DEKRA

ROAD SAFETY REPORT 2019
Children on the Road

Steps Towards Making
Vision Zero a Reality.

DEKRA

With
Supplement for Children

Accidents:
There is still a lot to be done on the road to "Vision Zero" regarding accidents with children

The human factor:
With their behavior on the road, parents are the most important role models for children

Vehicle technology:
Automated assistance systems can increase road safety also for children


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On the safe side.

Greater Safety for Children on the Roads

Berkeley, Rouen, Bristol, Trier, Vicenza, Darwin – all of these cities are united in one statistic: They all have around 110,000 inhabitants. But what does this fact have to do with a road safety report? The answer is simple: A city of this size would become devoid of people in the space of one year if it were inhabited exclusively by children under the age of 15. According to data published by the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, almost 112,000 road users in this age group lost their lives in 2017. Relating this tragic fact to the size of a city clearly illustrates just how shattering it is. This is why we took the conscious decision to make children under the age of 15 the focus of this year's DEKRA Road Safety Report.

If we consider that "only" 593 children under the age of 15 lost their lives in traffic accidents in 2017 in the EU, and 1,233 in 2016 in the USA (figures for 2017 have not yet been published), we can make a guess as to which parts of the world this problem is most serious in: mainly Africa and Asia. According to the IHME, nearly 85 percent of children under the age of 15 killed in traffic accidents come from low and middle-income countries. Nevertheless, the more long-term trend is positive: IHME data shows that 223,500 lives were lost among road users in the under-15 age group in 1990 – around twice as many as in 2017. But that is by no means a reason for complacency. After all, every child killed on the roads is one child too many.

With that in mind, the preliminary accident figures for Germany for 2018 are downright alarming. According to estimates by the German Federal Statistical Office, 79 children under the age of 15 lost their lives in traffic accidents on German roads last year. This equates to an increase of no less than 30 percent compared to the 61 deaths recorded in this age group the year before. We will need to look very closely at what caused such a dramatic rise.

Dipl.-Ing. Clemens Klinke,
Member of the Management Board DEKRA SE

Of course, this age group and the 15 to 18-year-olds age group still make up the smallest portion of all 3,270 (preliminary figure) of the traffic-related deaths recorded in Germany in 2018. Nevertheless, this was the largest percentage increase in any age group in 2018. By way of comparison, France's preliminary figures on deaths among children and young people aged 17 or under dropped almost 7.5 percent from 2017 to 2018, according to the Observatoire national interministériel de sécurité routière.

There are many reasons for the deaths of over 300 children worldwide under the age of 15 who lose their lives on the roads every day. A lack of experience, misjudgment of risks and a failure to pay attention on the part of the children play just as large a role here as a failure to pay the proper attention, excessive speeds and distraction on the part of other road users, to name just a few examples. This Report will look at what measures can be taken in terms of the human factor, vehicle technology and infrastructure in order to achieve a lasting improvement in road safety of under-15-year-olds. In addition to this, as ever, it also aims to provide inspiration and advice – for politicians, traffic experts, manufacturers, and associations, and indeed for all road users. The special children's supplement enclosed with the Report underlines just how important road safety is to us at DEKRA – especially that of our youngest road users.

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The web portal: www.dekra-roadsafety.com

Since 2008, DEKRA has been publishing the annual Road Safety Report in printed form in several languages. The www.dekra-roadsafety.com web portal went live with the publication of the DEKRA Road Safety Report 2016. You can use this portal to access additional content supplementing the printed report (e.g. videos, interactive graphics etc.). The portal also covers a range of other topics and DEKRA activities concerning road safety. If you have a tablet or smartphone, you can link directly from the printed version to the web portal by scanning the QR codes that can be found throughout the report. Scan the code using an ordinary QR code reader and you will be taken directly to the corresponding content.

LEGAL NOTICE
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We Need to Change the Paradigm

Deaths and serious injuries are not the inevitable price we have to pay for our mobility. So why is it that we continue to accept 25 260 deaths and 135 000 serious injuries, right here in the European Union, each and every year? And what a price – the European Commission's latest study puts the external cost of road accidents at 300 billion euros a year.

It is true that that this is an international phenomenon, with the latest WHO data showing global deaths at 1.35 million each year. Rightly, it has been termed an epidemic. And it is also true that we are better than we used to be – we have reduced European casualty figures by more than half this century. But only in the crazy world of road safety can 25 260 dead be called a success. And this improvement has ground to a halt in the last few years, right across the European Union.

So we need to change the paradigm, and I am honoured to have been appointed by EU Commissioner for Transport, Violeta Bulc, as European Coordinator for Road Safety to help get us back on track, working with Member States, with organisations like DEKRA, with civil society and building new networks to deliver Vision Zero – zero road deaths and serious injuries by 2050. Connected, cooperative, automated, autonomous mobility will ultimately deliver huge benefits. Nonetheless, for many years to come we will need to rely on implementing the Safe System approach to road safety as humans will continue to make mistakes, and we need to do everything we can to stop people dying or being seriously injured by those mistakes.

We in the EU will continue to legislate where necessary – we have two important proposals on the table right now. The first incorporates the latest carefully costed improvements to vehicle safety, for example on automated emergency braking, and for intelligent speed assistance. As a package, these measures alone will reduce deaths by more than 25 000 over the next two decades. The second is to extend the benefits of road infrastructure safety management to more European roads – with thousands more lives to be saved as a result. I hope these measures will become law this spring.

Matthew Baldwin European Coordinator for Road Safety, Deputy Director-General for Mobility and Transport, European Commission

We also want to work in a different way with the road safety community. We want to agree with Member States on new safety performance indicators in each aspect of the Safe System – for example, vehicles, infrastructure, protective equipment, and speed – which in turn feed into intermediate death and serious injury targets. We cannot and should not try to legislate everything at the European level – but we do need commonly agreed targets to keep policy makers focused on what needs to be done. Which is why we are so pleased that we have a 50% reduction target for deaths in the EU by 2030 and also for the first time covering serious injuries.

Finally, we need to adapt. As vehicles become safer for their occupants – which is of course very good news – it becomes increasingly clear, unfortunately, just how dangerous the roads are for Vulnerable Road Users (VRU) - motorcyclists, bikers and pedestrians. They now account for 40% of deaths and in Europe's towns and cities, VRU are fully 80% of the casualties. We should be celebrating the rise in active mobility which does such wonders for our health and sanity. But again, death and serious injury are the true price of this glorious societal change. In these figures, the young are uniquely vulnerable - every day, 500 children are killed globally and 5000 seriously injured. Road accidents are the number one cause of death for 5-29 year olds, especially for young men – reminiscent of how, one hundred years ago, Spanish flu picked off the youngest, the most active people in society. Road crashes indeed risk to destroy our very future.

I warmly welcome DEKRA's vital contribution to our work, and I especially welcome the focus this report is placing on Vulnerable Road Users and within that, on young people in particular.

Greater Safety for Children

Because children lack experience, have not developed a proper awareness of the risks, and often exhibit immature behavior, they are among the most vulnerable road users. When an accident occurs, the consequences are often especially severe because of the increased vulnerability of children. In many parts of the world, the number of children under the age of 15 – who are the focus of this report – killed in road traffic is decreasing more or less steadily. In other parts of the world, the number remains high or is even increasing. No matter where in the world, the challenge to improve the safety of children permanently with the appropriate measures continues to be great.

Boy run over by car, girl struck by bus while crossing the street, man runs over child while driving off, and many more headlines. From time to time, news reports like these shake us up and highlight the great dangers to which children are exposed in road traffic. All over the world. The numbers speak clearly: According to the World Health Organization (WHO), more than 186,000 children and adolescents aged 19 years or less die each year in traffic accidents – over 500 per day and thus 20 each hour. Most of them are killed as pedestrians or vehicle occupants (Figure 1).

In its 2018 annual report "Global Action for Healthy Streets", the FIA Foundation (FIA = Fédération Internationale de l'Automobile) even estimates that 249,000 children and adolescents were killed in road traffic – which would be almost

Milestones along the Way to Greater Mobility and Road Safety

1902 Patent for a more pedestrian-friendly vehicle front end. The idea was based on obstacle deflectors like those found on railway vehicles. The idea was for pedestrians to be turned sideways.

1914 The world's first pedestrian traffic light appeared in Cleveland, Ohio, whereas the first traffic light in Europe appeared in Copenhagen in **1933**, and in Germany, such traffic lights didn't start appearing until **1937** (in Berlin).

1900 | 1905 | 1910

EIGHTY-FIVE PERCENT OF CHILDREN UNDER THE AGE OF 15 KILLED IN TRAFFIC ACCIDENTS WORLDWIDE COME FROM LOW- AND MIDDLE-INCOME COUNTRIES.

700 every day. The Institute for Health Metrics and Evaluation (IHME) at the University of Washington has also found that for every child killed in road traffic, there are four additional children that are permanently disabled and ten that are seriously injured.

If one limits the number of young road fatalities to children under the age of 15, who are the focus of this report, according to the IHME, with nearly 112,000 deaths, they account for just under 60 percent of the 186,000 children and adolescents killed

1

Every three minutes a child dies in traffic somewhere in the world

This means:

20 children per hour

500 children every day
—> six double-decker buses

3,500 children every week
—> ten jumbo jets

15,500 children every month
—> eight large passenger ships

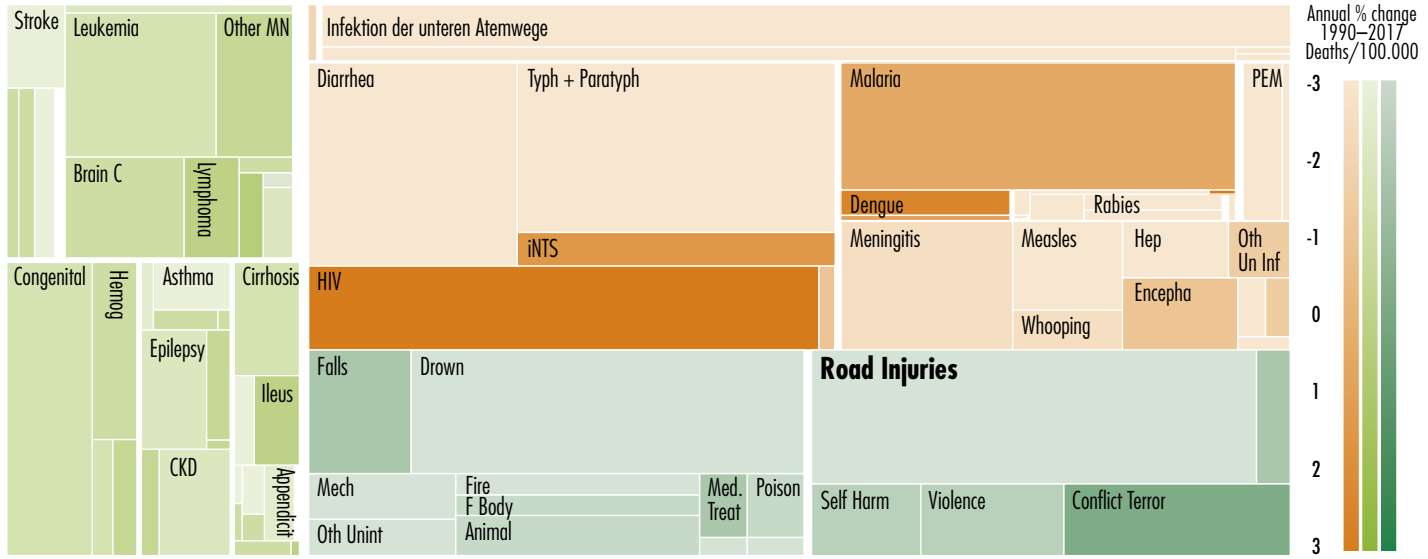
186,000 children every year
—> two large stadiums

Source: World Health Organization, Global Estimates, 2014

2

Types of death of children worldwide, 5-14 years, 2017

Children between the ages of 5 and 14 die the most frequently in traffic accidents worldwide



The darker the color, the greater the average annual increase between 1990 and 2017; the lighter the color, the greater the average annual decrease between 1990 and 2017

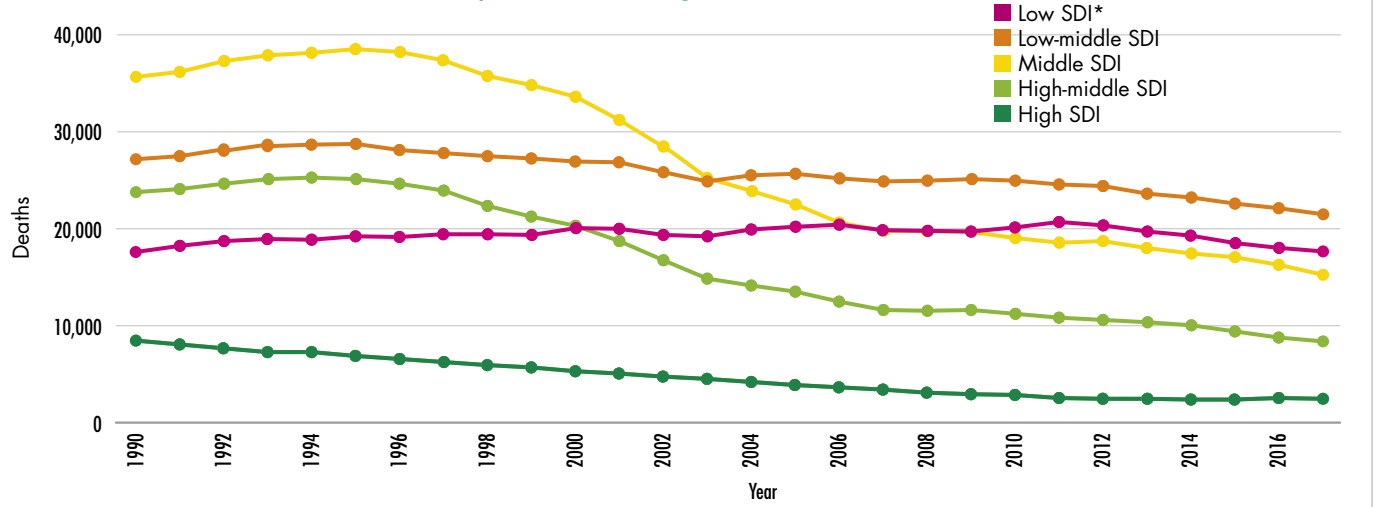
Source: IHME

1920s The first crossing guard units were formed to ensure safe street crossings in front of schools in St. Paul, Minnesota, and Omaha, Nebraska, among other cities in the US. Germany did not have official school crossing guards until **1953**.

1924 Patent for pedestrian safety. A collision with a pedestrian would cause a type of scoop to move upwards, preventing the pedestrian from slipping from the vehicle onto the road after the collision and being run over. Then the pedestrian is caught by a net.

1915 | 1920 | 1925

3 Deaths of children worldwide (5-14 years) according to income level



* SDI = Sociodemographic index

Source: IHME

in road traffic mentioned above. Globally, road accidents were the most common cause of death for the age group of 5- to 14-year-olds (8.5 percent) in 2017 (Figure 2).

Typhoid fever and malaria (just under eight and 7.5 percent respectively) followed in second and third place. In this context, it is interesting to consider these figures for individual regions. For example, in the European Union road accidents also accounted for the largest percentage of all deaths of children 5 to 14 years old in 2017 (12.7 percent), followed by tumors of the central nervous system (10.2 percent) and congenital diseases (8.8 percent). Also in the USA, road accidents were the most common cause of death for 5- to 14-year-olds in 2017 – no less than 18 percent. Death from congenital diseases and violent attacks, each at approximately seven percent, followed in a distant second and third place. In China, drowning was the leading cause of death in this age group in 2017 (25 percent), while traffic accidents accounted for almost 17 percent of deaths. In Africa, traffic accidents came third with 7.3 percent, after HIV (14.5 percent) and malaria (13.8 percent).

All of these are alarming numbers that at the same time highlight the high risk to which children and adolescents are exposed in road traffic. If we base the figures for children and adolescents below the age of 15 on all traffic fatalities worldwide – in their "Global Status Report on Road Safety 2018", the WHO writes that the number has risen from 1.25 million to 1.35 million since the 2015 Report – they account for 8.25 percent. According to the IHME,

SAFE ROADS FOR EVERYBODY ALSO MEANS SAFE ROADS FOR CHILDREN.

1933 The first pedestrian traffic light in Europe is installed in Copenhagen.

1949 The pedestrian crosswalk or "zebra crossing" appears internationally for the first time in the Geneva Protocol on Road Signs and Signals.

1951 Introduction of the vehicle inspection for motor vehicles in Germany. The purpose of the vehicle inspection is to ensure that the number of vehicles with technical safety defects on the road is as low as possible.

nearly 85 percent of children under the age of 15 killed in traffic accidents come from low- and middle-income countries. This proportion is comparable across all age groups (Figure 3).

In view of the continuing high risk of children being killed or seriously injured in road traffic in many parts of the world, a number of years ago the WHO adopted ten strategies to improve the safety of the youngest road users as part of the United Nations' "Global Plan for the Decade of Action for Road Safety 2011-2020". For example, the "Ten Strategies for Keeping Children Safe on the Road" include:

- Speed: Speed limits of 30 km/h on roads with a high density of pedestrian and bicycle traffic as well as high crossing requirements, as in front of schools and pre-school facilities, enforcement of speed limits by using automatic speed cameras, road construction measures to reduce speed.

- Driving under the influence: Legal requirements for maximum blood alcohol content while driving (basically 0.05% for everybody and 0.02% for young drivers), enforcement of legal requirements through random checks with breathalyzers, installation of ignition interlock systems in vehicles of persons who have ever been convicted of driving under the influence.

- Bicycle and motorcycle helmets: Regulation and enforcement of laws for motorcycle helmets that determine the type and fit according to the age of the wearer,

Andreas Scheuer
MdB, German Federal Minister of Transport and Digital Infrastructure

We must provide even better protection for children in road traffic

Children are curious. They want to discover what's happening around them. They want to explore the world on their own. Sometimes, they suddenly disappear out of their parents' sight. Sometimes, they are too rash and do not pay attention to moving vehicles. There are many things that they cannot yet judge properly, because they have neither the experience nor the perception of an adult. All this, coupled with the fact that other road users display a carelessness that is sometimes fatal and overlook or overestimate children, can have terrible consequences. Our prime objective must therefore be to provide even better protection for children in road traffic.

Fortunately, the number of children injured or killed in road accidents has decreased significantly over the past four decades. In 1978, 72,129 children aged 14 or less were involved in accidents. By 2017, this figure had been more than halved (29,259). In particular, the number of children under 15 who were killed also fell in this period. In 1978, there were as many as 1,449 fatalities in this age bracket. In 2017, 61 children – in other words just under 96 percent fewer – lost their lives in a traffic accident. This was the result of analyses by the Federal Statistical Office.

This is a positive trend but we cannot afford to be complacent. In the Coalition Agreement, we set out our commitment to "vision zero". In other words, to our most important objective – zero fatalities on the roads. But we still have a long way to go. We probably even have to admit that we will never achieve it. Because one hundred percent safety is unfortunately not realistic. But as an objective, vision zero is still right, because there is no number of fatalities that would be acceptable. And for this reason, this vision must be our common intention in our transport policy.

In this context, we consider road safety education at an early age to be of crucial importance. To this end, the Federal Ministry of Transport and Digital Infrastructure launched various initiatives years ago. They include the "Child and Traffic" programme in cooperation with the German Road Safety Council and the "Children in Road Traffic" programme in cooperation with the German Road Accident Prevention Organization. Both programmes support child care workers and parents of preschool-age children in their endeavours to teach children road safety. Specially trained facilitators show parents, for example, how they can prepare their children to be aware of the dangers posed by road traffic, especially by means of targeted exercises on routes where parents accompany their children, as well as by setting a good example themselves. Another important issue here is the safe restraint of child passengers in cars. But we also directly address the children ourselves – with our "Captain Bluebear" road safety primer, which is redesigned each year to cover topical issues from all fields of road safety and distributed to nursery schools and primary schools in Germany.

The general principle is: there must be no let-up in our endeavours to reduce even further the number of children involved in accidents. I consider this to be a task for the whole of society. It is up to all of us to play our part. I thus appreciate very much the dedication shown by the DEKRA expert organization, which also makes many and varied contributions towards reducing the number of accidents.

1953 In Germany, the use of crossing guards, officially referred to as "Verkehrshelfer" (traffic helpers) is introduced. The launch is the result of an initiative by several partners, including the "Deutsche Verkehrswacht" (German Road Safety Volunteer Organization).

1959 Hood ornaments are generally forbidden in Germany. This ban does not last long. Today, hood ornaments have to yield. So the Mercedes star bends, and the Rolls-Royce "Spirit of Ecstasy" retracts abruptly at the slightest touch.

1960 1970

support for initiatives that inform parents about the use of motorcycle and bicycle helmets and provide free or discounted helmets for children.

• Child restraint systems in vehicles: Legal requirement to secure children in appropriate restraint systems in all private vehicles, obligation for vehicle manufacturers to provide plug-in attachments for child restraint systems in all private vehicles (such as ISOFIX anchorage systems), educating parents about the proper use of child restraint systems.

• Visibility: Wearing high-contrast clothing, use of reflective strips on clothing or objects such as backpacks, equipping bicycles with front and rear lights as well as front, back, and wheel reflectors, improvement of street lighting.

Sofia Salek de Braun
Road Safety Ambassador for the PTV (Planung Transport Verkehr) Group

Story of a Horrifying Experience

I am originally from Bolivia in South America, but have been living in Germany for 18 years, where I work for the PTV Group in Karlsruhe. Until now, we have spent almost all our vacations visiting my family in Bolivia over Christmas so that the children and grandparents can spend some time together. In 2015, our trip started on December 11, and we arrived in Santa Cruz one day later. The entire family was waiting for us at the airport.

We went to the parking lot and the first question was, who is riding with whom and in which car? The decision was quick. Our 15-year-old daughter Catalina and I rode with my parents and my husband Gregor rode with his parents and our son Luca. When we arrived at my parents' house, I looked back and expected the others to be behind us, but could not see them. So we went into the house and after a few minutes I asked if Gregor had arrived. One of my brothers replied: "Not yet, but maybe they were detained at the entrance gate of this housing complex."

I went to the entrance to see if they were there, but did not find them. I went back to my parents' house and suddenly saw my brother coming out upset and talking on the phone. He said that there had been a car accident. A moment later, he jumped into his car and drove off. I ran after him, not knowing where he was going, when I suddenly heard sirens. Then I knew that something really bad had happened.

My brother stopped 200 meters in front of me. From far away I could see the wrecked car of my in-laws. He tried to stop me, but I did not stop and looked for my family. I came upon a group of people standing around someone – it was my husband. He stood up, but I could hardly recognize him because he was completely covered in blood. The first thing I asked was where our son was. He tried to put his arms around me, and I repeated the question. At that moment, I turned around and saw Luca lying on the ground. I fell to my knees thinking that this could not be true and that nothing could happen to us. I tried to take my child in my arms, but the first responders did not allow it before the police arrived.

THE POLICE ONLY ARRIVED AT THE SCENE OF THE ACCIDENT AN HOUR LATER

So I decided to lie next to him until they arrived. The rest of my family arrived at the scene of the accident and my older brother asked who had caused the accident. It turned out to be a 17-year-old youth who was speeding – 170 km/h in a 50-km/h zone – and without a driver's license. At that moment I stood up and said to my brother: "I don't want to know. Nothing and nobody can change anything about this situation." Then I lay

1963 Storchenmühle launches "Niki", the world's first child car seat model. In 1966, Britax Römer enters the car seat business with its "Lufki" (photo).

1978 Beginning of the "Child and Traffic" program by the German Road Safety Council.

DVR
Deutscher Verkehrssicherheitsrat

1978 An experimental safety vehicle is developed at four German universities (until 1982). This concept is designed explicitly for the safety of pedestrians and cyclists.

- Road infrastructure: Separation of different types of traffic and road users through measures such as pedestrian walkways, special pedestrian and cyclist lanes, or center barriers to separate the incoming vehicle traffic, creation of pedestrian zones to increase the safety of pedestrians, extension of the green phase for pedestrians at traffic lights near schools and pre-school facilities, increased investment in local public transport.

- Vehicles: Energy-absorbing crumple zones to protect vehicle occupants, design of pedestrian-friendly vehicle front ends, equipping vehicles with cameras and audible alarm systems to detect objects that may not be visible in the rear view mirror.

- Emergency care: Equipping emergency vehicles with medical equipment and materials suitable for children, "child-friendly" design of hospitals to min-

down again next to Luca. I could see as the lifeless bodies of my in-laws were removed from the car wreck.

It was more than an hour before the police arrived and did nothing but say that they had to take the bodies to the morgue. They wanted to place my child on the bed of a pickup. I did not accept that, so I took my child in my arms and climbed into their car. When we arrived at the morgue, a location far outside the city, I sat on the floor of a terrace holding my son in my arms for five hours until the autopsy began. During this time, I tried to understand what had just happened and how our lives had changed completely forever in only a few seconds.

ROAD SAFETY CHARTER IN BOLIVIA

When my husband left the hospital, he didn't say much. One day I saw him take a blank piece of paper and write down everything that had to improve and change in this country so that no other family would ever have to go through the same thing. Together with my husband and colleagues from the PTV Group, we created an initiative to promote a culture of road safety in Bolivia and to raise awareness of the significance of road safety among the local population.

We organized a workshop in Bolivia to develop a Road Safety Charter. The response has been very positive and our work is now being supported by the government, the Latin American development bank Corporación Andina de Fomento, and the Global Road Safety Facility, a partnership program of the World Bank, in the form of a wide range of measures. Our claim: Road safety is a common ethical responsibility. Everybody has to contribute. Because behind every accident victim, there is also a family – and there is nobody who isn't missed by someone.

Today, numerous campaigns in Bolivia are also drawing attention to the importance of seat belts in road traffic.

1980 Introduction of traffic-calming areas in the Road Traffic Act in Germany.

1980s First attempts to design the front ends of vehicles in consideration of pedestrian safety.

1984 Seat belts in the back seat required in Germany.

1987 The State of California passes a law requiring children under the age of five to wear a helmet when riding a bicycle.

1993 In Germany, from this year forward children who have not completed their twelfth year and are less than 150 cm in height must be transported in a child's seat.

1990 2000

Saul Billingsley
Executive Director, FIA Foundation

Deliver safety for every child on every street

Road traffic injury is now the leading cause of death, worldwide, for young people over the age of five. If we are to successfully deliver the Safe System approach, to make it relevant and relatable to policy-makers and the public alike, the urgent issue of children's and adolescents' basic human and civil rights – to play, to learn, to move, to breathe, to live – must be at the centre of debate.

Because the best way to ensure we design liveable cities, tackle climate change and deliver urban health for all is to write the prioritisation of child and youth needs and rights into the first line of the first page of every mayor's speech, every planning document and every technical manual. And, in fact, a policy, a shorthand encapsulating this child-centred objective, is written into the New Urban Agenda, the global policy framework for cities agreed by the United Nations in 2016: 'to promote the safe and healthy journey to school for every child as a priority'.

Ensuring that this commitment becomes reality on every street drives the campaigning of the Child Health Initiative, coordinated by the FIA Foundation. We consider this nothing less than a civil rights challenge for the 21st Century. The way we design our cities and allocate our road space is one element of the constant wider struggle over how we distribute our available resources fairly and efficiently.

Translating this into a practical agenda is our priority. So the FIA Foundation is investing in the work of the International Road Assessment Programme and many NGOs working at city level to democratise street design. Speed management by design is at the core of the approach, and there are strong and proven solutions available. So, for example, iRAP's 'Star Rating for Schools' initiative which measures traffic danger risk on the journey to school and offers counter-measures is now building momentum, with major partners, including the FIA and its more than 200 automobile clubs, poised to implement.

