

# 0-1 Title

## **Road Traffic Accident Involvement Rate by Accident and Violation Records: New Methodology for Driver Education Based on Integrated Road Traffic Accident Database**

Session 3 – Road Safety Data Collection and Reporting

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4<sup>th</sup> IRTAD2009 Conference  
Seoul, Korea, 16-17 Sep.2009

# 0-2 Outline of Presentation

1. Background
2. Integrated Database
3. Method
4. Results
5. Discussion
6. Conclusion



# 1-1 Background

## (1) Needs

Improving driver education

Driver education for old people

## (2) Seeds

Integrated traffic accident database

Improvement of computer



# 1-2 Targets of 3 Es

Engineering

Road  
Road Facility  
Vehicle  
Safety Device

System

Education  
&  
Enforcement

Road User



# 1-3 Education for Drivers



Age:65yrs  
Driver Experience:30yrs  
Accidents/Violations  
(previous 5 yrs): 2/0



Age:40yrs  
Driver Experience:20yrs  
Accidents/Violations  
(previous 5 yrs): 0/1



Age:45yrs  
Driver Experience:15yrs  
Accidents/Violations  
(previous 5 yrs): 0/3

Do you give them the same education?



Age:40yrs  
Driver Experience:20yrs  
Accidents/Violations  
(previous 5 yrs): 1/0



Age:50yrs  
Driver Experience:20yrs  
Accidents/Violations  
(previous 5 yrs): 0/5



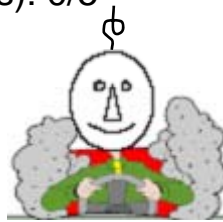
Age:65yrs  
Driver Experience:30yrs  
Accidents/Violations  
(previous 5 yrs): 0/0



Age:23yrs  
Driver Experience:5yrs  
Accidents/Violations  
(previous 5 yrs): 0/3



Age:55yrs  
Driver Experience:20yrs  
Accidents/Violations  
(previous 5 yrs): 1/0



Age:75yrs  
Driver Experience:40yrs  
Accidents/Violations  
(previous 5 yrs): 0/0



Age:30yrs  
Driver Experience:10yrs  
Accidents/Violations  
(previous 5 yrs): 1/3



# 1-4 Background

## (1) Needs

Improving driver education  
Driver education for old people

## (2) Seeds

Integrated traffic accident database  
Improvement of computer

It is necessary

not only to study accidents which have some mechanism  
but also to study drivers who have accident proneness.



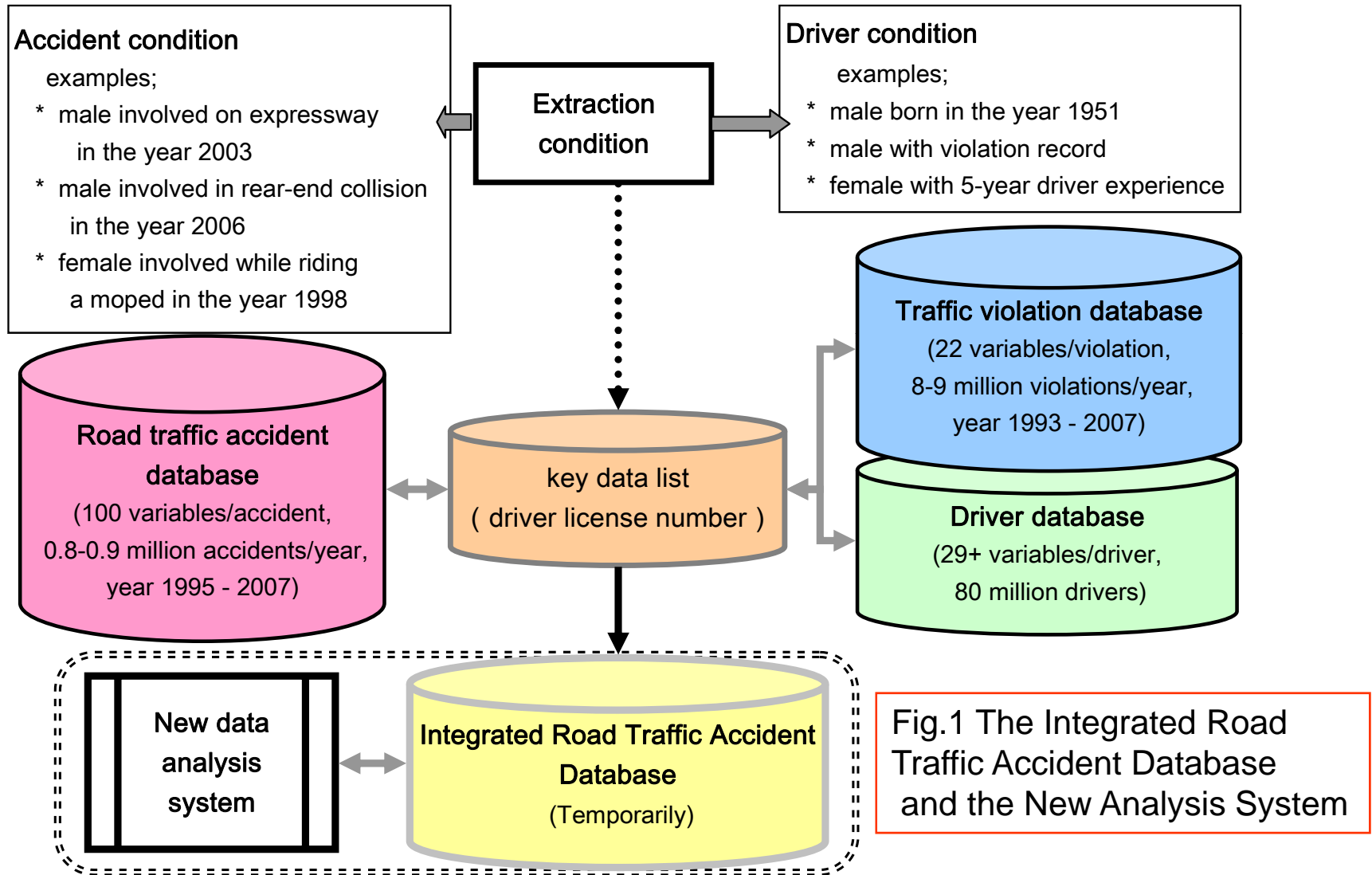
# 1-5 Objects

- 1) To develop a database integrated with road traffic **accident** and traffic **violation**
- 2) To study the relationship between **accident** or **violation** experience and an accident rate

For improving driver **education** and **enforcement**



# 2-1 Database System





## 2-2 Driver database

### Driver license number

sex	withdrawal while novice driver duration (moped)	(medium sized 2-wheel)/**
nationality	number of suspension (30-day)	(90-day, 180-day)
address (city)	number of revocation	violation/accident-free years
expiration date of the present license	years of driver experience	(1st class : 2 wheels, etc.)
issued date of the present license	special condition	(1st class : others) / (2nd class)
date of the latest violation	issued date of the first license	days since the last violation
date of the latest accident	(1st class : 2 wheels, etc.)	days since the last accident
special condition	(1st class : others) / (2nd class)	days since the last violation/accident
issued date of the first license	category of driver license	violation/accident-free days
(1st class : 2 wheels, etc.)	expiration date of novice driver	days of driver experience
(1st class : others) / (2nd class)	duration (moped)	(1st class : 2 wheels, etc.)
category of driver license	(medium sized 2-wheel)/**	(1st class : others) / (2nd class)
expiration date of novice driver	date of safety course for novice driver	days since the safety program for
duration (moped)	(moped)	novice driver (moped)
(medium sized 2-wheel)/**	(medium sized 2-wheel)/**	(medium sized 2-wheel)/**
date of safety course for novice driver	re-qualified date of license (moped)	days since the re-qualified date
(moped)	(medium sized 2-wheel)/**	(moped)
(medium sized 2-wheel)/**	type of driver education (moped)	(medium sized 2-wheel)/**
re-qualified date of license (moped)	(medium sized 2-wheel)/**	number of violations
(medium sized 2-wheel)/**	date of withdrawal while novice	number of accidents
type of driver education (moped)	driver duration (moped)	(medium sized 2-wheel)/**
(medium sized 2-wheel)/**	(medium sized 2-wheel)/**	: (medium sized 2-wheel)
date of withdrawal while novice	driver duration (moped)	
driver duration (moped)	(medium sized 2-wheel)/**	
(medium sized 2-wheel)/**		

