HIV Infection and Behavioural Risk Factors among Injecting Drug Users in Hai Phong, Vietnam

S M Tanvir Ahmed

BURP, MPH

School of Medicine
Griffith Health
Griffith University

Submitted in fulfilment of the requirements of the degree of

Doctor of Philosophy

February, 2015
ABSTRACT

Injecting drug use worldwide accounts for a high proportion of new Human Immunodeficiency Virus (HIV) infection, driving the national epidemics in many countries where HIV prevalence among injecting drug users (IDUs) is prominent. HIV testing started in Vietnam in 1988 and the first HIV case was detected in 1990. The epidemic has now concentrated among young IDUs in northern Vietnam. Hai Phong is one of the provinces located in the north of Vietnam which has become a high HIV prevalence province affecting young IDUs. The present research estimates HIV infection rates among IDUs in Hai Phong. It examines behavioural risk factors associated with HIV infection, sharing and condom use as well as highlighting drug and sex related transmission risks. The research has several stages including secondary analysis of national level behavioural survey data (2011) and qualitative exploratory research (2012). Each phase of the research supplements the others, in order to attain the research objectives and to address behavioural issues associated with the current epidemic.

Results reveal that high HIV prevalence (43.45%) persists in Hai Phong, affecting young (< 30 years) and young adult (30-39 years) IDUs. The risk factors for HIV infection among IDUs, after adjusting confounders include: being a young adult (30-39 years) (OR 3.7, 95%CI 1.5-8.8, p<0.05); being unmarried (OR 3.0, 95%CI 1.01-9.3, p<0.05); living for a lengthy time in Hai Phong (25 years or more) (OR 3.1, 95%CI 1.1-8.7, p<0.05); injecting over a long period (9 years or more) (OR 5.3, 95%CI 1.4-19.4, p<0.01); having a past history of needle sharing (OR 3.3, 95%CI 1.3-7.6, p<0.01); injecting along railway routes (during the last week) (OR 2.2, 95%CI 1.05-4.7, p<0.05); and rapid transition to injectable drugs (within a year) (OR 4.9, 95%CI 1.01-24.6, p<0.05).

The results of the research show that almost a quarter (24.34%) of IDUs are engaged in sharing practices (needles/syringes, drug solutions or other injection paraphernalia). The behavioural correlates associated with sharing among IDUs, after adjusting confounders include: past history of needle sharing (OR 2.7 95%CI 1.2-5.9, p<0.01); visiting more than one hotspots (over the last week) (OR 1.9, 95%CI 1.01-3.6, p<0.05); injecting more than once a day (over the last month) (OR 3.5, 95%CI 1.1-11.2, p<0.05); difficulty in obtaining sterile needles/syringes when needed (OR 3.3, 95%CI 1.3-8.7, p<0.01); and a
lack of knowledge of HIV transmission and non-transmission (rejecting two major misconceptions) (OR 2.1, 95%CI 1.1-3.9, p<0.05).

The results of the research highlight the fact that only 2 out of 5 (41.67%) IDUs have used condoms consistently with their regular partners (wives/girlfriends) over the last twelve months. The behavioural correlates associated with inconsistent use of condoms among IDUs, after adjusting confounders include: drinking alcohol occasionally in the month before the interview (OR 2.8, 95%CI 1.5-5.1, p<0.01); visiting injecting sites frequently (more than 10 times in the past week) (OR 4.5, 95%CI 1.6-12.4, p<0.01); and a lack of knowledge of HIV transmission and non-transmission (rejecting two major misconceptions) (OR 3.1, 95%CI 1.03-10.1, p<0.05). In addition, those who had more than two sexual partners in the last year are more likely (OR 3.7, 95%CI 1.1-12.8, p<0.05) and those who were aged between 30-39 years are less likely (OR 0.2, 95%CI 0.1-0.6, p<0.01) to be inconsistent users of condoms.

In addition to the survey results, findings from the qualitative exploratory research have confirmed drug injecting and sexual risk behaviours, highlighting a transmission risk among IDUs. Most of them injected the jointly purchased drugs in groups and are indirectly prone to HIV transmission risk. The places near railway lines and the vicinities where they took drugs offer minimum scope for safe practices and generate fear of police arrests. In addition, the non-condom use attitude of IDUs with different sexual partners generates the possible risk of heterosexual transmission among a low risk population. The context upon which IDUs engage in risk behaviours is largely the result of a number of situational factors, including places for injection, police raids, lack of availability of needles/syringes, limited coverage of harm reduction programs and the impact of the punitive drug policy.

