most notably, the invention of jaywalking during these early decades of the 20th century marginalized pedestrians both in a legal sense and in a concrete physical sense (literally pushing them to the margins of the streets), and created a framework within which the victims of vehicular violence were called upon to take responsibility for their own safety (Norton, 2008). All of this had as a consequence that much of the blame for vehicular violence began to be redistributed away from the motorists who produced this new and immense potential for violence and onto its victims. Since then,

vulnerable mobile bodies – pedestrians, bicyclists, the *flâneur* or the playing child – have been continuously and relentlessly disciplined with the threat of violence in everyday life: watch out and make way, or be killed.

Meanwhile, the human-made, and therefore *social* problem of vehicular violence itself was socially reconstructed as a *natural* problem. This is most clearly evidenced through the common use of the word “accident,” which frames the car crash as an unpredictable and unavoidable event (Featherstone, 2004; Reynolds et al., 2009; Short and Pinet-Peralta, 2010). This naturalization points to the fact that “automobility ‘works’” because its violence is denied (Beckmann, 2004, 94). The innovation of any new technology, such as the motor vehicle, is to also innovate a new risk, in this case the motor vehicle crash (Beckmann, 2004; Virilio, 2007): the moving car and the crashed car are two sides of the same coin. As research has borne out, socio-culturally, drivers tend to perceive the advantages of motoring in a very concrete and personal sense, while there is a blindness toward the disadvantages, which are viewed as “relative, distant, and questionable” (Wells and Beynon, 2011, 2494). Positively-charged notions of freedom, individuality, democracy, and “living the good life” are bound up with automobility (particularly in the United States, where automobility is viewed as inseparable from the American “way of life”), and further conceal vehicular violence (Culver, 2016; Böhm et al., 2006; Henderson, 2011; Huber, 2009). Finally, in combination with the fact that vehicular violence – as systemic violence – is not a concentrated but a spatio-temporally diffuse catastrophe, the naturalization and denial of vehicular violence have allowed car deaths to become largely invisible relative to their horrific ubiquity, shielding it from any substantial critique to this day.

With the naturalization of vehicular violence more or less cemented into place after 1930, automobile fatalities grew steadily along with the full-blown suburbanization of the country and the radical reorganization of American cities to suit the needs of cars. After a significant dip in traffic fatalities caused by a steep decline in driving amid the rationing and turmoil of World War II, traffic deaths soared in the postwar decades, reaching a new high in 1972 at 54,589 deaths. About as many Americans died due to cars *in 1972 alone* as died in theater during the 11 years of American involvement in the Vietnam War from 1964 to 1975 – total car deaths during this period were over ten times as high as American soldiers killed in theater in Vietnam (Department of Veterans Affairs, 2015). After this peak in 1972, the absolute number of traffic deaths fluctuated downward before leveling off beginning in the early 1990s in the low and mid-40,000s, averaging about 41,500 deaths annually between 1991 and 2001. This notable decline notwithstanding, the car continued to kill approximately as many people as the September 11th, 2001 attacks (about 3,000) every single month in the early 2000s – in fact, the number of people who died due to cars in 2001 alone in the United States was equal to that of about fourteen September 11th attacks (National September 11 Memorial & Museum, 2016). Having reached a new peak in 2005 of 43,510 killed, road deaths began to sink once again, with annual fatalities hovering

around the 32,000s between 2010 and 2014. While this represented a considerable decline, the number of annual traffic deaths during these years was still over twice as high as the already high number of homicides (14,249 in 2014) in the United States (FBI, 2015), and roughly equivalent to “two fully loaded 747 jets crashing into each other every week” (Short and Pinet-Peralta, 2010, 47). However, this period of steady decline abruptly ended with the “largest year-over-year percent increase in 50 years” of 8% from 32,675 in 2014 to an estimated 38,300 in 2015 (NSC, 2016, n.p.; see also NHTSA, 2015a).

Given these figures, it should be unsurprising that the automobile is currently one of the leading causes of death for Americans between the ages of 1 and 54, and it is either the first or second leading cause of unintentional injury death for all Americans of any age (CDC, 2015a, 2014b). Along with the untold grief and suffering that these deaths cause day after day, car crashes bring additional burdens for victims’ loved ones and for crash survivors. The Center for Disease Control (CDC, 2013b) estimates that car crash deaths in 2013 cost the victims’ loved ones \$44 billion in medical and work loss costs. Likewise, car crashes cause many times more injuries than fatalities. For every single person killed in a motor vehicle crash in 2012, eight people were hospitalized, and 100 people were treated in the emergency department and released (CDC, 2012). In total, about 2.5 million Americans went to the emergency department for automobile crash injuries that year, and 200,000 of these people were then hospitalized. These crash injuries were estimated to cause \$18 billion in lifetime medical costs, and \$33 billion dollars in lifetime work lost. Vehicular violence thus has serious consequences reaching far beyond “just” the number of the dead it leaves in its wake.

Overall, since Henry Bliss’ death in 1899, about 3,700,000 people have died in the United States because of cars. This is over three times as many American soldiers died in all US wars combined – beginning in 1775 with the Revolutionary War to today’s global War on Terror (Department of Veterans Affairs, 2015). America’s wars, the September 11th attacks, and the homicide deaths in the United States have undoubtedly been incredibly politically, culturally and socially impactful not only domestically, but for global society as a whole, and yet they still are greatly overshadowed by the deaths caused by driving. And, although American culture is saturated with honorable references to its fallen soldiers, the systemic violence of automobility is predominantly experienced as unique personal tragedy for loved ones, as just another mortality statistic for American society at large, and certainly not as a serious and sustained call to action.

The Injustices of Vehicular Violence in the United States

Not only is vehicular violence massive in scale, it is dealt in a demographically, socio-economically, modally, and geographically highly unjust manner. The elderly, the young, the poor, people of color, and vulnerable road

users (such as pedestrians and cyclists) account for a staggering proportion of total traffic deaths, even as these groups create less potential for violence for others through their own mobility.