variables : 29 +



# 2-3 Accident Database

location (prefecture)	geometry of the intersection	travel purpose : 1P/2P
police station	traffic signal	stop control regulation : 1P/2P
ID number	alignment of road	speed limit : 1P/2P
severity of accident	width of road	drunk driving : 1P/2P
number of fatalities	vehicle location at conflict	violation type : 1P/2P
number of seriously injured	median type	contributory factor (human) : 1P/2P
number of slightly injured	divider of footpath and driveway	contributory factor (vehicle) : 1P/2P
number of passengers : 1P/2P	collision type	contributory factor (road environment) : 1P/2P
road category	special mention : 1P/2P	maneuver : 1P/2P
site ID code	sex : 1P/2P	travel direction : 1P/2P
intersection ID code	age : 1P/2P	impact point of vehicle : 1P/2P
location (city)	<b>Driver license number</b> : 1P/2P	age : 1P/2P
date (year)	occupation : 1P/2P	seat instrument : 1P/2P
date (month)	<b>driver license number : 1P/2P</b>	airbag : 1P/2P
date (day)	qualification of driver license : 1P/2P	side airbag : 1P/2P
time (hour)	driving experience : 1P/2P	severity of casualty : 1P/2P
time (minute)	road user type : 1P/2P	part of physical damage : 1P/2P
day/night	<b>vehicle registration number : 1P/2P</b>	type of physical damage : 1P/2P
weather	vehicle category : 1P/2P	distance from home : 1P/2P
day of the week	vehicle figure : 1P/2P	culpable of the concerned driver
CBD/urban/others	cargo condition : 1P/2P	
road surface condition	operation administrator : 1P/2P	
geometry of road		

**variables : 31 + 35 \* 2**

1P/2P : 1st party and 2nd party



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## 2-4 Violation Database

**Driver license number** (driver license number)

date of event  
time of event  
police station  
sequential number  
violation 1  
violation 2  
type of accident  
severity of casualty  
level of fault  
cumulative demerit points  
demerit point  
address (prefecture)  
road category  
category of concerned driver license  
type of concerned vehicle  
category of enforcement  
date of enforcement  
cumulative demerit points for safety  
suspension days  
reduced suspension days  
type of enforcement

**Variables : 22**



# 3-1 Method : Data Process

Table 2a A: Number of drivers involved in a traffic accident in the year 2007

		violation records in the previous 5 years (2002 - 2006)						
		0	1	2	3	4	5 & more	total
accident records in the previous 5 years (2002 - 2006)	0	156,191	106,866	63,084	38,440	23,377	34,544	422,502
	1	11,350	12,580	9,995	7,042	4,882	7,937	53,786
	2	969	1,405	1,348	1,071	744	1,231	6,768
	3 & more	138	207	225	193	131	222	1,116
	total	168,648	121,058	74,652	46,746	29,134	43,934	484,172

Table 2b B: Number of drivers at the end of the year 2006

		violation records in the previous 5 years (2002 - 2006)						
		0	1	2	3	4	5 & more	total
accident records in the previous 5 years (2002 - 2006)	0	24,461,647	9,645,651	4,256,607	2,087,006	1,097,092	1,304,972	42,852,975
	1	795,194	624,359	383,885	235,565	144,421	204,498	2,387,922
	2	32,293	36,895	29,553	21,324	14,358	22,763	157,186
	3 & more	2,142	3,140	2,779	2,312	1,559	2,599	14,531
	total	25,291,276	10,310,045	4,672,824	2,346,207	1,257,430	1,534,832	45,412,614



## 3-2 Accident Involvement Rate

The Accident Involvement Rate (accidents/driver/year)

= the number of drivers involved  
in a traffic accident in the year 2007 /

the number of drivers at the end of the year 2006

<E-1>



# 3-3 AIR by Accident/Violation Experience

Table 2 The Accident Involvement Rate as 1st party in the year 2007  
by Accident and Violation Experience in the previous 5 years (2002 - 2006)  
< Male drivers in all Japan >

Table 2c C: Accident involvement rate (A/B) (%)

		violation records in the previous 5 years (2002 - 2006)							total
		0	1	2	3	4	5 & more		
accident records in the previous 5 years (2002 - 2006)	0	0.64	1.11	1.48	1.84	2.13	2.65	0.99	
	1	1.43	2.01	2.60	2.99	3.38	3.88	2.25	
	2	3.00	3.81	4.56	5.02	5.18	5.41	4.31	
	3 & more	6.44	6.59	8.10	8.35	8.40	8.54	7.68	
	total	0.67	1.17	1.60	1.99	2.32	2.86	1.07	



