UMTRI-2011-43 OCTOBER 2011

RECENT CHANGES IN THE AGE COMPOSITION OF DRIVERS IN 15 COUNTRIES

MICHAEL SIVAK
BRANDON SCHOETTLE

UMTRI
UNIVERSITY OF MICHIGAN
TRANSPORTATION RESEARCH INSTITUTE

RECENT CHANGES IN THE AGE COMPOSITION OF DRIVERS IN 15 COUNTRIES

Michael Sivak
Brandon Schoettle

The University of Michigan
Transportation Research Institute
Ann Arbor, Michigan 48109-2150
U.S.A.

Report No. UMTRI-2011-43
October 2011

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTRI-2011-43		

4. Title and Subtitle	5. Report Date
Recent Changes in the Age Composition of Drivers in 15 Countries	October 2011
	6. Performing Organization Code: 383818

7. Author(s)	8. Performing Organization Report No.
Michael Sivak and Brandon Schoettle	UMTRI-2011-43

9. Performing Organization Name and Address	10. Work Unit no. (TRAIS)
The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
The University of Michigan Sustainable Worldwide Transportation	14. Sponsoring Agency Code

15. Supplementary Notes

The current members of Sustainable Worldwide Transportation include Autoliv Electronics, China FAW Group, FIA Foundation for the Automobile and Society, General Motors, Honda R&D Americas, Meritor WABCO, Michelin Americas Research, Nissan Technical Center North America, Renault, Saudi Aramco, and Toyota Motor Engineering and Manufacturing North America. Information about Sustainable Worldwide Transportation is available at: http://www.umich.edu/~umtriswt

16. Abstract

The age distribution of drivers has major implications for vehicle demand, transportation safety, and environmental consequences of personal transportation. This study examined the recent changes in the percentage of persons with a driver's license in 15 countries as a function of age. The countries included were Canada, Finland, Germany, Great Britain, Israel, Japan, Latvia, the Netherlands, Norway, Poland, South Korea, Spain, Sweden, Switzerland, and the U.S.A. The results indicate two patterns of change over time. In one pattern (observed for eight countries), there was a *decrease* in the percentage of young people with a driver's license, and an *increase* in the percentage of older people with a driver's license. In the other pattern (observed for the other seven countries), there was an *increase* in the percentage of people with a driver's license in all age categories.

A regression analysis was performed on the data for young drivers in the 15 countries to explore the relationship between licensing and a variety of societal parameters. Of particular note was the finding that a higher proportion of internet users was associated with a lower licensure rate. This finding is consistent with the hypothesis that access to virtual contact reduces the need for actual contact among young people.

17. Key Words	18. Distribution Statement
driver's licenses, driver age, international trends, internet usage	Unlimited

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
None	None	25	

Acknowledgments

This research was supported by Sustainable Worldwide Transportation (http://www.umich.edu/~umtriswt). The current members of Sustainable Worldwide Transportation include Autoliv Electronics, China FAW Group, FIA Foundation for the Automobile and Society, General Motors, Honda R&D Americas, Meritor WABCO, Michelin Americas Research, Nissan Technical Center North America, Renault, Saudi Aramco, and Toyota Motor Engineering and Manufacturing North America.

The authors wish to thank the following individuals for their assistance in obtaining the data used in this study: Arie Abraham (Central Bureau of Statistics, Israel), Åsa Berglind (Swedish Transport Agency), Melita Dimza (Central Statistical Bureau of Latvia), Hideki Hada (Toyota Motor Engineering and Manufacturing North America), Jesin Kim (Hyundai Motors), Rainer Krautscheid (BASt, Germany), Kamil Kresowski (Motor Transport Institute, Poland), Aldis Lama (Road Traffic Safety Directorate, Latvia), Juha Luoma (VTT, Finland), Enrique Miralles Olivar (Asociación Española de la Carretera), Susanne Schönebeck (BASt, Germany), David Shinar (Ben-Gurion University of the Negev, Israel), Juris Smirnovs (Road Traffic Safety Directorate, Latvia), Fridulv Sagberg (TØI, Norway), Yvonne Achermann Stürmer (Swiss Council for Accident Prevention), Willem Vlakveld (SWOV, Netherlands), and Rinat Zaig (Israel National Road Safety Authority).

Contents

Acknowledgments ii
Introduction 1
Method 1
Results 3
Discussion 12
References 20

Introduction

Driver age affects a variety of important aspects of road transportation. As discussed in Sivak and Schoettle (2011), on the most fundamental level, age affects decisions about the balance of driving and other modes of transportation, and about the amount of driving (NHTS, 2011). Next, age greatly influences the type of vehicle that a driver purchases in terms of cost and vehicle class (and thus environmental impact) (BLS, 2010; McManus, Senter, Curtin, and Garver, 2009). Finally, driver age has a large effect on driving safety, both in terms of safety per distance driven and safety per person (Massie and Campbell, 1995; Ferguson, Teoh, and McCartt, 2007).

In Sivak and Schoettle (2011), we examined the changes in the percentage of persons with a driver's license as a function of age in the U.S.A. from 1983 to 2008. The results indicated that, over the past 25 years, there was a substantial *decrease* in the percentage of young people with a driver's license, and a substantial *increase* in the percentage of older people with a driver's license (see Figure 1). As a consequence, the largest group of drivers has shifted from young drivers to middle-aged drivers (see Figure 2).

In this study, we are extending this analysis to 14 additional countries. The purpose is to examine whether the changes observed for the U.S.A. are present in other countries, or whether they are particular to the U.S. conditions.

Method

We approached experts in 64 countries requesting analogous data to those in Figures 1 and 2. The contacted experts were from Europe (27 countries), Asia (17 countries), Africa (9 countries), the Americas (9 countries), and Oceania (2 countries). We requested data for 1983 and 2008—the same two years as the data in Sivak and Schoettle (2011).

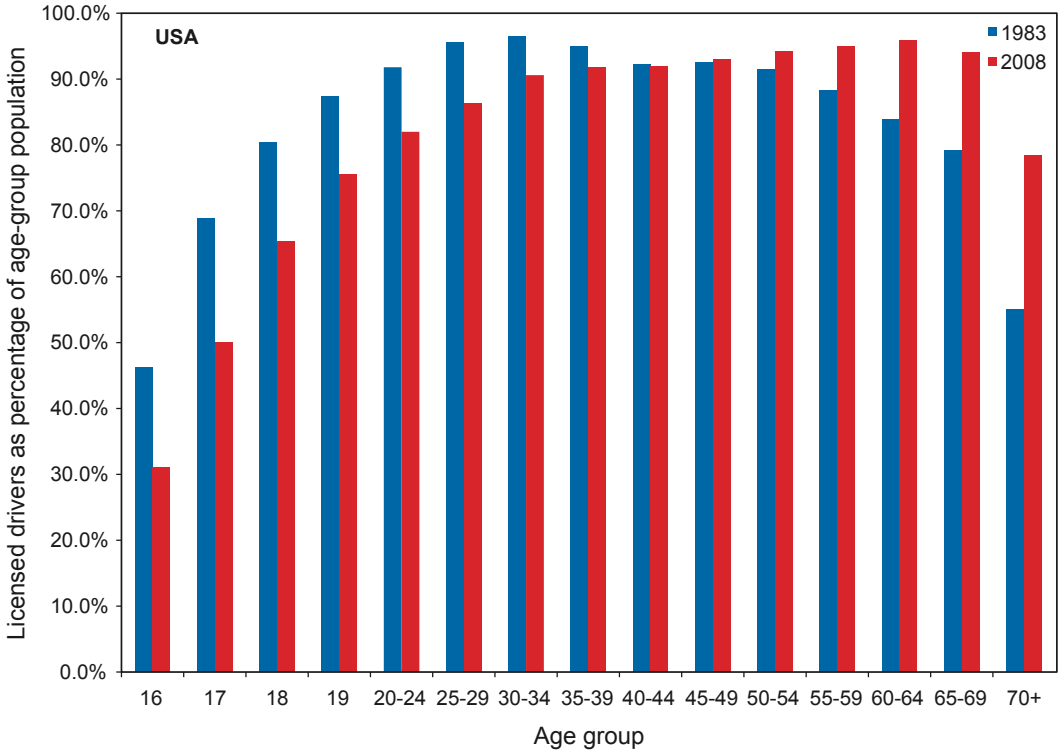

Figure 1. U.S.A.: Licensed drivers as a percentage of their age-group population (FHWA, 1984, 2009).

