

# **Road Safety Policies in Europe For Improving Pedestrian Environment : Lessons from France and Sweden**

## **ABSTRACT**

This study reviews how pedestrian safety programs in France and Sweden reduced the number of pedestrian fatalities and examines what can be implemented in the U.S. Primary focuses are on four road safety measures and their impacts on pedestrian safety outcomes: measures for (1) improving driver behavior; (2) sharing level of responsibility on roads; (3) improving built environment; and (4) promoting safety campaigns and educational programs. While their main strategies to improve pedestrian safety differed in both countries, a major similarity was the emphasis on shifting the responsibility of road safety from “road-users” to “decision-makers.”

## **KEYWORDS**

Pedestrian safety, pedestrian collision, road safety, France, Sweden, Vision Zero, transportation policy

## INTRODUCTION

For more than a decade, efforts to improve mobility and road infrastructure have been central to the conventional transportation policy in the United States. However, less attention has been devoted to improve pedestrian environment and the policies focused more on increasing mobility have created spatial disparities between road users: pedestrians, often called “vulnerable” road users, are more exposed to unsafe road environments than drivers. Today, traffic-related injuries affect a number of pedestrian lives in the U.S. According to 2009 National Household Travel Survey, 10.4 percent of all trips taken in the U.S. were on foot. In the same year, 4,019 pedestrians were killed, accounting for nearly 12 percent of the total traffic fatalities (IRTAD, 2011). Also, the probability of a pedestrian being killed on the U.S. roads significantly increased (Santos et al., 2009). Transportation policy should prioritize safe and affordable transportation options, such as walking and bicycling, for everyone and encourage equitable transportation investments for transportation-disadvantaged communities.

In a global context, there has been an effort to develop understandings of how to moderate pre-crash behaviors by implementing road safety policy, rather than superimposing engineering solutions to address collisions where they have already occurred. This perspective significantly improved pedestrian safety in some high-income European countries. According to the 2013 World Health Organization report, between 1995 and 2009, annual pedestrian fatalities declined by 38 percent in the top fifteen high-income countries, excluding the U.S., compared to 12 percent decrease in the United States. Although some states have fatality rates comparable to the high-income nations, no state matched the typical speed of pedestrian safety improvement in those best-performing countries (Transportation Research Board, 2011). The gap between safety progress in the U.S. and other high-income countries indicates that the U.S. may need more effective interventions to reduce pedestrian injuries and deaths. Therefore, studies on examining the strategies of implementing pedestrian safety programs in other high-income nations are necessary.

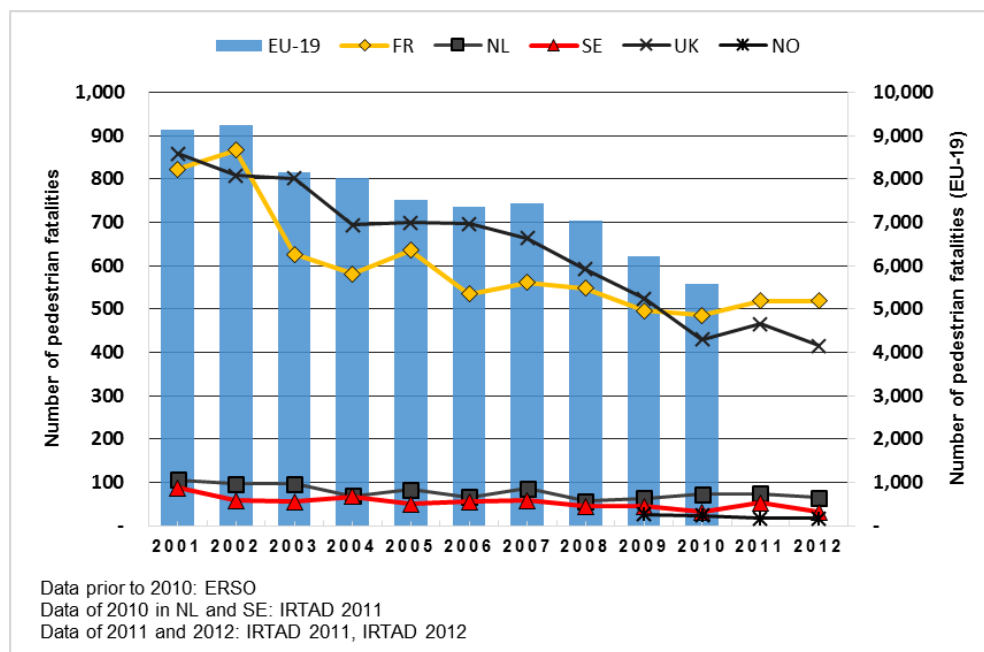
The principal goal of this research is to examine how the best-performing European countries have improved pedestrian safety and to explore the implementation strategies which could be modified in the U.S. The first part of this paper arrays the successful efforts of model countries to reduce pedestrian collisions. The second part reviews the cases of France and Sweden in detail and concludes by suggesting potential strategies for decision-makers in the U.S. to improve pedestrian safety effectively.