Demographic Injustices

Even though those between 30 to 64 years of age drive the most miles and spend the most time in a motor vehicle (AAA, 2015), those older and younger are in varying ways disproportionately impacted by vehicular violence. Regarding the older generations, although death due to various health conditions are more prevalent for Americans 65 and older than death by automobile (CDC, 2014a, 2014b), the elderly nonetheless have the highest risk of dying while on foot. Between 2003 and 2010, people aged 75 and older in the United States represented only 6.0% of the population, but 12.3% of pedestrian fatalities, while those 65 and older were 12.6% of the population but 20.8% of pedestrian fatalities (Smart Growth America, 2014, 13-14). At least two factors contribute to this disparity: first, the impacts of being hit by a car are on average more severe for the elderly than for younger pedestrians; and second, the elderly are more likely to require more time to cross the street and to avoid any potential danger (Tefft, 2013). Automobility also continues to pose a special threat to young people, much like it did during the inauguration of mass motorization in the 1920s. The motor vehicle is the leading cause of death for Americans between the ages of 5 and 24 – killing more young people than suicide, homicide, or any single health condition (CDC, 2014a). Teenage drivers between 16 and 19, for whom participation in automobility has long been promised as a “coming of age,” a milestone, and a transformative moment in their lives, are at three times the risk of death due to automobility than any other age group of drivers (CDC, 2015b).

Socioeconomic Injustices

The death dealt by the car is also socioeconomically inequitable, with the poor being much likelier to be killed in crashes than the wealthy. The poor constitute a greater proportion of vulnerable traffic participants, making them more likely to be killed by cars than motorists (a point to be further discussed below), and a disproportionate number of pedestrian deaths occur in poorer neighborhoods (Kravetz and Noland, 2012; Maciag, 2014). Further, the poor and people living in areas of concentrated poverty also make up a greater proportion of motor vehicle occupant fatalities. Using data from 1994 through 2007, Males (2009) found that drivers of every age group in poorer states were about twice as likely to be involved in fatal crashes than drivers in wealthier states. Males found that higher poverty levels are “significantly associated” with a number of factors that are associated with higher risk for fatalities and severe injuries in traffic, including teenage drivers (and teenage drivers in areas of concentrated poverty likely have less driver’s education experience than teenagers in wealthier areas), more occupants per vehicle, and more smaller-sized and older vehicles. Moreover, poorer communities generally have weaker local tax-bases, making it more likely

that their road infrastructure is less well maintained, which could conceivably lead to more crashes, and access to emergency medical attention may be worse compared to wealthier places. Further, Harper et al. (2015) found that the declines in motor vehicle deaths in the United States between 1995-2010 disproportionately benefited the highly educated (education being positively associated with wealth), while in contrast there was some evidence of *increases* in traffic fatalities among the least educated. Whether as motorist, cyclist, or pedestrian, the poor are more likely to die because of cars than the wealthy, and there is some evidence that the disparity may have worsened.

Racial Injustices

Considering the overrepresentation of people of color living in poverty in the United States, these socioeconomic injustices simultaneously suggest racial injustices. For instance, according to the CDC (2013a), between 2000 and 2010, Native American and Alaskan Native male pedestrians were killed at over four times and Black and Latino male pedestrians were killed at twice the rate as White male pedestrians. Some factors that help to explain the disparity are that people of color make more trips on foot than Whites, that they more often live in urbanized areas and near busy arterial roads, and that their communities have suffered both through less investment than wealthier communities and through the negative effects of urban renewal (Smart Growth America, 2014; Warlick, 2014). Yet racial disparities in vehicular violence are apparent beyond the issue of poverty. As one example, Goddard et al. (2015) identified direct evidence of racial bias of motorists vis-à-vis pedestrians. Using three Black males and three White males as identically dressed, height-and-weight-matched pedestrian test subjects in downtown Portland, Oregon, the study authors found that drivers were significantly less likely to stop for Black pedestrians than for White pedestrians, with Black pedestrians in the study being passed by twice as many cars as their White counterparts in a marked crosswalk. Further, Black pedestrians waited on average 32% longer than White pedestrians before a car yielded to them.

Modal Injustices

In light of the demographic and socioeconomic injustices of vehicular violence, it should come as no surprise that the overall decline in traffic deaths which has been gently celebrated as progress among transportation officials (NHTSA, 2011) has not benefited all modes equally. As illustratively noted by the National Highway Traffic Safety Administration (NHTSA, 2015b, n.p.), even while the overall 2014 road deaths “declined only slightly” from the previous year, “it was the safest year on record for passenger vehicle occupants: 21,022 Americans died in vehicles in 2014, the lowest number since FARS [Fatality Analysis Reporting System] began collecting data in 1975.” However, as the press release goes on to note, “the number of pedestrians killed rose by 3.1 percent from 2013.”

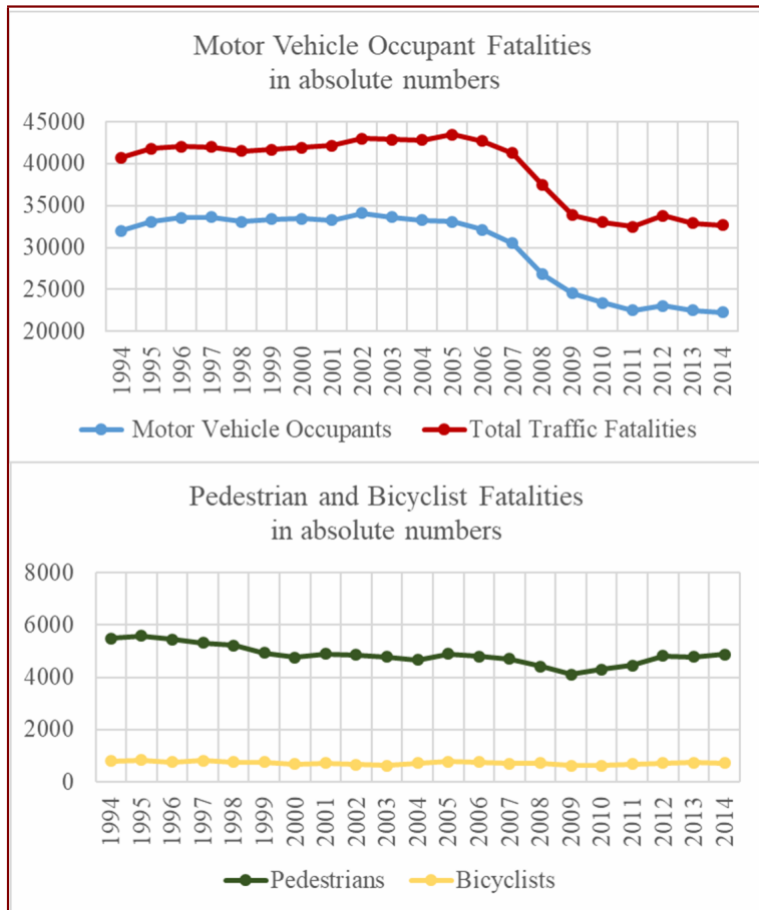


Figure 2: Motor Vehicle, Pedestrian, and Bicyclist Fatalities in Comparison - 1994 – 2014 (Source: FARS, 2016)