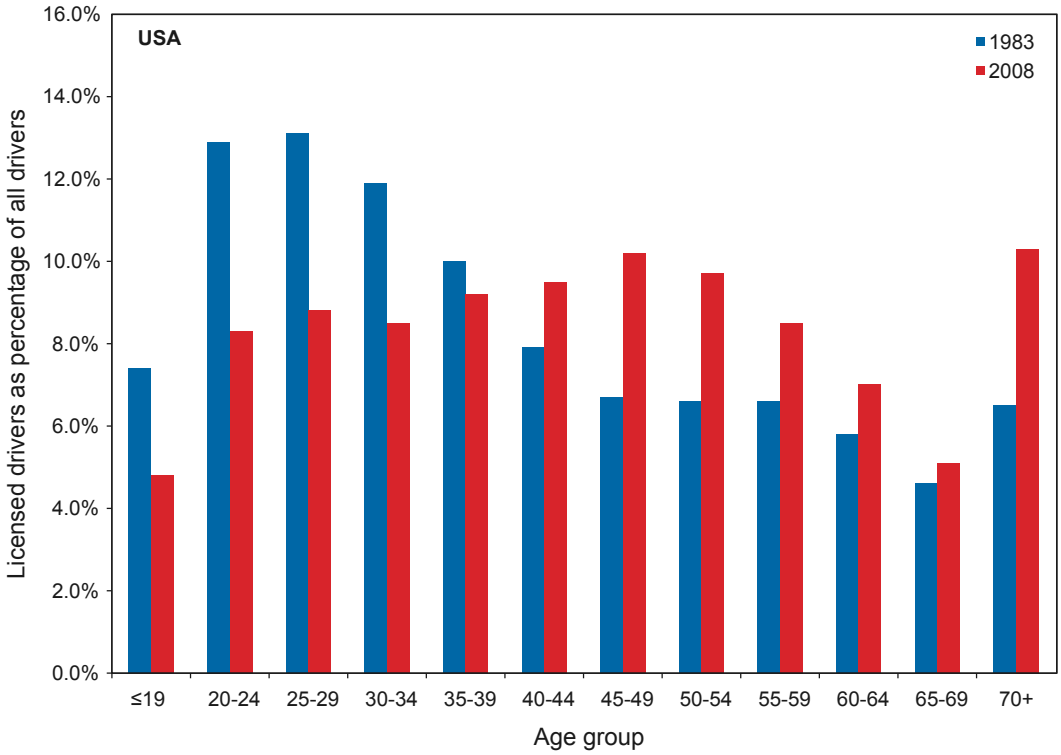

Figure 2. U.S.A.: Licensed drivers as percentage of all licensed drivers, by age (FHWA, 1984, 2009).

Results

We received usable data for 14 additional countries, although some of the data were for shorter time spans than requested, and age groupings were not always identical to that in Sivak and Schoettle (2011). Table 1 lists the properties of the analyzed data.

Table 1
Properties of the analyzed data.

Country	Years	Vehicle type	License type
Canada	1999, 2009	All vehicles	Full + graduated
Finland	1983, 2008	Passenger vehicles	Full + probationary
Germany	2002, 2008	Passenger vehicles	Full only
Great Britain	1995/1997, 2008	Passenger vehicles	Full only
Israel	1983, 2008	Passenger vehicles	Full + restricted
Japan	2001, 2009	Passenger vehicles	Full only
Latvia	2005[1], 2010[1]	Passenger vehicles	Full only
Netherlands	1985, 2008	Passenger vehicles	Full only
Norway	1991[2], 2009[2]	Passenger vehicles	Full + probationary
Poland	2007, 2009	Passenger vehicles	Full only
South Korea	2004, 2008	Passenger vehicles	Full only
Spain	1999, 2009	Passenger vehicles	Full + restricted
Sweden	1983, 2008	Passenger vehicles	Full only
Switzerland	1984, 2005	Passenger vehicles	Full only
U.S.A.	1983, 2008	Passenger vehicles	Full + graduated

[1] Dated January 1, 2006 and January 1, 2011, respectively.

[2] Dated January 1, 1992 and January 1, 2010, respectively.

The data will be presented in two groups, depending on the pattern of changes over time.

Decrease in young drivers and increase in older drivers

Seven countries showed the same pattern of results as was the case for the U.S.A. (a decrease in young drivers and an increase in older drivers). These seven countries, in the order of the length of the period covered, are as follows:

Sweden (Figure 3)
Norway (Figure 4)
Great Britain (Figure 5)
Canada (Figure 6)
Japan (Figure 7)
South Korea (Figure 8)
Germany (Figure 9)

Increase in both young drivers and older drivers

For seven countries there was an increase in both young drivers and older drivers. These seven countries, in the order of the length of the period covered, are as follows:

Finland (Figure 10)
Israel (Figure 11)
The Netherlands (Figure 12)
Switzerland (Figure 13)
Spain (Figure 14)
Latvia (Figure 15)
Poland (Figure 16)

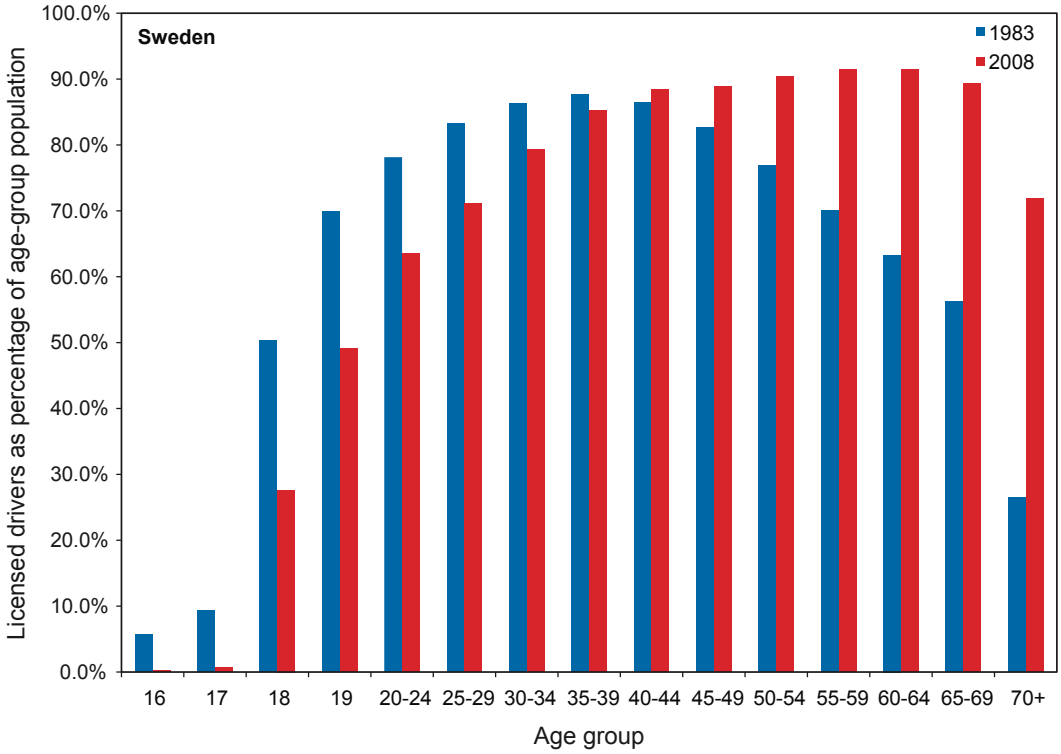

Figure 3. Sweden: Licensed drivers as a percentage of their age-group population (Swedish Transport Agency, 2011; Statistics Sweden, 2011).

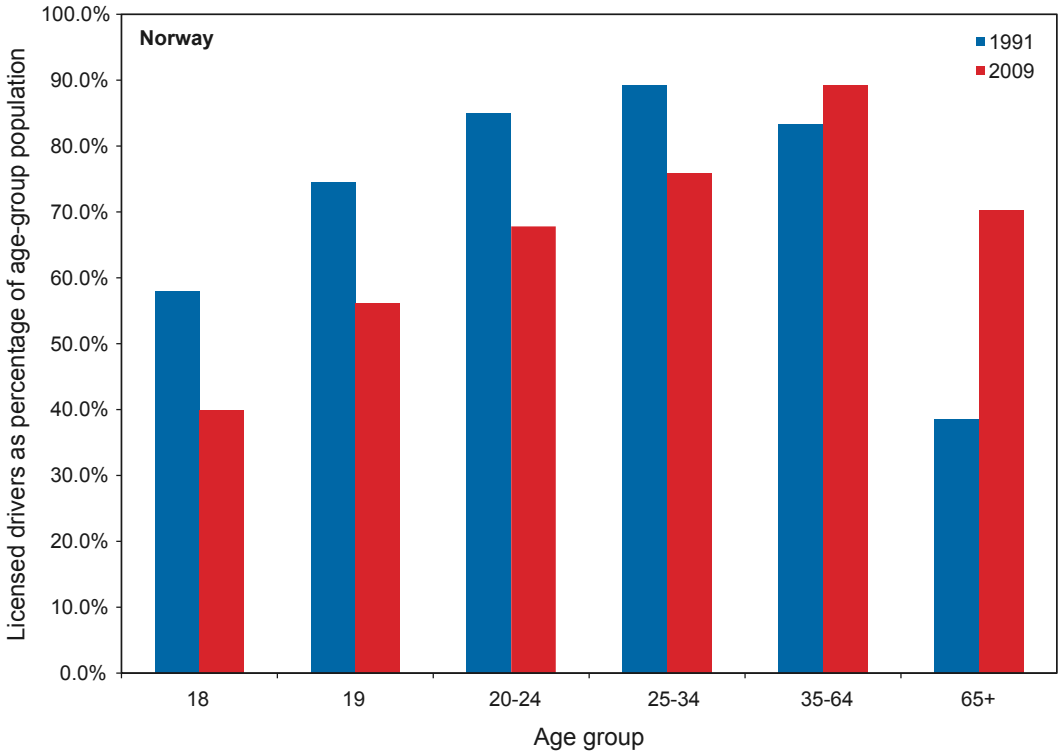

Figure 4. Norway: Licensed drivers as a percentage of their age-group population (Norwegian Public Roads Administration, 2011; Statistics Norway, 2011).