We have the tools, it is now time to use them to deliver safety for every child on every street.

AWARENESS OF THE IMPORTANCE OF ROAD SAFETY FOR CHILDREN HAS INCREASED SIGNIFICANTLY.

imize additional trauma to child accident victims, better access to counseling centers to mitigate the psychological consequences of road accidents on children and their families.

COMPREHENSIVE ACTION PLANS IN MANY PARTS OF THE WORLD

The WHO Strategic Plan also builds on the "2020 Action Agenda" published as part of the "#SafeKidsLives" global lobbying campaign, with five key requirements:

- Safe ride to school for every child including safe roads and speed management around every school.
- Safe school transport with seat belts in all school buses.
- Child-proof vehicles and measures to promote child restraint systems.
- Helmets for all children transported on motorized two-wheel vehicles.
- Enforcement of measures against driving under the influence.

The fact is, there has been much positive development in recent years, but to differing degrees around the world. For example, in the European Union, the number of children under the age of 15

1995 "Vision Zero" is applied to road traffic for the first time in Sweden. The declared aim: zero traffic fatalities or serious injuries.

1997 Euro NCAP introduces pedestrian safety ratings that explicitly include children's safety.

1998 The "European Enhanced Vehicle-Safety Committee Working Group 17" publishes its final report. The focus on pedestrian safety increases considerably.

killed in road accidents decreased between 2005 and 2017 by 55 percent from 1,325 to 593, according to the European Commission. In the US, according to NHTSA, the decrease between 2005 and 2016 was only 37 percent from 1,955 to 1,233, and in Africa, according to IHME, it was only 12 percent from 54,171 to 47,520 between 2005 and 2017.

So much remains to be done – and fortunately it is also happening in many countries. Children play an important role in many national initiatives and road safety programs. This is especially true in low- and middle-income countries. For example, just in November 2018, transport ministers from across Africa joined the first African Road Safety Forum in Marrakesh with Zoleka Mandela, the global ambassador of the Child Health Initiative, and her partners who published a new report titled "Un grand pas en avant" (A big step forward).

The report, co-authored by the FIA Foundation and the organizations Amend and Humanity & Inclusion, is aimed specifically at French-speaking countries in Africa and calls for effective action to be taken, including infrastructure and speed management, to improve the safety of walking children in countries like Burkina Faso, the Democratic Republic of the Congo, and Senegal. Background: Children in sub-Saharan Africa are killed in traffic accidents twice as often as anywhere else in the world. The report follows the 2016 publication "Step Change" that referred to road safety solutions developed in countries such as Tanzania, Zambia, and Ghana.

The African Road Safety Observatory, which was developed by the FIA Foundation together with the WHO and a consortium consisting of the FIA, the International Transport Forum, and the World Bank, was also introduced at the forum in Marrakesh. The International Road Traffic Accident Database (IRTAD) also played an important advisory role. Following its example, the African Road Safety Observatory is to collect data on traffic accidents and other indicators with the help of national governments in Africa and make them comparable.

Zoleka Mandela, Child Health Initiative Ambassador, presents the report titled "Un grand pas en avant" (A big step forward) at the first African Road Safety Forum in Marrakesh.

Many initiatives have also been launched on the other continents in recent years. For example, the "Vision Zero for Youth" pilot projects in Mexico City. This is the first Latin American city to focus on chil-

CHILDREN UNDER THE AGE OF 15 ARE SO AT RISK IN ROAD TRAFFIC, BECAUSE THEY HAVE VERY LITTLE EXPERIENCE TO DRAW FROM.

2005 European Directive (2003/102/EC) on the design of the front end of vehicles for the safety of pedestrians and other vulnerable road users becomes effective.

2006 First production vehicle with active hood (Jaguar XK).

2006 From November, vehicles with frontal protection systems ("cow catchers") must comply with Directive 2005/66/EC in the EU.

2008 Since April 8, only child seats that have been successfully tested according to ECE 44/03 or higher may be used in Germany.

2005 2010

Antonio Avenoso
Executive Director, European Transport Safety Council (ETSC)

Reducing Child Deaths on European Roads

More than 8,000 children aged 0-14 years have been killed in road traffic collisions over the last ten years in the European Union. Half of the children killed were travelling in cars, a third were walking and 13% were cycling, according to a research published last year by ETSC.

One in every 13 child deaths in the European Union occurs as a result of a road collision.

The data show that Sweden has the lowest rate of child road deaths in the European Union. At the other end of the spectrum, children in Romania are seven times more likely to die in a road collision.

A number of EU countries have also reduced child road deaths faster than other road deaths over the last decade including Hungary, Croatia, Greece, Portugal, The Netherlands, Spain and the UK in particular.

Measures that can reduce speeding are critical to preventing the deaths of more children. ETSC is calling for the EU to require vehicle safety technologies such as Intelligent Speed Assistance (ISA) and Automated Emergency Braking (AEB) that can detect pedestrians and cyclists to be fitted as standard on all new cars. Smart, cost-effective and proven vehicle safety technologies like these could be as important for saving children's lives as the seatbelt. But the real change will only come when, just like with seatbelts, these technologies are fitted on every car as standard, not as an optional extra on a select few.

Absent, inappropriate or incorrectly fitted child seats also remain a significant problem across the EU. According to the World Health Organization, correctly installed and used child restraints reduce the likelihood of a road death by up to 80%. ETSC is calling for better education, more enforcement and reduced VAT on child seats – permissible under EU law, but so far only put in place by Croatia, Cyprus, Poland, Portugal and the UK.

ETSC is also calling for EU Member States to introduce well-enforced 30 km/h zones in areas with high levels of walking and cycling, and around schools.

dren and adolescents in its goal of reducing the number of traffic fatalities. The pilot project supported by the Institute for Transportation and Development Policy (ITDP) and the insurance company AXA primarily targets the way to and from school. Teachers and students worked together to identify the most dangerous intersections near schools, and various traffic-calming measures – such as wider sidewalks, shorter pedestrian crossings, speed restrictions, and traffic bollards – were initiated.

Another of many beautiful success stories comes from Vietnam. In December 2007, a law requiring all motorcyclists and passengers to wear helmets came into force. Accompanied by effective campaigns conducted by the AIP Foundation and other partners, the results were visible immediately. The rate of helmets worn on urban streets rose from just six to over 90 percent. Already in the first year, injuries caused by traffic accidents decreased by one fourth, while the death toll dropped twelve percent. In the decade since the law was enacted, an estimated 500,000 head injuries and 15,000 fatalities have been prevented by the increased use of helmets. At the same time, the massive increase in the use of helmets has resulted in an estimated saving of USD 3.5 billion over a ten-year period, including medical costs, lost production costs, and permanent or temporary disability. Because of this positive development, and based on the fact that many children are transported to school on motorbikes in Vietnam, the Vietnamese government distributed motorbike helmets to nearly 1.8 million first graders free of charge throughout the country at the beginning of the 2018/2019 school year.

Countless other positive examples like this one could be identified around the globe. But alone the strategies and measures already mentioned demonstrate that awareness of the importance of children's road safety has increased significantly and

2012 Volvo introduces the first pedestrian airbag in the V40.

2013 ECE/UN Regulation no. 129, which states that child seats must be based on the size of the child and must have an ISOFIX attachment, becomes effective. The manufacturers themselves can determine the size range for which the seat is suitable. This regulation also requires certified child seats to allow children up to 15 months old to be transported only facing rearwards (corresponding to class 0+ of ECE-R 44).

2017 In France, a law requiring children under the age of 12 to wear a helmet on their bicycles becomes effective.

Entrance to Justin Kabwe Primary School in Lusaka, Zambia. Thanks to an infrastructure project supported by FedEx and the FIA Foundation, the safety of the once dangerous access roads has been raised to a high level.

that more and more efforts are being made to contribute to a permanent optimization. The present DEKRA Report, incidentally the twelfth of its kind, also wants to make a contribution by focusing on children under the age of 15. One of the reasons that this age group is so at risk in road traffic, is because they have very little experience to draw from. In addition, they have a short attention span, are easily distracted, and lack concentration – an often deadly mix of risks. In addition, small children are not able to estimate speeds. Whether for children who are walking, riding a bicycle, riding as passengers in a car, in a child seat on a bicycle, or in a trailer behind it, whether riding as passengers on motorized two-wheel vehicles, or using small electric vehicles, the following chapters discuss where there is still a backlog and the measures that can be taken to counter the high risk of accidents.

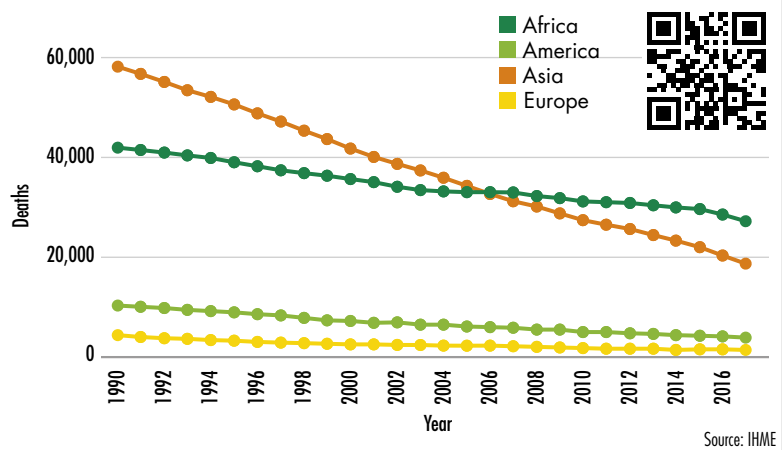
The facts in brief

- **Globally, road accidents were the most common cause of death for the age group of 5- to 14-year-olds in 2017.**
- **Eighty-five percent of children under the age of 15 killed in traffic accidents come from low- and middle-income countries.**
- **In the EU, the number of children under the age of 15 who were killed in traffic accidents between 2005 and 2017 decreased by 55 percent, while in the US the decrease was only 37 percent between 2005 and 2016, and in Africa, only approximately 12 percent between 2005 and 2017.**
- **Children in sub-Saharan Africa are killed in traffic accidents twice as often as anywhere else in the world.**

Still a Lot Needs to Be Done

As terrible as it is for all concerned, unfortunately, accidents involving children are still part of everyday life – worldwide. In recent years, great efforts have been made to reduce the number of accidents significantly and permanently. And these efforts are reflected in the constantly decreasing numbers of casualties. But despite the long-term positive development, the current situation is far from satisfactory, because the goal of transport policy endeavors with respect to fatal traffic accidents is "Vision Zero". There is still much to do to achieve this goal. It is especially important to tailor the respective measures as exactly as possible to local accident statistics. For example, while most children who die in traffic accidents in high-income countries are passengers in cars, most of those in low- and middle-income countries die as pedestrians and cyclists.

4 Traffic fatalities under 5 years



Source: IHME

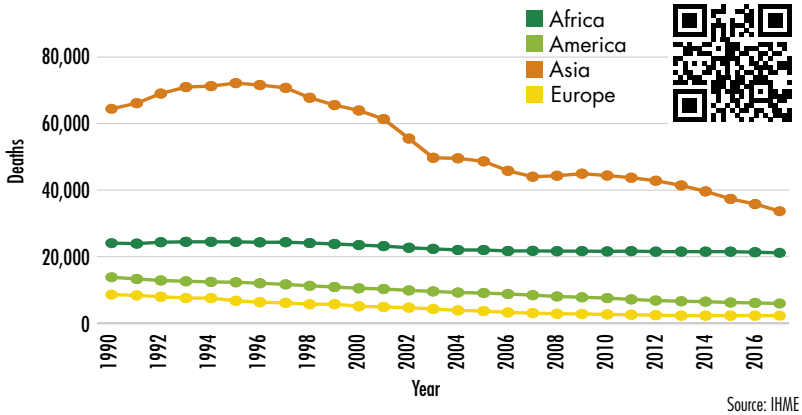
The number was already mentioned in the introduction to this report. According to the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, nearly 112,000 children under the age of 15 were killed in traffic accidents around the world in 2017 – approximately 49,000 of them were under five, and 62,500 were between 5 and 14 years old. Considering that there were a total of 223,500 traffic fatalities in these two age groups in 1990, more than twice as many as in 2017, until now the trend is quite positive. Asia was at the top in 2017 with just under 52,000 fatalities, followed by Africa with approx-

imately 47,550 fatalities, America with approximately 9,200 fatalities, and Europe with approximately 2,800 fatalities. The largest decline between 1990 and 2017 was achieved by Asia with just under 58 percent, while in Africa the decline in this period was only 27 percent (Figures 4-7).

In the case of children under five, Africa was by far the leading country in 2017 with approximately 26,550 traffic fatalities. This is also reflected in the proportion of fatalities in this age group per 100,000 population. While this proportion was approximately seven fatalities globally, it was 14 in Africa. And a few more figures: In traffic fatalities for 5- to 14-year-olds, between 1990 and 2017 Africa declined only by approximately 12 percent from 23,850 to 21,000, while Asia decreased 48 percent from 64,500 to 33,500. Africa and Asia continue to account for the majority of traffic fatalities below the age of 15. As already mentioned in the introduction to this report as well, many campaigns have been launched in these regions to ensure greater road safety for this age group in recent years.

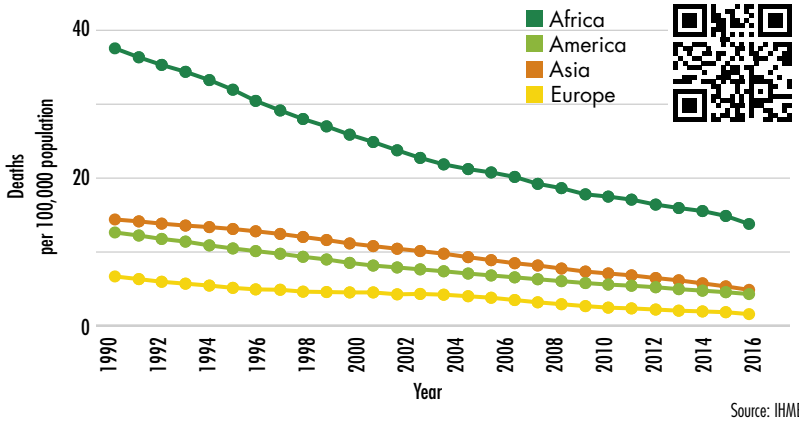
Basically, comparisons of the number of road users killed among different countries are not easy. The absolute numbers are undoubtedly an important indication, but at the end of the day, the reference to 100,000 people in this age group mentioned above for Africa, is even more significant when trying to measure the risk of getting killed in a road traffic accident. According to figures from the World Health Organization (WHO) and the International Road Traffic and Accident Database (IRTAD), countries such as Sweden, the United Kingdom, and Norway each have a value of less than three, while countries such as the USA or Chile have values greater than 10.

5 Traffic fatalities between 5 and 14 years



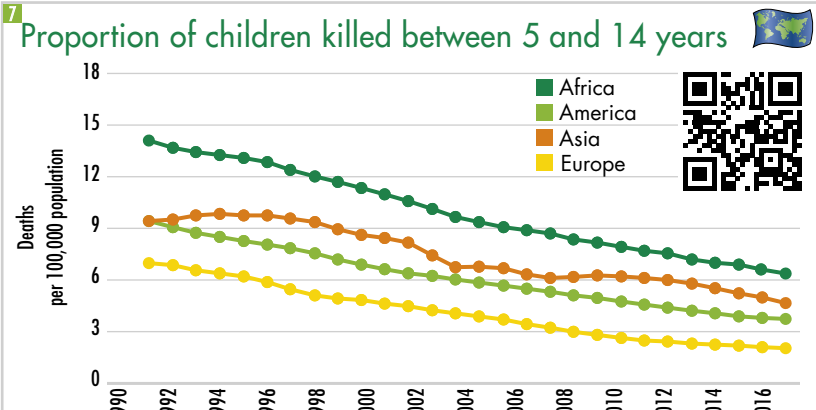
Source: IHME

6 Proportion of children killed under 5 years



Source: IHME

7 Proportion of children killed between 5 and 14 years



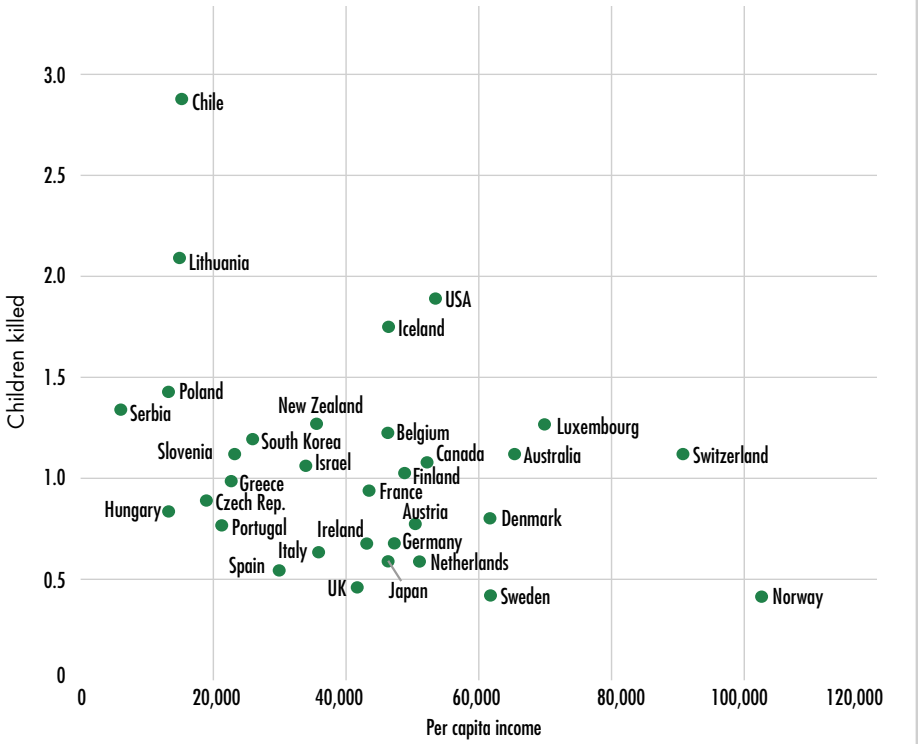
Source: IHME

COUNTRIES WITH HIGHER INCOME LEVELS ARE NOT NECESSARILY IN A BETTER POSITION IN TERMS OF ROAD SAFETY THAN LOWER INCOME COUNTRIES.

8

Children killed in road traffic

Average rate of children (0 to 14 years) fatally injured in road traffic per 100,000 persons in this age group (average from 2011 to 2016) by country

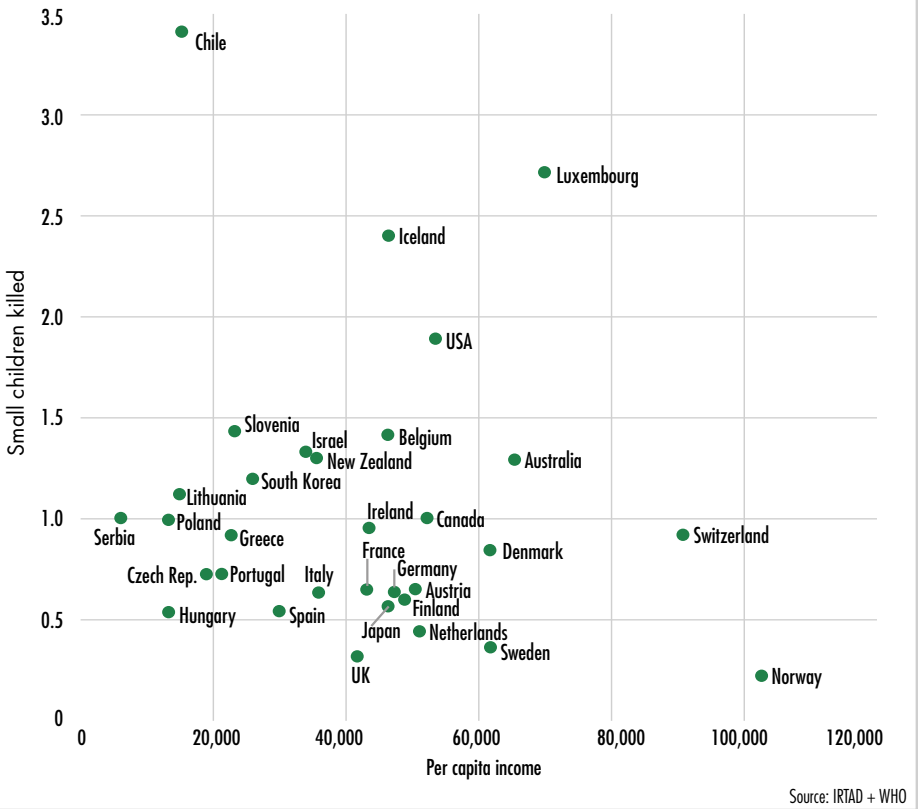


Source: IRTAD + WHO

9

Small children killed in road traffic

Average rate of small children (0 to 5 years) fatally injured in road traffic per 100,000 persons in this age group (average from 2011 to 2016) by country



Source: IRTAD + WHO

This figure for children up to the age of 14 demonstrates that children have a lower risk of being killed in road traffic than adults in every country on earth. The front runners here are Norway (0.414), Sweden (0.420); and the United Kingdom (0.460). Within this age group, children between 0 and 5 have even better values. Once again, Norway, Sweden, and the United Kingdom are at the top, with a fatality rate of less than 0.4 per 100,000 persons in this age group. In the US, the value of just under 1.90 is several times this figure.

Overall, there is a trend towards greater safety for children in road traffic in countries with a higher per capita income. However, this does not mean that countries with higher income levels automatically have better road safety for children. For example, Hungary and Denmark have a roughly equivalent comparison value of 0.836 and 0.802 respectively – with average incomes of EUR 13,260 and EUR 61,680 respectively (Figures 8 and 9).

In many parts of the world, road safety education is taught in a playful way at an early age.

Emmanuel Barbe
Interministerial Delegate for Road Safety

Greater road safety through good traffic education of children and adolescents

Every day 3,700 people die in traffic accidents worldwide, and at least 500 of them are children. This means that nearly 192,000 children lose their lives every year due to a traffic accident – an alarming number. In France, 104 children and adolescents under the age of 15 lost their lives in this terrible way in 2017. The majority of children under the age of 13 seriously injured in France are walking or cycling at the time of the accident (54 percent in 2017). On the other hand, almost 60 percent of adolescents (14 to 17 years) are involved in accidents on motorized two-wheel vehicles (mainly mopeds). These figures show a slight increase – they remind us of the need to safeguard the mobility of our children permanently so that they can travel safely at a young age as passive passengers in a child's seat or booster seat, and later as pedestrians, cyclists, and moped riders.

Great progress has been made in the field of transport of the youngest. The continuous development of legal requirements for child seats and seat belts (lap and diagonal seat belts) has significantly improved the safety of babies and small children. Since 2013, a new standard applies, according to which child seats are no longer to be based on the weight, but on the size of the child. But we face the problem that at least a quarter of children under the age of 10 who die as passengers in an accident are not wearing a seatbelt. Since March 2017, children under the age of 12 are also required to wear a helmet when riding a bicycle. This is to prevent the types of brain injuries that most commonly occur in bicycle accidents.

Childhood and early youth are the formative years when it comes to raising tomorrow's generation of drivers and getting young people to take responsibility for themselves and others. Children's brains are like sponges, and so they are receptive to suggestions and warnings of caution – and also remind their parents when they exhibit safety-threatening behavior while driving. According to a recent survey conducted by Allianz France-CSA in December 2018, approximately one-third of parents drive faster than allowed – even though their children are on board. Some parents talk on the phone, others drive under the influence of alcohol or disregard stop signs.

On January 9, 2018, the Comité Interministériel de la Sécurité Routière (French Interministerial Committee on Road Safety) adopted two complementary measures to increase the safety of children and adolescents in road traffic. The objective of the first measure is to promote concepts such as "pedibuses" and "velo buses", i.e. special pedestrian and bicycle routes to accompany the children, in order to ensure the safe movement of young road users. The second measure concerns the ministries of education, sports, and the interior, and is aimed at certifying young students to ride their bicycles to school independently and safely, under the title "Savoir rouler à vélo" (Know how to ride a bike). This means that they are able to cycle, ride along a marked route, and handle a traffic situation under real conditions.

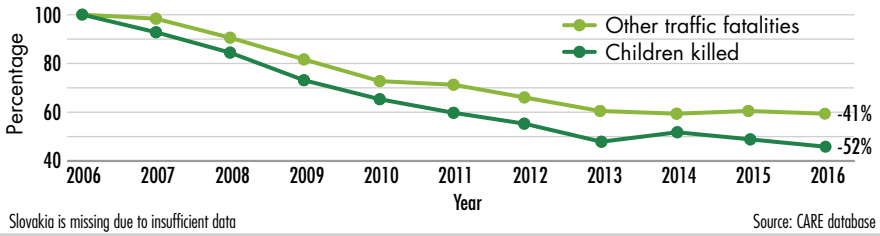
Those who have obtained the certificate "Savoir rouler à vélo" can prepare for the ASSR1 in seventh grade and ASSR2 in ninth grade. ASSR stands for "Attestation Scolaire de Sécurité Routière" (Road safety education certificate), and in addition to knowledge of the rules, also certifies acquired knowledge of road traffic risks such as alcohol and narcotics abuse and driving at excessive speed. These certificates represent the theoretical part of the moped license, which can be obtained from 14 years of age. The practical part takes place in the driving school and has been reformed to reduce the number of moped accidents. Since March 1, 2019, the requirements for those who want to apply for a moped license have increased. Then the training must be completed in eight hours on two days. In addition, as part of this risk awareness, at least one parent must be present to receive the information and to encourage the involvement of the entire family, so to speak. The fact is, the earlier the training starts, the more positive the risk behavior of road users. So in the future, 15-year-olds can prepare for a personal vehicle driver's license (the class depends on the country and state) by driving accompanied by a licensed driver. This concept resonates with more and more families and the success rate is convincing: More than 80 percent pass the test. In the group of those who complete traditional driver's license training from the age of 18, the success rate is only 60 percent.

The young people benefit from an "educational continuum", a ladder on which one step follows the next. These steps involve various actors who play a role in the daily lives of young people – such as driving instructors, teachers, and parents – and who want to provide them with skills and knowledge in the field of road safety. It gives young people tools that they can use throughout their lives so that they can respond to different situations in the best possible way and rely on their good reflexes. And who knows? Maybe this will also lead them to give their parents (remedial) lessons in road safety.

10

Road fatalities under the age of 15

In the EU, the number of children under the age of 15 who were killed in traffic accidents decreased by 52 percent between 2006 and 2016 – while the number of traffic fatalities in the other age groups declined by only 41 percent.



Slovakia is missing due to insufficient data

Source: CARE database

11

Number of children under 15 killed in specific EU member states.