Certainly, since the 1980s the absolute numbers of vulnerable users killed have decreased (Alliance for Biking and Walking, 2014), but looking at recent data from the FARS (2016) produces a more complicated picture. As Figure 2 demonstrates, the significant dip in overall traffic fatalities is mirrored by the dip in motor vehicle occupant fatalities, but the same cannot be said for cyclists and pedestrians. The absolute number of cyclists killed in traffic crashes remained fairly constant between 1994 and 2014, averaging 728 annually. Meanwhile, although there was a decline from about 5500 pedestrians killed in the mid-1990s to a low of 4109 in 2009, every year since the number of pedestrians killed has increased, reaching 4884 in 2014. So, from the year 2000 to 2014, the proportion of motor vehicle occupants of overall traffic deaths dropped by 11.5% (from 79.7% to 68.2%), while during the same period the combined proportion of pedestrian and bicyclist fatalities grew by 4.2% (from 13.0% to 17.2%).

Not only does this data suggest that the decline in overall traffic deaths has overwhelmingly benefited drivers and car passengers, it also points to the fact that

up until quite recently automotive industry safety efforts have been virtually entirely devoted toward protecting those inside rather than outside the car (Jain, 2004; MacGregor, 2009; Packer, 2008). Combined with the fact that an “arm’s race” has been occurring on US roads (wherein Americans have increasingly chosen heavier vehicles such as SUVs and pick-up trucks which provide greater protection for the vehicle’s occupants but pose a greater danger for those outside of the vehicle [Anderson and Auffhammer, 2014]), at the same time that biking and walking has become more common in states and cities throughout the country (Alliance for Biking and Walking, 2016), it is unsurprising that this disproportionality of bicyclist and pedestrian fatalities has worsened. The risks of vehicular violence continue to be outsourced from those who produce it onto more vulnerable mobile bodies who pose virtually no threat in return.

A natural temptation may be to look at the overall bicycle/pedestrian mode share, and to conclude that bicyclists and pedestrians are killed at a disproportionate rate respective to their numbers and that this disproportionality is itself the injustice. For instance, in the Alliance for Biking and Walking (2014, 14) benchmarking report, a “disparity” is pointed out, wherein “11.4% of all trips are taken by bicycle or on foot, 14.9% of roadway fatalities are pedestrians & bicyclists but only 2.1% of federal transportation funding goes to bicycling and walking projects” – an example that Gössling (2016) has also cited. To be fair, this statement does not explicitly address the question of what a fairer distribution of traffic deaths for pedestrians and bicyclist would look like. However, one possible interpretation of this statement is that if pedestrians and cyclists accounted for equal proportions of trips taken, of roadway fatalities, and of federal transportation funding, it would constitute a just distribution of traffic risk. Yet, this would still not fully address the scope of this injustice. As established in the conceptual framework above, unlike driving, which is dangerous for drivers and non-drivers alike, walking and bicycling in and of themselves are not especially dangerous activities – neither for their users, nor, in most cases, for bystanders. Instead, walking and cycling become dangerous activities in the presence of motor vehicles. Considering that these vulnerable users create little potential for mobility violence for themselves, and virtually none for motor vehicle occupants, how can it be just that they should be killed according to their proportion of traffic? Indeed, from the perspective of a just distribution of risk, should they legitimately experience any significant amount of vehicular violence in return?

Modal Injustices as Urban Injustices

Of course, most of those people who walk or bicycle as transport do so in urban areas. Consequently, just as in the early 1900s, the high rates of pedestrian and bicyclist deaths mean that these modal injustices, to a large degree, constitute social injustices predominantly affecting urban populations. The following examples, based on data from the Alliance for Biking and Walking (2016) and the American Community Survey (U.S. Census Bureau, 2013), help to demonstrate

this point. In Jacksonville, Florida, one of the most dangerous cities for pedestrians in the United States, only 1.2% of commuters³ walked to work, but pedestrians comprised 21% of all traffic fatalities. Or, in Fort Worth, Texas, where a mere 0.2% of commuters bicycled to work, bicyclists accounted for 9.5% of total fatalities, or a proportion nearly 50 times greater than their commute share. Even in Boston, the safest of the 52 largest US cities for pedestrians and where 14.8% of Boston's residents commute to work on foot, pedestrians were 34% of all city traffic fatalities. Finally, as a more recent example from another of the safest pedestrian cities, 131 pedestrians and 14 cyclists were killed in New York City in 2015, accounting for 54% and 6% of all traffic deaths respectively (WNYC, 2015). Of all 145 of these deaths, 144 of them were killed in a collision with a motor vehicle. In contrast, none of the 70 motor vehicle occupants killed in New York City in 2015 died after being crushed under the weight of a pedestrian's feet or a bicyclist's tire. As these examples help to demonstrate, vehicular violence constitutes virtually all of overall traffic violence in the contemporary American city.

Even as the picture is relatively grim in every city, the deaths of pedestrians and cyclists are geographically highly differentiated from city to city. Some of the safest cities include the denser cities such as Boston, Washington, D.C., and San Francisco – cities with relatively high rates of walking and cycling (Alliance for Biking and Walking, 2016; Smart Growth America, 2014). Meanwhile, the most dangerous cities for pedestrians and cyclists tend to be sunbelt cities that were built around the needs of the private automobile, and where fewer people walk and bike. According to Smart Growth America's (2014, 4-5) "Pedestrian Danger Index," which puts annual pedestrian deaths in relation to the total percent of people commuting by foot, the top ten most dangerous metropolitan areas for pedestrians are all sunbelt cities, with the four most dangerous cities being Florida's Orlando, Tampa, Jacksonville and Miami.

³ While commuting data does not account for other types of trips, meaning that these transport modes are underestimated with this data, the American Community Survey data is the best available for making year to year city and state comparisons.