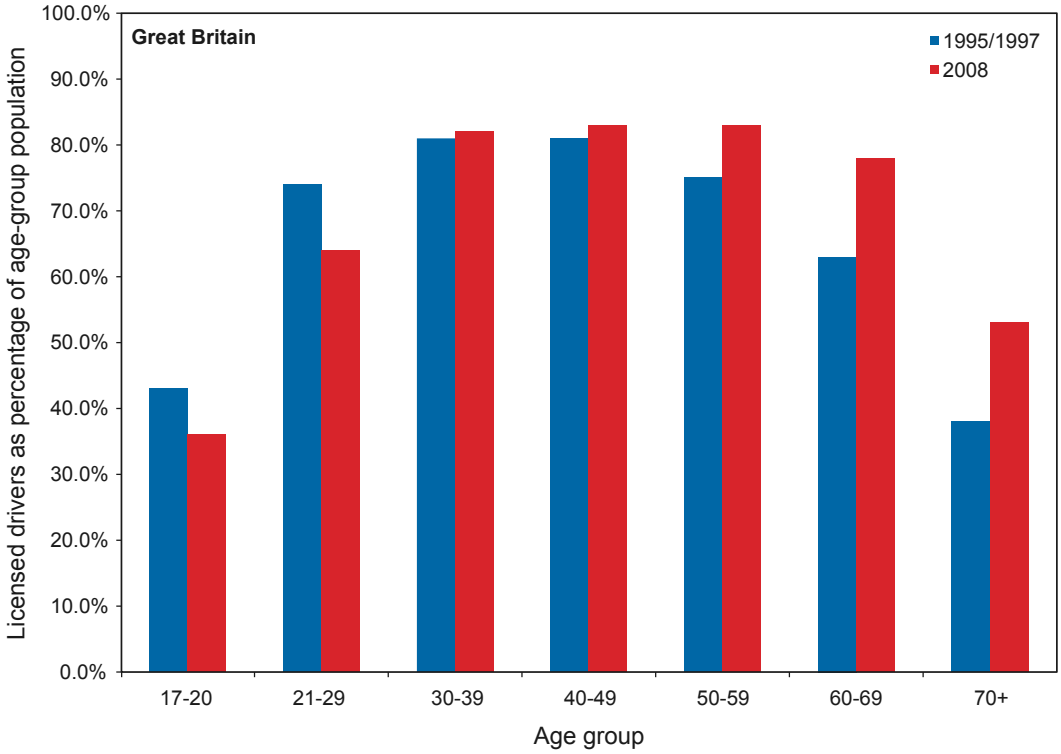

Figure 5. Great Britain: Licensed drivers as a percentage of their age-group population (Department for Transport, 2011).

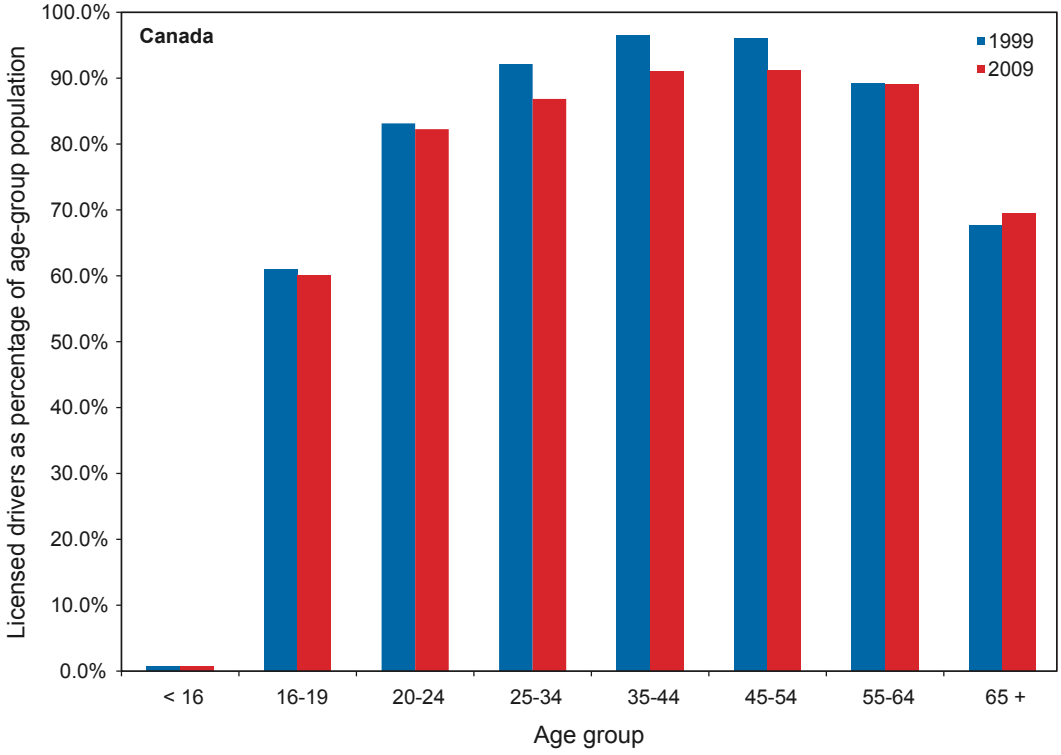

Figure 6. Canada: Licensed drivers as a percentage of their age-group population (Transport Canada, 2011; Statistics Canada, 2011).

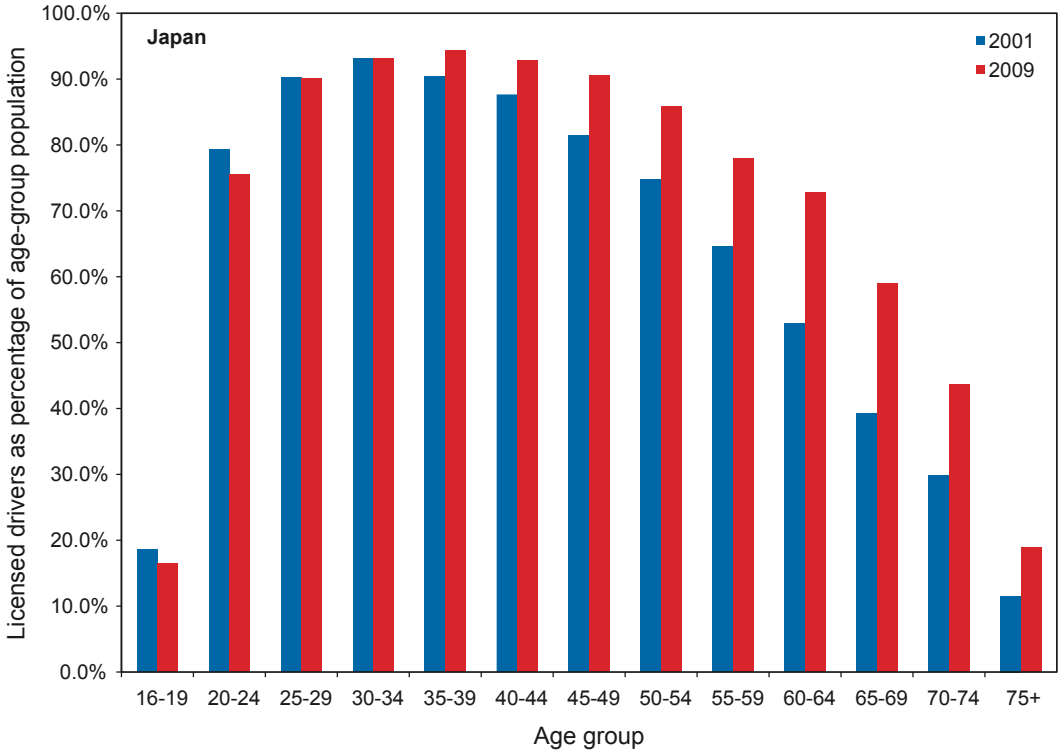

Figure 7. Japan: Licensed drivers as a percentage of their age-group population (National Police Agency, 2001, 2011; Ministry of Internal Affairs and Communications, 2011).

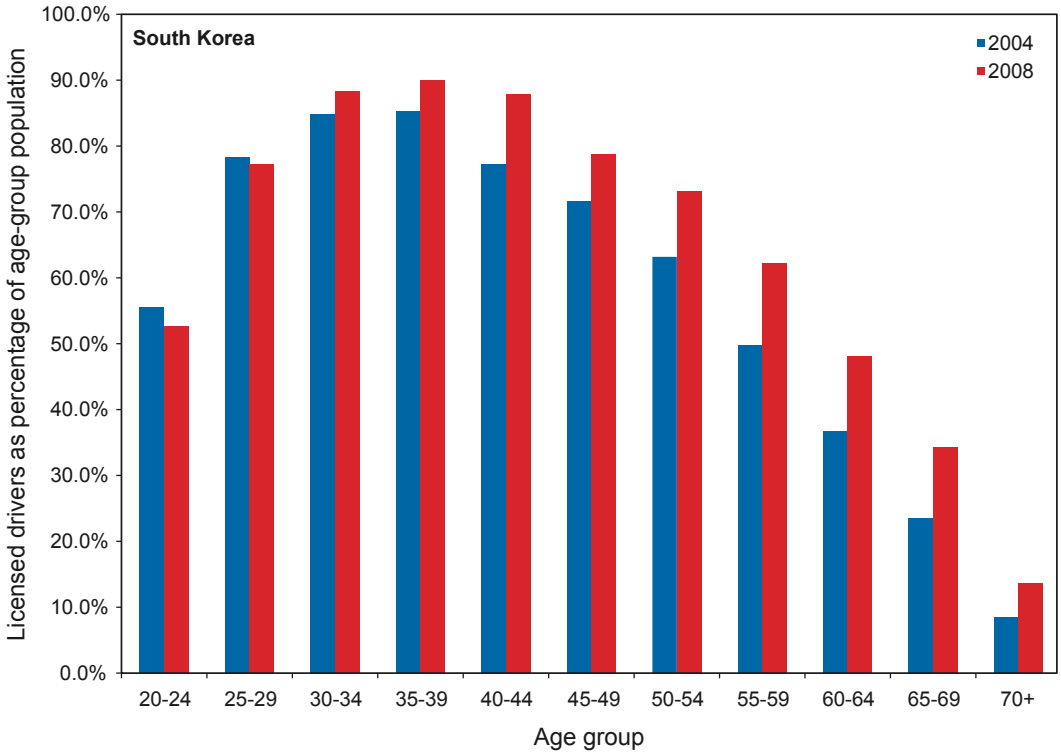

Figure 8. South Korea: Licensed drivers as a percentage of their age-group population (Ministry of Public Administration and Security, 2011; U.S. Census Bureau, 2011).

