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Medical workforce development in New Zealand: insights from a medical programme

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**A thesis submitted in fulfilment of the requirements for the
degree of Doctor of Medicine,
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Abstract – Te Whakarāpopototanga

New Zealand (NZ) has a reputation for excellence in medical education and training, and the cost-effectiveness of its health system. Like other Western countries, it is facing an immediate and major medical workforce crisis that is set to last for years. With little extra money available for education or health, the health demands from an ageing population and current inequities in delivery of care mandate an approach to obtain the most from every doctor trained. Medical schools have the responsibility for the selection and early education of these doctors.

Student numbers in NZ have increased; however, given that the vast majority of medical students will complete their medical degree, then proceed to work in a medically-related area, the composition of student cohorts and their experiences during the medical programme, are fundamental early steps in the shaping of a future specialist workforce for the community's needs.

This thesis examines aspects of medical workforce development in NZ from the perspective of an educational leader in the Faculty of Medical and Health Sciences (FMHS) at The University of Auckland, provider of one of NZ's two medical programmes. It describes ways that the FMHS is responding to the challenge to produce doctors with the aptitude to deliver the necessary medical care for its own community. It justifies endeavours already undertaken by the school, and clarifies ways in which medical schools, more widely, might enhance their contribution to the development of the future medical workforce.

Within the thesis are reports of studies based on data from students and graduates of the Auckland programme. The first describes the work and life experiences of Auckland women medical graduates and explores how these women made career choices. This investigation found that lives of women outside medicine have remained remarkably similar over decades: most have children, and most wish to work flexibly over that time. More women are entering specialties other than general practice, but there are ongoing barriers to participation and progression to specialist level. A conclusion is that the health and education systems must adapt further to maximise the contributions and productivity of this half of the workforce. Subsequent studies relate to the demographics and career intentions of current medical students, and the impacts of their education thus far on that choice. These studies were made possible through the establishment of the FMHS Tracking Project in 2006; described in detail. Among other findings, insights are gained into ways that the proportion of medical students interested in a general practice career may be increased.

The thesis concludes with the proposing of a framework within which medical schools and other stakeholders might consider selection of student cohorts and their education, as well as enhancing retention and workforce orientation towards the priority scopes of medical practice needed by the NZ community in the coming years.

Dedication – He Korero Tāpae

Mihi ki ngā rangatahi e whai ana i te mahi tākuta

I tāpaea tenei take kōrero ki te hunga rangatahi i Aotearoa e whai ana i te mahi tākuta. Ko te tumanako ko ngā mōhiotanga kua mau i a koutou i te Whare Wananga o Tamaki Makaurau hei awahina i a koutou ki te whakatukituki i te mahi whakapātari kei mua ia a koutou. Ma te whakamahi tika i aua mōhiotanga e whakapiki ai i te ora o ngā iwi katoa o Aotearoa.

Tihe mauriora.

Dedication to the doctors of tomorrow

This thesis is dedicated to all those young people in Aotearoa who are becoming doctors. May we at the University of Auckland have equipped you well for the challenging roles you will face in your future practice. May you use your knowledge wisely for the betterment of the health of all people of Aotearoa.

Good health to you all.

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The work presented in this thesis was undertaken over the period 1994 to 2010. There is no doubt the work was shaped by the New Zealand (NZ) socio-political context of the time. On the other hand, it is likely that the work has already contributed in some way to the significant health workforce reform now taking place in NZ. It is impossible, though, to quantify this. Suffice to say that, in the role of Associate Dean (Medical Programme) from 1999-2009, it was a privilege to share in the discourses of Deans and other leaders of NZ medical schools, health sector leaders, and colleagues involved in education at The University of Auckland, the Australian and New Zealand Medical Councils, and the Royal Australasian College of Physicians.

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Professor Iain Martin gave permission in June 2010 to use the diagram in Figure 3.

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Table of Contents

Abstract – Te Whakarāpopototanga	2
Dedication – He Korero Tāpae.....	3
Acknowledgements – Whakawhetaitanga	4
Funding sources.....	5
Permissions.....	6
Table of Contents	7
List of Tables	11
List of Figures.....	12
Abbreviations.....	14
Part 1 – Introduction – Kōrero Timitanga.....	16
Structure.....	16
The socio-political context.....	17
The NZ medical workforce.....	19
The role of the doctor.....	21
The medical school context.....	23
Auckland medical students and their programme	25
Ethnicity of current medical students	27
The changing generations	28
Research approach	29
The lens for this research	31
A personal perspective	32
An emerging theme	32
An hypothesis	33
A paradigm	34
Methods	35
Literature reviews.....	35
Ethics Committee approvals.....	35
Data sources and analyses.....	35
Part 2 – Lives and Careers of Auckland Medical Women Graduates – Ngā ahua noho me ngā umanga o ngā tākuta wahine o Te Whare Wananga o Tamaki Makaurau	37
Introduction.....	37
A study of University of Auckland women medical graduates.....	42
Aim.....	43

Subjects.....	43
Methods	43
Data Analysis	44
Results	45
Discussion	59
Summary.....	70
Future directions	71
Part 3 – Career Intentions of Auckland Medical Students – Ngā whakaaro umanga o ngā taura tākuta o Te Whare Wananga o Tamaki Makaurau.....	74
Measuring workforce outcomes of medical education	75
Long term tracking projects to answer workforce questions	78
The Medical Student Outcome Database and Longitudinal Tracking project (MSOD)	78
The Faculty of Medical and Health Sciences Health Professional Students and Graduates Tracking Project	79
Study 1 General Physicians – born or made?	84
Background.....	84
Aim.....	85
Participants.....	85
Results	85
Discussion	88
Study 2 Increasing student interest in General Practice in New Zealand	92
Background.....	92
Aim.....	92
Participants.....	93
Results	93
Discussion	96
Study 3 Characteristics of University of Auckland medical students intending to work in the regional-rural setting.....	101
Background.....	101
Aim.....	102
Participants.....	103
Results	103
Discussion	106
Study 4 The relationship between decile score of secondary school, the size of town of origin and career intentions of New Zealand medical students.....	109
Background.....	109

Aim.....	110
Participants.....	110
Methods	110
Results	111
Discussion	116
Study 5 Patterns of student loan debt in Auckland medical students	120
Background.....	120
Aim.....	120
Participants.....	121
Results	121
Discussion	122
Study 6 Differences in medical student career intentions by gender	125
Background.....	125
Aim.....	126
Participants.....	126
Methods	126
Results	126
Discussion	129
Study 7 Specialties of interest of Auckland students compared with the NZ medical workforce as a whole	132
Background.....	132
Aim.....	132
Participants.....	132
Results	132
Discussion	134
Strengths and limitations of the FMHS Tracking Project and its data.....	136
Strengths.....	136
Limitations	137
Part 4 – Synthesis and Conclusions – Te Whakamutunga.....	142
Major findings and future research questions	143
1. Improving the match between student intentions and workforce requirements.....	143
2. Improving the match between the medical student body and the community it serves.....	147
3. Building upon how students and doctors in NZ make career decisions.....	149
4. Enhancing participation of women in the medical workforce	151
A model of medical workforce development for medical schools.....	154

The outcome.....	154
Workforce orientation of medical student cohorts	154
A model of enhancement of medical workforce development	157
Conclusion	160
Bibliography – Rārangi Pukapuka	161
Appendix 1 Survey of Female Graduates from the Auckland School of Medicine (1974 – 1998)	175
Appendix 2 FMHS Tracking Project Entrance Questionnaire 2010	180
Appendix 3 FMHS Tracking Project Exit Questionnaire 2009.....	184

List of Tables

Table 1 2008 Auckland MBChB student ethnicity compared with the NZ medical workforce and population (2006 and 2026).....	27
Table 2 Distribution of the respondents by specialty (n = 305)	46
Table 3 Mean hours and income in early (< 10 years) and late postgraduate periods.....	47
Table 4 Timing and numbers of children by specialty.....	48
Table 5 Job satisfaction and impacts on career and family on scale from 1 (minimal) to 9 (maximal), by specialty	50
Table 6 Percentage of respondents in each specialty who had decided on that specialty at three time points .	50
Table 7 Influencing factors – mean score and 95% confidence intervals (CI).....	51
Table 8 Results of the principal component analysis	52
Table 9 Average hours worked, by gender and year (2003–2008)	62
Table 10 FMHS Tracking Project response rates	83
Table 11 Proportion of students indicating a <i>significantly positive</i> effect from factors affecting career choice .	88
Table 12 Levels of interest in general practice at entry, overall and by entry pathway - number (%).....	93
Table 13 Place of birth of medical students not born in NZ.....	94
Table 14 Levels of interest in general practice by birthplace, address in NZ and language spoken at home - number (%)	94
Table 15 Levels of interest in general practice at entry and exit, overall and by gender - number (%)	95
Table 16 Comparison between students with strong and no interest in general practice: effects of factors on career choice	96
Table 17 Destination of graduating Auckland medical students for their PGY1 year	104
Table 18 Numbers (%) of students from schools in each of the three decile groups with size of town of origin	111
Table 19 Mean number of specialties (SD) in which students expressed interest, by decile group.....	114

Table 20 Mean number of specialties (SD) in which students expressed interest, by size of town of origin.....	114
Table 21 Ethnicity of students in the 2006 exit cohort	121
Table 22 Study population by year and gender, with percentage of the total eligible population in brackets .	127
Table 23 Number and level of expressions of interest per student, mean (SD)	127
Table 24 Numbers of students with a <i>strong interest</i> in each specialty at exit from the programme, by gender	128
Table 25 Mean level of interest in each specialty, ordered by overall interest score	129
Table 26 Level of Auckland interest at exit in the priority areas compared with current proportions on MCNZ register.....	134
Table 27 Model of categories of students undertaking a rural immersion programme.....	155

List of Figures

Figure 1 Schema of match between medical students and workforce.....	16
Figure 2 Population projections by age cohort, assuming medium population growth (NZIER, with permission)	18
Figure 3 ‘The role of the doctor’ (I. Martin, with permission).....	22
Figure 4 Schema of the organisational stakeholders in education and training of doctors	24
Figure 5 Proportion of medical students by gender over time (Ministry of Health, with permission).....	38
Figure 6 Proportion (%) of NZ women doctors in each specialty in 2000 (middle bars) compared with Durham’s 1986 survey (left), and the NZ workforce as a whole in 2000 (right).....	46
Figure 7 Mean influence of the impact of factor ‘interest’ across specialties	53
Figure 8 Mean influence of the impact of factor ‘flexibility’ across specialties	53
Figure 9 Mean influence of the impact of factor ‘women-friendliness’ across specialties.....	54
Figure 10 Mean influence of the impact of factor ‘security’ across specialties	54
Figure 11 Levels of interest in general medicine in entry and exit cohorts (% reporting)	86

Figure 12 The effect of clinical attachments in general medicine on level of interest in this specialty (% of exit students).....	86
Figure 13 The role of clinical attachments in influencing a career choice in general medicine by level of interest in that specialty (% of exit students)	87
Figure 14 Intended career location of exit students in 2006 and 2007	103
Figure 15 Distribution of student ethnicity (regional-rural intentions vs. city intentions)	105
Figure 16 Comparison of percentages of students with <i>strong interest</i> in each specialty by whether intending to work in a city or a regional-rural area	105
Figure 17 Student distribution by school decile group and size of town of origin.....	112
Figure 18 Numbers of students from each school decile.....	112
Figure 19 Origin of Auckland medical students by regions of New Zealand and size of town (C. Mitchell, with permission)	113
Figure 20 Odds of students from low decile schools choosing a particular specialty compared with those from high decile schools.....	115
Figure 21 Odds of students from middle decile schools choosing a particular specialty compared with those from high decile schools	115
Figure 22 Odds of students from small towns choosing a particular specialty compared with those from major cities.....	115
Figure 23 Odds of students from provincial centres choosing a particular specialty compared with those from major cities	116
Figure 24 Odds of students from high decile schools in major cities choosing a particular specialty compared with those from all other areas and deciles	116
Figure 25 Comparison between genders of the percentage of students with a <i>strong interest</i> in each specialty	127
Figure 26 Proportion of students with a <i>strong interest</i> at exit in a specialty compared with current proportions of specialists in NZ.....	133
Figure 27 Workforce orientation model for a cohort of medical students.....	156
Figure 28 Model of enhancement of medical workforce development	159

Abbreviations

The following abbreviations are used in this thesis. Those less well-known are expanded when first used.

AMC	Australian Medical Council
AMWAC	Australian Medical Workforce Advisory Committee
CI	Confidence Interval
CMHSE	Centre for Medical and Health Sciences Education (was FEU)
CTA	Clinical Training Agency
d.f.	degrees of freedom
DHB	District Health Board
FEU	Faculty Education Unit (now CMHSE)
FMHS	Faculty of Medical and Health Sciences
FMHS Tracking Project	Faculty of Medical and Health Sciences Health Professional Students and Graduates Tracking Project
FRACP	Fellow of the Royal Australasian College of Physicians
GDP	Gross Domestic Product
GP	General Practitioner
GPA	Grade Point Average
HDC	Health and Disability Commissioner
HWAC	Health Workforce Advisory Commission
HWIP	Health Workforce Information Project
HWNZ	Health Workforce New Zealand
IMG	International Medical Graduate
MCNZ	Medical Council of New Zealand
MDANZ	Medical Deans of Australia and New Zealand

MBChB	Bachelor of Medicine Bachelor of Surgery (NZ medical degree)
MOE	Ministry of Education
MOH	Ministry of Health
MSOD	Medical Schools Outcomes Database and Longitudinal Tracking Project
MTB	Medical Training Board
NZ	New Zealand
NZGSL	New Zealand Government Student Loan
O&G	Obstetrics and Gynaecology
OECD	Organisation for Economic Co-operation and Development
OR	Odds ratio
PG	Postgraduate
PGY	Postgraduate Year
PHO	Primary Health Organisation
RACP	Royal Australasian College of Physicians
RMO	Resident Medical Officer (junior doctor)
RR	Relative risk
SMO	Senior Medical Officer
SPSS	Statistical Package for the Social Sciences
TEC	Tertiary Education Commission
UK	United Kingdom
UMAT	Undergraduate Medical Admissions Test
USA	United States of America

Part 1 – Introduction – Kōrero Timitanga

I touch the future. I teach.

Christa McAuliffe

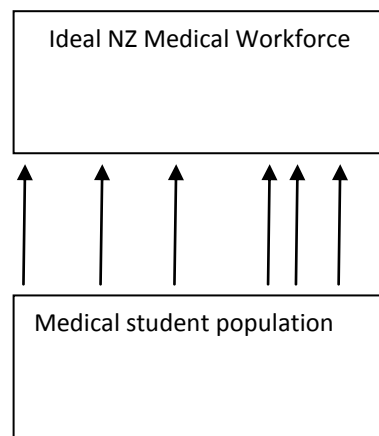
Structure

A strong medical workforce is the backbone of any health system. Recently, the ideal medical workforce for NZ was encapsulated within the vision of the Medical Training Board (MTB):¹

New Zealand has access to a high quality medical workforce trained in a sustainable, integrated system that values both trainees and trainers and that provides the right number of the right type of doctors providing the right care in the right location to meet the health care needs of the entire population.

Medical schools have the responsibility for the selection and early education of these doctors. Given that the vast majority of medical students will complete their medical degree and proceed to work in a medically-related area, the composition of student cohorts and their medical school experiences are fundamental early steps in the shaping of the future specialist workforce. Once medical students have graduated, they may train in one of over 35 different vocational scopes of practice recognised by the Medical Council of New Zealand (MCNZ).² Ensuring that the ‘right’ number of doctors enters each scope of practice has been the bane of workforce planning to date.¹ The optimum situation would be a perfect one-to-one match, both numerically and in aptitude for the requisite scopes of practice, between the NZ medical student population and the ideal NZ medical workforce. This concept is depicted in Figure 1.

Figure 1 Schema of match between medical students and workforce



Organised into four parts, this thesis examines aspects of medical workforce development in NZ. Using the example of one of NZ’s two medical programmes, the aim is to clarify the relationship among the composition and experiences of the medical student population, and their subsequent participation in the NZ medical

workforce. In so doing, it is hoped to identify areas where there is potential to enhance the involvement of NZ-educated medical students in delivery of the 'right care in the right location' in NZ,¹ and ways this may occur.

Part 1 – Introduction: outlines the context and rationale for my thesis along with relevant information about the NZ population, the NZ medical workforce, the current medical programme and its medical students. Part 1 finishes with a discussion on the research paradigm and methods used in this thesis.

Part 2 – Lives and Careers of Auckland Medical Women Graduates: contains my early work (1994-2003) describing the work and life experiences of Auckland women medical graduates, and how women make career choices. The work in this part led to two original peer-reviewed publications, and a review article.

Part 3 – Career Intentions of Auckland Medical Students: contains later work (from 2003 onwards). In this Part, the establishment of the FMHS Tracking Project is described along with reports of seven studies using data from this project. Studies relate to demographics and career intentions of current medical students, and the impacts of their education on that choice. The alignment among student factors and future medical workforce in NZ is explored. The Part concludes with a discussion on the strengths and limitations of FMHS Tracking Project research. To date, this work has led to five original peer reviewed publications, and a number of review articles and editorials.

Part 4 – Synthesis and Conclusions: discusses my main findings from the entire programme of work, their significance, and priorities for future research. It concludes with the development of a model of medical workforce development from a medical school perspective.

The socio-political context

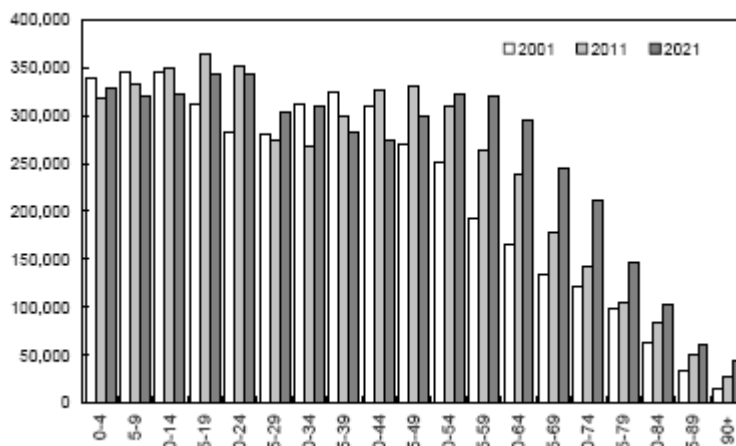
New Zealand is a small country of just over four million people of whom 15% are Māori.³ Despite an intention of the Treaty of Waitangi to protect Māori people, significant life expectancy gaps between Māori and non-Māori persist.⁴ Apart from the imperative to address inequities in health care delivery, the most significant health care challenge facing NZ currently is the increasing demand created by the needs of an ageing population with associated chronic disease. The marked increase in the numbers of people over 65, as the baby boomers age, is shown in Figure 2.⁵ The years from 2011 to 2021 are expected to be especially difficult, as demands will outstrip the labour supply; however, my experience as a general physician at Auckland City Hospital has shown me that health services are already having difficulty meeting the increased demands for acute care of older adult patients.

In 2030, the last baby boomer will turn 66. By then, the population pyramid in Western countries is expected to be more 'rectangular,' with roughly equal proportions of people in each decade, tailing off gradually after 70 for men, and 75 for women.⁶ The change in the population pyramid compounds the labour supply problem;

with little growth in the younger age groups between 2011 and 2021, there will be more competition from fields other than medicine for the relatively small pool of educated young people.

Within NZ, another challenge is that the greater Auckland population continues to grow; whereas, all other regions in NZ, including rural, are stable or declining. By 2031, Auckland will contain 38 percent of NZ's anticipated population of 4.8 million.³ Moreover, the Auckland region has a rapidly-changing ethnic composition coupled with extremes of income and health status. In the 2006 census, only 64% of the Auckland population identified as New Zealand European or 'New Zealander' compared with 76% in 1991.³ In the same census, 23% of the country's population reported being born overseas, up from 17% per cent in 1996. Half of these (around 440,000 people) were living in Auckland.⁷ These population shifts contribute to the challenges of up-scaling delivery of culturally-appropriate health services in some areas of the country, while downsizing services in other areas.¹

Figure 2 Population projections by age cohort, assuming medium population growth (NZIER, with permission)



Other major demands on modern health care systems are the spiraling costs created by high technology interventions and high patient expectations.^{8, 9} Because of the aforementioned demands, it has been estimated that the Australian health system by 2020 'will simply not be able to cope'.¹⁰ Nor can additional health demands be discounted from other quarters such as global warming, terrorism and emerging epidemics.¹¹

Currently, NZ spends about 9% of its GDP on health and is recognised for having a cost-effective health system.^{5, 12, 13} Much of the effectiveness is attributable to a strong primary health sector, and continuing public provision of nearly 80% of health services.¹² A health goal is that every person has an identifiable primary health care team, with each team containing at least one general practitioner.¹⁴ At this stage the ideal composition of the NZ specialist medical workforce as a whole has yet to be defined; however, the MTB recommended recently that much more of the medical school intake had to be directed into general practice, to ensure adequate preventive and chronic disease management.¹

The comprehensive and general nature of early medical training may have made the NZ system more capable of responding to shifts required in the mix of medical specialists.¹ Nonetheless, training doctors is expensive. The Deanery of the FMHS in May 2010 confirmed that the University receives about \$50,000 per student in Years 2 to 6 of the programme, of which the student pays \$11,545. Therefore, undergraduate education alone costs over a quarter of a million dollars per student. As there is little more public money available to allocate to health or education, cost-effective use of resources in both sectors is paramount.¹⁵ This shortage of money serves as another driver for an examination of the aptitude of medical students for the scopes of practice that will be needed in NZ in the future.