Country		2000	2005	2010	2015	2017	Change '00–'17
Belgium	under 15/ altogether	52 1,470	35 1,089	23 840	19 732	14 615	-73% -58%
Germany	under 15/ altogether	240 7,503	159 5,361	104 3,648	84 3,459	61 3,180	-75% -58%
France	under 15/ altogether	318 7,643	130 5,318	130 3,992	101 3,459	103 3,444	-68% -55%
Italy	under 15/ altogether	136 7,061	131 5,818	70 4,114	39 3,428	43 3,378	-69% -52%
Netherlands	under 15/ altogether	56 1,082	31 750	16 537	20 531	15 535	-73% -51%
Austria	under 15/ altogether	27 976	25 768	10 552	11 479	8 414	-70% -58%
Poland	under 15/ altogether	267 6,294	167 5,444	112 3,908	70 2,938	56 2,831	-79% -55%
Portugal	under 15/ altogether	66 1,629	27 1,094	18 937	14 593	3 602	-95% -63%
Romania	under 15/ altogether	184 2,466	152 2,629	95 2,377	76 1,893	67 1,951	-64% -21%
Sweden	under 15/ altogether	19 591	10 440	9 266	7 259	8 253	-58% -57%
Spain	under 15/ altogether	144 5,031	93 3,857	65 2,146	25 1,689	35 1,830	-76% -64%
Czech Republic	under 15/ altogether	54 1,486	41 1,286	17 802	18 734	12 577	-78% -61%
United Kingdom	under 15/ altogether	171 3,580	125 3,336	42 1,905	52 1,804	48 1,793	-72% -50%

Source: EU Commission, CARE database

ACCIDENT STATISTICS IN THE EU

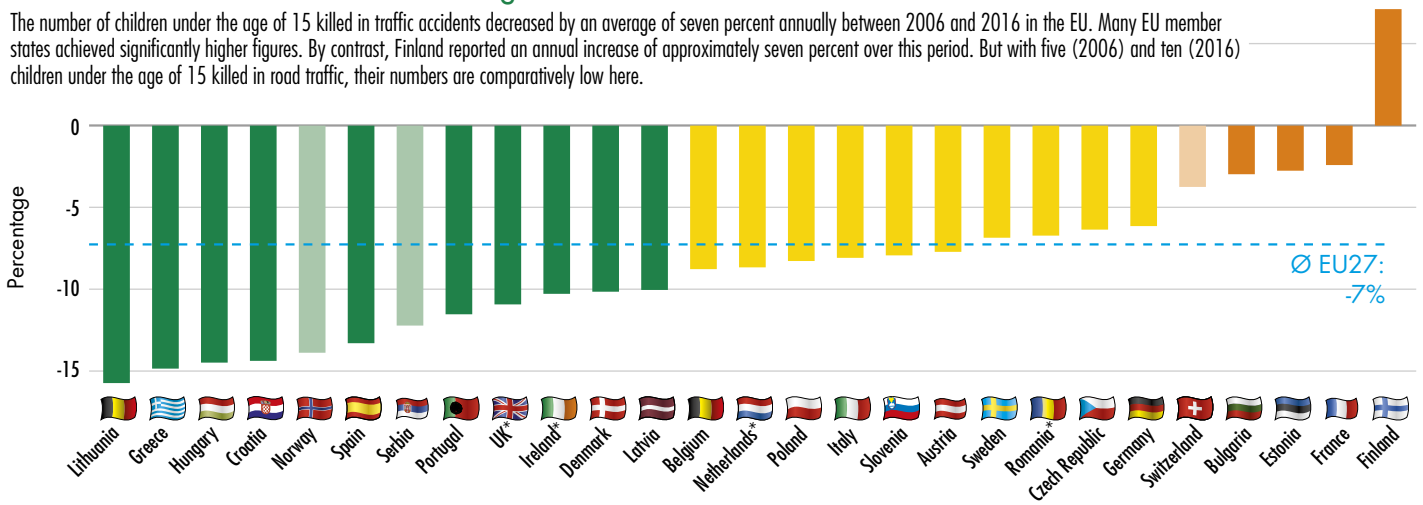
What does it look like in the European Union now? As the European Transport Safety Council (ETSC) wrote in its February 2018 issue of PIN Flash Report 34 "Reducing Child Deaths on European Roads", road safety for children under the age of 15 has improved faster over the last decade than road safety for the rest of the population (Figure 10). This applies to fatalities as well as serious injuries. Between 2006 and 2016, approximately 8,100 children lost their lives on the roads of the EU, compared to 593 in 2017. Almost one-sixth were in France alone, with 103 fatalities (Figure 11).

Approximately half the children killed in traffic accidents every year in the EU are vehicle occupants. In 2015, four percent of the 2,065 cyclists fatally injured in the EU were children under the age of 14. This rate varies among EU countries. In Sweden, no child in this age group died while riding a bicycle; in Germany five percent out of a total of 383 cyclists killed were children, in the Netherlands it was nine percent out of a total of 107, and in Hungary 15 percent out of a total of 34. Approximately 30 percent of children fatally injured were pedestrians; of the 5,516 pedestrians in the EU that were fatally injured in 2015, four percent were children.

12

Decrease in road fatalities under the age of 15

The number of children under the age of 15 killed in traffic accidents decreased by an average of seven percent annually between 2006 and 2016 in the EU. Many EU member states achieved significantly higher figures. By contrast, Finland reported an annual increase of approximately seven percent over this period. But with five (2006) and ten (2016) children under the age of 15 killed in road traffic, their numbers are comparatively low here.



*Data for the Netherlands, Romania, and the UK for 2006–2015; preliminary data for 2015/2016 for Ireland

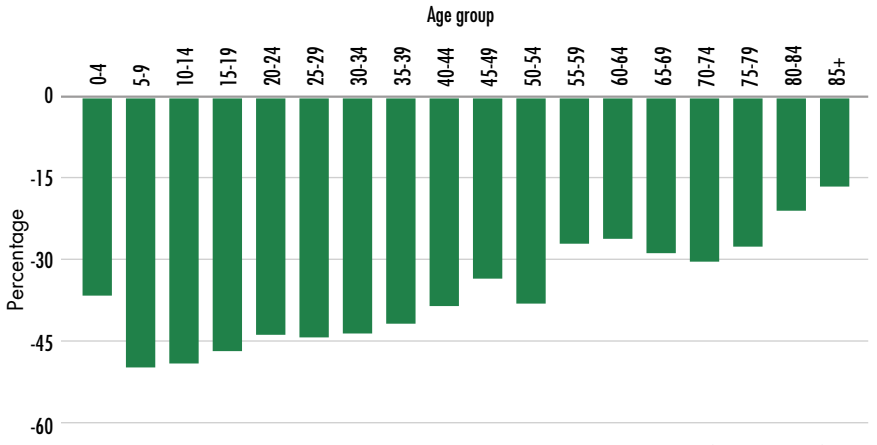
Source: CARE database and ETSC

APPROXIMATELY HALF THE CHILDREN KILLED IN TRAFFIC ACCIDENTS EVERY YEAR IN THE EU ARE VEHICLE OCCUPANTS.

Overall, according to the EU CARE database, children under the age of 15 had the lowest fatality rates compared to all other age groups. Between 2006 and 2015, fatality rates decreased in almost all age groups. The age groups 5 to 9 and 10 to 14 recorded the greatest decreases. Between 2006 and 2016, the annual average reduction in child mortality from road accidents in the EU was 7.3 percent, compared to 5.8 percent for the other age groups. The number of children killed in road traffic in the EU during this period was approximately 2.5 percent of total traffic fatalities and approximately six percent of all serious traffic accidents in the EU, while children accounted for more than one sixth of the population (Figures 12-15).

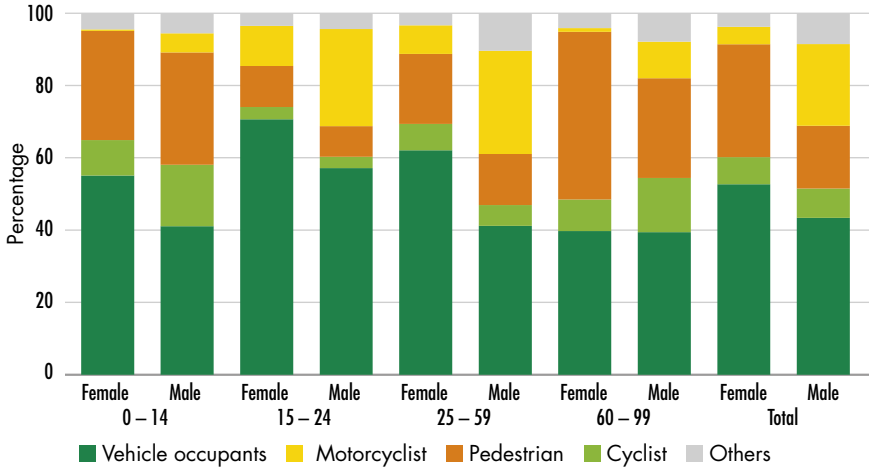
13 Decrease in road fatalities by age group

The number of traffic fatalities for 5- to 9-year olds and 10- to 14-year olds between 2006 and 2015 declined more than for the other age groups.



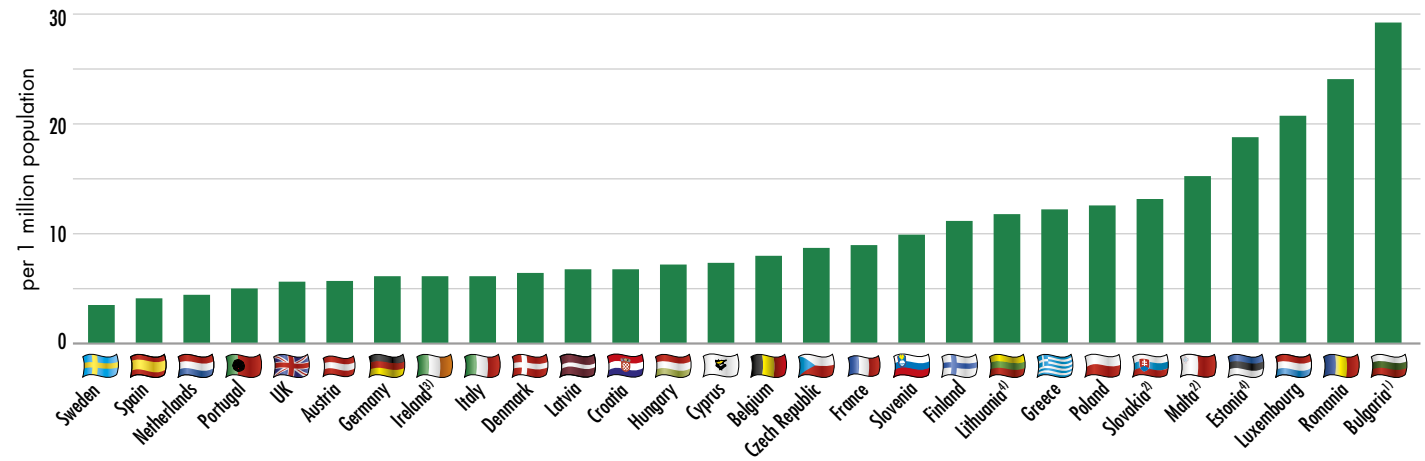
Source: CARE database/EUROSTAT, figures accurate as of May 2017

14 Distribution of traffic fatalities in the EU according to age, gender, and type of road use in 2015



Source: CARE database, figures accurate as of May 2017

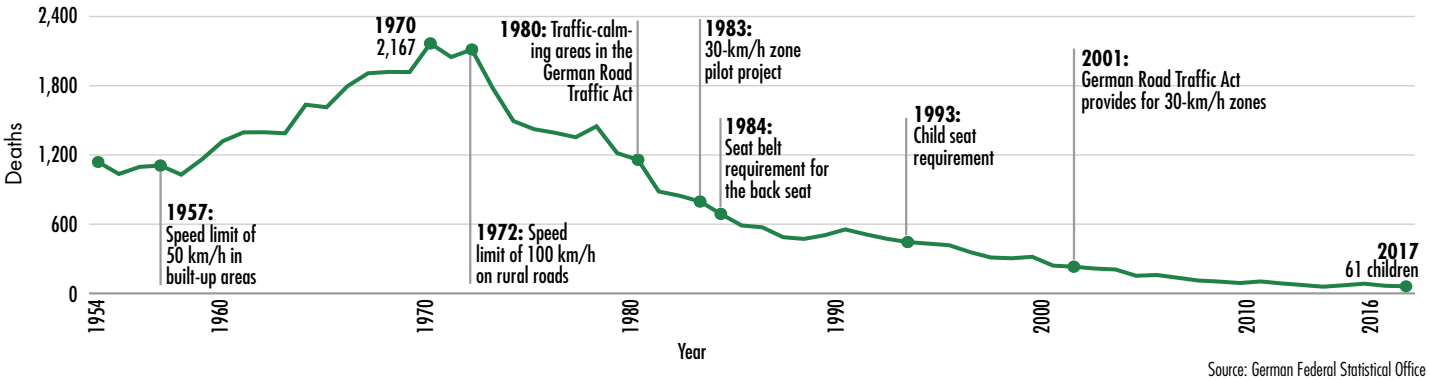
15 Children under 15 killed in road accidents in 2016 in EU member countries per 1 million population



Based on deaths within 30 days after the accident. As of January 1 respectively; for Germany, as of December 31 of the previous year census update. [1] Date: 2009; [2] Date: 2010; [3] Date: 2013; [4] Date: 2015

Source: CARE database

16 Children killed in road traffic in Germany



Source: German Federal Statistical Office

Prof. Anders Lie
Trafikverket (Swedish Transport Administration),
Road Safety Department

"Vision Zero" and the safety of children in Sweden

Vision Zero has as the ultimate goal, that no one should be killed or seriously injured in the road traffic. That is an ambitious goal and a goal that must be thoroughly monitored to identify successful methods and initiatives. The use of traffic safety indicators is one valuable approach to identify success within certain areas or for certain prevention strategies and preventive action. Another valuable way to monitor success is to look at special road user groups or localities, such as geographical regions. DEKRA has for some time gathered data about Vision Zero cities, a very meaningful way to illustrate micro successes.

In Sweden child safety is an area that have shown significant success over the last 60 years. Going back to the 1960s some 200 children aged 0-17 year were killed in traffic per year. The last few years there has been 15 killed children instead. A calculation has been made using the worst five year and the best five years for children in different age groups.

The data spans 1956 to 2017 a period of over 60 years. When looking at the age group 0-6 years there were 296 fatalities the five worst years, in the best five only 7 were killed. That is a 97,6% reduction. Looking in the group 7-14 years the reduction using the same methods is 94,9%. In age group 15-17 years the reduction has been 91,8%. If we compare these younger ages with the complete population in which we see an 80% reduction, it is clear, that we have had almost ten times better progress for the children aged 0-6 years. In age group 0-6 the fatality rate per population has been 0,12/100 000 population when we look at the five best years. The worst years were all between 1956 and 1975 with a central point in the middle of the 1960s. The good years are all in the last decade.

In the middle of the 1960s Sweden came to new insight when it comes to child safety. Instead of informing, training and educating the kids, the mantra was that children should be protected. They don't have the mental capacity to manage the complexity of traffic on their own.

But the safety has a backside in that children are often driven in cars instead of moving on their own. We now all have a common responsibility to make streets and roads so safe that parents can feel safe and secure to let the kids move on their own. Today the knowledge is the key to build a safe and secure urban mobility!

ACCIDENT STATISTICS IN GERMANY

As in almost all EU member states, the trend in traffic accidents involving children under the age of 15 is very positive in Germany. The figures from the German Federal Statistical Office show a clear decrease in children fatally injured in road traffic after reaching a maximum in the year 1970. In 1970, 2,167 children were killed in traffic accidents, but in 2017 it was "only" 61, that is, 97 percent less. In 2017, the number of children killed was less than 100 for the seventh time in a row. But on average, a child under the age of 15 years was injured on the road every 18 minutes. Altogether, almost 29,260 children were injured, of which approximately 4,270 were seriously injured. For comparison: In 1970, approximately 72,500 children were injured or killed in road traffic, and the decline by 2017 is nearly 60 percent (Figures 16 and 17).

Looking more closely at the accident figures and taking into account the type of road

BASICALLY BOYS ARE INVOLVED IN ACCIDENTS MORE THAN GIRLS, BOTH AS PEDESTRIANS AND AS CYCLISTS.

What should I do in case of an emergency? Get help quickly. The youngest road users learn this playfully.

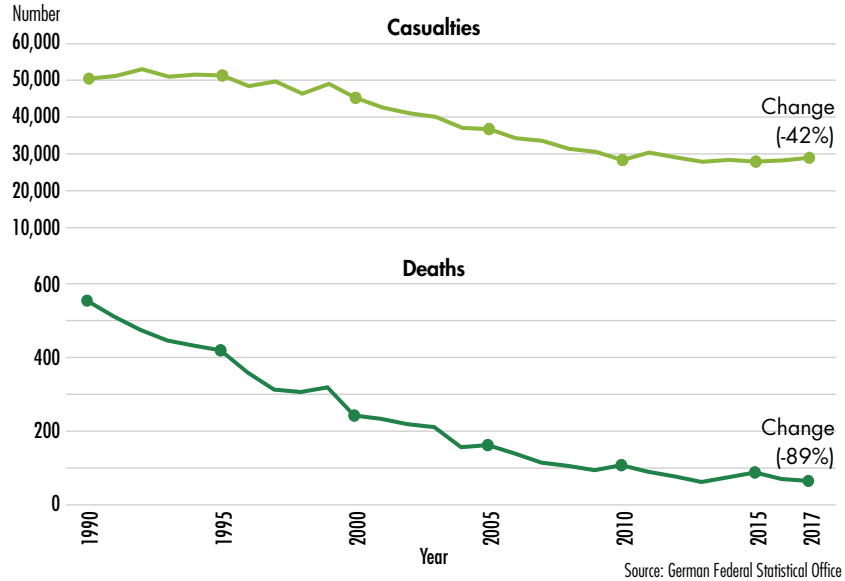
use, it is noticeable that in 2017 children were most frequently injured as car occupants (37.5 percent) and as cyclists (33.7 percent), and only 22.3 percent as pedestrians (Figure 18). In non-built-up areas, children are usually involved in accidents in cars, and in built-up areas as cyclists. Background: In non-built-up areas, fewer children move around on bicycles or by foot. Furthermore, child safety equipment in passenger cars is pushed to its limits due to the higher speeds on rural roads, for example. On the other hand, child safety equipment in passenger cars can realize its potential better in built-up areas.

But not only the means of transport is relevant to the risk of an accident, but also a variety of other factors, as accident analysis surveys show. Like the age of the child, for example. As pedestrians, especially 7- to 9-year-old boys are at risk; in the case of cyclists, it is the 10- to 15-year-old age group regardless of gender. Occupants of passenger cars have experienced a slight increase in accidents for both sexes at primary school age – a phenomenon associated with so-called "parent taxis", which is discussed in greater detail in the chapter on the human factor in this report.

Basically boys are involved in accidents more than girls, both as pedestrians and as cyclists. This can be associated with a generally greater tendency on the part of boys to take risks. As already mentioned, there are higher accident rates among girls traveling in cars, especially among 14-year-olds. According to experts, one of the reasons for this is riding with novice male drivers.

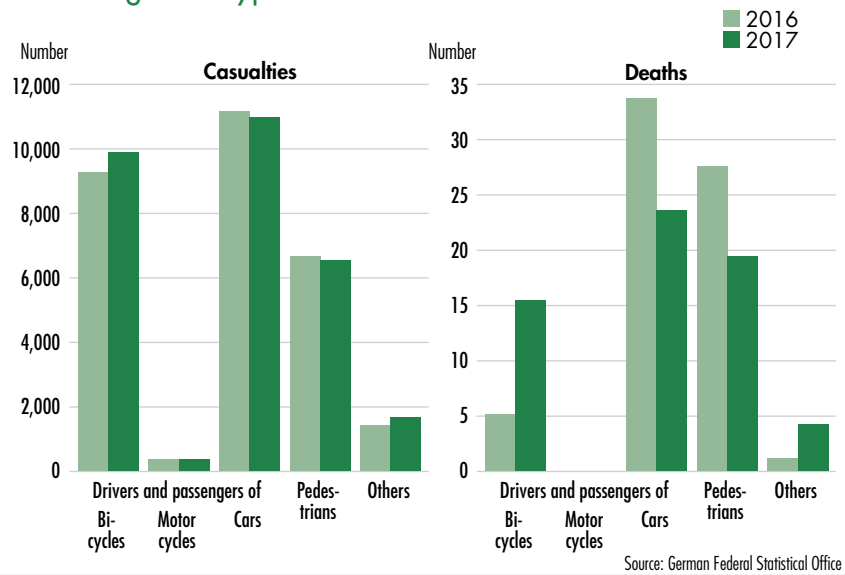
Hyperactive and restless children are at particular risk of being involved in a traffic accident because they are less focused and less attentive than

17 Children under 15 years harmed in road accidents



Source: German Federal Statistical Office

18 Children under 15 years harmed in road accidents according to the type of road use



Source: German Federal Statistical Office

In Germany, the police participate in numerous road safety education measures in pre-school facilities and elementary schools.

others. But extroverted children are also at greater risk because they play on the street with their peers more often than others. Spontaneous actions, such as suddenly crossing the road without paying attention to traffic, and suddenly emerging from behind objects obstructing the view, are the greatest sources of accidents involving children on foot. On the other hand, children on bicycles are involved in accidents more frequently due to incorrect use of the road or mistakes when turning, entering traffic and riding off, or not granting the right of way.

Three risk points can be identified with regard to the time of day: the way to school in the morning and the way back at midday, as well as in the afternoon, when the roads are used for playing, recreation, and socializing. According to the factors based on the time of day, greater numbers of accidents occur during weekdays. Fridays have the greatest incidence of accidents, which can readily be explained by the fact that children receive less homework on the last day of the week and also that commuter traffic starts earlier, in addition to the weekend traffic.

As far as the seasons are concerned, there are two different phenomena. In autumn and winter, accidents are more frequent in the morning on the way to school. The cause is considered to be poorer visibility of the children, who are often difficult to detect or are seen too late in the dark by other road users because they are wearing dark clothing without reflectors. In spring and summer, on the other hand, the risk of children being involved in an accident is greater in the afternoon when they are playing outdoors.

Pediatric biomechanics or why accidents often have such serious consequences for small children

The biomechanical characteristics of children and adults differ greatly, because children are not just small adults. This applies to the body proportions as well as to the strength of bones, muscles, and ligaments. While the head size at the time of birth is approximately a quarter of the body size, this ratio decreases to one-seventh for adult humans.

Add to this the fact that the strength of the neck muscles increases as the child develops. The neck muscles of a baby are not yet sufficiently developed to stabilize the proportionally larger head. This biomechanical peculiarity is the reason why babies are transported most safely in a rear-facing baby seat.

In comparison to the skull of an adult, the skull of an infant is less resistant to impact trauma. The bones of small children are softer and more flexible, and not all skull bones have already grown together firmly.

Also, the ribs of small children are more elastic than those of adults. Therefore, an impact causes more deformation of the ribs, which makes it easier for the organs inside to be injured. In addition, the chest and pelvis are smaller and thus the organs in the abdomen are less protected by the rib cage and pelvis.

RESTLESS CHILDREN ARE AT PARTICULAR RISK IN ROAD TRAFFIC.

The greatest risk of accident exists for children in built-up areas on roads with speed limits of 50 or 60 km/h. Speed restrictions in towns, especially in densely populated areas, significantly reduce the likelihood of an accident. Incidentally, approximately half of all accidents involving children are caused by somebody else. The main causes of accidents are red-light violations by drivers and a lack of attention to pedestrians and cyclists during turns, or speeding violations. The countermeasures that can be taken are indicated in the chapters on the human factor, vehicle technology, and infrastructure.

Álvaro Gómez Méndez
Director of the Observatorio Nacional de Seguridad Vial (National Road Safety Observatory, Directorate-General for Traffic)

Holistic approach for greater road safety for children

Because children are particularly at risk and heavily dependent on the behavior of other people, such as parents and relatives, school bus drivers, or caregivers, they have priority in all road safety plans and strategies. In Spain, children represent one of the twelve most important groups and focal points of the current Road Safety Strategy 2011-2020. In addition, one of the thirteen strategic goals of the leadership concept is to reduce the number of children who die without a child restraint system to 0 in 2020. In 2017, 5 children died under these circumstances.

In 2017, 35 children aged up to 14 years died in traffic accidents, which represents a significant decline compared to 60 fatalities in 2009. On the other hand, 346 children were hospitalized with injuries and 6,611 were injured without being hospitalized, with these figures representing two percent of all fatalities, four percent of hospitalized injuries, and five percent of non-hospitalized injuries. The death rate per million population was 5.

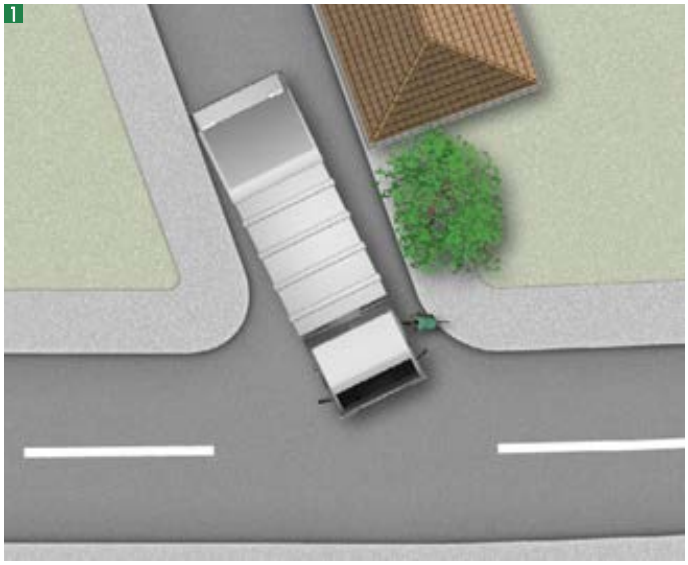
Most children – 22 of the 35 fatalities – died in accidents on highways, while accidents on urban streets involving children resulted primarily in injuries, amounting to 61 percent of those hospitalized with injuries and 62 percent of those injured without being hospitalized. As a final statistic, it should be noted that of the 35 children who died, 5 were on bicycles, 21 were vehicle occupants, and 9 were pedestrians.

Improving the safety of children requires a holistic approach. The road safety strategy defines three operational objectives. Firstly, a safe environment and safe routes to school from different perspectives must be ensured: the way to school for pedestrians as well as passengers in private cars and school buses, promoting sustainable mobility (on foot, by bicycle, in a shared vehicle). Secondly, the efficient use of child restraint systems is to be improved. According to current information, these systems can reduce injuries by between 25 and 90 percent, depending on the type of system and age of the child. Ultimately, greater priority must be given to teaching road safety in schools and informal ways to disseminate information must be promoted.

The facts in brief

- **Africa and Asia continue to account for the majority of traffic fatalities below the age of 15.**
- **In every country on earth, children under the age of 15 have a lower risk of being killed in road traffic than other age groups.**
- **The number of children killed in road traffic in the EU between 2006 and 2016 was approximately 2.5 percent of total traffic fatalities.**
- **In the EU, the age groups 5 to 9 and 10 to 14 recorded the greatest decreases in the number of fatalities.**
- **In 2017, the number of children killed in traffic accidents in Germany was less than 100 for the seventh time in a row.**
- **Approximately half of all accidents involving children are caused by third parties.**

Compelling Examples of Accidents in Detail



1 Sketch of the collision position
2–3 Scene of the accident
4 View through rear-view mirror
5–6 Final position of the vehicles

Limited view

TRUCK RUNS OVER CHILD

Sequence of events:

A truck was traveling down a narrow, slightly sloping street towards the intersection of a road with right of way. The driver wanted to turn left at the intersection. At the same time, a child on a bicycle approached the truck from the left. The boy was riding on the right-hand sidewalk of the road that had the right of way. As the truck was turning, a collision occurred between the left side of the truck and the child. The left wheel of the second axle rolled over the lower left leg and foot of the child.

Persons involved in the accident:

Driver of a garbage truck and a child on a bicycle

Consequences/injuries:

The child was seriously injured.
The truck driver suffered from shock.

Cause/problem:

It was too late when the truck driver was able to see the sidewalk on which the child was riding. The view into the intersection is severely limited by buildings and vegetation by the curve of the main road. In addition, the driver's view of child was blocked briefly by the side mirror and the A-pillar of the truck (blind spot). Despite adequate mirrors, there is no direct or indirect view of many areas around a truck from inside. Because of the buildings and vegetation, the child was not able to notice the truck until late. In addition, because of the age and level of development of the child, his ability to prevent accidents has not developed completely. As a result, children in dangerous situations are often overwhelmed and misjudge the danger.

