イタルダ インフォメーション **ITARDA INFORMATION** 交通事故分析レポート No.97

Special feature Wear a helmet to reduce injuries

from cycling accidents



Wear a helmet to reduce injuries from cycling accidents !!

In order to reduce cycling accidents (accidents in which bicycles are involved), efforts are being promoted to expand cycle paths, lanes reserved for cycling (cycling lanes) and cyclist/pedestrian facilities, and to increase common knowledge of road rules. However, eliminating cycling accidents is no easy task. Therefore, in addition to promoting measures to curb cycling accidents, it is also important to ensure widespread adoption of measures that will reduce injuries when accidents do occur. This issue will analyze trends in the number of casualties resulting from cycling, go on to analyze which parts of the body are injured and which surfaces inflict injury when accidents occur, and consider measures to reduce injuries.

2 Casualties resulting from cycling have not fallen as much as for other accident types

These figures show the trends in numbers of fatalities by means of transport (Fig. 1) and trends in numbers of injuries (Fig. 2), based on the Traffic Accident Database from 2001~2011. Different means of transport are indicated in different colors. Fatalities and injuries are decreasing year on year for all means of transport. Then, to investigate how the extent of the decreases in cycling fatalities and injuries compares with the decreases for other means of transport, we converted the figures to an index taking the 2001 fatalities and injuries as a baseline (=100) (Fig. 3 and Fig. 4). For fatalities, while there has been a striking decrease among four-wheeled vehicle passenger fatalities (Fig. 3), the decrease for cyclists and pedestrians has tended to be less in degree. Turning to numbers of injuries (Fig. 4), while there has been a striking decrease in injuries among motorcyclists, the decrease among cyclists has been the smallest among all the means of transport.



Following cycling accidents,

3

which parts of the body are injured and in what manner? ••••

Fig. 5 shows the composition ratio of primary injury sites among cyclists, broken down by the degree of injury. Fig. 6 and Fig. 7 show the different types of arm and leg injuries, which are both common among slight injuries. Fig. 8 and Fig. 9 show the different types of head and chest injuries, which make up many fatalities. The results can be summarized as follows.

- (1) Most people with slight injuries are injured in the extremities (arms and legs), while head and chest injuries are commonest among fatalities.
- (2) Among slight injuries to the extremities, the commonest types are cuts (lacerations), abrasions (crushing, scrapes) and contusions.
- (3) Among fatalities, the commonest types of injuries are fractures and lacerations/crushing/ contusions for head injuries, and fractures and rupture of internal organs for chest injuries.



Which parts of the body require protective equipment when cycling?

We used the combined figures for cyclists and passengers from 2009 to 2011 (a three-year period) from the Traffic Accident Database for the analyses discussed between Section 3 and Section 5.





Injuries to which body parts are the most dangerous for cyclists? ••••••••••••

Fig. 10 looks at what percentage of all injuries result in fatalities, for each primary injury site [= (No. of fatalities) / No. of casualties) x 100]. The injuries most likely to prove fatal are head injuries (2.2%, 1,265 people), followed by abdominal injuries (1.9%, 84 people) and chest injuries (1.1%, 249 people). The head deserves the most attention because injuries to this part are the largest contributors to fatality rates and the number of casualties. The absolute numbers of casualties with abdominal and chest injuries are lower than those with head injuries, but the fatality rates of abdominal and chest injuries are close to that of head injuries.



	Whole body	Head	Face	Neck	Chest	Abdomen	Back	Lower back	Arm	Leg	Other	Total
No. of fatalities	101	1,265	20	75	249	84	9	110	3	28	37	1,981
No. of serious injuries	0	6,403	1,728	902	4,171	361	388	2,847	6,919	10,139	6	33,864
No. of slight injuries	0	49,782	20,377	41,346	18,562	3,958	3,542	38,880	77,594	161,627	164	415,832
												(People)

Fig. 10: Fatality rate by primary injury site among cyclists (2009~2011)

When the head, abdomen or chest receives heavy impact, prompt examination by a doctor is critical.

5 Head injuries, which make up most fatalities, are usually inflicted by four-wheeled vehicles' exterior body panels and road surfaces

Let us now look at which surfaces are inflicting the injuries investigated in Section 4. Fig. 11 shows the distribution of injury-inflicting surfaces for 1,265 fatalities caused by head injuries. Most fatalities were caused by "Other/exterior vehicle parts" or "Road surface." "Other/exterior vehicle parts" indicates the four-wheeled vehicle body, excluding the tires. "Road surface" refers to the surface of the road and does not include road works equipment such as guard rails and safety barriers along the side of the road. Over the three-year period, 568 people died as a result of "Other/exterior vehicle parts" and 566 as a result of the "Road surface."



Fig. 11: Distribution of injury-inflicting surfaces for cyclists suffering fatal head injuries (2009~2011)

Helmets are effective at protecting the head when a cyclist collides with hard surfaces such as exterior vehicle parts or the road surfaces.