The NZ medical workforce

The medical workforce shortfalls resulting from increasing demands come on the back of chronic medical workforce shortages. This is not because of any deficiency in the clinical skills of graduates ... in fact, quite the opposite – NZ medical graduates are acknowledged to be among the finest in the world, with this a factor in the loss of about a quarter of locally-trained doctors to jobs overseas.¹⁶ A major factor in the workforce shortages is chronic ‘undertraining.’¹ NZ is among the countries with the lowest number of medical students per head of population in the OECD.¹² To maintain its health services, therefore, NZ has had to become the country in the OECD with the greatest reliance on international medical graduates (IMGs). These doctors made up 40% of the workforce in 2007.¹⁷ Compounding the workforce shortages is that only 50% of IMGs remain in the NZ workforce for more than one year; however, within the IMG group, doctors from Asian countries, South Africa and mainland Europe stay significantly longer on average.²

In NZ, as elsewhere, there is mal-distribution of the medical workforce both by specialty and location of practice.¹⁸⁻²⁰ Two of the most concerning deficiencies are the relative lack of NZ graduates entering primary care or working as specialists outside major urban centres.²¹ Approximately 35% of the active medical workforce in NZ is engaged in general practice, with a further 10% in other areas of primary care such as private community accident and medical practice or family planning.²

Worsening doctor shortages in the face of the increased health care requirements of an ageing population^{5, 16, 22} have led to several recent NZ government-commissioned reports.^{1, 15, 16} These reports identified broadly similar issues – recommending that NZ must become more self-sufficient in doctor training, and have a balanced workforce so that doctors work where they are most needed. Based on analyses of existing workforce data, the MTB calculated that 100 new medical student places should be introduced by 2012.¹ In 2009, this number was doubled to 200 as an election promise of the current National government, with the increases to be phased in over five years.²³

In 2009, yet another NZ government task force recommended the establishment of an agency to plan and direct the funding of the training of the New Zealand health and disability services workforce, including

medicine.¹⁵ This agency, Health Workforce New Zealand, (HWNZ, <http://www.healthworkforce.govt.nz>) has begun work, with improvement to the governance of the medical education continuum anticipated, particularly over the transition years between completing a medical degree (MBChB) and beginning vocational training. This agency has contracted another body, the Health Workforce Information Project (HWIP), to undertake analysis required to understand health system supply and demand better at a national level.

From 2010, there was a significant increase in medical student numbers, as well as an increase in General Practitioner (GP) registrar training places.²⁴ The medical students who started year 2 of their programmes in 2010 will enter the specialist workforce from 2022 onwards, so it will take time to see any effects on this workforce. The increase in medical student numbers has proved a stimulus to the FMHS at the University of Auckland to consider who should be offered the additional places, as well as how to meet the extra educational demands. It has been proposed that nearly all the additional medical students will be needed in general practice and other specialties of practice dictated by health needs of older people and a diversifying population.¹ Urban drift has resulted in a need for more doctors in outer metropolitan Auckland and regional centres, but little is yet known about the drivers to work specifically in these areas.

Any discussion of the NZ medical workforce must take into account the situation in Australia. New Zealand and Australia are now essentially one medical workforce market place: medical students may attend medical school in either country; the medical schools are accredited by the same body; there is reciprocity of registration for most doctors between the two countries; and most specialty training programmes are bi-national. A notable exception is general practitioner training, which is conducted separately in each country. In 2009, yet another barrier was removed and NZ-trained doctors now may qualify for Australian Medicare provider numbers.²⁵ As doctor salaries in Australia outstrip those in NZ, this latest decision is anticipated to exacerbate the exodus of NZ doctors across the Tasman. Although Australia is economically stronger than NZ, it still faces many of the same medical workforce challenges, along with the additional complexities of dual state and federal funding of health, and a widely-spread rural and remote population. In late 2009, a new national peak body called Health Workforce Australia was enacted, and charged with workforce reform including making clinical training arrangements more effective.²⁶

Recently, the NZ government introduced a three year voluntary bonding scheme, offering financial incentives to medical graduates who agree to work in areas of shortage, before training in one of general practice, general medicine, general surgery, psychiatry or pathology.²⁷ This has been moderately popular with over 100 agreeing to take up one of the incentives (Prof. Des Gorman, HWNZ, personal communication, 2010). While the measures discussed above may assist in shaping the workforce in Australia and NZ, they are complementary to, and relatively separated from, any role medical schools may play in shaping the future workforce.

In contrast with NZ, Australia has used greater measures to direct workforce to where it is needed. One example is the granting to IMGs of a Medicare provider number only if they worked in an area identified as having workforce shortages. Voluntarily bonded medical school places and rural student scholarships are granted on the condition students agree to work in an area of shortage for a time equivalent to years at medical school.²⁸ While it is common to hear laypeople in NZ discuss whether or not doctors should have to undertake compulsory 'country service,' as teachers used to, NZ has not moved in that direction. Neither compulsory service, nor bonding of NZ medical students, were discussed in the recent MTB report.¹ The evidence of the effectiveness of the medical student bonding initiatives in Australia is awaited; however, the scheme is not popular, and a significant relaxation of the bonding conditions has occurred over time.²⁸

NZ has an excellent source of cross-sectional national medical workforce data. Each year, every registered doctor in NZ must apply to the MCNZ for an Annual Practising Certificate; answering questions about work type(s), work place(s), hours worked per week, and any interruption to work during the year. The MCNZ combines this information with demographic data already held, and publishing the aggregated data in annual workforce reports – the latest of which was for 2008.² A summary of the annual reports and other workforce data was contained in the report of the MTB.¹ The national medical workforce data are reported for the NZ medical workforce as a whole, which is comprised of NZ graduates and IMGs. Given the rapid turnover of IMGs, there are difficulties in gaining accurate counts of doctors and in projecting workforce requirements. A problem for NZ medical schools is that the data are not sufficiently detailed regarding careers of their own graduates so as to inform any necessary changes to selection or education policies. In Australia, the Australian Medical Workforce Advisory Committee (AMWAC) has been the main body charged with collecting and synthesising workforce data. Within the last decade this group has identified the need for monitoring of workforce against health needs, so that adjustment could be made in the characteristics of those entering medical school.⁸ AMWAC recommended more data be obtained on the career choices of medical students from different Australian schools.²⁹ The dearth of systematic data to inform medical schools how best to choose and educate students for the future workforce, led the Medical Deans of Australia and New Zealand (MDANZ) in 2004 to establish the prospective Medical Student Outcome Database and Longitudinal Tracking project (MSOD).³⁰ Although over 11,000 students have been recruited, it is too early for this project to add substantially to what is already known. It is also largely Australian-driven with uncertain immediate benefits for NZ medical workforce development.

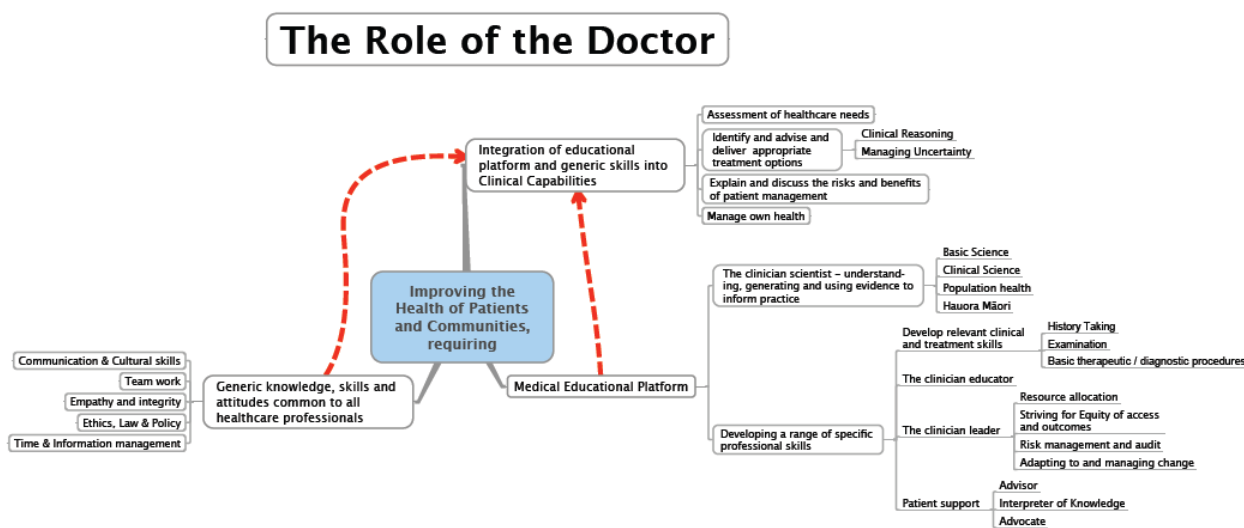
The role of the doctor

Within this changing educational, socio-political and financial climate, it was inevitable that the role of a doctor was called into question. Could the 13 years needed to educate a specialist be shortened, and thus bring specialists into the workforce sooner? Might other health workers take over the role of doctor? In response to these challenges, groups around the world have been addressing the question – what are the

essential competencies of a doctor? For example, the General Medical Council of the UK has organised its latest standards for undergraduate medical education around the three core roles of a doctor: as a scientist and scholar; as a practitioner; and as a professional.³¹ Another report identified that a key function of doctors is to make medical diagnoses.³² To do so, doctors require an extensive knowledge base and experience, with the ability to synthesise complex information rapidly. Doctors must be professional, and work with others to provide care for patients; yet they are looked upon to provide leadership, especially where there is risk or uncertainty, and to innovate.¹³ The roles, when considered together, might only be taken by someone with a comprehensive medical education, that is, a doctor.

At the University of Auckland a major medical curriculum re-energisation began in 2010. The Dean, Professor Iain Martin, in consultation with others, deemed the basis on which the curriculum is to be arranged is the 'role of the doctor.' He developed a map of contemporary graduate capabilities – shown in Figure 3. This map is novel in that it emphasises the clinical and professional attributes of doctors specifically; differentiating them from the generic capabilities that should be common to all health professionals.

Figure 3 'The role of the doctor' (I. Martin, with permission)



The fundamental role of doctors in modern health care systems appears secure, albeit with a need for them to be engaged in high-utility activities that require a medical degree. At this stage, there is no move to shorten medical training in NZ; but there is an increasing focus on ways to ensure progression of competent doctors through the continuum and into the specialist workforce as quickly as possible.¹ The spotlight is thus firmly on medical schools to ensure they provide the best foundation possible for the future medical workforce.

The medical school context

In 1968, The University of Auckland established NZ's second medical school after Otago, which had been established nearly a hundred years earlier in 1875. For simplicity, the term 'medical school' is used in this thesis to denote the collective academic structure that delivers a medical programme; even though, since 1999, the FMHS at Auckland has had five schools, each contributing to medical student education.

Auckland remains the smaller of the two schools in terms of student numbers; however, it will take the majority of the new medical students as clinical capacity has increased through the northward drift of the NZ population, and migration. Consequently, the proportion of Auckland and Otago students in the NZ medical workforce are anticipated to equalise gradually over the next few decades.

Both NZ medical schools must meet the accreditation standards of the Australian Medical Council (AMC), by agreement with the MCNZ. These standards define the main goal of undergraduate medical education as:

*to develop junior doctors who possess attributes that will ensure that they are competent to practise safely and effectively as interns in Australia or New Zealand, and that they have an appropriate foundation for lifelong learning and for further training in any branch of medicine.*³³

In the same set of standards, there is an implicit reference to the role of a medical school in workforce development, yet little guidance as to how this might be achieved:

*Medical schools have a responsibility to select students who can reasonably be expected to respond to the needs and challenges of the whole community, including the health care of these groups.*³³

For the purpose of this thesis, medical student selection is considered as part of undergraduate medical education for the reasons that it is directly under the purview of medical schools, and defines the student body. The tax-paying public in NZ might expect that all medical students have the aptitude, aspirations and incentives to work in roles and places where they are most needed; however, to date there has not been such a clear and close articulation between undergraduate medical education and the shape of the medical workforce.

While local medical schools must take into account feedback from stakeholders in development of their own missions, schools have relative freedom with respect to defining student selection policies and the curriculum students follow, provided they can be justified. Historically, much of the emphasis of undergraduate education has been on the acquisition of knowledge, skills and attitudes necessary for doctors, usually as judged by the faculty of that institution. Armed with a better understanding of how adults learn,³⁴ medical schools have concentrated on developing educationally-sound curricula, characterised by learning outcomes and standards to be achieved in assessment, along with new educational methods such as problem-based learning. Arguably and understandably, they have been more focused on the short-term goal of ensuring their graduates are

competent to practise as interns under supervision on day one of PGY1, than on the longer term goals of specialist workforce development.

Until recently, there has been remarkably little discussion as to how undergraduate medical education contributes to assuring an optimum mix of doctors to care for the ‘right patients’ in the ‘right place’. One of the reasons is that it takes at least six further years for a medical school graduate to become a specialist. This training is conducted in a complex health system by a range of stakeholders, including the MCNZ, colleges, DHBs and GPs. The main stakeholders in NZ (prior to the advent of HWNZ) are shown in Figure 4.

Figure 4 Schema of the organisational stakeholders in education and training of doctors

Years	Stage of education and training	Main stakeholders apart from the learner
lifelong	Specialist (Continuing Professional Development)	Colleges, MCNZ, unions, DHBs, PHOs
4+ years	Specialty training	DHBs, Colleges, GPs, AMC, MCNZ, CTA, unions
2+ years	PGY 1 and 2	DHBs, MCNZ, CTA, union
6 years	Undergraduate Medicine	University medical schools AMC, MOE, TEC, MOH, DHBs, GPs

The medical education and training continuum in NZ is discontinuous, with no one body taking overall responsibility for successful completion through to specialist level. After graduation from medical school, there is annual employment for junior doctors who, each year, apply to any DHB of choice until they enter a training scheme. Even when in a training scheme, appointment to jobs occurs annually. With each interruption, there is the potential for NZ doctors to be lost from the system (e.g. to Australia or beyond) with the MCNZ the only stakeholder that could be aware of this loss, and then only in a vicarious way. Graduates who wish to work in overseas jurisdictions may apply for a Certificate of Good Standing from the MCNZ, or they may fail to apply for an Annual Practising Certificate the following year. Another issue is that most medical students make up their mind about career choice only after they have finished medical school.^{35, 36} A third barrier is the right of doctors to choose their specialty and location of practice; this has long been defended by national doctors’ associations in NZ, Australia and elsewhere. Broadly, registration and education requirements relate primarily to the competency of the doctor (doing things the ‘right way’), rather than whether doctors meet health

needs. Effectively, this means that medical training and work in NZ occur in an open market place, with the only limitations on personal choice being the availability of medical training posts and jobs. An appropriate match of workforce with health need in such a free market might be achieved only through use of evidence-based strategies and incentives to promote development of the requisite range of doctors.²⁰

In Australasia, the AMC accreditation process is a powerful driver of schools' behaviour. The recent revision of AMC standards places a greater emphasis on the relationship among medical schools, other stakeholders and community groups.³³ Internationally, there are increasing calls for medical schools to be judged by how much of a difference they make to peoples' well-being.³⁷ Medical schools are already becoming more socially-responsible; using a range of initiatives to address the 'shameful' mal-distribution of health resources.³⁸ One study has even ranked US schools by assessing the proportion of graduates in primary care, working in health professional shortage areas, or with under-represented minorities in a composite social mission score.³⁹

Recent statements from FMHS leaders provide evidence of a commitment to fulfilling its social contract; although evaluating whether or not this is the case will be a complex and multi-faceted endeavour:

Medical schools and professional colleges exist in and serve communities, such that mal-distributions of the medical workforce should be addressed by the training schemes for doctors.¹⁸

The demographic profile and numbers of those entering the programme will be based upon meeting the needs of the communities we serve, particularly but not necessarily exclusively those of the upper North Island.⁴⁰

All graduates will have demonstrated capabilities in ways of addressing the specific health rights of Māori, and of working towards minimising inequalities in health outcomes.⁴⁰

Auckland medical students and their programme

Auckland medical students are selected after one year at university, or a prior degree, using a ranking system based on Grade Point Average (GPA), and scores from interview and an aptitude test.⁴¹ *Inter alia*, the structured interview explores student commitment to working in NZ, and to reducing inequities in health care delivery. Interviewers are drawn from a wide range of health disciplines and community backgrounds. Students then undergo a further five years of education. The first two are largely campus-based; the next two taken in a wide range of clinical settings; with a final 'capstone' trainee intern year immersed in supervised clinical practice. Although based in the largest city in NZ, students learn in sites across the upper North Island and further abroad. All students undertake five general practice attachments, two of which are rural; with one goal to familiarise students with these scopes of practice. In the report of its latest accreditation in 2005, the programme was commended for its emphasis on national health priorities and health care of disadvantaged groups, as well as its strengths in more traditional teaching of medical sciences and clinical and professional

skills.⁴² Since that time, further strengthening of the curriculum in the areas of Hauora Māori (Health of Māori), and Population Health and Primary Health Care has occurred, and a regional-rural curriculum pathway for 20 year 5 students was introduced in 2008.⁴³

Domestic students at the University of Auckland are NZ or Australian permanent residents or citizens. International full-fee paying students make up less than 15% of the medical student body. The school has two special admission pathways: the Māori and Pacific admission scheme (MAPAS);⁴⁴ and the Rural Origin Medical Preferential Entry scheme (ROMPE).⁴⁵

These pathways offer groups disadvantaged in the standard selection process the opportunity to train in medicine; another aim is to diversify the student population to better meet community needs.⁴⁶ In 2009, applicants competed for 155 domestic places – of these, 30 were allocated to MAPAS students and 20 to ROMPE students. Nearly a third (31%) of the 799 students entering medical programme from 2005 to 2009 were from these two affirmative pathways; 120 in MAPAS and 100 in ROMPE. In 2010, the number of domestic places was increased by 36 to 191, with 45 places reserved for MAPAS and 30 for ROMPE.⁴⁷ Thus, almost 40% of places on offer in 2010 were from entry categories designed, in part, with the future workforce in mind. In the event, these were not fully subscribed owing to a lack of suitable candidates, especially in the ROMPE category (Chair, Medical Admissions Committee, personal communication, 2010).

For the standard pathway, applications well exceed the places available, and this shows no signs of abating. Because of the intense competition for places, most students now need to achieve an 'A' average, or GPA of 8, during their first year at university or previous degree (Chair, Medical Admissions Committee, personal communication, 2010). As a consequence, many individuals who would otherwise be fine doctors are not accepted, because of the need to use a meritocratic ranking system to determine which students are offered the limited spaces available. The situation in Auckland is not unique; medical schools more widely struggle with obtaining the 'best' students in the 'fairest' way.^{41, 48} Schools use selection tools that focus on identifying the qualities of a 'good' doctor, rather than where they will work, or what work they will do. Fairness in any selection process is unquestionable; yet, uncertainty persists that the current medical students, chosen by this process, are those best suited to achieve the vision of the MTB at the beginning of this part;¹ that is, the 'right type' of doctors for NZ.

An example of the Auckland medical student population resulting from the selection process just described is presented for context. In 2008, there were 703 students in years 2 to 6 of the medical programme. Of these, 48.2% (339) were male and 51.8% (364) female. Over 80% were younger than 25 years. About a quarter had a prior degree; that is, were graduate entrants.⁴⁹

Ethnicity of current medical students

Until about 20 years ago, the predominant medical student characteristics were being white, male, coming from higher socio-economic groups, and having university-educated parents – including one in eight with a parent in medicine.^{50, 51, 52, 53} The self-reported ethnicities of Auckland students in 2008 compared with those of NZ doctors in 2008, and with the NZ population in 2006 and 2026, are shown in Table 1. It should be noted that Statistics New Zealand and the University both use the broad category ‘Asian’ to include people from eastern Asia as well as those from the Indian subcontinent. The total proportions in the NZ population columns exceed 100% as about 10% of the NZ population identify with more than one ethnicity.

While there are differences in how the ethnicities were established for each group, some conclusions are possible. Currently over 70% of NZ doctors identify as ‘European’ although the comparable proportion in the student population is about half that, suggesting that the proportion of NZ doctors of European descent will decrease over time.

Table 1 2008 Auckland MBChB student ethnicity compared with the NZ medical workforce and population (2006 and 2026)

Ethnicity	Proportion of student cohort	Proportion of doctors in the NZ workforce ²	Proportion of NZ population 2006 ³	Proportion of NZ population 2026 ³
Māori	9%	3%	15%	16%
Pacific Is	7%	2%	7%	10%
European	38%	71%	77%	70%
Asian	35%	11%	10%	16%
Other minority	6%	13%	2%	-
No response	5%			
Total	100%	100%	Exceeds 100%	Exceeds 100%

Māori and Pacific doctors are markedly under-represented in the NZ medical workforce at 3% and 1.8% respectively,² compared with 2006 population percentages of 15% and 7%.³ This is a notable deficit in workforce terms; evidence from the US suggests a doctor population that looks like the community it serves is more likely to address the broader health needs of that community.^{54, 55, 39, 56} Moreover, these population groups are growing; estimates for 2026 are that 16% of the population will be Māori and 10% of Pacific origin.³ The proportions of Māori and Pacific students in the Auckland programme are encouraging; however, the very low proportions in the workforce, along with the current heavy reliance on IMGs, means any small increases in these minority workforce groups are diluted by an expanding denominator. Mathematically, it is impossible

ever to have Māori or Pacific doctors in proportion to the NZ population, unless there were to be marked over-representation of these minority groups in the medical student population. This would require augmentation of the affirmative action pathways already in place, at the expense of other pathways. Another limitation is the relatively low number of Māori or Pacific students finishing high school with the aspiration and educational preparation for medical training.

Another observation is the over-representation of medical students from an Asian background, compared with both the NZ doctor population and that of NZ generally. This is not new, being noted as far back as 1993.⁵¹ As these students come from the fastest-growing sector of the NZ population, the discrepancy between the observed and expected numbers may diminish slightly over time.