Avoidance measures, mitigation of consequences / strategy for road safety measures:

The intersection is clearly visible at the lowered curb. This suggests a slow approach. The vegetation would have to be reduced significantly in order to make the main road visible at an earlier stage. Depending on their development, children are often unable to make the right choice in dangerous situations. Road safety education and information can create safety awareness in children early on. In addition, all other road users should be made more aware of the particular behavior of children in road traffic.

Danger of the blind spot

BUS COLLIDES WITH CHILD

Sequence of events:

Coming from the direction of a school, the driver of a school bus wanted to turn right. An 11-year-old boy was riding his bicycle in the same direction on the , which he would no have been allowed to do. Both parties collided during the turn. The boy bounced against the front entrance area of the bus and then fell from his bicycle onto the road.

Persons involved in the accident:

School bus driver and boy on bicycle

Consequences/injuries:

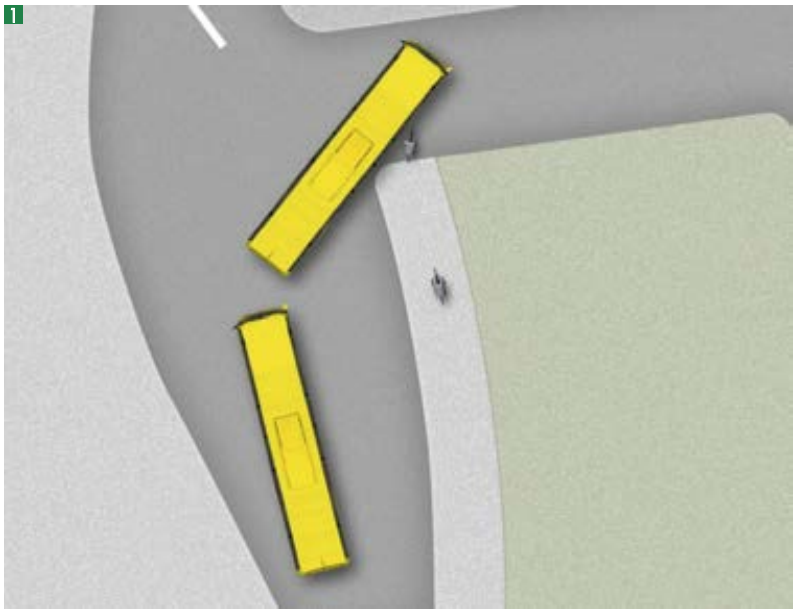
The boy was injured seriously when he collided with the school bus.

Cause/problem:

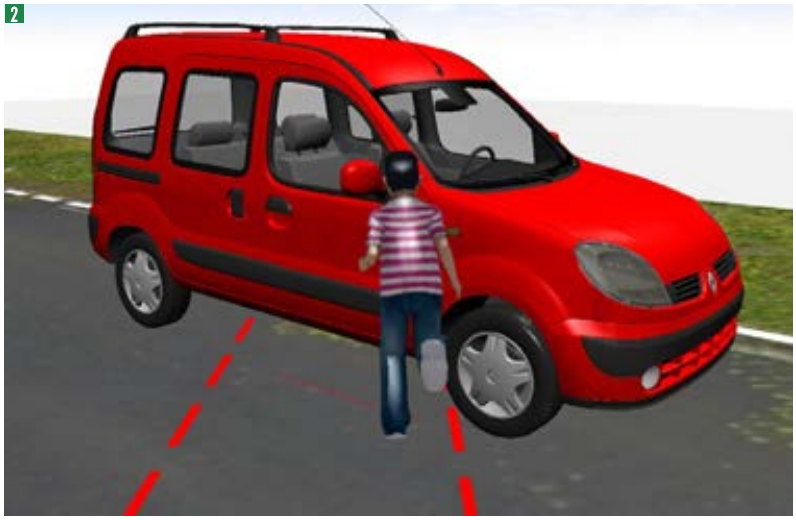
Because both parties were traveling at almost the same speed and the bus was shearing out before turning, the boy and his bicycle were in the bus driver's blind spot for a longer period of time.

Avoidance measures, mitigation of consequences / strategy for road safety measures:

Even a turning assistant could not have prevented this accident. Current specifications from Geneva require a lateral sensor range of 4 meters. The warning from the system would have been too late. The boy was not within this range until just before the bus sheared out. Even more careful and slower turn could not have prevented the accident. The cyclist could have prevented the accident by braking when detecting the danger.



1 Sketch of the sequence of events
2-4 Scene of the accident
5–6 Final position of the vehicles



1 Scene of the accident from the driver's perspective

2–3 Sketches of the collision position
4–6 Scene of the accident

Passing a school bus

EXCESSIVE SPEED

Sequence of events:

A car was driving at a speed of 45 to 50 km/h past a stopped school bus with the hazard lights flashing. Suddenly, a 12-year-old boy ran across the road from in front of the bus. The driver of the car could no longer brake or dodge in time, and hit the boy with the side of the vehicle, seriously injuring him.

Persons involved in the accident:

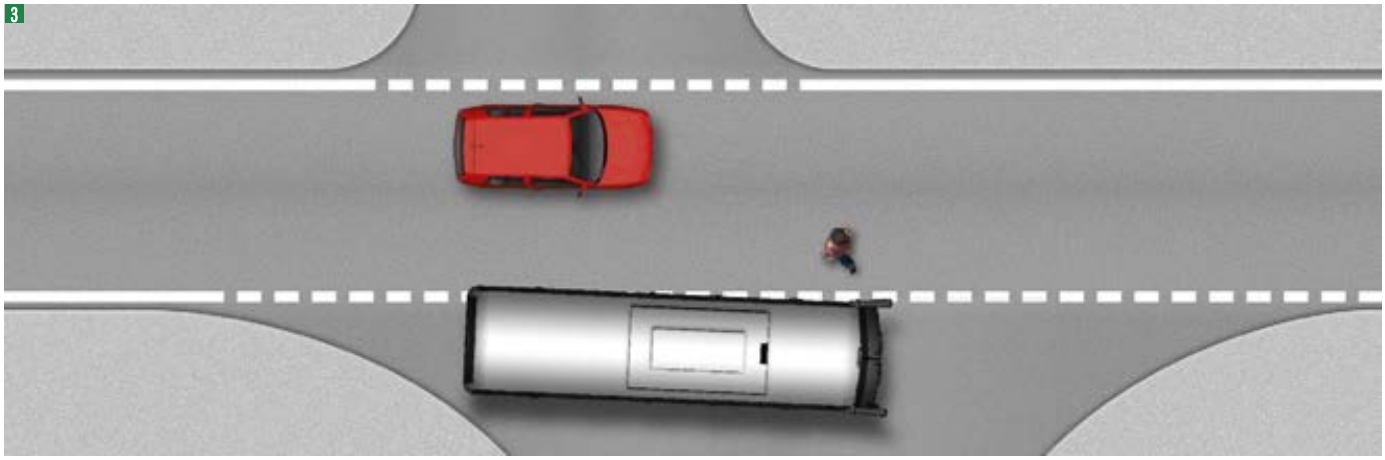
Car driver, boy on foot

Consequences/injuries:

The pedestrian was seriously injured by the collision.

Cause/problem:

The stopped school bus was obstructing the view ahead. In such situations, it is to be expected that passengers exiting the bus will cross the road behind or in front of the stopped bus. Special attention should be paid to children, who are unable to assess the danger correctly. According to §20 of the German Road Traffic Act, traffic from both directions may pass a bus waiting at a bus stop with the hazard lights flashing only at walking speed.



Avoidance measures, mitigation of consequences / strategy for road safety measures:

The accident would have been completely preventable if the permitted speed had been maintained. Admittedly, a modern automated emergency braking system with pedestrian detection would not have had a positive effect on the consequences of the accident at the speed at which the car was driving. The boy could also have prevented the accident by stopping at the front left corner of the bus and appropriately orienting himself to any possible cross traffic and acting accordingly. This way he would have been visible to the driver of the car. Ideally, the student would have even waited until the bus had departed and he was able to cross the street without any obstructions to the visibility.


6

Comparison of the accident situation with and without automated emergency braking (AEB)

	Original accident	Vehicle with AEB	Comparison	Compliance with the permitted maximum speed		Comparison
Distance based on detectability	11.1 m	11.1 m	The pedestrian can be detected from the car 11.1 meters before a subsequent collision.	11.1 m	11.1 m	
Speed at time of reaction	50.0 km/h 13.9 m/s	50.0 km/h 13.9 m/s		7.0 km/h 1.9 m/s	7.0 km/h 1.9 m/s	
Visibility before collision	0.8 s	0.8 s	**Without braking, 0.8 seconds remain until the point of collision.**	5.7 s	5.7 s	Without braking, 5.71 seconds remain until the point of collision.
	Original vehicle	**Vehicle with AEB**		**With emergency braking**	**Without driver reaction**	
Reaction time	1.0 s	0.6 s	Automated emergency braking reacts faster than a human and can start braking earlier. Here the car with AEB brakes before the collision. The original vehicle brakes only after the collision.	1.0 s	–	
Reaction distance	13.9 m	8.3 m		1.9 m	–	
Distance remaining until the collision point	-2.8 m	2.8 m		9.2 m	–	
Braking delay	8.5 m/s^2	8.5 m/s^2		8.5 m/s^2	0 m/s^2	
Braking distance until stopping	11.3 m	11.3 m		0.2 m	–	
Distance traveled after the collision point	14.1 m	8.5 m		-8.9 m	–	When emergency braking is initiated, the vehicle comes to a stop 8.9 meters before the actual collision point.
Collision speed	13.9 m/s 50.0 km/h	12.1 m/s 43.4 km/h	The collision speed has decreased notably.	0 m/s 0 km/h	0 m/s 0 km/h	
Braking time before collision	0.00 s	0.22 s				
Total time until collision	0.80 s	0.82 s	The vehicle with AEB arrives at the collision point 0.02 seconds later.		5.7 s	
	Pedestrian					
Pedestrian speed		14.0 km/h 3.9 m/s			14.0 km/h 3.9 m/s	
Distance traveled		0.1 m	The pedestrian travels less than 0.1 meter during the additional time. It remains a grazing collision.		22.2 m	If the vehicle does not brake, it will reach the collision point only after 5.9 seconds. During this time, the child travels 22.2 meters. He is certainly able to reach the other side of the road.
		0.241 m	**Distance of the car in the time saved in meters => Collision constellation remains at the mirror**			

AEB = automated emergency braking

Source: DEKRA

1 Sketch of the collision position
2–6 Final position of the vehicles

Right of way ignored

UNSECURED INFANT CARRIER

Sequence of events:

At an intersection in a residential area, the driver of a passenger car failed to yield the right of way to the driver of a minivan coming from the left, causing a collision. The van hit the car on the left front side. Then the car collided with a garden fence and the van collided with two parked cars.

Persons involved in the accident:

The drivers of two cars, a baby

Consequences/injuries:

The driver's baby sitting on the front passenger seat of the car was thrown out of the infant carrier as a result of the collision, and suffered serious head injuries. Both vehicle drivers were slightly injured.

Cause/problem:

The cause of the accident was the failure of the driver of the car to yield the right of way. The DEKRA accident expert found that the infant carrier was indeed placed in the rear-facing direction but was not secured by a seat belt. Neither was the baby secured in the infant carrier by the built-in seat belt. The passenger airbag was not deactivated. Thus, the infant carrier should not have been transported in the front passenger seat, but only in the back seat. Proper securing of the baby would have reduced the serious consequences of the accident.

Avoidance measures, mitigation of consequences / strategy for road safety measures:

The accident could have been prevented if the car driver had observed the right of way of the minivan driver coming from the left. The accident consequences could have been mitigated significantly for the baby if the infant carrier had been properly secured and the baby had been strapped in.

Not seen during turn

CAR COLLIDES WITH SMALL CHILD

Sequence of events:

The driver was driving a car on a street in a residential area and wanted to turn right. On the right sidewalk, a group of preschoolers approached him with their teachers. The group wanted to cross the road in a straight line. First the driver stopped to let the group pass. As the last teacher entered the sidewalk, the driver proceeded to turn right. As the driver was turning, he hit a two-year-old child, who was probably walking on the left side of the teacher.

Persons involved in the accident:

Car driver, small child on foot

Consequences/injuries:

The child was fatally injured.

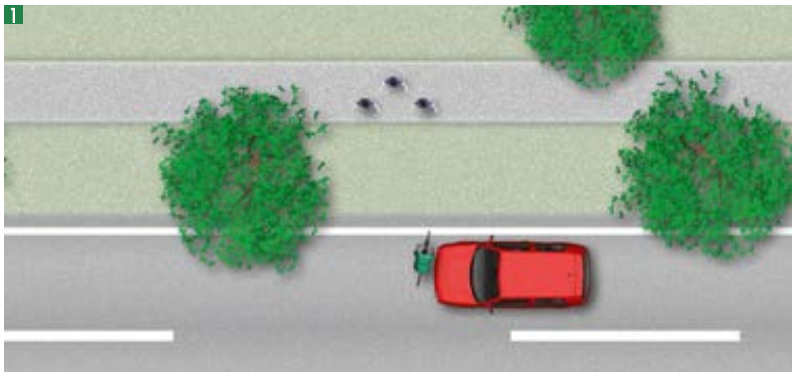
Cause/problem:

The driver's view of the child was blocked by the teacher and possibly also by vehicle components (exterior mirrors, frame of the windshield) during the entire turn.

Avoidance measures, mitigation of consequences / strategy for road safety measures:

Before initiating a turn, one should wait long enough to make sure that all the pedestrians have actually left the road and stepped onto the sidewalk. This is particularly important when children are crossing the road because their movements cannot be anticipated. Adults accompanying children must be aware that small children may not be seen from vehicles in the vicinity. Accordingly, they should remain in the street until the children have reached the sidewalk, especially when escorting groups.

1 Sketch: collision position
2 Final position of the car
3 View from the car
4–6 Scene of the accident



Mistake due to young age

CHILD MISJUDGES DANGEROUS SITUATION

Sequence of events:

Three children on bicycles were crossing a tree-lined rural road to get to the bicycle path on the opposite side. Another 5-year-old boy also wanted to cross the road. The boy detected the car coming from the right when he reached the lane in which it was traveling. He tried to push the bicycle back and the handlebar got twisted. A collision occurred with the car.

Persons involved in the accident:

Driver of a car and a boy pushing his bicycle

Consequences/injuries:

The child suffered serious injuries from the accident and died in the hospital later.

Cause/problem:

The accident site is in a tree-lined area. Due to the dense and closed canopy of trees, there was alternating light and shadow. As a result, the driver's vision was seriously impaired. Under these conditions, people wearing low contrasting clothes are difficult to detect. Although the child detected the danger of the approaching car, he made the wrong decision because of his age. Instead of walking the short distance to the right side of the road, he turned around. In the rush, the bicycle handlebar got twisted, delaying the child's flight reflex even more.

Avoidance measures, mitigation of consequences / strategy for road safety measures:

Due to the difficult light/dark visual limitations, the driver could not prevent the accident. A non-video based automated emergency braking system with pedestrian or cyclist detection would probably have prevented this accident.

1 Sketch of the collision position
2–4 Scene of the accident
5–6 Vehicles involved in the accident

Poorly visible bicycle

CAR COLLIDES WITH CYCLIST

Sequence of events:

An 8-year-old child on a bicycle wanted to cross the lane of a main road in the dark. He rode out of a driveway onto the road without stopping. At the same time, a car was approaching from the right. The driver did not notice the child in time, and there was a collision in the car's lane.

Vehicles:

Driver of a car and child on a bicycle

Consequences/injuries:

The child was seriously injured by the collision.

Cause/problem:

Children from the age of 8 are allowed to ride bicycles on the road in Germany. If this right is exercised, the bicycle must meet the requirements of the German road traffic licensing regulation. This bicycle was equipped with lighting that did not meet these requirements , and there were no side reflectors. The driver was not able to notice the cyclist until it was too late. The child disregarded the right of way of the car.

Avoidance measures, mitigation of consequences / strategy for road safety measures:

Automated emergency braking with a bicycle detection system, which is also effective in a non-built-up area, could have prevented the accident or at least significantly mitigated the consequences of the accident. Vehicles (including bicycles) that are used in road traffic must comply with road traffic licensing regulation. Therefore, parents must ensure that their children's bicycles comply with these regulations. When riding in the dark, cyclists should wear eye-catching and contrasting clothing, preferably with reflective elements. Parents should also encourage their children to dismount and push their bicycles when they cross busy roads or roads with fast traffic.

1 Sketch of the collision position
2 Scene of the accident
3–4 Bicycle lighting
5–6 Vehicles involved in the accident
7 Collision situation

Obscured view makes things worse

CHILD DISREGARDS RIGHT-OF-WAY RULES

Sequence of events:

A driver was driving a car in a residential area on a road with right of way. An 8-year-old child on a bicycle coming from the right side of an intersection from the driver's perspective wanted to get to the opposite side of the road. There was a collision between the front end of the car and the cyclist.

Persons involved in the accident:

Driver of a car and child on a bicycle

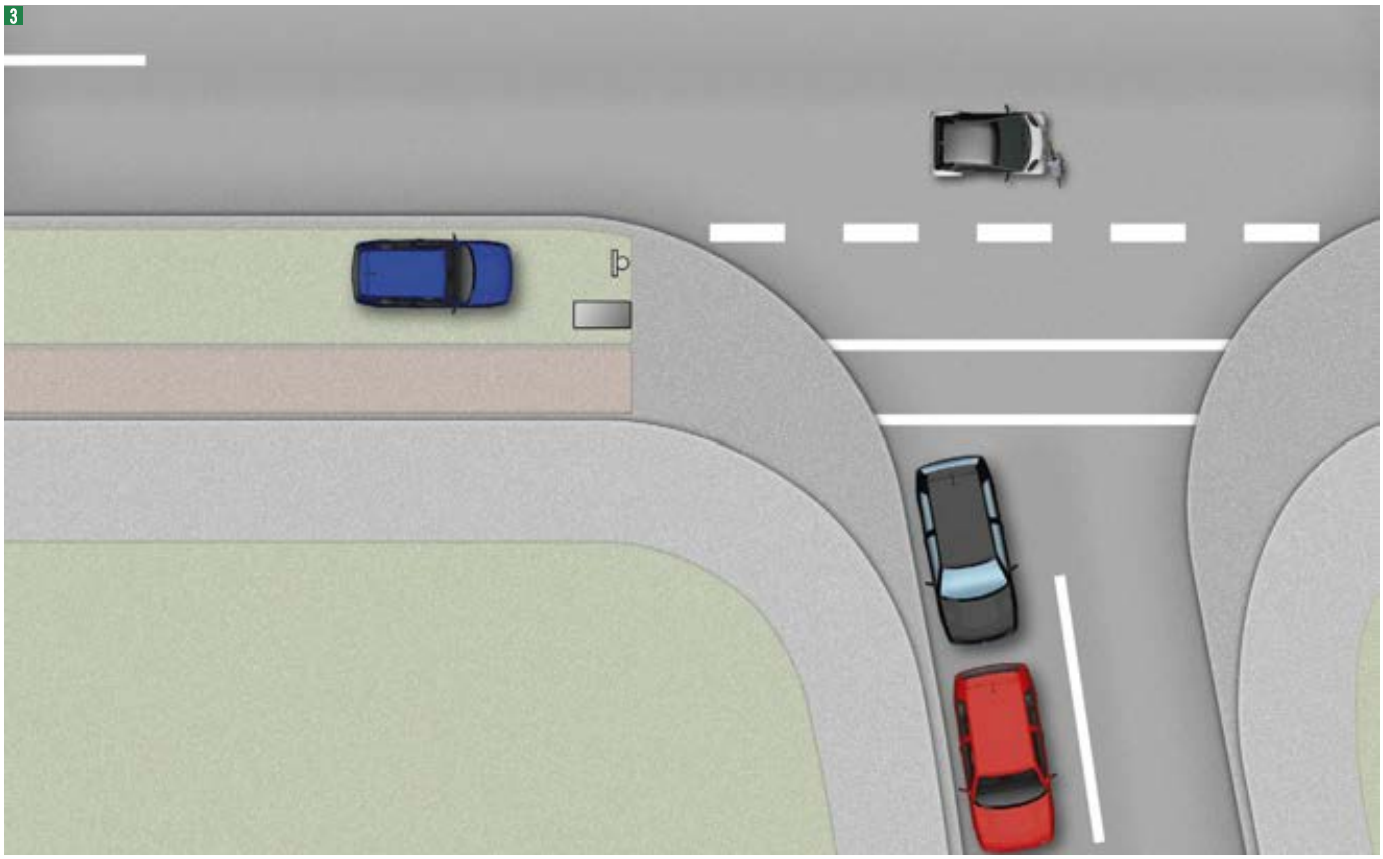
Consequences/injuries:

The child was thrown from the bicycle and seriously injured by the collision.

Cause/problem:

The child disregarded the right of way of the car. The driver of the car could not detect the child in time because of several objects obstructing his view (parked cars and electrical cabinet). According to witness statements, the child was riding very fast.

1–2 Driver's perspective
3 Sketch of the collision position
4 Reconstructed collision position
5–6 Scene of the accident

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Avoidance measures, mitigation of consequences / strategy for road safety measures:

The driver of the car could have prevented the accident only if he had previously selected an actual speed of no more than 42 km/h. An automated emergency braking system would have significantly reduced the collision speed even from 50 km/h.

On the part of the child, the accident could have been avoided if he had followed the traffic rules and granted the car the right of way.

A special safety flag on a flexible pole designed for children's bicycles and bicycle trailers could have made the bicycle visible earlier, because the flag would have protruded beyond the obstacles blocking the view.

Comparison of the accident situation with and without automated emergency braking (AEB)

	Original accident		Vehicle with AEB		Comparison
Distance based on detectability	16.7	m	16.7	m	The cyclist can be detected from the car 16.7 meters before a subsequent collision.
Speed at time of reaction	50.0 13.9	km/h m/s	50.0 13.9	km/h m/s	
Visibility before collision	1.2	s	1.2	s	1.2 seconds remain until the collision.
	Original vehicle		**Vehicle with AEB**		
Reaction time	1.0	s	0.6	s	AEB reacts faster than a human and can start braking earlier.
Reaction distance	13.9	m	8.3	m	
Distance remaining until collision	2.8	m	8.4	m	
Braking delay	8.5	m/s^2	8.5	m/s^2	
Braking distance until stopping	11.3	m	11.3	m	
Distance traveled after the collision point	8.5	m	2.9	m	
Collision speed	12.0 43.4	m/s km/h	7.1 25.5	m/s km/h	The collision speed has decreased remarkably.
Braking time before collision	0.22	s	0.80	s	
Total time until collision	1.22	s	1.40	s	The vehicle with AEB arrives at the collision point 0.18 seconds later.
	Bicycle				
Bicycle speed	25 6.9	km/h m/s			
Distance traveled	1.3	m			The bicycle travels 1.3 meters during the additional time.

AEB = automated emergency braking

Source: DEKRA

Greater Care Reduces Risk of Accidents

Children are a constant presence in road traffic. Pedestrian, cyclist, or passenger, occupant of public transport, user of roller blades, skateboards, or push scooters – there are many roles they can play that involve them in what happens on the roads. In addition to this, children can also be indirect road users. Unlike adults, they sometimes use parts of the road infrastructure for leisure activities: as somewhere to play, compete in sports, communicate, and meet up for group activities. All these different participation scenarios generate a huge variety of potential risks. In order to further reduce the number of children killed and injured in traffic accidents, we need to employ a diverse range of approaches.

Children start using the roads almost as soon as their lives begin. They are socialized to the existence of traffic while they are still just babies, even if they are not consciously aware of it. To start with, children are generally accompanied by their parents when using roads, usually as passengers in cars, in their prams, or – later on – on their own scooters or training bikes. They don't become independent road users until they start elementary school. But as they become less dependent on the adults around them, the risk of them suffering a traffic accident increases.

The fact is, learning how to behave around traffic is something that comes with experience. And since practice makes perfect, it takes time to acquire and internalize all the knowledge and skills we need to survive. With the way our development works, we can't pick it all up at once – we have to learn to walk before we can run. Granted, some of us are naturally fast learners, and we can also speed up the learning process with intensive practice at an early age, but the order in which we go through each stage of our development is predetermined by our basic psychosocial patterns.

One of the key prerequisites for ensuring that our children are safe around traffic is making sure that they possess all the necessary skills. These include the ability to control their own awareness and attention, a sufficient knowledge and understanding of the rules, and motor and social skills. For many years, we believed that these skills were fully developed by the age of 14. That may be the case for simple traffic situations that are easy to interpret, but as situations become more complex, it becomes clear that even this age group has not yet fully trained the combination of individual skills required. They are not always quick enough to notice things, and there are still deficits in their peripheral vision. In order to assess what we can expect from children of different ages as road users, we need to take a closer look at how individual skills and abilities are developed over time.

HEARING

Generally speaking, children have good hearing even as babies. The only difference is that a baby's hearing is less sensitive, so that noises have to be more intense for them to discern them at first. Under simple conditions, they will even demonstrate good directional hearing (Where is the noise coming from?) and auditory recognition of sounds (What or who is making what noise?) by the age of five. Selective auditory attention (Which noise is important?) is trickier. This depends on the maturity of the individual child's brain, and rarely works reliably until children reach the mid-elementary-school age bracket.

When it comes to using the road, we usually need our hearing to assess the situation and keep ourselves safe. Distinguishing between different volumes and pitches and localizing and distinguishing between sounds are some of the most important functions of our auditory perception. However, regardless of how well their hearing works, children don't tend to use it on the road until they reach the age of eight. While they can often hear horns, bells, screeching tires and other traffic noises, they are usually more focused on other things, such as their friends or toys. This increases the risk of accidents. In terms of auditory perception, even eleven-year-olds still demonstrate less ability to localize vehicle engine noises than adults.

VISION

The basic functions of sight develop in the first year of a child's life. They can usually see the full human range of color and brightness by the time they are two or three months old. Their ability to recognize objects starts with simple shapes while they are still babies, and continues to develop throughout childhood so that, by the time they reach adolescence – the period that stretches from late childhood and through puberty up to adulthood – they can recognize objects under complex conditions (e.g. from different perspectives and with different lighting).

There is some disagreement as to how long it takes for children to develop their full visual acuity and field of vision, with figures differing by several years depending on how the skills in question are measured. What seems certain is that visual acuity is, for the most part, developed in the first year of a child's life. The full field of vision may also be present from an early age, but it remains unavailable to the child because their cognitive functions – the mechanisms that affect their thought, comprehension, and knowledge – are not yet in full operation. Depth perception is well developed at just six months, and continues to mature until around the age of eleven. This affects the consistency of size – the ability to perceive objects as being of almost constant size despite differences in distance from the eye – and the ability to judge distances correctly. The latter of these skills seems to reach full development somewhere between the ages of six and nine. The abilities that take the longest to develop are the ability to judge speed and visual searching. These skills do not function reliably until the child reaches ten to twelve years of age, as they require more complex cognitive processes such as the ability to focus one's attention and to plan and execute a strategy to search for an object or person.

CHILDREN UNDER THE AGE OF EIGHT RARELY USE THEIR HEARING WHEN NAVIGATING ROADS AND TRAFFIC.

There are many different functions of a person's vision that are important when it comes to using the road. In addition to visual acuity at both close range and long distances, seeing in the dark or dusk, peripheral vision, and perception of color and movement are all essential. Visual perception of distance and speed represents a particular challenge, as this can only be achieved successfully in conjunction with cognitive skills. Children seem to compensate for deficits in this area in a number of ways, such as by being more careful when crossing roads. For example, they may wait for larger gaps in traffic before crossing in order to account for their slower information-processing and decision-making processes – what is known as a "slow start".