This research documented both the injection and sexual risk behaviours among IDUs which ultimately have been influencing the current epidemic situation. The existing harm reduction program among IDUs needs to be strengthened in order to reduce the current level of HIV infection.
KEY WORDS

AIDS
Correlates
Golden Triangle
Hai Phong
HIV
Injecting Drug Users
PLHIV
Prevention
Risk Factors
Risk Behaviours
Sharing Practices
Southeast Asia
Treatment
Vietnam
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Key Words</td>
<td>iv</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>v</td>
</tr>
<tr>
<td>List of Tables</td>
<td>x</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xi</td>
</tr>
<tr>
<td>Statement of Originality</td>
<td>xii</td>
</tr>
<tr>
<td>Key Terms</td>
<td>xiii</td>
</tr>
<tr>
<td>Abbreviations and Acronyms</td>
<td>xiv</td>
</tr>
<tr>
<td>Paper Published and Unpublished (in progress)</td>
<td>xv</td>
</tr>
<tr>
<td>Conferences Presentation and Participation</td>
<td>xvi</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>xvii</td>
</tr>
</tbody>
</table>

## Chapter One: Introduction

1.1 Background and Significance                                         1
1.2 Research Aim and Objectives                                         3
1.3 Research Questions                                                  4
1.4 Structure                                                           4

## Chapter Two: Literature Review

2.1 Theoretical Framework: Review and Conceptualisation                 7
   2.1.1 Modified Social Ecological Model                                 9
2.2 IDUs and HIV/AIDS Epidemic                                           11
   2.2.1 IDUs and the Current HIV/AIDS Epidemic                          11
   2.2.2 IDUs and the Regional HIV/AIDS Epidemic                          13
   2.2.3 Summary                                                         15
2.3 IDUs and Behavioural Risk factors                                    16
   2.3.1 Risk Factors for HIV Infection among IDUs                       16
   2.3.2 Correlates for Sharing among IDUs                               19
   2.3.3 Correlates for Condom Use among IDUs                            22
   2.3.4 Summary                                                         24
2.4 HIV Epidemic and Risk Behaviours among IDUs in Vietnam              24
   2.4.1 HIV Prevalence                                                 25
   2.4.2 Behavioural Factors Influencing the HIV Epidemic among IDUs     26
   2.4.2.1 Demographic Issues                                           26
   2.4.2.2 Drug Use Issues                                               27
   2.4.2.3 Sex Work Issues                                               28
   2.4.2.4 Overlapping Drug Use and Sex Work Issues                      29
   2.4.3 Epidemiologic Implications                                      30
2.4.3.1 Epidemics in IDU Subgroups 30
2.4.3.2 Chain of Infection 30
2.4.3.3 Drug Injecting FSWs 31
2.4.4 Proposed Research 31
2.4.5 Summary 32

**Chapter Three: Methodology** 33 - 60

3.1 Research Design and Conceptual Framework 33
3.2 Background Context of Research Design 36
  3.2.1 Integrated Biological and Behavioural Surveillance 36
3.3 Scoping Visit 37
3.4 Study Population and Study Area 38
3.5 Inclusion and Exclusion Criteria 38
  3.5.1 Inclusion Criteria 39
  3.5.2 Exclusion Criteria 39
3.6 Survey Research (Phase Two, Behavioural Survey) 40
  3.6.1 Sampling 40
  3.6.1.1 Sample Size Calculation 40
  3.6.1.2 Selection of Sampling Strategies 40
  3.6.1.3 Time Location Sampling 42
  3.6.2 Data Collection 44
  3.6.2.1 Training and Piloting of Questionnaire (Pre-testing) 44
  3.6.2.2 Data Collection Procedures 45
  3.6.2.3 Survey Questionnaires 47
  3.6.2.4 Other Data Collection Forms 48
  3.6.3 HIV Testing 49
  3.6.4 Data Management and Analysis 49
  3.6.4.1 Data Security 49
  3.6.4.2 Data Entry 49
  3.6.4.3 Data Storage 50
  3.6.4.4 Study Variables 50
  3.6.4.5 Data Analysis 52
  3.6.5 Ethical Considerations 54
3.7 Exploratory Qualitative Research (Phase Three) 54
  3.7.1 Participants and Selection Process 54
  3.7.1.1 Participants 54
  3.7.1.2 Contents 55
  3.7.1.3 Recruitment 55
  3.7.2 Data Collection 56
  3.7.3 Data Management and Analysis 57
  3.7.3.1 Data Organization and Preparation 57
3.7.3.2 Transcription and Translation 57
3.7.3.3 Data Analysis 58