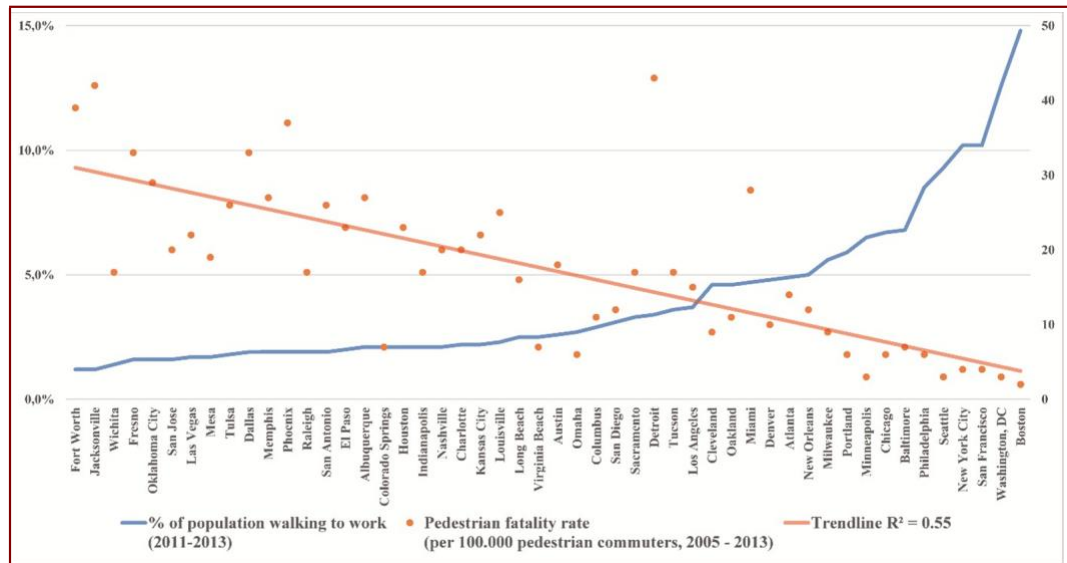


Figure 3: Safety in Numbers Effect for Pedestrian Commuters in 50 Largest US Cities (Sources: Adapted from Alliance for Biking and Walking, 2016; U.S. Census Bureau 2013)

This significant variation can be broadly explained by the “safety in numbers” effect, first demonstrated by Jacobsen (2003), whereby the more pedestrians or cyclists there are in a given place, the safer that respective activity becomes. Based on an analysis of extensive data on both walking and bicycling, Jacobsen (2003, 208) found that “[t]his relationship is consistent across geographic areas from specific intersections to cities and countries.”⁴ Similarly, investigating the safety in numbers effect regarding cyclists in Australia, Robinson (2005) found that if cycling doubles, then the fatality and injury risk fell per kilometer by about 34%, while conversely, if cycling halves, then the risk increased by about 52%. Accordingly, as depicted in Figure 3, there is a negative association between the percentage of commuters who walk and the rate of pedestrian fatalities in the 50 largest US cities. A strikingly similar image is produced if one charts the data for bicycling (see Alliance for Biking and Walking, 2016, 40).

It's the Cars, Stupid!

The safety in numbers effect provides strong evidence that pedestrian and bicycling deaths and injuries do not increase linearly along with the absolute numbers of pedestrians and bicyclists on the road, which would suggest that these are random “accidents.” The best explanation for this effect is that human behavior

⁴ Jacobsen’s (2003) study included walking and bicycling data from 68 California cities, 47 Danish towns, datasets from the United Kingdom and the Netherlands, and data from 14 European countries.

“has an important role in preventing these injuries” (Jacobsen 2003, 205). However, it is not pedestrian and bicyclist, but “motorist behavior [which] largely controls the number of collisions” (Jacobsen 2003, 208) and whose behavior appears to change with an increase in vulnerable road users. That is, safety in numbers works because as motorists become increasingly accustomed to these “other” road users, they become less likely to hit them in the first place. With more vulnerable users on the road, motorists become more likely to anticipate vulnerable users and to see them (thereby decreasing so-called “looked-but-did-not-see” collisions [Reynolds et al., 2009]). More pedestrians and cyclists on the road also makes drivers likelier to either be an occasional pedestrian/bicyclist themselves and/or to have loved ones who are, which presumably increases their “intermodal empathy” (Nixon, 2014) toward vulnerable users. Simply put, while the topic of urban mobility safety is incredibly complex, the problem really is the cars, and the more people that forego driving and instead use transit, walk, or bike in their city, the safer urban mobility will become.

Discussion and Conclusion

All mobile bodies produce a potential for mobility violence through their movement, making violence a fundamental aspect of mobility. However, compared to other common modes of human transport, the car has proved itself an especially violent technology. The sheer scale of this violence is horrific, making automobility a relentless but spatio-temporally diffuse catastrophe. While vehicular violence impacts people from all walks of life, it is not randomly distributed. Rather, as highlighted above using the example of the United States, it is demographically, socioeconomically, modally, and geographically intensely unjustly distributed. The car is a special danger to the young and the elderly, to the poor, to people of color, and to pedestrians, cyclists and other vulnerable road users – all of whom being people who typically produce less potential for violence through their own mobility than drivers. Certainly, some of these inequalities are reflections of the prevailing socioeconomic inequalities in US society. Nonetheless, the essential problem of vehicular violence is intrinsic to and borne out of the basic physical properties of automobility. Even though a greater focus on traffic safety has arisen in the United States (and elsewhere) over the last decades leading to a decrease in total traffic deaths, the fundamental inequalities of vehicular violence have remained. Motor vehicle occupants have enjoyed the lion’s share of the benefits of improved traffic safety, while the most vulnerable road users continue to be severely threatened by everyday vehicular violence.

One of French cultural theorist Paul Virilio’s (2007, 10, emphasis original) most deservedly quoted sentiments is that: “To invent the sailing ship or steamer is *to invent the shipwreck*. To invent the train is *to invent the rail accident* of derailment. To invent the family automobile is to produce the *pile-up* on the highway.” It is both simple, and, considering how this relationship is so often overlooked, profound. Indeed, as Virilio (quoted in Dumoucel, 2010, n.p.) has also

remarked, "...you can't innovate without creating some damage. It's so obvious that being obliged to repeat it shows the extent to which we are alienated by the propaganda of progress." Likewise, the problem of death and the car is not a new one, yet vehicular violence remains an underexplored issue in geography, and it remains far too often unrecognized in everyday struggles for the more socially just, sustainable, and livable city. In moving forward, I suggest the following implications and directions for future research, as well as strategies for political action and activism.