While the rationale for diversification through affirmative action pathways is relatively well-established on equity grounds, the extent to which the whole medical student population has to mirror the NZ community to meet its needs has not yet been articulated. If the profile of ethnicities of the Auckland medical student population is to match the NZ population, what is the reference population to which it should match? Options would include the current NZ population, the future NZ population, the Auckland or upper North Island populations, or the 15-39 year age group from which medical students are drawn. To further illustrate this point, the proportions of Māori, Pacific and Asian peoples in the 15-39 age group are 2 to 3% higher than in the general population.^{57, 3}

The changing generations

In a discussion of future workforce, changes in the nature of medical work as a result of generational shifts need to be considered. Regardless of the sociopolitical changes described earlier, the career expectations of current generations of medical students – Generation X (born 1965-1979) and Generation Y (born 1980-1994) – may differ from those of their older colleagues and supervisors from the Baby Boomer generation (1946-1964). The more recent generations reportedly place greater emphasis on work-life balance, and will be less prepared to endure long hours for little tangible reward.⁵⁸

Most current medical students come from Generation Y, the most 'well-off' of any generation so far. As such they may have unrealistic lifestyle expectations at the beginning of their working lives. For this generation, casual work is likely to be more acceptable, as is the multi-stage medical career where doctors retrain in medical or other careers depending on life circumstances and interests.⁵⁹ Furthermore, these doctors may interact differently with patients and colleagues: a recent systematic review of 72 studies, involving over 14,000 students who underwent standard empathy tests, found a significant decline in empathy levels since 2000.⁶⁰ The authors identified these students as more self-centred, narcissistic, and competitive than their predecessors; labeling them 'Generation Me', and attributing much of the observed change to violent visual media and the rise of on-line social networking and texting.^{60, 61} Getting the most productivity from current

generations of students will likely require solutions that embrace flexibility; allowing more individualised approaches to learning and working, greater choice of work, and less directional styles of leadership.⁵⁸

Whether or not the perceptions of differences in attitudes to work across generations are borne out in medical practice is not yet certain. For example, a mixed methods study comparing Baby Boomer and Generation X physicians in Canada found that, while Baby Boomers generally viewed Generation X physicians as less committed to their careers, there were few observed differences between the two groups with respect to work-life balance, work hours and attitudes towards patient care.⁶² Notwithstanding this finding, it is without doubt that the average working hours of doctors are dropping.² There is also a growing awareness of how to keep doctors well and functioning optimally.⁶³ My conclusion is that medical workforce shortages will not be solved by a return to the long hours of practice, or sacrifice of self and family life for work, as happened in the past.

Research approach

The work in this thesis is research in that it aims to discover or explain, through critical or scientific enquiry.⁶⁴ Arguably, it contains elements of audit in that it sought to evaluate how well the Auckland medical programme was functioning; however, this was not the primary aim. Single trials answering specific questions are incorporated into a programme of medical education research showing evidence of features that have been identified by others as important. These include evidence of progress of thought,⁶⁵ refinement of understanding of problems rather than necessarily providing solutions,⁶⁶ and new ways of representing how complex systems work.⁶⁷ Recently, Cook and colleagues⁶⁸ outlined a hierarchy of medical education studies, starting with 'descriptive' studies (which make observations but no comparisons), moving to 'justification' studies that compare groups to assess whether an intervention worked, and finally, 'clarification' studies that answer how or why the intervention works, and which may contain predictive or modelling aspects. The same authors called for more of the latter to advance the understanding of medical education.

While all of the studies reported in this thesis contain descriptive elements, most also contain findings that justified decisions taken by the FMHS and clarified the relationship among medical students, their education and workforce participation. Furthermore, Part 4 draws knowledge gained from the studies, the literature and practical experience, into a model that provides a simple schema to assist medical schools and others in their mission to develop the ideal workforce.

This section introduces the research paradigm, or perspective, which led to the methodology for the research. It then outlines briefly the methods that have been used.

Internationally, a range of studies has been conducted into the relationship among medical students, their experiences at medical school and the workforce. The most prevalent type of study starts from having defined an area of workforce shortage, seeking to identify characteristics of those students who may enter this scope

of practice. An example would be the comprehensive USA study that used 20 years of graduating medical student data linking students and their curriculum to determine whether or not they worked in primary care, care for underserved populations or rural practice.²⁰ The authors found birth in a rural area, interest in serving underserved populations, and rural or inner-city training experiences all significantly increased the likelihood of students working in these areas. Women in this study were much less likely to choose rural practice, and men less likely to choose primary care.²⁰ Others have reported student factors associated with an increased likelihood of entering general practice as a desire for varied scope of practice,⁶⁹ being female and older,⁷⁰ and having a rural home town address.^{70, 71} Consistently, studies find that being a rural origin student, or experiencing education in a rural setting, increase the likelihood of students working in rural areas following graduation,^{72, 73} with student characteristics being a stronger predictor than curriculum experiences.⁷⁴

Other studies seek to evaluate the outcomes of investment in initiatives designed to address workforce shortages, such as rural programmes. Examples include studies of parallel rural curricula in Australia,^{72, 75} and the FMHS's own Pūkawakawa programme.⁷⁶

A third group of studies explores what careers are preferred by specific groups of students. For example, a detailed review of specialty choice in Britain found women graduates consistently more likely than men to choose general practice, obstetrics and gynaecology, paediatrics or pathology.⁷⁷

Many of the smaller studies linking medical students and their education to workforce have been conducted by individuals with a specific, rather than a general, workforce interest. Some are reports of small self-selected cohorts of students experiencing tailor-made curricula,^{72, 78} and are often retrospective. There are, though, significant gaps in the literature of relevance to the NZ setting. For example, although more diversity in the medical student population has been called for,⁴⁶ almost no data exist about the careers indigenous doctors choose, and why.

Each study sheds some light on the link between medical schools and workforce. However, none considers the constitution of a medical school student cohort overall, or the education all students should receive, in order to maximise the chances the cohort will yield doctors who will provide the 'right care' in the 'right location.' Perhaps this is an impossible task, as there are so many factors that contribute to career choice before, during or after medical school.⁷⁹ AMWAC found, for example, that only 58% of doctors had made up their minds about career by the end of PGY2, with earlier decisions made by those entering surgery.²⁹ They identified the most influential intrinsic factors in career choice to be appraisal of one's own attributes, interest in helping people and the intellectual content of specialty. The most important extrinsic factors were discipline-related work cultures and working conditions experienced during and after medical school.²⁹

Medical education refers to the practice of becoming a medical practitioner, including education and training, as well as continuing maintenance of competence. Education and training, though, are different. The word

'education' is derived from Latin (*e – ducere*, to lead out of). The Random House dictionary defines education as 'the act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgment, and generally of preparing oneself or others intellectually for mature life.' In contrast, the same source defines training as 'practical education (learning to do) or practice, usually under supervision, in some art, trade, or profession'.⁸⁰

Workforce development is a relatively new concept, drawing together principles of education, training and workforce planning, including an understanding of the nature of the demand.⁸¹ Workforce development is emerging as a framework within which to consider vocational education and training; part of which is how schools and organisations prepare individuals to enter or re-enter the workforce, and respond to changes that affect workforce effectiveness.⁸¹

Medical workforce development is complicated. One major reason is that to produce a medical specialist takes a very long time – at least 13 years – with the students entering the programme now not specialists until at least 2020. Education and training take place primarily within universities and health care institutions; however, there are many other stakeholders involved, as was shown in Figure 4. Each institution could be regarded as a complex adaptive system in which many agents act in parallel ... constantly acting and reacting to what the other agents are doing.⁸² Despite the many decisions made every moment by a range of individuals, these systems manage to adapt and self-organise. In any complex adaptive system, the outcome is a result of 'mechanism' plus 'context'; research into what works must take into account both aspects.⁸³ Ostensibly simple solutions may have consequences that offset predicted gains.¹ New understandings as to what works must emerge from observations in constantly evolving circumstances.⁸⁴ There is no guarantee that findings from one setting are necessarily applicable to other settings. Furthermore, there is no unique lens through which to view medical workforce development – it must be considered from the perspectives of the individual, stakeholder organisations and society.⁸¹

The lens for this research

With the goal of enhancing NZ medical workforce development, this thesis explores how graduates from one NZ medical programme participate (or will participate) in the NZ medical workforce. My perspective is as one NZ woman medical graduate working within one NZ medical school (Auckland), and in one clinical specialty (General Internal Medicine) in one metropolitan hospital (Auckland). Nevertheless, the privilege of being the Associate Dean for the medical programme at the University of Auckland for ten years from 1999 to 2009, makes this a unique and hopefully, helpful, perspective. This role was challenging administratively and leadership-wise; yet, it afforded countless opportunities to engage with others, within the school and without, while deciding upon future directions. Regular activities included curriculum design and implementation, student selection, dealing with fitness to practice issues, teaching and supervision, advice to stakeholders on medical education matters, and accreditation of other medical schools, to name a few. It gave great insights as

to how the pieces of the medical workforce development jigsaw might better fit together. This thesis examines, primarily, how the student body as a whole, and groups within it, may participate in the workforce. It does not consider other important roles of a medical school in medical workforce development, such as academic teaching in the health care environment, or engagement in national health workforce policy development.

A personal perspective

Thinking back, I have always had a sense of public duty to NZ and its people, with a trust in those in positions of power, and a willingness to hear others points of view ... almost to the extent of putting my own needs second. This likely arose from being born at the tail-end of the baby boom to traditional Kiwi parents involved in a number of community service roles. Living for a short time in the USA in the 1970s opened my eyes to civil rights and feminism. Study at the University of Auckland from 1977 to 1986 coincided with other formative events: the Bastion Point protest and evictions in 1978; the Haka Party incident in 1979; the Springbok tour in 1981; the visit of the nuclear-powered frigate USS Texas in 1983; and the sinking of the Rainbow Warrior in Auckland Harbour by French secret service agents in 1985. Each event was shockingly memorable – forcing a reflection of one’s own views and how they meshed with those of friends, family and colleagues. Each firmed my view of a world where power imbalances existed; one where equal opportunities and natural justice could not be assumed. I developed the perspective that those in the position to speak up and support minorities had a moral duty to do so; however, this was quite at odds with my conservative NZ upbringing, and with the mores of the medical profession at the time. As a result, the approach I’ve taken to date has been very much working for evolutionary change within existing structures and systems, rather than advocating for more radical change. The work in this thesis is one way of showing some personal social accountability, and hopefully contributing to a better world for patients and their doctors in the early part of the 21st century, within the resources available. To an extent, the thesis is the story of my involvement in what I now see as an emerging focus on medical workforce development at the medical school of the University of Auckland.

An emerging theme

The early work of this thesis was conducted while a lecturer at the University of Auckland; driven by a desire to see women doctors access all specialties equitably, and advance up the academic ladder alongside their male colleagues. It seemed somewhat disheartening and even misleading for jobs to be offered to talented women who had less of a chance to contribute fully to the NZ health or medical education systems than their male colleagues. As will be discussed in Part 2 of this thesis, these thoughts were not unique – being well-articulated in a recent UK government report into the status of women in medicine:⁸⁵

No doctor should be wasted because they cannot find a place in the system that is compatible with their other roles as a parent and partner;

We should make our goal a [medical] profession where every woman and every man goes as far as they wish and as far as their talents permit.

Through my experiences as Associate Dean, clinician, teacher and researcher, my own perspective has evolved to one where *no medical student should be wasted*.

Every medical student is a *taonga* (treasure); any loss of full participation has an impact on the individual, and, from the public perspective is wasteful of resources, both in direct education costs and the opportunity costs of a forgone medical training place. In a broader social sense, it is an imperative to have as many 16-65 year olds as possible occupied in gainful employment both for economic reasons and because those in employment have better health.⁸⁶ These strong workforce, clinical, social and financial imperatives have led me to conclude that the medical student body must, to the greatest possible extent, contain students with the aptitude, and intrinsic and external motivation, to participate fully in the specialist disciplines needed by the NZ health system. The significant increase in student numbers in NZ provides a convenient juncture at which to review and refine strategies for selection and education of medical students, to ensure this is the case.

An hypothesis

My programme of research and ideas started in the 1990s, and continues to the present day. As the studies were conducted over at least a decade, it is incorrect to assume there was ever one unifying hypothesis or research plan from the outset. Rather, the research questions arose naturally from personal interest or an emergent need for better evidence. Subsequent questions were refined based on a range of experiences, including previous research findings. All along, the goal of the research was to define better the relationship between student characteristics, experiences at medical school and in training, and the medical workforce. Through this knowledge, it might be possible to develop evidence-based strategies to ensure that no medical student's education and training is wasted.

If there is one overarching hypothesis, it might read as:

That it is possible to enhance the likelihood NZ will have the future medical workforce it needs through careful attention to the role a medical school plays in medical workforce development. In particular, how might a medical school promote participation of its students in the medical careers most needed by the NZ workforce, through selection processes and learning experiences.

My thesis incorporates original published reports of studies of students and women graduates of the University of Auckland's medical programme, along with supplementary studies. These studies explored how students and graduates from this programme are working, or are likely to work in the future. While the results from studies at one medical school may not necessarily be applied to a different setting, once they are analysed and considered together with other published findings, it has been possible to generate new understandings of the nexus between a medical school and workforce, and where further research is likely to

be fruitful. To this end, a model is proposed in Part 4 that draws together the findings and themes into a schema that may be useful to other jurisdictions facing similar issues.

A paradigm

Because of the focus on medical and clinical science in their training, doctors are most familiar with a positivist approach to medical research. In this paradigm, knowledge is assumed to be unambiguous and certain – something that is ‘posited’.⁶⁴ The ontology is that reality exists and is explainable, with the researcher’s stance being one that is neutral, objective and reductionist.⁶⁴ Research questions are usually represented as hypotheses to be tested – to be proved or disproved. As a medical doctor with an undergraduate science degree in mathematics, this stance was the most familiar to me, and formed the basis on which this research programme commenced in the 1990s.

Over time, and with experience, it became clear that any findings in this area were not absolute, and had to be interpreted within the context of the studies, and taking into account the complexity of the health, education and wider social environments. In this regard, my paradigm now most closely resembles a post-positivist one. This is characterised by an ontology of critical realism, owing to the ‘weaknesses in the human as a researcher and the complexity of the enquiry;’ however, there is still assumed to be an overarching objective truth.⁶⁴ The post-positivist investigator aims to be neutral, but may use multiple or mixed methods, often in natural rather than trial settings. The epistemological stance acknowledges that the outcomes may never be totally certain; instead, seeking to establish the ‘probable truth’.⁶⁴

One difficulty with this paradigm is that my relationship to the research was not totally neutral. The study of women medical graduates was motivated by a personal need to discover and mitigate any barriers to success. For nearly a decade, I chaired the Board of Studies and was member of its main subcommittees including the Medical Admissions Committee. This gave insights as to what data were lacking, and how data could be used to inform programme policy. There were political aspects to the choice of those questions. Additionally, the emerging workforce crisis has cast doubt as to how well the health needs of family, colleagues and oneself will be met in the future – introducing even more personal aspects into the research. As an aside, I am left pondering whether or not any researcher is truly neutral with respect to either the topic or the outcomes of their research?

The lack of neutrality, resultant questioning of social structures, and use of findings to inform policy development, are all elements of other research paradigms, such as critical theory.⁶⁴ Nevertheless, the studies presented in this thesis have in common the following: an *a priori* aim; testing using accepted methods, with results discussed critically in light of previous understanding of the topic. My programme of research seeks to provide pragmatic, evidence-based, strategies as to how a medical school may better ensure that its students are indeed the ideal NZ medical workforce in the future.

Methods

This is an introduction to the methods used in the thesis; although in some cases, these are described in greater detail within the respective studies.

Literature reviews

By necessity, literature reviews appear in the thesis in several places: first, in this introduction to make the case for the thesis (conducted in 2010); second, as part of the background to each study (variable timing, over a decade); third, in the discussion of each study in order to place the findings in a more recent context than when the study was conducted (2009-2010); finally, in Part 4, where the implications of the programme of research are considered (2010).

Literature searches were conducted using key words entered into search engines such as PubMed (©U.S. National Library of Medicine), Medline (©ProQuest), or Google Scholar (©Google). Other studies were located through searches of bibliographies of relevant publications, from personal communication at conferences and other meetings, or from referee suggestions. Owing to the breadth of the field and range of studies, the literature review has had to be focused. For these reasons, it could not be described as systematic in the sense of, say, a Cochrane systematic review.⁸⁷ More recent studies, and studies conducted in Australasia, have been preferred for their applicability to the NZ context and, in many cases, their quality. Studies from other countries are included only where there is some relevance to the NZ education or health systems, or because they are the most comprehensive in the field. Publications from the journal *Medical Education*, pre-eminent in the field, were preferred. References were managed using EndNote X1 software (©Thomson) supplied under the shared licence held by the University of Auckland.

Ethics Committee approvals

Ethics applications for the studies were sought, and approved, by the University of Auckland Human Participants (previously Human Subjects) Ethics Committee. The reference numbers for the two main projects are:

Lives and Careers of Auckland Medical Women Graduates – 2000/Q/057;

The Faculty of Medical and Health Sciences Tracking Health Professionals and Graduates Project – 2004/457.

Data sources and analyses

The data on which the studies are based came from written questionnaires (both mailed and administered face-to-face), university student databases and other databases such as that of the MCNZ. The two main sources of data were the study of medical women graduates reported in Part 2 and the FMHS Tracking Project described in Part 3. Many of responses were elicited using Likert (categorical) scales with descriptors. Quantitative data were analysed using standard summary statistics (mean, median, SD, range), along with t

tests for continuous variables, Chi-square tests for categorical variables and more detailed tests as needed. The level of statistical significance is represented either by *P* values, with the exact value reported where possible, or by 95% Confidence Intervals (CI). While a *P* value of <0.05 was regarded as statistically significant, educational or clinical significance was also sought. The main modelling approach used was a form of factor analysis. The only qualitative analysis used a general inductive approach of critical themes.⁸⁸

In medical education research, there has been a longstanding debate as to the most appropriate methods and, in particular, whether quantitative or qualitative methods are superior, or may be combined.⁸⁹ Owing to the acknowledged complexity of medical education, mixed methods are increasingly accepted as appropriate. Ways need to be found to triangulate, explain and expand upon findings.⁸⁹ If the quality of research is judged by how much progress is made in enhancing understanding of problems, rather than by the methods used,⁶⁵ it is sincerely hoped that this thesis, by reporting on my programme of research in the light of others' reports, provides new insights into the relationship among medical schools, their students and workforce participation, to maximise the contribution of each student within the workforce.

Part 2 – Lives and Careers of Auckland Medical Women Graduates – Ngā ahua noho me ngā umanga o ngā tākuta wahine o Te Whare Wananga o Tamaki Makaurau

...to adjust to the reality of women's lives instead of denying it, so that they can be better mothers and better doctors

Marcia Angell⁹⁰

A smooth transition [to a more feminised medical workforce] will occur only if we stop to think about the process we are engaged in: a modern population of students is being squeezed through a system designed historically for white males

Grace McGeoch⁹¹

Women fought long and hard for entry to medicine; it will require continuous commitment and effort to ensure that they fulfil their potential

Sir Liam Donaldson⁸⁵

This Part contains studies conducted from 1994 to 2003 into the work and life experiences of Auckland women medical graduates, and how women make career choices. The work reported in this part led to a review article:

Poole PJ. Room for more women in clinical specialties. NZ Med J 2000;113:105-107;⁹²

and two original peer-reviewed publications:

Lawrence J, Poole PJ. Career and life experiences of New Zealand women medical graduates. NZ Med J 2001; 114: 537-40;⁹³

Lawrence J, Poole P, Diener S. Critical factors in career decision making for women medical graduates. Med Educ 2003;36:1-9.⁹⁴

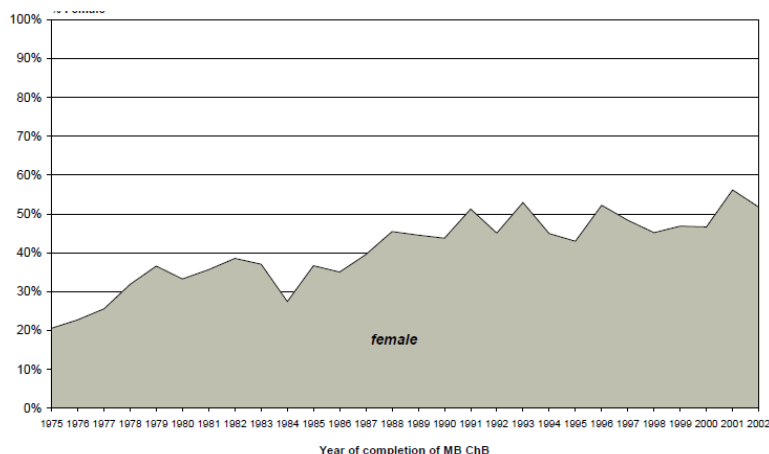
Introduction

As a contemporary medical educator, it is hard to imagine a medical school class that had a minority of women within it. Yet, the first NZ women medical graduate, Emily Siedeberg, qualified only in 1896. Thereafter, a '10% rule' was reported to be in existence at the Otago medical school;⁹⁵ although whether this was to increase, or restrict, the number of women is not entirely clear. In the 1960s, women with aspirations to tertiary education and, in particular, medicine, were aided in their goals by the wider availability of contraception and the emergence of feminist ideals. By nature, women are drawn to the ethos of medical practice and perform well in the meritocratic selection processes used by medical schools. As a consequence, the proportion of women

in medical schools rose steadily towards population percentages during the latter half of the 20th century.⁹⁶ This rise is shown in Figure 5. The Figure also shows that, for over 15 years, there have been roughly equal proportions of women and men graduating from medical schools in NZ.

Since 2001, the proportion of women in the graduating class at the University of Auckland has fluctuated around an average of 55% (range 50-60%, Medical Programme Directorate, personal communication, 2009).

Figure 5 Proportion of medical students by gender over time (Ministry of Health, with permission)



In the 1970s, women doctors began to question the male-dominated professional structures in medicine, but made few inroads.⁹⁷ By and large, medical women were not radical,⁹⁷ exerting a more 'liberal feminism'.⁹⁸ Women sought to demonstrate their equality through their own ability, actions and choices. Change was thought possible without, necessarily, altering the structure of society.⁹⁸ While the feminist movement had given rise to the ideal of gender neutrality – that women should achieve at the same rates as men⁹⁹ – many medical women report being naïve to the challenges of combining medical and family responsibilities.¹⁰⁰

Personally, it came as a shock to hear Professor Barbara Heslop give the advice at an FRACP pre-Part 1 course in Dunedin in 1989 that trainees who were mothers would have little chance of passing the examination. She told the group present that studying for a fellowship in addition to two other full-time jobs – medical practice and raising a family – was too difficult. Sans children, I passed the FRACP Part 1 the following year; although not before enduring some adverse feedback because of a decision to job share prior to the examination. Early the next year brought the birth of a child, a short period of maternity leave before starting work again at registrar changeover in June, followed by a move to Wellington at the end of the year to follow my Naval husband. It proved impossible to find a part-time medical registrar job in Wellington. Advanced physician training became a balancing act of child care, supporting a busy husband, heavy clinical responsibilities, and education of self and others. It resulted in shattering fatigue and a decision to limit our family to one child.