Identifying safe crossing points is also a problem. Until the age of nine, children primarily choose the points at which they cross the road based on the visibility of vehicles – irrespective of whether their own position means that their vision is blocked by other obstacles. What is equally dangerous is the fact that their visual searching when crossing a road (the act of actively looking for vehicles with their eyes) is often performed as more of an unthinking ritual, if at

Mobility and Road Safety Education

Many experts agree that the process of learning how to use the road safely and competently needs to begin at an early age. Parents should start teaching their children how to use the road before they start going to kindergarten, and continue building on this basis throughout kindergarten and school. However, mobility and road safety education is only successful if the knowledge the child learns can be applied to practical situations in their day-to-day interactions with traffic.

During the first year of their lives, most of a child's road use will be experienced in the company of their parents. As such, these adults and their own real behavior provide role models for the child. They can also build on this by actively passing on information to their children or teaching them to be careful in specific situations on the routes they travel in everyday life.

The aims of mobility and road safety education in kindergartens include promoting perception, training psychomotor skills and abilities, teaching social understanding, promoting the skills required in handling traffic situations, and motivating children to contribute to protecting the environment.

When they start school, depending on the individual child's sphere of action and how they use the road, the focus will initially shift to bicycle training and getting to school. In addition to learning traffic regulations and improving their social awareness and ability to recognize dangerous situations on the road, children of this age also gain practical experience of how to travel safely by bicycle and act safely in and around their schools and homes.

At higher school grades, mobility and road safety education focuses primarily on developing the appropriate social skills. Legal regulations and specific knowledge relating to combining alcohol and drugs with road use also play a role. Another central topic is ensuring safety and exercising responsibility in personal mobility, and engendering an awareness of the economic and ecological factors involved in mobility.

Collaborations with external partners and facilities such as the children's parents, the police, transportation companies, associations, organizations, and initiatives are also an essential supplement to the work carried out in schools.

all. This can even apply in children up to 14 years old. Although many children will at some point possess all the skills they need, they will often fail to use them either properly or at all due to impulsiveness or being distracted.

MOTOR SKILLS AND ABILITIES

Since the speed at which individuals develop motor skills and abilities can vary greatly, it is almost impossible to put a label on when each step in this development will be completed. It is important to distinguish between skills and abilities in this context. Skills are visible patterns of movement that are performed consciously and deliberately. The basic forms of movement include sitting, standing, gripping, running, and jumping, and are learned at a very young age. Especially in their first year of life, a child will acquire an astounding number of new gross and fine motor skills. Each of these skills will improve and become more clearly defined with time, until the child reaches their peak motor activity level at around seven or eight years old. Once this level has been attained, a process of individualization begins. The course this takes can vary greatly, ranging from stagnation and negligible development to very dynamic development of motor performance.

Motor abilities, on the other hand, are the control and functional processes that form the basis for our motions and positions. These include physiological traits such as stamina and strength, but most importantly also cover all of the factors that affect our sensory performance, perception, cognitive abilities and motivation. For example, while the act of throwing an object at a target requires a certain amount of strength, it also requires the ability to judge distance and throwing technique. As such, the corresponding motor abilities cannot be acquired until he other areas of development have reached the necessary level. One example of the complex interplay between different functions is in visual motor ability, where visual information is used to control movement. This ability improves as a child gets older, thus allowing the child to perform the corresponding movements faster, more reliably and with greater precision. Another example is the sense of movement within one's body, or coenesthesia. This term refers to a person's awareness of their own position in a space, which does not develop until between the ages of six and twelve.

Regulating one's balance is also an activity that requires several of our body's functions to work to-

gether, which is why smaller children have difficulty staying balanced with their eyes closed, as they rely primarily on visual information for their orientation. As the body matures, vision becomes less important and is superseded by the use of coenesthesia.

One of the largest risk factors in interactions with traffic is the small size of children's bodies. This makes it harder for the children themselves to see past obstacles, and also prevents other road users from seeing them easily.

A sense of balance is most important when it comes to riding a bicycle. The problem in this scenario is caused by the fact that a child's head is quite large in proportion to the rest of their body, which makes hard for them to find their balance. In terms of motor skills and abilities, children should possess the skills required to ride a bicycle by around the age of ten. In order to cycle safely on the road, however, they must be able to utilize a huge number of more complex motion and cognitive processes that involve different functions working together. Children will not possess the appropriate abilities until they are around 14. Due to the intrinsic developments they undergo during puberty, however, they are also more likely to take risks and overestimate their own abilities at this age, which once more increases the risk of accidents.

COGNITIVE ABILITIES

One of the most elementary cognitive abilities is attention. In the first years of a child's life, this is primarily controlled reflexively – the child simply reacts to external visual or acoustic stimuli. It is not until between the ages of five and eleven that they develop the ability to direct their attention with focus and deliberate intent. This ability reaches adult levels around the age of 14. This ability is extremely important for children in terms of road safety, as they will not possess cognitive control of their own behavior unless they can actually direct their attention toward the traffic around them. As soon as they are distracted, the link to their memory – and thus to their knowledge of how traffic works, the traffic regulations, how to behave, and risk awareness – is lost. Correspondingly, the risk of an accident becomes very high. The phenomenon of distraction persists into puberty. It is a similar story with divided attention, or the ability to pay attention to two or more requirements at the same time. Children especially have difficulty with this when the tasks do not all have the same priority.

When a child suddenly jumps onto the road from between two parked vehicles, it is sometimes almost impossible to avoid an accident.

RISK AWARENESS

Risk awareness develops in three stages, starting from the age of six. The first stage is the development of an acute risk awareness, whereby a risk is not detected until the actual moment of danger, sometimes leaving little scope to act. Next, at around the age of eight, children develop anticipation risk awareness, meaning they begin to be able to recognize potential hazards as dangerous in advance. Children in this phase can alter or even completely avoid the dangerous situation by taking alternative action. In the last phase, which begins at around nine or ten, children develop preventive risk awareness, which enables them to avoid hazards before they occur. As a restriction, it should be noted that from the anticipation risk awareness phase onward, a child cannot assess risks adequately based solely on their own experiences with traffic – they also require other sources of information, particularly knowledge of the risks associated with particular types of traffic.

DURING PUBERTY, CHILDREN OFTEN RECOGNIZE DANGER BUT CONSCIOUSLY IGNORE IT.

This is made more difficult by the fact that risk awareness can fluctuate greatly depending on the situation at hand. Particularly when playing, younger children feel much safer that they actually are in the real traffic situation they are in (high subjective

Parents should teach their children how to cross a road safely at the earliest age possible.

sense of safety combined with low objective safety). In puberty, children are able to recognize risks, but they consciously ignore them or even gravitate toward them during risky cycling maneuvers, when running across the street, or when acting out dares.

KNOWLEDGE AND UNDERSTANDING OF ROAD TRAFFIC

While a knowledge of road traffic covers the reproduction of terminology, rules, and signs that a child or person has learned, and understanding of it also includes the cognitive abilities that are required in order to analyze, assess, and process individual traffic situations differently. Younger children ten to learn traffic knowledge by heart but have great difficulty applying rules correctly and interpreting signs correctly in real-life situations. It has also been shown that children only actually understand half of the traffic terminology they learn. Generally speaking, understanding of road traffic continues to increase throughout childhood, with the biggest leap coming when children start going to school. From this point onward, they will experience more and more success in applying what they have learned and understood to real-life traffic situations, with their greatest difficulties coming in situations that don't fit the patterns they have learned. In addition to this, the tendency to adapt their behavior statically to fit what they have learned rather than the actual situation in front of them persists for a long time in children. One example of this is crosswalks: Children declare these areas as safe and naturally assume that cars will always stop to let them cross here. Therefore, they often fail to pay attention to what is going on around them properly – or at all – before stepping out onto the crossing.

CHANGING PERSPECTIVE

The actions of younger children are based on a very egocentric view of the world. While they are aware of differences between themselves and others, until about halfway through elementary school they see themselves as the center of the world, and assume that others share this perspective. They are not capable of imagining situations from another person's perspective, be that mental or physical. Classic examples of this include the common assumption among children that they can be seen because they can see themselves, or that there are no cars around because they themselves cannot see any due to obstacles.

It takes many years to develop the ability to recognize, see things from, and anticipate other perspectives. This process is not completed until puberty, by which time young people are able to recognize the perspectives of entire groups and take this information into account in their own behavior (old people react more slowly; drivers cannot see pedestrians or cyclists as well in the dark).

CHILDREN AS PEDESTRIANS

At every stage of their development, the way children use the road differs significantly from the approach taken by their adult role models. Let's take the good news first: Unlike many adults, children very much observe traffic regulations. In their own way, they use crossing aids such as pedestrian crossings and lights, take the shortest route when crossing the street and stop when they see a red light.

In all other ways, however, the way children use the road can best be described as erratic and unpredictable. Young children in particular are faster and less calm in the way they use the road. Their movements are less regular, and their attention is often not directed at the traffic on the road. Running, jumping, screaming children at the side of the road are many drivers' worst nightmare. If they are playing or out in groups, drivers need to have both hands on the wheel, keep their eyes wide open, reduce their speed, and be ready to brake at any time. Children often do not pay attention – or at least not

enough – to what is happening around them before crossing the road, whether it is a main road or a side street. They generally look to the left and right, irrespective of which direction any vehicles are coming from, and it is not unusual for them to step onto the road suddenly – which can result in an accident if drivers are unable to react quickly enough.

It is also typical for children to adopt a rather static approach when it comes to adapting themselves and their behavior to suit the traffic around them. Depending on their age, they can find it difficult or impossible to adapt situationally. One example of this can be seen in the way children cross the road between parked vehicles. Children stand on the edge of the sidewalk and look from there to see whether the road is clear, even if they cannot see anything from this perspective. They do not stop again when they reach a point from which they can see the road, and do not check again to see whether the road really is clear. On the other hand, it is also common for children to look around them very carefully even before crossing a road with good visibility for them, and they often wait until the road is completely clear before stepping out – which can take quite some time in some areas.

CHILDREN AS CYCLISTS

Even before children start using their bicycle as a means of getting around and using the roads independently, they use it for sports and playing. The very smallest children often start practicing on training bikes, and most children get their first "real" bicycle while still in preschool. Riding a bicycle is a complex activity that requires not only motor skills and abilities, but also highly developed cognitive and sensory skills and abilities. Sufficient risk awareness and knowledge of the rules of the road are also essential to safe road use. When using a bicycle, children must be able to check over their shoulders without veering off course, brake effectively in a way that suits the situation at hand, monitor traffic attentively, and become part of it without any problem.

However, children are often overwhelmed by this variety of challenges. Younger children especially are unable to perform the necessary procedures without help from an adult. Strictly speaking, this means they are not (yet) suited to riding a bicycle. But caution is also required with older children: According to the German Federal Statistical Office, 10 to 15-year-olds are the group involved in the most accidents as cyclists in Germany. The main causes of this are handling mistakes when turning and a failure to observe rights of way. Insufficient knowledge of traffic regulations is also a problem, especially among younger cyclists.

Many parents recognize this danger to their children, and consequently do not allow them to cycle on their own. A survey conducted by the German Road Safety Council (DVR) in 2012 revealed that 56 percent of parents do not allow first-graders to cycle on their own; for five to seven-year-olds, this figure was 68 percent. 28 percent of parents allowed their children to cycle on their own as long as they believed the child in question was mature enough, the journey short enough, and that there was not too much traffic. 14 percent of those surveyed allowed their first-graders to cycle on their own without any restrictions.

CHILDREN OFTEN OVERESTIMATE THEIR ABILITY AS CYCLISTS AND TAKE TOO MANY RISKS AS ROAD USERS.

In terms of psychological development, the reasons for the deficits mentioned above are clear. The basics are acquired throughout childhood and youth over the course of various steps or leaps in development. The scope for speeding up these processes by means of external influence is limited; theoretical and practical training can help, for example, but only if the child in question is ready for it and has already undergone the necessary basic development.

As a fundamental prerequisite for safe road use on a bicycle, the child in question must be able to apply and implement their motor procedures reliably. A child must first have had enough practice in riding a bicycle before they can be expected to take in what is happening on the road around them, and to recognize and pay attention to factors important to their safety. There are a number of relevant predictors that can be used to estimate whether a child possesses suf-

Not only at the time of a cycling exam in primary-school age: Children's bicycles should always comply with regulations, e.g. in terms of brakes and lighting. The picture shows a positive example in the bike on the right and a negative one on the left.

ficient motor skills for cycling on the road: the current age of the child, the age of the child when they start to acquire these skills, and the use of training bikes. Generally speaking, it is assumed that the motor skills required to coordinate their basic task and the additional, safety-related motion requirements (checking over the shoulder, using hand signals when turning, etc.) will overwhelm most children younger than eight.

Even eight to ten-year-olds who possess the necessary practice in their motor skills waste too much of their attention on irrelevant information, and are unable to multitask effectively, as is often necessary when cycling. When performing a cognitive and a motor-skills-related task simultaneously, they will focus more on their motor skills. As a result, it takes them longer to recognize stimuli that provide information relating to their safety, which in turn slows their reaction time and increases the risk of an accident occurring, especially as they will be moving much faster on the bicycle than they are used to doing on foot. Even at twelve, children still take longer to react than adults.

Another critical factor is that children grossly overestimate their abilities as cyclists, and the number of risks they take on the road is thus disproportionately high compared to what they are actually capable of. From a psychological perspective, there are two main leaps in development: between the ages of seven and eight, and thirteen and fourteen, a child's performance will increase significantly in several areas, including reaction time and their ability to travel in a straight line without swerving. But even once their cognitive, motor, and sensory abilities and skills have fully matured, young people do not automatically become safe and reliable road users, as they possess lower risk awareness than adults and tend to overestimate their abilities. This increases the risk of accidents, and is exemplified by a tendency toward risky maneuvers (taking hands off the handlebars, using headphones while cycling) and the decrease in the number of young people willing to wear helmets when cycling.

Other countries, such as Spain, have imposed more regulation on this issue. The Spanish government has made ensuring the safety of children in these situations a priority, and they are generally required by law to wear helmets until the age of 16. Outside of towns and cities, this requirement applies to citizens of all ages.

SAFETY MEASURES AND RECOMMENDATIONS

In order to reduce the risk of accidents, German law states that children must keep to the sidewalk up to the age of eight. They are still permitted to cycle on the sidewalk after this, until they reach the age of ten. From this point onwards, children must use bicycle paths or the road, just like adults. By this point at the latest, their means of transport must comply with the relevant provisions of the German Road Traffic Licensing Regulation (StVZO). It is also indisputable that the use of a helmet when cycling is an important precaution in further improving safety. Surveys show that 76 percent of children aged between six and ten in Germany wear a helmet; however, this figure drops to just 29 percent in the ten to sixteen age group. The

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The Important Role of Parents in Road Safety and Mobility Education

Road safety and mobility education should ideally start at an early age and be treated as a life-long process. Parents play an important role in road safety work, especially between the early stages when a child begins to acquire their first experience of road use and when, as a young adult, they are accompanied by a parent or guardian when learning how to drive. As role models for their children, they play a significant role in shaping both their mobility and how they behave on and around the road. With this in mind, the road safety psychology institute "sicher unterwegs" – with assistance from the Austrian General Accident Insurance Institute AUVA – offers three different, theory-based, scientifically evaluated road safety workshops for parents, which use an interactive learning approach to make parents aware of their importance as role models in teaching their children how to use the roads safely and sustainably.

As a first step, the workshop for parents of kindergarten children teaches the parents how preschool children perceive roads and traffic situations differently to adults due to the way their psychological development works. In the next step, the parents learn through practical exercises the most effective methods of teaching kindergarten children about road safety in a way that is fun and appropriate for their age group so that they have a solid foundation for the road safety education they will receive when they start school.

The aim of the workshop for parents of schoolchildren, which builds on the content of the first two steps, is to help parents to accurately judge their child's abilities based on their age and personality, and teach them the steps for easing their child into independent road use slowly, using safe boundaries and taking care not to overwhelm the child or make them feel unchallenged. As well as learning to be good pedestrians, it is also important for children to be taught how to ride a bicycle at this stage. In the "FASIKI" road safety workshop, the parents are then taught what to looking out for when practicing cycling with their children, how best to structure practice exercises, and everything a child needs to get about safely on their bicycle. We believe that road safety should be fun and easy to incorporate into everyday life. Those who follow this credo can turn road safety training into important quality time for parent/child bonding – while also demonstrably improving their children's safety on and around roads.

Children aren't always as orderly as this on their way to school.

idea of making helmets a legal requirement is an issue that has been raised again and again in Germany, but its advocates have so far failed to push such legislation through. Even helmets for children are merely recommended and not mandatory.

One important means of improving the safety of children on bicycles is bicycle training courses. Such courses make children feel safer – including on a subjective level – and are most effective when taken in real traffic situations. However, protected spaces such as school playgrounds are also suitable environments for training motor abilities. In Germany, children are usually given bicycle training in fourth grade. These courses teach them theory (traffic regulations) and also require them to complete practical exercises, usually in the sheltered environment of a traffic training area. At the end of the course, the children then take a bicycle test as a means of documenting the successful completion of their bicycle training.

The German Road Safety Council (DVR) recommends that parents do not allow their children to ride a bicycle on their own to school or in their free time until they have taken their bicycle training and passed their bicycle test. Many schools in Germany have strict rules regarding the circumstances under which children are permitted to cycle to school. Children should first have completed practice runs with their parents to hone their motor skills to a reliable level, familiarize them with the route, and engender an awareness of the potential risks along the route. Allowing a child to get used to cycling will increase their subjective sense of safety.

In addition to safety measures taken at the personal level for each individual child, however, infrastructure considerations such as safe traffic routing are also necessary in order to both increase objective safety and make the children feel safer. At the end of the day, this is what will determine whether cycling is accepted as a means of transport. Cycling is a desirable means of transport for children of school age providing it comes with the experience of being treated as an equal by other road users.

PARENTS AS ROLE MODELS

The importance of observational learning and modeling in determining whether certain behaviors are adopted during childhood is widely accepted in the field of psychology of learning. According to Albert Bandura's "modeling" theory, an emotional relationship or similarity between the model and the observer, higher status on the part of the model, the prospects of success, and the potential positive consequences of adopting the behavior in question all stimulate the learning process.

If we apply these findings to traffic and the way children learn how to act on and around roads, it becomes obvious that parents occupy a position of high value as "objects of observation" in this process. This applies particularly between the ages of around twelve and fourteen, which is the earliest point at which children can be expected to have developed to a sufficient level all the skills and abilities necessary to act as independent road users. Due to the close connection they share with their children, parents will inevitably become role models to them. This is borne out by the way that children follow the example of their parents. Parents are very much aware of this, and adhere to traffic regulations far more often in the presence of their children than when alone or in adult-only groups. Despite their best efforts, however, they do not always manage to act as good role models all the time. One possible reason for this is that not all parents are able to reflect on and critique their own automatic behavior, and thus (more or less subconsciously) pass the wrong or dangerous behavioral traits on to their children. In light of this issue, other socialization authorities (kindergarten

BY CONSISTENTLY WEARING THEIR OWN HELMETS, PARENTS CAN INCREASE ACCEPTANCE AMONG THEIR CHILDREN.

and school) have a critical role to play in giving children the tools they need to become safe and responsible road users using a mixture of objective theory and practical teaching.

On the issue of bicycle helmets, there is a very clear discrepancy between what parents teach their children and how they actually behave. According to the "Deutsche Verkehrswacht" (German Road Safety Volunteer Organization), while three in four children wear bicycle helmets, the same can only be said for around one in six adults. The reasons for this are often trite – fashion is one factor that is mentioned particularly often – and entirely disproportionate to the increased risk of accident and injury. This is in spite of the fact that parents are extremely important role models when it comes to wearing helmets; indeed, it is difficult to think of another road use safety measure where learning by example plays such a significant role. By always wearing their helmets when cycling, parents increase the acceptance among their children of doing the same – and if they give their children the chance to choose their own helmets, they will have done everything they can to encourage them to enjoy wearing a bicycle helmet.

GETTING THE KIDS TO SCHOOL – FACING THE SCHOOL RUN VERSUS LETTING THEM MAKE THEIR OWN WAY

The chaos on the roads around schools in the morning has been a cause of frayed tempers for many years, with elementary schools in particular a hive of activity. Some surveys have shown that, on overage, more than 30 percent of all elementary school children are dropped off in the car right in front of the school building. In areas where the conditions are less favorable (no child-friendly infrastructure, long distance between home and school, lack of public transport), this figure can be even higher. The issue of the "school run" has become a source of concern all over the world: A study conducted by Allianz Australia in 2018 showed that two thirds of Australian parents spent up to eight hours a week ferrying their children by car, and similar figures have been reported in the UK. According to a survey of parental driving habits conducted on behalf of TescoCars in 2011, around a third of British parents invested up to 50 hours per month in driving their children to school and leisure activities.

There are an array of different reasons behind this trend. Societal changes such as a free choice of school and the longer journey this entails for the children, changes in employment habits, higher car ownership, and the permanent pressure to fit more into our daily schedules are all factors in this development. At the same time, parents are often worried that something might happen to their children. In a survey conducted by major German automobile club ADAC on safety on school routes, 80 percent of parents said they were scared of sending their children to elementary school on their own. These fears

As cyclists, children are highly at risk in road traffic.

pertained to both social security (physical assault, attacks, bullying) and the safety of children on the roads (busy roads, danger of a traffic accident, traffic situations on the way to school too complex). While these fears are understandable, they are happily becoming more and more distanced from reality, and a wide range of activities in recent years have contributed toward making routes to schools safer. Many parents completely ignore the fact that, by driving their own children to school, they themselves are increasing the amount of traffic on the roads and causing additional danger to those children who walk or cycle to school.

WHY LEAVING THE CAR AT HOME CAN PAY OFF

It goes without saying that the death or injury of a child is always a horrific tragedy. All the same, the overprotectiveness of some "helicopter" parents – while undoubtedly well-meaning – has barely any positive consequences for their children. Instead of improving their safety, the willingness of parents to drive their children everywhere actually encourages the increasing immobility of their offspring, resulting in deficits that both affect how the children themselves behave in traffic and have a negative impact on their health and social skills. Due to a lack of experience, children who are driven everywhere display greater uncertainty in their behavior when they have to navigate through traffic environments by themselves. They lack practice, and as such their abilities are less well-developed and they struggle to overcome more complex traffic situations. This is especially pronounced in children who cycle, an area where they should start developing necessary skills as early as possible – preferably while still in kindergarten. Children who do not learn to cycle later, especially those who wait until after fourth grade, will find it harder to pick up, which will be reflected by deficits in the bicycle test and other areas. From a health perspective, the lack of exercise can also act as a trigger for additional problems: Obesity and the potential physical complications thereof, which range from diabetes to cognitive degeneration, eventually increase the risk of accidents, which in turn compounds parents' fears and makes them more protective.

Making one's own way to school is an important milestone on a child's path toward independent mobility. As well as giving them direct experience of road use, it also boosts their health, development and ability to learn, as outdoor exercise promotes concentration, alertness, mental wellbeing, receptiveness, and – in many cases – social contact and communication. On top of this, leaving the car at home is better for the environment.

MEASURES FOR PROMOTING ACCEPTANCE

There are several different approaches that can be taken to encourage parents to skip the school run and leave the car at home. Yet from letters and verbal reminders at parents' meetings to the implementation of repressive measures by the authorities, these attempts to change behavior are often met with only limited success. A combination of infrastructure and pedagogical measures is much more useful. This starts with ensuring that routes to schools are forgiving of mistakes and tailored to suit the abilities of children, which is key to garnering greater acceptance for independent mobility. At the same time, school mobility programs are important as a further means of boosting traffic awareness among children. The school, parents, public administration authorities, and police must all work together to come up with the best way of drawing up routes to schools, implementing road safety measures, etc. Last but not least, children must be encouraged to speak to their parents and convince them of the importance of mobile independence in everyday life – after all, this is often exactly what the children themselves want.

MAKING THEIR OWN WAY TO SCHOOL IS AN IMPORTANT MILESTONE ON A CHILD'S PATH TOWARD INDEPENDENT MOBILITY.

THE LATEST FACTS ON HOW CHILDREN GET TO SCHOOL

In November 2018, the forsa Institute conducted a representative survey in Germany on how children get to school on behalf of DEKRA. The survey followed a systematic, randomized procedure and was participated in by 1,020 parents of children between the ages of six and sixteen who were required by law to attend school, as well as 1,009 persons with no children of mandatory school age. The aim of this panel selection was to clarify whether the attitudes of parents whose children have to get to and from school every day differ from those of the rest of the population.

In total, 48 percent of the parents of children between six and sixteen declared that their child got to school by bus or public transport. As a rule, one in three children (32 percent) walks to school, or back home from school, while 25 percent travel by bike. Only 23 percent of the parents included in the survey had children who were regularly taken to or collected from school by car.

Girls used public transport more often than boys, who tended to walk to school more often. Likewise, older children between the ages of twelve and sixteen took public transport to school more often than younger children. Children between the ages of six and eight were dropped off or collected by car more often than older children, or alternatively walked the route – probably because the distance from a child's home to their elementary school tends to be short. In cases where this does not apply, parents tend to drive their smaller children to school. The nine to fourteen age group were the most common users of bicycles for traveling too and from school (Figure 19).

Participants living in smaller towns and villages with fewer than 5,000 inhabitants recorded far higher than average figures for their children traveling to school by bus or another means of public transport. A constant proportion of 21 to 24 percent of parents in settlements of all sizes used their own car to drive their children to and from school – a surprising figure in that this mode of transport does not seem to be affected by whether the child lives in a rural or urban area.

Those surveyed were also asked what they worried about most when thinking about how their children got to school. More than one in two of the parents surveyed (57 percent) expressed concern that their child could be involved in a traffic accident and injured through the fault of others. 46 percent feared that their children would be harassed or threatened by strangers, while one in five (20 percent) were worried that their child would be picked on or bullied by their peers. 19 percent were worried that their children would not be careful enough and would cross the road on a red light, for example. Parents under the age of 40 were far more likely than average to worry that their child could be involved in a traffic accident and injured through the fault of others (70 percent) or be threatened or harassed by strangers (59 percent). The most laid back parents from this point of view were those aged 50 or over.

19 How Children Get to School

How does your child get to and from school?

	Public transport	Walking	By bicycle	"School run"[1) 2)]
Total	48	32	25	23
Gender of child:				
Boy	44	34	26	23
Girl	52	29	24	23
Age of child:				
6 to 8	25	53	11	36
9 to 11	45	36	25	19
12 to 14	58	18	34	19
15 to 16	62	22	27	20
Size of home town (population):				
Fewer than 5,000	67	22	12	21
5,000 to fewer than 20,000	53	33	17	24
20,000 to fewer than 100,000	36	33	37	24
100,000 or more	44	36	27	23

All figures stated as percentages. [1)]Multiple answers permitted – total percentage greater than 100. [2)] Taken to/picked up from school by car

Source: DEKRA/forsa

20 Reasons for Driving Children to School*

I drive my child to/pick them up from school because…

I drive my child to/pick them up from school because…	Total*	Walking	By bicycle
… their school is on my **way to work**	43	43	43
… it would take them too long to get to school otherwise	29	29	29
… there are no good public transport connections for the route	25	25	25
… walking or cycling to school would be too dangerous	19	24	13
… the school is too far away	18	17	19
… we are in a car pool with other children	14	15	13
… it gives me or my partner more time with our children	10	15	5
… it is cheaper than a ticket for public transport	7	7	6

All figures stated as percentages.* Basis: parents who drive their children to/from school
**Multiple answers permitted – total percentage greater than 100.