## CASESTUDIES

### Efforts to Reduce Pedestrian Collisions in European Union

During the last several decades, a number of pedestrian safety measures have been implemented worldwide, largely in developed countries. The European Union (EU), for example, reduced the death rate by 39 percent from 2001 to 2010, partly as a result of national policies, public education, and campaigns to make roads safer (Pace et al., 2012).

Pedestrian safety outcomes of some EU countries have improved in a short period of time: only since the 1980s, there has been an understanding about the need for road planning for pedestrian safety and in the mid-1990s, related policies were implemented (International Transportation Forum, 2012). The efforts have been led by cooperative parties, including professionals, politicians, the publics, and transportation-related institutions, working toward “zero death” on the roads. Some leading countries have achieved high reductions in pedestrian deaths. In 1994, Sweden launched its “Vision Zero” program and the Netherlands adopted “Sustainable Safety” strategy. Similarly, Norway, France, and the United Kingdom (UK) have continued their road safety interventions (Hauer and Brustlin, 2010). These countries are known for effective long-term preventive strategies that help reduce the considerable costs of pedestrian injuries (e.g., costs for care) and save the lives of pedestrians (Figure 1).



**Figure 1** Pedestrian fatalities per million inhabitants by EU-24 country in 2010 (Data source: Pace et al. 2011, 4)

Pedestrian safety is also a primary concern in the United States. From 2001 to 2010, the pedestrian death rate was reduced by 12.6 percent, while total road deaths were reduced by 22 percent (National Highway Traffic Safety Administration, 2012). Compared to the death reduction rate of the EU nations during the same period (39 percent), the U.S. figures still lag behind. Therefore, there is a potential to reduce pedestrian collisions by applying the lessons of effective cases. A good starting point for this would be to understand the backgrounds, policy implementation strategies, and results of the safety policies in selected countries. This research focuses on four road safety measures and their impacts on pedestrian safety:

- Measures for improving driver behavior;
- Measures for allocating level of responsibility on roads;
- Measures for improving built environmental factors; and
- Measures for safety campaigns and educational programs.

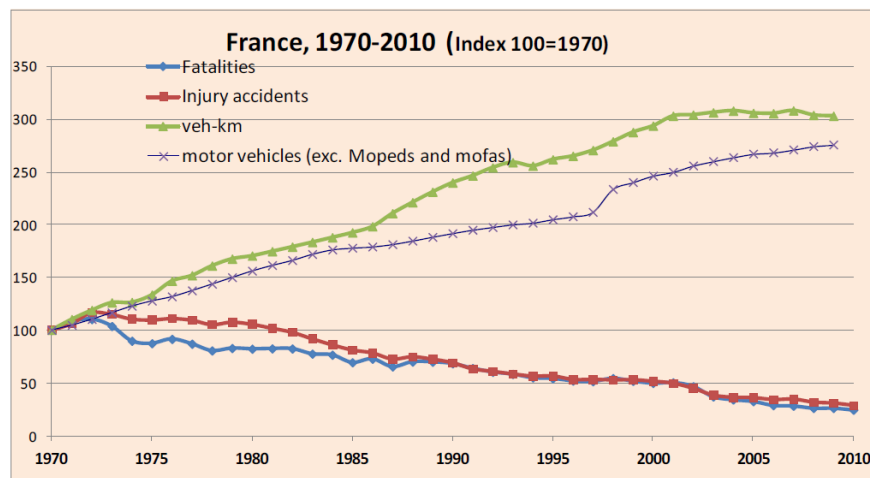
As mentioned above, this paper reviews the cases of France and Sweden. France implemented strong enforcement and education for road safety, while Sweden focused more on improving road infrastructure and design. Moreover, strong political commitments and diverse groups working for pedestrian safety in both countries add valuable lessons for future pedestrian safety programs.