Along the way a small problem arose because junior doctors were, and still are, employed on annual contracts with an individual DHB, with maternity leave pay available only after a return to employment for a continuous period of more than six months to the same DHB. I was deemed ineligible by days, as the registrar rotation year did not coincide exactly with calendar months. Fortunately this was resolved after negotiation.

Thanks to the efforts and guidance of two mentors, Professors Peter Black and Ian Simpson, I returned to my alma mater in 1993 as a part-time locum Lecturer in Medicine.

The dearth of women in the higher echelons of medicine in NZ, particularly in the clinical specialties and in academia, was reported by Heslop in 1987.¹⁰¹ She concluded that women were limited in their career options with respect to men because the postgraduate training system effectively culled many women with children before they had the chance to acquire a postgraduate qualification. Heslop based her argument on four premises: most women will have children; raising a family was not any easier in the 1980s than it had been previously; post graduate training was not likely going to get shorter or easier; nor would there be more medical jobs in the future that did not need postgraduate (PG) training. She noted the low proportions of women training at the time in clinical specialties such as medicine (27%), surgery (7%), and anaesthesia (26%) at that time. Adverse consequences for the NZ health system were predicted if women did not participate fully – Heslop calculated that New Zealand’s medical schools could supply only about half of the specialists that the country required.¹⁰²

A major study into the lives of medical women in NZ was undertaken in 1986 by Durham and colleagues as part of larger survey of doctors.¹⁰³ This was sponsored by the NZ Council for Postgraduate Medical Education and the Medical Women’s Association, with funding from the Health Workforce Development Fund. A questionnaire was mailed to 1525 doctors (including those trained overseas) with a response rate of 85.5%.

The authors conducted three analyses, namely:

1. a description of all NZ female medical graduates from 1955-1982;
2. a comparison of male and female graduates from 1974-1982;
3. a qualitative study.

Among the significant findings were:

- women were less likely than men to be a principal in a general practice, a specialist or a senior academic (relative risk (RR) 0.65, 95% CI 0.56-0.76);

- women were more likely than men not to be working on the survey date (RR 3.48, 95% CI 2.24-5.42), and less likely to be working full-time (RR 0.62, 95% CI 0.58-0.66);
- women were more likely than men to choose their career based around family commitments (RR 5.02, 95% CI 3.81-6.60), and more likely to report career difficulties (RR 1.55, 95% CI 1.34-1.79); and
- women were less likely to be in a long-term relationship than men (78.4% vs. 85.7%, RR for being single = 0.92, 95% CI 0.87-0.97).

Shortly afterwards, Dennerstein and colleagues studied 903 female medical graduates from the University of Melbourne,¹⁰⁴ matching them by year of graduation with 851 male counterparts. Their findings were similar to Durham's, in that males were significantly more likely than females to be medical specialists, or to have held a leadership position. In a recent systematic review, Kilminster and colleagues confirm that, regardless of health care system, medical women remain segregated horizontally (women concentrated in certain areas of work) and vertically (women under represented at higher levels of the professions).¹⁰⁵

In the Melbourne study, 40% of females and 25% of males were single,¹⁰⁴ and 47% of women had never had children, compared with 33% of males ($P < 0.001$). Of those with children, 25% of female doctors reported that their partner took primary responsibility for child care compared with 97% of males ($P < 0.001$). In an Australasian study of 248 women physicians with an FRACP, Sewell found 76% were married.¹⁰⁶ Of these, 79% had children. These women had a mean of 1.5 children (range 1-4), with the average age at the birth of the first child was at 31 years. Another Australian study compared the choices of women at the beginning and end of medical school, and again as interns, finding women more likely than men to choose general practice at every stage. The main reasons given were the flexibility and nature of medical practice.¹⁰⁷

In late 1993, I was nominated to participate in a University of Auckland Department of Medicine Working Party that had been convened to evaluate issues facing women clinical academics. This reconvened in 1998 with myself as chair. The working party reviewed the literature, and found consistently that academic women physicians were promoted more slowly than men, with this not explained by productivity or differential attrition.¹⁰⁸ This also applied the University of Auckland; there was relative under-representation of medical women in the clinical academic departments, with those women tending to be clustered at the lower end of the academic scale.⁹² At the time, 6 of 16 (37%) clinical academics in the Department of Paediatrics were women. In the Department of Obstetrics and Gynaecology, there were seven academic women (two professors, two associate professors and three senior lecturers) out of seventeen academics (41%). Although in Psychological Medicine nearly half the academics were female, none was above Senior Lecturer level.⁹²

Despite making up nearly 50% of medical students, only 25% of physician trainees and 10% of surgical trainees were female at that time.⁹² In contrast, over 40% of paediatrics trainees were female, despite the training

programme being similar in structure to adult medicine: three years of basic training followed by another three of advanced training, with the two periods separated by a difficult Part 1 examination offered only once per year. One possible explanation was the presence of senior women in Paediatrics in Auckland, as a result of proactive recruiting of women into academic positions in the early days of the department. Paediatrics may, as a consequence, been perceived as a more women-friendly specialty.

I prepared a review article for publication summarising the findings of the working party. This included my interpretation of the strategies that would lead to an increase in the proportion of women in clinical specialties.⁹²

I. Strategies for individuals contemplating a clinical specialty

- train with ambition and conviction in an enjoyable specialty
- develop a supportive network of family, friends and colleagues
- seek out a trusted mentor for support and career guidance
- state needs clearly and negotiate reasonable conditions and pay
- get involved in the organisations that make key decisions
- recognise that parenting skills are valuable to everyday medical practice

II. Strategies for institutions and society

(“Institutions” were public and private employers, universities, government, and professional bodies).

Recruitment

- foster career paths of student doctors, especially over the critical time between medical school and specialty training
- recognise the challenges for students and trainees who are also caregivers
- encourage and provide mentors and role models
- eliminate harassment and discriminatory practices
- address these issues in teaching programmes at several levels

Work and training environment

- encourage flexible work practices to meet employee needs

- ensure part-timers have equal access to the information, facilities and opportunities that are available to full-timers
- provide adequate maternity leave and cover
- facilitate re-entry into the workforce when required
- agree on suitable job or training expectations prior to employment
- base performance review and promotion on previously agreed goals
- encourage women to apply for promotion

While Australasian studies had identified barriers for medical women; recommending significant changes to the health and education systems to enable medical women to balance their work and family lives, the situation potentially worsened in NZ during the 1990s.⁹² In 1991, there was the cessation of the Medical Reserve Scheme that had been funded by government since 1979 for career maintenance for medical women. In 1995, a new Medical Practitioners Act was introduced, requiring all general practitioners to have vocational (specialist) registration if they wished to practice independently. Finally, university student fees increased steadily through that decade, with uncertain short and long-term effects on women and other minority groups.

A study of University of Auckland women medical graduates

Following a presentation to a medical student careers seminar in 2000 that included the findings of the working party, I was approached by a student, Joanna Lawrence, to discuss a proposal for a summer studentship. Joanna was then a third-year medical student. I was a Senior Lecturer in Medicine, but had just been appointed as Assistant Dean (Medical Programme) with responsibilities for the quality of the medical curriculum at Auckland, and graduate capabilities. In her application to the MCNZ for funding for the studentship, Joanna wrote:

The topic, why more women are not becoming specialists despite increasing representation in medical schools, is of much interest to me. I have always given my academic studies very high priority and derive a lot of pleasure from success in this area ... as I progress further through my medical training, it seems to me that commitment to my academic studies involves sacrifices. A future family is important to me and I look forward to the day when I have my first child. Unfortunately, a strong career drive in addition seems to be at conflict with my more maternal desires. I believe that I have the ability to succeed and be an asset to medicine and I view many of the females in my class in the same light, but statistics show that despite having equal capabilities, we woman are not reaching the higher positions and specialty fields. I would like to know why. Is it our desire to have a family life? Is it a lack of

professional support or role models? My research aims to follow on primarily from the article written by Dr Phillippa Poole, published in the NZ Medical Journal in 2000 to investigate the critical features of those specialties that are attractive to women.

Joanna's curiosity matched mine, and was typical of other medical students at the same stage – "why weren't we told?"¹⁰¹ Somewhat optimistically in hindsight, Joanna and I believed that obtaining information about the lives of medical women would lead to rapid developments in training programmes and jobs to better meet women's needs.

Aim

Together we planned a study with the aim of determining how and when women make medical career choices,^{93, 94} and the critical features of specialties that have attracted a large percentage of women. In particular, we wished to study:

- factors that determine career choice;
- the impact of career on family life;
- the impact of family life on career;
- job satisfaction.

Subjects

The subjects were chosen randomly from a list of all medical women who had been in their final year at the University of Auckland medical school between 1973 (the first graduating class) and 1997, and who remained on the NZ medical register. The original list provided by the MCNZ contained 1,500 names of males and females. Males were culled from the list by comparison with student lists held by the University of Auckland. Anticipating a 70% response rate, surveys were mailed to a random sample of 415 of the 664 eligible women, to obtain a sample size of 300.

Methods

Questions in the survey asked about demographic characteristics, work and life patterns, and influences on career decisions. Structured answers with fixed answer sets formed the majority of the questionnaire, however there was provision for free text responses in specific places: effect of part-time work and partner's occupation on career progression; major influencing factors on career choice; and job satisfaction. The design and methods were based largely on those of Durham¹⁰³ conducted 13 years earlier. This was chosen for two reasons: first, it was an approach used previously in NZ; second, it allowed some direct comparisons to be made over time. The survey was developed in consultation with a FMHS biostatistician and modified after feedback from 4 of the 10 individuals invited to pilot it. The final survey fitted onto four A4 sides. A full copy of the survey may be seen in Appendix 1.

The University of Auckland Human Subjects Ethics Committee approved the project (reference 2000/Q/057). Surveys were mailed to the address recorded on the MCNZ Register in November 2000, with one reminder letter sent in December 2000 to non-responders. Respondents were identified by their MCNZ registration number written on the bottom left corner of the supplied freepost return envelope, which was then discarded. Respondents were then assigned a random subject number and thus, there was no identifying information on the survey form. All descriptions of subgroups were sufficiently general to avoid identification of individuals. All data were entered into an Excel spreadsheet.

Originally it had been planned to follow the survey with several in-depth individual interviews. These were not held as the open-ended questions generated sufficient information for a secondary qualitative analysis.

Data Analysis

Three separate analyses were conducted:

1. An analysis of descriptive statistics

Summary statistics and simple measures of mean and distribution were used on data that had been entered into a Microsoft Excel spreadsheet. Standard statistical techniques were used, including Chi-square tests for categorical variables. Medians were used except where mean and median values were similar, where means are reported. For comparison, Durham's 1986 survey of 1083 women practising medicine in NZ,¹⁰³ and the MCNZ annual workforce report in 2000¹⁰⁹ were used.

Each discipline category included specialists and those training in that specialty. The categories were the same as had been used by Durham. The terms 'community medicine' and 'psychological medicine' used in Durham's survey were considered synonymous with the contemporary terms 'public health' and 'psychiatry'. 'Medicine' covered general medicine and all the subspecialties of medicine; similarly for surgery. The specialty of emergency medicine was the only new specialty since the Durham study. Those categorised as 'other' included community accident and medical practice, breast medicine, palliative care, appearance medicine, travel medicine, sports medicine, mental/sexual health, research, family planning, management, medical writing, medical informatics, and house officers not in a training programme. Many of these are conducted in the primary care setting.

To analyse time trends, respondents were categorised as either early or late postgraduate (PG). The early PG period was 9 years or less since the end of medical school, and late PG was 10 years or later. The rationale was that most women would have decided upon a specialty by 10 years after graduation.

2. A principal component analysis using varimax rotation^{110, 111}

This mathematical technique is used to explore whether or not the picture presented by the 19 influencing factors plus relevant other variables (hours and satisfaction) was explainable by a smaller set. Analyses were performed using SPSS v. 11.0 (©IBM, Chicago).

3. Qualitative analysis

Responses to open-ended questions on major influences on individual's career choice were transcribed into Microsoft Word, then analysed for common themes using a general inductive approach.⁸⁸ This was regarded as a secondary analysis, owing to the inclusion of both quantitative and qualitative aspects in the questionnaire. The qualitative comments were organised under the categories that had been established in the principle component analysis, and coded according to the respondent's:

- age;
- occupational status
 - general practice (gp) or
 - specialty other than GP (sp);
- marital and family status
 - single without children (s/-)
 - single with children (s/c)
 - partner, no children (p/-)
 - partner and children (p/c).

Results

The response rate was 74% (306 respondents), although not all answered every question. Respondents were a median of 11 years post graduation from medical school, with 137 (45%) in the early PG group and 166 (55%) in the late PG group. Graduates made up 16% of entrants to medical school compared with 27% in 1986.¹⁰³ Only two women were not working.

Practice specialty

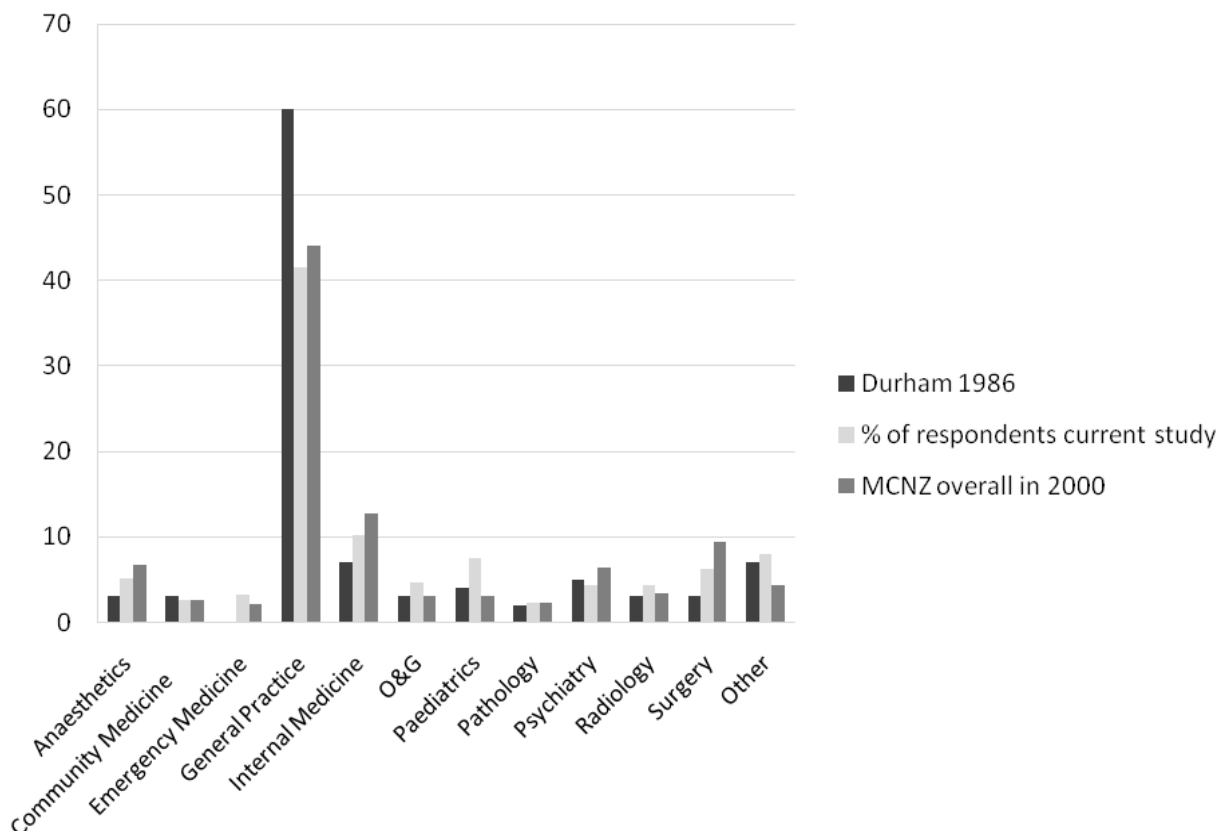
The specialties of the respondents are shown in Table 2. By far the largest number of women was in general practice. The proportion in general practice was significantly lower than it had been in 1986 (42% vs. 60%, $\chi^2 P = 0.009$). Women were moving into other clinical specialties, including ten into emergency medicine. For reference, the distribution by specialty of Auckland women graduates compared with the distribution of NZ medical women in the 1986 Durham study¹⁰³ and the overall NZ medical workforce in 2000¹⁰⁹ is shown in Figure

6. A test for independence of the three distributions did not reach statistical significance ($\chi^2 P = 0.74$) even with Yates' correction for proportions under 5%, suggesting that some of the changes observed applied to men as well.

Table 2 Distribution of the respondents by specialty (n = 305)

Specialty	No.	(%)	Specialty	No.	(%)
Anaesthetics	16	5.2	Paediatrics	23	7.5
Community Medicine	8	2.6	Pathology	7	2.3
Emergency Medicine	10	3.3	Psychiatry	13	4.3
General Practice	129	41.6	Radiology	13	4.3
Internal Medicine	31	10.2	Surgery	19	6.2
O&G	14	4.6	Other	22	7.2

Figure 6 Proportion (%) of NZ women doctors in each specialty in 2000 (middle bars) compared with Durham's 1986 survey (left), and the NZ workforce as a whole in 2000 (right)



Age

The median age for all respondents was 37 years (range 26 - 63yrs). The youngest women were seen in anaesthetics (median 33.2 years) and the oldest were in general practice (median 38.7 years) and 'other' fields (median 38.6 years).

Ethnicity

Eighty-eight percent of women identified as European, 3.3% Māori, 5.5% Asian, 1.7% Indian and 1.4% from Pacific Islands. There was a higher representation of Māori and Pacific Island graduates in community health than in any other field (37.5%). The nine women respondents who were Māori were younger on average, and only one had a prior degree. Two were in surgery, two in community health and three in general practice.

Hours and income

The mean number of hours per week is shown in Table 3. Overall, women worked a mean of 42 hours per week. Women in the early PG period worked over 16 hours more per week than those in the late PG period.

Table 3 Mean hours and income in early (< 10 years) and late postgraduate periods

Specialty	Early PG	Late PG	Early PG	Late PG
	Mean hrs/wk	Mean hrs/wk	Est. income/hr*	Est. income/hr*
Anaesthetics	55.5	45	\$29.5	\$51
Community	41	35	\$21	\$26
Emergency	44	38	\$24	\$31
General Practice	39	33	\$24	\$28
Medicine	57	41	\$20	\$41
O&G	59	48	\$22	\$65
Paediatrics	51	47	\$22	\$42
Pathology	52	35	\$23	\$47
Psychiatry	52	40	\$25	\$36
Radiology	53	40	\$23	\$41
Surgery	62	50	\$22	\$47
Other	45	24	\$36	\$44
Mean / person / wk	51	34.5	\$23	\$44

The mean annual gross income for women graduates was estimated at \$69,240. Those in O&G and surgery showed the largest increments in income between the early and late PG periods whereas the changes were smaller in other fields, and lowest overall in general practice, community and emergency medicine. The

income per hour was estimated from those respondents who had filled in both hours and income. Gross income was divided by the number of hours worked per week and then by 52 weeks.

Children

The timing and numbers of children by specialty of the mother are summarised in Table 4. The mean number of children per Auckland graduate was 1.4, and 60% of respondents had had children, compared with 1.8 children on average and only 48% with children in 1986.¹⁰³ For the sub-sample of women with children, the mean age at birth of first child was 31 years, and the mean number of children was 2.3.

Overall, at least half of the women in every specialty had had a child. No-one in O&G, psychiatry or anaesthetics gave birth to a child in the first 9 years post-graduation. Thirty-eight percent of respondents indicated a desire to have more children, especially those working in radiology (63%) and paediatrics (43%). Women with children felt that they contributed 56% of childcare, their partner 22%, paid employment 17%, and extended family, 5%. Of these mothers, 88% took maternity leave and 85% returned to work part-time. Those women taking time out of the workforce took on average 14 months off completely and 47 months part-time. Per child, this translated to 6 months out of the workforce plus another 20 months of part-time work.

Table 4 Timing and numbers of children by specialty

Specialty	Number (%) of Total	% with children	% of Early PG (45%)	% of Late PG (55%)	Mean age at birth of first child	Mean number of children*
Anaesthetics	16 (5.2%)	38%	0%	100%	32	0.7
Community	8 (2.6%)	75%	50%	100%	31.5	1.9
Emergency	10 (3.3%)	60%	50%	67%	31.5	1
General Practice	127 (41.6%)	78%	55%	90%	30	1.8
Medicine	31 (10.2%)	42%	14%	75%	31	1
O&G	14 (4.6%)	64%	0%	89%	31	1.5
Paediatrics	23 (7.5%)	26%	8%	50%	33	0.4
Pathology	7 (2.3%)	57%	25%	100%	32	1.3
Psychiatry	13 (4.3%)	39%	0%	83%	30	1
Radiology	14 (4.3%)	36%	13%	80%	33	0.8
Surgery	19 (6.2%)	32%	17%	57%	33	0.7
Other	22 (7.2%)	82%	71%	86%	29.5	2.1
Mean		60%	41%	88%	31	1.4

*The mean number of children is divided by all women in that specialty group.

Part-time working

Sixty-four percent of respondents indicated that they had worked part-time (for any reason at any stage) in their career. Those in 'other' fields (82%), emergency medicine (80%) or general practice (77%) were most likely to have worked part-time, with those in radiology (31%) and surgery (32%) the least likely.

Job-sharing

Only 37% of all those who had worked part-time had job-shared. Women in emergency medicine and psychiatry were the most likely to have job-shared (86% and 75% respectively). No-one in pathology or radiology had job-shared and rates were low amongst surgeons and anaesthetists (each 17%).

Partners

Of the 305 respondents, 82% reported they were in a long-term relationship. Thirty-seven percent of partners were also medical graduates. These medical partners worked longer hours than the Auckland medical women (50 hours per week compared with 42 hours per week, on average). The proportion of women who felt they spent enough time with their partner ranged from a low of 10% in O&G to a high of 50% in community medicine and anaesthetics.

