UNDERSTANDING OF SOCIO-ECOLOGICAL BARRIERS TO PRIMARY SCHOOL CHILDREN'S WALKING TO AND FROM SCHOOL IN TEHRAN

ROYA SHOKOOHI

**THESIS SUBMITTED IN FULFILMENT
OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY**

**FACULTY OF BUILT ENVIRONMENT
UNIVERSITY OF MALAYA
KUALA LUMPUR**

2012

Acknowledgements

I would like to express my sincere thanks to my supervisors, Associate Professor Dr. Sr. Noor Rosly Hanif and Associate Professor Dr. Melasutra Md Dali. They have been wonderful teachers and counsellors for the past three and half years. They freely shared their own knowledge and wisdom and provided help and support whenever I turned to them. My experience at University of Malaya was enriched because of the opportunity to work with them and I look forward to continuing this collaboration in the future.

Many thanks go to the faculty of the Built Environment and staff in the departments of Estate Management and Architecture at the University of Malaya for their assistance during my time at UM. I would like to thank Prof. Michael Gregory Lloyd who asked profound questions to develop a deeper understanding of children's status and their travel pattern; also, he introduced me to Dr. Susan Zeedyk who has done great research relating to children and safety. I would also like to thank Ar. Lim Take Bane and my dear friend Jeanette Moosavi who edited the English for my papers and reports.

I can never adequately thank the children, their parents and the staff of the schools involved in my study for their participation in my research. Without their precious gift of time, this research would have not been completed. I would like to thank Mr Mahmoud Dolat Abady in the Department of Transportation and Traffic in Tehran for giving me access to useful information about children walking to school and traffic safety as well as introducing me to a key informant in the Educational Traffic Park in Tehran (Pounak).

I do not have adequate words to thank my family and friends for their encouragement and love. They were the best support system to help me through the

dissertation and through life. Special thanks go to my parents who inspired in me the courage to try and the strength to achieve.

I would not have been able to continue in the Ph.D. programme yet for the great support from my husband Youshij and my daughter Roshan. Without their patience and love I would not have reached this stage. To them my debt is the greatest.

Table of content

Abstract i
Abstrak iii
Acknowledgements v
List of Figures x
List of Tables xiii
List of Maps xv

CHAPTER 1: Introduction.....1

1.1 Introduction 1
1.2 Barriers to children in their walking to and from school in developed countries 3
1.3 Multidisciplinary issues 6
1.4 Problem statement in Tehran 10
1.5 Research aim and scope 12
1.6 Structure of thesis 16

CHAPTER 2: Literature review.....21

2.1 Introduction 21
2.2 Urban planning- Transportation and urban design 24
2.3 Public health- Physical activity 34
2.4 Public health- The journey to school 37
2.5 Conclusion 60

CHAPTER 3: Over view of urban development in Tehran.....61

3.1 Introduction 61
3.2 Natural specifics and urban division 62
3.3 Urban development in Tehran before revolution 65
3.4 Environmental problem in Tehran 71
3.5 Status of children in Tehran and their education 77
3.6 Policies relating to children's travel mode in Tehran 82
3.7 Conclusion 85

CHAPTER 4: Research methodology.....87

4.1 Introduction 87
4.2 A conceptual framework 88
4.3 Testing the conceptual framework 93
4.4 Research sample sites 94
4.5 Data collection procedure 99
4.6 Data analysis 110
4.7 Analytical methods 111
4.8 Model specification 115
4.9 Limitations 125
4.10 Conclusion 127

CHAPTER 5: Descriptive results and discussion.....129

5.1 Basic information about children's trip to and from school 129
5.2 Descriptive results of urban design elements in neighbourhoods 144

CHAPTER 6: Results of initial Multinomial Regression Models and discussion 157

6.1 Introduction 157
6.2 Analytical methods 158
6.3 Results 158
6.4 Discussion 183
6.5 Conclusion 186

CHAPTER 7: Examining the relationship between environmental safety factors & children walking to and from school (Results and discussion).....188

7.1 Introduction 188
7.2 Mediators and Moderators 189
7.3 Hypothesis tested 190
7.4 Traffic safety hypothesis 197
7.5 Analytical methods 198
7.6 Results 201
7.7 The relationship between built environment factors and environmental safety factors 223
7.8 Interactions 228
7.9 Comparing the environmental barriers for children in their walking to and from school 231
7.10 Discussion 245
7.11 Conclusion 256