Source: DEKRA/forsa

PARENTAL MOTIVES IN CHOOSING HOW THEIR CHILDREN GET TO SCHOOL

43 percent of those surveyed who drove their children to school did so because the school was on their own way to work. 29 percent said that it would take their children too long to get to school otherwise, while 25 percent said that there were no good public transport connections for the route. Around one in five of those in this subgroup said that their children's route to school was too dangerous or too far for them to walk or cycle.

14 percent of the subgroup said that they drove their children to school or picked them up because they were in a car pool with other children, and ten

percent said that it gave them or their partner more time with their children. Seven percent believed that driving their children to and from school worked out cheaper than a public transport ticket.

Men (24 percent) were more likely than women (13 percent) to say that they drove their child to school because the route was too dangerous for them to walk or cycle, and far more men (15 percent) than women (5 percent) said that doing so gave them or their partners more time with their children (Figure 20).

Those who did not drive their children to or from school were also asked to give reasons for their choice. Two thirds (67 percent) said that they wanted their children to learn to navigate roads and behave safely – a factor that was particularly important to parents under the age of 40.

39 percent didn't drive their children to and from school because they had a good connection to the public transport network. This attitude was particularly prevalent among parents over the age of 50, who may have different standards compared to "back in the day" than their younger counterparts. 34 percent were in favor of their children not being driven to school because they would be accompanied by other children. When asked about the environmental concerns of this issue, 26 percent of those surveyed said that driving their cars to the school would disturb local residents and damage the environment, and the same number expressed concern that doing so would endanger other schoolchildren.

ENCOURAGING CHILDREN TO BECOME INDEPENDENT ROAD USERS

There are a number of different methods parents can use to promote safe road use in their children. Therefore, those included in the survey were asked how suitable they found each of these options. The most commonly chosen option was that parents should set an example for their children in terms of how to use the road, for example by consistently observing the traffic regulations (82 percent). This is also the best approach from psychological perspective, as learning by example from parents is the most important form of leaning for all children. Explicitly explaining the specific dangers of road use to children also plays an important role (80 percent), though it is even more important to actively help the child to navigate the dangers of road use by practicing with them – a fact recognized by 79 percent of those included in the survey. Accompanying children on routes that they need to take often, such as routes to school or sports clubs, and testing

AN ENCOURAGING NUMBER OF PARENTS ALLOW THEIR CHILDREN TO ACQUIRE THE NECESSARY ROAD USE SKILLS BY NAVIGATING PUBLIC TRAFFIC THEMSELVES.

Safety jackets and high-visibility clothing help other road users to see children from far away.

out these routes on foot or by bike together with the child is also seen as an important means of improving independence and ensuring that children use the road more safely (80 percent).

73 percent believe that it very is important to explain to children what signs on the roads and crosswalks mean in order to encourage safe road use. Around two thirds of those surveyed believed that training children to ride a bicycle or scooter safely (69 percent) and working with their children to define a safe route to use regularly to travel to and from school (67 percent) were very important measures.

In terms of practical exercises, women were more likely than men to say that they considered the measures in question to be very important in encouraging their children to use the road safely. In addition to this, 60 percent of those surveyed believed it was very helpful to dress their children in high-visibility clothing to ensure that they would be noticed by other road users. This measure was particularly popular among parents of younger children. It would be preferable to campaign at all levels for this measure to be used for children in all age groups

When asked which of the options provided they had utilized at least once in order to promote safe road use in their children, between 70 and 85 percent of those surveyed (depending on the measure in question) said that they had already explained specific dangers and road signs to their children, practiced routes and dangerous situations with them, and trained their children in the use of scooters or bicycles. Due to the high risk of injury for children, especially those on bicycles, the latter measure in particular is of great importance.

70 percent of those surveyed had decided on a route to school together with their child. 60 percent said that they had dressed their children in high-visibility clothing to ensure that they were seen by other road users, though this is still used too rarely as a means of increasing visibility.

Only a small number of those included in the survey had watched videos or clips on road safety with their children, or used road playmats. Women were generally more likely than men to say that they had tried the different options at least once in an effort to encourage their children to behave more safely on and around roads (Figure 21).

All in all, the issue of the school run was relevant to less than a quarter of the parents included in the sample group. Three quarters were confident that their children could make their own way to and from school by foot or using public transport and took steps to help their children develop the abilities required to do so. The techniques that yielded the most success in this were practical exercises such as trying out routes together with children, drawing their attention to dangers and traffic signs, and training them to ride bicycles or scooters. It would be good to see an increase in active safety, for example in the form of reflective clothing being worn by children in all age groups.

VIEWS ON HOW CHILDREN GET TO SCHOOL FROM THE PERSPECTIVE OF THE REST OF THE POPULATION

In addition to this, those included in the survey who did not have children of mandatory school age were also asked their opinion on cars performing school runs. No distinction was made between households that did not yet have children of mandatory school age, those that no longer had them, and those that had never had them. This part of the survey was restricted to elementary school children. Only a small number of those surveyed (11 percent) said they generally had no problem with parents driving their children to school by car in the morning. Acceptable reasons given by this subgroup included school routes that were too complex for the children and contained difficult traffic situations (70 percent), the risk of children being harassed by strangers (68 percent), and saving time (60 percent).

21 Which Measures Do You Use?

Parents had used the following options at least once themselves to encourage their children to use the road safely:

	Total*	Male	Female
Explicitly teaching my child what to look out for when using the road and how to navigate the situation:	85	83	86
Explaining to my child what signs mean on roads and at crosswalks:	82	80	85
Setting an example to my child when using the road, e.g. by making sure I always follow traffic regulations:	82	79	84
Trying out routes that my child will use frequently, such as the route to school or a sports club, together with my child on foot or by bicycle:	79	75	84
Practicing with my child to help them navigate dangers on the road:	76	71	84
Training my child to ride their bicycle or scooter safely:	74	71	78
Working with my child to set a route to and from school:	70	65	76
Dressing my child in high-visibility clothing so that other road users notice them:	60	59	61
Watching videos or clips on road safety with my child:	8	9	7
Using a road playmat to teach my child the theory of traffic regulations:	6	6	6
Visiting a traffic training area with my child:	5	7	4

All figures stated as percentages. * Multiple answers permitted – total percentage greater than 100. Source: DEKRA/forsa

The vast majority (86 percent) of those included in the survey who did not have children of mandatory school age said that children should not be driven to school by car if this could be avoided (Figure 22). The main reason given for this opinion was the belief that children should learn how to get to and from school safely and independently (90 percent). 77 percent also said that children walk to school with other children and should socialize with their peers, while 61 percent said that cars put a strain on the environment and disturbed local residents. This figure was much higher than in the subgroup of parents with children of mandatory school age (23 percent). 40 percent reasoned that doing the school run by car was not necessary because most towns, cities and communities offered good public transport connections. 37 percent said it was too dangerous for all parents to drive their children to school.

As such, the acceptance for parents doing the school run is extremely low among non-parents. Just like the parents who did not drive their children to school, they were in favor of the opportunities to develop abilities and skills that children stood to gain from making their own way to and from school.

TRAFFIC ACCIDENTS WITH CHILDREN – A SOURCE OF PARTICULAR PSYCHOLOGICAL STRESS

Experience has shown time and again that traffic accidents trigger strong feelings of fear and helplessness in children – irrespective of whether they simply see them or are directly involved themselves. The subjective danger experienced by the child is of particular significance, while the extend of the injuries suffered plays less of a role.

Both during and in the immediate aftermath of the accident, the child will be in a state of high mental agitation, causing large quantities of stress hormones to be released into their bloodstream. Most children will respond to this by crying, screaming, becoming aggressive, shaking and feeling dizzy. Depending on the severity of the injury, they may also run around or away from the site of the accident in panic. Some children will experience a strong urge to talk, wanting to tell people straight away about what they have experienced, while others will "freeze up", suddenly entering into complete silence, retreating into themselves, and becoming

THE CALMER AND MORE RELAXED PEOPLE THE CHILD RELATES TO REMAIN DURING AND IN THE IMMEDIATE AFTERMATH OF AN ACCIDENT, THE EASIER THE CHILD WILL FIND PROCESSING THE EXPERIENCE.

22 Views on Parents Using Their Cars for the School Run

Would you say you generally have no problem with parents driving their children to school in the morning?

	Yes	No*
Total	11	86
Male	11	86
Female	12	85
aged 18 – 29	15	82
aged 30 – 44	16	80
aged 45 – 59	11	86
aged 60 or older	10	88
Size of home town (population)		
- Fewer than 5,000	17	79
- 5,000 – 19,999	10	87
- 20,000 – 99,999	10	89
- 100,000 – 499,999	14	83
- 500,000 <	10	85

All figures stated as percentages.
*Remaining percentage where figures do not add up to 100 = "Don't know" Source: DEKRA/forsa

unable to move. The latter reaction may give the impression that the child has not been affected by the accident, but it is actually simply a defense mechanism to prevent them from being completely overwhelmed by what they have experienced.

Jürgen Fix
Head of Police Station,
Gelsenkirchen Police Department

On-site Experiences with Stubborn "Helicopter Parents"

It was a rainy morning when the representatives of the German Road Traffic Authority, the German Road Safety Volunteer Organization, Parents' groups, and the police met up to discuss whether a stopping point could be set up in front of a school for parents doing the "school run" – and if so, where. The school is situated just off a through road, and there are on-demand crosswalk lights in front of the school. I turned up in my uniform and a yellow raincoat, so I was easily recognizable. My ability to contribute to the discussion was limited, as parents kept stopping in front of the school to drop off their children. This meant there was a constant need for my attention, as illustrated by the following three examples:

A mother stopped in the traffic lane in front of the school. She switched on her hazard warning lights, then the child in the rear left seat got out into busy traffic – then even leaned back in to get their school bag out of the car. I went over to the car and told the mother that she couldn't stop where she was, informing her that her hazard lights didn't give her the right to violate traffic regulations and that it was dangerous to let her child exit the car into oncoming traffic. The mother refused to see reason, simply answering that she did the same thing every morning and nothing had ever gone wrong. In response to this, I directed her to drive into the cul-de-sac opposite the school and issued her a warning with a fine of 15 euros for non-permitted stopping/use of hazard warning lights.

A little later, a father coming from the opposite direction stopped right in the crossing area of the crosswalk lights. Since I was still on the road due to another incident just before, I instructed him to move on immediately. He said he just wanted to quickly drop off his child. I informed him that he was very much within his rights to do so – just not where he currently was – and suggested he use the cul-de-sac opposite the school instead. The father simply said I shouldn't be such a stickler for detail. He remained where he was and switched on his hazard warning lights while his son got his school things together in the car. When I instructed him again to drive on, he simply said, "Not until my son's got out." I instructed him once more to drive on. He answered, "I'll be gone in a minute." I approached the car, then. The son was just getting out. Eventually, the father followed my direction to drive into the cul-de-sac. I explained the situation to him in detail, and issued him with a warning and a 30 euro fine for misuse of hazard waning lights and failure to follow my instructions in accordance with Section 36 of the German Road Traffic Act.

This was followed by a mother who stopped on the "school side" of the road to drop off her nine-year-old son. I instructed her to move along, but received only the "usual" response – followed by the declaration that she wanted to make sure her child got to school safely and that this was the only way to do so. In response to this, I asked her son whether he would be able to walk from 300 meters down the road (where we were planning to set up the "school run" stop), or even all the way from home with his classmates. The child answered quietly, "Yes, but my mum won't let me. I'd much rather walk with my friends, myself."

Children can find seeing dead bodies, blood, injuries, and vomit particularly disturbing, as well as other signs of an accident, such as tire tracks on the road from a braking vehicle. In particular, children experience pungent, acrid and unfamiliar smells more intensively than adults, and may suffer fear, headaches and nausea as a result.

Any child that is hurt in a traffic accident will feel pain accordingly. However, their subjective perception of this pain can vary greatly. For example, young children in particular may see injuries that are actually threatening as harmless while believing trivial injuries such as surface wounds to be extremely threatening. Due to a fear of making the situation worse, having to undergo painful treatment, or being shouted at, young children in particular also tend not to mention pain or disturbing thoughts. This must be taken into account when assessing the condition of the child in question.

Children feel much safer if they are with a familiar person they are close to when the traffic accident happens, while what they experience will be more disturbing to them if they are not accompanied by such a person. The calmer and more relaxed people the child relates to remain during and in the immediate aftermath of an accident, the more confident the child will be in processing the experience.

When children are the victims of an accident, this can be particularly distressing for the other victims and the family and friends – especially the parents. The question of guilt often becomes of central importance to those directly involved in the accident and others affected by it. Any eyewitnesses to the accident may also find it very distressing. However, since they do not have a personal, emotional connection to any of the direct victims, the do not generally need the same amount of psychological help as the family and friends of the victim.

DEVELOPMENT OF PSYCHOLOGICAL STRESS IN CHILDREN DURING THE PERIOD FOLLOWING THE TRAFFIC ACCIDENT

Generally speaking, children and the elderly are the two groups at the greatest risk of becoming pathologically traumatized after experiencing a psychologically stressful event. Younger children are generally affected more severely than older ones, as they are less emotionally secure and have not yet developed coping strategies based on past experience. Traumatized children may suffer impairments to their emotional, social, and psychomotor devel-

opment. In addition to the acute distress the child experiences, other short-term emotional consequences may include fear, anger, shame, sadness and listlessness. After the accident, their thoughts will often return to what has happened. Just like in adults, memories may resurface and cause sleep disturbances. The child may also find it difficult to concentrate, and their performance at school may begin to suffer. It is also not uncommon for a child's eating habits to change after an accident, and drastic weight loss or gain are often responses to such a traumatic experience.

In a study conducted by the Akademie Bruderhilfe organization, 38 percent of children who had experienced a traffic accident still exhibited symptoms of psychological stress four years after the incident. In turn, 37 percent of these children were scared of traffic on roads. 30 percent of the children in the study complained of sleep disorders, while 16 percent said they often suffered from nightmares and restlessness. Difficulties in concentration were found in 21 percent, and 16 percent exhibited a drop in their school performance. 12 percent of the children experienced aggression and outburst of anger. A number of other consequences were observed, some a long time after the traffic accident itself.

POTENTIAL DEVELOPMENT OF ANXIETY DISORDERS, PANIC DISORDERS, AND DEPRESSION

In the long term, there is a risk of difficulty fitting in, social isolation, specific compulsions, eczema, headaches, ulcers, digestive problems, and infections. Young people in particular may be susceptible to developing alcohol, nicotine, and drug addictions. There can be a significant delay in when the physical symptoms of experiencing a traffic accident start to manifest, especially in children. Even if a child's behavior does not seem to change in any way at first, this does not guarantee that they have not been psychologically traumatized by the event. Parents and teachers often underestimate the psychological effect that experiencing a traffic accident can have a child, which can lead to the child not receiving the help they need. This type of unprocessed psychological trauma brings with it a risk of developing other psychological disorders later in life.

Generally speaking, however, some children are very much able to process what they have experienced effectively. A stable family life and trust-based attachments to friends and adult figures who are close to the child will reduce the psychological stress and help them to overcome what they have experienced. It is especially helpful if the child feels that they can speak openly about their thoughts and feelings to the adults they are close to and accept help from them. Experiencing an accident and overcoming this experience can also have a number of positive effects, such as making them mentally stronger, improving their social maturity, and increasing their sense of responsibility.

Traffic accidents often have a serious psychological effect on everyone involved. Professional aid can help people to process what they have experienced.

Generally speaking, emergency psychological aid can be provided to help children in the aftermath of a traffic accident. The key to determining the correct approach here is to recognize at an early stage which children are at risk of developing a post-traumatic disorder further down the line. The child should be taken to therapy if their post-traumatic symptoms persist without abating for more than four weeks or if they are suffering particularly badly, if not before.

THERE CAN BE A SIGNIFICANT DELAY IN WHEN THE PHYSICAL SYMPTOMS OF EXPERIENCING A TRAFFIC ACCIDENT START TO MANIFEST, ESPECIALLY IN CHILDREN.



ADHERENCE TO SPEED LIMITS CAN PREVENT LARGE NUMBER OF ACCIDENTS

The information given in this section illustrates the importance of protecting children entirely from road use situations that endanger their safety, wherever possible. In addition to this, other road users such as car drivers - the group most likely to be involved in accidents with children - can also make a significant difference. One of the ways they can do this is by adjusting their driving style.

Stephan Campineiro
Rota das Bandeiras, Communication & Social Responsibility Manager

Long-Term Road Safety Education Program

Improved safety for more than 54,000 schoolchildren in nine municipalities along the Corredor Dom Pedro, a 297 km stretch of road managed by Rota das Bandeiras S.A. – that is the result of the "Rota da Educação" program, which was introduced in 2012. Rota das Bandeiras S.A. is a company in the Odebrecht TransPort Group, which is one of Brazil's largest operators in the fields of business and urban mobility, highways, integrated logistics, and transport systems.

When we took over the management of important highways in the rural areas of São Paulo state in April 2009, a region that covers 17 municipalities, our primary aim was to save lives by developing initiative to reduce the number of accidents in the area. It soon became clear that we needed a long term road safety education program. This is how the idea for the Rota da Educação was born. With its "Rota da Educação" program, Rota das Bandeiras invested in increasing the awareness of children so that they could act as multipliers, passing what they had learned about factors in road safety on to their families and communities.

The program offers road safety lessons to children between the ages of six and eleven at state schools along the Corredor Dom Pedro, a conurbation made up of 17 municipalities that is home to more than 2.5 million people. We hold regular training sessions for the coordinators and teachers at the school, where they can improve their knowledge of what needs to be taught in the road safety lessons. We also provide the schools and teachers with teaching materials. Over the course of the year, we also run the Concurso Cultural Rota da Educação, a competition that gives children the opportunity to present projects based on the concepts they have learned in the lessons.

In 2018, we received 3,600 entries. The jury of experts from Rota das Bandeiras, state colleges, the highway police, and the local government department for education and transport awarded bicycles and learning games to the best entrants.

The aim of most road journeys is to get from A to B as quickly, comfortably and safely as possible. Any obstacles to this goal are either grudgingly accepted, avoided wherever possible, or ignored completely, though the most common approach can vary wildly from region to region and depending on the mode of transport. While most car drivers will obey red lights, the acceptance of this traffic control measure drops drastically for cyclists, while many pedestrians treat it as nothing more than a recommendation. The risks of using cell phones on the road have also been common knowledge for some time, yet it is still all too common to see road users flaunting bans by writing and reading messages or browsing their playlists. The fact that they are endangering themselves and others by doing so does not seem to bother them. A similar phenomenon can be observed with regard to adherence to speed limits. In countries with a low density of monitoring measures and low fines, driving at 10 km/h over the speed limit seems to be socially acceptable, and even 20 km/h over is often seen as "not that bad". Road users who stick to the limits are often tailgated, put under pressure and overtaken dangerously. Almost no-one bothers to look into how severe the consequences can be if they exceed the speed limit even by a small amount. This can be the difference between minor or severe and fatal injuries, especially for children.

This problem can be illustrated using an example from a DEKRA crash test. In this test, a car is driving through a residential area on a road with a 30 km/h speed limit. There a vehicles parked at the side of the road. A pram is pushed out from between two parked vehicles by a parent attempting to cross the road. The driver of the car is observing the speed limit strictly, recognizes the situation and reacts by slamming on the brakes. The vehicle comes to a stop just in front of the pram, resulting in a nasty shock for everyone involved but luckily avoiding a collision.

The outcome is very different if the vehicle is driving "just" 10 km/h faster in the same situation. In the first case, the distance covered by the vehicle in the time it takes the driver to react to the situation is around 8.3 meters. When the car is traveling at 40 km/h, this increases to 11.1 meters. At 30 km/h, the vehicle comes to a stop after a total of 12.9 meters;

During the DEKRA test, the car hit the pram at a speed of 50 km/h before the driver had time to react, throwing it a distance of several meters through the air.

when starting at a speed of 40 km/h, it will cover 19.3 meters before stopping completely. When the car hits the pram after covering 12.9 meters, it will still be traveling at 35 km/h. This is enough to result in severe or fatal injuries for the baby in the pram or any other pedestrian. Drivers who are rushing along at 50 km/h will cover a distance of 13.9 meters before reacting to a situation, and will thus not even have started braking by the time the collision occurs. As shown in the crash test, this means that they will hit the pram at 50 km/h, with fatal consequences for the baby.

Accident research conducted by DEKRA shows that pedestrians and cyclists – very often children – appearing suddenly from between parked vehicles and other visual obstacles such as advertising hoardings and switch boxes are a very common occurrence, and regularly leads to accidents. Many of these accidents could be avoided if drivers were to observe speed limits and stay off the cell phones and other distractions.

It is also important to consider the psychological effects for the drivers themselves. If an expert tells you in court that you could have avoided the accident by observing the speed limit and your decision to drive "just" 10 km/h faster has ruined the life of a child and their family, this is much harder to cope with than the inevitable punishment. So those who want to get from A to B quickly, comfortably and safely should place the greatest emphasis on safety – otherwise they risk not getting there at all.

The Facts in Brief

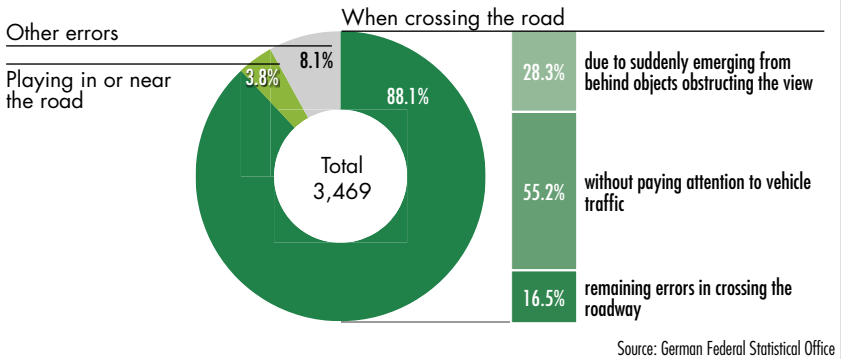
- **Road safety and mobility education needs to start at an early age.**
- **Parents and the way they act as road users are the most important examples to a child.**
- **Even 14-year-olds do not yet possess the ability to completely master complex traffic situations.**
- **In puberty, children are able to recognize risks, but they consciously ignore them or even gravitate toward them during risky cycling maneuvers, or when acting out dares.**
- **Children and young people should always wear helmets when cycling –as should their parents, in order to set a good example.**
- **Bicycle training courses are important in improving the safety of children on bicycles.**
- **Parents who drive their children to school and back are not helping them to learn how to use the road independently and safely.**
- **Depending on the severity of an accident, it may be sensible to implement emergency psychological measures to help the child.**
- **Keeping to the speed limit can help to prevent many of the accidents that involve children suddenly running out onto the road from between parked vehicles.**

Compensating for Errors as Effectively as Possible

Excessive speed, intentional or unintentional mistakes by road users, distraction, lack of experience, and excessive stress result in accidents daily – worldwide. Failure to use seat belts, missing or incorrectly used child restraint systems, or the absence of a helmet make injuries significantly more severe. In addition to the safety-oriented and compliant conduct of each individual, onboard driver-assistance systems can also contribute in particular to the constant reduction in the number of people injured in road traffic as active safety elements.

As DEKRA has pointed out many times in previous Road Safety Reports, human errors in traffic – including things like distraction – are a frequent cause of accidents. Regardless of whether one is only using the satnav briefly, adjusting the volume of the radio or the temperature of the air conditioning system, a few seconds are enough to travel several meters in blind flight even at a low speed. In such situations, features like automatic emergency brake assistance systems with cyclist and pedestrian detection have the potential to be of great benefit. The same applies to cases where children move carelessly in traffic and suddenly run into the street or endanger themselves by other mistakes.

23 Mistakes made by pedestrians (6 to 15 years)



Source: German Federal Statistical Office

Take Germany, for example: According to the German Federal Statistical Office, in 2017 the police registered a total of nearly 3,500 mistakes by pedestrians and approximately 6,700 wrong actions by cyclists aged 6 to 14 in road accidents involving personal injury (Figures 23 and 24). Most walking children made mistakes when crossing the road by ignoring the traffic or darting out suddenly from behind objects obstructing the view. The most common cause of accidents involving per-

sonal injury among 6- to 14-year-old cyclists was the incorrect use of the road. Next came errors in "making a turn, turning around, reversing, entering traffic, and riding off", especially errors when entering flowing traffic or starting into traffic from the side of the road. This information is available in the publication "Traffic Accidents Involving Children 2017" by the German Federal Statistical Office.

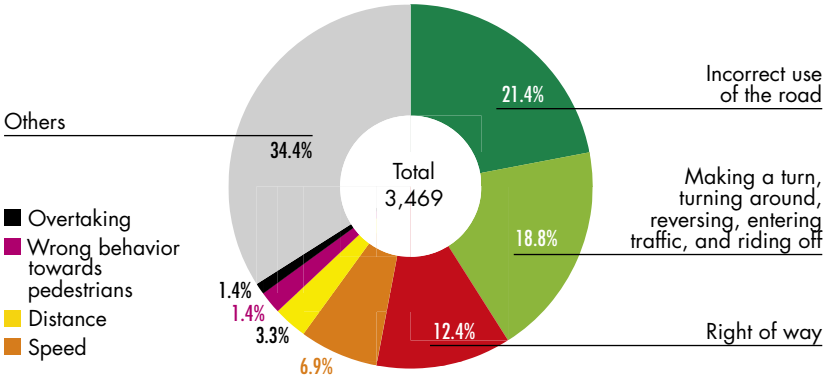
CRASH TESTS CONFIRM THE GREAT POTENTIAL BENEFITS OF ASSISTANCE SYSTEMS

With respect to the emergency brake assistance systems with pedestrian detection mentioned, enormous progress has been made in the field of sensor technology in recent years, producing ever faster and more reliable system reactions. While alert drivers require 0.8 to 1 second to detect a hazard, take the foot from the accelerator pedal, and step on the brake pedal, assistance systems control the braking within approximately 0.2 to 0.7 seconds depending on the situation. The sensors are often camera-based, and modern systems also have radar or lidar sensors to produce reliable results even in the dark and possibly even in adverse weather conditions.

At the beginning of 2019, the DEKRA Technology Center conducted numerous tests at the Lausitzring test site to demonstrate the effectiveness of such systems. The systems of three modern passenger cars were tested based on a current test standard of the European New Car Assessment Program (Euro NCAP). Here, a child dummy simulating the sequence of human movements "walked" onto the road from behind parked vehicles. The vehicles drove at defined speeds into the dummy that appeared suddenly. The test determined when and how the systems react and the speeds at which a collision can be prevented. The test candidates were the current models of the Ford Focus (model year 2018), the Volvo XC40 (model year 2017), and the Subaru Impreza (model year 2016). All systems detected the child and initiated emergency braking automatically. The driving speed of the vehicles was gradually increased until a collision occurred.

At a starting speed of 37 km/h, the Subaru Impreza was not able to reduce the speed completely, and it collided with the child dummy. But the collision speed was approximately 20 km/h, well below the starting speed. At a starting speed of 45 km/h,

24 Mistakes by cyclists (6 to 15 years)



Source: German Federal Statistical Office

In several crash tests, DEKRA demonstrated the effectiveness of automated emergency brake assistance systems with pedestrian detection.

Unauthorized use of motor vehicles by children

Nine-year-old drives his parents' car to the fair at night – Twelve-year-old drives his parents' car 1,300 km through Australia – Seven-year-old boy takes his neighbor's tractor and sets out on a grand tour: Headlines that we have read and at least suggest that fortunately nothing bad happened. Readers may dismiss such escapades with a smile. But not the parents of these children, who at such moments are not only extremely worried about the wellbeing of their children, but also about what could have happened if there had been an accident while they were driving on public roads and other road users had been affected.