Job satisfaction and impacts

Women rated their job satisfaction from 1 (minimal) to 9 (maximal), with the means for each specialty reported in Table 5. Eighty-seven percent of women reported a mean job satisfaction rating of 6 or greater, with a mean of 6.5. Overall satisfaction did not differ significantly with either age or ethnicity. The greatest job satisfaction was reported among those doing community medicine (7.6) and psychiatry (7.3). The lowest rates were found for those in medicine (5.9) and in emergency medicine and general practice (6.2). Ninety-one percent of those in psychiatry and 88% of those in community medicine said they would choose the same career again. The least likely to repeat were those in emergency medicine (57%) and internal medicine (58%). In all other areas between 60-70% indicated they would have done the same career again.

Based on a similar scale, the mean score for the job's impact on family life was 6.4, with the highest scores amongst the pathologists (7) and surgeons (7.2) and the lowest amongst anaesthetists (5.8). The impact of job on timing and number of children (5.9) was greater amongst those in pathology (7.8), and lowest in community health (5) and general practice (5.3). The impact of family on career choice averaged 5.6.

Timing of career choice

The preferred occupation of the participants at three time points during medical school is reported in Table 6. With the exception of surgery (59% decided), the minority of women (40%) had decided which field to enter at graduation from medical school. This compared with 16% in 1986.¹⁰³ When 'current career' was compared with 'desired career at graduation,' 27 women who originally intended entering medicine or surgery subsequently chose an alternative career with 16 of these becoming general practitioners.

Table 5 Job satisfaction and impacts on career and family on scale from 1 (minimal) to 9 (maximal), by specialty

Specialty	Job satisfaction	Impact of job on family	Impact of job on timing/no of children	Impact of family on career choice
Anaesthetics	7.2	5.8	6.0	4.6
Community	7.6	6.4	5.0	7.0
Emergency	6.2	6.8	6.8	6.9
General Practice	6.2	6.0	5.3	6.4
Medicine	5.9	6.9	6.7	5.3
O&G	7.2	6.8	6.8	2.4
Paediatrics	6.4	6.7	6.9	4.4
Pathology	6.7	7.0	7.8	4.8
Psychiatry	7.3	6.2	6.6	3.0
Radiology	7.2	6.3	6.2	5.3
Surgery	6.6	7.2	7.5	4.9
Other	7.1	5.9	4.0	6.9
Mean	6.4	6.4	5.9	5.6

Table 6 Percentage of respondents in each specialty who had decided on that specialty at three time points

Current specialty	Before medical school	During medical school	At graduation
Anaesthetics	0%	0%	21%
Community	12%	12%	12%
Emergency Medicine	0%	9%	27%
General Practice	21%	29%	47%
Medicine	9.5%	19%	43%
O&G	10%	30%	40%
Paediatrics	6%	6%	35%
Pathology	0%	0%	0%
Psychiatry	9%	45%	27%
Radiology	10%	10%	33%
Surgery	12%	53%	59%

Influences on career choice:

Respondents were asked to rate nineteen possible influences on a scale of 1–9 according to their impact upon career choice (1 = not at all, 9 = very strongly). Table 7 shows the items ranked from those with the highest impact to those with the least.

Table 7 Influencing factors – mean score and 95% confidence intervals (CI)

Influencing Factor	Mean	95% CI
Interest and enjoyment	7.7	7.57 , 7.83
Variety within job	7.1	6.92 , 7.28
Flexible working hours	6.6	6.31 , 6.89
Intellectual challenge	6.5	6.30 , 6.70
Compatibility with family responsibilities	6.5	6.20 , 6.80
Regular working hours	5.7	5.40 , 6.00
Opportunities to take time off	5.6	5.27 , 5.93
Encouragement from others to enter field	5.3	5.03 , 5.57
Ease of re-entry after taking time off	5.3	4.99 , 5.61
Positive experiences during undergraduate training	5.1	4.81 , 5.39
Lack of 'on call' duties	5.1	4.76 , 5.44
Role models in general	5.1	4.83 , 5.37
Job security	5.0	4.73 , 5.27
Mentors	4.9	4.61 , 5.19
Women role models	4.3	4.02 , 4.58
Compatibility with partner's job	4.9	4.59 , 5.21
Option of part-time training	4.8	4.46 , 5.14
Lack of sexual harassment	4.5	4.21 , 4.79
Financial reasons	3.6	3.33 , 3.87

The influences on career listed in Table 7 were then incorporated into a principal component analysis, along with the response for overall job satisfaction. This revealed that a model of four factors, each containing a distinct set of influences, could account for 79% of the total variance in the sample. The rotation converged in 8 iterations. To be considered in the model, an influence had a factor loading of at least 0.4.¹¹² By virtue of the influences that were contained in each factor, these were named 'flexibility', 'women-friendliness', 'interest' and 'security'. The four factors, along with the loading of each component influence, are reported in Table 8.

Table 8 Results of the principal component analysis

Factors and component influences	Loading
Factor 1: Flexibility	
Compatibility with family responsibilities	0.77
Compatibility with partner's job	0.62
Flexible working hours	0.82
Regular working hours	0.71
Lack of 'on call' duties	0.77
Option of part-time training	0.76
Opportunities to take time off	0.86
Ease of re-entry after taking time off	0.83
Hrs worked / wk	-0.47
Factor 2: Women-friendliness	
Women role models	0.71
Role models in general	0.85
Mentors	0.84
Encouragement from others to enter field	0.66
Lack of sexual harassment	0.43
Factor 3: Interest	
Intellectual challenge	0.55
Interest and enjoyment	0.82
Variety within job	0.64
Overall satisfaction	0.65
Factor 4: Security	
Financial reasons	0.78
Positive experiences during undergrad training	0.45
Job security	0.77

Once the factors were identified, the mean strength of influence of each factor on career choice was calculated by averaging individuals' scores for impact of each of the influences within that factor. The scale was the same as that used in Table 7, namely from 1 = not at all, to 9 = very strongly. The highest and most consistently - rated factor across the specialties was 'interest' (mean score 7), followed by 'flexibility' (5.8), 'women-friendliness' (4.9) and 'security' (4.7). The mean strength of influence of each factor was determined and compared across specialties. These are shown in Figures 7 to 10.

Figure 7 Mean influence of the impact of factor 'interest' across specialties

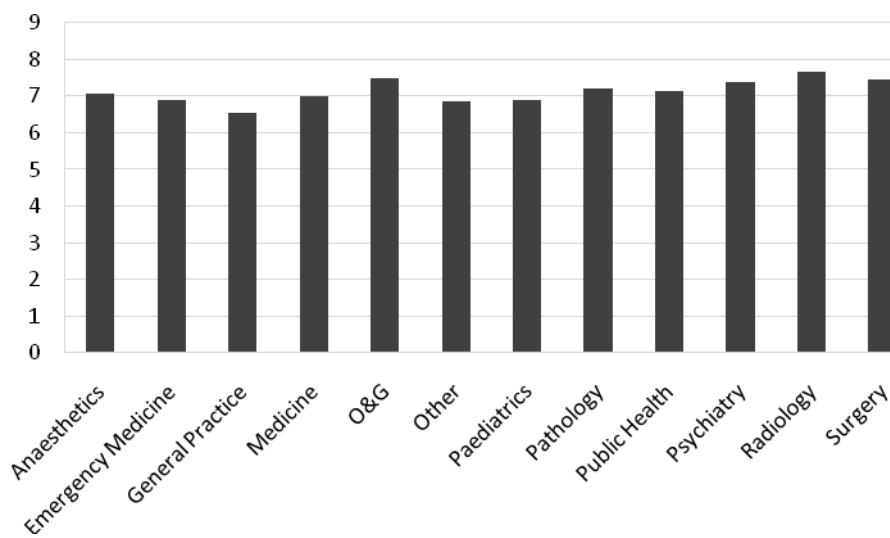


Figure 8 Mean influence of the impact of factor 'flexibility' across specialties

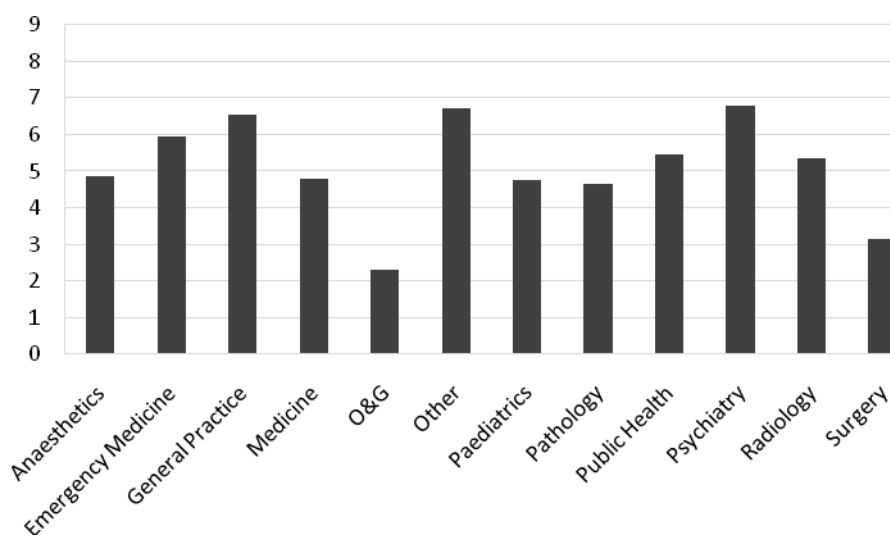


Figure 9 Mean influence of the impact of factor 'women-friendliness' across specialties

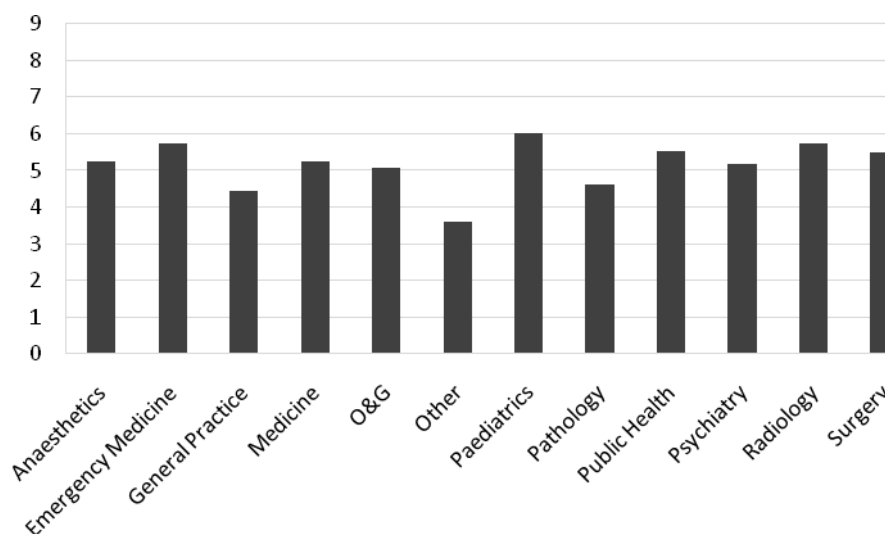
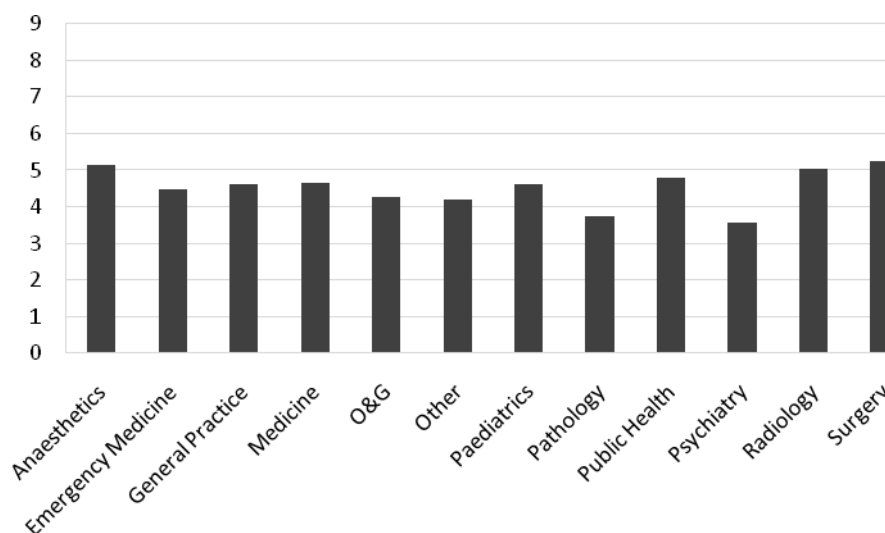


Figure 10 Mean influence of the impact of factor 'security' across specialties



Flexibility

Flexibility was the highest loading factor overall, accounting for 26% of the total variance in how women made career choices. There were, though, differences among specialties, with women in O&G and surgery rating the influence of flexibility very low, and those in public health and general practice rating it highly. The qualitative analysis supported the finding that flexibility is a strong influencing factor. The importance of accommodating family responsibilities was commented upon by 130 (43%) women in the open-ended questions.

It is very hard to have a family and a full-time career (38yr-gp-p/c)

It is so difficult to parent when working 60-70 hours /week with study, journal clubs, presentations on top of this (33yr-sp-p/c)

Long training means the time you may specialise coincides with limited time for child bearing (40yr-sp-p/c)

An additional 77 (25%) participants mentioned the importance of suitable working hours (referring to regularity, flexibility and lack of long hours). Long and inflexible work hours were considered a deterrent to undergoing specialist training:

The hours of work in the hospital system can be and usually are exhausting (34yr-sp-s/-)

The excessive hours that are worked as a house surgeon are a deterrent to considering undergoing hospital-based specialist training (30yr-gp-s/-)

My only friends who have continued training are either single, childless, or have supportive families / nannies (37yr-sp-p/c)

(Depends on) how long they can cope with being a training registrar in a hospital – working horrendous hours – while they really want to spend some time in the home and be a mother (27yr-gp-s/-)

Work hours in many specialties mean everything is compromised for career and it's not worth it (38yr-gp-p/c)

Of the survey respondents, 64% had worked part-time. The availability of part-time work, job sharing or maternity leave were mentioned by 48 (16%) women as important. Over 100 women made negative comments about working part-time compared with only 12 positive comments. Those who took periods of time off work felt they were viewed as less committed, less keen, and less serious about their career. They felt that they were less likely to be invited to work on research projects and were less involved in decision-making processes within departments.

Perceived by older male consultants as 'not committed', 'not well trained', 'not making the grade' 'not really up to it' (38yr-sp-p/c)

Tend to run into an unspoken but definite negative attitude from consultants and even other registrars (41yr-sp-p/c)

Others perceptions of one's lack of commitment to the career due to prolongation of specialty training may in the future reduce job opportunities in a competitive market (40yr-sp-p/c)

Difficulties were reported in getting involved in work related activities, such as departmental committees, and in meeting continuing education requirements. Specific issues raised were the ability to afford conferences and journals, missing educational meetings or materials from colleges/institutions not being sent to part-

timers. Keeping up to date with changes in the health sector (drug names, certification requirements and current specialists) was also problematic.

A longer time to gain confidence, skills and experience was reported, along with problems of re-entry after time was taken out of the system. These phenomena were emphasised particularly in clinical specialties:

Very difficult to get back into fulltime public hospital work (33yr-gp-p/c)

In clinical medicine very soon lose skills and knowledge if not constantly employing them (47yr-sp-p/c)

A lack of part-time job opportunities in the hospital during the early postgraduate years was cited as one of the major problems with the current working conditions facing women with children. In particular, the lack of flexibility with respect to part-time work and training was deemed by many to be one of the major deterrents to specialising:

I think it sad that many women doctors who choose to prioritise motherhood and family while in their late 20-30s end up returning to predominantly GP type work. Perhaps if there were more opportunities to job share as a registrar in the hospital, more of these women would go on to specialise in an area of their choice. There needs to be a general move towards making medicine a job that is more 'motherhood' friendly (27yr-gp-s/-)

I have a close group of female doctor friends and have watched them one by one leave the hospital system despite a real interest in different specialty areas. These are wonderful people and good doctors that I feel the hospital system is missing out on because of its family unfriendly environment (33yr-sp-p/c)

No part-time option weeds out women with children very rapidly (39yr-gp-p/c)

I'm currently at that point 'where to from here', do I specialise or not? It is causing a lot of stress for me and my family. What I'd love to do and what is possible are a long way apart. I want to spend time with my family not be a medical registrar coming home late, spending my spare hours studying, not being involved in my child's activities ... When I talk to other female doctors it's so much the same. It IS easier for men to specialise. Most female GPs I speak to can tell me what they would have liked to have become and that they did GP for reasons of flexible hours not through intellectual choice (30yr-gp-p/c)

It was acknowledged that children had a major impact on career progression (136 comments):

Desire to spend time with children vs. desire to work long hours on medical training scheme – family won – I changed to GP (34yr-gp-p/c)

Children have made the biggest impact on my career choice. The rigid training schemes of all the traditional specialties are prohibitive to training after children (33yr-sp-p/c)

Although it is my choice, I feel unable to consider specialising although I definitely would have had I not decided to have children (33yr-gp-p/c)

The jobs I have been doing are dictated by my need for part-time work so I don't lose all confidence in clinical medicine. I have a 2 year old daughter and my husband is a registrar and we feel someone (me) needs to be around. Totally devastating to my career. I had been working as a specialty registrar for 2.5 years (37yr-gp-p/c)

Although 'compatibility with partners job' was not ranked very highly, 41 (13%) respondents made the point that a supportive partner was important in achieving vocational success:

To succeed in specialist medicine with children you definitely need a supportive husband (38yr-sp-p/c)

My partner and I have a very equal set-up. This helps tremendously in my career choices, and success of my combining work and family commitments (37yr-gp-p/c)

Forty percent of respondents felt that their career came second to that of their partner, and some in non-GP practice felt that some compromise in terms of career was necessary in order to preserve their relationship:

Two years ago I decided to allow my job to come second because of the tensions of trying to maintain equality were too great. Prior to making this change we did not spend enough time together (42yr-sp-p/c)

We can't both work 60 hours plus per week without the family and relationship dissolving (48yr-sp-p/c)

Full-time and a relationship pretty well impossible. Time spent together in past poor (42yr-sp-s/-)

Women-friendliness

Women-friendliness was moderately important in all specialties. Sexism in medicine was cited by 18 (6%) women as a problem. Comments were made with regards to the hospital system being perceived as an unwelcoming working environment for women – 'one of the last bastions of paternalism:'

Medical hierarchy, especially the old boy network influences choices against careers regardless of interest/choice or skill (39yr-sp-p/-)

Certain fields were regarded as being highly male-dominated, and as such, acting as deterrents to entry of women:

With regard to hospital based specialties, there is still the impression amongst women that while senior staff (male mostly) will accept them as registrars and admit they do an equally good job as their male counterparts when it comes to being employed and accepted as a consultant, the boys get the jobs and the ladies struggle. The 'Boys Club' is still alive and well. (27yr-sp-p/-)

Some surgeon males can understand the concept of a female as a nurse, wife, lover or patient but have never spoken to a female at college – lack communication skills to talk for 8 hours across an operating table (30yr-sp-p/-)

A supportive environment was mentioned by 28 (9%) women, the importance of mentoring by 10 (3%), and the influence of women role models by 25 (8%) respondents.

Interest

Interest was the highest-rated factor, with the least variation among the specialties. These data suggest that interest is the prime driver for career decision-making for most women; this was also evident in the open-ended comments. Eighty nine (29%) women made specific comments pertaining to interest, most of these by women in specialties other than general practice:

Although it seems to be 'folklore' that women choose their specialty based on family/lifestyle reasons, I believe that this still takes second place to interest/enjoyment in your job (33yr-sp-p/-)

On the other hand, 45% of the comments made by general practitioners suggested that there was a compromise of career to accommodate family needs:

Family requires one parent input at least. I view my job as 2nd to the family (44yr-gp-p/c).

Creating a family naturally lent itself to mum being a mum, and dad continuing with established work pattern (40yr-gp-p/c)

Up until last year when we starting trying for children my career came first as I was the main income earner. However, now that I have chosen to stay home with our children and work only part-time, my husband's career comes first (30yr-gp-p/-)

Most female GPs I speak to can tell me what they would have liked to have become and that they did GP for reasons of flexible hours not through intellectual choice (30yr-gp-p/c)

Security

Security ranked as the lowest of all factors influencing career choice. Correspondingly, only 18 (6%) women made mention of this factor in the open-ended questions. However, the changing economic environment for medical students was noted.

Discussion

Major Findings

The major findings of this study are discussed within the context of developments over the 10 years since it was conducted. This discussion is organised under five headings; nevertheless, these sections are not mutually exclusive. The headings are: careers of women doctors in NZ; career structures; family patterns; career satisfaction and income; and factors in career choice.

Careers of women doctors in NZ

At the start of this millennium, medical women's specialty roles in NZ were less restricted than described in previous Australasian studies.^{104, 103, 107} General practice was the specialty chosen by over 40% of Auckland medical women graduates, with the next most popular specialties being internal medicine (10%), paediatrics (7%), and surgery (6%). Compared with 1986, there was a lower proportion in general practice and a higher representation of women in others specialties. These findings were consistent with those from sequential studies in the UK: Goldacre found an 8.8% decrease between 1993 and 1996 in the numbers of women choosing general practice and an increase of 4% in women choosing surgical specialties.¹¹³ It is likely that some of the observed move away from general practice is explained by the increasingly sub-specialised NZ medical workforce overall;¹⁰⁹ however, it was not possible from this study to determine whether Auckland women graduates had different preferences to other doctors in NZ, or access to other specialties had been made easier for women. In 2004, Adair and Tuck undertook another study³⁵ of Auckland graduates, building upon the methodology I had used.⁹⁴ A survey was sent to doctors who were two to five years post graduation, for a response rate of 43%. They found that general practice was the preferred career choice for 21% of the women compared with only 3% of men ($\chi^2 P < 0.001$). This suggested that, at the time, overall level of interest for newly-graduated Auckland doctors in general practice as a career choice was low, but was markedly higher in women than in men. As NZ needs a workforce containing a substantial proportion of GPs, it is positive that so many women enter general practice. From the perspective of women in this study, general practice should be seen as a positive career choice, and not a default pathway because training and work in other specialties is too rigid.

