2013년 대한 교통학회 대전·충청지회
국제 워크숍 하 계 학 술 발 표 대 회
고령자 교통안전 개선방안 연구를 위한 전문가 토론회

1. 행 사 개 요

◦ 일　　시 : 2013년 06월 13일(목요일) 15:30- 18:00
◦ 장　　소 : 한밭대학교 산학협동관 s5동 108호
◦ 주　　최 : (사)대한교통학회 대전·충청지회
◦ 주　　관 : 충남발전연구원, 한밭대학교 건설환경조형대학
◦ 참석 및 초청대상 : 시민, 전문가, 공무원(지방자치단체), 학생 등

2. 세미나 프로그램

사회 : 김원철 박사 (충남발전연구원 책임연구원)

16:00 – 16:10　**개회식**
개회사 : 김명수 교수(대한교통학회 대전·충청지회장, 한밭대 교수)
축　사 : 박진도 원장(충남발전연구원장)

16:10 - 17:10　**주제발표**
주제발표 1. Post-accident adaptation behavior and dynamic travel information: A comparison between the elderly and non-elderly
Junyi Zhang(IDEC, Hiroshima University 교수)
주제발표 2. Impacts of urban planning & transportation on healthy ageing
Dick Saarloss(Univ. of Western Australia 연구위원)
주제발표 3. Improvement of Walking Environments for the Transportation Vulnerable
이정범 박사(대전발전연구원 책임연구위원)

17:10-17:20　Coffee Break
17:20- 18:00　**토 론 및 질의 응답**
좌　장 : 김명수 교수(한밭대학교 도시공학과 교수)
토론자 : 장태연 교수(전북대학교 도시공학과 교수)
남궁문 교수(원광대학교 토목환경공학과 교수)
이백진 박사(국토연구원 국토인프라본부 연구위원)
김원철 박사(충남발전연구원 책임연구원)
이수범 교수(서울시립대학교 교통공학과 교수)
18:10　**폐 회**

CDI 세미나 2013-31

2013 고령자 교통안전 개선방안 연구 국제워크숍

Age-Friendly Safety and Welfare in Transportation

주최 : (사)대한교통학회 대전·충청지회

주관 : 충남발전연구원, 한밭대학교 건설환경조형대학

June 13, 2013

CDI 세미나 2013-31

2013 고령자 교통안전 개선방안 연구 국제워크숍

Age-Friendly Safety and Welfare in Transportation

주최 : (사)대한교통학회 대전·충청지회

주관 : 충남발전연구원, 한밭대학교 건설환경조형대학

일시 : 2013년 6월 13일(목) 15:30~18:00
15:30~18:00, June 13 (Thursday), 2013

장소 : 한밭대학교 산학협동관 s5동 108호
108, Industry-University-Institute Collaboration Building(s5), Hanbat Univ.

Program

16:00~16:10

Opening address :

Myung Soo Kim, President, Daejeon&Chungcheong branch, Korea Society of Transportation

Congratulatory message :

Jin Do Park, President, Chungnam Development Institute

16:10~17:10

Topic 1 : Post-accident adaptation behavior and dynamic travel information: A comparison between the elderly and non-elderly

Prof. Junyi Zhang (Hiroshima Univ.)

Topic 2 : Impacts of urban planning & transportation on healthy ageing

Dr. Dick Saarloos (Univ. of Western Australia)

Topic 3 : Improvement of walking environments for the transportation vulnerable

Dr. Jung Beom Lee (Daejeon Development Institute)

17:10~17:20 Coffee Break

17:20~18:00 Discussion, Q&A

18:10 Closing

Presenters

Prof. Junyi Zhang is a professor of Hiroshima University. Focusing on the various issues related to city, transportation, environment and tourism, as of April 2013, he already published 266 refereed academic papers (English: 209) and 294 non-refereed academic papers (English: 151). He has been awarded Best Paper Awards and Outstanding Paper Awards for 10 times by international/domestic associations and conferences. He has been acting as an ad-hoc reviewer for more than 30 internationally well-recognized journals and conferences in the fields of transportation, urban planning, energy and environment, tourism, and marketing.

Presenters

Dr. Dick Saarloos holds a college degree in urban design, and received M.Sc. and Ph.D. degrees in urban planning from the Eindhoven University of Technology (Netherlands). He has been working as a postdoctoral fellow in Hiroshima (Japan) and Perth (Australia). Currently, he resides in Korea, while being affiliated with The University of Western Australia as an adjunct research fellow. His main research interests are Spatial and temporal behavior of people in response to the built environment, Influences of the built environment on people's quality of life and health, Decision support instruments for urban planners and designers, and Agent-based modeling and simulation of people-environment interactions.

Presenters

Dr. Jung Beom Lee is a senior researcher at Daejeon Development Institute in Korea since 2009. He had his Ph.D. in civil engineering at Rutgers University under the guidance of Professor Kaan Ozbay. He is the recipient of the 2009 Best User Paper Award in Transportation Research Board Joint Simulation Subcommittee. His research interest is sustainable urban transportation planning and traffic safety for pedestrians in metropolitan settings.

International Workshop "Age-friendly Safety and Welfare in Transportation"
Hanbat National University (Daejeon), June 13, 2013

Post-accident adaptation behavior and dynamic travel information: A comparison between the elderly and non-elderly

Junyi ZHANG & Ying JIANG
Hiroshima University
zjy@hiroshima-u.ac.jp

Introduction

- Serious negative impacts of traffic accidents are represented not only by the large amount of property losses and human injury and fatality tragedies, but also the huge amount of travel time losses, follow-up accident recurring and so on.
- It is expected that effective countermeasures of ITS-based real-time accident information provision play various important roles in solving the above negative impacts.
- Information provision studies about how to provide valuable information and whether or not display reliability information to drivers become more and more important in the current traffic accident information studies.

Purpose

- Focusing on the expressway in Japan, this study examines how individualized dynamic traffic information influences drivers' adaptation behavior under different decision scenes and contexts.

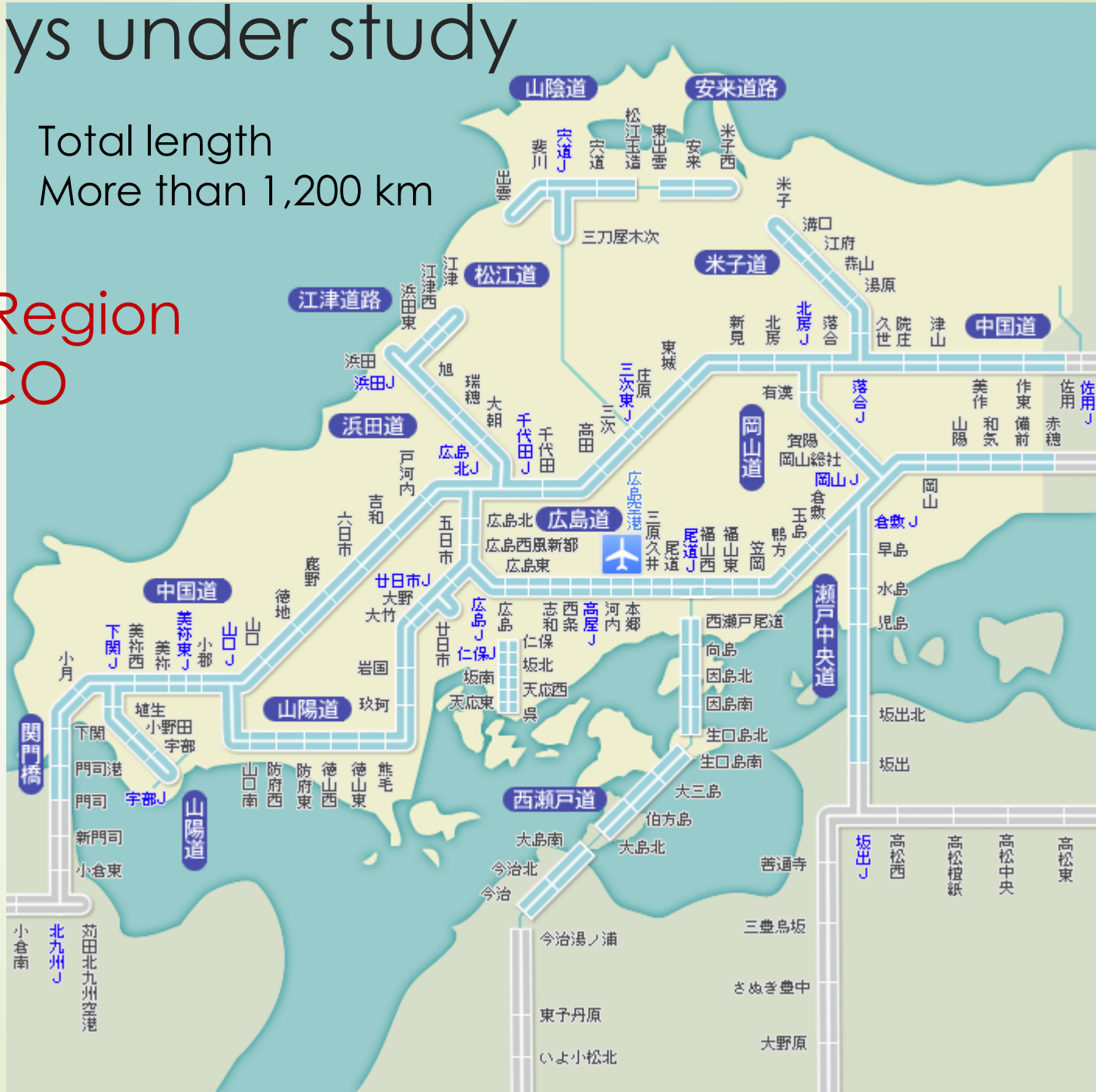
  In addition to conventional traffic information, several new types of traffic information related to the occurrence of traffic accidents are also reflected.

Expressways under study

4

Total length
More than 1,200 km

Chugoku Region
West NEXCO



A large-scale web survey

2,500 persons

Pilot Survey (2011.12)

- Travel information needs

Residents residing in the five prefectures in the Chugoku Region, who used the expressway at least once within the past one year.

1,923 persons (78%)

577 Drop out persons

new respondents: 577

Fresh 577 persons

SP Survey (2012.04)

- Adaptation behavior

Representative sample:

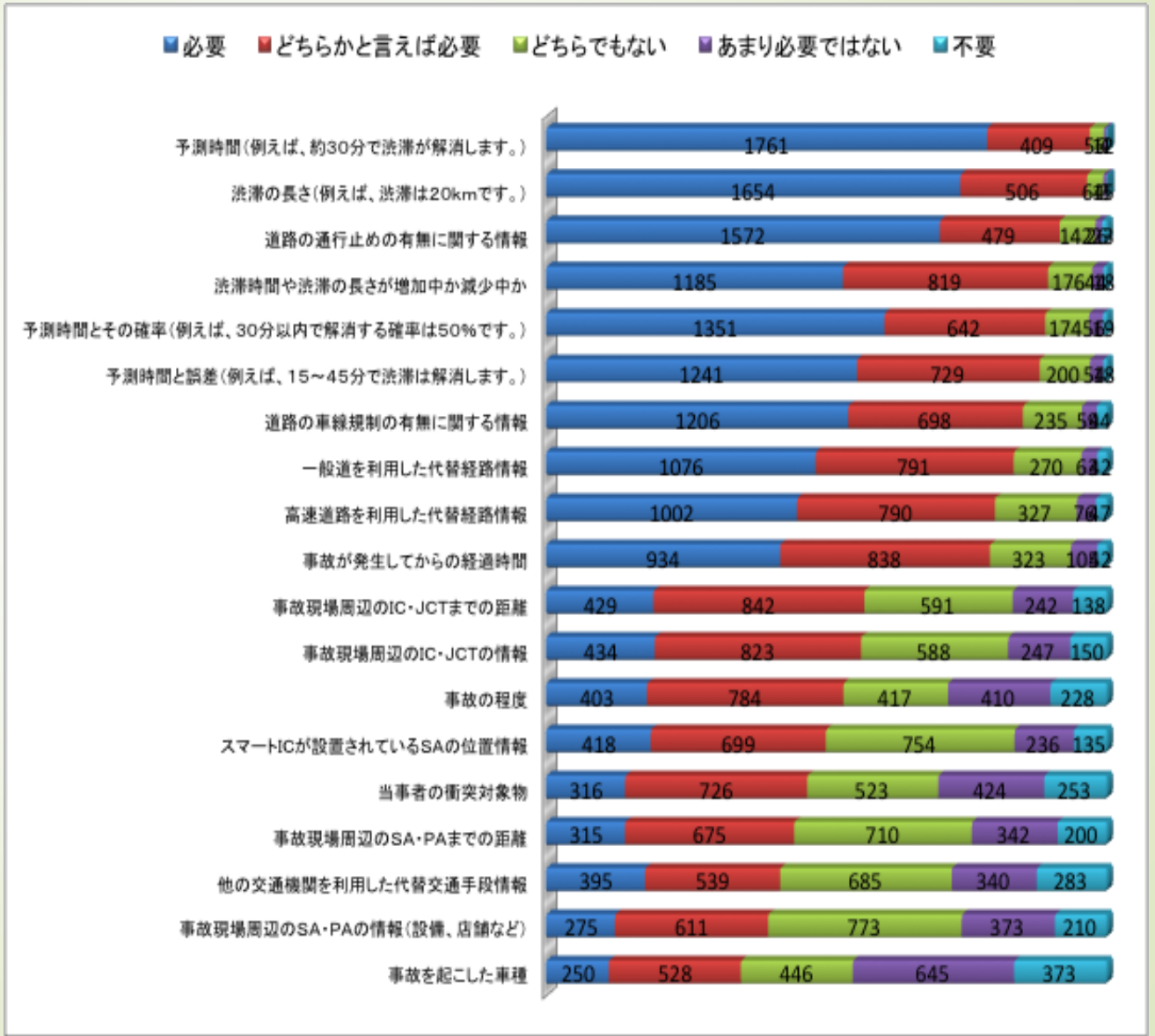
30,000 SP responses

(No. 1 in the world !?)

- 2,500 respondents （12 cards/person)
- 3 scenes: Before departure, On the way to expressway, On expressway (10,000(=2,500 * 4 SP)/scene)

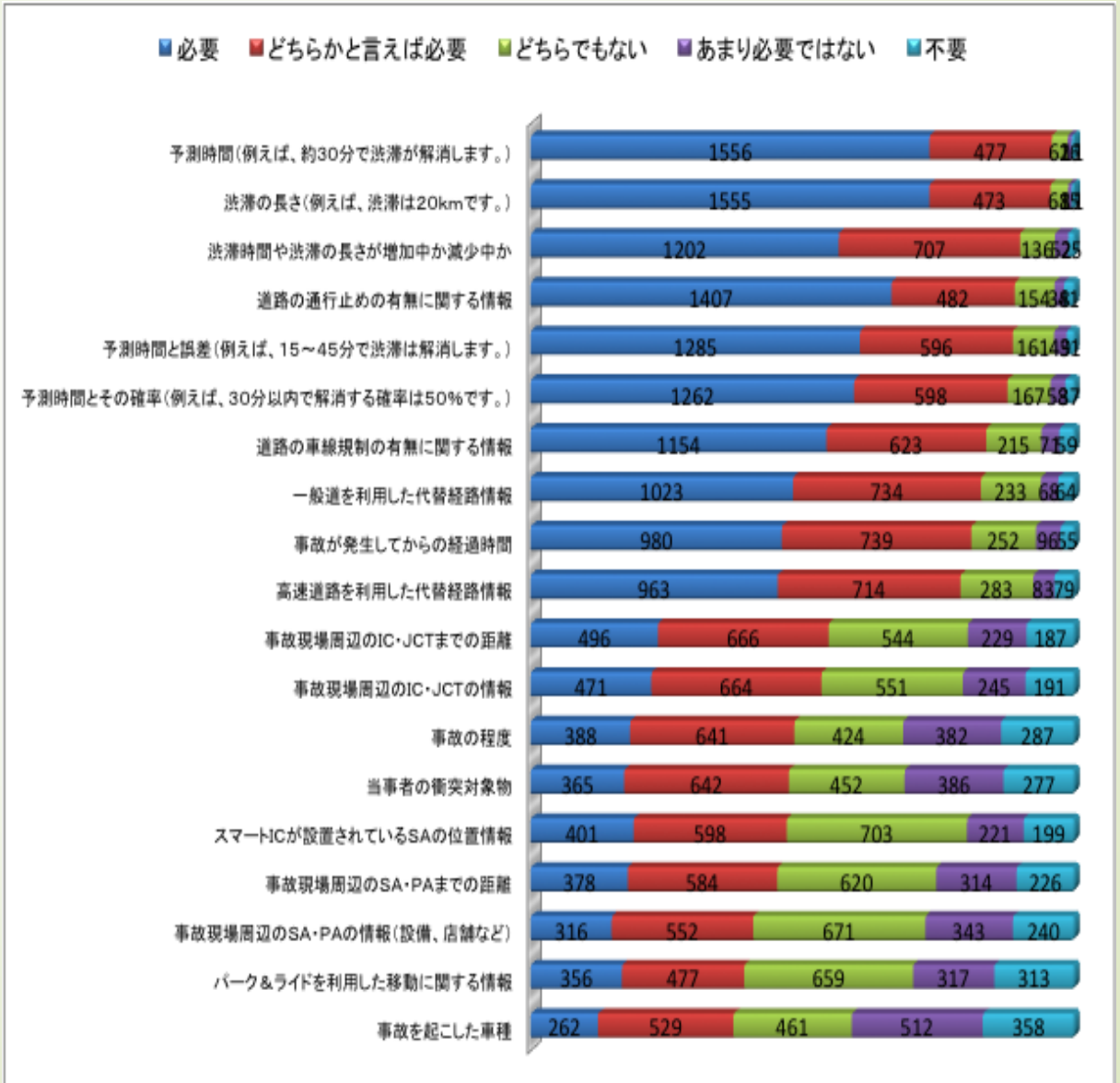
Travel information needs

Before departure



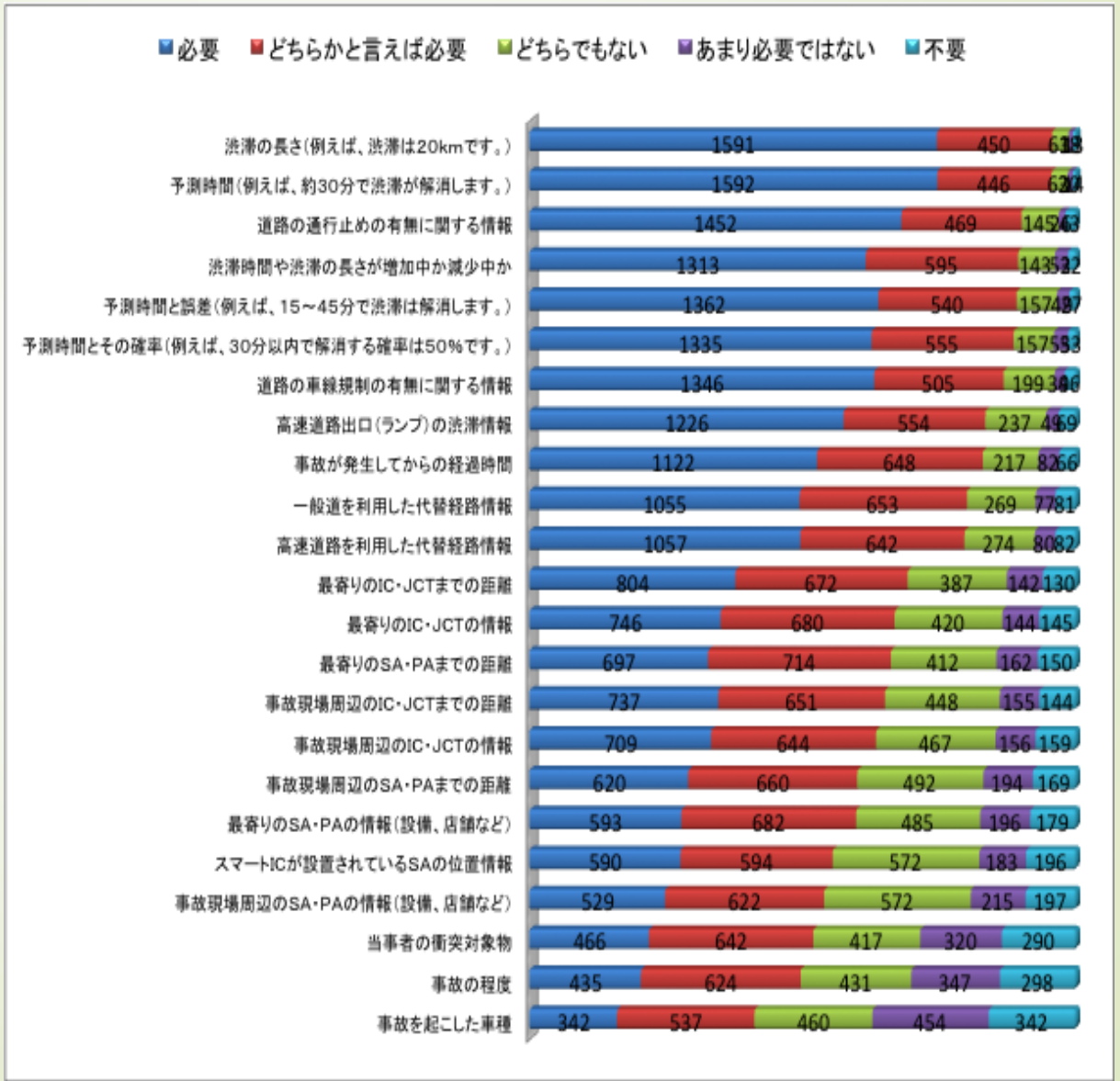
Travel information needs

On the way to expressway



Travel information needs

On expressway



SP survey: Attributes

Based on the pilot survey conducted in 2011, this study selected 12 attributes, each of which has two or three levels, including