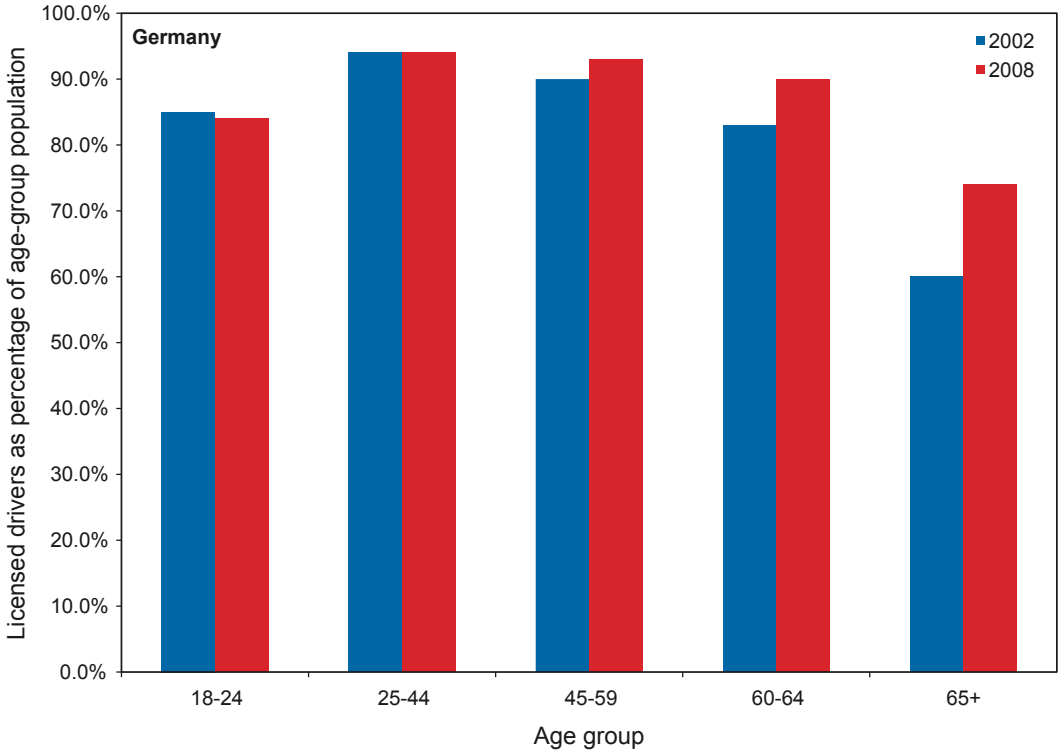

Figure 9. Germany: Licensed drivers as a percentage of their age-group population (Mobilität in Deutschland, 2011).

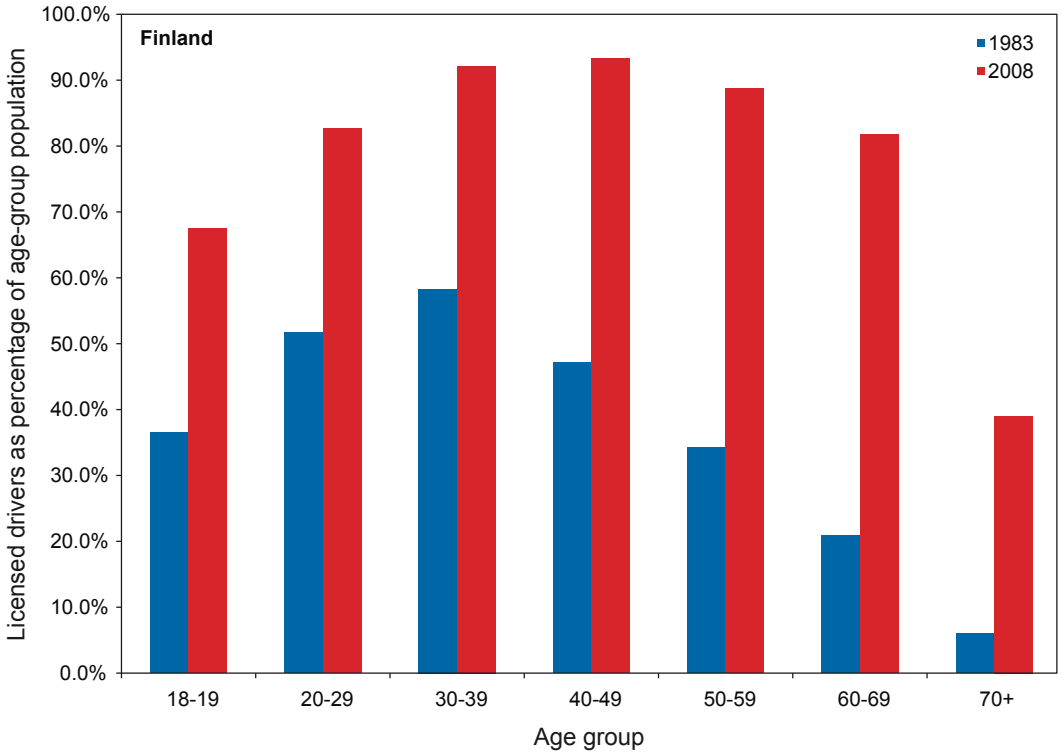

Figure 10. Finland: Licensed drivers as a percentage of their age-group population (Finnish Transport Safety Agency, 2011; Statistics Finland, 2011).

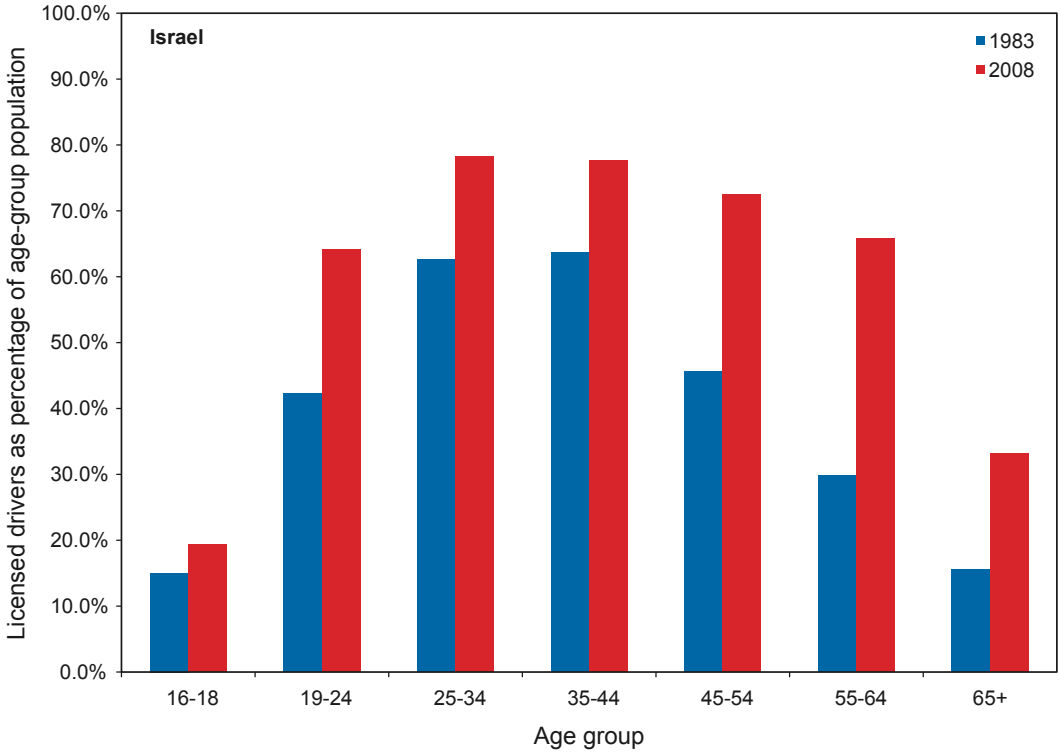

Figure 11. Israel: Licensed drivers as a percentage of their age-group population (Israel National Road Safety Authority, 2011; Central Bureau of Statistics, 2011).