By 2008, the proportion of women in the NZ medical workforce had risen to 39%.² This was close to the OECD average of 40%; although, owing to the lower base in 1990, feminisation of the NZ medical workforce had been occurring at a faster rate than elsewhere.¹² The flow-on effects of the rise in female medical students were evident: 46% of women in the medical workforce were younger than 40, compared with 28% of men; whereas only 4% of women doctors were over the age of 60 compared with 15% of men.² Not surprisingly, the proportion of women house officers had increased closely in parallel with the medical student numbers.² Women comprised 43% of general practitioners (up from 13% in 1980), although the proportion of women in

other specialties had increased only to 26% (up from 9% in 1980).² Others have noted these lower-than-expected numbers of women specialists, given the equal numbers of male and female students since 1991.^{85, 105} Therefore, despite signs of women entering a broader range of specialties, there was still segregation of women vertically, that is, relative under-representation at higher levels of the profession.

Apart from difficulties in meeting training programme requirements, the environment in which women work is likely to be important, and was mentioned by some respondents in this study. In their systematic review, Kilminster and colleagues found little evidence of gender difference in career motivation, academic performance and competencies to account for the limitation in range of women's careers.¹⁰⁵ They concluded that medical culture must be important; however, they reported a lack of evidence for this assertion.¹⁰⁵ Women in the present study had strong comments to make about the lack of family-friendliness and women-friendliness in the hospital setting, especially in surgical disciplines. Some women reported that the system did not value them, or their roles, as highly as men. The belief that women themselves are the problem, without questioning any barriers created by the system in which they work, has been reported elsewhere.¹¹⁴

Part-time women are not less dedicated or competent than their full-time colleagues. They perform just as well as their male counterparts at medical school. There is no universally-accepted definition of minimum time worked to maintain medical competence, with specialists working part-time still having to fulfill the annual continuing medical education (CME) requirements to retain medical registration under the NZ Health Practitioners Competency Assurance Act 2003. For those working part-time, this is often undertaken during unpaid time, in contrast to the situation for full-time, salaried employees. Furthermore, women doctors are less likely than men to be the subject of patient complaints,¹¹⁵ to be sanctioned for professional misconduct¹¹⁶ or be sued for medical malpractice;^{90, 117, 118} although this may, in part, reflect the types of practice in which women have traditionally been engaged, rather than necessarily better skills.

With respect to what will happen to the status of the medical profession as it is increasingly feminised, views are mixed. Not all agree that equitable access of women to all specialties would be a positive change. Some aspects of current health care may be lost – for example, the relative absence of males in general practice will limit choices of patients who seek a male doctor.⁹⁹ Women are more likely to use the patient-centred and team approaches to health care, with these well-suited to modern medical care of older patients with chronic diseases.¹¹⁹ Women doctors may be more likely to use 'empathetic' communication styles, however, this may result in women GPs seeing a disproportionate number of patients with time-consuming psychosocial problems.^{105, 120} It has been questioned whether women doctors have the necessary characteristics of innovation, tough-mindedness and risk-taking necessary to shape the health system for the challenges ahead.⁹⁹ On the other hand, tasks performed by men in societies are often seen as more important.⁹⁹ A 're-think of the masculine patterns of power' in medicine has been called for,¹¹⁴ as well as measurement of career success by other than hours worked, committee membership, or research outputs.¹²¹

In 2004, the President of the UK Royal College of Physicians, Professor Carol Black, raised the possibility that as Western medicine becomes more feminised, it will diminish to the status seen in Russia, where the vast majority of doctors are women.¹²² This was reported widely in the media and medical journals, provoking rancorous debate. Since then, fears of a loss of status of the medical profession have dissipated somewhat.¹²³ It has been pointed out that the increase in women students is not at the expense of men; it is a consequence of expansion in the total number of student places at medical school.⁸⁵ In NZ, medical student numbers only slightly favour women, with this proportion relatively stable in recently years. Consequently, the workforce cannot become predominantly feminised unless the other main source of doctors, international medical graduates, becomes markedly feminised. Another safeguard is that the Dean of the University of Auckland's Faculty of Medical and Health Sciences has stated that 'the demographic profile and numbers of those entering the programme will be based upon meeting the needs of the communities we serve'.⁴⁰ If the proportion of female medical students increased dramatically, it would, therefore, be possible to introduce measures to redress the shortfalls in numbers of males.

As their numbers grow, women must be involved in positions of influence to shape the future health system, and to serve as role models for those within medicine and in society at large.⁸⁵ Women are more likely to be leaders in specialties where they comprise over a quarter of the workforce, and in specialties such as general practice or public health with regular working hours that fit in with family responsibilities.¹²⁴ Getting more women to take on committee and leadership roles will involve encouragement and support of women.⁸⁵ Where systematic approaches to advance careers and promote leadership of medical women been used, they have met with notable success.¹²⁵⁻¹²⁷ Specific strategies to allow dovetailing of time out from career with activities such as research, teaching, working overseas or training in a subspecialty, will help women build the *curriculum vitae* necessarily to be promoted into senior jobs.

The most recent NZ trainee data² identified only three specialty areas with over 20 trainees where women were significantly under-represented. These were general surgery (35%), private accident and medical practice (25%) and orthopaedic surgery (5%). Women trainees outnumbered men in general practice, obstetrics and gynaecology, paediatrics, pathology, and public health medicine. For the specialties of anaesthesia, radiology, emergency medicine, internal medicine, and psychiatry, the proportion of women trainees ranged between 40 and 50%.² With the exception of orthopaedic surgery, these figures offer some hope that women will advance to specialist levels in sufficient numbers to yield influence in that specialty area.⁷⁷ The NZ Orthopaedic Association acknowledges it needs a greater proportion of female orthopaedic surgeons; however, only a small number of training places is available each year,¹²⁸ with these heavily over-subscribed. Furthermore, trainees in this specialty must rotate to smaller centres such as Whangarei, Palmerston North and Invercargill.¹²⁸ Each of these may have a negative effect on the numbers of women applying or being selected.

While women are now training in a broad range of specialties in greater numbers, some caution is required in interpretation, as not all women will complete the required years of postgraduate training. In the present study, there was evidence that some women changed career path from medicine and surgery to general practice, suggesting difficulty for some in meeting training or job requirements of subspecialties, or in juggling family and training. This finding is reported elsewhere.³⁶ Furthermore, the number and tenor of the qualitative comments related to the lack of flexibility in the health and training systems support this conclusion. The ‘leaking pipe’ phenomenon, whereby highly-educated women leave the workforce for family reasons, is well-recognised;¹²⁹ however, in contrast to other professions, there is little evidence that women leave the medical workforce completely at any higher rate than men. The retention of women in the NZ medical workforce eight to 14 years post-graduation is higher than men, with this being attributed to more women entering general practice and fewer pursuing specialty training or work abroad.¹⁰⁹

Career structures

Consistently, women doctors are found to work fewer hours per week than men.^{19, 130, 85, 105} In the present study, women worked an average 42 of hours per week – 51 in the early postgraduate period and 34 in the late postgraduate period. The hours worked by the Auckland women were higher than the NZ average (40-41 hours), shown in Table 9 below, constructed from MCNZ data.² This observation is likely due to the women in the present study being a younger cohort emerging from a newer medical school, and thus over-represented by younger women, who work similar hours to men.¹⁰⁹ The most senior women in the study were, at most, 28 years post medical school, who could not have been specialists for longer than 24 years.

Table 9 Average hours worked, by gender and year (2003–2008)

Gender	2003	2004	2005	2006	2007	2008
Men	49	48.5	48.3	47.9	47.7	47.4
Women	40.7	40.9	40.6	40.9	40	40.3
Total	46.2	45.8	45.5	45.3	44.8	44.7

The same table shows that medical women in NZ work, on average, seven hours fewer per week than their male counterparts, with the hours worked by women relatively stable in recent years. On the other hand, the average hours per week for men are declining.² It has been argued that feminisation of the workforce is one of the main contributors to medical workforce shortages, especially in specialties such as general practice where there is a high proportion of women.¹⁹ Much of the argument is based on a simple calculation of the deficit in the average hours worked per week compared with men. Another consideration is that woman doctors in NZ are more likely to be urban-based,¹³¹⁻¹³³ thus contributing to regional and rural workforce shortages.

My conclusion is that the medical workforce deficits in NZ attributable to feminisation may not be as great as has been anticipated. First, the average hours worked per week for men are declining² with average hours for new consultants in NZ are predicted to be 5% lower than for retirees.¹³⁴ In part, this is being driven by working time directives, however, younger generations seek improved work-life balances compared with their predecessors.⁵⁸ Second, it is seldom-considered that women doctors are more likely to stay in NZ,¹⁰⁹ particularly in the early post-graduate period, and may be proved to retire later.¹³⁵ Thus, their cumulative contribution over a working lifetime in NZ may be as great as men.

The increase in numbers of GP training places¹³⁶ and medical students from rural origins,⁴⁵ coupled with financial incentives for doctors who work in areas with shortages,¹³⁷ may improve the workforce situation outside urban centres; however, whether they will redress the gender imbalances there is not yet known.

For many women, the conventional, linear, full-time career trajectory is not their reality. Medical women's careers may follow a more 'M shaped' distribution ... peak in the early years, dip in the middle, and the potential for a peak in the later years.¹²¹ The proportion of women is highest in specialties with more predictable working patterns, and with more emphasis on communication skills and patient interaction than on technical procedures. Data from myself and others suggest that women remain most under-represented in surgical specialties. Changes in these disciplines to make the workload more predictable and the environment more 'women-friendly' may assist in attracting more women.¹³⁸ Suggestions of how to do this may lie within other surgical disciplines. Female ophthalmologists in Australasia, for example, are significantly more likely than men to be working fewer than 40 hours per week, but are just as satisfied in their work as their male counterparts.¹³³ The specialty of O&G has always been an attractive specialty for women, despite its unpredictable nature and significant surgical component; suggesting that there may be room to make work practices in surgery more flexible to meet the needs of women.⁸⁵

Despite the sanctioning of part-time or interrupted training by most colleges, it remains difficult in NZ to arrange a part-time job in the clinical specialties; few colleges reduce the total training requirements for part-time trainees.⁹² Another barrier is the inflexible configuration of house officer and registrar posts in NZ. Most require full-time employment for a 3, 4 or 6 month period, and there are very few part-time jobs. Only a third of the respondents who had worked part-time reported they had job-shared. Perhaps this is not such a surprise in a small country: to do so would require a work partner with a similar requirement; at the same stage of training; in the same location. Frequently, job-sharing starts with an informal approach from pairs of individuals to sympathetic consultants or services. Job-sharing has considerable benefits for employers, because part-timers usually work more than the sum of their parts, and leave can be covered. With hospitals and other medical practices needing to cover services around the clock, more creativity in rostering and scheduling of educational activities will better meet needs of doctors who desire to fit work around family commitments; with benefits of greater numbers of workers from which to draw at peak times.

Those who interrupt training seldom find extra provision to facilitate their re-entry to clinical work. Re-entry to an acute specialty after maternity leave can be daunting, particularly if still breast-feeding and experiencing sleep deprivation.⁹² As a consequence, options for women who wish to perform at a high level in a clinical specialty, and have children, are to delay childbirth, to limit the size of their families, or to abrogate the primary care-giving role. Nearly half of the women in the Durham study would advise other women to delay childbirth until after the completion of postgraduate qualifications, compared with a only quarter of men.¹⁰³ Heslop has argued that the triple burden of medical service, family and study commitments is too great, and that part-time training just prolongs the agony.¹⁰¹ The experiences of the women in this study were similar. Many wrote about the difficult decisions they had to make once their first child was born. Decisions whether or not to continue specialty training, or put family first, had profound impacts of the women themselves and some acknowledged the consequences to the workforce and NZ of the loss of participation of women in some specialties.

The mean age of the women in this study at the birth of the first child was 31 years. As school leavers graduate as doctors around age 24, for many, childbirth occurs well into vocational training, or early consultant practice. It is a priority to ensure these 'carefully selected and expensively educated' female doctors¹⁰⁴ fulfill their potential and are not lost to the workforce. Logically, women over this time need 'clear and unambiguous' mechanisms to step off and then get back on the specialist training ladder,⁸⁵ and would appreciate acknowledgment that their paths are different to men.

Family patterns

Over 80% of the Auckland medical women graduates who responded to this survey in 2000 were in a long-term relationship, 60% had children, with over a third desiring more children. Over three quarters of GPs had children, but only a quarter of paediatricians, with the remainder somewhere in between. The proportion of doctors with children was more than in the 1986 study,¹⁰³ although family size was smaller on average. The careers with by far the lowest impact on the timing and numbers of children were community medicine and general practice, suggesting a greater degree of flexibility in these specialties.

Women doctors' contributions to family responsibilities in this study were similar to those of Melbourne graduates in 1987, suggesting respective care giving roles for men and women had not changed much, despite changes in medical roles.¹⁰⁴ While the majority of women had managed to work part-time at some time, and averaged six months break from the workforce per child, many perceived this was detrimental to their career progression. Women also felt undervalued by the system for the difficult choices they had to make. Provision of readily-available, quality and affordable childcare has re-emerged as a major priority in recent reports,^{85, 130} although is not a new recommendation.^{103, 92} Another consideration is that as the whole population ages, more doctors regardless of gender, will be faced with care-giving for ageing relatives.

While most authors emphasise the challenges facing women who combine career and family, it may be overlooked that women doctors are more likely to be single than are men.^{103, 104, 133} Up to a quarter of women doctors live alone, and any discussion about the careers and lives of women doctors ought to consider their needs as well. Contributing social factors include a relative excess of women in working age groups and lower likelihoods of marriage among educated women.¹³⁹ Medical women may choose to avoid the threat to career posed by family commitments. Remaining single may allow women to achieve more in their careers but could result in a lack of emotional and financial support for that demanding career.⁹² Women physicians may be more likely to be divorced than their male counterparts and, in this situation, family needs may impinge even more on work opportunities, and increase the financial pressures for those women.¹⁴⁰

Career satisfaction and income

Despite the challenges, Auckland women medical graduates were satisfied with their careers. Those in careers with a greater perception of 'job impact on the family' tended to have lower satisfaction scores. The main exception to this trend was in general practice: women in this specialty were among the least satisfied, yet recorded among the lowest impacts of job on family and number of children. The qualitative comments suggest a dissatisfaction with the nature of the job, and a health and training system that necessitated a move to this specialty in order to balance work and family. Those in community medicine (now public health medicine) were the most satisfied, psychiatrists the most likely to choose the same career again, with women physicians the least satisfied. The explanation for the lower level of satisfaction among physicians is not known, but could relate to the demanding and inflexible training programmes, and often heavy clinical and on-call commitments.

For the participants of this study, career satisfaction did not correlate well with income. Those with both the lowest (community medicine) and the highest (O&G) estimated hourly rates had the among the highest satisfaction scores. Women who worked in jobs that were most influenced by family (community, emergency medicine, and general practice) tended to work shorter hours, but had some of the lowest hourly rates and the least differential between the early and the late postgraduate periods. It was notable that over a third of women in community medicine were Māori or from Pacific Islands, but numbers were small.

Female medical graduates from the University of Auckland may have smaller student loans than their male counterparts,¹⁴¹ but they were still considerable, and higher than their predecessors. This study and others confirmed women are more likely to work in general practice, to work part-time and to have breaks from work. Each of these may be associated with financial disadvantage compared with their male colleagues. Women in general practice are less likely to be principals or owners of the practice than men,^{85, 131} with nearly half of NZ women GPs in the late 1990s reported earning less than \$40,000 per annum.¹⁴² In 1996, it was calculated that it would take 60 years on a salary of \$60,000 (1.7 times the average NZ wage in that year¹⁴³) to pay back a \$45,000 loan that had accrued interest at 9%.¹⁴⁴ Fortunately, it is no longer the case that student loans attract interest;

however, the principal must still be repaid. At specialist level, women earn less than men, even when corrected for hours worked.^{133, 145} In a survey of Australasian women physicians, 59% of their family income on average, was contributed by these women, yet they were still the primary caregivers in most cases.¹⁰⁶ These factors suggest women may have a more limited capacity to pay back student loans compared with men, although this has not yet been proven. Rather than being regarded as a source of workforce shortages, it has been proposed that women doctors might, instead, be viewed as highly cost-effective members of society, given they earn less per hour than their male colleagues, are more likely to enter primary care specialties, and they manage without house-husbands.⁹⁰

Factors in career choice

For Auckland women graduates, the two main influences on career choice were 'interest and enjoyment' and 'variety within job'; with 'flexible working hours', 'intellectual challenge' and 'compatibility with family responsibilities' grouped a little lower. Other influences were relatively less important, with 'financial reasons' the least.

When a principal component analysis was performed on these influences to determine if they could be explained by a smaller number of uncorrelated variables, four distinct factors emerged (see Table 8). Based on the influences they contained, I named these factors 'interest', 'women-friendliness', 'flexibility' and 'security'. Of these, 'interest' and 'flexibility' were ranked more highly by more women, although there were differences by specialty.

The factor 'interest' included intellectual challenge, variety, interest and enjoyment. These influences were ranked the highest and most consistently across specialties (see Figure 7). 'Interest' was mentioned by over a quarter of the respondents in some way in the qualitative analysis. Job satisfaction also loaded onto the 'interest' factor suggesting an association between the two. 'Flexibility' was the group of influences accounting for the greatest amount of the overall variance in the principal component analysis (26%), and was mentioned by more than half of the respondents in the qualitative comments. 'Flexibility' included compatibility with family responsibilities and partner's job, flexible and regular working hours, lack of 'on call' duties, ability to work part-time and to take time off, and ease of re-entry after taking time off. Hours worked per week loaded negatively into this factor — not surprisingly, this is consistent with an inverse association between hours worked and flexibility. Those in general practice rated 'interest' lower than women in other specialties, and 'flexibility' among the highest. The qualitative comments suggested that many women were prepared to trade some interest for increased flexibility. The comments also revealed strongly-held views about lack of flexibility for women undertaking hospital-based specialties.

In contrast to 'interest', 'flexibility' was not rated consistently across specialties (see Figure 8). It was rated lower by women in O&G and surgery. Women in these two specialties, with often long and unpredictable hours, may have never rated flexibility as particularly important to them. Alternatively, the women who have

remained in the specialty are those women who rated flexibility less highly. The impact of family on career choice was the lowest in O&G of all the specialties, and career choice made relatively early, yet nearly two thirds of women had had children. In contrast only a third of women in surgery had children. The numbers of women these specialties are relatively small, so it is difficult to discern if these are true differences or not.

My findings that the two critical factors for women in career choice were 'interest' and 'flexibility', were consistent with those of Durham, who found that a quarter of women rated 'appeal', and a similar percentage, 'appeal + fits in with family', as the main reasons for choosing a specialty.⁶ While most people choose a career because of its intrinsic interest, Durham found 10% of her participants rated 'no appeal + fits in with family' as the best description of how they made a career choice. These descriptors were not used in the present study, but there were hints from some of the women GPs that this might still be the case. More recently, British women consultants have suggested that the main difference in how they made a career choice compared with their male counterparts was in the actions taken when forced to choose between their family life and their career¹²¹ – men will make more personal sacrifices to advance their career than women, who will more readily sacrifice their career. This tendency has also been reported among contemporary British women medical students who reported being more prepared than men to compromise professional attainment.¹⁴⁶ They attributed this readiness to compromise to five main causes: gendered stereotypes of women's social and professional roles; a lack of female professional role models; women's greater awareness of the tensions between career and family; various other informal social influences; and a lack of positive career advice to counterbalance these influences.¹⁴⁶ It seems inevitable that for most, the primary caregiver role will conflict with a medical career; allowances must be made for this by medical women, colleagues, employers and society at large. At present, professional women would seem to be making most of the compromises and this is unlikely to change. Dame Catherine Tizard, former Governor-General of New Zealand, observed that:

*The opportunities are there for women providing they are prepared to make sacrifices like deciding not to have children. This is a choice most men never have to make. They can have a career and a family too.*¹⁴⁷

'Women-friendliness' (including role models, mentors, encouragement to enter field, lack of sexual harassment), was the next most important factor, with 'security' (financial, positive experiences during undergraduate training, job security), the least. Patterns for each were fairly consistent across the specialties. Women were neutral about whether positive experiences during undergraduate training influenced career choice. Role models and mentors were not seen as particularly important influences for most, and having role models that were women was relatively unimportant. The lack of senior women role models or mentors with whom to discuss balancing of career and personal lives, may be a factor.^{101, 148, 149} Another explanation is that women struggling with work-life balance may serve as negative role models.

Owing to small numbers in the quantitative analysis, no separate analysis for women who were Māori was conducted. However, in the qualitative analysis several women reported pressure to work in particular areas and to act as role models for other young Māori females.

In this study, sexual harassment was the second lowest influencing factor with a mean score of 4.5/9; only exceeding debt. Sexual harassment was included in the list of possible influences on career enquired about. In medicine, the length of training and nature of the work mean there are numerous, sometimes emotionally-charged, interactions with colleagues, superiors and the public. Doctors of both sexes experience harassment, however, studies show that women are harassed more often than men during their careers. One study of resident doctors in the USA found that two thirds of women doctors were harassed either in medical school or during their residency, compared with less than a quarter of the men.¹⁵⁰ Women were most commonly harassed by male superiors; whereas the men were most often harassed by nurses, who were more likely to be male. Of women doctors employed in family practice in Canada, more than 75% had been sexually harassed by a patient at sometime in their careers.¹⁵¹ Risk of harassment of doctors by patients was higher in emergency departments or community health centres than in solo or group practices. Intoxicated patients posed a special problem for these female doctors. Several women reported on the unfriendly environment in the hospital, but none mentioned it in the qualitative comments.

A minority of women (40%) in this study had decided on a specialty by the time they finished medical school. Women surgeons were the most certain with over half deciding during medical school. These proportions were higher than seen in the Durham study (15%),¹⁰³ but consistent with the Adair and Tuck study in which 63% of medical graduates from the University of Auckland reported making their decision during the PGY1 or PGY2 years or later.³⁵ Initially, I had postulated that the low rate of career decision making in medical school may be a strategy by women to allow time to assess further their career choices while considering how to combine this with responsibilities at home.⁹⁴ On further reflection, this may not be the case. In NZ, three quarters of medical students are school leavers, graduating at about age 24. Thus, most women will have chosen a specialty to train in before they have had their first child, at a mean age of 31. Furthermore, Adair and Tuck found no significant difference in the timing of medical career choices between women and men graduates from the same medical school.³⁵

Strengths of the research

This study analysed data from over 300 women medical graduates from an urban NZ medical school, being approximately 13% of all New Zealand women graduates in the time period. This study confirmed, and built upon, findings from earlier studies in Australasia into the careers and lives of women doctors, especially that of Durham in 1986.¹⁰³ However, I estimate only 7% of the women in the Durham study were Auckland graduates, as the Auckland medical school opened only in 1968. This study is, thus, the first insight into careers and lives of women graduates from one medical school in NZ. An advantage of studying graduates from one

medical school is that the results are likely to be more homogenous, as they are less confounded by variations in selection processes, and undergraduate medical educational experiences. This study was the first detailed workforce study reported in the era of equal numbers of male and female medical students in NZ, and gave the first known insight into the working lives of Māori women doctors, albeit limited and with small numbers.