Basically, in addition to the mandatory supervision of minors, drivers must secure motor vehicles against unauthorized use before leaving them. For this purpose, regulations require special safety devices in connection with an immobilizer. Locking the doors alone does not meet this requirement, but only the purpose of making it difficult for vehicle thieves.

Ultimately it is also a matter of not leaving the ignition keys lying around the house in plain sight, practically "inviting" the kids to take a joyride. Knowing the precocious impulses of some children to drive a car, it may also be appropriate to keep the keys safe from unauthorized access.

Meanwhile, a new area of conflict is emerging: The world market is booming with electrically driven personal transporters that are referred to collectively as "personal light electric vehicles" that can now be found in many different designs especially in many major cities around the world. Whether as a personal vehicle or one on loan, teenagers and adults are expanding their personal mobility in a "hip" way. Of course, this group of people is experiencing something that young children will want to try as soon as possible and then use regularly themselves. Regardless of the legal framework created by legislation for this purpose, the boundaries will have to be narrower than some children may like.

the Volvo XC40 only collided with the dummy in a very low speed range. Even at a starting speed of 50 km/h, the Ford Focus came to a stop in front of the dummy, thus preventing a collision. Tests were not carried out at even higher speeds, as the maximum speed limit of 50 km/h for built-up areas in Germany was reached.

If a person had braked instead of an automatic brake assist in the Ford, based on a normal reaction time of one second and subsequent emergency braking from a speed of 50 km/h, a collision would have occurred at around 32 km/h. Very serious injuries occur at such collision speeds. While the Volvo barely had a collision from a starting speed of 45 km/h thanks to the brake assist, with a human being at the wheel, the collision speed would have been around 30 km/h. Here again, the potential benefits are obvious. In the case of the Subaru, the collision speed coming from 37 km/h would still have been 25 km/h. In this case, the system achieves at least the effectiveness of an attentive driver.

The tests demonstrate the enormous potential of automated emergency brake assistance systems. In two cases, the systems were clearly superior to humans, and in one, at least equivalent. If a driver distraction situation is added to the equation, all three systems are life-saving, even with an additional warning for the driver. However, emergency

Konrad Romik
National Road Safety Council, Ministry of Infrastructure

Avoid dangerous situations on the road

According to police statistics over 2 800 car accidents involving children under 14 happened in Poland in 2017. It is less by 5% than in 2016, and by 51% than in 2008. Still the threat of being involved in a car accident is over twice bigger for Polish children than the European Union average. The most tragic time for children on Polish roads is summer, especially holidays.

The biggest number of fatal victims among children are passengers. Solely in the age group between 0 and 6 years 63% of young passengers died in such a traffic accident, often in cars driven by their close family members. The second largest group of endangered children are pedestrians, followed by children riding a bicycle. Sadly juvenile cyclists, close after seniors, are the most common perpetrators of road accidents – over 18% of total number of traffic accidents involving cyclists.

Analyzing the security level on Polish roads we must notice that children are relatively the least endangered group of road traffic participants. Hazard indicator increases with children's self-reliance, which is clearly visible in the age group: 15-17 years.

Above mentioned statistics indicate that efforts to educate children and young people, as well as to develop their appropriate behavior concerning moving on the roads, are highly significant. Based on these activities they will be – as adults – aware road users, able to utilize their knowledge and capabilities to avoid dangerous situations on the roads.

LIKE ALL ASSISTANCE SYSTEMS, EMERGENCY BRAKING SYSTEMS CAN WORK ONLY WITHIN THE PHYSICALLY PRESCRIBED LIMITS.

braking systems – like all assistance systems – can only work within the physically prescribed limits. Also, they cannot detect all situations correctly, although technical progress keeps being made. So this does not relieve drivers from their obligations or even their responsibility for a safe and attentive driving style.

PS: The members of the "World Forum for Harmonization of Vehicle Regulations" of the United Nations Economic Commission for Europe (UN-ECE) agreed in February 2019 to make city automated emergency braking designed for city speeds of less than 60 km/h mandatory for new cars. In the EU and in Japan, the regulation is to apply from

Dr. Walter Eichendorf
President German Road Safety Council (DVR)

Exhausting all conceivable potentials

Children and road traffic do not go well together. Here, children are confronted with tasks that many cannot handle. Their abilities to handle complex traffic situations safely are limited.

The number of children involved in traffic accidents in Germany has decreased significantly over the past four decades. In 1978, 72,129 children under the age of 15 were involved in accidents; in 2017, the number was 29,259. But, the number of children killed in 2017 alone was 61. These figures are unacceptable.

In 2017, more than one third of children involved in accidents as passengers in a car were injured, which indicates poor or incorrect securing of the children in the car. Small children under the age of six (64 percent) are particularly affected. Students between the ages of 10 and 14 are mainly involved in accidents while riding their bicycles (almost 50 percent). The accident figures show that the activities for school traffic education in elementary school are inadequate – secondary schools must also become more proactive. In addition, the support of the police basically continues to be indispensable.

About one in three children of elementary school age involved in an accident is a pedestrian. The safe use of roads as a pedestrian must be practiced. The daily way to school offers an excellent opportunity – but only if the child is not driven to school by the parents. The requirement by many German federal states for schools to provide a current school route map is also a welcome development.

According to Vision Zero, all conceivable potentials for increasing road safety for children are to be exploited. The main requirement remains to adapt the infrastructure to the unprotected road users, especially in built-up areas. This requires a rethinking of politics, and we should not waste any time.

2022 for all newly registered passenger cars and light commercial vehicles. The UNECE and the EU expect the mandatory automated emergency braking to reduce the number of accidents by up to 38 percent and to result in approximately 1,000 fewer traffic fatalities per year.

CHILDREN MUST BE SECURED BETTER IN THE VEHICLE

Parents who do not properly secure their children in the vehicle or hold them in their laps completely unsecured while riding are also acting recklessly and negligently. In many countries of the world, it is mandatory for vehicles to have safety equipment adapted to the size and weight of babies and children. With infant carriers, child seats, and booster seats, suitable products are offered for every age and build. Accident statistics speak clearly and the benefits of the systems are undisputed. Nevertheless, there are still parents who do not secure their children at all or do so incorrectly, and there are countries that still do not require seat belts – unfortunately, always with tragic consequences. For example, according to the Observatoire National Interministériel de la Sécurité Routière (French Interministerial Committee on Road Safety),

MANY PARENTS ARE UNAWARE OF THE SERIOUS CONSEQUENCES OF NOT SECURING THEIR CHILDREN PROPERLY.

almost 20 percent of children and adolescents killed in car accidents in France in 2017 were not wearing seat belts. In 2016, according to the National Highway Traffic Safety Administration (NHTSA), 17 percent of traffic victims in the US under the age of 15 were not wearing a seat belt.

A large study by the German Insurers Accident Research (UDV) in 2018 found that in more than 1,000 cases examined in Germany, only 52 percent of the babies and children were correctly secured. In the vast majority of cases, a child protection system was available, but the children were often not buckled in, were buckled in wrong, or the system had not been installed properly. On the one hand, some of the reasons for this were that many users found the safety systems too complicated to handle or had problems recognizing errors in handling. Especially systems with no ISOFIX were viewed negatively in this respect. On the other hand, deliberate failures to secure children properly were registered far too often. The correlations identified in the study coincide with statements from other studies and surveys: only a short distance, comfort of the child, fast and sloppy securing due to bad weather, and time pressure.

Crash test by DEKRA with positioning of identical child dummies on the back seat

The dummy sitting on the left in the direction of travel is well secured in a child seat corresponding to its size. The seat ensures that the seat belt is positioned correctly and additionally protects with padding and energy-absorbing components even in lateral collision situations. The dummy on the right is sitting on the back seat without even the seat belt fastened.

After the crash test (frontal impact at 50 km/h), the strapped-in dummy is sitting in its seat. Due to the high delay values, a child would have been injured in this situation. But the severity of the injury would have been significantly less than with the child who was not wearing a seat belt at all. This dummy was thrown around inside the vehicle on impact and hit several times. This child would most likely not have survived the accident.

A child who is not wearing a seat belt is thrown by the vehicle in a collision and suffers serious or fatal injuries.

Many parents are unaware of the serious consequences of not securing their children properly. So basic physical laws are ignored and the life and health of their own offspring are jeopardized for their own convenience.

If the belt is not properly fastened, the child can hit the headliner in an emergency. Then the child is in danger of suffering serious injuries such as spinal cord compression. If the child is secured in the seat too loosely or if the seat is not the right size, under certain circumstances massive flections and hyperextension of the cervical spinal column may occur in the event of an impact. The nerve cords can be permanently damaged. If the head bumps against the front seat, a traumatic brain injury can occur in the worst case.

DEKRA conducted a crash test in 2019 to demonstrate the consequences of a collision at a normal speed of only 50 km/h in a built-up area. One child dummy was properly secured in a child seat, and a second child dummy sat in the back seat without wearing seat belts. Each dummy was made of six-year-old child with a height of 1.13 meters and a weight of 23 kilograms.

The pictures speak for themselves (see previous double page). While the properly secured child dummy is held back by the belt and also protected by the child seat, the unsecured dummy is thrown around in the vehicle. In a real accident, a child would have suffered severe to fatal injuries. In addition, the force of the impact against the back of the front seat and the risk of direct head-to-head contact also endanger the individuals sitting in front of the child.

Therefore, children must be properly secured in the vehicle for every trip, regardless of the distance, weather, and time pressure. But at the same time, vehicle manufacturers are also being encouraged to install ISOFIX anchor points as standard equipment on all back seats of cars – not just in countries where this is required. Manufacturers of child seats are required to word the operating instructions clearly and easy to understand and to make the handling logical and simple. In addition, the seat must be appropriate for the weight, height, and age of the child. It is best to let the child try out the seat before purchasing it.

OPTIMIZED VEHICLE FRONT ENDS FOR BETTER PROTECTION OF PEDESTRIANS

The construction and design of vehicles also play a very important role in the road safety of children who are walking or riding bicycles. This is especially true for passenger cars, as they are the objects most frequently involved in accidents. Fortunately, a lot has been done in this respect in recent decades. Optimizations made by vehicle manufacturers to protect pedestrians were aimed primarily at making any possible contact areas as smooth and soft as possible.

Jacobo Díaz
Asociación Española de Carreteras AEC
(Spanish Road Association)

Road safety education in the age of intelligent mobility

I do not know if it is just my personal impression, or if this image in general is not so common nowadays: a child sitting at the wheel of Dad's car, pretending to drive a car and honking persistently as imaginary drivers cross his path.

This change could be due to a more profound and indisputable change that has to do with the way we perceive driving today. The problems of current mobility, especially traffic congestion and environmental pollution in cities, mean that driving is no longer enjoyable.

This day-to-day experience is passed on to the smallest ones consciously or unconsciously. In addition, many of them experience this every morning on their way to school, whether by bus, by car, or on foot.

There is another phenomenon: Digital natives, referred to as post-millennials, have extended mobile phone use to all areas of life – both in their leisure time and in their work. Smartphone apps and digital platforms have become the best tools to carry out or facilitate daily activities.

In the field of transport, this leads to a rapid acceptance of all new forms of mobility: from community and car sharing solutions – whether by bicycle, motorcycle, or scooter – to the so-called personal mobility vehicles: scooters, skateboards, segways, etc.

All of these forms are suitable for a social group the majority of which lack their own financial resources. In this context, scooters, or pedelecs are excellent examples of this development. They can be used at a very early age, are cheap compared to other means of transport, and do not require parking. All this has led to an exponential increase in these personal mobility vehicles on our roads, which are used both privately and commercially by delivery and courier services. Consequently, this also means an increase in risks for all road users.

Therefore, in addition to the legal requirements, which must urgently be issued by the authorities, we also have to consider what kind of road safety education we need to offer to our children and adolescents right now.

Schools and families as well as authorities need to join forces to teach the very youngest that the city is there for everyone. And the focus of all activities must be on people and their safety. With regard to personal mobility vehicles, this means that their proper use must be practiced very early. They must be given the essential resources to prevent them from becoming a danger to themselves or to others.

In 2000, DEKRA conducted a crash test to examine which big risks push bumpers and squared front edges of SUVs hold, especially for children.

A quick look back: Until the 1970s, bumpers lived up to their name. Initially, they were made of nickel-plated or chromed steel and later of plastic. In contrast, today's bumpers consist of a large plastic cover that is filled with either energy-absorbing foams or deformation elements made of sheet metal or plastic structures. Also, today's bumpers are integrated into the vehicle design and there is no longer a gap between the bumper and the front grille. This reduces the bending moment in the legs caused by the impact and thus the likelihood of bone fractures as well.

If a pedestrian is literally knocked off his feet by the impact of a vehicle, a sequence of movements will follow, potentially resulting in serious injuries. Depending on the collision speed, body size, and vehicle front-end structure, the pelvis and upper body will bounce off the hood and possibly the windshield. The head will hit the vehicle with great force. In order to reduce the risk of injury resulting from a head impact, some deformation elements have been integrated into hoods of cars and the distance between the hood and engine block has been increased by design. The increased deformation clearance between the hood and the engine block allows the vehicle to absorb more impact energy, reduce head deceleration, and reduce the risk of impact with the rigid engine components installed under the hood. Active hoods, where the hood is raised in a collision with a pedestrian, are also used on some vehicles. Furthermore, the wipers are now hidden under the back area of the hood. A direct impact of the head on the components of a windshield wiper can cause serious injury.

Since 2012, there is also a standard pedestrian airbag that covers the lower windshield area. Depending on the vehicle, body size, type of collision, and speed, these airbags are also beneficial for children. Rigid hood ornaments are banned today in many countries because they pose an increased risk of injury. So today they either bend or are retracted abruptly at the slightest touch.

For many years, frontal protection systems, also called "cow catchers", were a fad on European roads, especially on SUVs and vans. But due to their massive design, they present a very high risk of injury, especially for children. The "cow catcher" was located especially at the height of the head and upper body of children. Severe to fatal injuries could already be expected from moderate speeds. Furthermore, the cow catchers undid all the measures designed for the front end of the vehicle to protect pedestrians. Therefore, since 2006 vehicles with frontal protection systems have to comply with Directive 2005/66/EC. Since then, the "cow catchers" have de facto disappeared from road traffic in Europe.

SUVS ARE RATHER UNWIELDY WHEN IT COMES TO MANEUVERING AND PARKING.

The consumer protection organization Euro NCAP explicitly includes the protection of walking children in its vehicle tests. A crash test headform that corresponds to the size of a child's head is used to assess the risk of injury during head impact. So vehicle manufacturers must also make child-critical areas of the vehicle front end safer to achieve a good overall result. Euro NCAP uses impactors corresponding to the body parts of an adult for the area of the thigh, pelvis, and legs. Forms explicitly for children do not exist in these cases – but they too benefit from the design improvements in these areas.

David Ward
President and CEO, Towards Zero Foundation

Making roads safe for children

Every day 3,700 people are killed in road crashes and many more suffer serious injuries. Shockingly traffic injuries are now the leading cause of death for children and young adults aged 5-29 years. In every world region children and young people are paying the price for unsafe roads, unsafe vehicles, and unsafe driver behaviour. With road safety now included in the UN's Sustainable Development Goals much more must be done to stop the carnage on the world's roads that kills 1.35 million every year.

Roads must be made safe for children, our most vulnerable road users. And by taking the action needed to protect them we will improve road safety for everyone. Ahead of next year's 3rd Global Ministerial Conference on Road Safety in Sweden we need to commit to a new decade of action for road safety with a target to halve road deaths and serious injuries by 2030. A new #50by30 target will help to save 675,000 lives a year, accelerate progress in global road injury prevention, and work towards a world eventually free from road fatalities and serious injuries.

The current Euro NCAP rating forces manufacturers to make significantly greater efforts in pedestrian safety to continue to receive four or five stars for their vehicles. The test for pedestrian emergency braking systems introduced in 2016 was also extended to include cyclists in 2018. In 2018, China NCAP introduced a pedestrian safety evaluation including AEB test. A pedestrian safety rating is also expected as part of the US NCAP in the next few years.

VEHICLE ALL-ROUND VISIBILITY REMAINS A BIG PROBLEM

When it comes to vehicle design, one aspect must not be forgotten: all-round visibility from inside the vehicle. And it is not always optimally provided, especially in the popular SUVs and vans. This was the result of a test of 69 vehicles conducted by the Touring Club Switzerland (TCS) in 2017, among other things. It determined how well the near field of the vehicles front and rear ends can be viewed, how well they can park, and which parking assistance systems are standard on board.

The evaluation of the measurements of the TCS showed that the small cars tested offer the best all-round visibility. Station wagons finished second, followed by cars of the compact class, vans, and limousines. SUVs, which usually provide a better view of the traffic in front

Hoverboard riders faster than pedestrians – but just as unprotected

In Hollywood in the 1980s, the so-called hoverboard was still a dream of the future. Michael J. Fox was on the road in the classic movie "Back to the Future". Today, the self-balancing,electric, single-axle machines with the same name work in reality – even if not in the hovering form – and are especially popular with children and adolescents. Unlike the segway, which has been around for some time, these boards do not have a "handlebar". The wheel drives are controlled by two electric motors simply by shifting the weight of the feet.

But now the risks of hoverboards are – unlike in Hollywood – very real. This is substantiated by a crash test conducted by DEKRA. Here, a car collided at around 40 km/h with a dummy on a hoverboard, which was thrown 18.8 meters. A real accident would have resulted in serious injury. Because just like pedestrians, hoverboard riders are unprotected on the road and seriously endangered in collisions with cars, for example. But at speeds of up to 20 km/h, a hoverboard travels much faster than a pedestrian. Since motorists are usually not expecting to encounter hoverboards, critical situations are inevitable. Even collisions between hoverboard riders and pedestrians can have painful consequences.

In Germany, a personal light electric vehicle regulation is currently being worked on to regulate by law where and how fast vehicles with electric motors, with or without a handlebar, like electric scooters and hoverboards, are allowed to be ridden: on the road, on a bicycle path, or on the sidewalk? So far, use on public roads in Germany is prohibited. The regulation is to provide clarity on this point as well as on the question of registration requirements. Other EU countries such as France, Finland, Belgium, and Denmark allow the use of personal light electric vehicles with a top speed of 20 km/h, otherwise they are legally equated with bicycles or pedelecs.

and to one side because of the raised position of the seats, but are rather unwieldy when it comes to maneuvering and parking, trailed behind. In this respect, small cars have a clear advantage, according to the TCS. Because the distance between the driver and the rear window is shorter, the viewing angle is steeper and obstacles behind the vehicle can be seen earlier when it is reversing. Even station wagons have an advantage with respect to the rear view, because the rear window often slopes steeply.

The TCS results also reflected this evaluation impressively. While you can see the upper edge of a 50-centimeter-high obstacle from a distance of 1.9 meters in the compact smart fortwo when reversing, it would be visible from inside the SUV Ford Edge only from 12.5 meters away. In real life, this obstacle could also be a child playing on a tricycle. The fact that this is not a problem to be underestimated is demonstrated repeatedly by tragic accidents in which children are killed or injured by reversing cars.

For example, NHTSA studies in the US for the years 2007 to 2011 found that approximately 85 of the estimated almost 270 road users killed in accidents involving cars moving in reverse were children under the age of five. The NHTSA estimates that about 40 percent of fatal accidents involving cars moving in reverse do not occur on public roads, but in private driveways and parking lots. To prevent this, since May 2018 all newly registered cars in the USA must have a vehicle backup camera. The European Commission is also considering requirements.

Field of view measurement by DEKRA – sample vehicle

With normal seat adjustment (longitudinal adjustment center, height adjustment center, backrest angle 25 degrees), the driver cannot see the yellow areas at a height of 50 cm from inside the sample vehicle Ford Focus. In an unfavorable seat position (longitudinal adjustment center, height adjustment low, backrest angle 35 degrees), he also cannot see the red areas at a height of 50 cm. This can have serious consequences for small children outside the vehicle in a real situation on the road.

The facts in brief

- **As pedestrians, children are most likely to make mistakes when crossing the road. The use of the road has the greatest potential for error when they are riding a bicycle.**
- **Automatic emergency brake assistance systems offer great potential for avoiding accidents – but they do not release the driver from his responsibility for safe and attentive driving.**
- **Children must be properly secured in the vehicle for every trip – regardless of the distance, weather, and time pressure.**
- **Vehicle front end optimizations by manufacturers over the years have led to better protection of pedestrians in the event of a collision making the contact areas as smooth and soft as possible.**
- **Vehicle backup cameras could also soon compulsory for new vehicles in the EU.**

Seeing and Being Seen

In addition to vehicle technology systems for passive, active and integral safety, adherence to traffic regulations, and ensuring correct and attentive conduct on the road, infrastructure also has an important role to play in improving road safety for children. There are a whole series of measures that offer scope for optimization in this regard, such as ensuring that sufficient road lighting is in place and intact, setting up speed monitoring points in areas with a high risk of accidents, and ensuring that appropriate signage is in place in the vicinity of kindergartens and schools, to name but a few examples.

From the previous chapters in this Report, it is clear that the human factor and vehicle technology are both crucial components in ensuring road safety. However, a properly functioning and efficient infrastructure is just as essential – especially when considering the safety of children on the road. One of the main priorities in this regard is to use road construction and traffic regulation measures to minimize the risk of accidents and, ideally, to prevent certain accident scenarios entirely. As far as possible, it is also important to take the abilities and limitations of children's conduct on the road into account when designing the road environment.

SCHOOL ROUTE MAPS SHOULD SHOW THE SAFEST ROUTE, NOT THE SHORTEST.

In order to further improve road safety in built-up areas, for example, traffic calming zones have now been in place for many years in a lot of towns, cities and municipalities. In these areas, vehicles are required to travel at walking speed, and pedestrians, cyclists, and drivers are all required to look out for and accommodate one another. As an extension of this idea, there are also "pedestrian priority zones" where vehicles are subject to a maximum speed of 20 km/h. Traffic calming zones were introduced in Germany in the late 1970s, and have been part of the German Road Traffic Act since 1980. There are similar regulations in other European countries, such as Austria, France, Belgium, and Switzerland.

However, it is important to remember that such concepts are not a panacea. When employed judiciously, they can play a valuable role in improving road safety, reducing the number of vehicles taking "rat runs" and alternative routes, making criti-

cal areas in front of kindergartens and schools safer and less busy, and creating safe spaces for pedestrians – especially playing children. However, all too many traffic calming zones come with their own risks. It is harder to teach children who grow up in these areas to understand the dangers of busy traffic, and if they behave as they do "at home" in other areas without traffic calming, this can lead to dangerous situations. Since the requirement to travel at walking speed also applies to cyclists, such measures also rob them of attractive alternative routes that would otherwise allow them to get away from main roads dominated by motor vehicles.

MORE SAFETY ON SCHOOL ROUTES

Efficient infrastructure measures such as safe sidewalks and bicycle paths, and speed limits and 30 km/h zones for motor vehicles, are especially important in the vicinity of kindergartens and schools. "Driver feedback signs" have proven very effective in this regard. These show drivers the current speed of their vehicle together with a symbol, such as a happy or sad face. Experience has shown time and again that telling drivers directly when they are doing something wrong and combining this with an emotive visual, or praising them directly for keeping to the speed limit in a way that is also visible to others, is often more effective and has more of a lasting effect than giving them a ticket for driving too fast – especially in cases where they are only exceeding the speed limit by a small amount.

Jane Terry
Senior Director of Government Affairs
for the National Safety Council

Lead the Cultural Shift to safety

In the United States, the "Safe Routes to School program" is an important program that most children do not know exists. This program instills a culture of safety in children who walk and bike to school, because of the vital work included within it. Additionally, more school districts are buying school buses with 3-point seat belts. All passenger should be buckled in all vehicles, every ride. We have robbed our children of this critical safety system in school buses for too long, but thankfully, that is changing.

While much progress has been made, more still can be done. In the U.S., car crashes are the second-leading cause of death for children under the age of 1 and the leading cause of death for kids and young adults from ages 1-24. Children are required to be rear-facing until age 2 in 12 states, including Illinois, where a new law went into effect in January. Studies show this can prevent head, neck and spinal cord injuries. But we need all 50 states – not just 12 – to require young children to be rear-facing. When it comes to protecting our youngest passengers, a patchwork system isn't good enough.

Childhood is exactly the time when safety should be front and center. That way, children will come to expect safety as they age, and they will lead the cultural shift to safety. NSC, like DEKRA, is committed to reducing the number of children hurt in crashes. One is too many. Our littlest passengers remain our biggest treasures.

Greater Awareness for the Safety of Children on the Road

Objects that appear large to children quickly become visual obstacles to them. As a result, they may prevent our smallest road users from seeing an entire section of the road. On top of this, many children often misjudge distance and speed in such situations. In order to remind parents of how children perceive the world of traffic, DEKRA has designed a series of oversized "Gulliver" cars. This initiative increases awareness of our smaller road users and helps adults to adapt their own behavior.

Prefect Dr. Roberto Sgalla
Former Central Director for Traffic Police, Railways, Communication and Special Departments for the State Police

Keeping Children Safe in All Driving Situations

One of the most important road traffic regulations regarding children is the mandatory requirement to use restraint systems (children's seats) for children with a height of 1.50 meters or less. Children who have to use a child's seat can also be transported on the front seat. In such situations, the individual regulations regarding the position of the child's seat (facing forward/backward in relation to the direction of travel) must be observed, except for Group 0 seats, which can only be fitted on the back seat. If the child's seat is facing backward, the front airbag must be deactivated.

In addition to protecting children while driving, regulations have recently been introduced to ensure that they remain unharmed in cases where adults forget to take them out when leaving the car. In October 2018, Article 172 of the Italian Road Traffic Act was revised. This article requires all persons who transport children under four years of age in their vehicles to use equipment that will prevent them from forgetting their children. This regulation applies to children's seats installed in cars and trucks of all sizes,

and aims to protect the safety of our smallest citizens, as they cannot yet protect themselves. However, it is also designed to offer protection for their parents and family members, who are under stress due to their hectic daily lives and can fall victim to a kind of inexplicable blackout, resulting in an often fatal mistake. The usual reasons for this are being in a hurry, stress and overexertion – common features of life for adults in modern society. As a result of these conditions, they can forget their children because they think they are in school, with their grandparents or at home.

In 2018, Italian traffic police reported 4,099 violations involving a failure to use restraint systems for children during normal and targeted patrols. The total number of minors not using a restraint system or safety belt came to 4,619.

As a reflection of the importance assigned to stamping out non-use and incorrect use of safety belts and restraint systems by road traffic authorities, Italian police conducted twelve large-scale targeted inspections throughout the country over the course of 2018. During the course of these inspections, 854 violations involving non-use of the aforementioned systems by minors were reported. If we take into account the fact that a total of around 16,000 offenses involving safety belt regulations were reported during these campaigns, non-use or incorrect use of safety belts by minors accounted for more than five percent of these cases.

Although it could now prove difficult to achieve the European Union's Horizon 2020 target for reducing the number of deaths on the roads, the real challenge remains in reducing to zero the number of children who become victims of traffic accidents due to mistakes made by adults rather than through any fault of their own.

ENSURING THAT EVERYONE PAYS ATTENTION TO THEIR SURROUNDINGS COULD PREVENT MANY TRAFFIC ACCIDENTS INVOLVING SCHOOL BUSES.