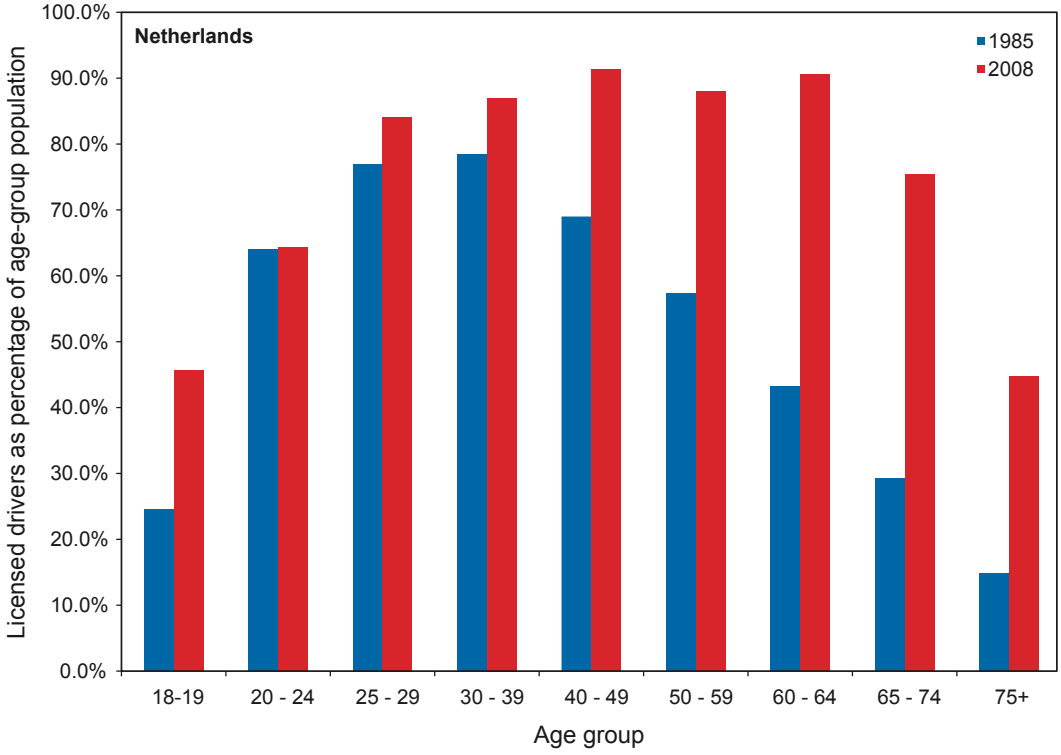

Figure 12. Netherlands: Licensed drivers as a percentage of their age-group population (Institute for Road Safety Research [SWOV], 2011).

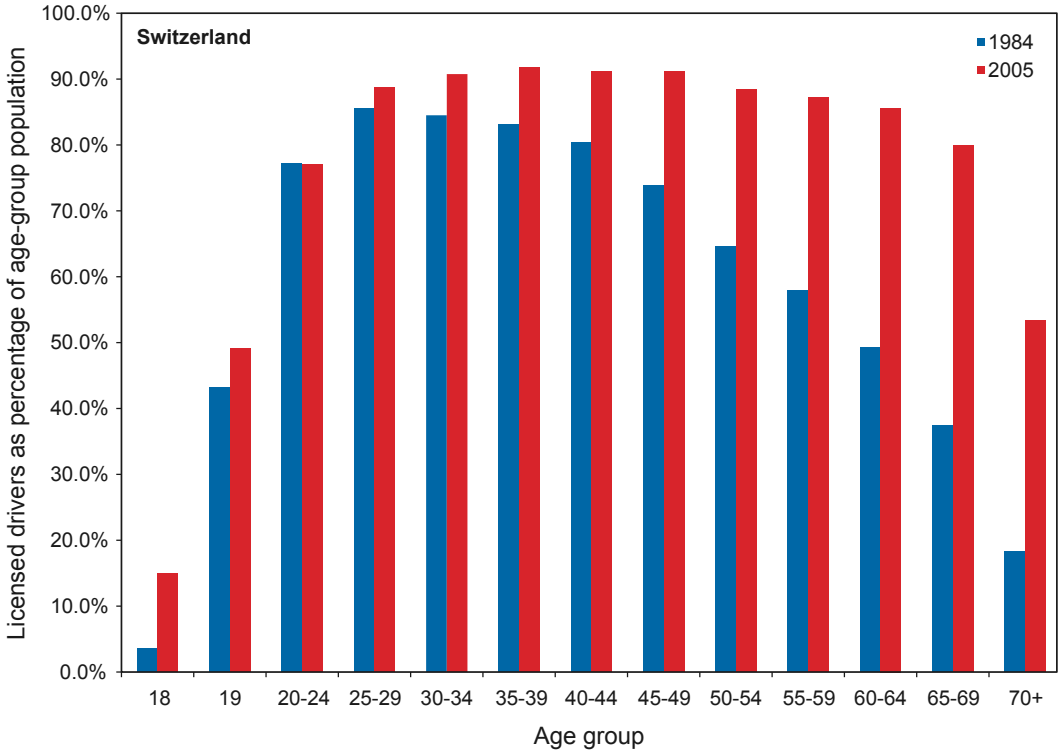

Figure 13. Switzerland: Licensed drivers as a percentage of their age-group population (Swiss Federal Statistical Office / Swiss Federal Office for Spatial Development, 2011).

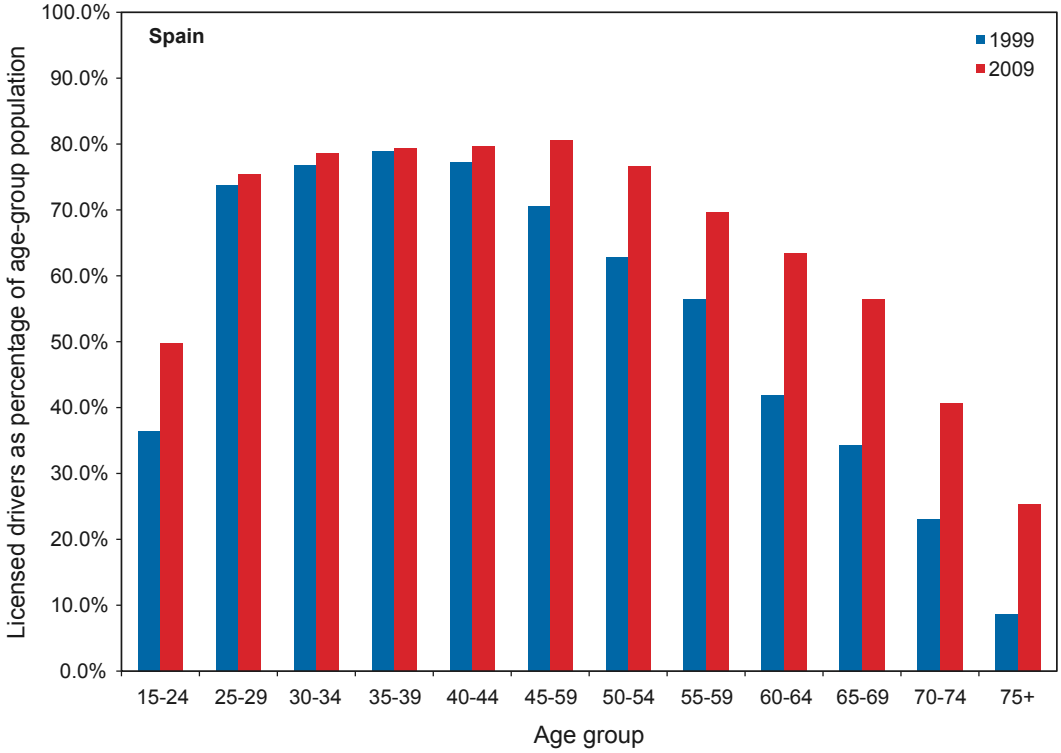

Figure 14. Spain: Licensed drivers as a percentage of their age-group population (Ministerio del Interior de España, 1999, 2009; U.S. Census Bureau, 2011).

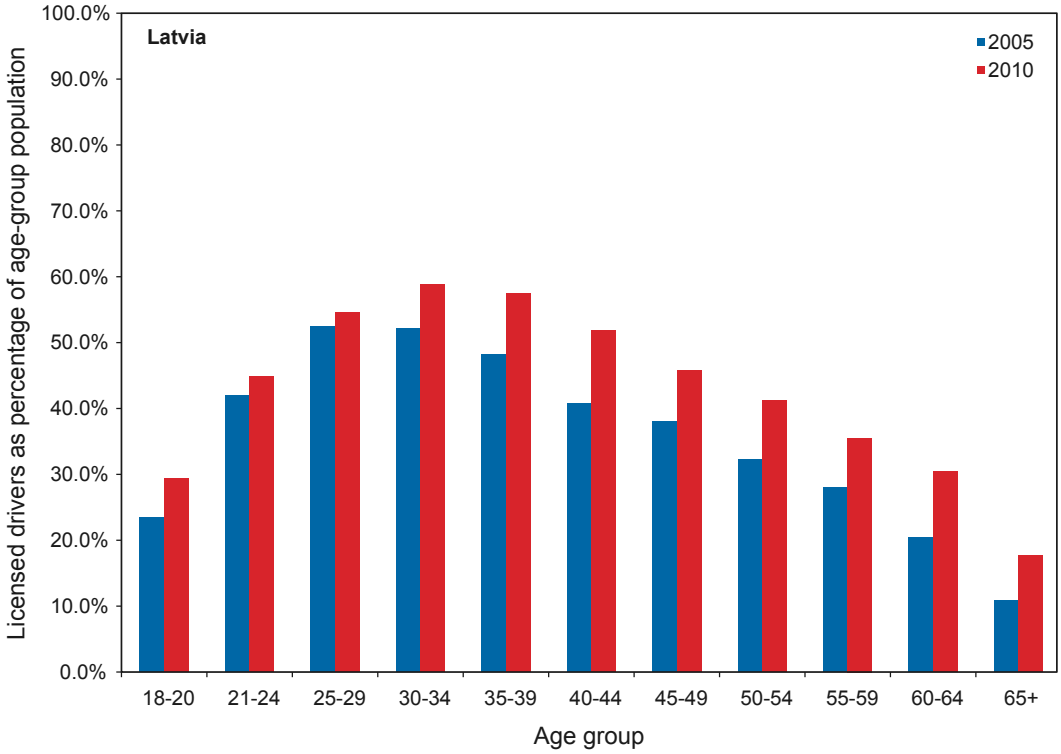

Figure 15. Latvia: Licensed drivers as a percentage of their age-group population (Road Traffic Safety Directorate, 2011; Central Statistical Bureau, 2011).