CHAPTER 8: Conclusion.....257

8.1 Introduction 257
8.2 A summary of the research findings 259
8.3 Policy implications of the research findings 264
8.4 Future research 269
8.5 Research highlights 271

Bibliography.....274

APPENDIX A:
Example of parents' questionnaire (English version).....299

APPENDIX B:
Example of parents' questionnaire (Persian version).....307

APPENDIX C:
Example of children's "Writing Activity" (English version)……...316

APPENDIX D:
Example of children's "Writing Activity" (Persian version)…….....317

APPENDIX E:
Example of children's "Spider chart" (English version).....318

APPENDIX F:
Example of children's "Spider chart" (Persian version).....319

APPENDIX G:
Example of instrument for urban design measurements.....320

List of figures

Figure 2.1: Built environment factors which correlates with walking to and from school 43
Figure 2.2: Personal safety factors which correlates with walking to and from school..45
Figure 2.3: Traffic safety factors which correlates with walking to and from school....49
Figure 2.4: Socio-demographic factors which correlates with walking to and from school.....54
Figure 2.5: Culture norms and parental attitude which correlates with walking to and from school.....59
Figure 3.1: Main aspects of the educational system in Iran.....81
Figure 4.1: Diagram of the conceptual framework of barriers for elementary-aged children walking to and from school ..... ……89
Figure 4.2: Triangulating Design Mixed Methods Research Design..... 102
Figure 4.3 :Two initial multinomial logisti regression models..... 120
Figure 5.1 :Grade distribution of children involved in the study..... 129
Figure 5.2: Income groups' distribution of parents involved in the study..... 130
Figure 5.3: Income groups' distribution of parents' educational level involved in this study..... 131
Figure 5.4: Income groups' distribution of number of children in a household 131
Figure 5.5: Income groups' distribution of number of children under 5 years old in a household..... 132
Figure 5.6: Income groups' distribution of number of children under 5 years old in a household..... 132
Figure 5.7: A child's current travel mode to and from school regardless of the different income groups..... 134
Figure 5.8: A child's current travel mode to school regarding child's gender 135
Figure 5.9: A child's current travel mode to school regarding child's age..... 136
Figure 5.10: Typical adult escort when walking to school 137
Figure 5.11: A child's current method of transport to school across different socio-economic areas 137
Figure 5.12: A child's current method of transport from school across different socio-economic areas..... 138
Figure 5.13: The preferred method of transport for a child to go to and from school .. 138
Figure 5.14: The preferred method of transport for a child to go to and from school .. 139

Figure 5.15: The preferred method of transport for a child to go to school..... 140
Figure 5.16: The preferred method of transport for a child back home..... 140
Figure 5.17: The distribution of the study population based on parental perceived distance between home and school 141
Figure 5.18: The cross tabulation between parental perceived distance between home and school and different socio-economic status areas..... 141
Figure 5.19: The cross tabulation between parental perceived distance between home and different travel modes to school 142
Figure 5.20: The cross tabulation between parental perceived distance between home and different travel modes from school..... 143
Figure 5.21: street with pavements on both sides 149
Figure 5.22: street with pavements on one side 149
Figure 5.23: street with no pavements at all 150
Figure 5.24: first floor windows facing the street on left and fences of the courtyards on right..... 152
Figure 5.25: the commercial floors in one of the neighbourhoods in Tehran..... 153
Figure 5.26: in front of the main gate of one the schools with two traffic lanes 154
Figure 5.27: a street around one the schools with speed bumps and students who are walking 154
Figure 5.28: street trees in one of the neighbourhoods from high-income areas..... 155
Figure 5.29: a small park in a neighbourhood from low-income area 155
Figure 6.1: The first floor windows are covered with curtains……..... 176
Figure 6.2: The first floor windows are not clear glass, so they cannot be seen through……..……..…176
Figure7.1:The moderation model of the analytical framework shows how traffic safety and neighbourhood safety impact on children walking to and from school……..189
Figure 7.2: Stands on pavements to prevent motor cycles being ridden on pavements 250
Figure 7.3: and Figure 7. 4: construction sites in middle income (left side) and low-income areas. 252
Figure 7.5: On-street parking in middle income areas..... 254
Figure 7.6: Wide streets in high-income areas with narrow pavements 254
Figure 7.7: Narrow streets in low-income areas without pavements 254
Figure 7.8: Wide streets with more than more than 4 lanes of traffic in middle income areas.....255
Figure 8.1: The modified conceptual framework based on results of study……..…268