- **accident condition information** (two attributes): (1) location from entrance ramp to the accident site (hereafter, distance to site) (close or far) and (2) accident severity (fatal, no fatal, or no information));
- **accident impact information** (two attributes): (3) queue length (long, short, or no information) and (4) queue changing trend (increase, decrease, or no information);
- **alternative route or travel mode information** (three attributes): (5) ordinary road, (6) other expressway route, and (7) other travel modes; all the three attributes have the same three levels, i.e., yes, no, or no information; and
- **traffic measure information** (five attributes): (8) traffic regulation (with/without regulation, or no information), (9) clearance time (long, short, or no information), (10) clearance time estimation accuracy (high or low), (11) probability of clearing away the traffic congestion at a certain clearance time (high (80%), low (60%)), and (12) time provision method (point information or interval information).

Orthogonal fractional factorial design: 24 SP profiles were obtained

SP survey: Alternatives

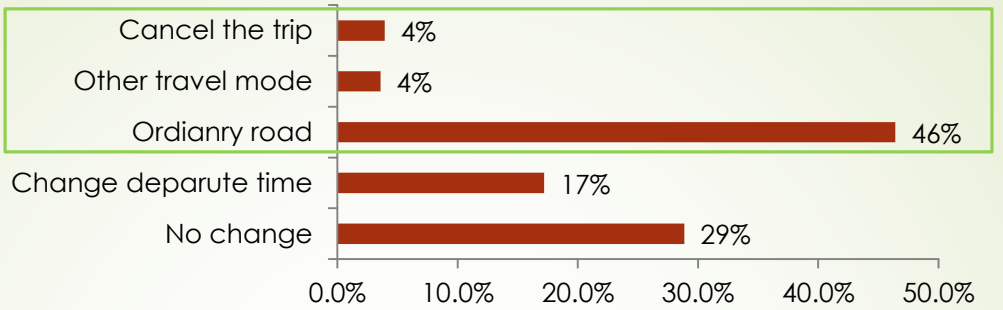
Before departure & On the way to expressway		On expressway	
1	No change	1	No change
2	Change departure time (Early departure)	2	Wait& see at SA/PA
3	Alternative ordinary road	3	Alternative expressway
4	Other travel mode	4	Ordinary road detour
5	Cancel the trip	5	Ordinary road
		6	Other travel mode
		7	Cancel the trip

SP profiles

Card no.	Q-length	Q-trend	Clearance time	Accuracy of clearance Time interval	Time interval provision	Accident Severity	Alternative ordinary road	Alternative expressway	Other travel mode	Lane regulation	Distance to accident site	Clearance time accuracy
card_1	Long	No info	Short	No info	No info	No info	No info	No info	No info	No info	Long	60%
card_2	No info	Increasing	Short	No info	No info	No info	Don't have	Don't have	Have	Don't have	Long	60%
card_3	Short	Decreasing	Long	No info	No info	No info	Have	Have	Don't have	Have	Short	60%
card_4	Short	Increasing	Long	High accuracy	Provision	No info	No info	No info	Have	No info	Short	80%
card_5	Long	Decreasing	Long	High accuracy	No info	Have fatal accident	Have	No info	Have	Don't have	Long	60%
card_6	Long	Increasing	Short	Low accuracy	No info	No fatal accident	Don't have	No info	Don't have	Have	Short	80%
card_7	No info	Decreasing	Short	Low accuracy	Provision	Have fatal accident	Don't have	Have	Have	No info	Short	60%
card_8	Long	Decreasing	Short	High accuracy	Provision	No info	Don't have	Don't have	Don't have	Don't have	Long	80%
card_9	Long	No info	Long	No info	No info	Have fatal accident	Don't have	Have	Don't have	No info	Long	80%
card_10	No info	Decreasing	Long	Low accuracy	No info	No fatal accident	Have	Don't have	No info	No info	Long	80%
card_11	No info	Decreasing	Short	Low accuracy	No info	No info	No info	No info	Don't have	No info	Long	60%
card_12	Short	Increasing	Short	High accuracy	No info	Have fatal accident	Don't have	Have	No info	No info	Long	60%
card_13	No info	No info	Short	High accuracy	No info	Have fatal accident	No info	Don't have	Don't have	Have	Short	60%
card_14	Short	No info	Long	Low accuracy	No info	No info	Don't have	Don't have	No info	Don't have	Short	60%
card_15	Long	Increasing	Short	Low accuracy	No info	No info	Have	Have	Have	Have	Long	60%
card_16	Long	Increasing	Long	Low accuracy	Provision	Have fatal accident	No info	Don't have	No info	Have	Long	60%
card_17	No info	No info	Long	High accuracy	No info	No fatal accident	Don't have	No info	Have	Have	Long	60%
card_18	Long	Decreasing	Short	High accuracy	No info	No fatal accident	No info	Have	No info	Don't have	Short	60%
card_19	Short	Increasing	Short	High accuracy	No info	No fatal accident	Have	Don't have	Don't have	No info	Long	60%
card_20	No info	Increasing	Short	No info	No info	Have fatal accident	Have	No info	No info	Don't have	Short	80%
card_21	Short	No info	Short	Low accuracy	Provision	Have fatal accident	Have	No info	Don't have	Don't have	Long	60%
card_22	Short	No info	Short	Low accuracy	No info	No fatal accident	No info	Have	Have	Don't have	Long	80%
card_23	Short	Decreasing	Short	No info	No info	Have fatal accident	No info	Don't have	Have	Have	Long	80%
card_24	No info	No info	Short	High accuracy	Provision	No info	Have	Have	No info	Have	Long	80%