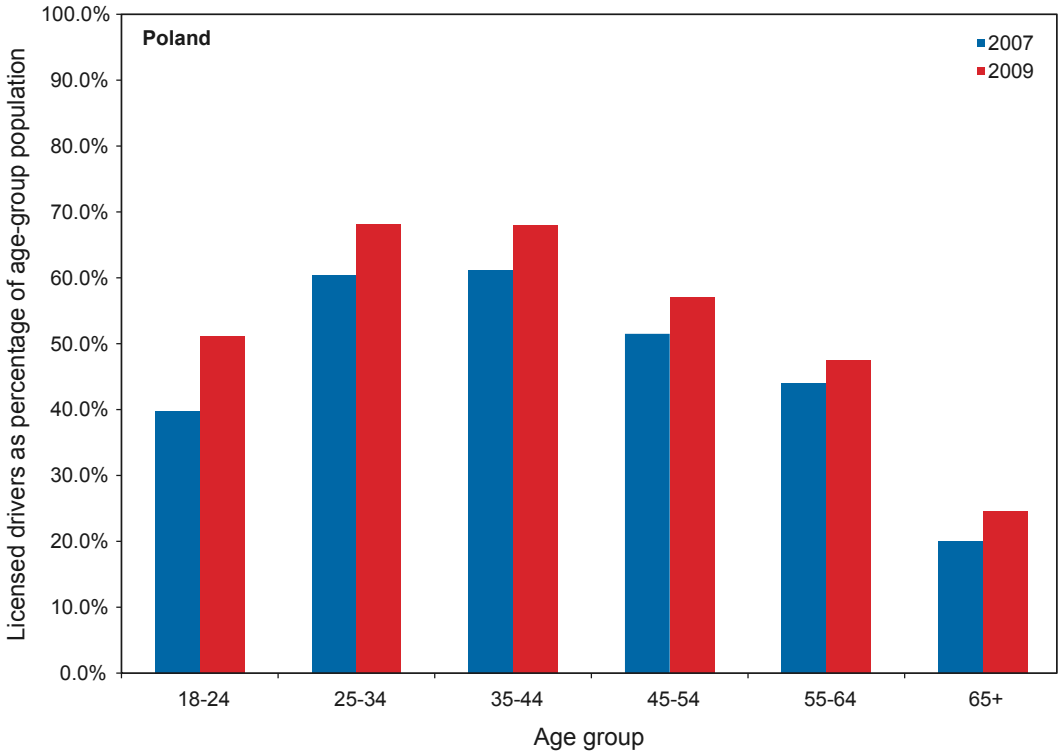

Figure 16. Poland: Licensed drivers as a percentage of their age-group population (Motor Transport Institute, 2011).

Discussion

Analysis of related variables

A regression analysis was performed on the percentage of young drivers in one age category to explore the relationships between driver licensing and a variety of societal parameters. The age group selected was between 20 and 24 years of age (or, depending on the country, the nearest age group). The independent variables in the analysis were as follows (see Table 2 for the actual values):

- *Gross National Product Purchasing Power Parity (GNP PPP) per capita (current international $)*; the data are for the same year as the driver's license data (World Bank, 2011)
- *Vehicles per 1,000 people*; the data are for 2008 (World Bank, 2011)
- *Passenger cars per 1,000 people*; the data are for 2008 (World Bank, 2011)
- *Vehicles per km of road*; the data are for 2008 (World Bank, 2011)
- *Percentage of unemployed*; the data are for the same year as the driver's license data (World Bank, 2011)
- *Percentage of population in megacities* (more than 1 million people); the data are for the same year as the driver's license data (World Bank, 2011)
- *Median age of the population*; the data are for 2008 (CIA, 2011)
- *Mean years of schooling*; the data are for 2010 (United Nations, 2011)
- *Cell phone subscriptions per 100 people*; the data are for the same year as the driver license data, except that the data for Latvia are for 2009 (World Bank, 2011)
- *Internet users per 100 people*; the data are for the same year as the driver's license data, except that the data for Latvia are for 2009 (World Bank, 2011)

Table 2
Variables used in the regression analysis and their corresponding values.

Country	% of people with a driver's license[1,2]	GNI PPP per capita	Vehicles per 1000 people	Cars per 1000 people	Vehicles per km of road	% Unempl.	% of people in megacities	Median age	Years of school.	Cell phone subs. per 100 people	Internet users per 100 people
Canada	82.3	37280	605	399	14	8.3	44	39.1	12.1	68	78
Finland	82.7	37990	534	461	36	6.3	21	41.6	10.3	129	84
Germany	84.0	37770	554	502	71	7.5	8	43.0	12.2	129	78
Great Britain[3]	64.0	37490	526	462	77	5.3	26	39.6	9.3	126	78
Israel	64.4	27120	313	260	126	6.1	57	29.9	11.9	123	48
Japan	75.6	32880	593	319	63	5.0	49	43.5	11.6	90	78
Latvia	44.9	16350	474	412	15	17.1	0	39.6	11.5	99	67
Netherlands	64.3	42060	515	449	62	2.8	12	39.7	11.6	125	88
Norway	67.8	55390	575	461	29	3.2	0	38.7	12.6	111	92
Poland	51.1	18200	495	422	49	8.2	4	37.3	10.0	117	59
South Korea	52.6	27080	346	257	161	3.2	48	35.8	11.6	94	80
Spain	75.4	31520	606	486	41	18.0	24	40.3	10.4	111	61
Sweden	63.6	40870	521	464	8	6.1	14	41.1	11.7	118	89
Switzerland	77.1	39160	567	522	61	4.4	15	40.4	11.0	92	68
U.S.A.	82.0	47100	809	451	38	5.8	45	36.6	12.5	89	76

[1]The data on driver's licenses are for 2008 (Finland, Germany, Great Britain, Israel, the Netherlands, South Korea, Sweden, and the U.S.A); 2009 (Canada, Japan, Norway, Poland, and Spain); 2010 (Latvia); and 2005 (Switzerland).

[2]The data on driver's licenses are for 20-24 year olds (Canada, Japan, Netherlands, Norway, South Korea, Sweden, Switzerland, and U.S.A.), 20-29 year olds (Finland); 18-24 year olds (Germany); 21-29 year olds (Great Britain); 19-24 year olds (Israel); 21-24 year olds (Latvia); 18-24 year olds (Poland); and 25-29 year olds (Spain).

[3]The data on driver's licenses are for Great Britain. All other data are for the United Kingdom.

The overall regression was statistically significant, $F(4,10) = 10.20$, $p < .01$ ($r^2 = .80$). The following four independent variables were significant predictors of the percentage of persons with a driver's license: GNI PPP per capita ($t = 4.96$), median age ($t = 4.09$), proportion of population in megacities ($t = 2.96$), and internet users per capita ($t = -3.33$).

A positive t value indicates a positive relationship between the predictor and the dependent variable, and vice versa. Thus, the results indicate that higher societal wealth, older population in general, and higher proportion of population living in megacities were each associated with *higher* licensure rates among young persons. On the other hand, higher proportion of internet users was associated with *lower* licensure rates among young persons. This later finding is consistent with the hypothesis that access to virtual contact reduces the need for actual contact among young people.

Resulting pattern of the age distribution of drivers

For those countries for which there was a decrease in the percentage of young people with a driver's license and an increase in the percentage of older people with a driver's license, it is not surprising that the distribution of the drivers exhibited a shift towards the older age groups. As an example of this trend, Figure 17 shows the changes in licensure for Sweden.

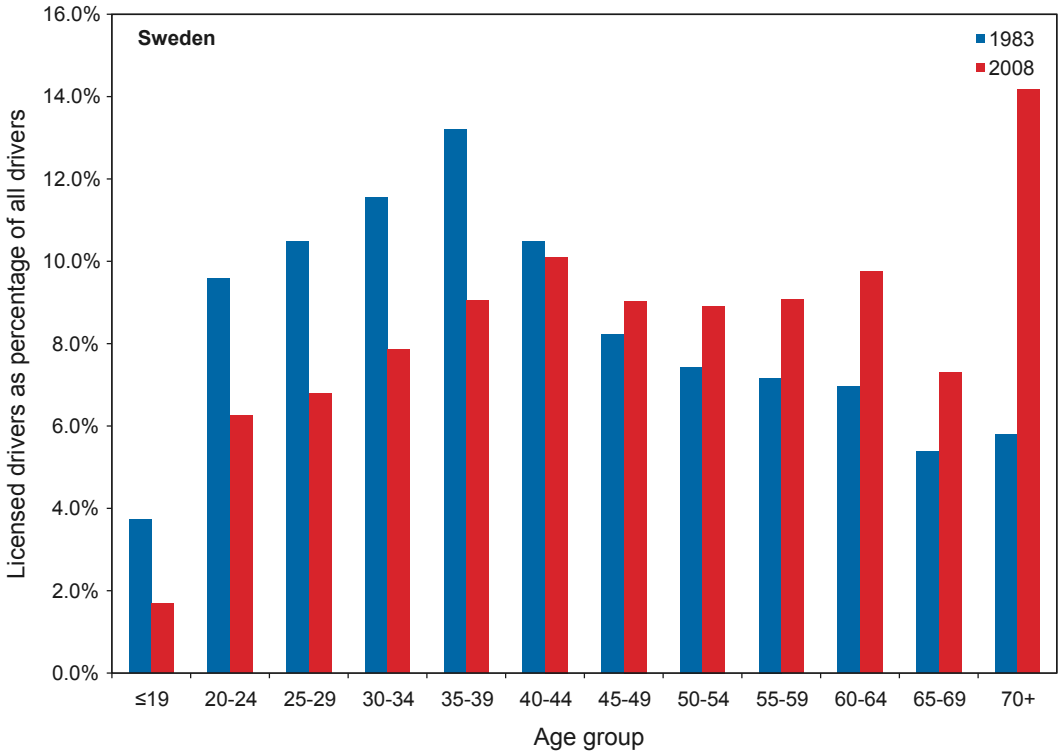

Figure 17. Sweden: Licensed drivers as percentage of all licensed drivers, by age (Swedish Transport Agency, 2011; Statistics Sweden, 2011).

