

The carnage wrought by major economic change: ecological study of traffic related mortality and the reunification of Germany

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Abstract

Objective To document the effects of sudden economic change on death rates for occupants of cars in the former German Democratic Republic (East Germany).

Design Ecological time series study of East Germany in comparison with the former Federal Republic of Germany (West Germany) before and after reunification in 1990.

Setting East and West Germany from 1985 to 1996.

Subjects Populations of East and West Germany between 1985 and 1996.

Main outcome measures Death rates for occupants of cars.

Results After the reunification of Germany, East Germany experienced a sudden, temporary affluence and a concomitant fourfold increase in death rates for car occupants between 1989 and 1991. Although death rates increased in all age groups, young adults (aged 18-24) were most affected. The death rate per 100 000 population for those aged 18-20 years increased 11-fold between 1989 and 1991; for those aged 21-24 years the increase was eightfold.

Conclusion A tragic consequence of the reunification of Germany was a dramatic increase in the death rate for car occupants. Sudden economic change and availability of cars resulted in both a rise in vehicle ownership and an increase in the number of inexperienced drivers on roads that were ill prepared for the increased traffic. The lesson learnt from Germany is that during times of economic change and modernisation, measures to prevent the predictable injury deaths that will result need to be considered.

Introduction

On 9 November 1989 the Berlin Wall came down. Overnight, residents of the former German Democratic Republic (East Germany) gained access to previously unavailable Western cars. By the middle of 1990 East German currency was converted one for one to the currency of the former German Federal Republic (West Germany), enabling East Germans to buy cars.¹ Analysis of death rates for car occupants in Germany during the period of reunification provided a unique

opportunity to document the effect on traffic accidents of sudden economic improvements.

Methods

The International Road Traffic and Accident Database (version 1.1), maintained by the German Federal Ministry of Transport, provided data for East and West Germany on population, numbers and types of vehicles, the number of kilometres driven, the length of the road network, and death rates.² Overall and age specific death rates after reunification were compared with average death rates over the five years (1985-9) before reunification. Analyses were restricted to deaths because data on injuries are subject to reporting biases³ and unlikely to be comparable for two countries undergoing governmental changes.

Results

The death rate for occupants of cars in East Germany rose from 4 per 100 000 population in 1989 to 16 per 100 000 in 1991. Similarly, the death rate per billion kilometres travelled increased from 14 in 1989 to 42 in 1991 (fig 1). The number of excess deaths in East Germany was 1223 in 1990 and 2021 in 1991 compared

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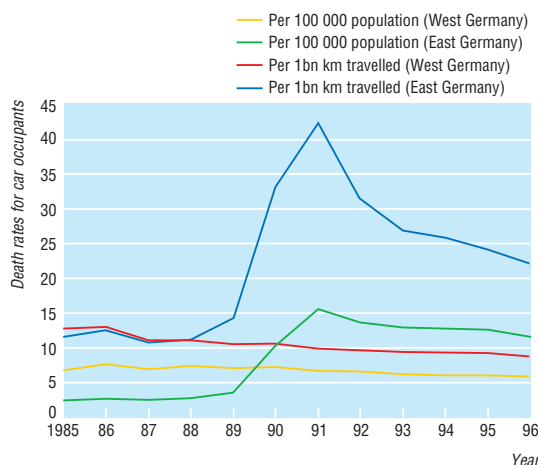


Fig 1 Death rates for occupants of cars for former East and West Germany

Table 1 Numbers of deaths per 100 000 population for occupants of cars of different ages in former East Germany before, during, and after reunification in 1990

Year	Age group (years)								Total
	0-5	6-9	10-14	15-17	18-20	21-24	25-64	≥65	
1985	17	7	6	8	20	37	265	40	400
1986	24	12	8	5	33	50	274	43	449
1987	15	3	9	4	21	46	270	35	403
1988	14	12	8	4	24	55	289	43	449
1989	17	6	14	11	33	57	387	69	594
1990	38	20	27	56	236	226	989	90	1682
1991	35	25	21	74	324	391	1481	129	2480
1992	35	16	33	84	267	311	1291	131	2168
1993	25	12	36	72	234	331	1232	98	2040
1994	19	10	25	100	299	262	1174	103	1992
1995	10	17	25	113	322	275	1059	132	1953
1996	8	11	20	109	344	214	994	121	1821

with the average annual number of deaths during 1985-9 (table 1). In contrast, the death rate for car occupants in West Germany remained largely unchanged.