## Road Safety Programs in France and Sweden

### France (2002-2005)

In France, strict road enforcements have made considerable progress in road safety. France has achieved among the steepest declines in road fatality rate between 1997 and 2008 of all the OECD countries: reducing fatalities per vehicle kilometer travelled by 6.9 percent (TRB, 2011). The 1997 and subsequent French road safety programs were effective in reducing pedestrian crashes without any specific pedestrian safety targets. Its main principle on altering drivers' behaviors by enforcement and education, significantly improved pedestrian safety significantly.

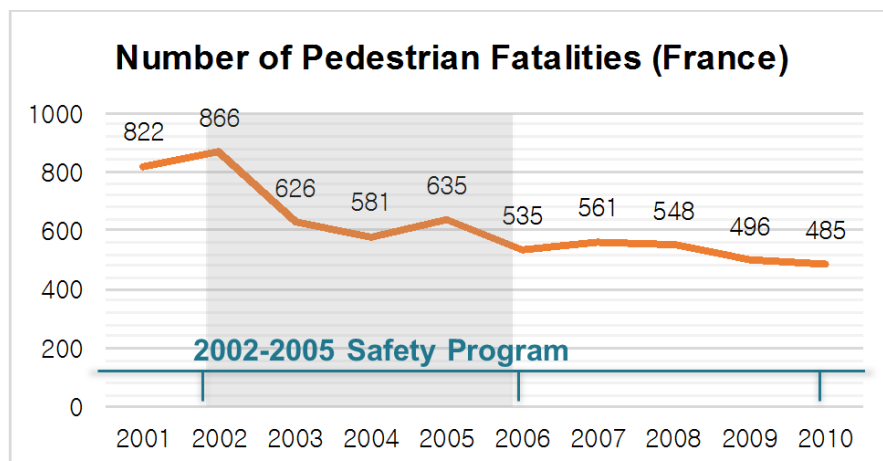
Since the 1970s, the number of deaths on the roads increased (Figure 2) (IRTAD, 2009). In 1973, there was a major change in legislation as a primary solution to reduce road injuries: blanket speed limits and compulsory seatbelt-wearing were introduced, and a law on drunk-driving was established. Moreover, Prime Minister Jacques Chaban-Delmas implemented an extraordinary media campaign, promoting safe road behavior—"Keep your speed down and don't drink and drive"—and attracted public participation (Gerondeau 2006). In 1997, the French Inter-ministerial Road Safety Committee set an ambitious target to reduce road fatalities from about 8,000 (number of deaths in 1996) to 4,000 by 2002 to achieve marked improvement in road safety for the first time, but there was no remarkable decline in road users. Also, the level of enforcement in France was still one of the lowest in Europe (Muhlrad, 2006).



**Figure 2** Reported road fatalities, injury crashes, motorized vehicles, and vehicle-kilometers in France, 1970-2010 (Source: IRTAD 2011, 133)

In 2002, there was a considerable change in public attitudes to improve road safety originating from President Chirac's victory speech. The president announced priorities for his upcoming five-year term of office (2002-2007), one of which was to improve road safety. He described his own crash experience during a speech. This deeply-felt commitment was effective at raising the public's and politicians' awareness of road safety (Gerondeau, 2006). Affected by the president's charismatic leadership, the Inter-ministerial Road Safety Committee (CISR) launched the 2002-2005 Road Safety policy. About 1,000 fixed radar units were installed throughout France in 2002 and an additional 500 mobile units were installed in the following year to enforce driver speeding behavior by an automatic control system (Hauer and Brustlin, 2010). Serious speed enforcement, strong political commitment, and active public support have shown successful improvements in pedestrian safety outcome, especially in drivers' behavioral adaptation, without rigorous infrastructure-oriented development in France (Hauer and Brustlin, 2010).