However, this shift towards older drivers was present in all countries, even those that had an increase in the percentage of younger people with a driver's license, as illustrated in Figure 18 by the data for Switzerland. This is the case because, for those countries, the increase in the licensure of young persons was generally smaller than the increase in licensure for older persons, and because of the aging of the general population.

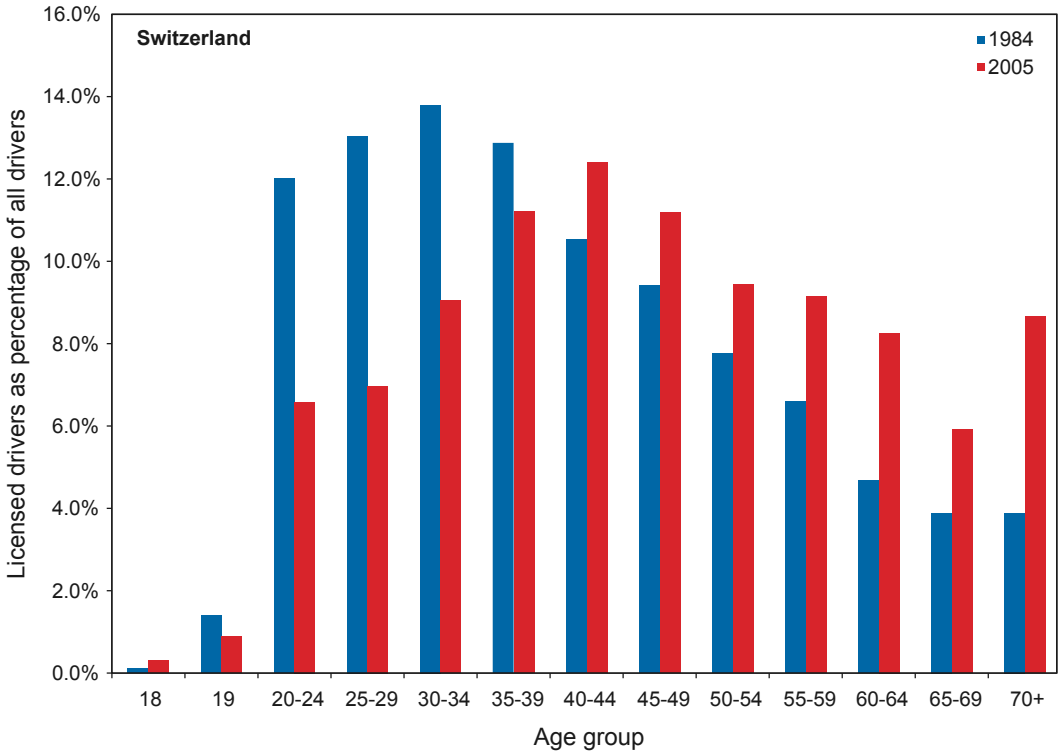

Figure 18. Switzerland: Licensed drivers as percentage of all licensed drivers, by age (Swiss Federal Statistical Office / Swiss Federal Office for Spatial Development, 2011).

Gender effects

This report has concentrated on changes over time by age combined for both genders. For three of the 14 countries, we also received the data by gender, and these data are shown in Figures 19 through 21. For two of these countries (Norway and Great Britain), the patterns of change for the combined population were similar to those for males and females. However, that was not the case for Spain. Here, the pattern of change for the combined population and for females (an increase in young drivers and older drivers) was different from that for males (a decrease in young drivers and an increase in older drivers).

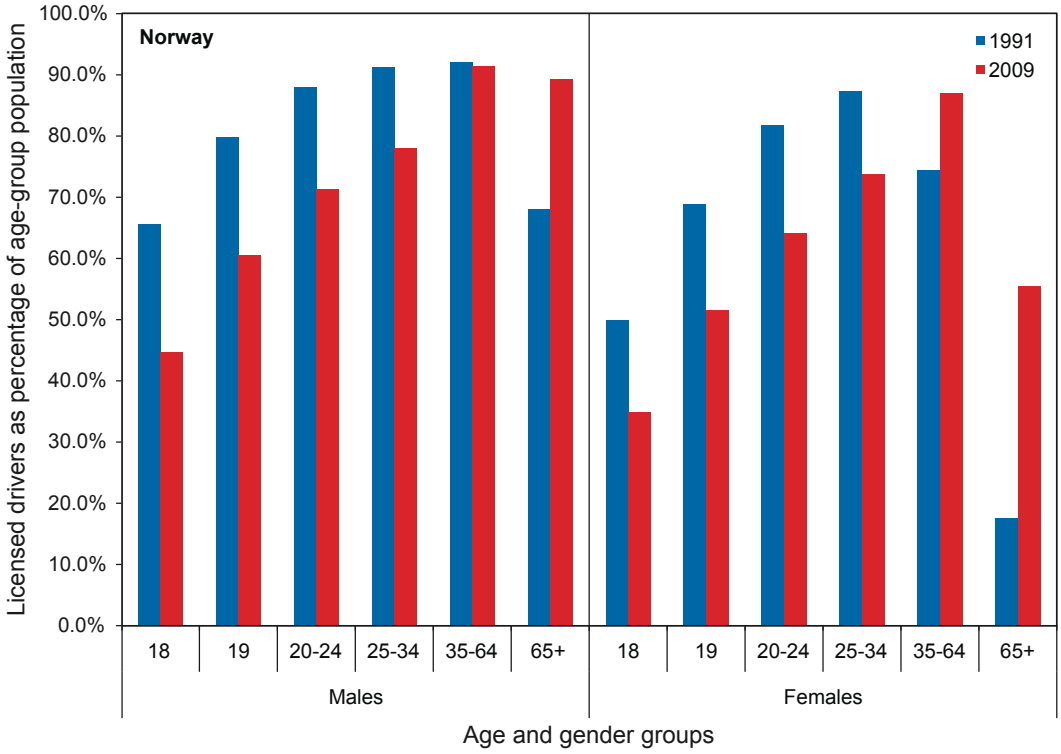

Figure 19. Norway: Licensed drivers as a percentage of their age-group population, by gender (Norwegian Public Roads Administration, 2011; Statistics Norway, 2011).

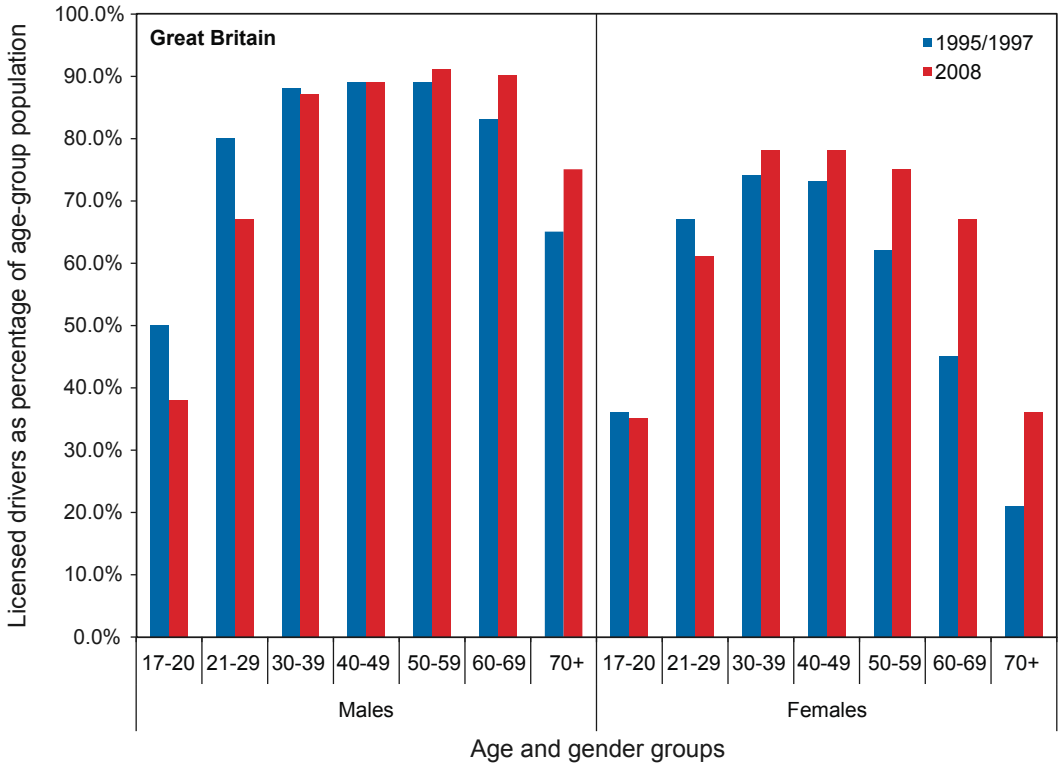

Figure 20. Great Britain: Licensed drivers as a percentage of their age-group population, by gender (Department for Transport, 2011).