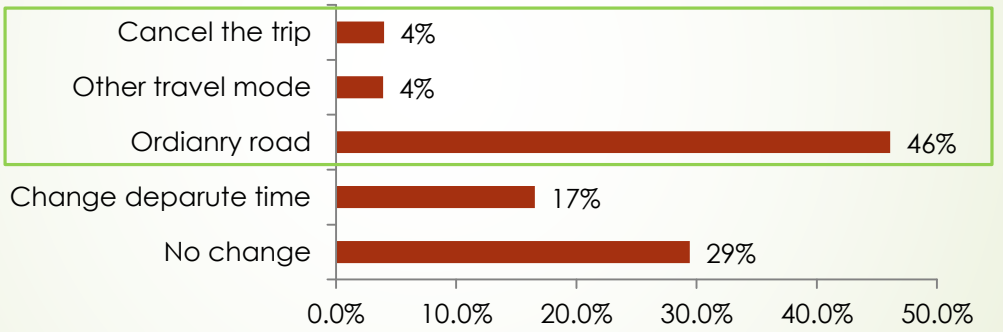
Stated adaptation behavior

Before Departure



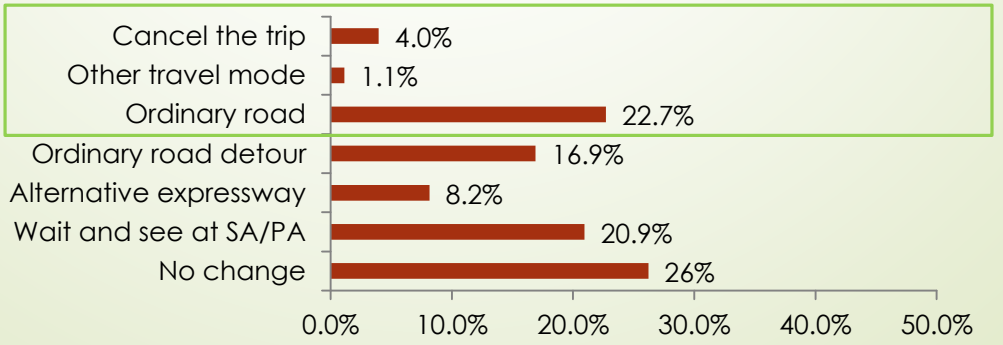
54%

On the Way to Expressway



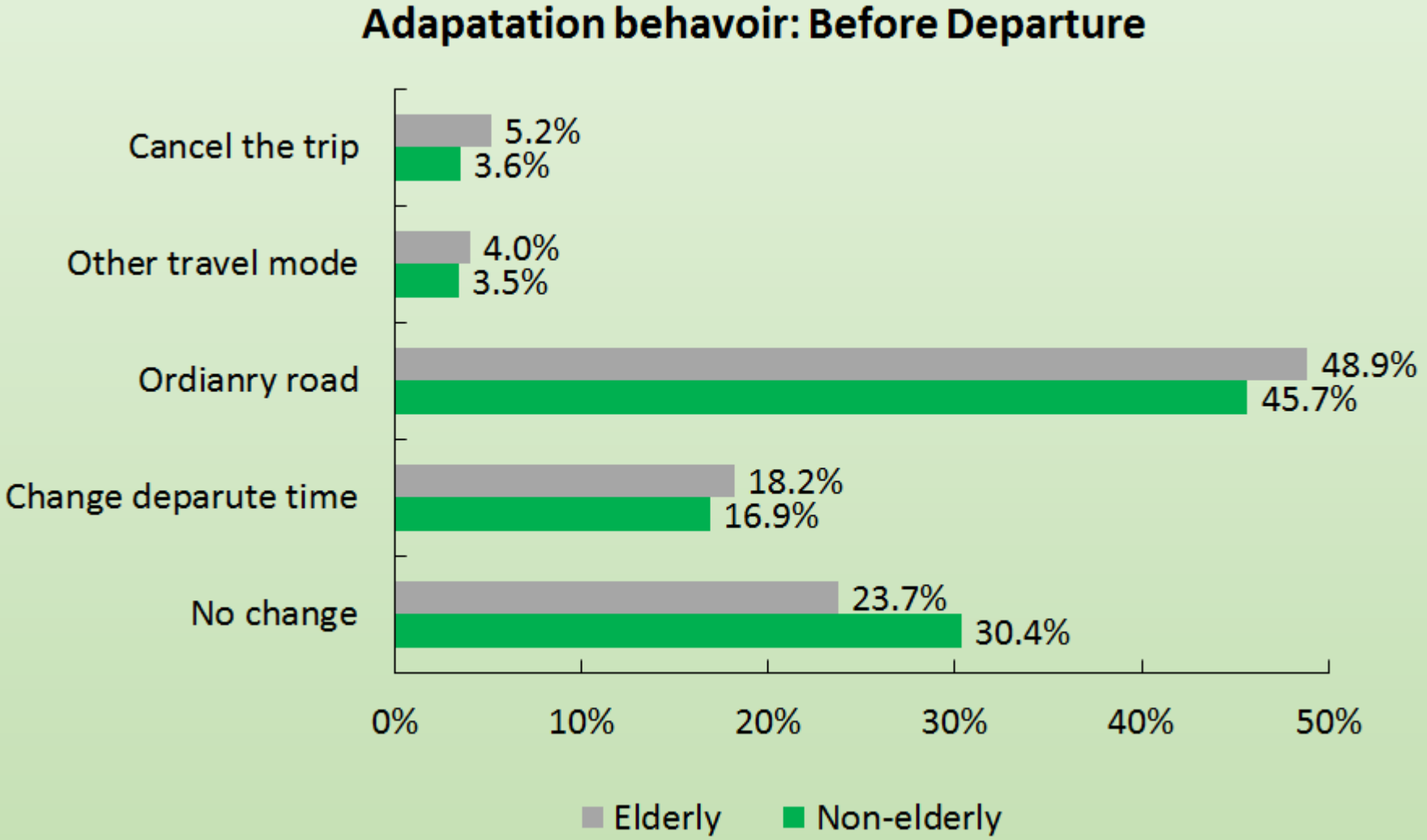
54%

On Expressway

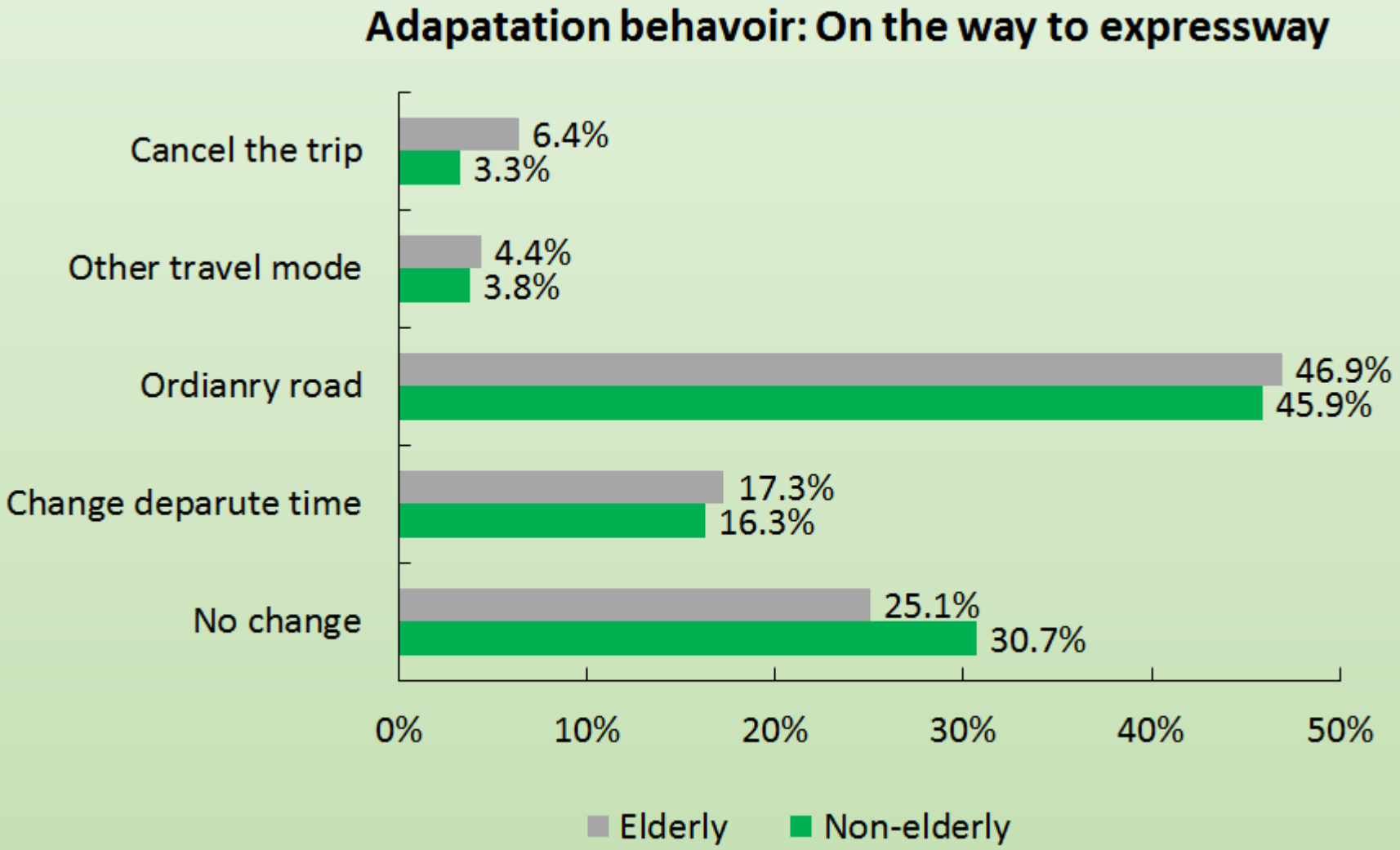


28%

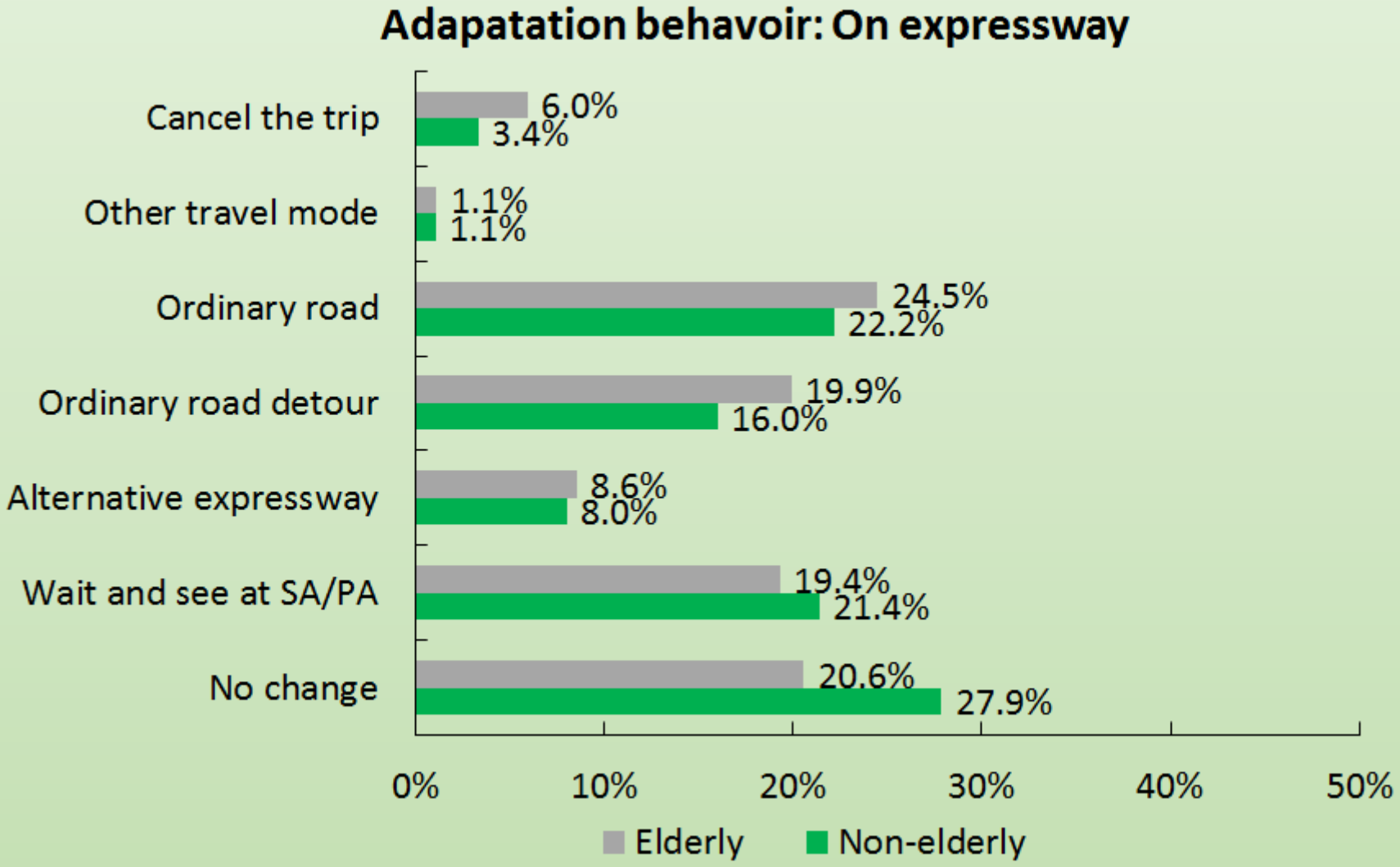
Stated adaptation behavior



Stated adaptation behavior



Stated adaptation behavior



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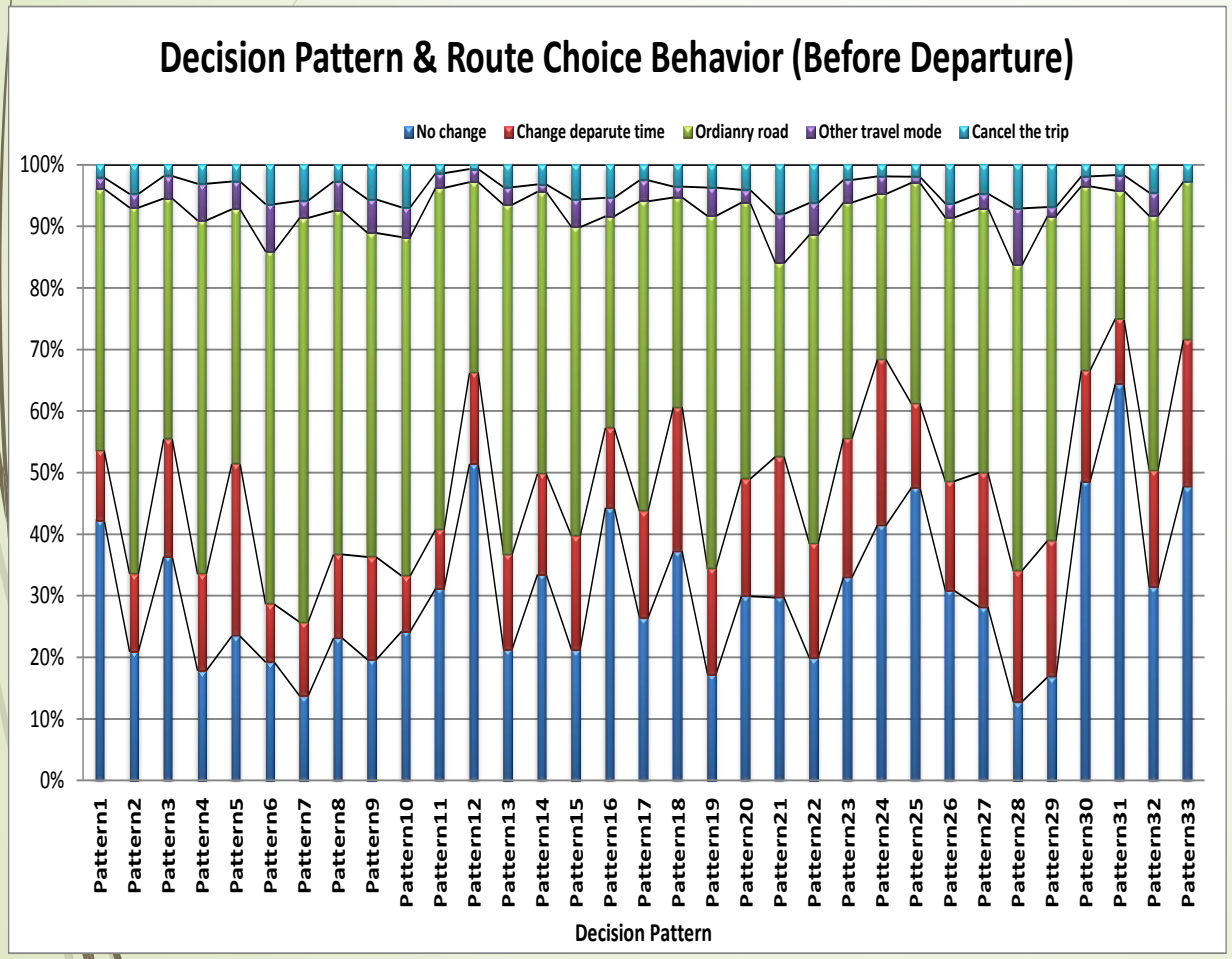
Heterogeneous adaptation

Before Departure



Before Departure Pattern						
Pattern#	Distance to Site	Clearance Time	No fatal accident	Queue decrease	Fatal accident	clearing away %
1	<=17.4	<=20				
2	<=17.4	(20,28]	0			
3	<=17.4	(20,28]	1			
4	<=17.4	(28,48]	0			
5	<=17.4	(28,48]	1			
6	<=17.4	(48,68]				
7	<=17.4	(68,72]	0			
8	<=17.4	(68,72]	1			
9	<=17.4	>72		0		
10	<=17.4	>72		1		
11	(17.4,34.8]	<=28		0		
12	(17.4,34.8]	<=28		1		
13	(17.4,34.8]	(28,84]	0			
14	(17.4,34.8]	(28,84]	1			
15	(17.4,34.8]	>84				
16	(17.4,34.8]	<=20				
17	(17.4,34.8]	(20,68]		0		
18	(17.4,34.8]	(20,68]		1		
19	(17.4,34.8]	(68,84]		0		
20	(17.4,34.8]	(68,84]		1		
21	(17.4,34.8]	(84,106]				
22	(17.4,34.8]	>106				
23	(69.3,140]			0	0	
24	(69.3,140]			1	0	
25	(69.3,140]	<=28			1	
26	(69.3,140]	(28,72]			1	
27	(69.3,140]	(72,106]			1	
28	(69.3,140]	(106,142]			1	
29	(69.3,140]	>142			1	
30	>140				0	0.6
31	>140				0	0.8
32	>140			0	1	
33	>140			1	1	

Note: ″clearing away % ″ represents ″the probability of clearing away the traffic congestion at a certain clearance time;

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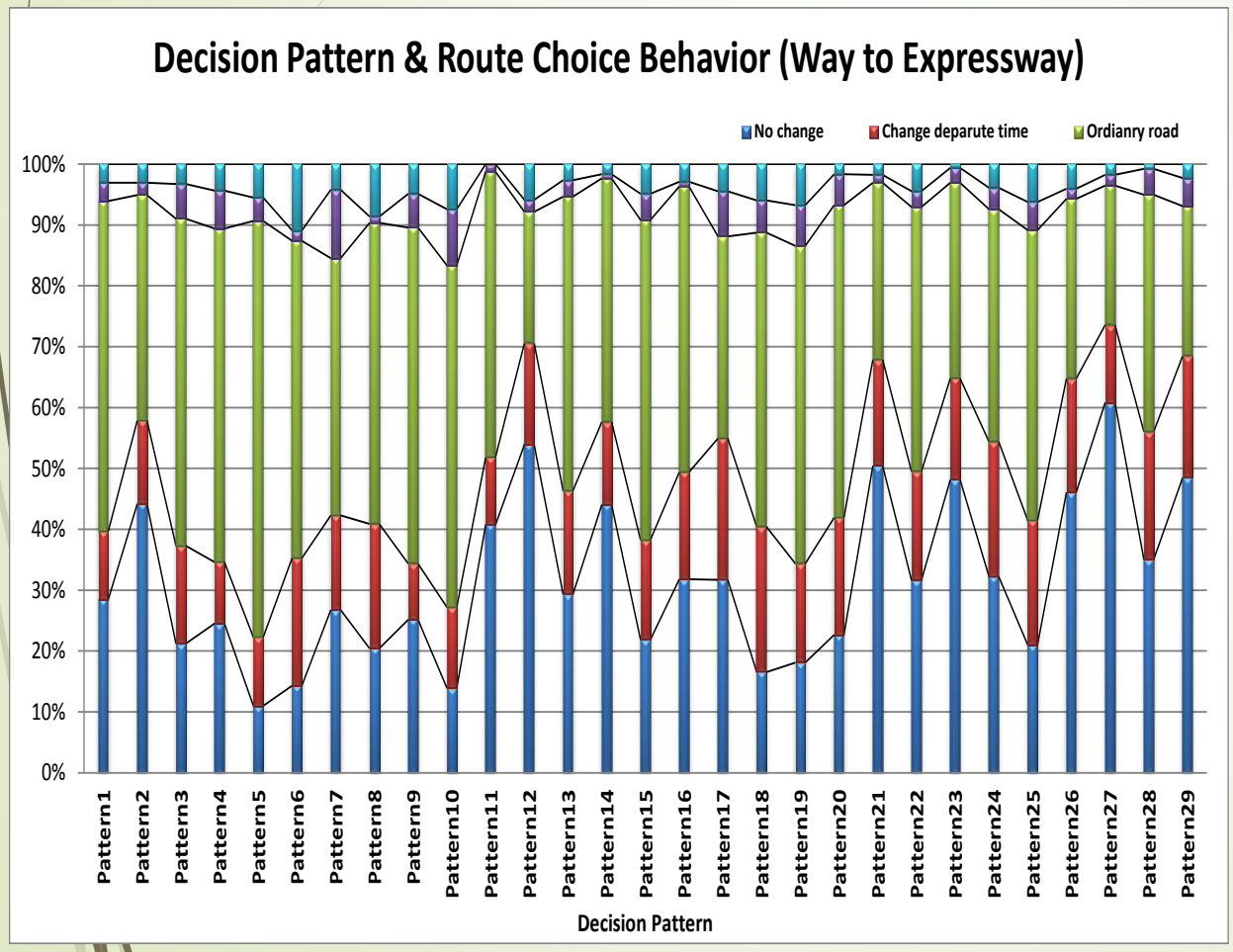
Heterogeneous adaptation

On the way to expressway



Way to Expressway Pattern						
Pattern#	Distance to Site	Clearance Time	No fatal accident	Queue decrease	Fatal accident	clearing away %
1	<=17.4	<=28	0			
2	<=17.4	<=28	1			
3	<=17.4	(28,48]				
4	<=17.4	(48,84]			0	
5	<=17.4	(48,84]			1	
6	<=6	(84,106]				
7	(6,10.5]	(84,106]				
8	(10.5,17.4]	(84,106]				
9	<=6	>106				
10	(6,17.4]	>106				
11	(17.4,34.8]	<=20				
12	(34.8,69.3]	<=20				
13	(17.4,69.3]	(20,42]				0.6
14	(17.4,69.3]	(20,42]				0.8
15	(17.4,69.3]	(42,84]	0			
16	(17.4,69.3]	(42,84]	1			
17	(17.4,69.3]	(84,106]			0	
18	(17.4,69.3]	(84,106]			1	
19	(17.4,69.3]	>106		0		
20	(17.4,69.3]	>106		1		
21	(69.3,140]	<=42				
22	(69.3,140]	(42,68]				0.6
23	(69.3,140]	(42,68]				0.8
24	(69.3,140]	>68			0	
25	(69.3,140]	>68			1	
26	>140				0	0.6
27	>140				0	0.8
28	>140				1	0.6
29	>140				1	0.8

Note: ″clearing away % ″ represents ″the probability of clearing away the traffic congestion at a certain clearance time;

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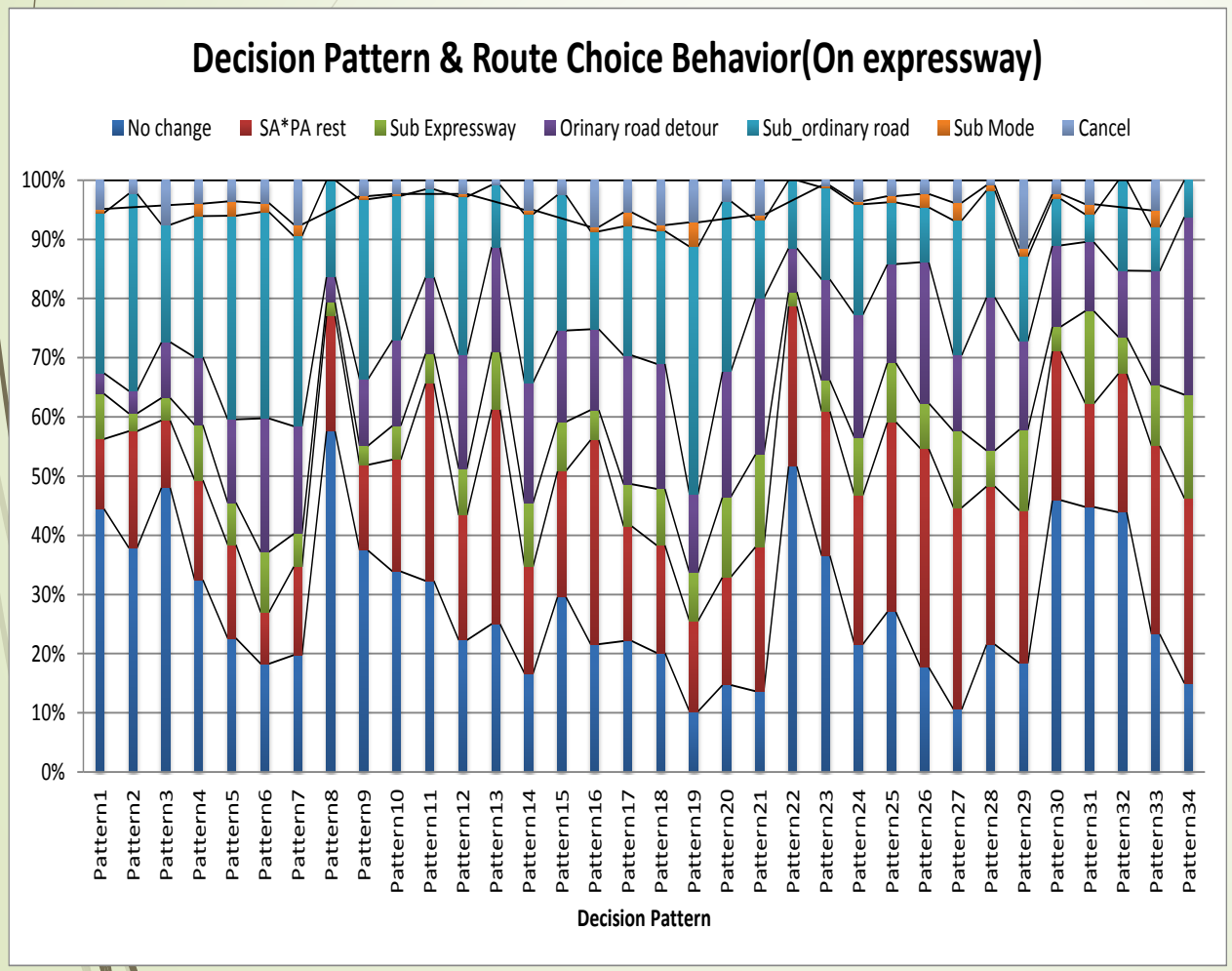
Heterogeneous adaptation

On expressway



On Expressway Pattern							
Pattern#	Distance to Site	Clearance Time	No fatal accident	Queue decrease	Fatal accident	Time accuracy	clearing away %
1	<=6	<=20					
2	(6,10.5]	<=20					
3	(10.5,17.4]	<=20					
4	<=17.4	(20,68]		1			
5	<=17.4	(20,68]		0			
6	<=17.4	>68		1			
7	<=17.4	>68		0			
8	(17.4,69.3]	<=20		1			
9	(17.4,69.3]	<=20		0			
10	(17.4,69.3]	(20,42]	0				
11	(17.4,69.3]	(20,42]	1				
12	(17.4,69.3]	(42,48]	0				
13	(17.4,69.3]	(42,48]	1				
14	(17.4,69.3]	(48,72]	0				
15	(17.4,69.3]	(48,72]	1				
16	(17.4,69.3]	(72,106]		1			
17	(17.4,69.3]	(72,106]		0			
18	(17.4,69.3]	>106					<=4.8
19	(17.4,69.3]	>106					(4.8,7.7]
20	(17.4,69.3]	>106					(7.7,12]
21	(17.4,69.3]	>106					>12
22	(69.3,140]	<=42		1			
23	(69.3,140]	<=42		0			
24	(69.3,140]	(42,106]				0.6	
25	(69.3,140]	(42,106]				0.8	
26	(69.3,140]	(106,136]			0		
27	(69.3,140]	(106,136]			1		
28	(69.3,94.5]	>136					
29	(94.5,140]	>136					
30	>140	<=106			0		
31	>140	>106			0		
32	>140	<=68			1		
33	>140	(68,136]			1		
34	>140	>136			1		

Note: ″clearing away % ″ represents ″the probability of clearing away the traffic congestion at a certain clearance time;