# 3-4 AIR by Accident/Violation Experience

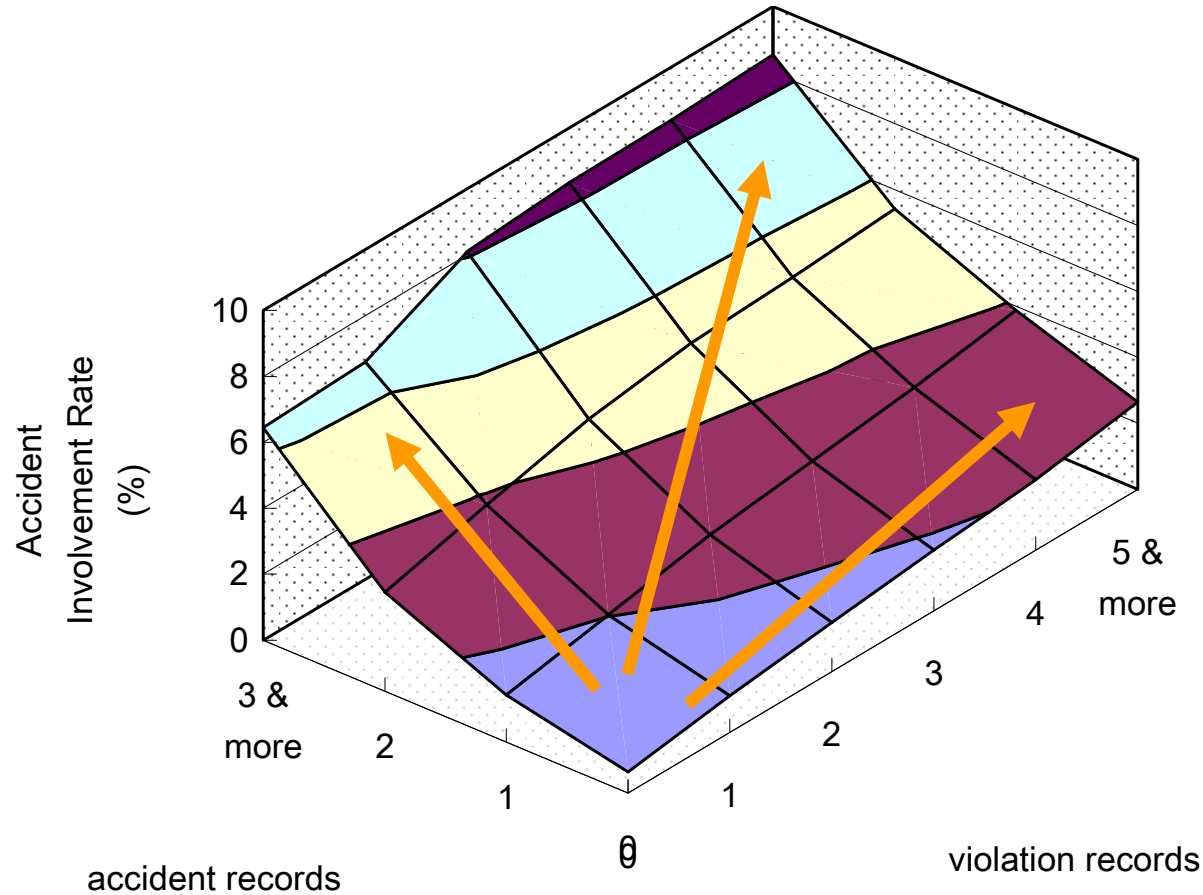
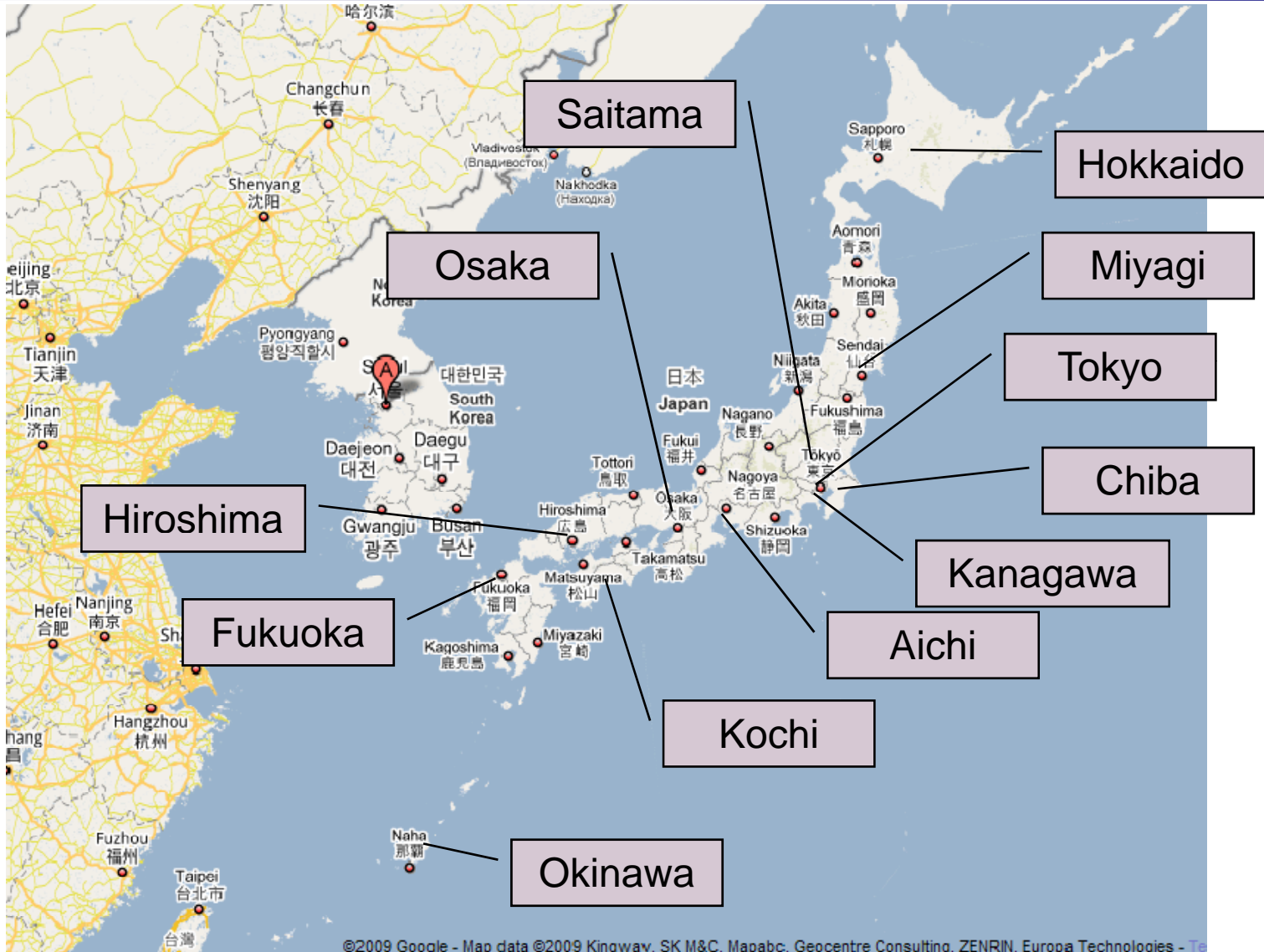


Fig.2 The Accident Involvement Rate as 1st party in the year 2007 by Accident and Violation Experience in the previous 5 years (2002 - 2006) < Male drivers in all Japan >



# 3-5 Analyzed prefectures



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# 3-6 Analyzed Data

Table 1 The Number of Drivers with Accident/Violation Record in 5 years (2002-2006)

Prefecture/ sex	Number of drivers	Drivers with accident record		Drivers with violation record (Y2002-2006)										
				any type		illegal parking		speeding		disregarding traffic signal		disregarding stop sign		
					%		%		%		%		%	
Hokkaido	male	1,932,276	84,845	4.4	974,794	50.4	107,605	5.6	595,680	30.8	137,624	7.1	79,078	4.1
	female	1,428,797	33,088	2.3	425,635	29.8	50,878	3.6	224,965	15.7	52,298	3.7	43,228	3.0
Miyagi	male	844,081	40,839	4.8	338,118	40.1	31,787	3.8	144,015	17.1	28,661	3.4	36,481	4.3
Tokyo	male	4,352,226	229,528	5.3	1,910,047	43.9	770,213	17.7	616,370	14.2	158,267	3.6	277,358	6.4
	female	2,878,173	52,621	1.8	519,354	18.0	243,113	8.4	89,858	3.1	27,728	1.0	89,164	3.1
Saitama	male	2,590,781	155,613	6.0	1,050,556	40.5	247,985	9.6	345,294	13.3	82,541	3.2	161,378	6.2
Chiba	male	2,224,900	114,789	5.2	976,506	43.9	228,068	10.3	310,396	14.0	64,948	2.9	136,009	6.1
Kanagawa	male	3,181,388	189,271	5.9	1,471,592	46.3	488,720	15.4	509,784	16.0	98,151	3.1	135,432	4.3
Aichi	male	2,718,921	157,507	5.8	1,144,033	42.1	261,880	9.6	462,089	17.0	128,501	4.7	215,334	7.9
Osaka	male	2,960,636	198,318	6.7	1,459,758	49.3	517,404	17.5	680,516	23.0	326,023	11.0	90,090	3.0
Hiroshima	male	1,023,416	60,394	5.9	408,428	39.9	56,510	5.5	111,337	10.9	53,456	5.2	47,765	4.7
Kochi	male	273,805	12,582	4.6	130,083	47.5	11,935	4.4	58,585	21.4	12,083	4.4	24,647	9.0
Fukuoka	male	1,739,191	135,329	7.8	866,582	49.8	134,587	7.7	420,826	24.2	103,270	5.9	113,433	6.5
Okinawa	male	462,358	15,870	3.4	199,634	43.2	45,500	9.8	25,430	5.5	19,851	4.3	4,161	0.9
All Japan	male	45,412,614	2,559,639	5.6	20,121,338	44.3	3,844,034	8.5	7,972,374	17.6	2,239,700	4.9	2,722,713	6.0
	female	34,494,598	1,129,535	3.3	8,678,614	25.2	1,616,173	4.7	2,674,249	7.8	776,785	2.3	1,530,105	4.4

Note) Japan consists of 47 prefectures.