First, this basic framework of conceptualizing mobility violence can contribute to a renewed discussion in transport geography regarding justice and equity in urban transport (Gössling, 2016; Pereira, Schwanen and Banister 2017). This analysis supports Gössling's (2016, 3) assessment of the fundamental injustice of the disparity of cyclists and pedestrians being "disproportionately often the victims" while motorists produce "most accident risks." By systematically accounting for the root cause of this violence, however, an assessment of a just distribution of traffic risk should go further than the label of "disproportionality." As described above, with streets being reconstructed as spaces of flows as opposed to spaces of place-making, the rights of vulnerable traffic participants to physical integrity have been fundamentally subordinated to the rights of car drivers to travel at high speeds. Instead, as Pereira, Schwanen and Banister (2017, 15) make the case in their Rawlsian-Capability Approach to transport justice, while the freedom of movement is indeed crucial, this freedom should be subordinated to the more immediate right to physical integrity on the grounds that an "individual's basic rights and liberties should never be violated or sacrificed on the grounds of improving the accessibility levels of others." Therefore, we must consider whether *any* exposure of vulnerable users to vehicular violence is in principle acceptable in a framework of urban transport justice, and be willing to more explicitly label vehicular violence as unjust.

Second, further attention to mobility violence can contribute to the study of the politics of mobility – an area of concern that bridges the subfields of urban, transport, and mobilities geographies (see, e.g. Cidell and Prytherch 2015), and one that can arguably serve as a center point for a more critical urban transport geography – as the following example demonstrates. Through the process of its naturalization, vehicular violence has been implicitly declared an acceptable risk both by society at large and by every individual engaging in driving. Implicit in the act of driving is the willingness on the part of the driver to subject themselves (and those for whom they are making the decision – their children, for example) to the risk of being killed or injured in a car crash. Perhaps less obvious in the act of driving a car is the equally implicit willingness to subject non-drivers to the risk of being killed through this act. In other words, every time a driver gets behind the wheel of the car, whether to travel to work or just to pick up a carton of milk from the grocery store, there is some chance that they may hit a family trying to cross the street or a cyclist on her way to work. Whether they actively acknowledge it or not,

each time they drive, motorists are accepting the risk of doing harm to people who cannot do harm back: in terms of unequal power dynamics, the SUV driver and the pedestrian are essentially at opposite ends of the spectrum. To make matters worse, quite often those threatened most by this risk are those already exposed to other, overlapping social injustices.

This unequal power relation rooted in the ability to cause physical harm to another is regularly made use of in the politics of daily traffic. In this regard, mobility violence, and vehicular violence in particular, is a fundamentally political force that shapes urban geographies, in that it constitutes and is constitutive of unequal power dynamics by disciplining bodies both through its actualization and through the threat of its actualization (Prytherch, 2012). The driver who fails to yield the right of way to a pedestrian in a crosswalk – a common occurrence even in major US cities – automatically exercises the threat of violence toward keeping the pedestrian fixed in place. The threat of violence functions, therefore, as a shockingly mundane bludgeon in the politics of navigating the city, one which, in this case, may be subconscious for the driver, but is palpable and unambiguous for the pedestrian. Indeed, the unyielding car driver makes a demand that the pedestrian forego their right to safely cross the street, and the pedestrian often has little choice but to assent to this demand or be crushed. Vehicular violence produces landscapes of fear and anxiety, and hence social and physical exclusion, marginalization, and immobilization. Consequently, vehicular violence is not only socially unjust in and of itself, but from the perspective of spatial justice (Soja 2010), it also has a constitutive role in shaping unequal urban geographies.

Third, critical geographers who have thus far not engaged in transport and mobility can nonetheless contribute to and benefit from attention to (auto)mobility and violence in important ways. One notable strength of critical geography is in theorizing systems of exploitation, oppression and aggression, as well as how resistance can be effectively approached to challenge such systems. In this regard, (auto)mobility offers a wide and largely untapped field of potential for critical geographers to both further theoretical understanding of oppression and resistance in general, and to produce theories and strategies for resisting antagonisms of automobility in particular. Having only scratched the surface in this analysis, a deeper exploration of the dimensions of the concepts of violence and justice appears especially promising. Regarding violence, automobility as a form of systemic violence ultimately constitutes but one arena in which hegemonic social systems produce mundane mass murder. For critical geographers who have been increasingly examining the geographies of violence, vehicular violence – being both “overt” such that “we can easily recognize its horrifying effects and deadly consequences,” yet simultaneously “hidden beneath ideology [and] mundanity” – constitutes not only a highly relevant concern, but something of a theoretical puzzle that can help to inform further theorizations of the geographies of violence (Springer and Le Billon, 2016, 1). Moreover, because vehicular violence is not only biophysical but biopolitical (Foucault, 2004), a biopolitical analysis of

vehicular violence would also be a productive direction for critical geographical research. Such an analysis may further elucidate, for instance, the process whereby a science is made out of a range of traffic fatality statistics, and through which a particular combination of regulatory techniques are applied to the population which produce the “optimal” situation of mobility for the society. The end result of this process being, by all appearances, that the sacrifice of all these dead and wounded is an “acceptable” trade-off for the collective automobility of the population. Regarding justice, vehicular violence is obviously highly problematic. Much like many other aspects of contemporary American (and increasingly global) society, the patterns of death and violence of the car are disturbingly unjust, with those who benefit the least from automobility more likely to suffer its worst consequences. Considering that much of the work on social justice has focused on socioeconomic injustices both in transport geography (e.g. Culver, 2017; Revington, 2015; Stehlin 2015) and human geography as a whole (Soja, 2010), vehicular violence provides an impulse for critical geographers to address how biophysical injustices can be considered alongside the political-economic in broader debates of social justice.

A fourth implication of this analysis is that vehicular violence constitutes an urgent social problem, especially for cities. Critical scholars must not only focus on theorizing vehicular violence, but also develop strategies for action. Libraries could be filled with the texts relevant for reducing this violence, and so I only aim to suggest the following three broad strategies. First, an overarching strategy must be to increase awareness of vehicular violence in academic research, in the classroom, and in public discourse. It must be de-naturalized as an unavoidable hazard of daily life, and instead be reconceptualized more broadly as a social problem and an ultimately human-made, manufactured risk. Toward this goal, it is crucial that the scale and the injustice of vehicular violence become both widely discussed and made more visible beyond the relatively limited number of interested scholars and activists and opened up to a broader public. One simple and immediate way that we as academics can do this is by making it a point to discuss this urban social problem in the classroom.