Whereas all age groups in East Germany experienced higher death rates for car occupants, those aged 18-20 years showed the largest increase between 1989 and 1991, from 5 per 100 000 to 54 per 100 000—an 11-fold increase (fig 2). Death rates for those aged 21-24 increased eightfold, from 5 per 100 000 to 44 per 100 000. Death rates for other road users showed much smaller increases, from 1.4 to 1.5 for motorcyclists, 3.2 to 3.6 for pedestrians, and 1 to 1.3 for bicyclists.

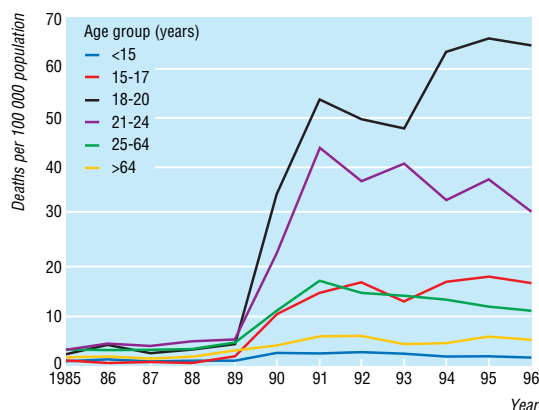


Fig 2 Death rates per 100 000 population for car occupants by age in former East Germany

Table 2 Data on cars in former East and West Germany before, during, and after reunification in 1990

Year	Former East Germany				Former West Germany			
	No of cars owned ($\times 10^3$)	Increase (%)	No of km travelled ($\times 10^9$)	Increase (%)	No of cars owned ($\times 10^3$)	Increase (%)	No of km travelled ($\times 10^9$)	Increase (%)
1985	3398		33 700		25 845		332 451	
1986	3558	4.7	35 700	5.9	26 917	4.1	359 492	8.1
1987	3699	4.0	37 600	5.3	27 908	3.7	383 764	6.8
1988	3846	4.0	40 000	6.4	28 878	3.5	405 747	5.7
1989	4004	4.1	42 800	7.0	29 755	3.0	415 427	2.4
1990	4952	23.7	51 500	20.3	30 685	3.1	431 488	3.9
1991	5630	13.7	59 117	14.8	31 322	2.1	437 292	1.4
1992	5940	5.5	69 288	17.2	32 007	2.2	440 671	0.8
1993	6240	5.1	76 469	10.4	32 652	2.0	441 354	0.3
1994	6681	7.1	77 397	1.2	33 084	1.3	428 307	-3.0
1995	6881	3.0	80 700	4.3	33 524	1.3	433 700	1.3
1996	7031	2.2	81 800	1.4	33 957	1.3	435 200	0.3

Between 1989 and 1991 the number of cars increased by 41% in East Germany and the number of kilometres travelled increased by 38% (table 2). In contrast, the values in West Germany remained constant or decreased. The total length of the road networks in East Germany increased by only 3% between 1989 and 1992.

Discussion

The effects of reunification on East Germany provide rare insight into the impact of major economic change on traffic deaths. Between 1989 and 1991 East Germans experienced a sudden temporary affluence and access to previously unavailable cars. Kühnen and Brüning reported that the overall death rate for traffic accidents more than doubled in East Germany between 1989 and 1991.⁴ Our examination of the separate effects of reunification on car occupants and other road users showed a fourfold increase in death rates for car occupants, with an 11-fold increase for those aged 18-20 years. These age specific mortality analyses extend previous governmental transportation studies of the effects of reunification^{4,5} by focusing on the deaths of car occupants and by highlighting the critical effect of young drivers' inexperience on traffic accidents during periods of economic development.