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# 4-1 Study 1: Accident experience

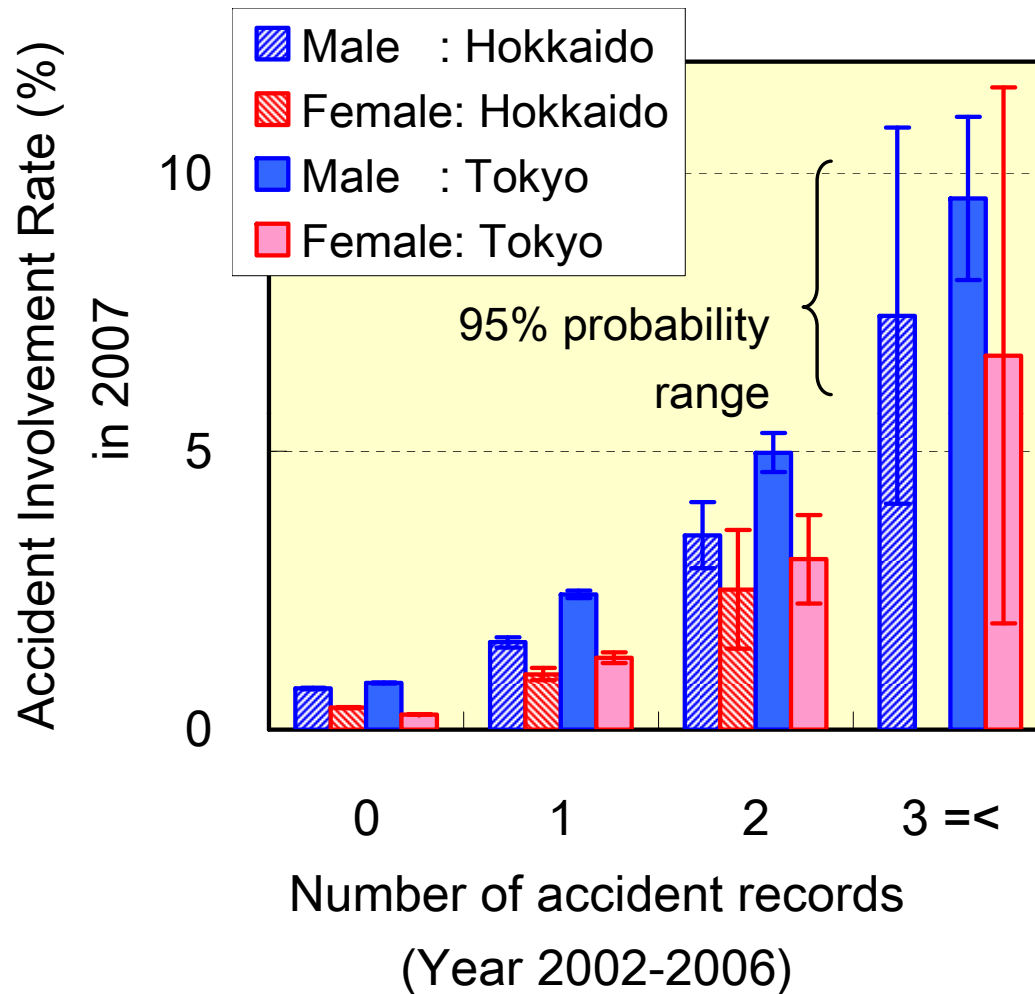


Fig. 3 The Accident Involvement Rate by Accident Experience as the 1st party



## 4-2 Study 1: Violation experience

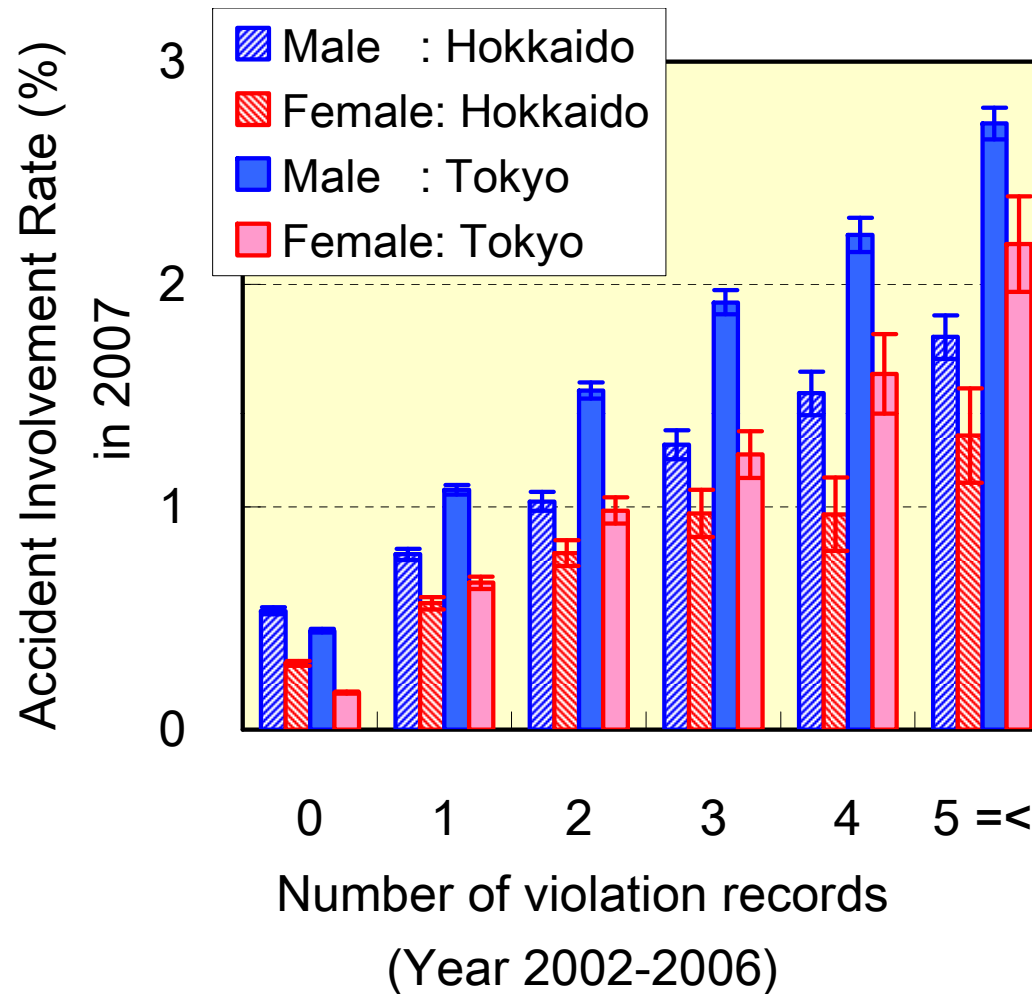


Fig. 4 The Accident Involvement Rate by Violation Experience