MNL analysis

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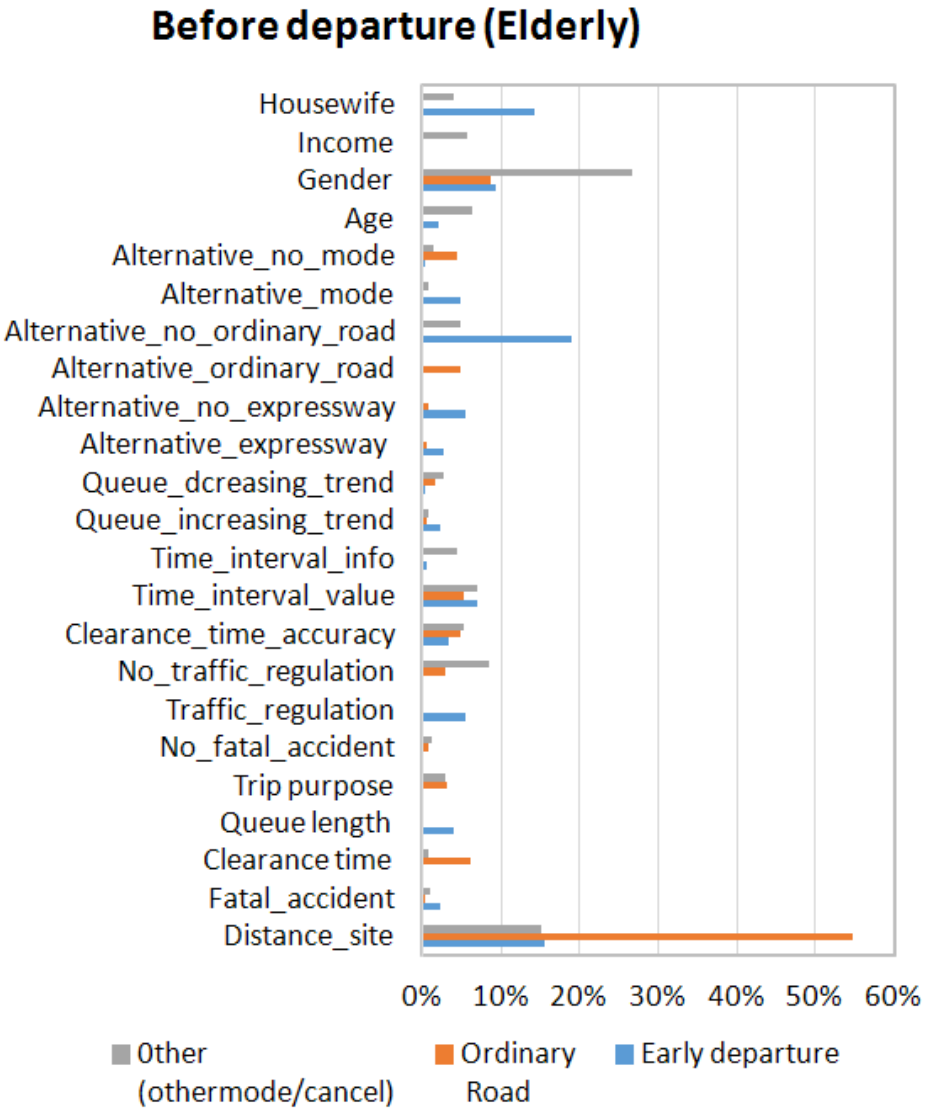
Alternatives / Factors (inc. SP attributes)	Before departure: Early departure	Before departure: Ordinary Road	Before departure: Others	On the way to expressway: Early departure	On the way to expressway: Ordinary Road	On the way to expressway: Others	On expressway: Rest at nearby SA/PA	On expressway: Other expressway	On expressway: Detour from ordinary	On expressway: Ordinary road usage	On expressway: Others
Constant	-1.16	2.11	6.35	-0.75	2.45	1.65	2.23	-4.09	4.48	3.45	5.45
	0.30	1.32	-0.01	0.03	1.05	0.09	0.70	-0.49	0.46	0.33	-0.56
Distance_site	-1.95	-5.53	-3.68	-1.61	-5.41	-3.44	0.00	0.49	-5.12	-2.59	0.00
	-1.84	-5.15	-5.21	-1.83	-4.47	-4.15	0.00	-1.13	-4.68	-2.10	0.00
Fatal_accident	-0.13	0.07	0.16	0.14	0.05	0.12	-0.05	0.23	-0.03	0.14	-0.05
	0.26	0.49	0.60	0.23	0.33	0.36	0.03	0.16	0.10	0.07	0.30
Clearance time	0.00	-0.05	0.02	-0.06	0.00	0.03	-0.04	-0.13	-0.03	0.00	0.03
	-0.11	0.38	0.36	0.04	0.11	0.13	-0.12	-0.04	0.03	0.09	0.09
Queue length	-3.16	0.27	-1.38	1.23	1.12	1.02	1.74	1.97	0.21	0.31	0.39
	7.05	-3.04	-3.77	0.52	0.42	-0.31	0.60	1.62	0.47	0.56	0.65
Trip purpose	0.05	0.25	0.30	-0.14	0.17	0.21	-0.05	-0.14	0.12	-0.05	-0.41
	-0.04	0.04	0.19	0.06	0.10	0.15	0.02	-0.09	0.08	-0.02	0.06
No_fatal_accident	0.03	-0.13	0.20	-0.11	-0.44	-0.52	0.05	0.36	-0.14	-0.27	-0.22
	-0.10	-0.27	-0.28	-0.23	-0.36	-0.72	-0.10	-0.46	-0.44	-0.56	-0.51
Traffic_regulation	0.21	0.00	0.08	0.02	-0.18	0.06	0.15	-0.22	-0.10	-0.19	0.03
	0.06	0.08	0.06	-0.03	-0.05	-0.08	0.05	0.09	-0.03	-0.03	-0.10
No_traffic_regulation	-0.02	-0.23	-0.50	-0.08	-0.27	-0.34	-0.06	-0.66	-0.19	-0.49	-0.64
	-0.05	-0.14	-0.20	-0.11	-0.15	-0.17	-0.10	-0.22	-0.28	-0.11	0.00
Clearance_time_accuracy	-0.80	-1.47	-1.93	-1.45	-1.30	-1.83	-1.31	-2.07	-1.70	-1.72	-1.55
	-0.60	-1.09	-0.98	-0.17	-0.55	-0.62	-0.04	0.30	-0.60	-0.40	-0.56
Time_interval_value	3.94	5.10	7.45	8.10	3.11	6.06	9.28	17.19	13.71	9.18	14.60
	2.65	2.51	1.91	9.08	7.60	13.48	13.09	23.06	15.52	7.54	11.60
Time_interval_info	0.08	-0.04	0.40	-0.39	-0.25	-0.16	-0.02	-0.52	-0.48	-0.34	-0.05
	0.02	-0.19	-0.19	-0.49	-0.50	-0.89	-0.62	-1.45	-0.85	-0.50	-0.69
Queue_increasing_trend	-0.14	-0.11	-0.14	-0.07	-0.07	-0.36	0.08	0.16	-0.09	-0.05	-0.25
	0.08	0.05	-0.02	-0.09	0.00	-0.10	0.03	-0.42	-0.10	0.02	-0.02
Queue_dcreasing_trend	0.05	-0.17	-0.29	0.24	-0.30	-0.50	0.13	-0.02	-0.11	-0.14	-0.62
	-0.17	-0.43	-0.43	-0.21	-0.38	-0.56	-0.02	-0.46	-0.37	-0.32	-0.29
Alternative_expressway	-0.15	0.10	0.08	-0.39	-0.08	-0.89	-0.32	1.06	0.06	-0.21	-0.23
	0.00	0.19	0.15	-0.05	-0.01	0.06	-0.22	0.62	-0.18	-0.26	-0.04
Alternative_no_expressway	-0.21	-0.12	0.00	-0.14	-0.19	-0.23	-0.45	-0.63	-0.35	-0.19	-0.30
	0.04	0.03	0.18	0.04	-0.03	-0.01	-0.09	-0.21	-0.26	0.05	0.01
Alternative_ordinary_road	-0.04	0.30	0.08	-0.03	0.29	0.11	-0.19	0.18	0.17	0.56	-0.26
	-0.13	0.10	-0.34	-0.01	0.24	-0.21	0.01	0.46	0.14	0.21	-0.16
Alternative_no_ordinary_road	0.39	0.06	0.37	0.28	-0.02	0.73	0.37	0.09	-0.13	0.04	0.54
	0.05	-0.11	-0.13	0.05	-0.10	-0.12	0.12	0.24	0.01	-0.10	-0.06
Alternative_mode	-0.20	-0.04	-0.15	-0.12	-0.02	0.15	-0.11	-0.09	-0.28	0.02	-0.55
	-0.08	-0.02	-0.10	-0.07	-0.04	0.06	-0.01	0.05	-0.20	0.11	0.03
Alternative_no_mode	-0.06	-0.28	-0.20	-0.40	-0.31	-0.24	-0.17	-0.23	-0.47	-0.33	-0.06
	-0.06	-0.06	-0.13	-0.13	-0.17	-0.05	-0.10	-0.23	-0.26	-0.13	-0.01
Age	0.26	0.04	-0.84	0.27	-0.01	-0.04	-0.21	0.64	-0.40	-0.23	-0.66
	0.02	0.10	0.01	0.00	0.07	-0.06	-0.06	-0.05	0.10	0.11	-0.02
Gender	-0.26	-0.38	-0.84	-0.21	-0.31	-0.78	-0.16	0.22	-0.37	-0.27	-0.94
	-0.25	-0.13	-0.41	-0.20	-0.19	-0.37	-0.32	-0.36	-0.39	-0.29	-0.53
Income	0.00	0.00	-0.41	0.07	0.14	-0.22	-0.19	0.70	0.02	0.20	0.10
	-0.37	-0.25	-0.18	-0.24	-0.16	-0.16	-0.25	-0.30	-0.12	-0.14	-0.19
Housewife	0.36	0.01	-0.35	0.18	-0.06	-0.38	0.12	0.76	-0.09	0.30	-0.09
	-0.30	-0.16	-0.39	-0.27	-0.30	-0.43	-0.34	-0.45	-0.42	-0.42	-0.60

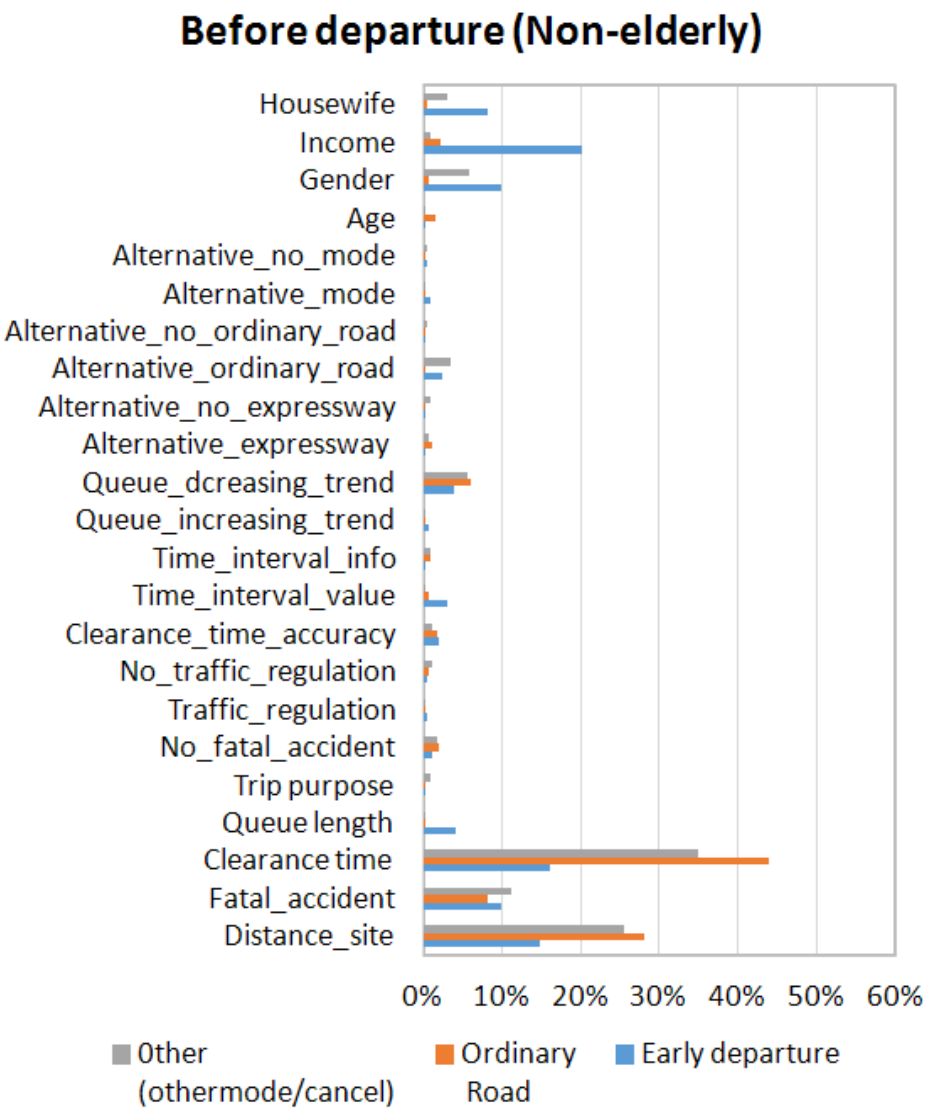
Reference: no change

Upper:
Elderly

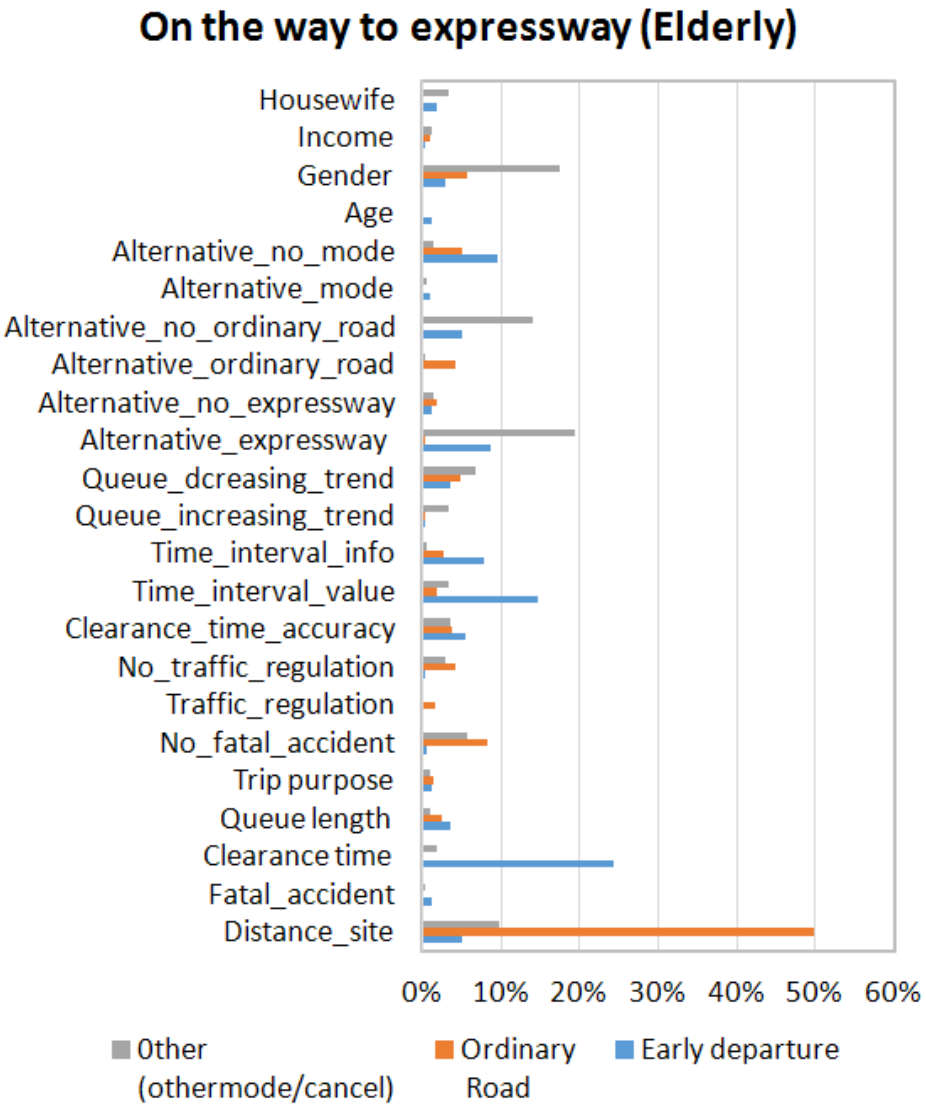
Lower:
Non-elderly

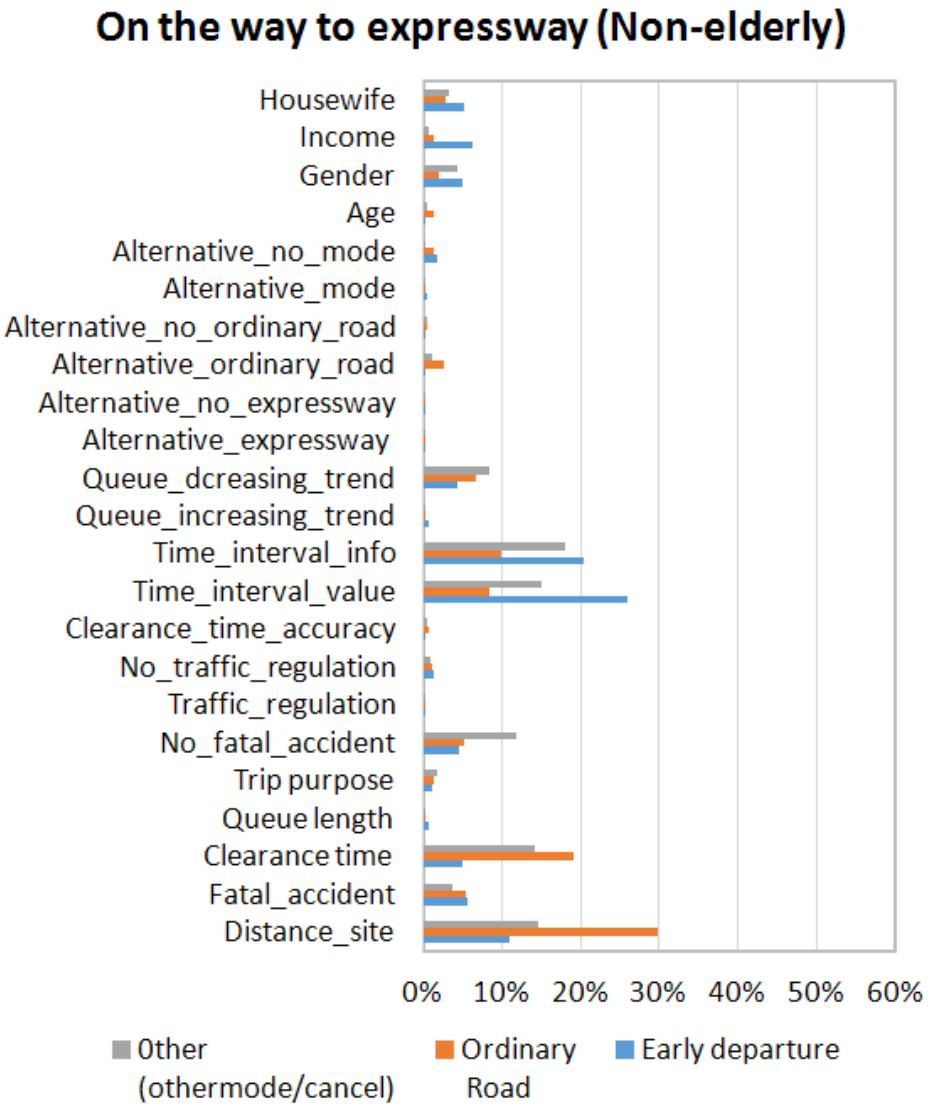
Influential factors
(Variance proportion (larger) -> Influence (Larger))