3.7.4 Ethical Considerations 58

3.8 Data Synthesis and Report Writing 59

Chapter Four: Survey Results 61 - 97

Section 4.1: Characteristics and Behavioural Risk Profile 62
4.1.1 Socio-demographic Characteristics 62
4.1.2 Drug Use and Sharing (N/S, Drug Solution or Equipment) 63
4.1.3 Sexual Behaviour and Condom Use Status 67
4.1.4 HIV Knowledge, Awareness and Related Services 70

Section 4.2: HIV Infection and Associated Risk Factors 73
4.2.1 Prevalence of HIV 73
4.2.2 Factors Associated with HIV Infection 73
4.2.2.1 Socio-demographic Factors 73
4.2.2.2 Drug Use and Sharing Equipment 75
4.2.2.3 Sexual Behaviour and Condom Use 77
4.2.2.4 HIV Knowledge, Awareness and Services by HIV Status 78
4.2.3 HIV Infection and Risk Factors: Multivariate Analysis Results 79

Section 4.3: Sharing and Correlates of Sharing Practices 81
4.3.1 Prevalence of Sharing Practice 81
4.3.2 Factors Associated with Sharing Practices (Univariate Analysis) 81
4.3.2.1 Socio-demographic Characteristics 81
4.3.2.2 Drug Use and Sharing Status 82
4.3.2.3 Sex Work and Condom Use 85
4.3.2.4 HIV Knowledge, Awareness and Services by Sharing Status 86
4.3.3 Correlates of Sharing Practices (Multivariate Analysis) 86

Section 4.4: Condom Use and Associated Correlates 88
4.4.1 Prevalence of Condom Use 88
4.4.2 Factors Associated with Condom Use Behaviours (Univariate Analysis) 88
4.4.2.1 Socio-demographic Characteristics 88
4.4.2.2 Drug Use and Condom Use Status 89
4.4.2.3 Sex Work and Condom Use 91
4.4.2.4 HIV Knowledge, Awareness and Services by Condom Use 92
4.4.3 Correlates of Inconsistent Condom Use (Multivariate Analysis) 93

Chapter Five: Exploratory Qualitative Research 98 - 127

5.1 Characteristics of the Participants 98
5.2 Qualitative Data Analysis Thematic Framework 100

5.3 Drug Use and Sharing Behaviours 101
5.3.1 Drug use 101
5.3.1.1 Context of First Drug Use 101
5.3.1.2 Length of Using Drugs 103
5.3.1.3 Types of Drugs Using Currently 103
5.3.1.4 Drug Using Friends and Network Characteristics 104
5.3.1.5 Place of Injecting 104
5.3.1.6 Last injecting session 106
5.3.2 Sharing Behaviours 108
5.3.2.1 Context of Group Injecting 108
5.3.2.2 Process of Collective Drug Preparation 109
5.3.2.3 Sharing in Collective Drug Use (N/S, water containers, filter) 111
5.3.2.4 Personal Views about Sharing Behaviours 114
5.3.2.5 Attitude and Perception of Friends towards Sharing Behaviours 114
5.3.2.6 Management strategies to avoid sharing 115
5.3.3 Summary on Drug Use and Sharing Behaviours 116

5.4 Sexual Behaviours and Condom Use Status 116
5.4.1 Sexual Behaviours 117
5.4.1.1 Context of Sexual Debut: Age, Partner, Place 117
5.4.1.2 Sexual Partners 117
5.4.1.3 Last Sexual Intercourse 117
5.4.2 Condom Use Behaviours 118
5.4.2.1 Personal Views on Condom Use 119
5.4.2.2 Context of Engaging in Condom and Non-condom Sex Acts 120
5.4.2.3 Attitude and Perception of Friends 121
5.4.3 Summary on Sexual behaviours and Condom Use 122