# 4-3 Study 1: by violation type

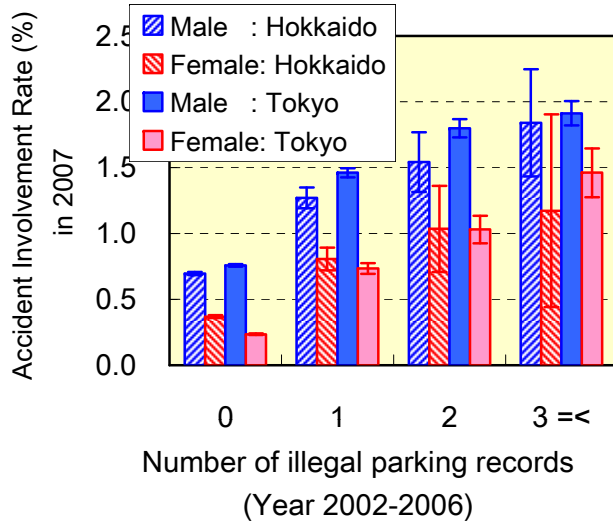


Fig.5

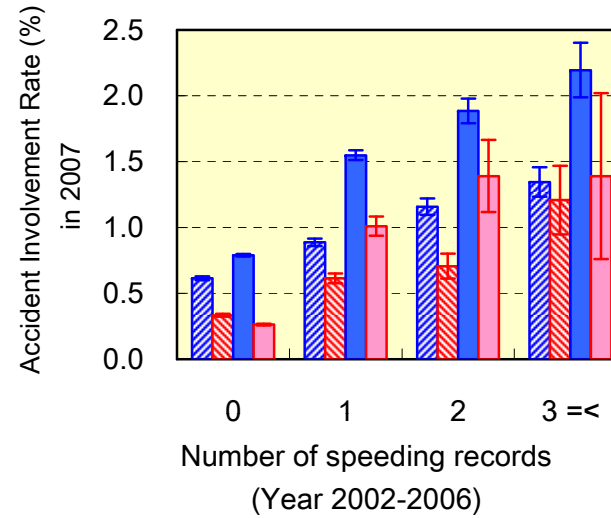


Fig.6

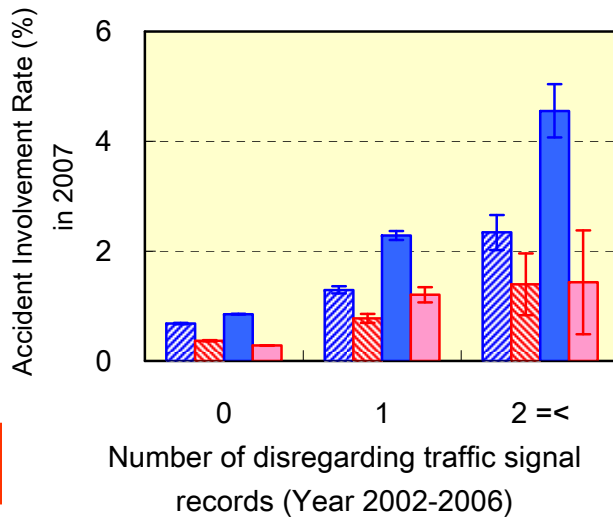


Fig.7

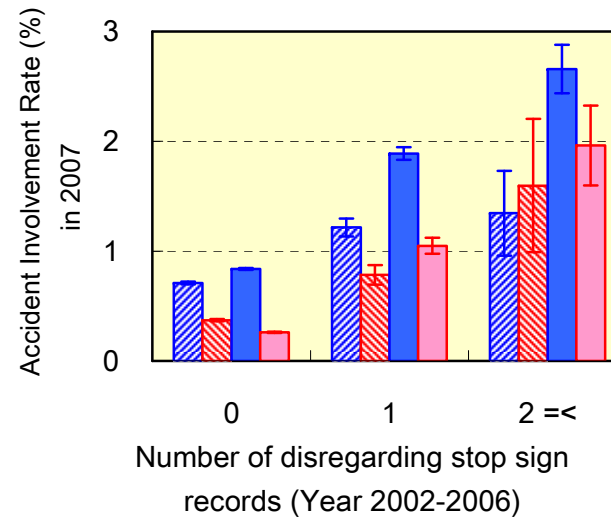


Fig.8



# 4-4 Study 2: by prefecture

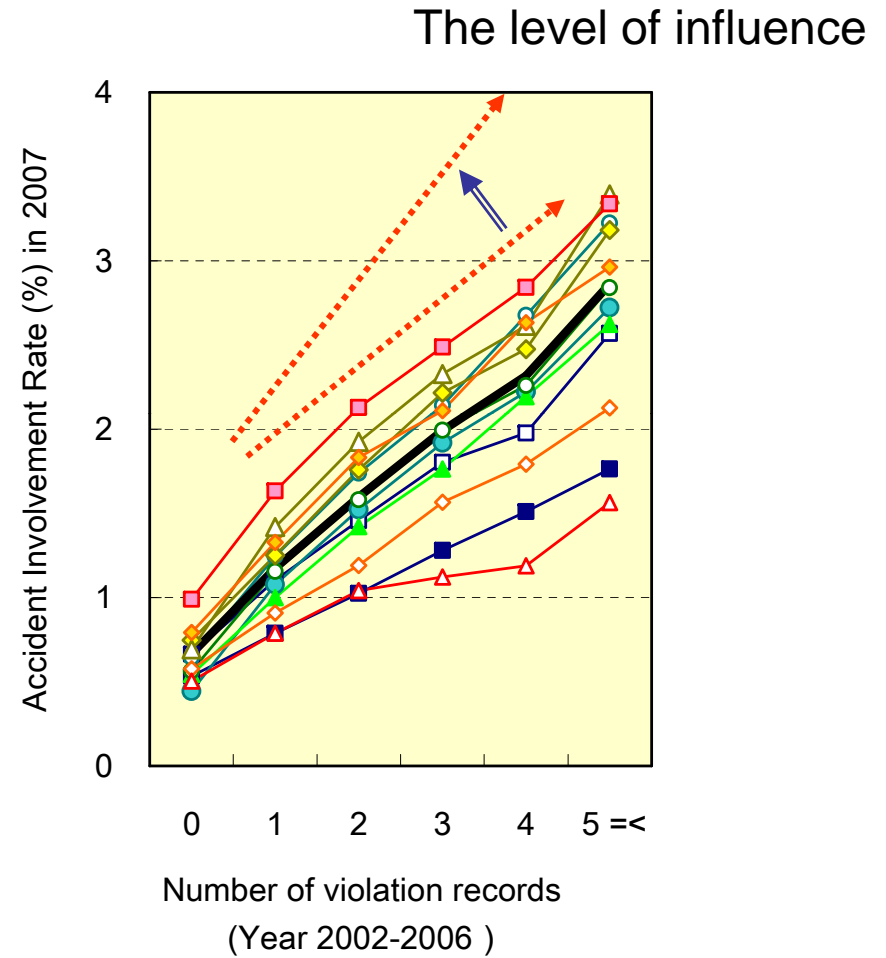
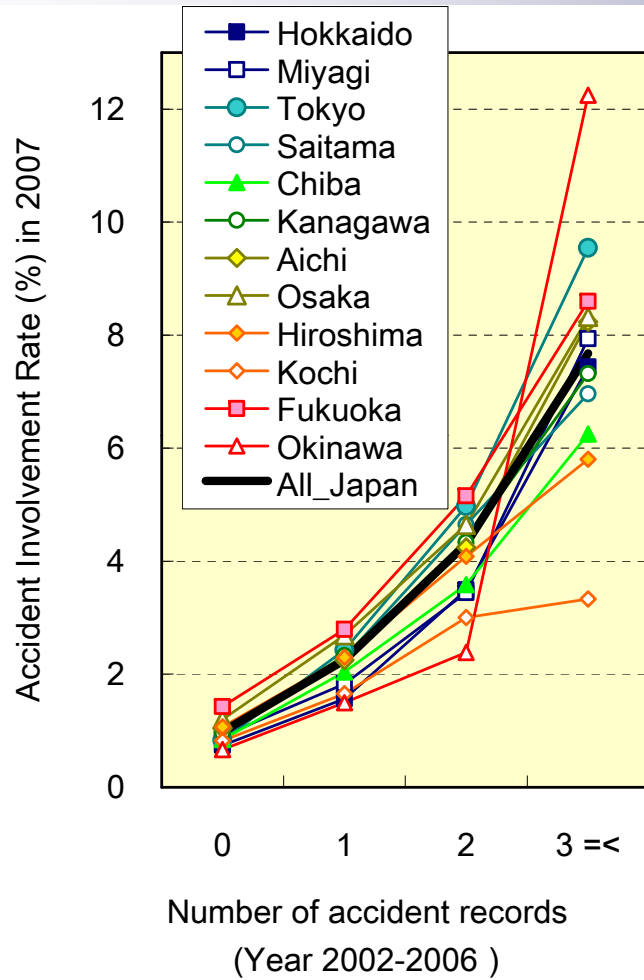