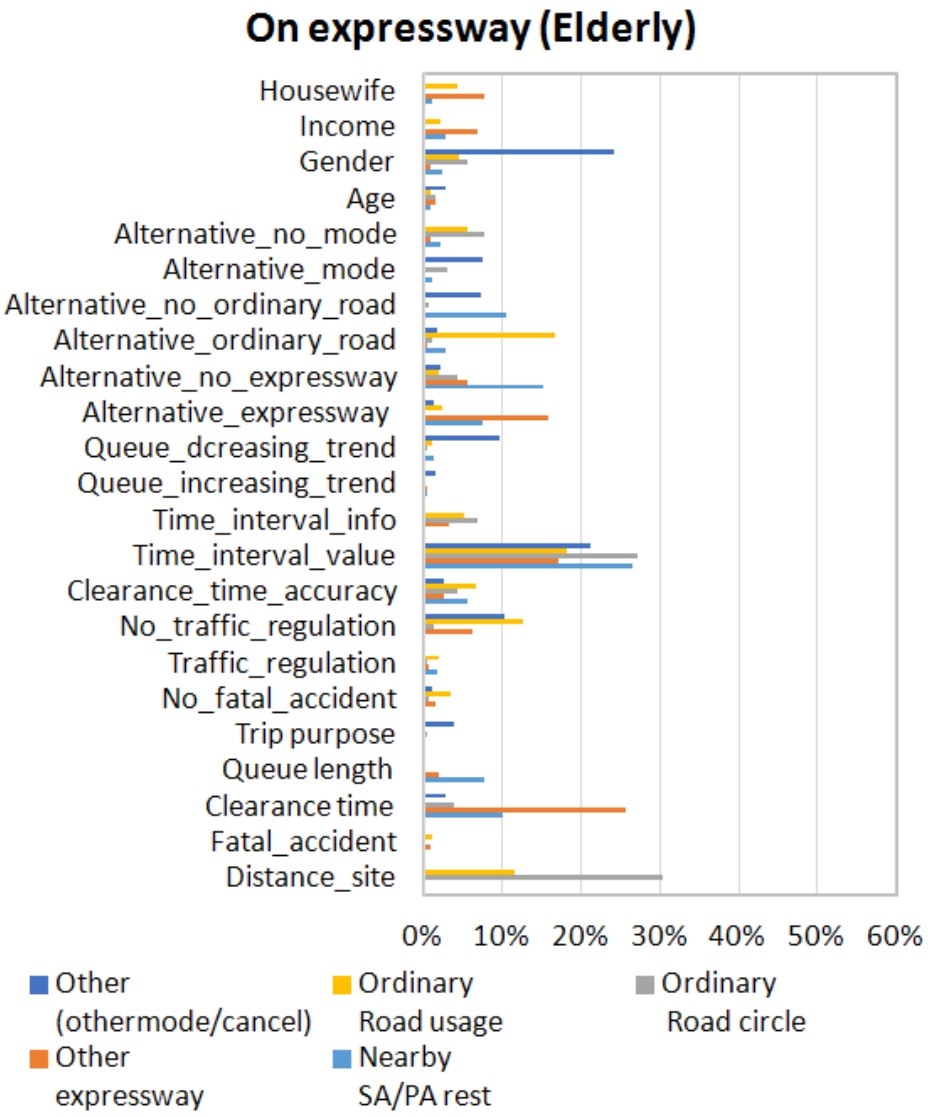


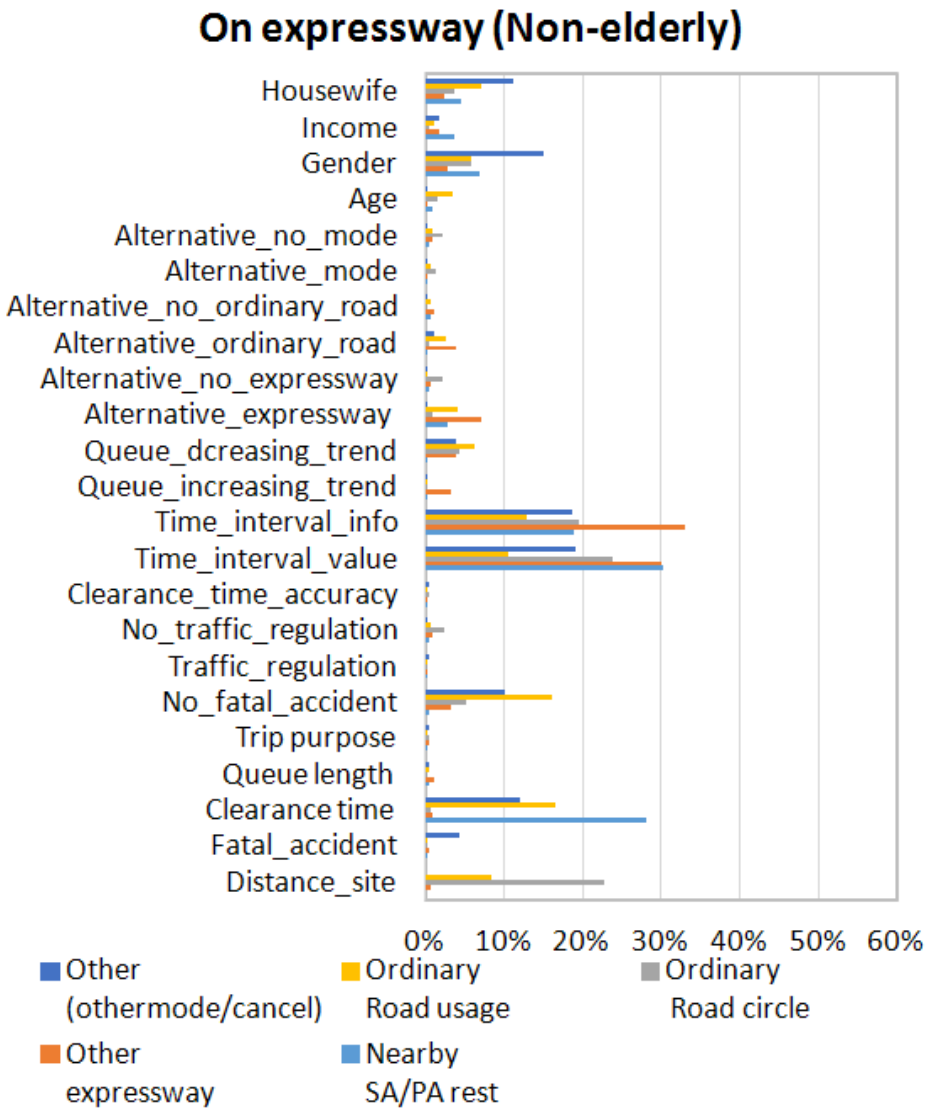
Influential factors
(Variance proportion (larger) -> Influence (Larger))





Influential factors
(Variance proportion (larger) -> Influence (Larger))





Conclusions

- Influential information contents are considerably different across the adaptation patterns, confirming the importance of individualized dynamic traffic information.
- Nearly 70% of drivers' behaviors will be influenced by the information provision of traffic accident related information on expressways.

Conclusions

Influential information	Elderly	Non-elderly
Before departure	1.Distance to accident site 2.No alternative ordinary road 3.Time interval value 4.Clearance time accuracy 5.No traffic regulation	1.Clearance time 2.Distance to accident site 3.Fatal accident (info) 4.Queue decreasing trend
On the way to expressway	1.Distance to accident site 2.Clearance time 3.Alternative expressway 4.Time interval value	1.Distance to accident site 2.Time interval info 3.Time interval value 4.Clearance time
On expressway	1.Time interval value 2. Clearance time 3. Distance to accident site 4.Alternative routes/modes	1.Time interval info 2.Time interval value 3.Clearance time 4.No fatal accident 5. Distance to accident site

Acknowledgement

- This study was fully supported by the joint research between Hiroshima University and the Chugoku Regional Branch, West Nippon Expressway Company Limited (West NEXCO), Japan.

"Age-Friendly Safety and Welfare in Transportation"

Impacts of urban planning & transportation on healthy ageing

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Adjunct Research Fellow
School of Population Health
The University of Western Australia

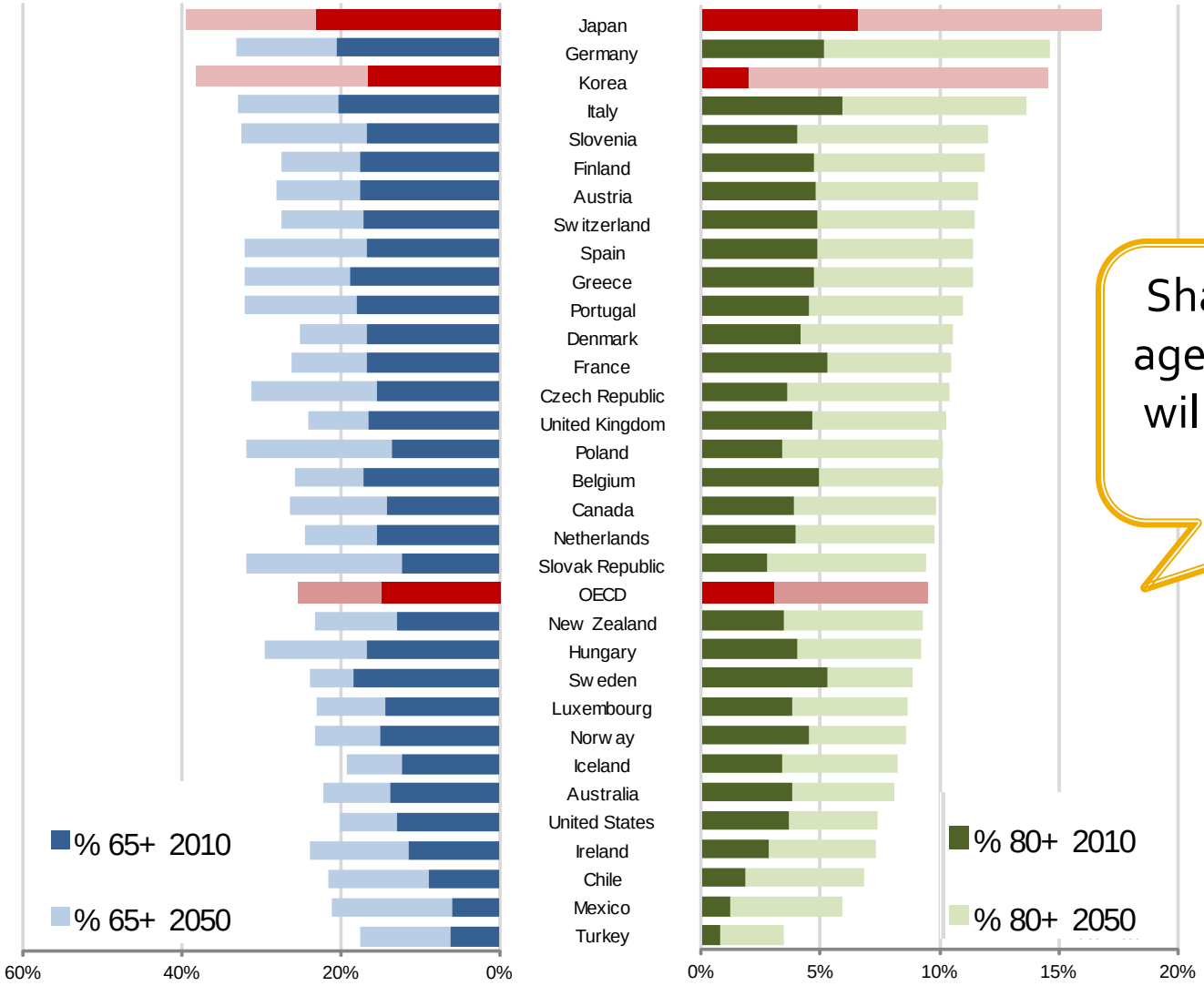
Outline

1. Ageing & health promotion
2. The built environment & health
3. Needs of elderly people

1

Ageing & Health Promotion

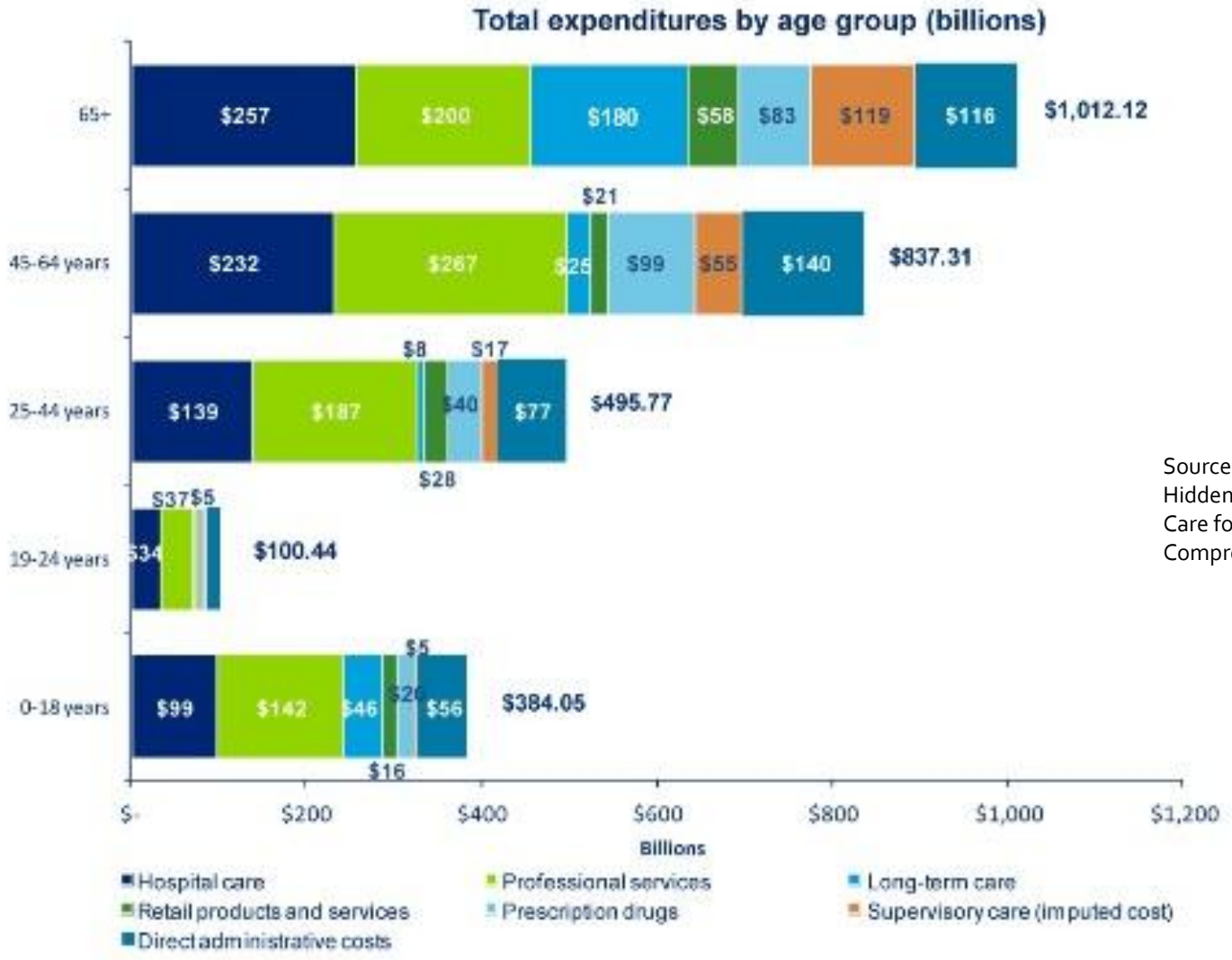
Population Ageing (2010-2050)



Shares of the population aged over 65 and 80 years will increase significantly by 2050

Source: OECD Labour Force and Demographic Database, 2010.