Between 2002 and 2007, France achieved a 43 percent reduction in transportation-related mortality rates, after its 2002-2005 road safety policy initiative. The efforts to reduce alcohol consumption before driving, speeding, and mobile-use while driving profoundly helped improve pedestrian safety. Finally, in 2010, France reached its lowest overall road fatality level since its crash data records had begun in the 1970s (IRTAD, 2013). Focusing on the 2002-2005 French Road Safety program, there was a remarkable reduction in the number of pedestrian fatalities: 37.4 percent of pedestrian deaths reduced (Figure 3).



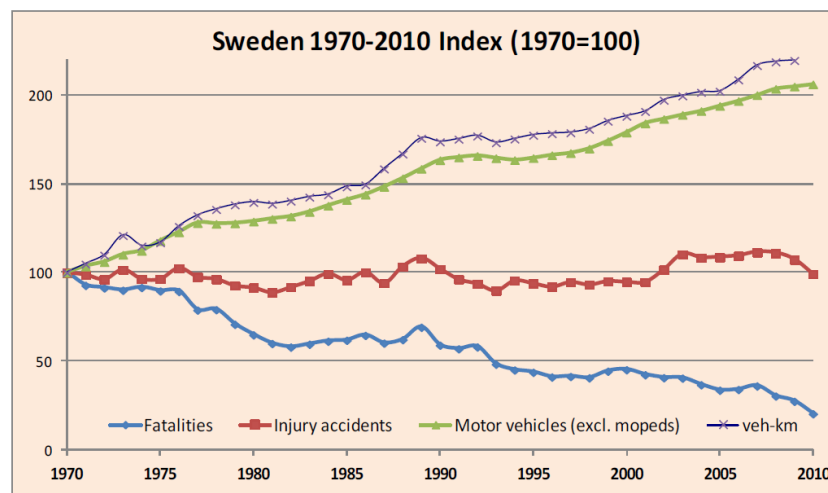
**Figure 3** Number of Pedestrian fatalities in France by year, 2001-2010 (Data: CARE Database, 2012)

### Sweden (1997-2007): Vision Zero

Sweden is one of the leading countries that managed to substantially reduce pedestrian fatalities. The main changes investigated by the Swedish Road Administration (SRA) were new ways of allocating responsibilities and improving road infrastructures and facilities for safe road environment.

Traffic safety in Sweden has been a priority since 1967, when the Swedish government decided to change its traffic system from moving on the left-hand to the right-hand side of the roadway (Koornstra et al., 2002). During the late 1960s and early 1970s, the Swedish Road Safety Office was established and they tested various speed limits to ensure a safe road environment for all road users, especially for pedestrians. With these efforts, Sweden's rate of traffic fatalities per vehicle kilometer travelled has reduced and been among the lowest of the OECD countries since the late 1970s (TRB, 2011).

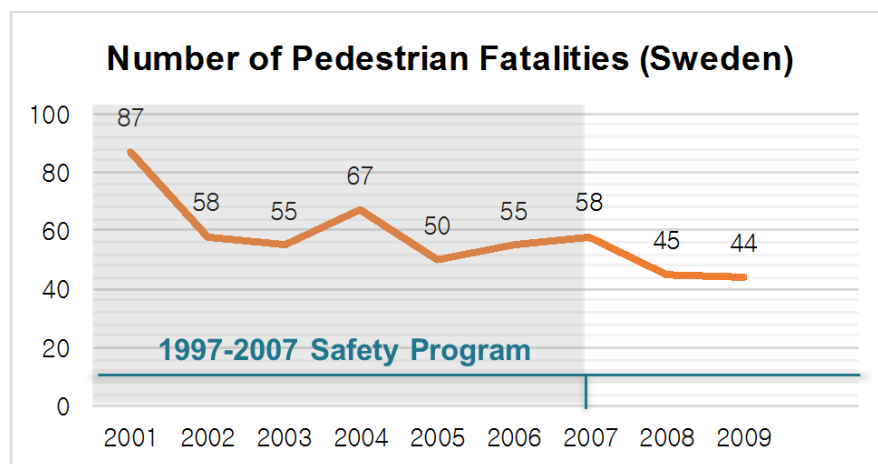
In order to further improve road safety outcomes, SRA launched "Vision Zero" program in 1997. This program is still known for its radical policy principles which aim to eliminate any severe injuries or fatalities on the road (Belin, Tillgren, and Vedung, 2012). Vision Zero starts with the idea that "human make mistakes". Based on this principle, the Swedish Road Authorities and traffic regulators aimed to provide a transportation system that was "forgiving [of] the errors of drivers" (TRB, 2011): focused on adapting the road system to the individual and his or her capacities rather than adapting individual behavior to the road system (Belin et al., 2012).