Fig.9/10 The Accident Involvement Rate by Experience and Prefecture  
< Male drivers >



# 4-5 Study 2: Violation by prefecture

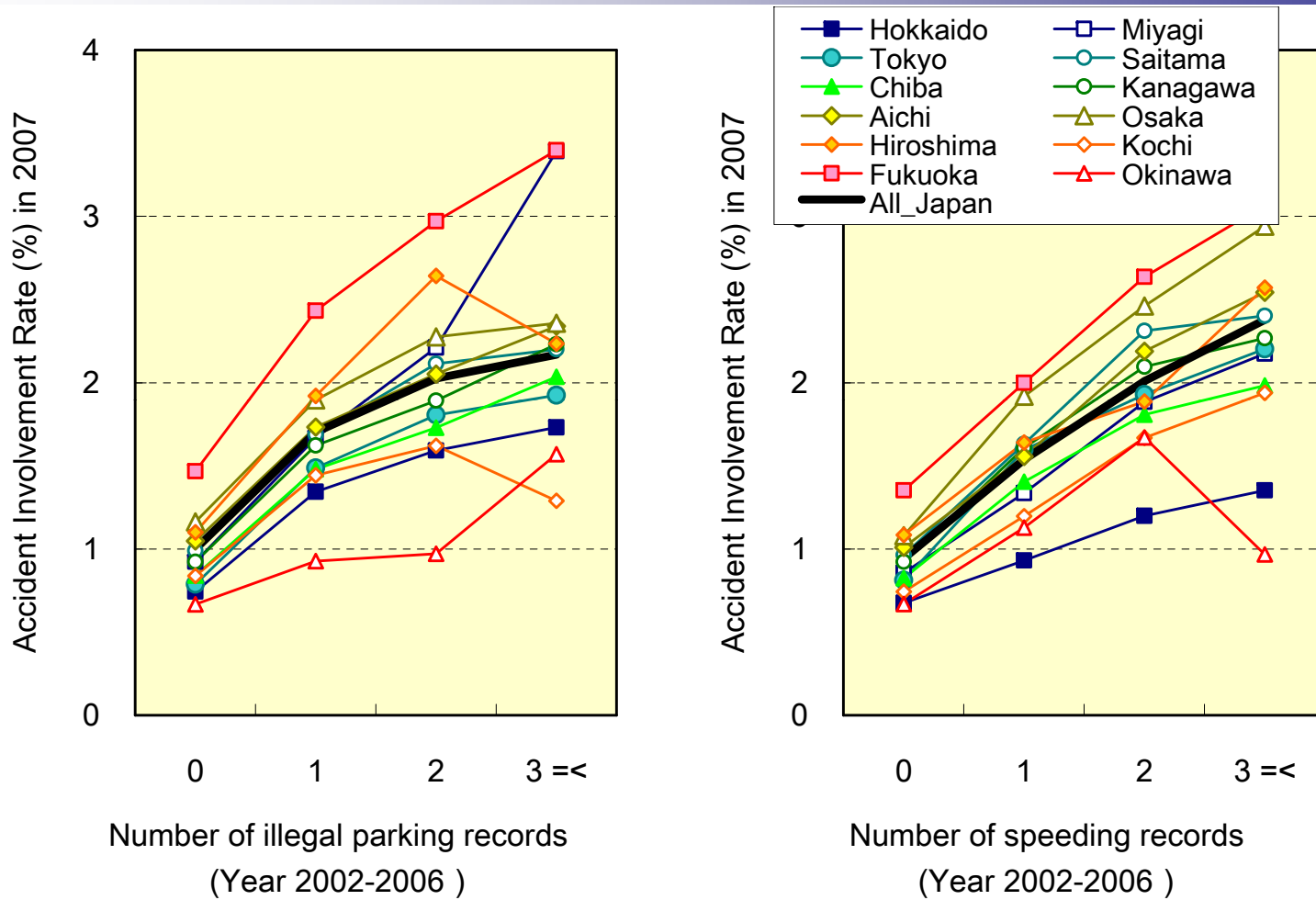


Fig.11/12 The Accident Involvement Rate by Violation Experience and Prefecture  
< Male drivers >



# 4-6 Study 3: by age

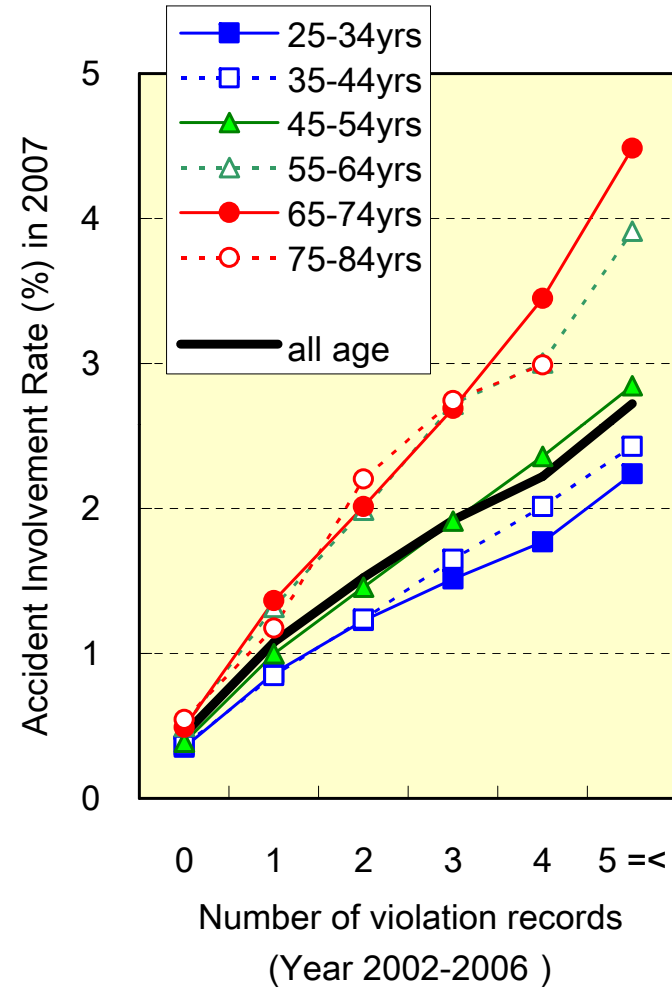
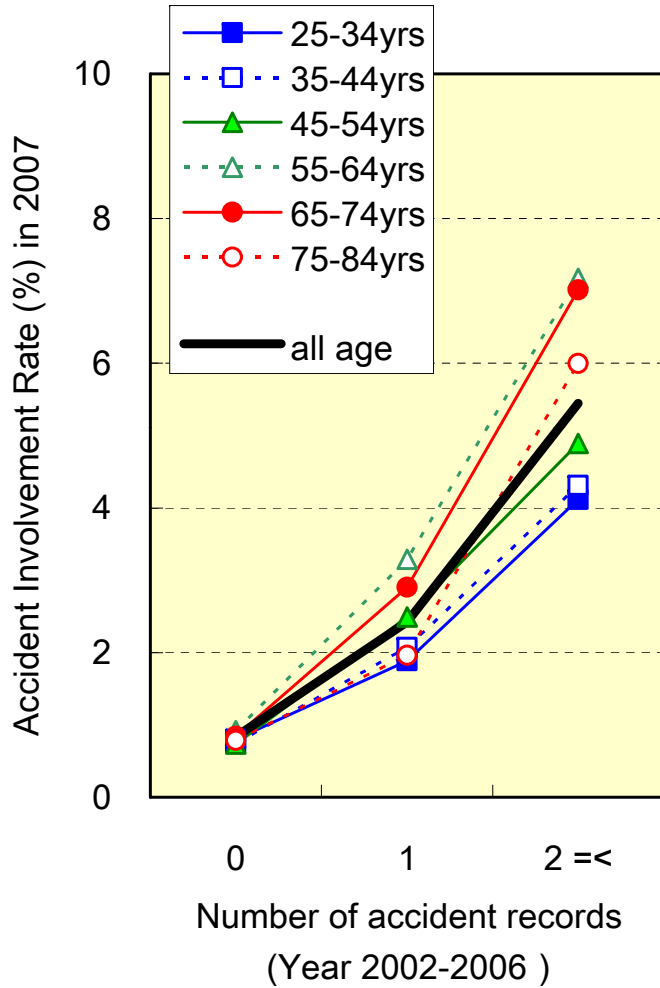