5.5 Access to Harm Reduction Services 123
5.5.1 Access to Free Safe Practice Products 123
5.5.2 Personal Views on Services 124
5.5.3 Comments from Friends 124
5.5.4 Summary on Service Accessibility 125

5.6 Recommendations from Participants 125

**Chapter Six: Discussion and Research Implication** 128 - 154

6.1 Discussion 128
6.1.1 Factors associated with HIV infection 128
6.1.2 Correlates of sharing practices 137
6.1.3 Correlates of inconsistent condom use behaviours 143

6.2 Strengths and Limitations 151

**Chapter Seven: Conclusion** 155 - 158

7.1 Implications of this Research 155
7.2 Future Research Considerations 156
7.3 Conclusion 157

**REFERENCES** 159 - 180
APPENDICES  

Appendix A: Memorandum of Understanding (MOU - GU & VAAC)  
Appendix B: Letter of Support as External Supervisor  
Appendix C: Sample Size Calculation  
Appendix D: Mapping, Sampling Frame Development under TLS  
Appendix E: Behavioural Survey Questionnaire (Phase Two)  
Appendix F: Ethical Procedure: Survey Research (Phase Two)  
Appendix G: Interview Checklist (Phase Three)  
Appendix H: Letter of Approval (GU-HREC) (Phase Three)  
Appendix I: VAAC Letter of Authorization (Phase Three)
LIST OF TABLES

Table 3.1: Research phases and key features of research questions, objectives and aim 35
Table 4.1: Socio-demographic characteristics 63
Table 4.2: Drug use characteristics and sharing practice 64
Table 4.3: Sexual behavioural characteristics and condom use status 69
Table 4.4: HIV knowledge, awareness and services 71
Table 4.5: Socio-demographic distribution by HIV status 74
Table 4.6: Drug use and sharing practice by HIV status 77
Table 4.7: Sexual behaviours and condom use by HIV status 78
Table 4.8: Knowledge and HIV testing by HIV status 79
Table 4.9: Risk factors for HIV infection among IDUs in Hai Phong 80
Table 4.10: Socio-demographic information by sharing behaviour 82
Table 4.11: Drug use information by sharing behaviours 84
Table 4.12: Sexual behaviour information by sharing behaviour 85
Table 4.13: Knowledge and HIV testing information by sharing behaviours 86
Table 4.14: Sharing practices and correlates of sharing practices 87
Table 4.15: Socio-demographic information by condom use status 89
Table 4.16: Drug use information by condom use status 91
Table 4.17: Sexual behaviours information by condom use status 92
Table 4.18: Knowledge and HIV testing information by condom use status 93
Table 4.19: Condom use and correlates of condom use behaviours 94
Table 4.20: Association between explanatory and outcome variables (adjusted p-values) 96
Table 5.1: Socio-demographic characteristics of respondents 99
LIST OF FIGURES

Figure 2.1: Behavioural Domains in Social Cognitive Theory 8
Figure 2.2: Modified Social Ecological Model for HIV Epidemiologic Research among IDUs 10
Figure 2.3: Sub-regional Diffusion– Epidemic Take Off (TO), First Case (FC) 14
Figure 3.1: Research Flow Diagram 34
Figure 3.2: Map Showing Vietnam and Selected Districts for IBBS in Hanoi, Vietnam 39
Figure 3.3: Criteria for Selecting Sampling Method 41
Figure 3.4: Data Collection Procedures at Study Centre 46
Figure 4.1: Attempt for quitting injection drug use (IDU) and different mechanisms 66
Figure 4.2: Frequency of sexual episodes and sexual partner types 68
Figure 4.3: History of HIV testing and ARV services 71
Figure 4.4: Knowledge of methadone clinic and methadone treatment 72
Figure 5.1: Transmission risks in group injecting, sharing & places for injecting (….direct relationship and ____ indirect relationship) 116
Figure 5.2: Sexual Behaviours, Partner Relationships and Condom Use Attitude (Filled arrow shows strong attitude and break arrow shows casual attitudes) 66
STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

___________________________
Ahmed, S M Tanvir
KEY TERMS

Sharing practice or behaviour: Sharing practice or behaviour includes any type of sharing in which IDUs often engage, such as (i) distributive sharing (distributing needles/syringes to other IDUs) after personal use, or (ii) receptive sharing (receiving needles/syringes from others IDUs) after their use, or (iii) sharing drugs and other injection paraphernalia (common water containers, spoons, cookers) during drug preparatory stage including backloading/frontloading, a technique frequently applied during dividing purified drugs among members. The term ‘sharing’ is interchangeably used with the terms ‘needle sharing’ or ‘needle/syringe sharing’.