A second strategy is to encourage policies and practices in cities that reduce vehicular violence. In the United States and elsewhere, laws and norms continue to privilege high-speed flows of automobiles over the needs and desires of vulnerable mobile bodies. While a complete dismantling of automobility in the foreseeable future is unrealistic, alternatives must be aggressively encouraged, especially in dense urban areas, while automobility is minimalized and tamed. Literature on this subject abounds (e.g. Foletta and Henderson, 2016; Sadik-Kahn 2017, as two recent works), but generally involves a package of strategies to build and improve public transport, pedestrian, and cyclist infrastructure, and reconnect communities that have been fragmented through ubiquitous parking and road infrastructure, all while disincentivizing driving. As the safety in numbers effect suggests, encouraging walking and bicycling may in and of itself be an effective method for

improving pedestrian and bicyclist safety. Further, it underlines the fact that motorist behavior is crucial for reducing the deaths of pedestrians and cyclists. So, rather than cracking down on jaywalking or castigating bicyclists for not wearing helmets (both of which serve to further conceal the origin of vehicular violence and shift blame to its victims [Culver, 2018]), greater efforts should first and foremost be made at increasing motorist awareness of and respect for vulnerable users. Such strategies would not only reduce vehicular violence, but would also have countless social and environmental benefits. These strategies are entirely realistic, as plainly evidenced by the experience of already existing car-free zones and much safer urban mobility conditions throughout many Dutch, Danish, and German cities (Buehler and Pucher 2012).

As a third and final strategy by way of concluding, vehicular violence should be recognized as a core issue within an overarching progressive vision of mobility (Henderson, 2013) – a vision which should be more explicitly unified with broader struggles for the just, sustainable, and livable city. One pragmatic possibility for activists to consider integrating in their efforts is the basic mission of a campaign such as “Vision Zero,” which aims at essentially turning on its head the fundamental logic of traffic engineering and policy that has privileged high-speed flows over prioritizing human life. Regardless of how this is approached, though, a greater value for human life must clearly go hand-in-hand with the struggle to achieve a just city, and if concepts such as the right to the city and gentrification can become topics of popular debate and activism, then certainly the same should be possible for the issue of vehicular violence. However, this requires us to aggressively address the issue of death and the car as an unjust social problem and actively combatting it – because at least for the near and middle term, vehicular violence isn’t going anywhere.

Acknowledgements

This research is part of a larger research project funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) CU 334/1-1. I must thank Lukas Fieber for his gracious help with the physics. I also thank Franziska Kirschner for her constructive feedback on a draft of this paper.

References

- AAA (American Automobile Association). 2015. American Driving Survey: Methodology and Year One Results, May 2013-May 2014. http://newsroom.aaa.com/wp-content/uploads/2015/04/REPORT_American_Driving_Survey_Methodology_and_year_1_results_May_2013_to_May_2014.pdf
- Alliance for Biking and Walking. 2014. Bicycling and Walking in the United States: 2014 Benchmarking Report.

- <https://www.bikewalkalliance.org/storage/documents/reports/2014BenchmarkingReport.pdf>
- Alliance for Biking and Walking. 2016. Bicycling and Walking in the United States: 2016 Benchmarking Report. <https://www.bikewalkalliance.org/download-the-2016-benchmarking-report>
- Anderson, Michael and Maximilian Auffhammer. 2014. Pounds that kill: The external costs of vehicle weight. *The Review of Economic Studies*, 81(2), 535-571.
- Beckmann, Jörg. 2004. Mobility and safety. *Theory, Culture & Society*, 21(4-5), 81-100.
- Blomley, Nicholas. 2007. Civil rights meet civil engineering: Urban public space and traffic logic. *Canadian Journal of Law and Society*, 22(2), 55-72.
- Böhm, Steffen, Campbell Jones, Chris Land and Matthew Paterson. 2006. Introduction: Impossibilities of automobility. In, Steffen Böhm, Campbell Jones, Chris Land and Matthew Paterson (eds.), *Against Automobility*. Malden, MA: Blackwell, pp. 3-16.
- Buehler, Ralph. and Pucher, John. (2012). Walking and Cycling in Western Europe and the United States: Trends, Policies, and Lessons. *TR News*, 280 (May-June), 34-42.
- CDC (Centers for Disease Control and Prevention). 2012. Motor Vehicle Crash Injuries. <http://www.cdc.gov/vitalsigns/crash-injuries/index.html>
- CDC (Centers for Disease Control and Prevention). 2013a. Motor Vehicle Traffic-Related Pedestrian Deaths – United States, 2001-2010. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6215a1.htm>
- CDC (Centers for Disease Control and Prevention). 2013b. State-Specific Costs of Motor Vehicle Crash Deaths. <http://www.cdc.gov/motorvehiclesafety/statecosts/index.html>
- CDC (Centers for Disease Control and Prevention). 2014a. 10 Leading Causes of Death, United States: 2014, All Races, Both Sexes [Table]. http://webappa.cdc.gov/sasweb/ncipc/leadcaus10_us.html
- CDC (Centers for Disease Control and Prevention). 2014b. 10 Leading Causes of Unintentional Injury Deaths, United States: 2014, All Races, Both Sexes [Table]. http://webappa.cdc.gov/sasweb/ncipc/leadcaus10_us.html
- CDC (Centers for Disease Control and Prevention). 2015a. Seat Belts: Get the Facts. Retrieved June 15 2016 from <http://www.cdc.gov/motorvehiclesafety/seatbelts/facts.html>
- CDC (Centers for Disease Control and Prevention). 2015b. Teen Drivers. http://www.cdc.gov/motorvehiclesafety/teen_drivers/