After reunification many East Germans bought cars, as shown by a 41% increase in the number of cars from 1989 to 1991. Typically, a car was the first major purchase made by East German citizens long deprived of them (M A K Kühnen, personal communication). Many drivers, especially those involved in crashes, were young and inexperienced.⁶

Changes in East Germany

Few improvements were made to the roads to prepare for this period of burgeoning travel. From mid-1990 to the end of 1997 DM76bn were invested in the transport infrastructure of East Germany. However, only about DM32bn went to improving roads, and not until the middle of 1990. The provision of safety equipment, such as guard rails and emergency telephones, on East German highways was not completed until the end of 1994.⁷ In addition, East German speed limits of 100 km/h on motorways (autobahns) were strictly enforced before reunification but were harmonised with the West German recommendation of 130 km/h after reunification (U Meissner, personal communication).

The fourfold increase in the death rate for car occupants during the two years when the number of cars and the distance travelled both increased by about 40% is understandable in the light of what is known about young and inexperienced drivers. In the United States in 1990, for example, drivers aged 16 had more than three times as many fatal crashes per million miles driven as did drivers aged 25 and older.⁸ For drivers aged 16-19 as a group the crash rate based on mileage was seven times that for drivers aged 35-64.⁹

Increased traffic volume and inadequate roads doubtless contributed to the increased death rates in East Germany. If increased traffic volume had been the central factor, however, larger increases in death rates for other road users would have occurred. Furthermore, the quality of East German roads was poor both before and after reunification, but death rates did not rise until

after reunification. Thus, the central factor contributing to the drastic increase in death rate for car occupants apparently was the great increase in unskilled drivers.

Changes in West Germany

West Germany had similar traffic adjusted death rates before reunification but did not show similar increases after reunification. Furthermore, the number of cars and distance travelled in West Germany remained constant or decreased. Thus, reunification seems to have had little effect on car travel and death rates in West Germany. The people of West Germany had access to world markets before reunification, so the opening of the borders did not increase the access to cars by inexperienced drivers.

Implications

Although such rapid changes are unlikely to occur elsewhere, knowledge gained from the period of German reunification could save lives in countries where economic development is proceeding more gradually and where large shifts in the characteristics of road users are occurring. For example, in countries such as China inexperienced drivers are replacing bicyclists. Understanding the effects of economic change on traffic accidents is essential for policy makers in developing countries and for international organisations that aid in the development of such countries.

Although modernisation of underdeveloped nations and their economies is ultimately beneficial, it can be fatal for the citizens if appropriate measures to prevent injury are not instituted. Measures that can be quickly instituted include attention to excessive speed, use of seat belts, action on drink driving, improvements to roads, and special restrictions on young drivers.^{3 8 10-15} The medical and public health communities of countries experiencing substantial economic development can lead in efforts to ensure that modernisation is not accompanied by tragic increases in deaths and injuries.

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Key messages

- German reunification was associated with a fourfold increase in death rates for car occupants in former East Germany between 1989 and 1991, young adults having an 11-fold increase
- Access to previously unobtainable cars and the youth and inexperience of drivers contributed to the increased traffic accidents in East Germany after reunification
- Although modernisation of underdeveloped nations and their economies is ultimately beneficial, it can prove fatal without appropriate injury prevention measures
- Public health and medical communities must take the lead in ensuring that economic change does not adversely affect the health and safety of the public

were generated by RM. The paper was written jointly by FKW, CR, RM, and SPB. All authors substantially edited and reviewed the manuscript. FKW is guarantor for the study.

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Commentary: Road deaths in European countries

Mark McCarthy

The data in this comparative time series analysis are dramatic: apparently almost 2000 extra deaths among car users in the former East Germany in 1991 alone. Such an "experiment of opportunity"¹ is important evidence for public policy when more formal designs are precluded.

