

**Aboriginal and Torres Strait
Islander women:
An examination of smoking
during pregnancy**

Conor Gilligan
B.BioMedSci (Hons)

Thesis submitted for fulfillment of the award of:
Doctor of Philosophy (Health Behaviour Science)
The University of Newcastle

Submitted February 2008

I hereby certify that the work embodied in this Thesis is the result of original research and has not been submitted for a higher degree to any other University or Institution.

*Signed:*_____

Date: _____

Acknowledgements

Firstly, I must thank Professor Peter Dunkley for encouraging me to spread my wings from the world of biochemistry, and Professor Rob Sanson-Fisher for having faith in me to make the transition into public health and health behaviour science. Rob; the wisdom and experience which you have so generously shared with me have been inspirational, and I am immensely grateful for the opportunities you have given me.

My co-supervisors Professor Catherine D'Este and Dr Sandra Eades have also been wonderful teachers. Cate; your patience with my floundering efforts in statistics has been incredible. Particularly during the late phases of the writing process, your knowledge and ability saved both my thesis and my sanity.

My PhD adventure took me to Far North Queensland where I found friends and colleagues whose hard work and support I could not have survived without. All the staff at Wuchopperen health service, TAIHS Mums and Babies, and in Women's Health at Cairns Base Hospital, helped me to keep the wheels turning. Particularly at Wuchopperen, the assistance and emotional support of Dr Mark Wenitong, Dr Sharmilla Biswas, Dr Annie Thomas, and my surrogate father in the north; Noel Rofe were invaluable.

The writing process and my somewhat manic work regime were made immeasurably easier by the help of Frances Kay-Lambkin, Meredith Tavener, and the 'girls in the office' at the David Maddison Building.

I must thank my friends and family for still being my friends and still speaking to me at the end of this process. My brother, sister, and close friends were all still there when I

finally emerged from 'social hibernation' during my most busy times. Sarah; my friend and life-long lab partner (long after I've left the lab), you're my 'go-to' girl. Kate, I'm lucky to have a sister and a friend who is so understanding. Virginia, you kept me sane in 'the dungeon' in year one, and were there to help me celebrate when the writing was done. Dave, Jess, Nicole, and Laurette; you've all been instrumental in helping me to get through this process relatively unscathed.

My parents deserve special thanks...and probably a medal. Mum and Dad; you have been my rock throughout my life, and particularly in the last three years. Dad; your wisdom, those counselling sessions over the phone, your encouragement and your understanding have kept me going when I wanted to give up and become a professional traveller. Mum; your acceptance of my decisions and understanding has meant a lot, your survival packs provided nutritional and emotional sustenance in my loneliness.

Finally, I'd like to dedicate this work to two amazing role-models in my life. My Grandfather Bill who told me that I'd be going to Uni before I'd even started kindergarten, and my Grandmother Joy, whose strength and wisdom continue to inspire me. I love you and miss you both.

Table of Contents

Acknowledgments.....	i
Table of Contents.....	iii
List of Tables.....	vii
List of Figures	ix
List of Boxes	x
List of Appendices.....	x
Abstract.....	xii
List of Abbreviations	xiv
 <i>Chapter 1 – Indigenous health, social health, and the health of Australians.....</i>	 1
Introduction	2
History and governance	8
Australian finds a social conscience	14
Informing health policy for Aboriginal and Torres Strait Islander Australians	16
Other more recent approaches to governance and policy	18
Why does the gap remain?	20
The need for evaluation	23
The status of Australia’s Aboriginal and Torres Strait Islander people today	25
Multiple risk factors	36
Where to start in bridging the gap.....	37
References	40
 <i>Chapter 2 – Antenatal health risk factors among women giving birth at Cairns Base Hospital.....</i>	 47
Introduction	48
Social and demographic predictors of birth outcome	48
Health and health risk behaviours associated with poor birth outcomes.....	52

Chapter 2 continued...

Study objectives.....	55
Methods.....	56
Statistical analysis	63
Results.....	68
Discussion	82
Future directions	90
References	92

Chapter 3 – Antenatal smoking in vulnerable population groups: An area of need..... 116

Introduction	117
Methods.....	120
Results.....	124
Discussion	128
Conclusion.....	134
References	136

Chapter Four – Intervening to reduce antenatal smoking: What can we tell clinicians about the most effective strategies for intervening with antenatal smoking? 140

Introduction.....	141
Looking to the published literature	142
Methods.....	145
Statistical analysis	154
Results.....	155
Discussion	166
References	175

Chapter 5 – Knowledge and attitudes regarding smoking during pregnancy: A descriptive study of Aboriginal and Torres Strait Islander women to guide the design of an effective intervention..... 182

Introduction	183
Methods	189
Statistical analysis	192
Results	195
Discussion	207
Conclusions	217
References	219

Chapter 6 – A critical examination of publications relating to the validation of cotinine as a gold-standard measure of cigarette consumption 243

Introduction	244
Methods	247
Results	254
Discussion	259
References	264

Chapter 7 – Establishing cotinine cut-points for smoking in antenatal Aboriginal and Torres Strait Islander women 282