Direct Sharing: Distributive or receptive sharing where needles/syringes are shared is known as direct sharing.

Indirect Sharing: Sharing liquid drug solution and other injection paraphernalia (common water containers, spoons, cookers) and frontloading or backloading (a technique adopted by IDUs to divide liquid drugs among group members) involving previously used syringes. These are known as indirect sharing because of the indirect transmission risks associated in this process.

Hotspots: The places where IDUs gather to meet and inject. These are also the places where drugs are being sold.

Young, Adult and Older IDUs: IDUs who are less than 30 years and 40 years or above are categorised as young IDUs and older IDUs respectively. Those who belong within the age bracket of 30 to 39 years have been categorised as young adult IDUs.

Regular Partners: Wives or girlfriends of the IDUs termed as regular partners and described as regular partners (wife/girlfriend).
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>ARV</td>
<td>Antiretroviral</td>
</tr>
<tr>
<td>ATS</td>
<td>Amphetamine Type Stimulants</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence Interval</td>
</tr>
<tr>
<td>EIA</td>
<td>Enzyme Immune Assay</td>
</tr>
<tr>
<td>FHI360</td>
<td>Family Health International 360</td>
</tr>
<tr>
<td>FSW</td>
<td>Female Sex Worker</td>
</tr>
<tr>
<td>GU</td>
<td>Griffith University</td>
</tr>
<tr>
<td>HCV</td>
<td>Hepatitis C Virus</td>
</tr>
<tr>
<td>HCMC</td>
<td>Ho Chi Minh City</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>IBBSS</td>
<td>Integrated Biological and Behavioural Surveillance</td>
</tr>
<tr>
<td>IDUs</td>
<td>Injecting Drug Users</td>
</tr>
<tr>
<td>IRB</td>
<td>Institutional Review Board</td>
</tr>
<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MSM</td>
<td>Men who have Sex with Men</td>
</tr>
<tr>
<td>MMT</td>
<td>Methadone Maintenance Treatment</td>
</tr>
<tr>
<td>MSEM</td>
<td>Modified Social Ecological Model</td>
</tr>
<tr>
<td>N/S</td>
<td>Needles/Syringes</td>
</tr>
<tr>
<td>NIHE</td>
<td>National Institute of Hygiene and Epidemiology</td>
</tr>
<tr>
<td>NRL</td>
<td>National Reference Laboratory</td>
</tr>
<tr>
<td>OR</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>OST</td>
<td>Oral Substitution Treatment</td>
</tr>
<tr>
<td>PHR</td>
<td>Partners in Health Research</td>
</tr>
<tr>
<td>PLHIV</td>
<td>People Living with HIV</td>
</tr>
<tr>
<td>PMC</td>
<td>Preventive Medicine Centre</td>
</tr>
<tr>
<td>PPS</td>
<td>Probability Proportion to Size</td>
</tr>
<tr>
<td>PSU</td>
<td>Primary Sampling Unit</td>
</tr>
<tr>
<td>RDS</td>
<td>Respondent Driven Sampling</td>
</tr>
<tr>
<td>SEA</td>
<td>South East Asia</td>
</tr>
<tr>
<td>SEM</td>
<td>Social Ecological Model</td>
</tr>
<tr>
<td>STD</td>
<td>Sexually Transmitted Diseases</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually Transmitted Infection</td>
</tr>
<tr>
<td>TLS</td>
<td>Time Location Sampling</td>
</tr>
<tr>
<td>UNAIDS</td>
<td>Joint United Nations Program on HIV/AIDS</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>VAAC</td>
<td>Vietnam Authority of HIV/AIDS Control</td>
</tr>
<tr>
<td>VCT</td>
<td>Voluntary Counselling and Testing</td>
</tr>
<tr>
<td>VND</td>
<td>Vietnamese Dong</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance Inflation Factor</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>Approx.</td>
<td>Approximately</td>
</tr>
<tr>
<td>ID.</td>
<td>Identity/Identification</td>
</tr>
<tr>
<td>No.</td>
<td>Numbers</td>
</tr>
<tr>
<td>Sl.</td>
<td>Serial</td>
</tr>
</tbody>
</table>
PAPER PUBLISHED