But other analyses are possible. The World Health Organisation's international mortality statistics record

that total deaths for road injuries (code E471 of the ninth revision of the international classification of diseases) for former East and West Germany combined rose from 9524 in 1989 to 10 478 in 1990 and 10 917 in 1991—a rise of under 1500.² In addition, total deaths had fallen to 8949 by 1995.² So during this time deaths among those outside cars—cyclists, motor cyclists, pedestrians—seem to have decreased while those

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among car occupants increased. And who were the young car occupants killed in the east? If some were West German residents (more likely to drive than young former East Germans) the population denominators used in the study of Winston et al would need to be reconsidered.

It is instructive also to look at other European countries. In 1995 (latest available data) the rate of all road deaths in men aged 15-24 was 40.3 per 100 000 in Germany, similar to the rate in West Germany before unification (38.4 in 1989). Neighbouring Poland had a rate in 1995 of 35.4, but in Greece it was 54.2. As long ago as 1949 Smeed showed that, for all countries, the road death rates per vehicle decrease as the number of vehicles increases, with many factors contributing, including driver experience and road design.³ Car design, by contrast, does not necessarily increase safety, especially for non-road users.

Yet emphasising injury prevention in car use ignores the bigger picture. Before unification West Germany had 7615 road deaths in 1989. Public transport incurs fewer deaths per kilometre travelled than do cars: reducing car ownership and promoting integrated transport can shift travel back to bus and rail. Promoting walking and cycling will have positive health benefits.⁴ And reducing the use of cars will help limit global warming and the effects which now threaten us all.⁵

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Prevention of vertical transmission of HIV: analysis of cost effectiveness of options available in South Africa

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Abstract

Objective To assess the cost effectiveness of vertical transmission prevention strategies by using a mathematical simulation model.

Design A Markov chain model was used to simulate the cost effectiveness of four formula feeding strategies, three antiretroviral interventions, and combined formula feeding and antiretroviral interventions on a cohort of 20 000 pregnancies. All children born to HIV positive mothers were followed up until age of likely death given current life expectancy and a cost per life year gained calculated for each strategy.

Setting Model of working class, urban South African population.

Results Low cost antiretroviral regimens were almost as effective as high cost ones and more cost effective when formula feeding interventions were added. With or without formula feeding, low cost antiretroviral interventions were likely to save lives and money. Interventions that allowed breast feeding early on, to be replaced by formula feeding at 4 or 7 months, seemed likely to save fewer lives and offered poorer value for money.

Conclusions Antiretroviral interventions are probably cost effective across a wide range of settings, with or without formula feeding interventions. The appropriateness of formula feeding was highly cost effective only in settings with high seroprevalence and reasonable levels of child survival and dangerous where infant mortality was high or the protective effect of breast feeding substantial. Pilot projects are now needed to ensure the feasibility of implementation.

Introduction

Whereas paediatric HIV infection is on the verge of being eliminated in the United States, in sub-Saharan Africa it has become a common cause of admission to hospital and a major contributor to childhood mortality.¹ The results of recent studies showing the efficacy of short course antiretroviral treatment for the prevention of vertical transmission of HIV in breastfed and formula fed infants has led to debate around their more widespread introduction internationally.²⁻⁴

For some years now, developed countries have had in place cost effective methods to prevent the vertical transmission of HIV.⁵ In developing countries, however, these interventions have not been offered on a routine basis. The main reason for this is the perceived high cost of transmission prevention programmes rather than lack of evidence of effectiveness. Interventions that seem to reduce vertical transmission in developed and developing countries include substitution of formula feeding for breast feeding⁶ and administration of antiretroviral agents to mother and child around the time of birth.^{2-4 7-9} Caesarean section significantly reduces vertical transmission,¹⁰ although cost effectiveness is not established even in developed countries¹¹ and it is unclear how feasible elective caesarian sections are in areas with poor resources. Other interventions, such as the use of vaginal antiseptics before delivery and the administration of vitamin A with or without micronutrients, have yet to be conclusively evaluated.^{12 13}

For policymakers the health and economic benefits of avoiding childhood HIV infection need to be balanced against the costs of implementing vertical transmission prevention programmes and any adverse effects that may be incurred through such