While longitudinal tracking projects of medical students are being established (see Part 3), this study included women who were in the process of choosing, or had already chosen their specialty. Therefore, it allowed insights into the changes in work practices over time as reported by individual women, rather than at one point in time (cross-sectionally). Moreover, the data showed that women chose careers and worked differently across the specialties. As the questions were more detailed in terms of qualitative aspects, it provided knowledge that was complementary to the comprehensive annual workforce surveys conducted by the MCNZ. By deliberately comparing the qualitative comments of women in general practice, the largest subgroup, with those in all other specialties, greater insights into some of these differences were obtained.

The return rate was acceptable for a postal survey. To maintain anonymity, there was no analysis of the characteristics of the non-responders, but I have no reason to think there was over-representation of any specialty in the non-responders, given that the specialty distributions were roughly similar to other data (see Figure 6). The only concern is that women who were not working numbered only two, so others outside of the NZ workforce may have been missed. Nevertheless, the fact that so many women who responded had taken time out from the workforce, with barriers reflected in the tenor of the qualitative comments, made me confident that the major issues for contemporary women doctors had been identified. The sample size, plausibility and concordance with international literature each suggest the results are likely to be generalisable other modern Western female medical workforces.

Limitations of the research

The survey instrument developed for this study was based on an earlier survey; with input from a biostatistician. While it had face-validity, it was not subjected to in-depth validation or reliability testing prior to use, other than piloting for acceptability. Despite this, there is evidence that it was reliable. For example there was high reliability in the rating of the influences on career choices (Cronbach $\alpha = 0.88$). All the influencing factors loaded into the factor analysis with a level of > 0.4 , suggesting all were at least moderately important. As a consequence, the variance unexplained by the factor analysis was relatively small.

Both quantitative and qualitative responses were solicited in the same questionnaire, with the possibility that the items rated for importance by respondents prompted some of the voluntary open-ended responses. In order to address this, qualitative analysis was regarded as secondary, and explanatory with respect to the quantitative analysis. There was an internal consistency among the scores derived from the quantitative analysis and the number and tenor of comments in the qualitative analyses. Few comments were raised in the qualitative analysis that had not been incorporated in the quantitative analysis.

As the study was retrospective it can only indicate associations, rather than cause and effect. Women may have rated influencing factors based on recall of experiences, and on whether or not they had been able to succeed in their chosen field. Survivor bias is a distinct possibility given that some women reported a shift from an intention to do medicine or surgery, to general practice. The only way to circumvent this problem is to undertake studies prospectively. This is discussed further in Part 3 of this thesis.

The retrospective nature of the study meant that only those registered in NZ were surveyed. A study of those women no longer on the MCNZ register would be difficult to do in terms of recruitment, but would shed light on reasons for not maintaining registration in NZ. These would include emigration, giving up medicine, or both. It is self-evident that minimising the number of women in this group is desirable in workforce terms.

We considered women to be in a specialty, even if they were still undergoing training. As not all women will complete the training they begin, with the largest number moving from medicine or surgery to general practice, the estimates of proportions of women physicians and surgeons may be overinflated, with the proportion in general practice under-estimated. Furthermore, many women in the 'other' category worked in primary care settings.

There were small numbers in some specialties or groups, such as community health and Māori women. This introduces the possibility of random error creating spurious differences (Type 1 error), or that important differences were missed (Type 2 error). For example, there may be specific issues for medical women who are Māori or from Pacific Islands that have not emerged from this study.

The question on income was optional and answered by only 64% of respondents; raising the possibility of response bias. Some (especially in general practice) may have used their net, rather than their gross, income. Thus, this analysis was regarded as an estimate only, but was shown, if only to make the point there are marked variations among specialties in patterns of earning. My conclusion is that women doctors who chose a specialty for its inherent flexibility may face more financial constraints than other doctors.

Summary

There is little doubt that a medical workforce that is up to 50% female will be different. Positive and negative effects might be anticipated on the doctor-patient relationship; local delivery of health care; societal delivery of health care, and the medical profession itself.¹¹⁹ Nevertheless, women have been shown to be well-prepared to adapt and to provide the type of care needed in the future, as long as the education and health systems are conducive to their doing so. If this is the case, the impact of feminisation on productivity of the medical workforce is likely to be less marked than has been predicted.

This study found the way NZ medical women make career choices and their personal situations to be remarkably similar to women elsewhere in the western world, with this being stable over decades. A firm

conclusion is that women and their lives are unlikely to change significantly; therefore, any moves to increase their participation in the workforce must involve changes in training and work practices. It is salutary to realise that it is nearly 30 years since the following appeared in a New England Journal of Medicine editorial:

*Part-time work, time out for having and raising a family, and a smooth re-entry into medicine could, with only modest ingenuity, be incorporated into the structure of medical training and academic medicine ... the present practice of requiring each woman to blaze her own trail is, at best, clumsy and wasteful of effort. It is also demoralizing.*⁹⁰

Evidence from this study and others suggest that progress is being made in terms of women's participation in specialties other than general practice. Currently, women trainees in NZ are significantly under-represented only in the orthopaedic surgery training programme; however, it remains to be seen whether the increased numbers of women trainees can remain in specialist training, and enter the consultant workforce at a greater rate than currently. If the entry rate of women into consultant practice cannot be accelerated, NZ will continue to be faced with a group of talented women who fail to achieve their full potential in the field of their choice. In addition to the disenchantment for the women themselves, this is wasteful in terms of training resources and will exacerbate the shortages of New Zealand-trained specialists, as predicted by Heslop over 15 years ago.¹⁰²

Challenges remain in finding and removing barriers to full participation of medical women in training and employment. For the majority of women who will have children, initiatives that allow, and value more flexible training and work practices particularly through the years of child-raising, are needed. It is a workforce imperative that women do not forego permanently a fulfilling career, to meet immediate family needs. On the other hand, the needs of the quarter of medical women who are single must also be met.

Future directions

There are some areas where more could be done to assist women participate as fully as possible in the specialty of their choice. The lack of available, quality childcare continues to be identified a major barrier to women's full participation in the medical workforce.^{92, 130, 131, 85} Greater efforts must be made to provide this if health services are to retain women doctors. Whether women doctors have more difficulty in paying off student debt than men still needs to be determined. If they do, this would support affirmative actions such as debt relief, or further tax deductions on child care for women doctors.^{85, 92, 103}

Career counselling for women during medical school and the early postgraduate years is sometimes proposed. This may help mitigate the perceptions of difficulty in balancing training and family commitments.¹⁴⁶ In Auckland, medical students organise careers evenings, but there is no dedicated time for career counselling within the programme. The regional RMO training unit organises an annual Careers Fair, and produces a written handbook¹⁵² and a website, each with a dedicated section on Women in Medicine. I suggest a local

pilot (with appropriate evaluation) to determine whether or not formal systematic career counselling of women students and doctors is beneficial, and how, when, or by whom this is best done.

A detailed enquiry into the current training requirements for each specialty in NZ was outside the scope of this thesis, but would be valuable. This might be correlated with the proportion of women in training and specialty practice. Aspects of interest include: how part-time training is encouraged and managed; provisions for re-entry after a break; credit for prior learning; and whether or not any training time is discounted for competent doctors over the period of part-time work. Given the preponderance of women trainees in O&G, but not in surgery, further comparisons of the experiences of women in these two specialties would be informative in terms of determining how to configure training and work for women in specialties characterised by unpredictable workloads with major procedural aspects.

Currently, there is no one body responsible for monitoring the entire duration of medical workforce development. Having a single employer and training directorate for the duration of postgraduate training^{1, 85, 153} may offer an advantage in terms of keeping track of medical women, advocacy for flexibility, planning leave, and accountability for facilitation of their re-entry into the workforce after time away.

Another investigation might look at the current situation with respect to part-time medical training jobs available in DHBs. Pilot studies might be undertaken to determine whether or not a mandatory quota of part-time or job-share positions, or contestable funding for career maintenance positions, increase retention of women in this sector. The latter would be an incentive for employers to create such positions. Additionally, this would highlight the validity of such a career path alongside more traditional, full-time and continuous medical training.

The most comprehensive data on the roles of women in the NZ medical workforce comes from the annual workforce surveys undertaken by the MCNZ. While cross-sectional studies give some perspective into the varying work patterns of women in particular specialties, these might be complemented by long-term tracking studies of individual women's careers, to obtain a more accurate picture of the profile of those careers over a working life. This study might document hours, type and location of practice (including any changes), periods of part-time work, and any breaks from work. A more accurate comparison of women's and men's contributions to the workforce might be the average working hours per lifetime in NZ. As far as workforce development is concerned, further tracking of both women and men through the early postgraduate years would be helpful to see how and when each of these groups enter specialty training, and the frequency and timing of any significant shifts from an initial choice.

This study raised my awareness that many of the issues were not exclusive to women, and may be shared by their contemporary male colleagues. What would be better for women may well be better for men too, both personally, and through greater participation in the NZ workforce. How the entire medical student body from

the University of Auckland may participate in a NZ specialist workforce to meet the medical needs of NZ in the future is the topic of Part 3.

Part 3 – Career Intentions of Auckland Medical Students – Ngā whakaaro umanga o ngā tauira tākuta o Te Whare Wananga o Tamaki Makaurau

The first step towards success in any occupation is to become interested in it

Sir William Osler¹⁵⁴

This Part contains research conducted by myself, in collaboration with others, from 2003 onwards. The establishment of the FMHS Tracking Project is described along with reports of early studies using data from this project. Studies relate to demographics and career intentions of current medical students, and the impacts of their education on that choice. The alignment between student factors and future medical workforce in NZ is explored. This work has led to five original peer reviewed publications:

Poole P, McHardy K, Janssen A. General physicians – born or made? Use of a tracking database to answer workforce questions. *Int Med J* 2009; 39: 447-452;¹⁵⁵

McHardy K, Janssen A, Poole P. Women medical students accrue less student loan debt than their male counterparts. *NZ Med J* 2008;121:37-44;¹⁴¹

Pasley T, Poole P. Characteristics of University of Auckland medical students intending to work in the regional/rural setting. *NZ Med J* 2009;122:50-60;¹⁵⁶

Poole P, Bourke D, Shulruf B. Increasing student interest in general practice: where to from here? *NZ Med J* 2010;123:6-8;¹⁵⁷

Mitchell CJ, Shulruf, B, Poole, PJ. Relationship between decile score of secondary school, the size of town of origin and career intentions of New Zealand medical students. *J Primary Health Care* 2010;2:183-9.¹⁵⁸

Additionally, the work has informed review articles and editorials:

Poole P, Moriarty H, Wearn A, Wilkinson T, Weller J. Medical student selection in New Zealand: looking to the future. *NZ Med J* 2009;122:88-100;⁴¹

Gorman D, Martin I, Poole P. Selecting the future doctors: the role of graduate medical programmes. *Int Med J* 2005;35:501-2;¹⁵⁹

Gorman D, Poole P, Scott J. On the maldistribution of the medical workforce. *Int Med J* 2007;37:669-71.¹⁸

Measuring workforce outcomes of medical education

In Part 1 – Introduction, the case was made for medical schools to be more socially accountable. The obligation upon them to assist in development of a workforce that contains a sufficiently wide range of medical practitioners to meet the health needs of the population is widely accepted and expected.³⁷ This obligation begs the question of the optimum mix of the student body and range of educational experiences to develop this future specialist workforce. Historically, empiric approaches to selection and curriculum design have been the norm, with medical school education primarily occupied with the delivery of a coherent and educationally-sound programme to ensure students are ready to work as interns under supervision as soon as they have their degree.³³ As the great majority of intern practice in NZ occurs in acute settings in hospitals, the twin goals of education for internship and development of the future specialist workforce are not necessarily well-aligned. While medical schools obviously have a key role to play, internship in NZ might better reflect the reality of modern medical practice to assist in the alignment of the twin goals. This Part explores how medical schools might look beyond the development of interns; to what can be done at undergraduate level to better predispose the student body to become the ideal future specialist medical workforce for NZ health needs.

In 1993, Collins and White provided the first report on the characteristics of medical students at the University of Auckland.¹⁶⁰ There was no explicit discussion in this paper as to the workforce roles Auckland graduates took, or were anticipated to take, although there were some inferences. The role of the admission committee was reported as selection of students who would ‘achieve the educational goals of the school, be good doctors, and fulfill the medical needs of the community.’¹⁶⁰ The medical school had opened in 1968 with the MAPAS scheme started in 1972 with 3 places on offer. Ranking students who had met an academic threshold on their personal qualities was thought to be the best way to select 115 students from over 600 applicants. Among the findings were that nearly 10% of students during the first 25 years did not complete medical school, with this more evident among MAPAS students.

Powis and colleagues from the University of Newcastle, Australia, have conducted a programme of studies to determine how to select fairly the ‘best’ students for medicine.^{161, 162} This work has led to the development of aptitude tests such as UMAT (© Acer, Melbourne), or GAMSAT (© Acer, Melbourne), now used in the selection batteries of all Australasian medical schools. These tools are designed to assess problem solving, reasoning and personal qualities important in medical practice, which are not assessable by other tests. Currently this group is working on a new Professional Qualities Assessment.¹⁶³ Their studies have been based on students from one medical school, Newcastle. Again, their work has been primarily focused on the selection of ‘good’ doctors, rather than necessarily selecting for characteristics that predispose to participation in any particular specialty in the workforce.

As discussed in Part 1, NZ is fortunate in having a complete set of cross-sectional national workforce data collected annually by the MCNZ.² There are, though, acknowledged difficulties in gaining accurate counts of

doctors given the rapid turnover of IMGs, and in projecting workforce requirements.¹ Moreover, the MCNZ annual reports describe the whole NZ medical workforce (NZ and international medical graduates) and not by medical school of origin. It is only through further work, such as in this thesis, that trends become sufficiently informative for medical schools to use at the levels of selection and education.

Part 1 introduced some types of workforce studies conducted to date – which students are more likely to enter areas of need, the effectiveness of selected curricular initiatives, and the career choices of women. Part 2 of this thesis expanded upon the latter, describing the lives of medical women in NZ, how they make career choices, and where there is room to enhance participation.^{35, 93, 103}

Descriptive and cross-sectional workforce studies are helpful in describing characteristics of students and doctors in the workforce, but can only identify associations. Retrospective studies, as in Part 2, where data is collected from a particular group about past events or characteristics, may provide more information than observational cross sectional studies, but have the limitations of survivor and recall bias. These types of studies, while conducted retrospectively, may also include prospective aspects. One such study is the 20-year follow-up study of students who entered Westminster medical school in the UK between 1975 and 1982.¹⁶⁴ Scores collected at entry on a standard intelligence test, and A-levels, were correlated with career outcomes, considered under four categories – dropouts, career progression, research outputs, and stress/burnout/satisfaction with medicine as a career. The investigators found 9% of graduates were no longer on the medical register; with the response rate an impressive 68%, given the time interval since admission. Grades on high school A-levels predicted the time to reach the level of specialist, or principal in a general practice, with the intelligence test having little added predictive value. While this validation study of medical school selection tools supports the use of previous academic achievement in selection, it measures successful outcomes in a traditional, doctor-centered way; not whether the doctors selected entered careers as needed by the community, or the health of the community improved. It might also be questioned how highly ‘career progression’ and ‘research outputs’ would be ranked as measures of career success globally, given pressing health needs, gross inequities in global health status, and a more diversified medical workforce.

The next step is comprehensive, prospective, and ongoing quantitative data collection, tracking medical students from entry to medical school, into their careers. Studies of this type enable more detailed investigations of how selection and curriculum factors affect careers, and thence, workforce. In health, the classic longitudinal study is a prospective cohort study which explores differences in outcomes between exposed and non-exposed individuals in the cohort and their development of a disease, such as cancer.¹⁶⁵ This approach enables conclusions to be drawn as to cause, although other clinical trials may be needed to confirm that the natural history of the disease may be altered by affecting the exposure. Large cohort studies such as the Framingham Heart Study have enabled the development of predictive risk models.¹⁶⁶ These now form the basis of preventative treatment strategies to reduce heart disease in individual patients.

Prompted by rural workforce shortages in Western Australia, a prospective longitudinal study followed 229 students who started medical school in that state in the years 1984 and 1989, to identify factors predicting medical career choice and practice location.⁷¹ Students had completed a range of questionnaires at entry, and the three outcomes of interest were general vs. specialist practice, rural vs. urban practice and an intention to work rurally in the future. Over 95% of graduates were evaluated at an interview held 4 years after graduation. The investigators found that 15% had not completed medical school. Students who were male and had a father in medicine were less likely to become GPs; with women, more likely. Regardless of career choice, students who had ever lived in a rural area were significantly more likely to intend to work in a rural area.

Within the last decade, the Australian Medical Workforce Advisory Committee (AMWAC) has identified a need for monitoring of workforce against health needs, with a purpose being to make any necessary adjustments in the characteristics of those entering medical school.^{8, 29} Additionally, in 2002, AMWAC began a large, short-term longitudinal prospective study of Australian postgraduate doctors. Nearly 8,000 doctors in vocational training were approached, with responses received from 54%.²⁹ In 2004, the original respondents were surveyed again, with 71% of these replying. This was only 36% of the original target population. The study assessed each doctor's current work, satisfaction, demographics, reasons for career choice, and future career plans. An example of the findings obtainable with such a study was that, only two thirds of the respondents in 2004 felt their career had progressed in accordance with their 2002 expectations. For nearly half of the respondents, completion of vocational training was taking longer than they had expected, with part-time training and time-out from work factors associated with this delay. This study provided insights into the pathways trainees take during training, and confirmed the importance of flexibility of work and training to trainees, but it was limited in duration, and had low return rates in the original cohort.

The potential of large scale tracking projects in understanding medical workforce development is great: sequential cohorts are enrolled, and, once the study is mature enough, a range of explanatory studies is possible. The power of such studies is in understanding causes and effects, rather than being merely descriptive or identifying associations. For example, since 1974, the UK Medical Careers Research Group has collected information on the careers of all UK doctors at 1, 3 and 5 years following graduation and beyond.¹⁶⁷ This study continues to provide data not only on the range of careers entered, but is now a sufficiently mature dataset with which to assess the predictive validity of doctors' previous statements of career intention.³⁶

The power of such projects is in understanding causes and effects, rather than being merely descriptive or identifying associations. Modelling with techniques such as factor analysis, multiple regression and structural equations, may be used to predict outcomes with greater certainty, or provide more sophisticated explanations for observations.³⁰ A key area for study is the interaction between the characteristics of the learner and their experiences on career choice.¹⁶⁸ While little may alter the intrinsic aptitude of individual students^{8, 29} medical schools have the capacity to modify both the student mix and the curriculum, and

through a tracking project, evaluate the outcomes. Given the increasing class sizes and limitation of resources at their disposal, it is a priority for medical schools to answer such questions as: is it more productive, from a workforce perspective, to offer places on costly rural immersion programmes to students from rural backgrounds, or to those from urban areas who are amenable to rural practice?

Because of the unique situation in Australasia, where all undergraduate training in two countries is accredited by the same body (AMC), robust comparisons of workforce outcomes among diverse medical school programmes that have met the same accreditation standards are possible. It is a natural laboratory. Another favourable aspect is the close and constructive relationship among the Medical Deans of Australia and New Zealand (MDANZ).

Long term tracking projects to answer workforce questions

The Medical Student Outcome Database and Longitudinal Tracking project (MSOD)

In the early part of this millennium, the members of MDANZ, prompted by AMWAC, identified a dearth of systematic data to inform medical schools how best to choose and educate students for the future workforce. At the same time, education funders were seeking evidence of value in workforce terms from expensive initiatives such as rural clinical schools. These drivers led, in March 2004, to the establishment by MDANZ of the prospective Medical Student Outcome Database and Longitudinal Tracking project (MSOD).^{30, 169} This ambitious project aimed to investigate how the characteristics of medical students, their experiences while at University and their pathways through postgraduate training affect their career destinations. The MSOD project drew heavily on the expertise of Professor Howard Rabinowitz, leader of one of the world's longest, and best-known, medical student tracking projects.^{73, 170} In his study, the practice outcomes of small cohorts of rural origin students in the Jefferson Medical College Physician Shortage Area Program (PSAP) since 1974 have been collated, and compared with their classmates who did not undertake the PSAP. Some results from this study are incorporated into Study 3 of this Part.

Since its inception, the MSOD project has expanded from being an Australian national project to an international one, with the joining of the NZ schools, Otago and Auckland, in 2008 and 2009 respectively. Now, all students entering a medical school in Australia or New Zealand are invited to participate in MSOD and complete a survey at entry. Three short follow-up surveys at 1, 3 and 5 years after completion of medical school are planned. In addition, medical schools provide a description of each participating student's course of study to the database on an annual basis.

The challenges of governance and management of this project are considerable, however the high level commitment and leadership of MDANZ has assured a relatively smooth implementation to date. Although over 11,000 students have been recruited, it is still too early for this project to add substantially to what is

already known. It remains largely Australian-driven with uncertain immediate benefits for NZ medical workforce development.

My role in MSOD has been as the FMHS liaison person with the MSOD project. This has required attendance at MSOD workshops, oversight of survey administration and data collection, and liaison with the Associate Dean (Education) and Faculty of Medical and Health Sciences Health Professional Students and Graduates Tracking Project (FMHS Tracking Project) advisory group (see below) with respect to streamlining collection of MSOD data with collection of data for the FMHS Tracking Project.