Published


Paper 4: Drug injecting and HIV risk among injecting drug users in Hai Phong, Vietnam: Qualitative Results BMC Public Health (View Paper Online)

Paper 5: Access to HIV Prevention Services for Injecting Drug Users in Hai Phong, Vietnam: Qualitative Results International Journal of Medical and Health Sciences Research (View Paper Online)

Paper 6: Early Stages of HIV Epidemic among Injecting Drug Users: Lessons to be Learned. Global Journal of Medical and Public Health (View Paper Online)

In Progress & Post-submission

Paper 7: Risk environment and punitive drug law: Policy implication from a qualitative research among injecting drug users in Vietnam [in progress]

Paper 8: Harm Reduction Program among Injecting Drug Users: An Overview of Evidence [in progress]


CONFERENCE PARTICIPATION & PRESENTATION

Conferences

2011

2012

2013


2014


Research Symposia

2012
Global Health Institute – HIV/AIDS, two weeks (June 8-22) HIV symposium in Brown University. Providence, Rhode Island, USA.

Other Events

2014
Council of Australian Postgraduate Associations Inc. (CAPA): National Postgraduate Conference and Annual Council Meeting (November 24-28) in Australian National University, Australia
ACKNOWLEDGEMENT

I would like to thank everyone who assisted in this research as a Doctor of Philosophy student at Griffith University, Queensland, Australia. First and foremost, my deepest gratitude goes to the principal supervisor Professor Donald Stewart for his continuous interest in this research, valuable time, precious efforts, dedicated reading and constructive comments. I would like to express my sincere thanks for his constant motivation and implicit guidance to complete the research. My sincere thanks are also due to Professor Nguyen Thanh Long, at the Vietnam Authority of HIV/AIDS Control (VAAC) who served as an external supervisor in this research. I would like to thank him for the support of VAAC and his cooperation during field activities, without which the research would not be possible. I am also grateful to Dr Phan Thi Huong in VAAC for her valuable support in assuring official arrangements in government and non-government organizations in order to carry out different meetings and field procedures at a provincial level. My sincere thanks are also due to Dr Tra Tran Thi Bich in VAAC for her valued cooperation during the scoping visit. Dr. Tra also deserves special thanks for organizing my accommodation at the dormitory of the Hanoi School of Public Health. I would like to thank Dr Patricia Lee for her invaluable contribution to the interpretation of statistical results and finalisation of the thesis chapters.

I owe Dr Steven Mills in Family Health International (FHI360) a debt of gratitude for allowing the use of behavioural survey datasets for this research. I am also greatly indebted to Dr Nguyen Cuong Quoc in FHI360 for his valuable suggestions, which he provided during several meetings throughout my time in Vietnam. My special thanks to Dr Tran Vu Hoang in Partner in Health Research (PHR) in Vietnam who is one of the Principal Investigators (PI) in the behavioural survey (the datasets of this survey used in this research for secondary analysis in phase two). I would like to thank him for his technical advice relating to survey data analysis and his great contribution in implementing the exploratory qualitative research. My gratitude also goes to Minh Hoang in PHR for handy tips to manipulate statistical software and assistance in data analysis. I would also like to thank Ms Van Anh Do Thi and Minh Hoang for conducting the interviews, as well as other people from the provincial program who facilitated the recruitment process.
I am highly grateful to the Australia Awards for supporting my PhD study in Australia and I am thankful to the student contact officers who showed genuine concern about my timely progress. I would like to thank the Population and Social Health Research Program (PSHRP) for granting limited funds towards conference attendance and publications. I would like to thank the tutors at the Griffith English Language Institute (GELI) for their substantive contribution in correcting and editing this thesis.

My appreciation goes to many good friends for their fellowship and support during my PhD journey. I thank them for helping, encouraging and sharing emotions. I also thank Ms Van Anh Nguyen in VAAC for the time she has given to help me to understand the local culture, to taste the local food and to guide shopping expeditions during my time in Vietnam.

I would like to sincerely thank my family members for their inspiration and encouragement throughout the PhD journey, especially during my struggle in field data collection. Lastly, my greatest gratitude goes to the almighty Allah for providing the strength and ability to complete this research.