Introduction	283
Objectives	286
Methods	286
Statistical analysis	290
Results	293
Discussion	303
Conclusions	308
References	309

<i>Chapter 8 – A pilot randomised controlled trial to test the effectiveness of an intervention to help Aboriginal and Torres Strait Islander women quite smoking during pregnancy: Study design and preliminary results.....</i>	<i>315</i>
Introduction	316
Key elements of intervention	317
An ongoing study	330
Objectives of the study	330
Methods	331
Statistical analysis	345
Results	347
Discussion	368
What can be drawn from the results?	380
References	383
 <i>Chapter 9 – Future directions</i>	 <i>443</i>
What do these studies add to the field?	444
Antenatal smoking is one marker of the vulnerability of Aboriginal and Torres Strait Islander women	444
What works in the effort to intervene in antenatal smoking?.....	445
The social environment predicts continued smoking during pregnancy.....	445
Cotinine is a robust measure of smoking status and tool for the validation of self-report	446
Detecting smoking and using opportunities for intervention.....	446
Mobilising social support.....	448
The extra impact.....	449
Implications for research design	449
Alternative evaluation designs	451
A way forward.....	453
References	454

List of Tables

Table 2.1	Comparison of participant and non-participant demographic characteristics	70
Table 2.2	Participant characteristics	71
Table 2.3	Variables included in, and excluded from, cluster analysis	73
Table 2.4	Demographic characteristics of women within each cluster	75
Table 2.5	Health and lifestyle characteristics of women within each cluster ..	76
Table 2.6	Obstetric and gynaecological characteristics of women within each cluster	77
Table 3.1	Discrepancies in infant mortality rates between Indigenous and non-Indigenous groups	118
Table 3.2	Trends in publication volume	126
Table 4.1	Minimum methodological criteria for inclusion of studies into the review	147
Table 4.2	Criteria for assessment of included studies.....	149
Table 4.3	Meta-regression analysis; intervention strategies used	159
Table 4.4	Meta-regression analysis; logistical features of the intervention ..	160
Table 4.5	Meta-regression analysis; outcome measures and timing	162
Table 4.6	Participant numbers, attrition and smoking cessation levels achieved, multiple linear regression.....	162
Table 4.7	Meta-regression analysis; methodological features	164
Table 4.8	Cut-points used to distinguish smokers from non-smokers in cotinine analysis.....	165
Table 5.1	Characteristics of participants and non-participants.....	197
Table 5.2	Responses to knowledge items	198
Table 5.3	Responses to attitude items.....	199
Table 5.4	Enabling factors	201
Table 5.5	Reinforcing factors	202

Table 5.6	Stressful events experienced in previous 12 months	203
Table 5.7	Final logistic regression model for predictors of continued smoking during pregnancy	204
Table 5.8	Patterns of smoking behaviour.....	206
Table 6.1	Criteria used to assess the adequacy of tests for cotinine and summary of results.....	249
Table 7.1	Characteristics of the population assessed for environmental influences and individual variation	295
Table 7.2	Univariate analysis of potential confounding factors for cotinine..	296
Table 7.3	Final linear regression model of factors associated with cotinine level	297
Table 7.4	Characteristics of the validation sample.....	298
Table 7.5	Examination of cut-points for CO and cotinine	299
Table 7.6	Sensitivity and specificity calculations for self-reported smoking status with cotinine validated smoking status at 250ng/mL cut-point	301
Table 7.7	Sensitivity and specificity calculations for self-reported smoking status with cotinine validated smoking status at 175ng/mL cut-point	302
Table 7.8	Sensitivity and specificity calculations for self-reported smoking status and passive smoking level with cotinine validated smoking status at 175ng/mL cut-point.....	302
Table 8.1	Demographic characteristics of consenting and non-consenting eligible women at baseline	351
Table 8.2	Demographic characteristics of women recruited from Wuchopperen and TAIHS	352
Table 8.3	Baseline characteristics of AC and UC participants	354
Table 8.4	Primary smoking cessation outcomes.....	355
Table 8.5	Process measures recorded 3-7 days after intervention delivery.....	360

Table 8.6	NRT use and success.....	362
Table 8.7	Percentage of women who were provided with NRT who agree with the statements	364

List of Figures

Figure 1.1	The link between physical health, health behaviours and mental health	33
Figure 2.1	Eligibility and consent process	69
Figure 3.1	Trends in publication volume	125
Figure 3.2	Classification of publications	127
Figure 4.1	Number of papers regarding smoking cessation during pregnancy published since 1995 which met levels of methodological criteria	156
Figure 4.2	Forrest plot of studies included in the meta-analysis	158
Figure 5.1	Summary of eligibility and recruitment numbers	195
Figure 7.1	Receiver Operator Characteristic (ROC) curve of carbon monoxide determined smoking status and cotinine levels.....	300
Figure 8.1	Recruitment process for the pilot RCT to April 2007	348
Figure 8.2	Follow-up and analysis of pilot sample, those eligible for 34-36 week follow-up before April 2007	349
Figure 8.3	Uptake of the intervention and attempts to quit smoking	359