Fig.13/14 The Accident Involvement Rate by Experience and Age Group  
<Male drivers in Tokyo>



# 4-7 Study 3: Violation by age

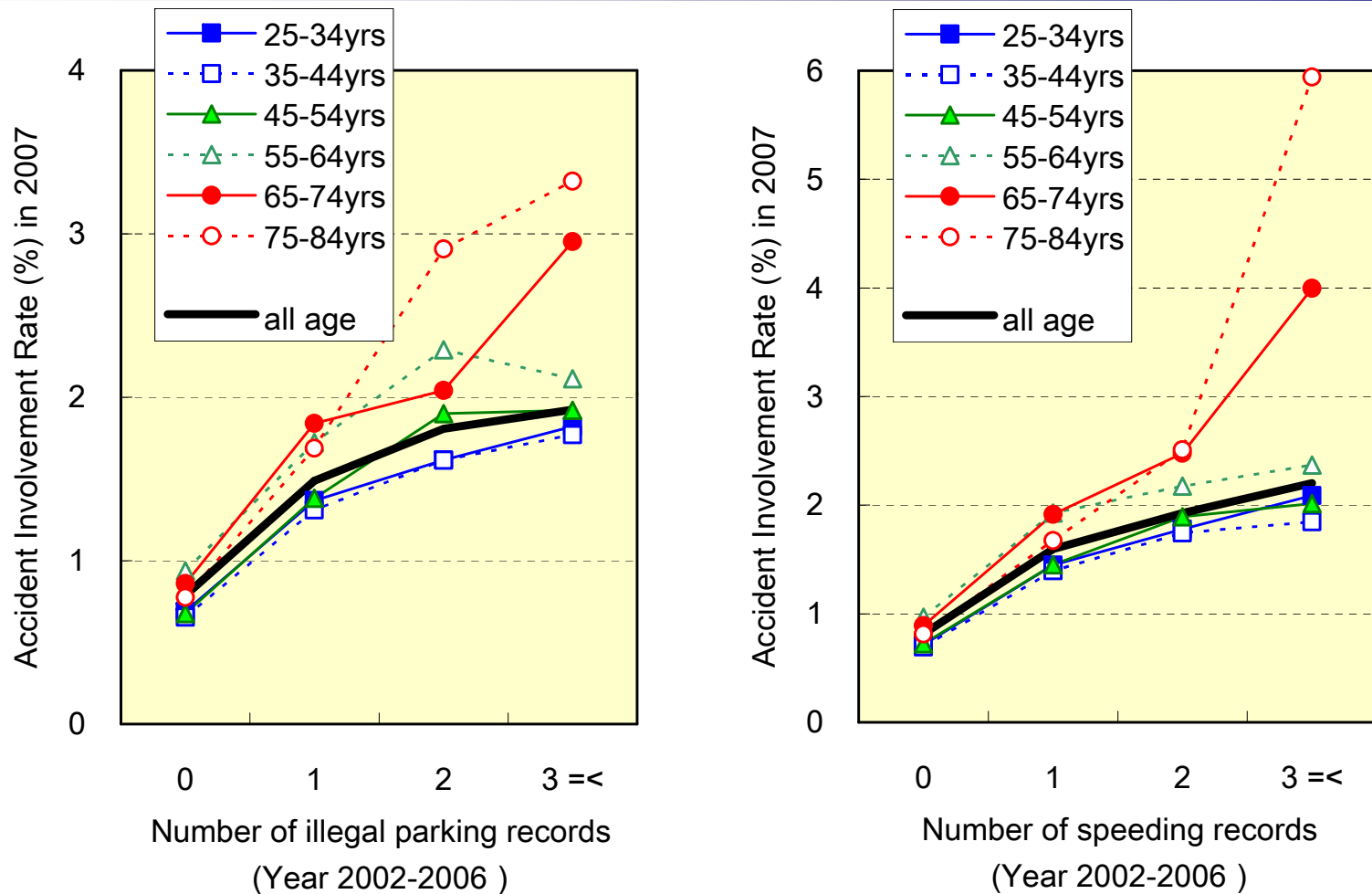


Fig.15 The Accident Involvement Rate by Experience and Age Group  
< Male drivers in Tokyo >





# 5-1 Discussion 1: the Relation A

The more the number of **experienced accidents** is, the higher the accident involvement rate is.

and

The more the number of **punished violations** is, the higher the accident involvement rate is.



## 5-2 Two rate

The Accident Involvement Rate (accidents/driver/year)  
= **an accident rate per exposure** (accidents/kilometrage)  
x average driving frequency (kilometrage/driver/year)  
<E-2>

If Exposure (kilometrage)  $\propto$   
the Number of Rear-end Collisions as the 2<sup>nd</sup> Party

The Accident Involvement Rate (accidents/driver/year)  
= **the Relative Accident Rate** (accidents/rear-end collisions)  
x average driving frequency \* (rear-end collisions/driver/year)

<E-3>



## 5-3 High accident Involvement Rate

A driver with a high Accident Involvement Rate has

a high **accident rate per exposure**,

or

a high **driving frequency**,

or

a high **accident rate per exposure** and  
a high **driving frequency**.