Ageing & Healthcare Costs



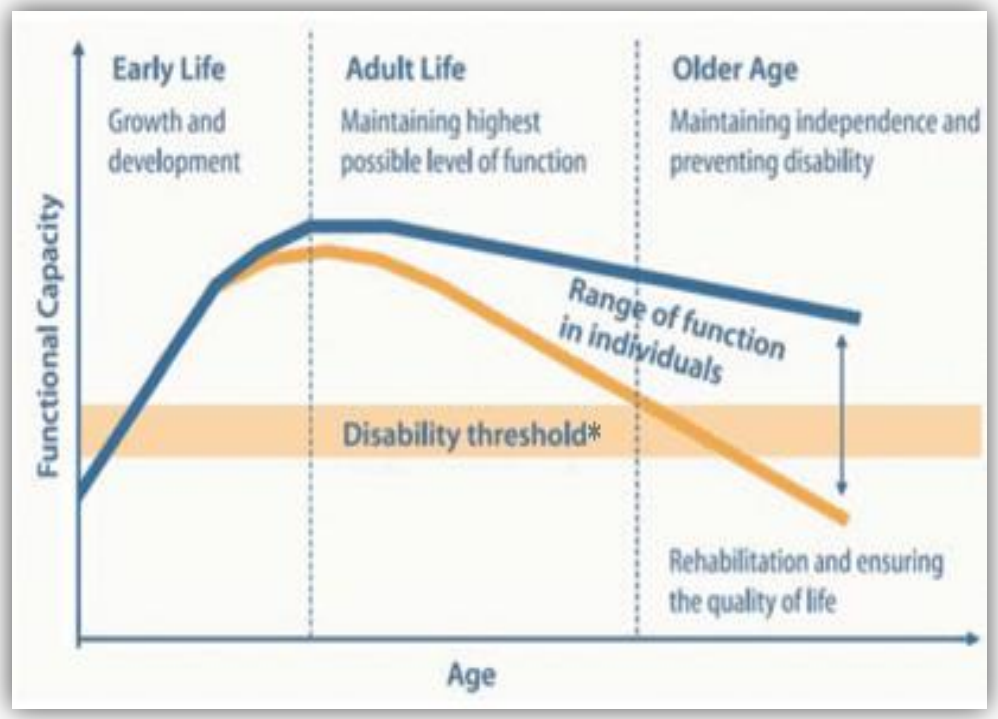
Source: Deloitte (2009), The Hidden Costs of U.S. Health Care for Consumers: A Comprehensive Analysis

Healthy Ageing

- As people age, they become more susceptible to disease and disability. **But** much can be prevented, delayed or treated by adopting healthier lifestyles

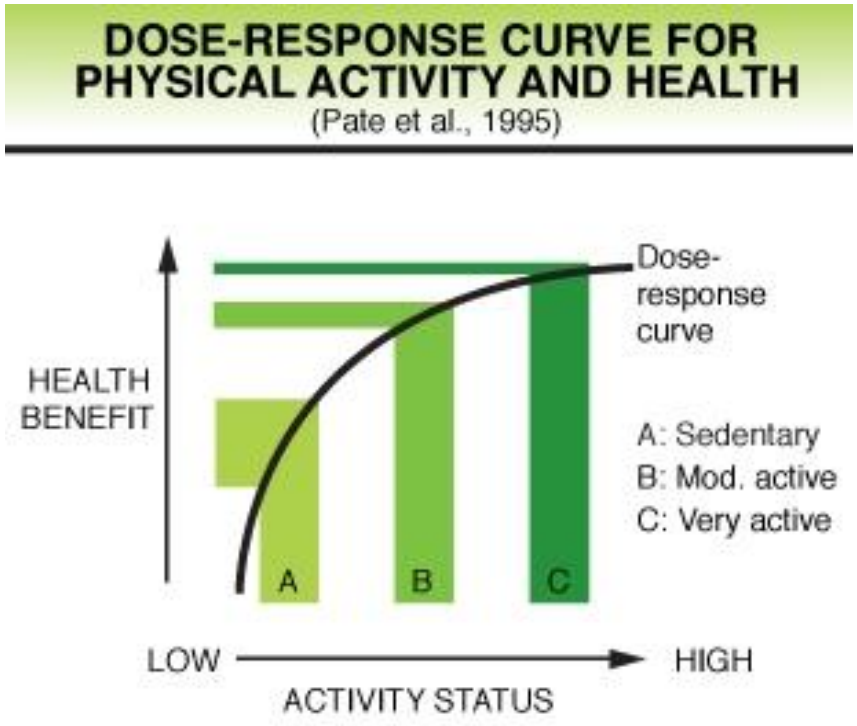
- Healthy Ageing
  - Extend healthy life years
  - Live independently
  - Reduce risk of falling

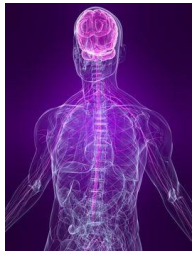
- Lifestyle behaviors
  - Nutrition
  - Substance use/misuse
  - Physical activity



Promotion of Physical Activity

- Lower risk of
  - Early death
  - Heart disease
  - Stroke
  - High blood pressure
  - Diabetes
  - Colon & breast cancer
- Prevent obesity
- Reduce risk of falls
- Reduce depression






Physical Activity Guidelines

Source: American College of Sports Medicine & American Heart Association (2007)

- Minimum recommendations (elderly)

- **5x per week 30 min. moderate-intensity physical activity**
  - noticeably accelerated heart rate (5 or 6 on a scale 0-10)
  - e.g., brisk walking

OR

- **3x per week 20 min. vigorous-intensity physical activity**
  - rapid breathing and substantial increase in heart rate (7 or 8)
  - e.g., jogging

PLUS

- exercise for muscular strengthening, flexibility, balance & coordination, and cognitive tasks

Promotion of Walking

- Natural activity
- Outdoors

Walking for transportation

Walking for recreation

Values of Walking vs. Driving

Health benefits

Reduced congestion

Low environmental impact

Social interaction

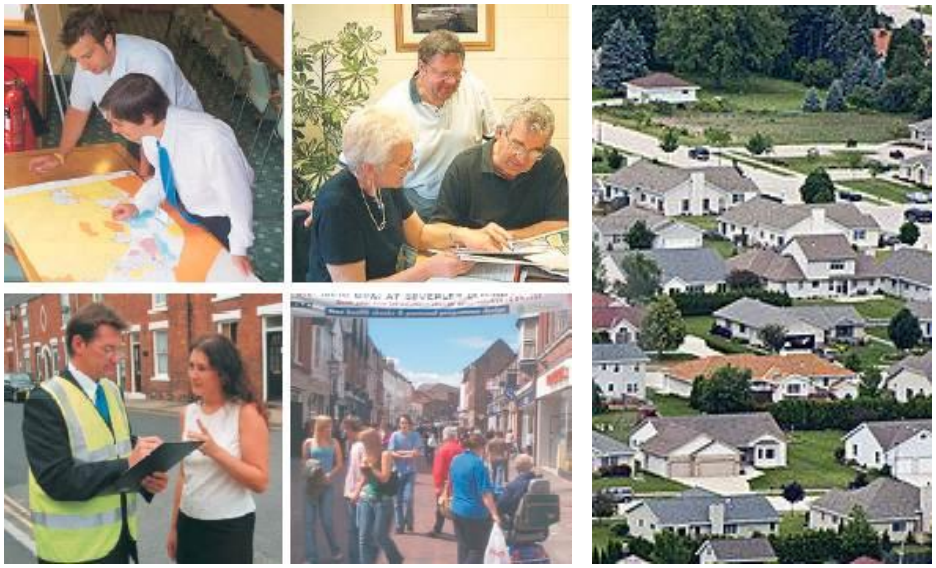
Recreational value

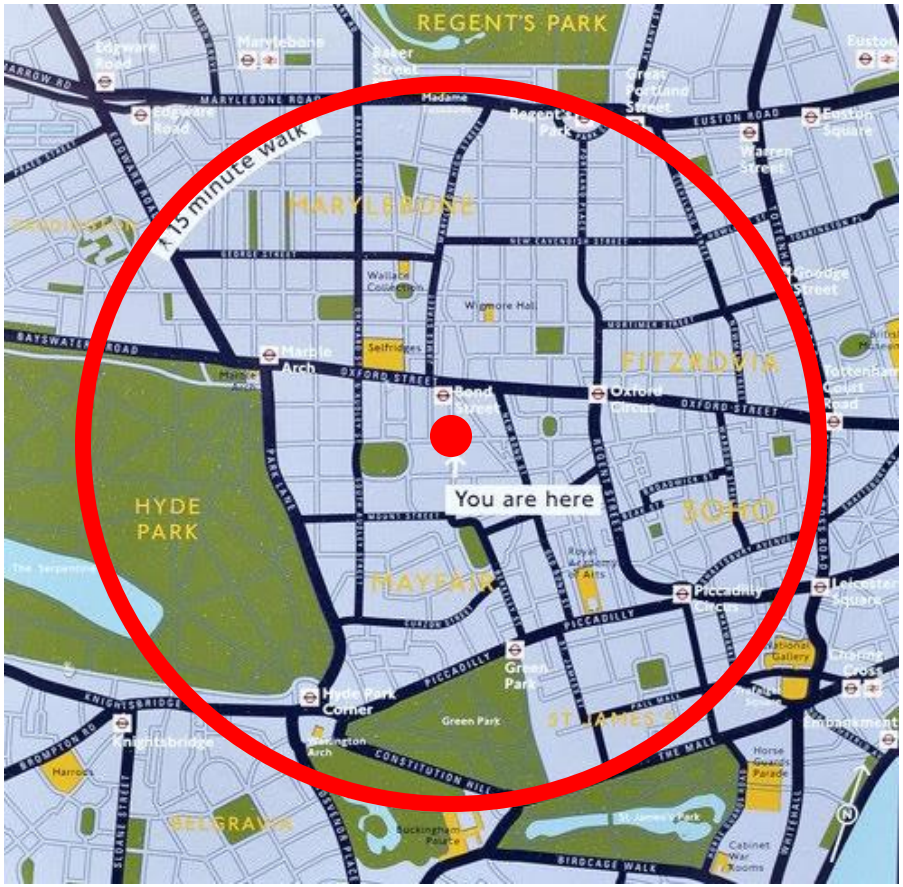
2

The Built Environment & Health

Focus of Research

- "The neighborhood"
  - People's homes
  - Social community





Measurement

Walkability

- Measure of the walking-friendliness of an area
- Safety, comfort and convenience

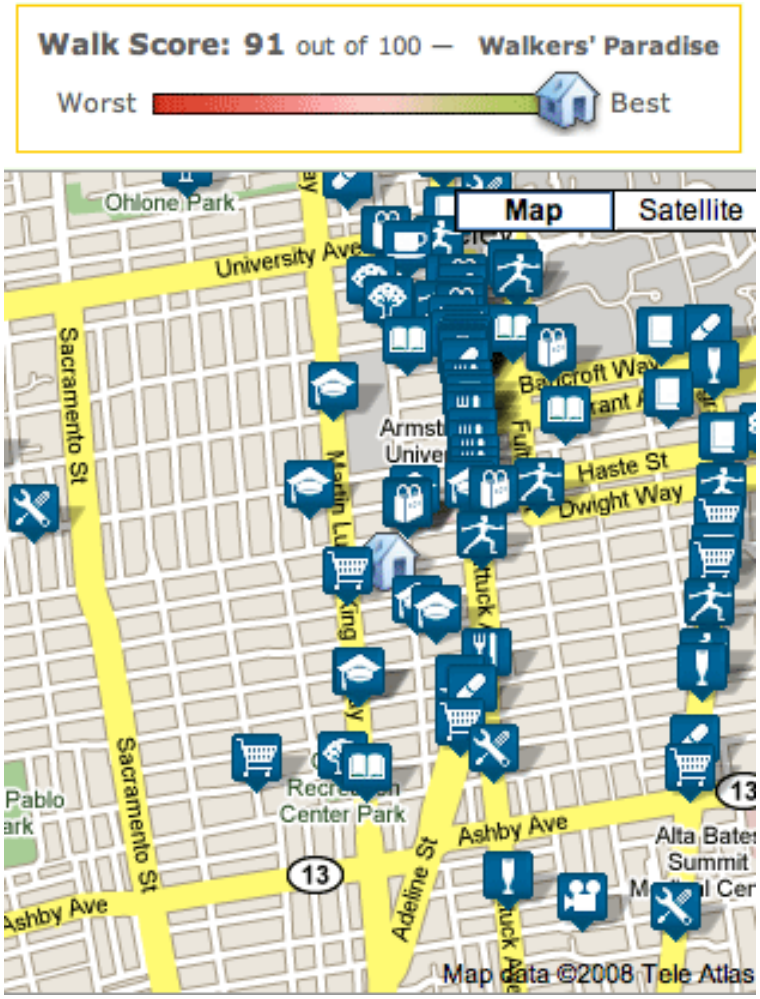
Levels of Physical Activity

- Sufficient
- Insufficient
- Sedentary (inactive)

FINDING 1
Mixed Land-Use

- People need **destinations** within a walkable distance from their homes

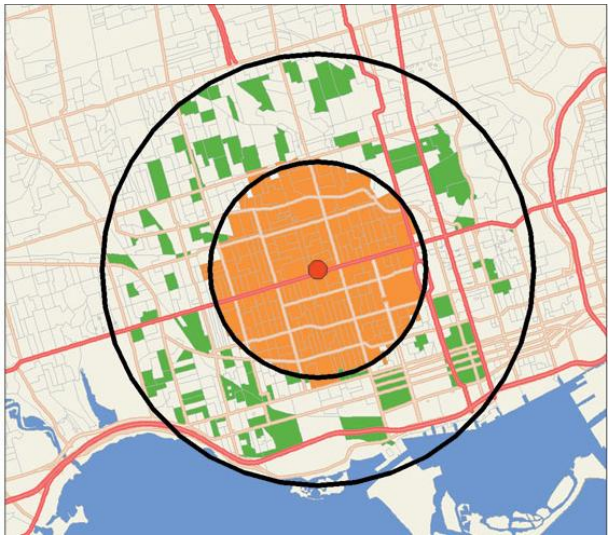
- Diversity of destinations
  - Shops
  - Services
  - Parks & open public spaces
  - Public transport stops
  - Schools & workplaces

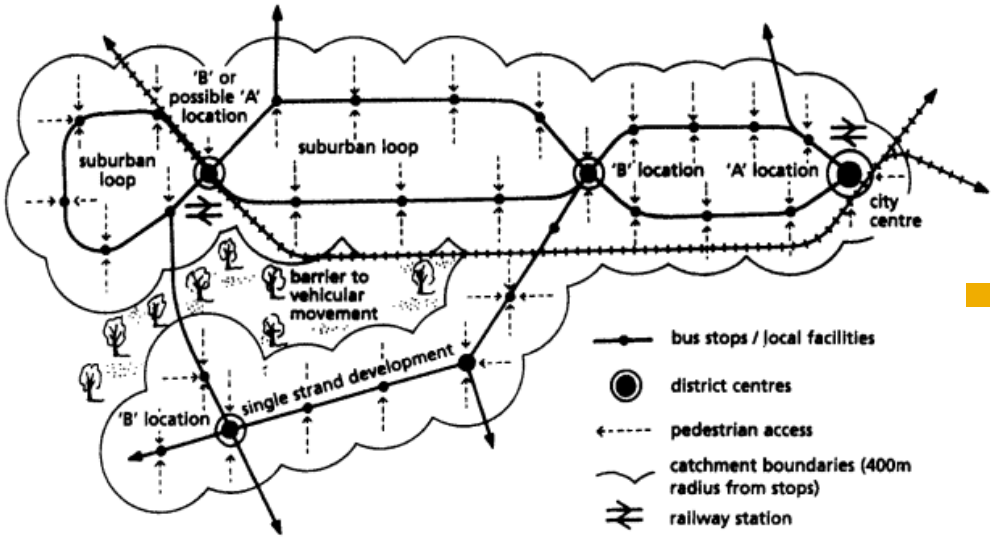


http://www.walkscore.com/

FINDING 2
Residential Density

- Local businesses need enough potential customers in their "trade area"

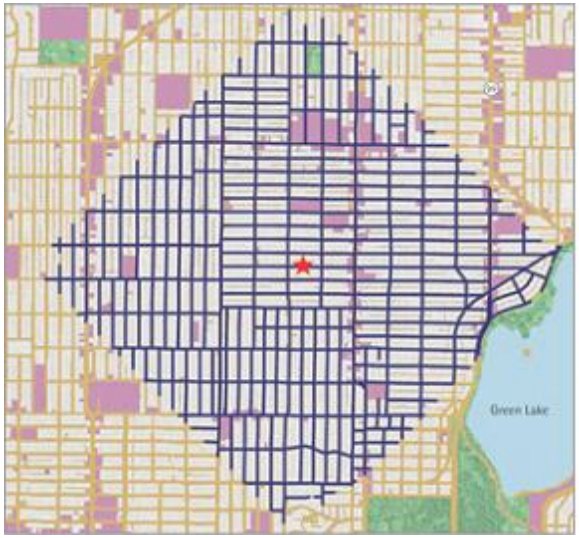




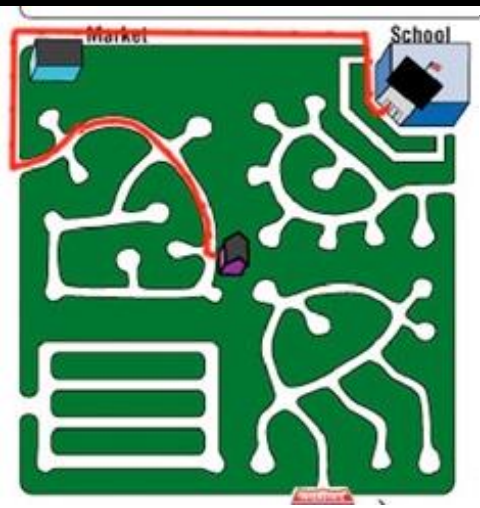
- Higher densities allow better public transport service

FINDING 3
Street Connectivity

- Directness of travel
- Route options
- Linkage with public transport
- Safe crossings at intersections



Places to be reached within 15 minute walking



Distance home – school

FINDING 4
Walking Infrastructure

- Availability
- Comfort
- Safety
- Attractiveness

FINDING 5
Urban Green Space

- Health benefits
  - Stress relief by exposure to nature
  - Opportunities for physical activity and social interaction

FINDING 6
Safe & Clean Environment

- Perceived safety
  - Social safety
  - Traffic safety
- Cleanliness

In sum
The Built Environment…

- Influences choice behavior
  - Transportation
  - Leisure activities

- Needs to provide opportunities to be active
  - Meaningful nearby destinations
  - Attractive routes (safe, comfortable & clean)
  - Access to well-serviced public transport

3

Needs of Elderly People

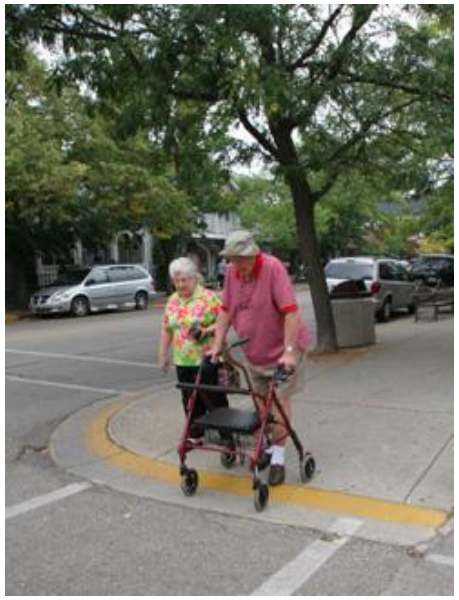
Elderly People in Traffic

- Age-related factors
  - Decline in vision acuity
  - Slower reaction time
  - Slower walking speed
  - Fear of falling
  - More vulnerable in crashes

- Unsupportive environments
  - Hamper independent living (ageing-in-place)
  - Increase risk of social isolation

Perceived Barriers to Walking

- Walking distance to destinations
- Physical strain of walking
- Poor sidewalk conditions
- Lack of resting places along routes
- Dangerous intersections (crossings)

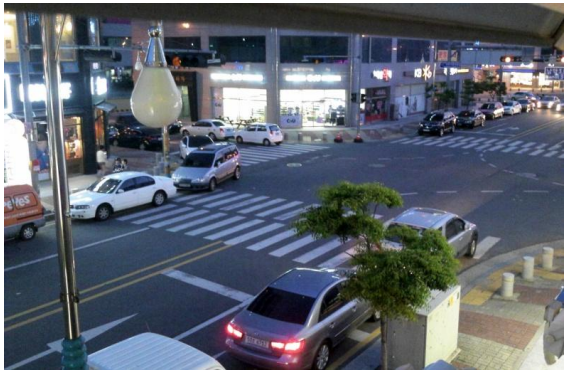


Streetscape Improvement

- Priorities
  - Improve conditions for walking (+cycling + public transport)
  - Create 'quality places' that are inviting and safe
- Elements
  - Road cross-sections
  - Traffic management
  - Sidewalk conditions
  - Landscaping
  - Street furniture
  - Building fronts

Safer Environments

- Sidewalks & footpaths
  - Quality & maintenance of pavement
  - Surveillance ('eyes on the street')
- Crosswalks
  - Shorter crossing distances
  - Longer pedestrian intervals
- Law enforcement
  - No parking on sidewalks
  - No parking around crosswalks



Closing Notes

- It is not **age** *alone* but also a person's **health status** that affects transportation mode use, transportation problems, or personal mobility

- Environments that enable **elderly people** to stay more active and healthy can contribute to better health of the **whole population**