List of Boxes

Box 7.1	Adapted criteria for the validation of a diagnostic test.....	287
---------	---	-----

List of Appendices

App 2.1	University certificate of ethical approval for study	99
App 2.2	Cairns Base Hospital letter of ethical approval for study	100
App 2.3	Board of Mookai Rosie Bi Bayan letter of ethical approval for the study	102
App 2.4	Information statement and consent form.....	103
App 2.5	Health and risk factors during pregnancy questionnaire	108
App 4.1	179
App 5.1	University certificate of ethical approval for study	224
App 5.2	TAIHS endorsement letter for study	225
App 5.3	Wuchopperen endorsement letter for study	227
App 5.4	Participant information statement and consent form	229
App 5.5	Knowledge and attitudes questionnaire	233
App 5.6	Univariate analysis of variables for their association with smoking behaviour	239
App 5.7	Percentage of women who believe that smoking in pregnancy could increase the risk of each adverse outcome.....	241
App 5.8	Percentage of women who agree with the attitude statements	242
App 6.1	Characteristics of validation studies.....	271
App 6.2	Thirty-one papers classed as relevant to the present study	279
App 7.1	University certificate of ethical approval for study	311

App 7.2	Cotinine diary	312
App 7.3	ROC curve coordinates.....	314
App 8.1	Follow-up questionnaire	390
App 8.2	NRT questionnaire	393
App 8.3	Training manual	396
App 8.4	Pamphlet 1, Pamphlet 2, Pamphlet 3 and Pamphlet 4.....	425
App 8.5	Reminder card (front and back)	434
App 8.6	Calendar for TAIHS participants	435
App 8.7	Support letter sent to woman's household	436
App 8.8	Magnetic card for the fridge	437
App 8.9	Information sheet for NRT gum.....	438
App 8.10	Three to seven day follow-up questionnaire	440
App 8.11	Wuchopperen AC form	441
App 8.12	Wuchopperen UC form	443

Abstract

After decades of discrimination and deprivation, Australia's Aboriginal and Torres Strait Islander population faces social circumstances and health status which resemble that of a third world population group. With a wide range of health risk factors and morbidities among this population, a logical place to begin tackling the health problems is at the beginning of life. With increasing recognition of the influence of the intrauterine environment upon health, not only during infancy but into adulthood, improving health during pregnancy offers substantial benefit for present and future generations.

The poor health of Aboriginal and Torres Strait Islander Australians is deeply ingrained in social deprivation, poor mental well-being, and an array of modifiable risk factors. Smoking is one risk factor at the centre of this complex web. Smoking is often accompanied by, or used as relief in, stressful situations associated with socio-economic status, mental health, illness, and other addictions.

In order to determine the most appropriate way to tackle the smoking issue among Aboriginal and Torres Strait Islander women, a series of studies were conducted. Initial literature reviews found limited evidence derived from methodologically rigorous studies in mainstream populations, and even less evidence for Aboriginal and Torres Strait Islander, or other Indigenous groups. Exploration of the knowledge and attitudes of these women in relation to antenatal smoking was conducted to identify the most appropriate targets for intervention.

The findings from extensive background studies were drawn upon to design an intervention which aimed to be culturally appropriate for Aboriginal and Torres Strait Islander women, providing intensive support to assist these women to quit smoking

during their pregnancy. Pilot data from the resulting intervention is presented in Chapter 8 of this Thesis.

The social network among Aboriginal and Torres Strait Islander communities appears to play a central role in the behaviour of individuals. With an array of risk factors and influences found not only in the individuals surrounding women, but in their socio-economic circumstances and overall environment, it may be that the most important approach for achieving health and behaviour change among this population is the mobilisation of social support and efforts to intervene with multiple elements of that environment.

List of Abbreviations

AC	Additional Care
ACCHS	Aboriginal Community Controlled Health Services
AHRQ	Agency for Healthcare Quality and Research
AIHW	Australian Institute of Health and Welfare
ANOVA	One way analysis of variance
APGAR	Activity, Pulse, Grimace, Appearance, and Respiration
BMI	Body Mass Index
CDC	Centres for Disease Control
EPOC	Effective Practice and Organisation of Care
ESRD	End Stage Renal Disease
ETS	Environmental Tobacco Smoke
FAS	Foetal Alcohol Syndrome
GP	General Practitioner
HIV/AIDS	Human Immunodeficiency Virus/Acquired-Immune Deficiency Syndrome
NCCAM	National Centre for Complementary and Alternative Medicine (United States)
NHMRC	National Health and Medical Research Council (Australia)
NNT	Number Needed to Treat
OECD	Organisation for Economic Cooperation and Development
RCT	Randomised Controlled Trial
SCBU	Special Care Baby Unit
SD	Standard Deviation
SGA	Small for Gestational Age
STATA	Statistical software package

STI	Sexually Transmitted Infection
TAIHS	Townsville Aboriginal and Islander Health Service
UK	United Kingdom
US	United States (of America)
USPSTF	US Preventive Services Task Force
WHO	World Health Organisation