# 5-4 RAR and Driving Frequency

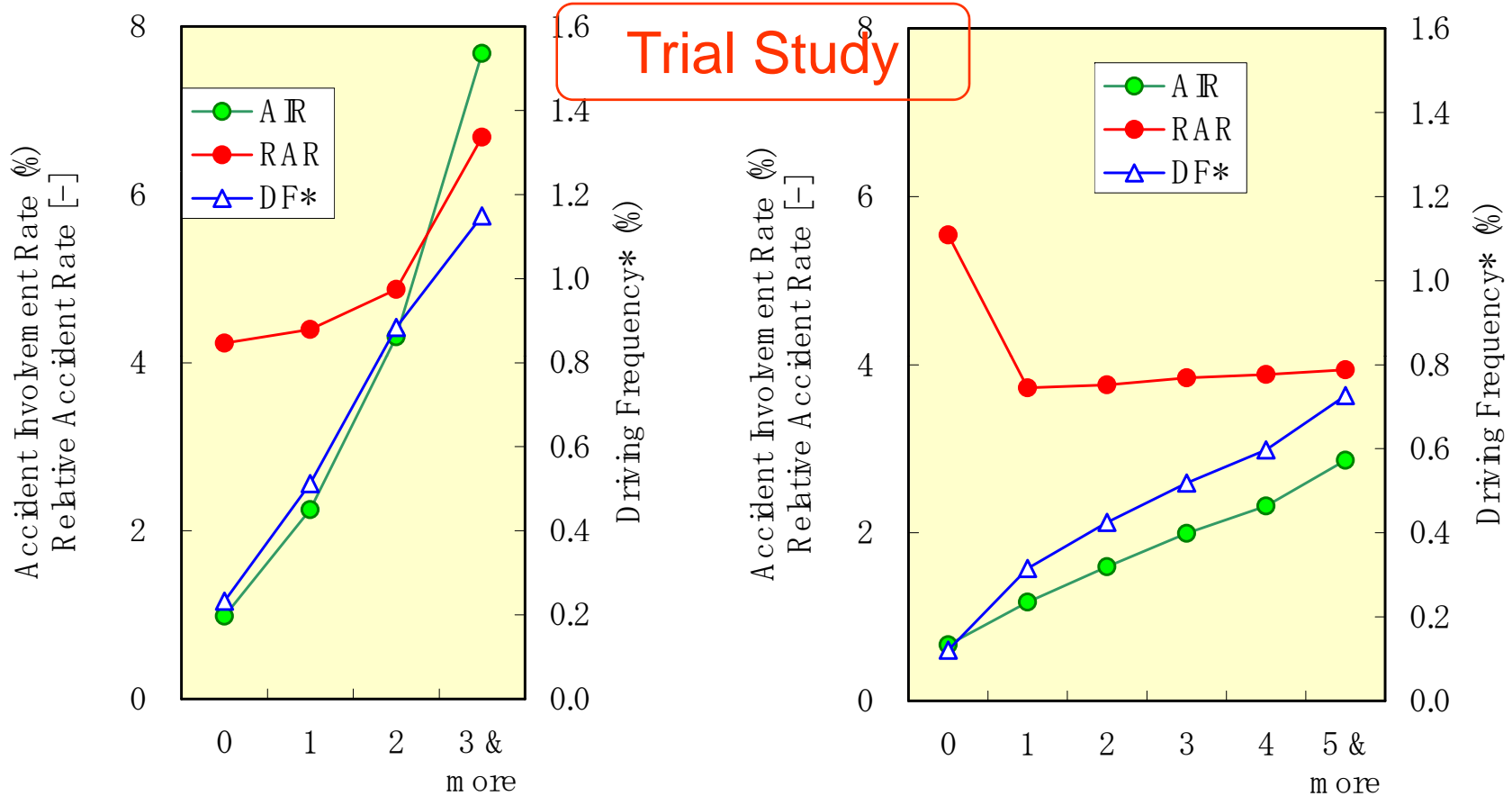


Fig. A The Accident Involvement Rate, Relative Accident Rate and Driving Frequency\* by Experience ( Male drivers in All Japan )



# 5-5 Discussion 2: Driver education

A driver education based on violation experience is proposed.

## (1) As preventive safety measures

Violation frequency was ten times as many as accident, then most of drivers may experience a violation earlier than an accident. And a safety education for traffic violators can be carried out earlier than that for accident drivers.

The effect will be realized earlier than that for accident drivers.

## (2) More related to driver's consciousness and behavior

Most of traffic accidents are not caused by driver's intentional behavior or consciousness, but most of traffic violations are committed by driver's consciousness. It is easy to change his intentional behavior or consciousness.



# 5-6 Discussion 3: Influence of Experience

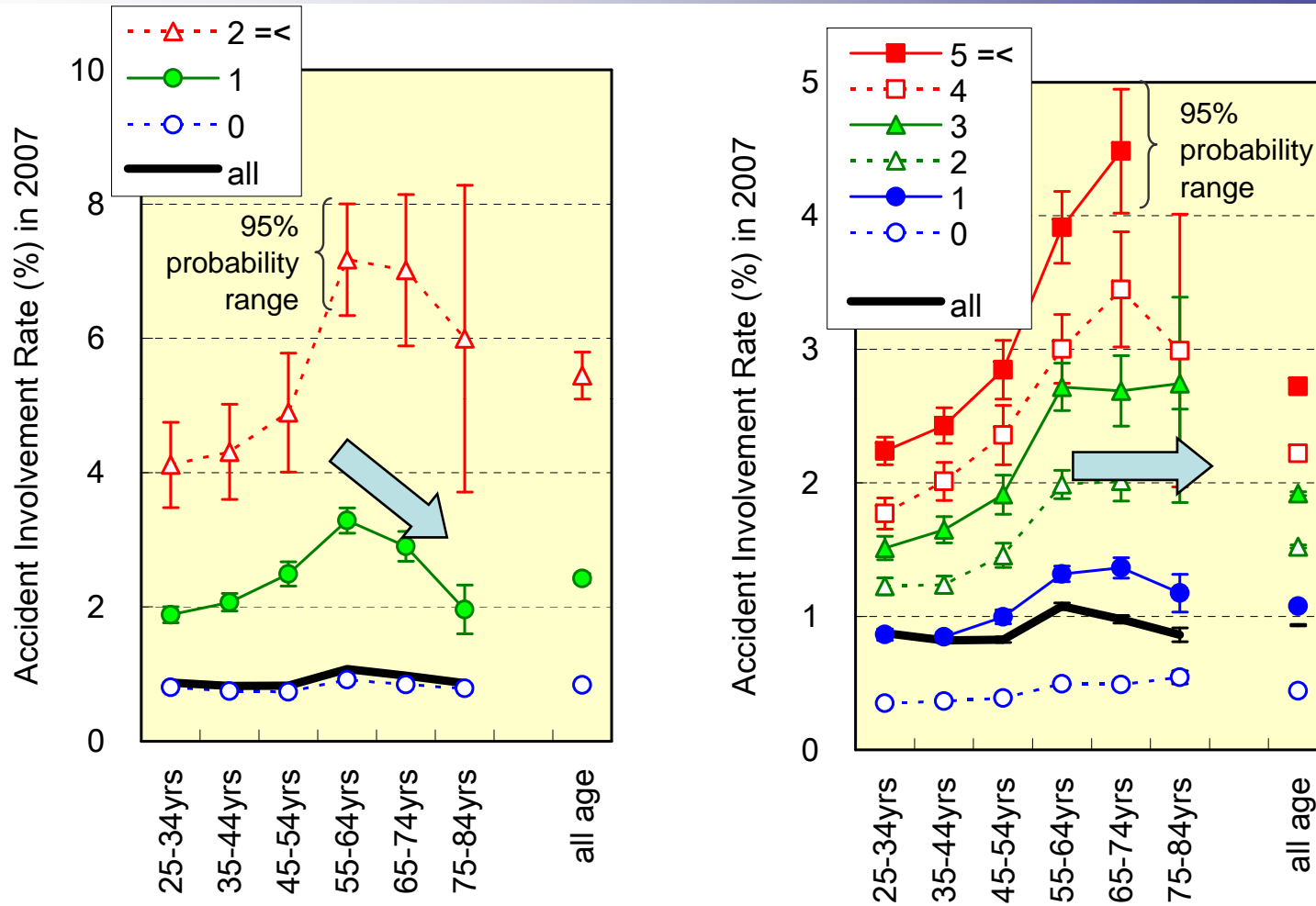


Fig.13/14 The Accident Involvement Rate by Age Group and Experience  
<Male drivers in Tokyo>



# 6 Conclusions

(1) The more the number of **accident/violation** records is, the higher the accident involvement rate is.

<4-1,4-2>

(2) The number of **violation records** is a useful indicator of risk of accident as same as the number of **accident records**.

<4-3 >

(3) The influence of **accident experience** to reduce the **accident involvement rate** is found in only old drivers.

<5-6>



# 7 End

Thank you very much  
for your attention!



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