Thank you
감사합니다

Improvement of Walking Environments for the Transportation Vulnerable

2013. 6.13

Jung-Beom Lee

Daejeon
Development Institute

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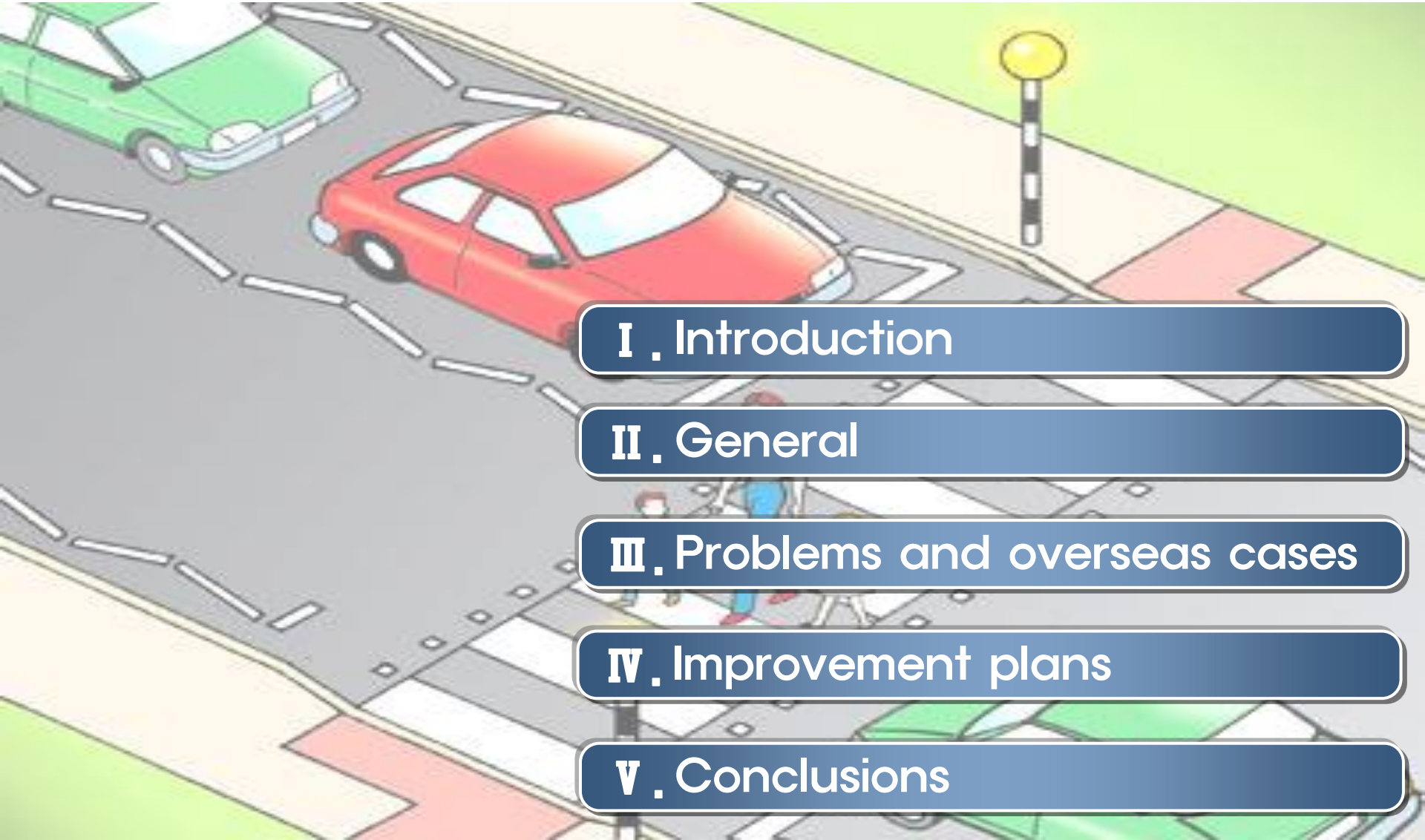


Daejeon Development Institute

Background

Definition

- Increase the interest of the pedestrian environment
  - ❖ Generic term of transportation vulnerable: people who are the disabled, the elderly, pregnant women, children, and inconvenient to go
- The law concern about convenient movement of transportation vulnerable in Korea was Enforced in 2010
- In general: The transportation vulnerable
  - ❖ USA: Elderly or disabled
  - ❖ Now: The mobility handicapped(Including the elderly, pregnant women, children, person with the burden)

Daejeon Development Institute

Background

- Progress of elderly

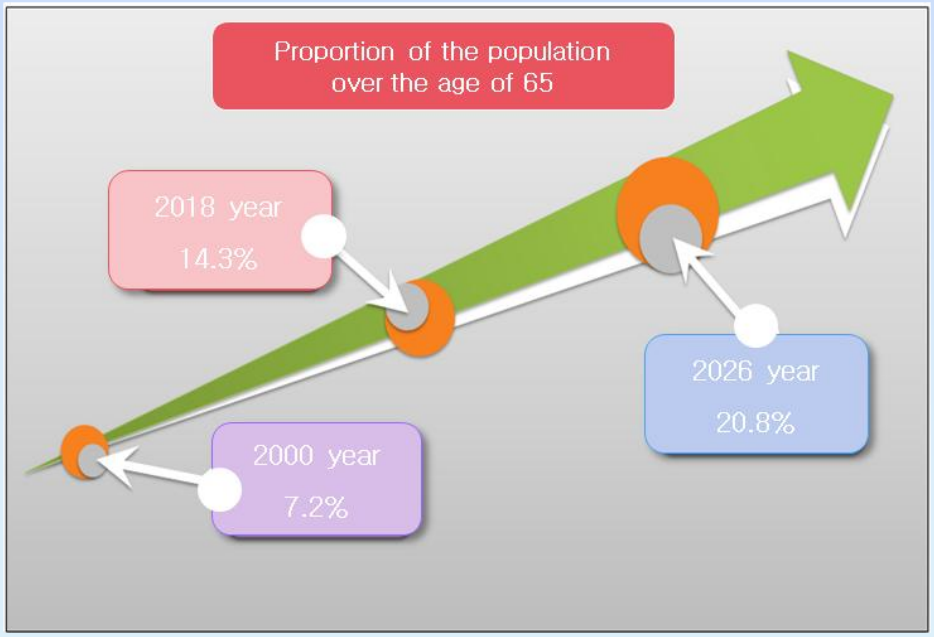
Proportion of the population over the age of 65

(Unit : %)

Year	1980	1990	1998	2000	2008	2009	2010	2018	2026	2030	2040	2050
Proportion	3.8	5.1	6.6	7.2	10.3	10.7	11	14.3	20.8	24.3	32.5	38.2

Source: The National Statistical Office

- An aging society: 7%
- Aged society: 14%
- A super-aged society: 20%



Daejeon Development Institute

Background

Trend of an aging population in each year

	Year			Year spent	
	7%	14%	20%	7%→14%	14%→20%
Japan	1970	1994	2005	24	11
France	1864	1979	2018	115	39
UK	1929	1975	2028	46	53
USA	1942	2014	2032	72	18
Korea	2000	2018	2026	18	8

Source: National Institute of Population and Social Security research

Daejeon Development Institute

Background

Safety for transportation vulnerable

- Build a safe pedestrian environment for the **elderly**
  - ❖ Elderly pedestrian casualty has been increased in all cities
  - ❖ Pedestrian fatality account for 61% of all accidents
  - ❖ Seoul: Elderly pedestrian accidents compared to 2008 was an increase of 163
  - ❖ Elderly pedestrian fatality rates is doubled high more than the general population
- The number of **children** killed on the roads
  - ❖ In OECD countries, Korea ranks highest in the number of traffic fatalities per 100,000 children (3.1 children, Japan: 0.9 child)
- Transportation policy for pedestrian vulnerable is an important issue. But it is hard to be improved due to lack of budget.

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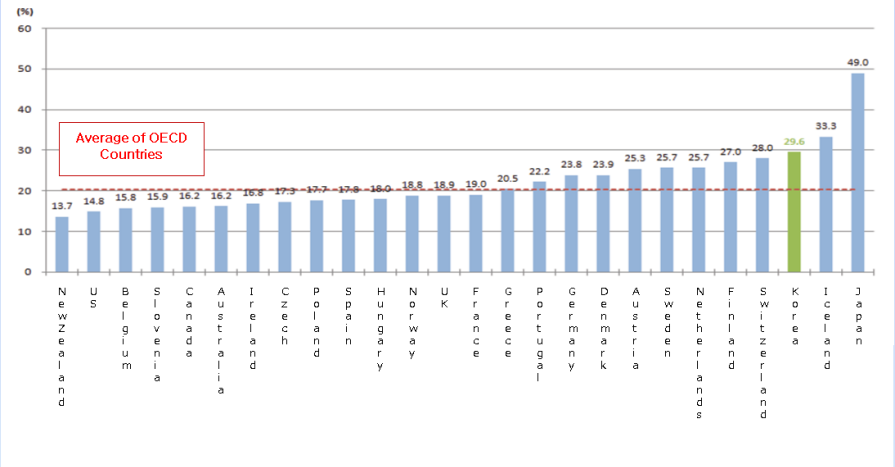
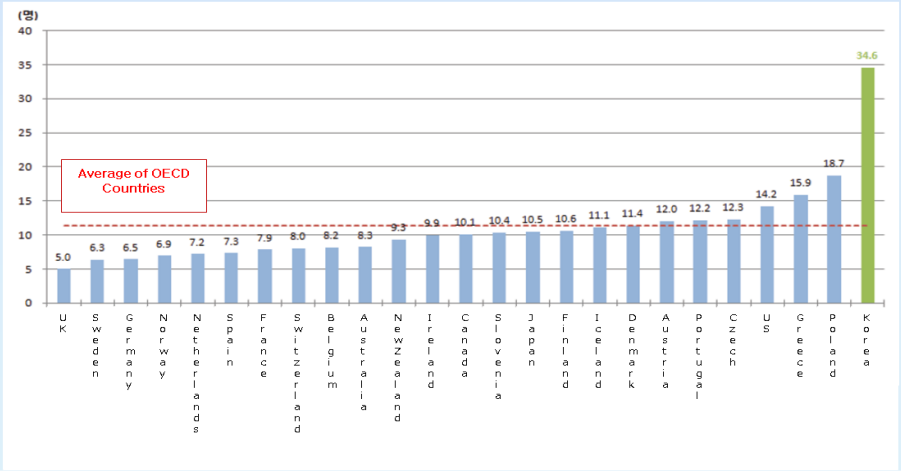
Elderly traffic accident

- Traffic fatality of elderly aged over 65 in 2008
  - ❖ Japan: 49.0%
  - ❖ Iceland: 33.3%
  - ❖ Korea: 29.6%



- Traffic fatality of elderly aged over 65 per 100,000 people in 2008
  - ❖ Korea: 34.6 people
  - ❖ More than three times high compared to average of OECD countries



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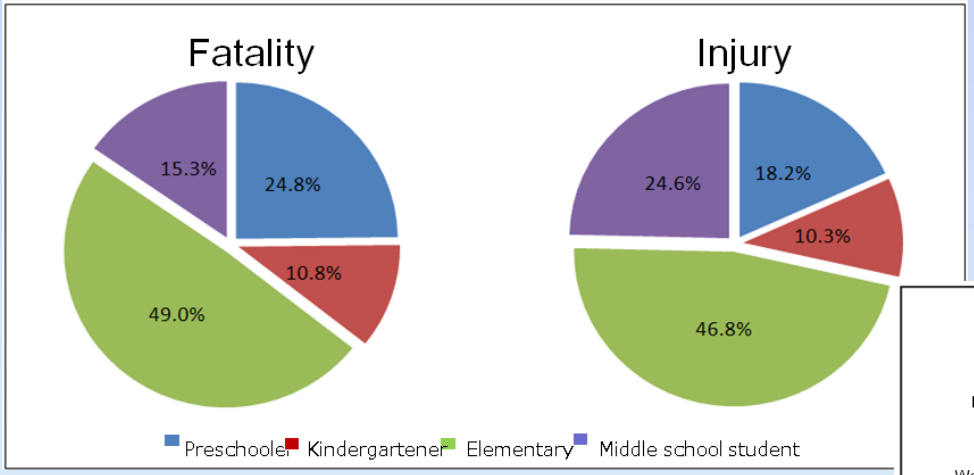
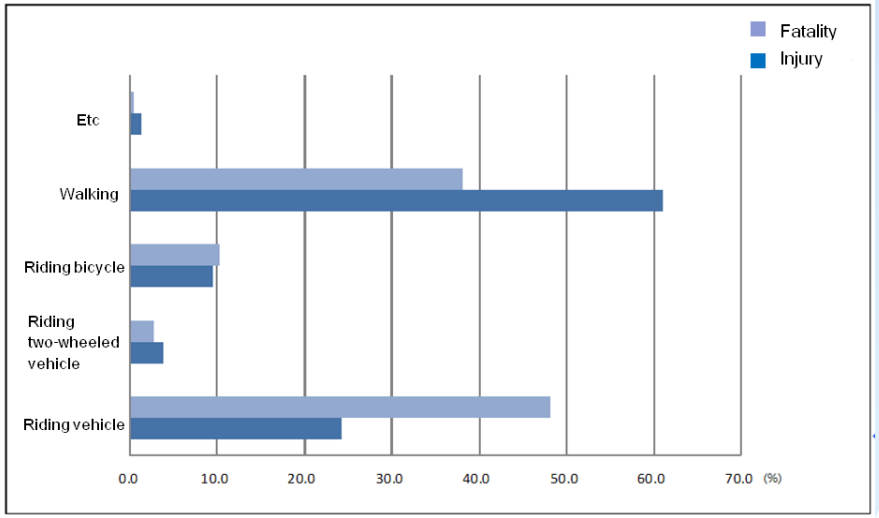
Children traffic accident

- Child casualty composition per grade
  - ❖ Elementary fatality rate: 49%
  - ❖ Injury rate: 46.8%
  - ❖ The majority of pedestrian death occurs in walking





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Walking Casualty

❑ Traffic accident by borough in Daejeon

- Pedestrian fatality of 7 metropolitan cities: 2,137 people
- Pedestrian injury in 2009: increased to 51,381people
- Pedestrian fatality and injury in Daejeon increased 67 and 1,415 people respectively
- The number of elderly pedestrian casualty increased in all metropolitan cities

Elderly and children pedestrian casualty

	Pedestrian casualty				Child pedestrian casualty				Elderly pedestrian casualty			
	Fatality		Injury		Fatality		Injury		Fatality		Injury	
	'08	'09	'08	'09	'08	'09	'08	'09	'08	'09	'08	'09
Seoul	258	241	10,887	11,519	12	10	1,507	1,498	97	97	1,370	1,533
Busan	111	128	3,659	4,019	4	6	544	537	35	49	559	582
Daegu	94	92	3,042	3,141	5	3	519	523	38	38	457	502
Incheon	78	87	2,876	2,885	2	1	507	449	38	29	344	364
Guangju	69	49	1,724	1,879	1	2	352	359	30	30	229	246
Daejeon	55	**67**	1,321	**1,415**	3	2	244	250	26	28	191	196
Yulsan	48	54	1,152	1,145	3	1	232	192	16	22	131	134
Total	2,137	**2,137**	48,688	**51,381**	90	96	8,798	8,616	903	952	7,181	7,832

자료: 지역별 교통사고 통계, 도로교통공단

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Child pedestrian characteristics and rick elements

❑ Child pedestrian

- Child pedestrian characteristics
  - ❖ Do not look around when crossing
  - ❖ Follow other’ s jaywalking
  - ❖ Only look at one side of crossing when they cross
  - ❖ Expecting that the car will be stopped
  - ❖ Break into a run as soon as the light turns green
  - ❖ Stopping in the crossing road
  - ❖ Waiting for the green signal from the road
- Examples of problems at a school zone
  - ❖ No speed hump or bump
  - ❖ No segregation between pedestrian and vehicle
  - ❖ Child safety problem due to illegal parking

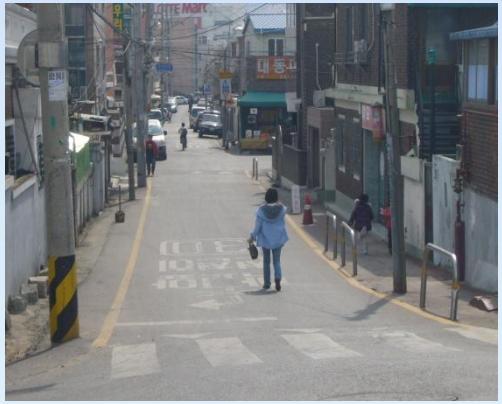
Problem

❑ School zone

No crash barrier and illegal parking

Inappropriate crash barrier

Children walking at the driveway



No color road pavement

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Overseas case

❑ The New York City Pedestrian Safety Study & Action Plan, 2010

- New York: By 2030, NY DOT consolidates the speed regulation in order to reduce the traffic fatalities by half goal
- 2009 year in NY city is the safest year ever / Traffic fatality and pedestrian fatality decreased to 35% and 52%, respectively compared to the year in 2001
  - ❖ 36% of accidents caused by driver negligence leads to pedestrian's death or serious injury
  - ❖ 27% of the accidents is the pedestrian deaths or injuries due to the driver's violation
  - ❖ 80% of pedestrian deaths or injuries occurred by a male driver
  - ❖ Two-thirds of serious pedestrian accidents occurred in the main road
  - ❖ From the main road, about 15% of the accidents happen, but 60% of the fatal accidents are occurred

- 2010-2011year plan
  - ❖ Installation of pedestrian signal at 1,500 intersections
  - ❖ Installation of 20mph zone to 60 mile length road in order to improve pedestrian safety

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Overseas case

❑ Traffic policy for elderly pedestrians

NY Safe Routes to Seniors

- Background

❖ Transportation Alternative(TA) started 'Safe Routes for Seniors Campaign' for elderly pedestrians

❖ In 2008, TA started the Safe Routes to Seniors project with NYC Department for the Aging (focuses on the elderly pedestrian safety)

- Check lists

❖ not enough time to cross the streets

❖ broken or missing pedestrian ramps

❖ faded and hard-to-see markings

❖ turning vehicles failing to yield

❖ poor drainage or ponding in crosswalks

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Overseas case

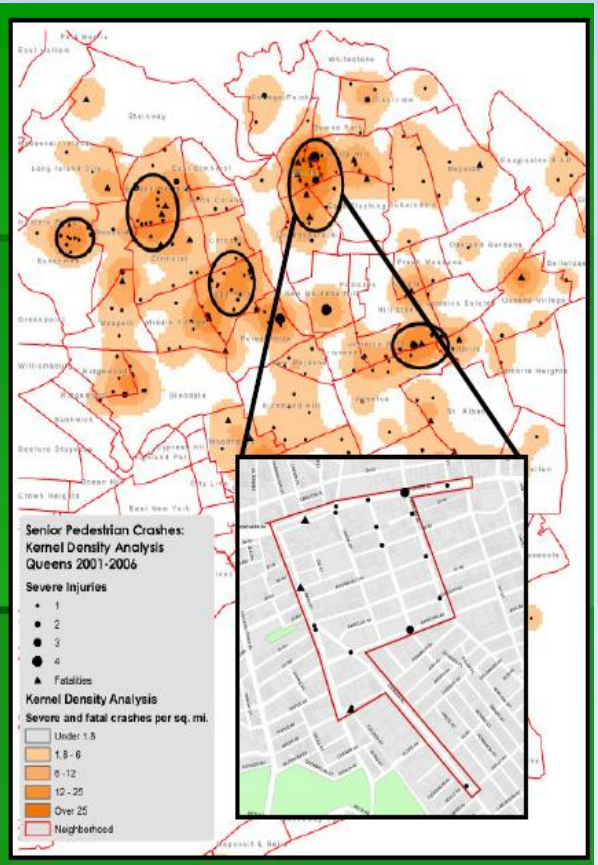
❑ Traffic policy for elderly pedestrians