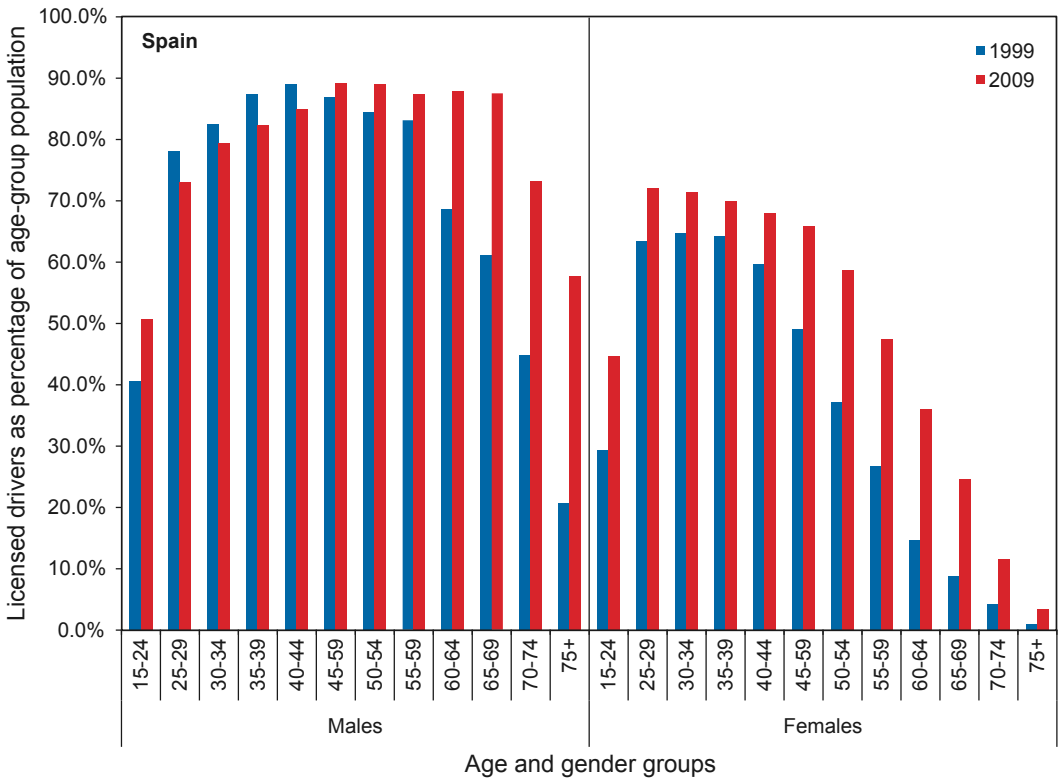

Figure 21. Spain: Licensed drivers as a percentage of their age-group population, by gender (Ministerio del Interior de España, 1999, 2009; U.S. Census Bureau, 2011).

Implications for the future

The future evolution of licensing trends by age will have potentially major implications for future transportation and its consequences. Specifically, licensing trends will likely affect the future amount and nature of transportation, transportation mode selection, vehicle purchases, the safety of travel, and the environmental consequences of travel. Consequently, future research should attempt to more comprehensively examine the mechanisms involved in the recent age-related changes in licensure.

Conclusions

The age distribution of drivers has major implications for vehicle demand, transportation safety, and environmental consequences of personal transportation. This study examined the recent changes in the percentage of persons with a driver's license in 15 countries as a function of age. The countries included were Canada, Finland, Germany, Great Britain, Israel, Japan, Latvia, the Netherlands, Norway, Poland, South Korea, Spain, Sweden, Switzerland, and the U.S.A. The results indicate two patterns of change over time. In one pattern (observed for eight countries), there was a *decrease* in the percentage of young people with a driver's license, and an *increase* in the percentage of older people with a driver's license. In the other pattern (observed for the other seven countries), there was an *increase* in the percentage of people with a driver's license in all age categories.

A regression analysis was performed on the data for young drivers in the 15 countries to explore the relationship between licensing and a variety of societal parameters. Of particular note was the finding that a higher proportion of internet users was associated with a lower licensure rate. This finding is consistent with the hypothesis that access to virtual contact reduces the need for actual contact among young people.

References

BLS [Bureau of Labor Statistics]. (2010). *Consumer Expenditure Survey – 2009 expenditure tables*. Available at: http://www.bls.gov/cex/csxstnd.htm.

Central Bureau of Statistics (Israel). (2011). *Personal communication*.

Central Statistical Bureau (Latvia). (2011). *Latvian population breakdown by year of birth and nationality [Latvijas iedzīvotāju sadalījums pēc dzimšanas gada un valstiskās piederības]*. Available at: http://www.pmlp.gov.lv/lv/statistika/Ird_arhivs.html.

CIA [Central Intelligence Agency]. (2008). *CIA World Factbook 2008*. Available at: https://www.cia.gov/library/publications/download/download-2008/index.html.

Department for Transport. (2011). *National Travel Survey. Full car driving licence holders by age and gender: Great Britain, 1975/76 to 2009* (Table NTS0201). Available at: http://www2.dft.gov.uk/pgr/statistics/datatablespublications/nts/.

Ferguson, S.A., Teoh, E.R., and McCartt, A.T. (2007). Progress in teenage crash risk during the last decade. *Journal of Safety Research, 38*, 137-145.

FHWA [Federal Highway Administration]. (1984). *Highway statistics 1983.* Available at: http://www.fhwa.dot.gov/policyinformation/statistics.cfm.

FHWA [Federal Highway Administration]. (2009). *Highway statistics 2008.* Available at: http://www.fhwa.dot.gov/policyinformation/statistics.cfm.

Finnish Transport Safety Agency. (2011). *Personal communication*.

Institute for Road Safety Research [SWOV] (Netherlands). (2011). *Personal communication*.

Israel National Road Safety Authority. (2011). *Personal communication*.

Massie, D.L., Green, P.E., and Campbell, K.L. (1997). Crash involvement rates by driver gender and the role of average annual mileage. *Accident Analysis and Prevention, 29*, 675-685.

McManus, W., Senter Jr., R., Curtin, R., and Garver, M. (2009). The demographic threat to Detroit's automakers. *Journal of Targeting, Measurement and Analysis for Marketing, 17*(2), 81-92.

Ministerio del Interior de España. (1999). *Anuario Estadístico General – 1999*. Available at: http://www.dgt.es/was6/portal/contenidos/es/seguridad_vial/estadistica/publicaciones/anuario_general/anuario_general010.pdf.

Ministerio del Interior de España. (2009). *Anuario Estadístico General – 2009*. Available at: http://www.dgt.es/was6/portal/contenidos/es/seguridad_vial/estadistica/publicaciones/anuario_general/anuario_general012.pdf.

Ministry of Internal Affairs and Communications (Japan). (2011). *Population estimates*. Available at: http://www.stat.go.jp/english/data/jinsui/2.htm.

Ministry of Public Administration and Security (South Korea). (2011). *Personal communication*.

Mobilität in Deutschland. (2011). *Personal communication. BASt calculations based on MID2002/2008 (BASt-U2k-26/2011)*.

Motor Transport Institute (Poland). (2011). *Personal communication*.

National Police Agency (Japan). (2001). *Driver's license statistics 2001 Edition [運転免許統計 平成13年版]*. Available at: http://www.npa.go.jp/toukei/menkyo/menkyo5/h13nen_main.pdf.

National Police Agency (Japan). (2011). *Driver's license statistics 2009 Edition [運転免許統計 平成21年版]*. Available at: http://www.npa.go.jp/toukei/menkyo/menkyo13/h21_main.pdf.

NHTS [National Household Travel Survey]. (2011). *2009 National Household Travel Survey*. Available at: http://nhts.ornl.gov/.

Norwegian Public Roads Administration. (2011). *Personal communication*.

Sivak, M. and Schoettle, B. (2011). *Recent changes in the age composition of U.S. drivers: Implications for the extent, safety, and environmental consequences of personal transportation* (Technical Report No. UMTRI-2011-23). Ann Arbor: The University of Michigan Transportation Research Institute.

Swedish Transport Agency. (2011). *Personal communication*.

Statistics Canada. (2011). *Estimates of population by age and sex for Canada, provinces and territories* (Table 051-0001). Available at: http://www5.statcan.gc.ca/cansim/pick-choisir?lang=eng&searchTypeByValue=1&id=0510001.

Statistics Finland. (2011). *Population according to age (5-year) and gender in the whole country 1865 – 2010*. Available at: http://pxweb2.stat.fi/database/StatFin/vrm/vaerak/vaerak_en.asp

Statistics Norway. (2011). *Personal communication*.

Statistics Sweden. (2011). *Personal communication*.

Swiss Federal Statistical Office / Swiss Federal Office for Spatial Development. (2011). *Personal communication. Calculations by bfu - Swiss Council for Accident Prevention, based on the Swiss microcensus on travel (1984 and 2005).*

Road Traffic Safety Directorate (Latvia). (2011). *Personal communication*.

Transport Canada. (2011). *Personal communication. Based on data received from the provinces and territories.*

United Nations. (2011). *International Human Development Indicators. Mean years of schooling (of adults)*. Available at: http://hdr.undp.org/en/media/Mean-Years-of-Schooling-July-15.xls.

U.S. Census Bureau. (2011). *International Data Base (IDB)*. Available at: http://www.census.gov/population/international/data/idb/.

World Bank. (2011). *Data - Indicators*. Available at: http://data.worldbank.org/indicator?display=default.