**Figure 4** Evolution in numbers of road fatalities, injury crashes, distance travelled, and vehicles-km in Sweden, 1970-2010 (Source: IRTAD 2011, 300)

Also, Vision Zero's new responsibility allocation strategy to call for experts to have causal responsibility for safety issues, not the road users, has reduced road injuries by 2-3 percent annually (Johansson, 2009). Moreover, its innovative traffic management principles, such as limiting vehicular speed to 30 km/h (20 mph), a speed which does not exceed human tolerance, have been one of the unique interventions to control speeding and ultimately prevented pedestrian fatality rates. Similar innovative upgrades have been applied to mode-split (e.g., vehicles exceeding 70 km/h or 40 mph must be separated by barriers) and intersection design (e.g., roundabouts and 1+2 lanes).

Focusing on the period of 1997-2007, the number of pedestrian fatalities was cyclical but reduced by 33.3 percent (Figure 5).



**Figure 5** Number of Pedestrian Fatalities in Sweden by year, 2001-2010 (Data Source: Pace et al. 2012)

### **Measures for Improving Driver Behaviors**

- *France:* Among three different regulations (i.e. laws and sanctions for drunk-driving, speeding, and mobile-use while driving), strong enforcements on speeding behavior, including fixed penalty and point-demerit systems were effective to improve driver behaviors in France (Gerondeau, 2006). Between 2001 and 2005, speeding violations had decreased by 30 percent, and pedestrian fatality rates dropped by 22.7 percent during the same period (Année, 2005; Hauer and Brustlin, 2010).
- *Sweden:* Sweden's 1997-2007 Vision Zero emphasized the control of speeding which took the view that vehicle speeds should not exceed the level of human tolerance (Retting and Knipling, 2010). Much less attention, however, was drawn to enforce mobile-use while driving. Sweden still has no regulations on mobile-use, whether hand-held or hands-free, while driving. The government strongly believes that such communication devices have positive effects on saving lives on the roads (e.g., allowing faster emergency calls) (Vadeby et al., 2012).



### ***Measures for Allocating Level of Responsibility on Roads***

- *France:* In France, the primary responsibility for road crashes was on “everyone”, which includes all road users, policy-makers, and road designers (Gerondeau, 2006). Less blame was put on pedestrians when the pedestrian-automobile crash occurred, and the government shared the main responsibilities for road collisions. This principle of responsibility-share helped alter individuals’ attitudes toward road safety. However, no public report indicates what proportion of decreased pedestrian fatalities was due to this principle.
- *Sweden:* The Vision Zero approach placed the main burden for safety on transportation system designers (e.g., road managers, politicians, police, and transport carriers) by “recognizing humans’ weaknesses (Johansson, 2009).” If road users fail to obey traffic rules or if crashes occur, the system designers were required to take any necessary further steps. Thus, system designers played an important role in reducing pedestrian fatalities and serious injuries in Sweden (Belin et al., 2012).

### ***Measures for Improving Built Environmental Factors***

- *France:* While there was a strong political will to improve road safety between 2002 and 2005, less attention was given to the environmental modifications and technical solutions in France. New speed limits were implemented on urban and rural roads: 50 km/h (30 mph) and 90 km/h (50 mph), respectively (SWOV, 2001). However, the new speed limits were still fatal for pedestrians, and the French government decided to adopt a “30 km/h zone” for the 2006-2009 safety program (Murard, 2009).
- *Sweden:* In 1997, the Swedish government started to build roads with features that ensure low injury risk of pedestrians, which largely determined the opportunity of infrastructure project investments at that time (TRB, 2011). The Swedish Road Authorities implemented various environmental modifications of separating or combining different travel modes. Moreover, planners, engineers, and architects collaborated to ensure the safety of non-motorized traffic in urban areas based on the “Calm Street” design guidelines which aimed to minimize the conflicts between motorized and non-motorized traffic (McAndrews, 2013). Further efforts in improving road design were also based on Vision Zero principles: the construction of “roundabouts” was popular and these were effective at reducing critical pedestrian injuries on urban roads by reducing vehicle speeds. On rural roads, “2+1 road” with a median barrier design replaced conventional two-lane roads, which helped reduce severe crashes on rural roads by more than 75 percent (IRTAD, 2009).