The selection of pilot areas using GIS spatial analysis

Senior Areas: Queens

- Flushing*
- Jackson Heights
- Jamaica Hills
- Rego Park
- Sunnyside

*Pilot Area



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Overseas case

❑ Traffic policy for elderly pedestrians

- Measures

❖ Installing new or upgraded pavement markings

❖ High-visibility crosswalks

❖ Advance stop bars to encourage drivers to stop before a crosswalk rather than in it

❖ Narrow streets by reducing the number of vehicle lanes

❖ Various road facilities maintenance activities

1. replacing missing roadway signs

2. repairing broken curb ramps

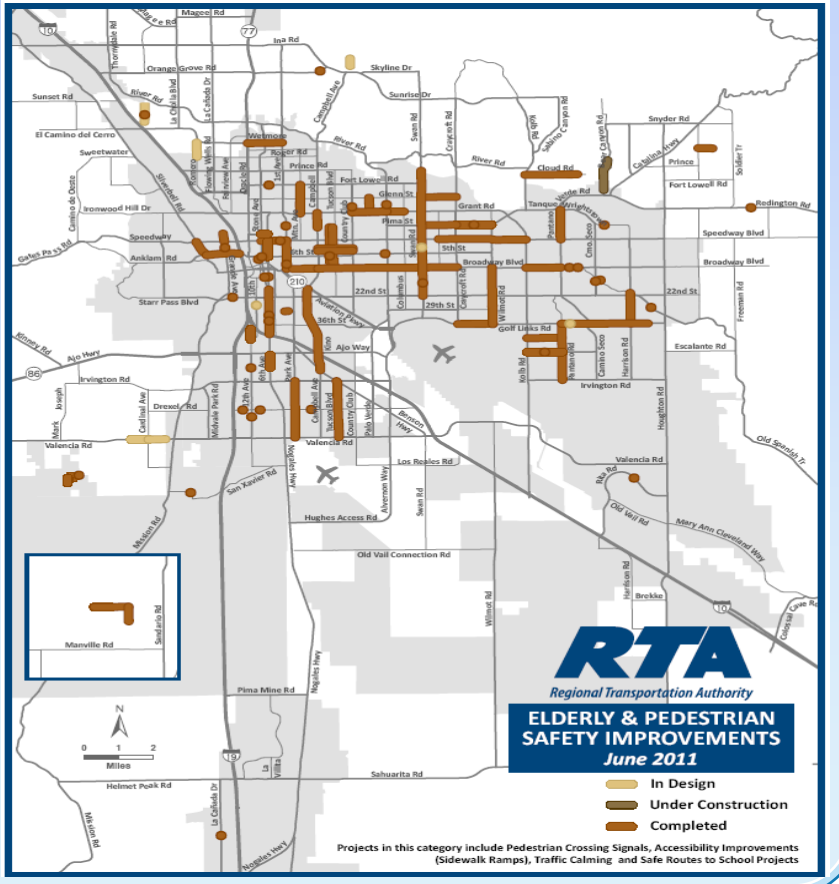
❖ Leading Pedestrian Intervals(LPI), which activate a walk signal before vehicles get a green light. So pedestrians can have a head start into a crosswalk

Overseas case

❑ Traffic policy for elderly pedestrians

- **Safe streets for seniors**

The areas for elderly pedestrian safety improvement



Overseas case

❑ Traffic policy for elderly pedestrians

- **Conclusion**
  - ❖ Install transport facilities and educate about transport safety to secure the elderly pedestrian safety

Safe driving for pedestrian accident prevention

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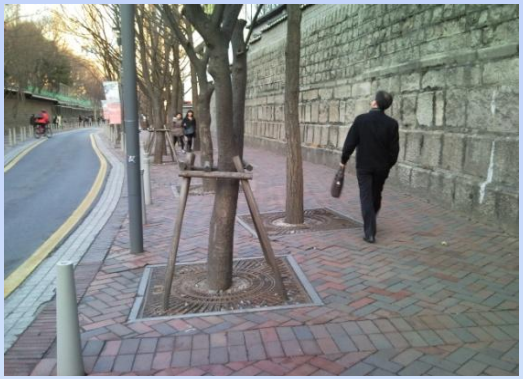
Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Secure pedestrian passage



- Traffic Calming

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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Smart Crosswalk

❖ LED bulbs installed in the vehicle stop line to increase the visibility

❖ LED bulbs was obtained approval from California Traffic Control Devices Committee(CTCDC) in 1999 and firstly installed at the intersection in California

❖ This can be helpful to reduce vehicle vs. pedestrian accident

Red light running

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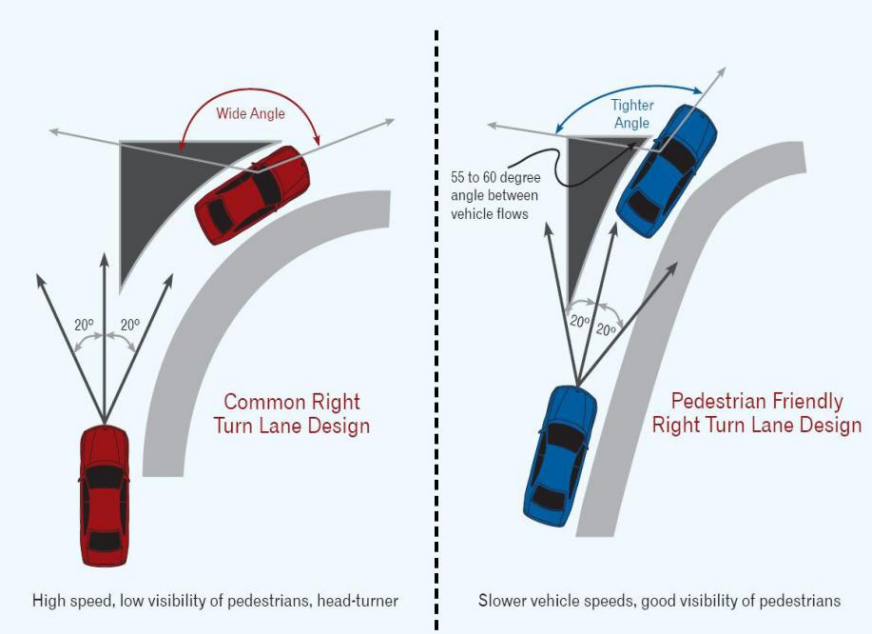
Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Reduce the turn angle

❖ Driver reduces vehicle speed to turn right / pedestrian safety can be ensured

❖ Crossing distance is shorter and a sight distance between vehicle and pedestrian is improved



Reducing right turn angle

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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Marking at local street

Cross mark and flash light

- Pedestrian-friendly design

Pedestrian-friendly design

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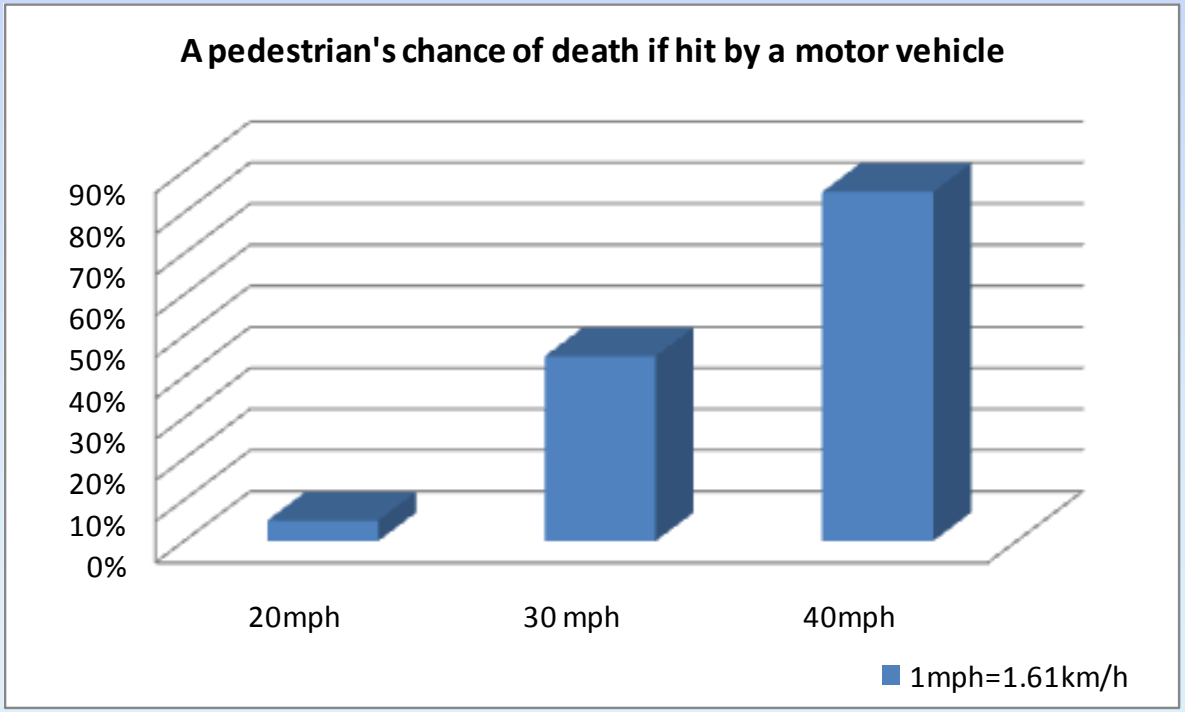
Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Vehicle speed restriction is important.
  - ❖ Why a driver has to drive with no more than 30km/h speed at the school zone

Fatal accident ratio per speed



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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Improve school zone

〈Improve pavement marking〉

〈Crash barrier at school zone〉

〈Color pavement at school zone〉

〈Word legends on the pavement〉

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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

〈Neckdown〉

〈Hump type crosswalk〉

Speed reduction facilities

Traffic calming

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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

〈Pedestrian-friendly sign〉

〈Conspicuous sign 〉

〈Ensure nighttime visibility〉

〈Insert the word about fine〉

〈Install driver feedback sign〉

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Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Install lighting facility around crosswalk
  - ❖ Install in-pavement flashing markers at accident-prone area, especially at night
  - ❖ Install a red blinker ahead of the crosswalk / driver could easily recognize pedestrian crossing
- Remove obstacles at crosswalk
  - ❖ Obstacles such as distribution boxes, streetlights, or trees around crosswalk could cause traffic accident because of obstructing of field of vision
- Install refuge island
  - ❖ Refuge island with minimum dimension of 1.2-1.8m wide and 2.4-3.6m long
  - ❖ Pedestrian accident reduced from 19% to 60% after installing the refuge island in NY city

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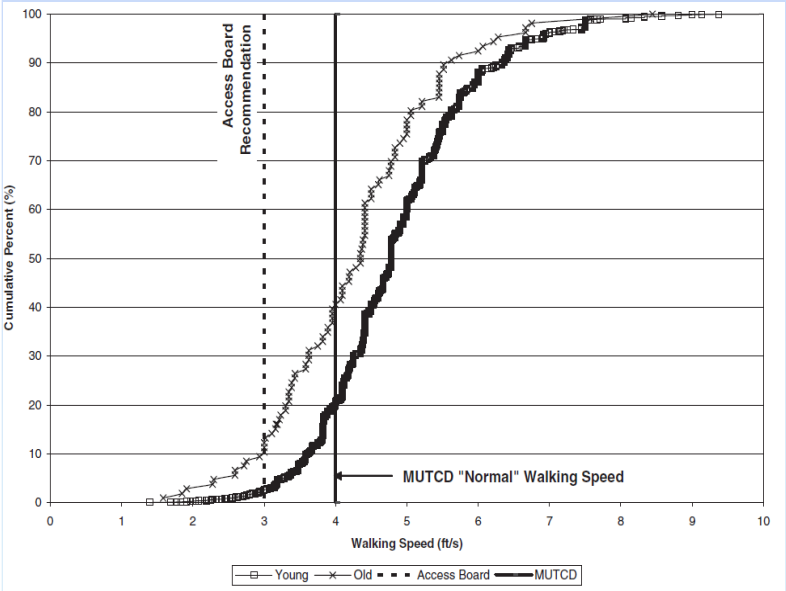
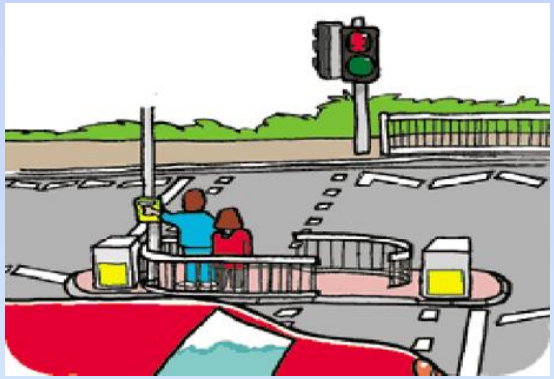
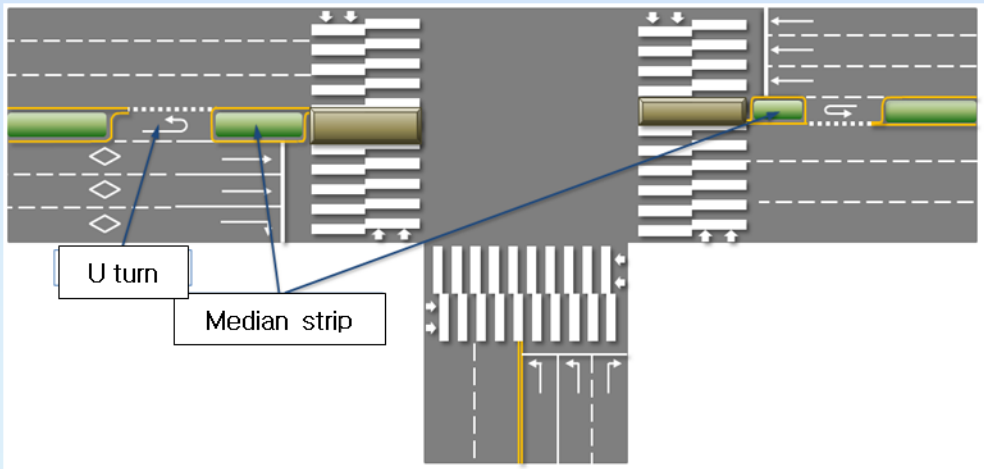
Improvement method for transportation vulnerable

❑ Design for pedestrian safety

- Adjust crossing time for elderly pedestrian
  - ❖ Pelican crossing, Staggered Pelican crossing, PUFFIN crossing
- Make refuge island







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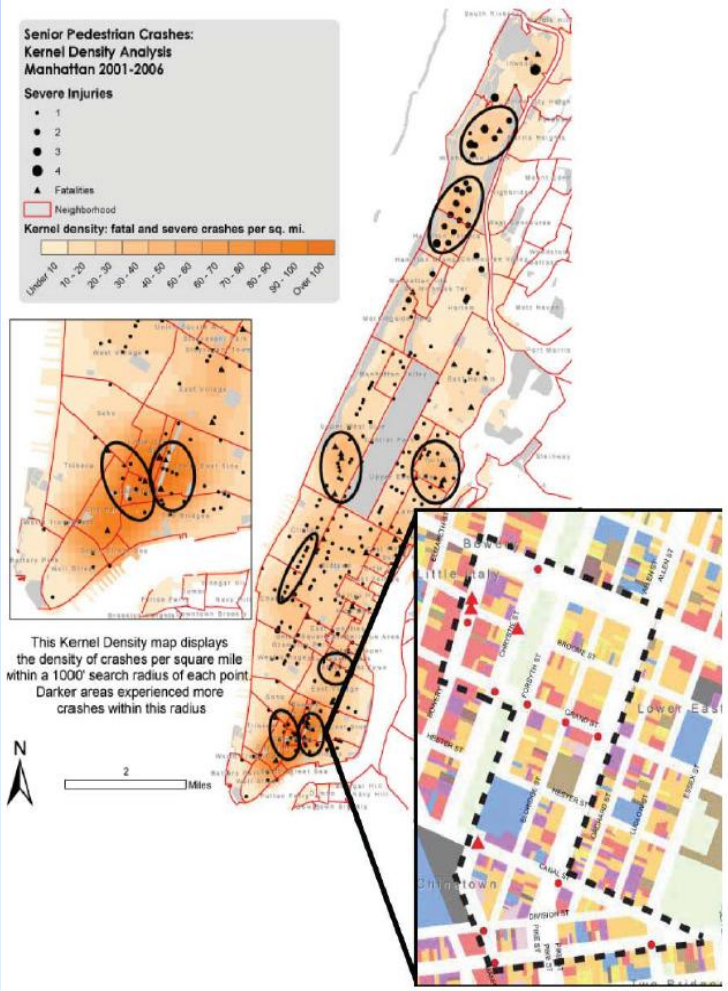
Improvement method for transportation vulnerable

❑ Design for pedestrian safety

Create database

- Create elderly accident database to manage the frequent accident area



2001~2006 Accident frequency of vehicle vs. pedestrian in Manhattan

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Conclusions

- Importance of Pedestrian-oriented transportation policies
- Create a barrier-free environment by improving the pedestrian environments for children and elderly pedestrian

Recommendations

- Sustainable study has to be performed to make barrier-free environment for transportation vulnerable
- Apply Various pedestrian-friendly design through traffic calming techniques
- Have long-term plan for pedestrian safety such as Safe Routes to Seniors project
- Make database about frequent accident area to improve pedestrian environment

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References

- NCHRP(2006), Improving Pedestrian Safety at Unsignalized Crossings, Transportation Research Board
- Morris County Division of Transportation(2006), Wharton Borough Safety Routes to School Program
- School Crossing Protection Committee(2011), Traffic Control Manual for School Crossing Protection
- Sadik-Khan, J. (2008), Reduced School Speed Limit Pilot Study-Parts I & II, New York City DOT
- Traffic Safety Toolbox: A guide for Teachers, New York City DOT
- Public Works Department Miami-Dade County(2011), Traffic Safety Plan for Elderly Pedestrians
- IRTAD http://cemt.org/IRTAD/Irtad_Database.aspx 2010.7
- OECD Statistics http://www.oecd.org/statsportal/0,3352,en_2825_293564_1_1_1_1_1,00.html 2010.7
  http://newurbannetwork.com/article/nys-complete-streets-bill-passes-unanimously-14898
- Complete Streets Policy Analysis 2010: A Story of Growing Strength
  (http://www.completestreets.org/webdocs/resources/cs-policyanalysis.pdf)

Thank You !

Discussion

Discussion

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Q&A

Thank you !