6 What is the situation regarding helmet use? •••••••••

From the discussion so far, it is evident that helmets are very useful for reducing injuries. Let us now compare the fatality rates among cyclists wearing helmets and those not wearing helmets in actual accidents. In Fig. 12, the fatality rates based on the numbers of cyclists and passengers suffering head injuries over a five-year period from 2007 to 2011 are plotted on a graph. It is evident that the fatality rate declines in the order of "Helmet not worn" "Helmet worn \rightarrow Came off" and "Helmet worn \rightarrow Did not come off."



Fig. 12: Fatality rates by helmet use situation (2009~2011)

*: The scope of the graph represents a 95% confidence interval. The graph uses data from a five-year period (2007~2011) because the volume of data for "Helmet worn → Came off" and "Helmet worn → Did not come off" is small and the degree of variation considerable.

Wearing a helmet correctly reduces the fatality rate to approximately 1/4 of the fatality rate for not wearing a helmet

Even when a helmet is worn, it cannot be expected to be effective if it comes off before the person suffers the impact. Wearing helmets and fastening the chinstrap correctly are both critical.

Table 1: No. of casualties and estimated no. of fatalities by helmet use situation among people suffering head injuries

	Helmet not worn	Helmet worn →Came off	Helmet worn →Did not come off	Total
No. of fatalities (people)	2,181	22	27	2,230
No. of casualties (people)	94,922	1,073	4,697	100,692
Fatality rate (%)	2.30	2.05	0.57	2,021
Estimated no. of fatalities (people)	546	6	27	579
				(People

The estimated number of fatalities in Table 1 (the bottommost row) gives the estimated figure based on the assumption that the fatality rates are all the same values as "Helmet worn \rightarrow Did not come off" (0.57%), for the numbers of casualties for each helmet use situation. It is estimated that if all cyclists wore helmets correctly, of all those cyclists killed by head injuries over the five-year period (2,230 people), approximately 1,651 people (=2,230 - 579) would not have been killed. While this is a rough calculation, these figures indicate clearly that helmet use has a significant effect.

Helmets are essential items for junior/senior high school students!

Finally, let us discuss what age groups need to put particular effort into wearing helmets. Fig. 13 compares the numbers of cyclist casualties with those of pedestrian casualties for each age group. It is evident that for all age groups apart from children under 6, the number of cyclist casualties is greater. In other words, once children start using bicycles, the extent to which cyclist casualties exceed pedestrian casualties grows greater, peaking in the junior/senior high school years in particular (9~14 times the number of pedestrian casualties).



Fig. 13: Comparison of cyclist casualties with pedestrian casualties by age group (2007~2011; aggregation of primary and secondary party casualties)

(People)

8 Summary (findings)

- (1) Cyclist fatalities and injuries have decreased less than fatalities and injuries among other means of transport.
- (2) A large number of fatal accidents are caused by injuries to the head and chest, while injuries to the arms/legs are commoner among accidents causing serious/slight injuries.
- (3) Injuries to the head, abdomen and chest have higher fatality rates.
- (4) The commonest injury-inflicting surfaces are "External vehicle parts" and "Road surface."
- (5) Wearing helmets reduces the fatality rate to 1/4 of the fatality rate for not wearing a helmet. Based on the numbers of casualties and fatality rate between 2007 and 2011, it is calculated that if helmets were to be worn correctly by all cyclists, 1,651 lives would have been saved.
- (6) Among junior/senior high school students, the numbers involved in cyclist accidents are considerable, occurring at 9~14 times the rate of pedestrian accidents.



9 To reduce injuries when cycling •••••••••

- (1) Bicycles are vehicles too. Be sure to wear a helmet when you cycle.
 - Junior/senior high school students, who cycle a great deal, should consider helmets essential items and be sure to wear them.
 - Make wearing helmets a habit among toddlers and children aged under 13; efforts to make it mandatory to ensure that children this age wear helmets are currently being enforced.



- 3) Adults should wear helmets at the same time, so that they are good role models for children.
- Efforts should be made to raise awareness in elderly cyclists; for example, that wearing helmets can compensate for their reduced physical resistance.
- (2) Cyclists who suffer heavy impact to the head, chest or abdomen should avoid brushing this off and be examined promptly by a doctor.
- (3) Cyclists should make use of elbow/knee protectors as well as helmets. Even cyclists who find protectors too cumbersome when traveling should take care to protect themselves with long sleeves, long pants and gloves, which can reduce the degree of injury in small accidents.

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You must

wear your helmet when you ride

your bike.

No.97

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交通事故総合分析センターは、平成4年(1992年)に国家公安委員会、運輸省(当時)、建設省(当時) から設立許可を受けて、公益法人として設立されました。その後平成24年(2012年)4月に公益財団法人に 移行しました。 我が国で唯一道路交通法第6章の3の定める「交通事故調査分析センター」の指定を国家公安委員 会から受けた調査研究機関であり、交通事故の防止と被害の軽減のための交通事故の調査分析を

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