The Fraunhofer Institute for Transportation and Infrastructure Systems IVI runs an interesting project that deals with this issue. The project, which won the German Mobility Award in 2017, is called "FAPS – Fraunhofer IVI Accident Prevention School" and tackles the risk of accidents for children on their daily route to school. The idea is to confront schoolchildren with real accident scenarios in the immediate surroundings of their school and thus heighten their awareness of dangerous situations. The aim of the project is to prevent accidents from occurring by encouraging precautionary behavior. To this end, the Fraunhofer IVI has tapped into the possibilities offered by smart data: Tailor-made data – based on the geographical location of the school in question – are extracted from the accident databases of government authorities and made available to the schoolchildren for their project work. Working in a virtual space, the children use these data to create typical accident scenarios in which they could be injured or killed, map out the locations close to their school where there is a high risk of accidents, work out the specific risks that apply to pedestrians, cyclists, children, and young people, and determine the visibility conditions for the parties involved in an accident when it occurs.

In light of the fact that there is still much scope for improvement in road safety education at primary and secondary education throughout Europe – as stated by the European Transport Safety Council (ETSC) in its January 2019 report "The Status of Traffic Safety and Mobility Education in Europe" – the value of a project like "FAPS – Fraunhofer IVI Accident Prevention School" that uses modern media and encourages active participation cannot be overstated. With this in mind, towns, cities and municipalities around the world should continue to push on with their efforts to draw up school route maps. Generally put together as a joint effort by the police, the traffic authorities and the schools themselves, these maps provide a systematic summary of dangerous points in the area and important information to consider when choosing a child's route to school, such as specially designed crossings, highly dangerous points on the route, how traffic is routed along individual streets, bus stops, train and metro stations, zebra crossings, traffic lights, traffic islands and other road construction measures, the locations of school crossing guards, and visual obstacles in crossing areas, such as parked cars, hedges, and trees.

EXERCISING CAUTION AT BUS STOPS

When dealing with the issue of accidents on school routes, it is also important to mention the areas

around bus stops and school buses, as dangerous situations can often occur here, too. Many of these often dicey situations could be avoided if the children paid a little more attention to what was going on around them and if all the other users showed a little more consideration, especially as school buses are clearly marked as such in most countries. These buses can take many forms, ranging from the specially designed vehicles used in regions such as North and South America, Australia, New Zealand, and Africa, which come in eye-catching colors, are clearly recognizable, and are equipped with a number of warning systems, to "normal" buses that can also be used for other forms of passenger transportation. In Germany, for example, school buses and vehicles that are currently being used to transport schoolchildren must be marked with corresponding signs on the front and rear of the vehicle. The effectiveness of these signs must not be impaired by other words or images. In addition to this, Paragraph 20 of the German Road Traffic Act (StVO) includes a general provision for all drivers of motor vehicles stating that the utmost care must always be exercised when passing any public transport bus, tram or marked school bus that has stopped at a designated stop – even on the other side of the road. Other countries have a general ban on passing school buses in either direction when they are at a stop.

In Germany, the regulations state that it is illegal to overtake any bus or marked school bus that is approaching a bus stop and has switched on its hazard warning lights. If the bus in question stops at a bus stop and keeps its hazard warning lights on, the German Road Traffic Act states that other road users may only overtake the bus at walking speed and at a distance that ensures that there is no danger to passengers or passers-by. The requirement to move at walking speed also applies to oncoming traffic on the same road. In Germany, however, this rule applies to all school and public transport buses, not just school buses. Generally speaking, drivers should always be ready to brake when they see a school bus stopping, and should adapt their speed to ensure that any danger to the schoolchildren is minimized right from the start.

Of course, there are also rules that the schoolchildren need to follow. The most important of these is: Never cross the road in front of or behind the bus while it is stopped. The safe thing to do is to wait until the bus has driven off. Until it has done so, it is not really possible to see whether the road is clear and it is safe to cross. In order to prevent dangerous situations before they even occur, it is also important to get to the bus stop in plenty of time before the bus is due to leave. If you come too late, you may be tempted to run across the road without looking for traffic, which will put you in danger.

Caution also needs to be exercised when waiting at the bus stop. Anyone waiting for a bus should be stood at least one meter from the curb, as the bus will swing out a little when it pulls up and when it drives away. If the bus stop is fenced off, even impatient passengers need to wait behind the fence so that they don't get stuck between the fence and the bus. And there's a simple rule when boarding: Let others get off before you get on. It is also important not to push, as this can easily cause someone to stumble or fall.

Colorful, Safe and Child-Friendly

Following over a year of preparation and implementation work, the first "children's zebra crossing" planned by elementary school children has been opened in the Sindorf neighborhood of the German town of Kerpen. Designed by the children themselves, the main aim of the crossing is to make it safer for many children to get to their school – the largest elementary school in Kerpen. The reason for working with the schoolchildren was a realization on the part of town planners that children are most likely to accept and use crossing systems such as crosswalks when they are involved in the planning work themselves. But the children's involvement didn't stop with the planning – they were also on site for all the important phases of the construction, and even painted a roundabout next to the zebra crossing and the area around it themselves. An evaluation process conducted in parallel to the project showed that the addition of the children's elements to the traffic hub has had a lasting effect in reducing the speed of motorized traffic in the area.

While the child has a good view of the traffic on the road from his position, drivers may not see the child themselves until far too late due to the road sign, for example.

José Miguel Trigoso
President of the Portuguese Association for Road Accident Prevention (PRP)

The Responsibility of Schools and Parents

Due to their physical and mental abilities, children remain among the least capable road users until the age of 14. They therefore require special protection. This means both adapting the road environment to meet their needs and training them in how to act as road users – as pedestrians, passengers, and cyclists. This work is a top priority for the EU and Portugal, and has produced good results. In fact, the number of children aged 14 and under who were killed on the roads in the EU was reduced by 49.6 percent between 2006 and 2015, while the number of traffic fatalities in those aged 15 and over also dropped by a respectable 39.9 percent.

The trend in Portugal has been even more positive in this regard, with a continuously high decrease in these figures. Between 2010 and 2017, the number of children killed on the roads here decreased by 83 percent, the number of severe injuries by 48 percent, and the number of minor injuries by 25 percent. Over the same period, the decrease in the other age groups was just 35 percent for fatal injuries, 11 percent for severe injuries, and 3 percent for minor injuries. Between 1995 and 2017, the number of fatal injuries dropped from 108 to 3, the number of major injuries from 882 to 67, and the number of minor injuries from 4,590 to 2,340.

What are the reasons behind this improvement? When it comes to ensuring that children use the road safely, both the school and the parents have an important role to play: the school as a center of knowledge transfer and the parents as role models and the people responsible for the safety of their children (using child restraint systems, supervising and accompanying children as pedestrians on the roads). In order to implement the change, recent years have seen an overhaul of the learning objectives for preschool and elementary school road safety lessons ("Referencial de Educação Rodoviária para a Educação Pré-Escolar e Ensino Básico"), the development of a bundle of further training measures for teachers, and the provision of well thought-out, interactive, digital teaching materials (ANSR and PRP) that can be used both at home and in schools.

More work still needs to be done on establishing the systematic use of the program in all schools and further developing and improving the road environment in built-up areas, especially in residential districts, in front of schools, and in other areas used by children. When we achieve this, we will have a system that approaches the goal we have been working toward, the only conceivable goal for this age group: "Vision Zero" – zero deaths and zero injuries caused by road traffic accidents.

For many years now, DEKRA has been using a low floor bus as a school vehicle to demonstrate to children the most important rules of conduct when traveling by bus. A crash test dummy and other equipment are used to explain important points such as the dangers involved when a bus brakes suddenly, and why it is dangerous to get too close to the wheels of the bus.

SAFETY TO GO

The benefits of maximized infrastructure quality with intact, well-lit streets, speed monitoring points in high-risk areas, suitable signage in the vicinity of kindergartens and schools, and many other measures can be supplemented by road users – especially children – contributing to their own safety, for example by wearing high-contrast clothing with reflective elements, including on their shoes and school bags. This makes it easier for drivers to see children – especially at dusk, in the dark or in the dim light of fall.

One simple but effective means of protecting children on the roads was introduced by DEKRA back in 2004: the "A head for safety" campaign. Under this initiative, many of the expert organization's branches hand out signal-red safety caps to schoolchildren – mainly first graders – and at the same time explain to them the dangers of the road and how to act as road users. The caps help to improve safety in two ways: The signal-red coloring helps drivers to notice the children during the day, while the reflective light strips that run all around the cap make it far easier to see them at dusk and in the dark. Around 2.5 million of these caps have been handed out in Germany since 2004, and international DEKRA subsidiaries in countries such as Sweden, Poland, Austria, the Czech Republic, Slovakia, and South Africa have since also joined the campaign. There is also another version of the cap available for the colder months to ensure that the children are remain easy to see while also keeping their ears warm.

REDUCING THE RISK OF CYCLING FOR CHILDREN

The figures given in the Accidents section of this Report for Germany and other EU member states clearly show that children are relatively often injured on the roads as cyclists – in Germany, for example, over 30 percent of the children under 15 who are involved in traffic accidents are cyclists. Extending the bicycle path network in a way that provides safety on the road and ensuring that bicycle paths are properly maintained are very important factors in reducing the risk of accidents, especially in urban areas. While more bicycle

A striking difference: Thanks to the retroreflective elements on their clothing, the children in the photo on the right are easily visible even in the dark. Without these elements, as shown in the photo on the left, they are hard to pick out and may not be seen until late, with all the consequences this entails.

paths are in fact being built, not all of them provide their users with the level of protection required. Especially in built-up areas, where there is rarely space for a separate bicycle path between buildings, cyclists often have to share road space with busy traffic, separated from it only by a line painted on the road surface – which might not even be easy to see, depending on how old and worn it is.

On roads where cyclists have their own lanes, the main problems are keeping this lane separate from the sidewalk, poor markings around driveways, and bicycle paths that suddenly disappear in the middle of a road. On top of this, drivers often take up space on bicycle paths to park or stop their cars. Politically speaking, new bicycle paths are an easy sell. But as long as the focus remains on the amount of kilometers added to the bicycle network rather than on establishing a sensible bicycle path infrastructure that also helps to make cycling safer, our roads will continue to be painted with structures that confuse all road users. This leads to dangerous situations, especially for children with little experience on the roads. The situation requires a drastic rethink. We need to think beyond sim-

RETROREFLECTIVE ELEMENTS ON THEIR CLOTHING, SHOES AND SCHOOL BAGS MAKE CHILDREN MORE VISIBLE TO DRIVERS.

Maria Lovelock
Programme Manager NZ, Road Safety Education Limited

Creating safer roads in Australia and New Zealand through education

Most children demonstrate an understanding of "right" and "wrong" behaviour from an early age. But children and teenagers have been found to be poor decision-makers if they feel pressured, stressed or are seeking attention from peers.

To counter this for over 15 years RSE has provided its flagship RYDA program to 600,000 young people across Australia and New Zealand. RYDA focuses on cognition development, building social competency, resilience and motivating low risk behaviour. Facilitators work with students to develop and practise personalised strategies and life skills to help them respond positively to challenges on the road, both as drivers and highly influential passengers.

RYDA evaluations demonstrate significant improvements in knowledge, attitude and intended behaviour in crucial areas such as speed, distractions – mobile phones and same age passengers and the relevance of mood.

Educationally, we adopt a whole – school approach (students, their parents and teachers) recognising the school curriculum and the 'safe system'; as a not-for-profit organisation, our business model reflects broad engagement with the community, importantly including governments and our major corporate partners. This is not without its challenges as within a combined population approaching 30 million, there are nine different jurisdictions each with their own road laws and approach to road safety.

Continually evaluated for attitudinal and behavioural change, the evidenced-based RYDA program is also under the guidance of our Advisory Council consisting of global experts from the UK, Australia and New Zealand with disciplines in behavioural science, psychology, engineering and education.

ply creating new bicycle paths, too; the road maintenance authorities also need to be provided with the resources to ensure that our bicycle paths are always ready for use – all year round.

Another factor that is just as important as safe bicycle paths is ensuring that bicycles have effective lighting – not just so that cyclists can see properly on the road, but in particular so that they can be seen easily at all times. Even during times of year when there is more light, child cyclists in particular should always make sure that they themselves can see well, and that they are easily visible to other road users. On the topic of lighting, Paragraph 17 of the German Road Traffic Act states that the prescribed lighting equipment must be used at dusk, in the dark, and when otherwise required by the prevailing visibility conditions. Lighting equipment must not be covered up or dirty.

The prescribed lighting equipment is described in Paragraph 67 of the German Road Traffic Licensing Regulation (StVZO), which states that bicycles must be fitted with a dynamo that operates the front and tail lights. Disposable or rechargeable batteries can also be used as an alternative. The prescribed lighting equipment is divided into two types: passive and active lighting equipment.

- Active lighting equipment (headlights and tail lights): These are mounted securely and sensibly at the front and rear, and can be supplied with power reliably by a dynamo. If the bicycle also has a parking light function for the headlight and tail light, safe active lighting is guaranteed at any time of day or night. As of 2017, cyclists are not required to keep removable headlights or tail lights with them or attached to their bicycles during the day. Of course, this means that cyclists need to have both good time management skills and a solid awareness at all times of the problem and the risks associated with cycling without active lighting at dusk or even at night – not to mention the potential fines. On the other hand, it is now also legal for headlights for low beams to have a high beam and/or daytime running light function – and for tail lights to have a brake light function.

- Passive lighting equipment (reflectors and reflective equipment): In detail, these are a white, front-facing reflector, a Category-Z, red, rear-facing reflector ("large-area rear reflector"), and yellow, front and rear-facing pedal reflectors. In addition to this equipment, optional, white, retroreflective strips can be added on the tires or wheel rims, or white, retroreflective spokes/spoke sheaths or yellow spoke reflectors can be used. All of this equipment must be firmly fixed to the bicycle in its entirety and kept unobscured at all times – even during the day. This is intended to ensure that cyclists can always be noticed quickly at night when the

Dr. Bernhard Ensink
Secretary General of the European Cyclists' Federation (ECF), 2006-2019

Traffic Health for our Children

The UN Convention on the Rights of the Child states that children have the right to health, education, leisure, play and rest. In order to exercise all these rights, they need a safe environment where they can move around freely and independently – when playing, exploring the area around their home and traveling to school.

The ECF referred back to these rights, which where formulated by the United Nations in 1990, in its "Charter of Vancouver on Children and Cycling" in 2012 and, together with the City of Vancouver, declared cycling a human right for children. Everything DEKRA works for is important in allowing children to exercise this right: safe technology, standards, guidelines, and safe behavior on the roads. Not to mention a suitable bicycle infrastructure, of course. Without this, the right of children to cycle will never come into effect.

"Vision Zero" has now become a guiding principle for all of us, not just for DEKRA. Committing to this aim is a worthwhile investment – and not just because successful implementation of "Vision Zero" would mean no more deaths from traffic accidents. Road safety also helps to allow children the freedom and independence they need in their physical movement. When children and their parents experience the road and the area they live in as safe, both objectively and subjectively, this is of great benefit to the children's health. Better road safety and a greater sense of safety lead to more children walking and cycling (again) to get wherever they need to go, being actively mobile, and living more healthily. This is why I see "Vision Zero" as "Vision Beyond Zero" and like to refer to road and traffic safety as "traffic health". Our traffic systems should help to improve our children's health, not make them ill.

We need a strong, global partnership committed to sustainable, safe traffic systems with attractive and safe infrastructure for pedestrians and cyclists. Good collaboration between committed companies like DEKRA and civic organizations like the ECF and the World Cycling Alliance (WCA) is in keeping with this ideal. This way, we can give all children the ability to move freely and independently – when playing, going to school, exploring, and shaping their environment.

FUNCTIONING ACTIVE AND PASSIVE LIGHTING EQUIPMENT SIGNIFICANTLY REDUCES THE RISK OF ACCIDENTS FOR CYCLISTS.

Making Bicycles Road-Safe – Legal Requirements in Germany

Children often like to travel by bicycle, either in their free time or as a way of getting to school. This makes it all the more important to ensure that their bicycles have all the necessary safety equipment and are inspected regularly. This applies in particular to the bicycle's active and passive lighting equipment and brakes. In addition to this, children should always wear bicycle helmets, no matter how short the distance they are cycling.

Required lighting equipment according to the German Road Traffic Licensing Regulation (StVZO)

Active lighting equipment Removable items do not need to be attached or carried around during the day		**Headlight** for low beam, → also permissible with high beam and/or daytime running light function
		Tail light, red → also permissible with brake light function
		Power source: dynamo, disposable battery, rechargeable battery, or combination of the above
Passive lighting equipment All items **must be permanently installed and unobscured** at all times		**Reflector**, white, front
		Pedal reflectors, yellow
		Reflector, Cat. Z, red, back
	Optional	**Retroreflective strips** on tires or wheel rims, white
	Optional	**Retroreflective spokes/spoke sheaths**, white
	Optional	**Spoke reflectors**, yellow

Other equipment required by the StVZO

- Two independent brakes
- One clear-sounding bell

Recommended accessories

- Chainguard
- Mudguards, front and rear
- Luggage rack
- Bicycle lock
- Bicycle stand

Attractive design and full safety equipment in a bicycle make children both happy and safe.

headlights of a motor vehicle fall on them, even if they are not seen beforehand.

Parents should pay special attention to their children's bicycles. Unlike for special "kids'" bikes and training bicycles, which generally do not have the necessary safety equipment and thus cannot legally be used on roads or bicycle paths – which it is illegal for children under the age of eight to use anyway – shops offer "full StVZO equipment" on road bikes for even the youngest cyclists. This includes permanently installed lighting equipment – preferably with a hub dynamo and a parking light function. Checks must also be performed to make sure that the bicycle's lighting equipment is not obscured by any baskets or bags. In addition to this, the bicycle should be inspected regularly to ensure it remains in safe condition. After all, if a brake fails in a real-life situation, even the best light and a perfect bicycle path will be of no help. The German regulations should very much be seen as recommendations for countries whose requirements are not as comprehensive.

The Facts at a Glance

- When it comes to designing our infrastructure, the needs of children are more important than ever. A clear, well-organized, and comprehensible system that is forgiving of errors benefits all road users.
- Safe sidewalks and bicycle paths, speed limits, and 30 km/h zones for motor vehicles are key elements in improving road safety, especially in the vicinity of kindergartens and schools.
- The abilities and limitations of child behavior on the roads are another factor that must always be taken into account when designing the urban road environment.
- School route maps provide a systematic summary of dangerous points in the area and important information to consider when choosing a child's route to school.
- At bus stops, ensuring that other road users look out for children and adjust their speed must be our top priority.
- When buying a bicycle for their child, parents should always make sure that it has the equipment required by the German Road Traffic Licensing Regulation (StZVO) – especially the required lighting equipment.
- Maintenance of bicycle paths is just as important as it is for roads. This also includes dealing with winter conditions.

The Trend is Positive – But We Still Cannot Afford to Be Complacent

Traffic accidents that result in severe or fatal injuries to children never stop being shocking – to both the families of those involved and the parties responsible for the accident. In accidents involving under-15-year-olds, these culpable parties are often drivers of cars. There have been many positive developments in this area in recent years. Nevertheless, there is still a lot of work to be done to improve road safety for this age group, especially in terms of the human factor, vehicle technology and infrastructure.

The trend over the last few years is clear: On the roads of both Europe and other parts of the world, the number of children under the age of 15 who lose their lives in traffic accidents is happily decreasing. Whereas 1,325 children in this age group were victims of such accidents in the EU in 2005, "only" 593 children were killed on the roads in 2017. That is a decrease of 55 percent. This figure has not dropped as dramatically in the USA. While the country's figures for 2017 have yet to be published, between 2005 and 2016 the number of children killed in traffic accidents dropped by 37 percent, from 1,955 to 1,233. But that is by no means a reason for us to rest on our laurels, especially as the preliminary accident figures for Germany for 2018, for example, show that the number of deaths has increased once more. Furthermore, the figures for Africa and Asia presented in this Report confirm that there are still immense challenges ahead for those in charge, especially in these regions. There are plenty of areas where lasting improvement is required.

One of our most important tasks in this regard is without doubt providing road safety education – preferably starting at preschool age as, depending on their development, children are often unable to make the right choice in dangerous situations. With this in mind, we need to explain enough about the risks of road use to children for them to acquire an awareness of safety from as early an age as possible. In addition to this, however, all other road users should be made more aware of the particular behavior of children in road traffic. Adult road users, and especially parents, need to be aware of their status as role models and ensure that they are always setting a good example – through measures such as wearing a bicycle helmet and behaving correctly when crossing a road. The fact is, children often imitate the behavior they see in "grown-ups". Unfortunately, this can lead to fatal mistakes in real-life situations.

In addition to providing adequate road safety education, it is also important that we establish a safe

road infrastructure in the vicinity of kindergartens and schools. This can take the form of speed reduction measures, for example – a consideration that is also important due to the severe effects of collision speed on the severity of the injury. In terms of the areas surrounding kindergartens and schools, it is also important to remember the issue of the "school run". It should go without saying that parents who drive their children to school and drop them off more or less on the doorstep have the child's best interests at heart, but it doesn't help them to learn how to use the road independently and safely. On top of this, the chaos on the roads around kindergartens and schools in the morning often leads to risky situations.

The benefits of maximized infrastructure quality with intact, well-lit streets, speed monitoring points in high-risk areas, suitable signage in the vicinity of kindergartens and schools, and many other measures can be supplemented by road users – especially children – contributing to their own safety, for example by wearing high-contrast clothing with reflective elements, and ensuring that their bicycles have working lighting equipment. This makes it easier for drivers to see children – especially at dusk, in the dark or in the dim light of fall.

One frequent cause of accidents, as DEKRA has pointed out many times in previous Road Safety Reports, is human errors in traffic – including things like distraction. Regardless of whether one is only using the satnav briefly, adjusting the volume of the radio or the temperature of the air conditioning system, a few seconds are all it takes to cover several meters driving blind, even at low speed. In such situations, features like automatic emergency brake assistance systems with cyclist and pedestrian detection have the potential to be of great benefit. The same applies to cases where children move carelessly in traffic and suddenly run into the street, or endanger themselves by making other mistakes.

However, as has been stated in previous DEKRA Road Safety Reports, there is one clear requirement we should never forget: If we want to prevent as many dangerous situations as possible on the roads before they even occur, it remains absolutely essential for all road users to behave responsibly, be realistic when judging their own abilities, and demonstrate a high level of acceptance for the rules and regulations. After all, the person at the steering wheel is still the one with the most potential to affect whether or not an accident occurs. No matter how good our vehicle technology becomes and how much we perfect our road infrastructure, nothing will alter that fact.

DEKRA's Demands

- **In and on all vehicles (cars, bicycles, motorcycles), children must always be transported in the seats designed for this purpose.**
- **Before and during every journey, children must be secured in their seats using the appropriate restraint systems for their age and height (child's seat, infant carrier). This applies for short journeys, too – and of course for the child's very first car journey, for example when taking them home from the hospital.**
- **As is the legal requirement in some countries, children must always wear a helmet when riding a bicycle. Parents must always act as role models in this regard.**
- **Like those for adults, children's bicycles must be fitted with working active and passive lighting equipment – as is legally required in Germany, for example – to ensure that children on bicycles are easily visible at any time of day.**
- **Acceptance of the rules and regulations – especially in terms of speed, how to act at traffic lights and behavior toward pedestrians and cyclists – must be promoted by means of intensive awareness training.**
- **Parents must allow their children to gain their own experience of using the road as appropriate for their age and level of development, and to acquire the appropriate skills.**
- **If unavoidable, the "school run" must be organized in a way that does not put anyone in the vicinity of the school in danger.**
- **Junctions, crossroads and crosswalks must be kept clear of obstructions such as parked vehicles, signs, traffic infrastructure and street furniture, as these objects significantly increase the risk of accidents.**
- **As a general rule, speed limits of a maximum of 30 km/h must be imposed on school routes and the areas around schools, kindergartens, and playgrounds in order to make them safer.**
- **Children must learn how to behave correctly on buses and at bus stops.**
- **The careful maintenance and upkeep of bicycle paths is essential to making cycling safe.**
- **Road safety education from kindergarten age through to the teenage years is essential to ensuring that children and young people use the road safely.**
- **All adults must be aware that they are seen as role models by children. Regardless of whether you can see children or have any with you in or on your vehicle, you must always use the road in such a way that children will be able to adopt your behavior without putting themselves in danger.**

Any Questions?

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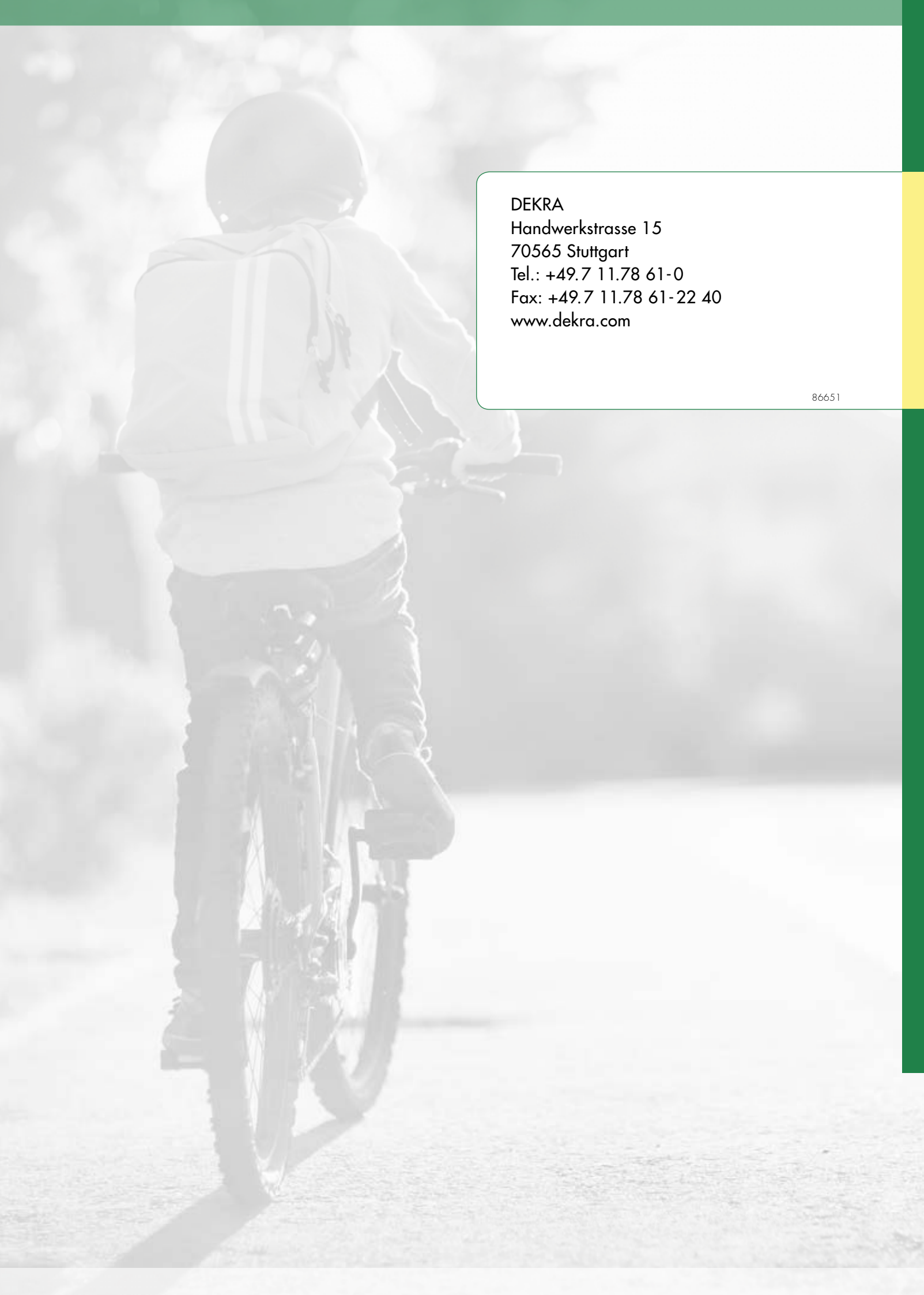

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