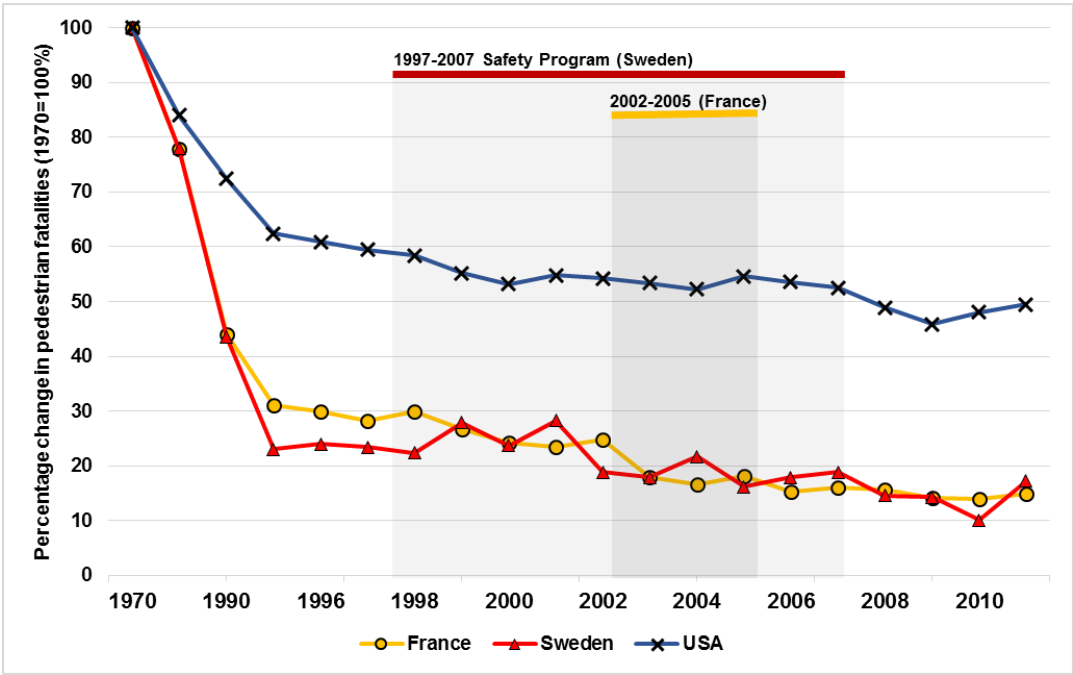


**Figure 6** Roundabout (on left) and a 2+1 road with a center barrier (on right) (Source: Derr. 2003, 13)

### **Measures for Safety Campaigns and Educational Programs**

- *France:* The French government has been very active in carrying out safety campaigns to improve road user behavior since the 1970s. These efforts were even more effective along with new policy implementations in 2002: media campaigns successfully improved driver behavior along with the new automatic control and sanction system. Within a year, between 2002 and 2003, road fatalities dropped by 21 percent and pedestrian fatalities decreased by 27.7 percent (Pace et al. 2012). In terms of safety education, a life-long education program, starting from primary school, enabled France to achieve continuous reduction in the number of deaths. Also, the safety certificate program for young road users of different age groups highlighted the successful educational measures in France (Kwasniak, 2009).
- *Sweden:* Compared to France, the efforts to educate younger road users have been less active in Sweden. Road safety education (e.g., teaching crossing skills) was part of the official school curriculum, but it was not mandatory: each school decided on its extent (Dragutinovic and Twisk, 2006).

Overall, the road safety programs in France and Sweden are examples of a process seeking to redefine experts' political responsibilities and to improve built environments to raise safety awareness among all road users. Despite recent improvements in road safety in the United States, the current pedestrian safety level is far below the level of the best-performing countries (ITF, 2012). Compared to the pedestrian death reduction rate of France and Sweden between 1970 and 2011, the U.S. figures still lag behind: total pedestrian fatalities declined by 85 and 82 percent in France and Sweden, respectively. By contrast, there was only a 51 percent fall in pedestrian deaths in the U.S. over the same period (Figure 7).