List of tables

Table 3.1: Average monthly climate indicators for Tehran 65
Table 4.1: The variables taken into account in the analysis..... 121
Table 4.2: The hypothesized relationship between variables and walking to school ... 123
Table 5.1: Participant's characteristics 133
Table 5.2: Parental perception of traffic safety and neighbourhood safety barriers for their children in their walking to and from school..... 144
Table 5.3: Children's perception of traffic safety and neighbourhood safety barriers in their walking to and from school 144
Table 5.4: Percentage of blocks within ½ km radius of school with urban design characteristics..... 146
Table 5.5: Percentage of blocks within ½ km radius of school with urban design characteristic across different areas 147
Table 6.1: Association between non-urban form variables and travel mode of children to school 159
Table 6.2: Association between non-urban form variables and travel modes of children back home 163
Table 6.3: Association between no-urban form and urban form variables with travel modes of children to school 167
Table 6.4: Association between non-urban form and urban form variables with travel modes of children from school..... 172
Table 6.5: Model fitting information: the comparison between non-urban form and built environment models. 178
Table 6.6: Comparison between basic model and expanded model to see the magnitude of impact of non-urban form variables on children's transportation modes to school after adding built environment variables to the models..... 179
Table 6.7: Comparison between basic model and expanded model to see the magnitude of impact of non-urban form variables on children's transportation modes back home after adding built environment variables to the models..... 181
Table 7.1: Hypothesis testing: The influence of traffic safety and neighbourhood safety on walking to school 191
Table 7.2: Hypothesis testing: The influence of traffic safety and neighbourhood safety on walking from school..... 191

Table 7.3: Hypothesis testing: The influence of traffic safety and neighbourhood safety factors that prevent children to walk to and from school autonomously vary across different areas 192
Table 7.4: Summary of indexed independent variable and Cronbach's alpha.....193
Table 7.5: Association between non-urban form factors on parental decisions about travel modes of children to school after entering indexes 203
Table 7.6: Association between non-urban form factors on parental decisions about travel modes of children back home after entering indexes 206
Table 7.7: Relationship between traffic safety and neighbourhood safety with the likelihood of children walking to school 209
Table 7.8: Relationship between traffic safety and neighbourhood safety with likelihood of children walking back home.....213
Table 7.9: Influence of built environment factors on predicting the probability of children walking to school.....218
Table 7.10: Influence of built environment factors on predicting the probability of children walking to school.....220
Table 7.11:The effects of built environment factors on neighbourhood safety factors.223
Table 7.12: The effects of built environment factors on traffic safety factors.....225
Table 7.13: Regression with interaction variables to establish the effect of TSI and NSI factors on the probability of children's walking to school.....230
Table 7.14: Regression with interaction variables to establish the effect of TSI and NSI factors on the probability of children's walking back home.....232
Table 7.15: ANOVA test shows the initial difference between barriers across income groups. 233
Table 7.16: Scheffe test, provide multiple comparison across areas 234
Table 7.17: Barriers for children in their walking to school in high income areas.....238
Table 7.18: Barriers for children in their walking to school in middle income areas...239
Table 7.19: Barriers for children in their walking to school in low income areas.....240
Table 7.20: Barriers for children in their walking back home in high income areas....242
Table 7.21: Barriers for children in their walking back home in middle income areas 243
Table 7.22: Barriers for children in their walking back home in low income areas.....244

List of maps

Map 3.1: Map of Iran and its location in Asia. 63
Map 3.2: Location of Tehran in Iran 63
Map 3.3: Administrative districts of Tehran, red lines show the boundaries between the districts and green lines show the areas 64
Map 3.4: Historical growth of Tehran 66
Map 3.5: North-South axis in Tehran 68
Map 3.6:Tehran has expanded along the West-East axis 70
Map 3.7: Concentration of official and commercial activities in the central areas 71
Map 3.8: Restricted traffic zone and Odd/Even area 76
Map 3.9: Classification of districts in Tehran according to their socio-economic status 78
Map 4.1: Different socio-economic status areas in Tehran, source: master plan of Tehran 96
Map 4. 2: School catchment areas in Tehran 97
Map 5.1: The neighbourhood surrounding schools in district number 7 (red spots show the schools) 145
Map 5. 2: Location of buildings in a plot 152