- Chong, Shanley, Roslyn Poulos, Jake Olivier, Wendy L. Watson and Raphael Grzebieta. 2010. Relative injury severity among vulnerable non-motorised road users: Comparative analysis of injury arising from bicycle-motor vehicle and bicycle-pedestrian collisions. *Accident Analysis and Prevention*, 42(1), 290-296.
- Cidell, Julie and David P. Prytherch (eds.). 2015. *Transport, mobility, and the production of urban space*. New York: Routledge.
- Cidell, Julie. 2015. Uncanny Trains: Cities, Suburbs, and the Appropriate Place and Use of Transportation Infrastructure. In, Julie Cidell and David Prytherch (eds.), *Transport, Mobility, and the Production of Urban Space*. New York: Routledge, 134-150.
- City of New York. 2014. 25 Mile Speed Limit FAQ. <http://www.nyc.gov/html/dot/downloads/pdf/2014-10-twenty-five-mile-speed-limit-faq.pdf>
- Citystreets.org. 2013. The First Pedestrian Fatality. <http://citystreets.org/projects/bliss-plaque/>
- Cooter, Roger and Bill Luckin. 1997. In, Roger Cooter and Bill Luckin (eds.), *Accidents in history: injuries, fatalities and social relations*. Amsterdam and Atlanta: Editions Rodopi, pp. 1-16.
- Culver, Gregg. 2015. A bridge too far: Traffic engineering science and the politics of rebuilding Milwaukee's Hoan Bridge. In, Julie Cidell and David Prytherch (eds.), *Transport, Mobility, and the Production of Urban Space*. New York: Routledge, 81-99.
- Culver, Gregg. 2016. Moving forward or taking a stand?: Discourses surrounding the politics of Wisconsin High-Speed Rail. *Mobilities*, 11(5), 703-722.
- Culver, Gregg. 2017. Mobility and the Making of the Neoliberal Creative City: The Streetcar as a Creative City Project? *Journal of Transport Geography*, 58, 22-30.
- Culver, Gregg. 2018. Bike helmets – a dangerous fixation? On the bike helmet's place in the cycling safety discourse in the United States. *Applied Mobilities*, DOI: 10.1080/23800127.2018.1432088
- Department of Veterans Affairs. 2015. America's Wars. http://www.va.gov/opa/publications/factsheets/fs_americas_wars.pdf
- Dumoucel, Caroline. 2010, September 3. Paul Virilio [Interview]. Vice Media. <https://www.vice.com/read/paul-virilio-506-v17n9>
- FARS (Fatality Analysis Reporting System). 2016. National Statistics. National Highway Traffic Safety Administration.
- FBI (Federal Bureau of Investigation). 2015. Uniform Crime Report: Crime in the United States, 2014. [https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-](https://www.fbi.gov/about-us/cjis/ucr/crime-in-the)

- u.s./2014/crime-in-the-u.s.-2014/offenses-known-to-law-enforcement/murder/murder/murder.pdf
- Featherstone, Mike. 2004. Automobilities: An Introduction. *Theory, Culture & Society*, 21(4-5), 1-24.
- Foletta, Nicole and Jason Henderson. 2016. *Low Car(bon) Communities: Inspiring Car-free and Car-lite Urban Futures*. Abingdon: Routledge.
- Foucault, Michel. 2004. *Security, Territory, Population*. New York: Palgrave MacMillan.
- Freund, Peter and George Martin. 2007. Hyperautomobility, the Social Organization of Space, and Health. *Mobilities*, 2(1), 37-49.
- Goddard, Tara, Kimberly Barsamian Kahn and Arlie Adkins. 2015. Racial bias in driver yielding behavior at crosswalks. *Transportation Research Part F: Traffic Psychology and Behaviour*, 33, 1-6.
- Gössling, Stefan. 2016. Urban Transport Justice. *Journal of Transport Geography*, 54, 1-9.
- Graw, Matthias and Hans Günter König. 2002. Fatal pedestrian-bicycle collisions. *Forensic Science International*, 126(3), 241-247.
- Gresser, Edward. 2014, July 16. Traffic accidents kill 1.24 million people a year worldwide; wars and murder, 0.44 million. *Progressive Economy*. http://www.progressive-economy.org/trade_facts/traffic-accidents-kill-1-24-million-people-a-year-worldwide-wars-and-murders-0-44-million/
- Harper, Sam, Thomas J. Charters and Erin C. Strumpf. 2015. Trends in Socioeconomic Inequalities in Motor Vehicle Accident Deaths in the United States, 1995-2010. *American Journal of Epidemiology*, 182(7), 606-614.
- Henderson, Jason. 2006. Secessionist Automobility: Racism, Anti-urbanism, & the Politics of Automobility in Atlanta, Georgia. *International Journal of Urban & Regional Research*, 30(2), 293-307
- Henderson, Jason. 2009. The spaces of parking: Mapping the politics of mobility in San Francisco. *Antipode*, 41(1), 70-91.
- Henderson, Jason. 2011. The politics of mobility in the south: a commentary on sprawl, automobility, and the gulf oil spill. *Southeastern Geographer*, 51(4), 641-649.
- Henderson, Jason. 2013. How We Get There Matters: Ideologies of Mobility. In *Street Fight: The Politics of Mobility in San Francisco*, Amherst and Boston: University of Massachusetts Press, pp. 17-37.
- Huber, Matthew T. 2009. The use of gasoline: Value, oil, and the “American way of life”. *Antipode*, 41(3), 465-486.