**Figure 7** Trends in pedestrian fatalities in France, Sweden, and the US, 1970-2011 (1970=100%)  
 (Data source: IRTAD 2011, 2013 for France and Sweden and NHTSA 1990, 2001, 2009, 2010 for the US figures)

In France and Sweden, as discussed above, public officials hold causal responsibility for road safety policy and undertake rigorous interventions to reduce pedestrian deaths on roads. The gap between road safety progress in France and Sweden, and the U.S. indicates that the U.S. may be missing important opportunities to improve pedestrian safety. With respect to implementing safety strategies of case countries into context in the U.S., the first step should include raising public safety awareness by ensuring traffic injuries as a social problem, not a private problem: raise the safety “culture” of society.

## CONCLUSION

One of the most important aspects for New Urbanism is to design places for the comfort of the pedestrians. Pedestrian safety, however, is an issue in most communities in the U.S today: conventional transportation planning undervalues the impacts of safety on equity and health. Safety-conscious transportation planning will not only create walkable neighborhoods, but also connect more people to various opportunities. Ultimately, safe walking environment will create more equitable society by providing more accessible and affordable mode of transport for everyone.

Sweden has not achieved the rapid rate of decline in the pedestrian fatality rate that France has experienced during its safety program period, but both countries have seen a reduction of more than 80 percent since 1970. By contrast, the pedestrian fatality rate in the United States has decreased by less than 50 percent since 1970. Part of the reasons are because U.S. transportation policies have underemphasized the need for improving unsafe road behavior, and focused more on improving vehicles and road infrastructures (McAndrews, 2010).

Although, the U.S. is a larger country than France and Sweden, and most U.S. cities were designed to encourage auto-oriented development over the decades, the findings suggest that the strategies from Europe can potentially be modified and implemented in the United States. In general, the implementation of new safety interventions in the U.S. should involve raising awareness among the public and encouraging decision-makers to more effectively improve walking environments. Also, the strategies of combining different measures (e.g., implementing new speed limits and safety education at the same time) through an active collaboration between experts from different fields will help increase pedestrian safety more effectively. More importantly, legitimate road safety interventions must be consistent with the overall goals for the transportation planning system.

Along these lines, further research on how planners and professionals in other fields (e.g., architecture, public health, and public policy) can support pedestrian safety should be carried out. Currently, in the U.S., pedestrian safety is a transportation and public health problem, but as noted throughout this study, safety components should be recognized as a land-use, design, and policy problem too. Therefore, future research is needed that examines how planners, states' or cities' safety program (e.g., Complete Streets or Safe Routes to School) managers, and other decision-makers can help raise the salience of pedestrian safety in the U.S. and shift the balance of road safety responsibility to reflect experts' roles in system risk.

## REFERENCES

- Annee, Bilan Del'. 2005. "La Sécurité Routière En France". Paris.
- Belin, Matts-Åke, Per Tillgren, and Evert Vedung. 2012. "Vision Zero-A Road Safety Policy Innovation." *International Journal of Injury Control and Safety Promotion* s19 (2) (January): 171–9.
- Hiron, Benoit. 2008. "Sharing the street in urban areas: the example of the "code de la rue" (street use code) in France." Center for Studies on Urban Planning, Transportation and Public Facilities (CERTU). Presentation: 2012 Annual Conference of the Transportation Association of Canada in Fredericton.
- Derr, Ray. 2003. "Application of European 2+1 Roadway Design." *Transportation Research Board* (275) (April).
- Dragutinovic, Nina, and Divera Twisk. 2006. "The Effectiveness of Road Safety Education: A Literature Review". Leidschendam, The Netherlands.
- Ekman, Lars and Hyden, Christer. 1999. "Pedestrian Safety in Sweden." Federal Highway Administration (FHWA-RD-99-091) (December).
- Gerondeau, Christian. 2006. "Road Safety in France: Reflections on Three Decades of Road Safety Policy." FIA Foundation for the Automobile and Society.
- Hauer, Ezra, and Vanasse Hangen Brustlin. 2010. "White Papers for 'Toward Zero Deaths', A National Strategy on Highway Safety: 9. Lessons Learned from Other Countries". Washington, D.C.
- IRTAD. 2009. "Road Safety Annual Report 2009."
- . 2011. "Road Safety Annual Report 2011."
- . 2013. "Road Safety Annual Report 2013."
- International Transportation Forum (ITF). 2012. "Pedestrian Safety, Urban Space and Health." OECD Publishing.
- Johansson, Roger. 2009. "Vision Zero – Implementing a Policy for Traffic Safety." *Safety Science* 47 (6) (July): 826–831.
- Koornstra, Matthijs, David Lynam, Göran Nilsson, Piet Noordzij, Hans-Erik Pettersson, Fred Wegman, Peter Wouters, and SWOV. 2002. "SUNflower: A Comparative Study of the Development of Road Safety in Sweden, the United Kingdom, and the Netherlands". Leidschendam.
- Kwasniak, Andrew. 2009. "French Lessons: A Review of an Effective Road Safety Program." Institute of Transportation Engineers. *ITE Journal* 79 (8) (August).
- McAndrews, Crolyn Ann. 2013. "Road Safety as a Shared Responsibility and a Public Problem in Swedish Road Safety Policy." *Science, Technology & Human Values* 38 (6) (June 25): 749–772.
- . 2010. "Road Safety in the Context of Urban Development in Sweden and California". University of California, Berkeley.

- Moudon, Anne Vernez, Lin Lin, Junfeng Jiao, Philip Hurvitz, and Paula Reeves. 2011. "The Risk of Pedestrian Injury and Fatality in Collisions with Motor Vehicles, a Social Ecological Study of State Routes and City Streets in King County, Washington." *Accident; Analysis and Prevention* 43 (1) (January).
- Muhlrad, Nicole. 2006. "Speed Enforcement and Road Safety in France." In *GAMBIT 2006*, 20.
- Murard, Frédéric. 2009. "The « Code de La Rue » (Street Use Code) Program in France."
- National Highway Traffic Safety Administration. 2012. "Traffic Safety Facts: 2010 Data". Washington, D.C.
- . 2013. "Traffic Safety Facts 2011 Data: Pedestrians". Washington, D.C.
- Pace, Jean-François, María Teresa Tormo, Jaime Sanmartín, Pete Thomas, Alan Kirk, Laurie Brown, George Yannis, Petros Evgenikos, Panagiotis Papantoniou, Jeremy Brandstaetter, et al. 2012. "Traffic Safety Basic Facts 2012 'Pedestrians.'"
- Retting, Richard, and Knippling, Ronald. 2010. "White Papers for: 'Toward Zero Deaths', A National Strategy on Highway Safety: 4. Safer Vehicles." Washington, D.C
- Santos, McGuckin, Nakamoto, Gray, and Liss. 2011. "Summary of Travel Trends: 2009 National Household Travel Survey." U.S. Department of Transportation. Federal Highway Administration (FHWA-PL-11-022) (June).
- SWOV Institute for Road Safety Research. 2005. *Advancing Sustainable Safety: National Road Safety Outlook for 2005-2020*. Edited by Fred Wegman and Letty Aarts. SWOV.
- Transportation Research Board (TRB). 2011. "Achieving Traffic Safety Goals in the United States: Lessons from other Nations." Transportation Research Board Special Report 300. Committee for the Study of Traffic Safety Lessons from Benchmark Nations. Washington, D.C.
- Vadeby, Anna, Åsa Forsman, Arne Carlsson, Urban Björketun, and Mohammad-Reza Yahya. 2012. "Evaluation of the New Speed Limits – Traffic Safety and Environmental Effects". Linköping, Sweden.
- World Health Organization. 2013. "Global Status Report on Road Safety 2013: Supporting a Decade of Action."
- . "European Status Report on Road Safety: Towards Safer Roads and Healthier Transport Choices." 2009. Copenhagen.
- Zegeer, Charlie, William Hunter, Loren Staplin, Fran Bents, Richard Huey, and Janet Barlow. 2010. "White Papers for 'Toward Zero Deaths', A National Strategy on Highway Safety: 5. Safer Vulnerable Road Users : Pedestrians, Bicyclists, Motorcyclists, and Older Users". Washington, D.C.