- Jacobsen, Peter Lyndon 2003. Safety in numbers: more walkers and bicyclist, safer walking and bicycling. *Injury Prevention*, 9, 205-209.
- Jain, Sarah S. Lochlann 2004. "Dangerous instrumentality": the bystander as subject in automobility. *Cultural Anthropology*, 19(1), 61-94.
- Kravetz, Daniel and Robert Noland. 2012. Spatial Analysis of Income Disparities in Pedestrian Safety in Northern New Jersey. *Journal of the Transportation Research Board*, 2320, 10-17.
- Kröyer, Höskuldur R.G. 2015. The relation between speed environment, age and injury outcome for bicyclists struck by a motorized vehicle – a comparison with pedestrians. *Accident Analysis and Prevention*, 76, 57-63.
- MacGregor, David. 2009. The Safety Race: Transitions to the Fourth Age of the Automobile. In, Jim Conley and Arlene Tigar McLaren (eds.), *Car Troubles: Critical Studies of Automobility and Auto-Mobility*. Farnham: Ashgate, pp. 181-196.
- Maciag, Mike. 2014. Pedestrians Dying at Disproportionate Rates in America's Poorer Neighborhoods. *Governing*. <http://www.governing.com/topics/public-justice-safety/gov-pedestrian-deaths-analysis.html>
- Males, Mike A. 2009. Poverty as a determinant of young drivers' fatal crash risks. *Journal of Safety Research*, 40(6), 443-448.
- Minn, Michael. (2013). The political economy of high speed rail in the United States. *Mobilities*, 8(2), 185-200.
- National September 11 Memorial & Museum. 2016. FAQ about 9/11. <http://www.911memorial.org/faq-about-911>
- New York Times. 1899, September 14. Fatally Hurt By Automobile. <http://query.nytimes.com/mem/archive-free/pdf?res=9C05E0DC173DE433A25757C1A96F9C94689ED7CF>
- NHTSA (National Highway Traffic Safety Administration) 2010. An Analysis of the Significant Decline in Motor Vehicle Traffic Fatalities in 2008. <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811346>
- NHTSA (National Highway Traffic Safety Administration). 2011. Traffic Fatalities in 2010 Drop to Lowest Level in Recorded History. <http://www.nhtsa.gov/PR/NHTSA-05-11>
- NHTSA (National Highway Traffic Safety Administration). 2015a. Early Estimate of Motor Vehicle Traffic Fatalities for the First Half (Jan – Jun) of 2015. <http://www-nrd.nhtsa.dot.gov/Pubs/812217.pdf>
- NHTSA (National Highway Traffic Safety Administration). 2015b. Traffic fatalities fall in 2014, but early estimates show 2015 trending higher. <http://www.nhtsa.gov/About+NHTSA/Press+Releases/2015/2014-traffic-deaths-drop-but-2015-trending-higher>

- Nixon, Denver V. 2014. Speeding capsules of alienation? Social (dis)connections amongst drivers, cyclists and pedestrians in Vancouver, BC. *Geoforum*, 54, 91-102.
- Norton, Peter D. 2008. *Fighting Traffic: The Dawn of the Motor Age in the American City*. Cambridge, MA: MIT Press.
- NSC (National Safety Council). 2016, February 17. Motor Vehicle Deaths Increase by Largest Percentage in 50 Years. <http://www.nsc.org/Connect/NSCNewsReleases/Lists/Posts/Post.aspx?ID=103>
- Packer, Jeremy. 2008. *Mobility without mayhem: Safety, cars, and citizenship*. Durham, NC: Duke University Press.
- Paterson, Matthew. 2007. *Automobile politics: ecology and cultural political economy*. Cambridge: Cambridge University Press.
- Pereira, Rafael H., Schwanen, Tim and Banister, David. 2017. Distributive justice and equity in transportation. *Transport Reviews*, 37(2), 170-191.
- Prytherch, David L. 2012. Codifying the Right-of-Way: Statutory Geographies of Urban Mobility and the Street. *Urban Geography*, 33(2), 295-314.
- Prytherch, David L. and Dominique T. Daly. 2015. Rights and Duties of Circulation on American Streets: To 'Proceed Uninterruptedly' or 'with Reasonable Care?'. *Mobilities*, 10(2), 211-229.
- Revington, Nick. 2015. Gentrification, Transit, and Land Use: Moving Beyond Neoclassical Theory. *Geography Compass*, 9(3), 152-163.
- Reynolds, Conor C.O., M. Anne Harris, Kay Teschke, Peter A. Cripton and Meghan Winters. 2009. The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature. *Environmental Health*, 8(47), 1-19.
- Robinson, Dorothy L. 2005. Safety in numbers in Australia: more walkers and bicyclists, safer walking and bicycling. *Health Promotion Journal of Australia*, 16(1), 47-51
- Sadik-Khan, Janette and Seth Solomonow. 2017. *Street Fight: handbook for an urban revolution*. New York: Viking.
- Sheller, Mimi and John Urry. 2000. The city and the car. *International journal of urban and regional research*, 24(4): 737-757.
- Short, John Renne and Luis Mauricio Pinet-Peralta. 2010. No Accident: Traffic and Pedestrians in the Modern City. *Mobilities*, 5(1), 41-59.
- Smart Growth America. 2014. Dangerous by Design 2014. <http://www.smartgrowthamerica.org/documents/dangerous-by-design-2014/dangerous-by-design-2014.pdf>

- Soja, Edward. 2010. *Seeking Spatial Justice*. Minneapolis: University of Minnesota Press.
- Springer, Simon and Philippe Le Billon. 2016. Violence and space: An introduction to the geographies of violence. *Political geography*, 52, 1-3.
- Stehlin, John. 2015. Cycles of investment: bicycle infrastructure, gentrification, and the restructuring of the San Francisco Bay Area. *Environment and Planning A*, 47(1), 121-137.
- Tefft, Brian C. 2013. Impact speed and a pedestrian's risk of severe injury or death. *Accident Analysis and Prevention*, 50, 871-878.
- Urry, John. 2004. The 'System' of Automobility. *Theory, Culture, Society*, 21(4/5), 25-39.
- U.S. Census Bureau; American Community Survey. 2013. American Community Survey 3-Year Estimates, Table B08301. <http://factfinder2.census.gov/>
- Virilio, Paul. 2007. *The original accident*. Cambridge, UK: Polity.
- Walks, Alan. Stopping the 'War on the Car': Neoliberalism, Fordism, and the Politics of Automobility in Toronto. *Mobilities*, 10(3), 402-422.
- Warlick, Sam. 2014, August 29. Inside Dangerous by Design: Pedestrian fatalities among people of color. Smart Growth America. <http://www.smartgrowthamerica.org/2014/08/29/inside-dangerous-by-design-pedestrian-fatalities-among-people-of-color/>
- Wells, Peter and Dimitrios Xenias. 2015. From 'freedom of the open road' to 'cocooning': Understanding resistance to change in personal private automobility. *Environmental Innovation and Societal Transitions*, 16, 106-119.
- Wells, Peter and Malcolm J. Beynon. 2011. Corruption, automobility cultures, and road traffic deaths: the perfect storm in rapidly motorizing countries? *Environment and Planning A*, 43(10), 2492-2503.
- Wells, Peter. 2007. Deaths and injuries from car accidents: an intractable problem? *Journal of Cleaner Production*, 15, 1116-1121.
- WNYC. 2015. Mean Streets. <http://project.wnyc.org/traffic-deaths-2015/>
- Žižek, Slavoj. (2008). *Violence: Six sideways reflections*. New York: Picador.