The Faculty of Medical and Health Sciences Health Professional Students and Graduates Tracking Project

At the same time that MSOD was being considered, the desirability of long-term tracking of FMHS students into the workforce was being recognised. The drivers were similar to those of the MSOD project; however, the FMHS initiative was not confined to medical students. The establishment of nursing and pharmacy programmes at the University of Auckland in 2000, coupled with a lack of any workforce outcome data for these professions, provided additional impetus. Moreover, the careers entered into by graduates from the Bachelor of Health Science degree, introduced in 2001 to prepare non-clinical health professionals for careers in fields such as health informatics, health management or case management, were of great interest to the FMHS.

In 2003, the incumbent Head of the Faculty Education Unit (FEU), Associate Professor Margaret Horsburgh, initiated discussions about student tracking with the heads of the Medicine, Nursing, Pharmacy and Health Sciences programmes. As the Associate Dean (Medical Programme), I was involved from the outset, and remain involved in both the FMHS Tracking Project and the MSOD project.

An Advisory group was set up, chaired by the Deputy Dean, Professor Robert Kydd. This group developed a proposal for the FMHS Tracking Project. By 2005, the FEU had a new Head, and medical programme leaders particularly, were keen to see the project implemented. In 2005, Professor Des Gorman moved from being Director of Medical Admissions to Head of the School of Medicine, contributing his expertise to the design of the questionnaire, and further impetus to the project. Initial Ethics approval was granted by the University of Auckland Human Participants Ethics Committee in December 2004 (Ref. 2004/457) for a period of three years, and extended on 4 September 2007 for a further three years. A new application was approved in 2010. The surveys were developed collaboratively with the programme leaders; the first entry and exit cohorts of students were polled in 2006.

The FMHS Tracking Project is funded by the Dean of the FMHS, and overseen by the Associate Dean (Education) who chairs the Governance Board. This Governance Board has representatives from each programme, the Centre for Medical and Health Sciences Education (CMHSE, was FEU), project administrators and students. Its terms of reference (Deanery, personal communication, 2010) are to:

- receive reports from the project administrator and database developer;
- consider and rule on issues related to data entry, data management or changes etc.
- consider requests for changes to questionnaires;
- review and approve current and proposed uses of the data;
- maintain oversight of ethics approval and ensure ethical requirements are met;
- handle any other matters related to the project.

Day-to-day management occurs through dedicated administrative staff in the CMHSE. A core FMHS Tracking Project team meets regularly to discuss smaller administrative details related to the project, identifying any issues that need to go the Governance Board. This group produces an annual report of summary statistics. Applications to use the data must be approved by the Associate Dean (Education), and it is expected that staff from the CMHSE are involved in data analysis, and the preparation and authorship of publications.

The aim of the FMHS Tracking Project is to provide an accurate depiction of the effect of student factors, curriculum and clinical experiences on career choices, thus providing data on which curriculum and workforce planners may base future strategies to assure New Zealand has a workforce for health needs. It is a prospective, longitudinal project linking survey-based data obtained at entry and exit from the programme with data from registration bodies. In the case of medicine, linking with MCNZ registration databases will be performed at 2, 5 and 12 years post-graduation.

Relationship between FMHS Tracking Project and MSOD

While several staff members have been involved in both projects, collection of data for the FMHS Tracking Project pre-dated, by three years, that for the MSOD project. The main reason for the delay was that Australian Federal government funding for MSOD did not extend to NZ. It was only in 2008 that NZ was formally invited to join MSOD, with the NZ medical school deans agreeing to meet the costs involved from within their own budgets.

Copies of the current FMHS Tracking Project entry and exit questionnaires for medical students and the MSOD questionnaire appear in Appendix 2 and 3 respectively. There are some important differences between the FMHS Tracking Project and MSOD. The FMHS Tracking Project is designed to answer questions relevant to the NZ setting. Moreover, it is designed to meet the specifications of several health professions. Another difference is that the FMHS Tracking Project has an exit survey, and does not need to collect year-by-year information on curriculum in the way that MSOD does. As NZ entered MSOD later, most of the questions and categories of responses had already been decided upon; as a consequence, some MSOD questions had limited application to the NZ context. For example, there is an emphasis on questions that assess the effect of specific Australian

government scholarships and federally-funded rural programmes on student career choices ... these are not a feature of the NZ setting. There is now a NZ version of MSOD so that students in NZ medical schools only answer questions relevant to the NZ setting. One persistent anomaly is that it is still not possible from MSOD data to identify Māori or Pacific students who may be in medical schools in Australia. The MSOD question in the Australian version about indigeneity refers only to Aboriginal and Torres Strait Island peoples. I know of at least one Māori student in medical school in Australia, and there are likely several more.

The FMHS has decided to continue with the two tracking projects, in parallel, for the meantime; however, being involved in two tracking projects has meant some compromises. In contrast to the situation at other medical schools, where students complete the MSOD in its entirety, Auckland students complete one survey with relevant data being channelled to both the FMHS Tracking Project and the MSOD project. This has required minor modifications to the FMHS Tracking Project questions to align them better with those of MSOD, and additional work for school administrators; however, the sole driver is to limit unnecessary demands on students. An advantage of my personal involvement in the two projects is the valuable insights gained as to how to manage such projects and ensure the potential of both may be realised.

Administration of FMHS Tracking Project Questionnaires

The medical student entry questionnaire (see Appendix 2) incorporates questions covering student demographics and career intentions. Variables such as gender, age and ethnicity are obtained directly from nDeva, the university student administrative system. At the University of Auckland, students self-report their ethnicity which is then coded within five main categories – European, Māori, Asian, Pacific Island, and Other. Students from the Indian subcontinent are included in the Asian category, following the convention used by Statistics New Zealand.

The medical student exit questionnaire (see Appendix 3) is shorter; being principally focused on career intentions and influencing factors, with some information on finances and family commitments. In particular, students are asked how strongly specific experiences at medical school, including clinical attachments, affect career choice.

Both entry and exit questionnaires have a similar question on career intention. For a range of 18 specialties, including general practice, students are asked to indicate whether they have a *strong interest*, *some interest* or *no interest* in pursuing that career in the long term. There was an exception in the original entry questionnaire in 2006: this survey included a question on ‘anticipated employment after registration’ in which students could tick any of a list of 12 disciplines, ‘other’ or ‘unknown’. For subsequent analyses, any *interest* was assumed where students ticked a specialty, *no interest* if they did not tick it, or *undecided* if they ticked ‘unknown’. From the end of 2010, another question will be added in line with the MSOD questionnaire: this will ask students to indicate their top three specialties of interest, in order.

For medical students at entry, questionnaires are administered on their first day of medical school, during Year 2 orientation. For the past three years I have introduced students to the study during my address to them; students may then read a subject information sheet before completing a written survey. Completion is taken as consent to be enrolled in the FMHS Tracking Project. The exit survey is completed by Trainee Interns; being invited to complete this on the day they return to campus to sign the scrolls they will receive at the qualifying ceremony. Often there are several other surveys for them to complete at the same time.

Analysis

The studies reported in this Part used data from the FMHS Tracking Project surveys. These were entered into Excel spreadsheets. Student data was anonymised before analysis. The code linking the unique study number and student ID was held by the data manager in the CMHSE. All students completing a survey were regarded as responders; however, in the uncommon event students did not answer a complete question, missing data was excluded from the analysis.

Simple summary statistics (e.g. mean, median, SD, range) were sufficient for many of the descriptive components, with Pearson's Chi-square test for interpretation of categorical data. Where more complex analysis was required, consultation was undertaken with Dr Boaz Shulruf of the CMHSE. Other tests used included Fisher's exact test, Goodman and Kruskal's gamma test, cross tabulation and logistic regression.

The first entry and exit cohorts of medical students were surveyed in 2006. Therefore, the FMHS Tracking Project is not yet sufficiently mature to allow paired comparisons between intentions at entry and exit, and thence with longer term data on eventual location and vocational scope of practice. As a consequence, caution must be used in interpreting comparisons of differences between the levels of interest in entry and exit students, as this may relate to cohort bias.

FMHS Tracking Project response rates

The number of responders compared with the total numbers of students in the class each year is reported in Table 10. Surveys have been completed by 754 students at entry and 575 at exit, yielding responses rates of 87% and 81% respectively. The lower response rate in the exit survey in 2007 (53%) was due to an administrative error which meant that the written surveys were not offered to the exiting students as planned. Instead, graduates were sent an email; the questionnaire was attached for them to print, complete and return. In the event, the 2007 survey results were similar to the 2006 findings. As there had been no major differences in selection or curriculum for the two cohorts, it was felt that data from 2007 could reasonably be included in the studies, without introducing significant bias. It does highlight difficulties with return rates for electronic surveys, compared with those that are paper-based.

A detailed study of non-responders to the invitation to participate in the FMHS Tracking Project is outside the scope of the existing ethics application, and has not been undertaken. It would be of interest to study how the

non-responders to the FMHS Tracking Project progress through medical school and into their eventual careers, to see if they have an increased risk of professional problems. Students who have problems at medical school with compliance with handing in assignments on time, or meeting immunisation requirements, are more likely to run into registration difficulties as medical practitioners.¹⁷¹

Table 10 FMHS Tracking Project response rates

Year	2006	2007	2008	2009	2010	Total
Entry						
Responders	112	124	161	177	180	754
Total	152	163	171	184	199	869
Rate	74%	76%	94%	96%	90%	87%
Exit						
Responders	115	71	136	145	n/a	467
Total	131	133	150	161	n/a	575
Rate	87%	53%	91%	90%	n/a	81%

Studies using medical student data from the FMHS Tracking Project

The next section reports studies I have undertaken using FMHS Tracking Project data. Each project is presented in a relatively standard format. A brief context precedes sections on background, aim, participants and results. Where specific methods were used, or purposive subgroups selected for the analysis, these are indicated. Discussion is focused around the findings of that particular project. At the end of this Part, there is a more wide-ranging discussion of the strengths and weaknesses of the FMHS Tracking Project programme of research. The major findings and future directions are revisited in Part 4 – Synthesis and Conclusions.

Study 1 General Physicians – born or made?

At the time of this study, I was President of the Internal Medicine Society of Australia, the specialty society of general physicians in Australasia. This study was the first use of FMHS Tracking Project data, and it explored questions from two of my own areas of interest – General Medicine and Women in Medicine. The study was published in the Internal Medicine Journal in 2009.¹⁵⁵

Dr Karina McHardy was the inaugural Clinical Medical Education Fellow under my supervision in the Medical Programme Directorate in 2007. Karina had been an exceptional medical student at the University of Auckland who is now pursuing doctoral studies in public health at Oxford.

Background

The case for NZ having a large proportion of doctors with generalist skills was made in Part 1 of this thesis. Generalists have a breadth of medical knowledge and skills. They diagnose and manage patients with common and important diseases in primary and secondary care settings. Quality and cost-effectiveness of care are each associated with higher proportions of generalists in the medical workforce,¹⁷² and generalists may prove more deployable than subspecialists to meet emergent health needs.¹³ Despite the key role of generalists in health systems worldwide, medical workforce shortages are more marked in generalist specialties.¹⁷³ By far, the largest group of generalists is GPs, but another group is general physicians who are specialists with a postgraduate qualification in general internal medicine. Key roles of these doctors are to provide care for acutely-ill adults requiring hospitalisation with undifferentiated illnesses, as well as ambulatory care of those with chronic or complex disease beyond the scope of GPs, particularly where there are few subspecialists.⁹ The shortage of general physicians is exacerbated by the increased demand for acute health services created by ageing populations with complex and chronic diseases⁹⁶ coupled with a lower proportion of physicians entering general medicine, compared with subspecialty medicine.⁹

Factors contributing to inadequate recruitment of general physicians include relative inequities in work conditions and remuneration compared with other subspecialties, and the loss of general medicine training opportunities through increasingly subspecialised inpatient units in major centres.⁹ Additional factors are that doctors are working fewer hours on average and the general medicine workforce is typically older than other physicians. There is also maldistribution: shortages of regional rural general physicians more marked than in metropolitan centres.^{9, 21} As there are also fewer subspecialists outside major centres, this magnifies problems in health service delivery to communities in regional and rural settings. In a relatively small country such as NZ, where a significant proportion of the population resides in provincial areas, emphasis must continue to be placed on a generalist approach to both training and practice to ensure the appropriate mix of medical professionals and skills for the population's health need.^{9, 134}

Apart from rural experience, little is known about the impact of a medical curriculum on career choices.^{174, 175} Historically, women have had a greater preference for general practice, however, it is not known whether or

not they also prefer the consultant general physician role. The more feminised medical workforce, together with the current shortages in generalist areas, prompt a consideration of the potential influence of medical curriculum and student demographics on a general medicine career choice.

Aim

The aim was to explore the perceived influence of various factors on career choices of medical graduates. A specific question was whether or not medical school experiences might affect the choice to become a general physician. A secondary aim was to perform a gender-specific analysis to identify potential differences between the career preferences and intentions of males and females with respect to general medicine. A third aim was to determine if interest in one generalist specialty was associated with interest in other generalist specialties.

Participants

Two entry cohorts (2006 and 2007), and one exit cohort (2006) from the FMHS Tracking Project were studied.

Results

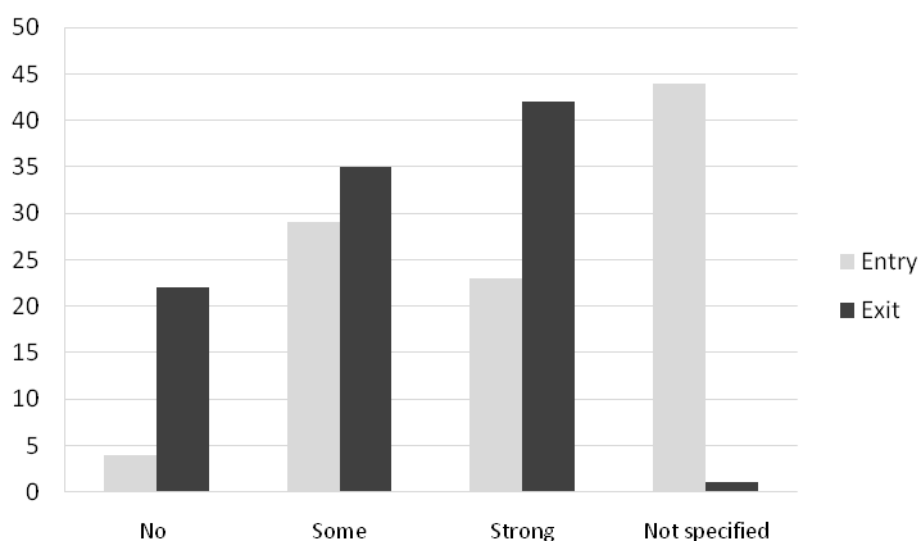
The response rate was 75% (236/315) in the entry cohorts and 88% (115/131) in the exit cohort. Women comprised 53% of the entry group and 61% of the exit group. Twenty-six percent of students had a tertiary qualification prior to entering the medical programme. Three-quarters of students listed a large city (population > 100,000) as their home town, while 11% were from areas with a population fewer than 10,000.

Career intentions

A comparison of the levels of interest between entry and exit cohorts is shown in Figure 11. The levels of interest in general medicine differed significantly between entry and exit cohorts ($\chi^2 P < 0.0001$). A *strong interest* in general medicine was reported by 23% of the entry cohort and 41% of the exit cohort. This difference remained statistically significant after adjusting for the large number of those who selected 'unknown' in the 2006 entry cohort (this was not a possible choice for the 2007 entry cohort). Over 75% of exit students reported either *some interest* or *strong interest* in general medicine as a career. The proportion reporting *no interest* in pursuing a career in general medicine was 4% in the entry group and 22% in the exit cohort.

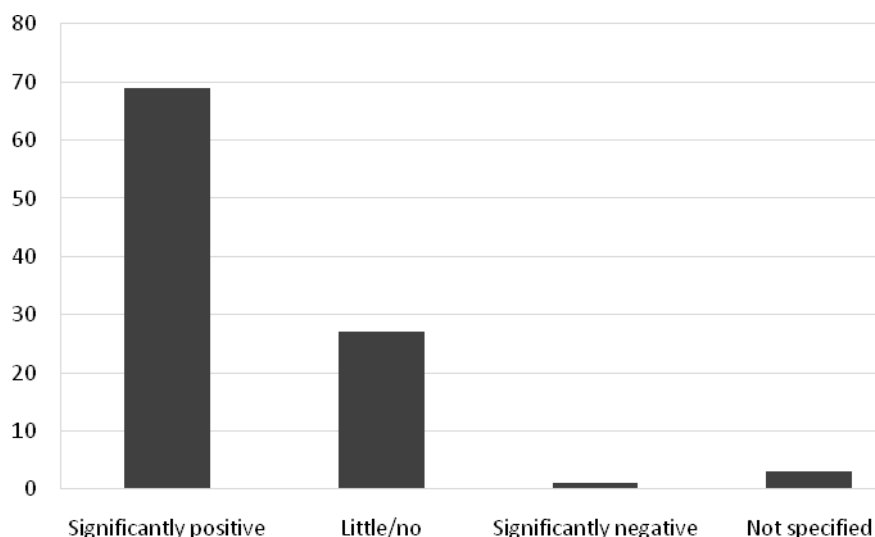
When data were analysed according to gender, there was no statistically significant difference in the levels of interest in general medicine between males and females. With respect to intended community of work, no differences were seen between the responses of the total study population and those with a *strong interest* in general medicine. Fourteen percent of the total study population, compared with 12% of those with a *strong interest*, indicated a preference for working in a rural environment ($\chi^2 P = 0.64$). An intention to work in an urban or city area was reported by 61% of the total exit study cohort, and 67% of those reporting a *strong interest* in general medicine ($\chi^2 P = 0.50$). The rest of the study participants were *undecided* about their intended future community of work.

Figure 11 Levels of interest in general medicine in entry and exit cohorts (% reporting)



Nearly 70% of exit students reported a positive experience during their clinical attachment in general medicine had a *significantly positive* effect on their reported intended future career choice. A further 27% of exit students report that a positive experience during their clinical attachment had *little or no effect* on their career preference. This is shown in Figure 12.

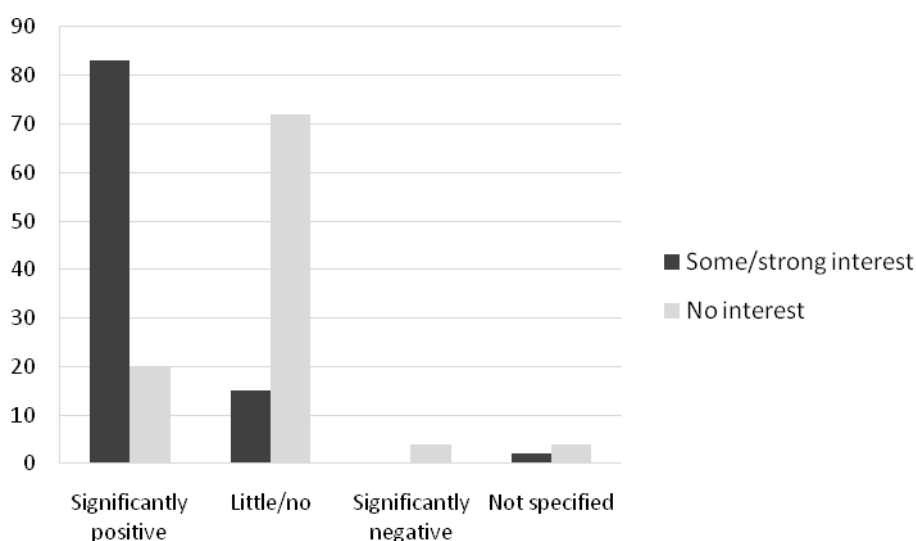
Figure 12 The effect of clinical attachments in general medicine on level of interest in this specialty (% of exit students)



The responses of the exit students reporting *some interest* or *strong interest* in general medicine were then compared with those reporting *no interest* in general medicine in regard to the extent to which interest in the discipline was determined by experience during their clinical attachment(s). This is shown in Figure 13. Eighty-three percent of those who reported either *some interest* or *strong interest* in a career in general medicine also reported that their clinical attachment in that area had a *significantly positive* effect on their career

choice. No students with an interest in general medicine indicated their clinical attachment had a *significantly negative* effect on their career choice. Of students with *no interest* in pursuing a career in general medicine, 72% of those students reported that their attachment had *little / no effect* on their future career choice. Only 20% of students reported that their clinical attachment in that area had a *significantly positive* effect on their career choice. Five students (4%) with *no interest* in general medicine reported that their clinical attachment had a *significantly negative* effect on their career choice.

Figure 13 The role of clinical attachments in influencing a career choice in general medicine by level of interest in that specialty (% of exit students)



Overall, students showing an interest in general medicine were no more likely to report an interest in other generalist areas, such as general practice and general surgery. Instead, they were more likely to report a strong interest in another medical subspecialty. Of the 48 exiting students who reported a *strong interest* in pursuing a career in general medicine, 46 (over 95%) also reported *strong interest* in a career in the medical subspecialties.

Factors affecting career choice

In the next question in the exit survey, students were asked to rate eight factors as to whether they had a *significantly positive effect*, *little / no effect*, or a *significantly negative effect* on their intended career choice. The percentage of students indicating a *significantly positive* effect from each factor is reported in Table 11.

Having a positive experience in a clinical attachment, a positive role model in the specialty area and flexibility within the specialty are the three main factors identified by students as influencing their career decisions. These three factors were significantly more important than other factors included in the questionnaire. Only thirteen students (11%) reported that the debt from their student loan would significantly affect their career choice.

Table 11 Proportion of students indicating a *significantly positive* effect from factors affecting career choice

Factor Affecting Career Choice	Significantly Positive Effect (% of Exit students)
Positive experience in clinical attachment	94%
Positive role model	88%
Flexibility in specialty	82%
Positive experiences in lectures / teaching	66%
Area of need in health system	44%
Potential for remuneration	28%
Friend / family member in area	17%
Student loan debt	11%

The factors influencing career decisions did not vary significantly as a function of gender. Women and men were equally likely to report that their loans would impact on their career choices (11% in both males and females). Similarly, they were just as likely to indicate that their student loan would have *no effect* on their career choices (77% in females, 71% in males, $\chi^2 P = 0.42$). Eighty-six percent of women reported that flexibility in training is an important consideration in their career decision-making process versus 75% of men ($P = 0.15$). Women and men were similarly likely to indicate that having a positive role model was a significant factor in determining future career choices (84% vs. 93% respectively, $\chi^2 P = 0.16$).

Flexibility in a training programme was not of greater importance to graduates interested in a career in general medicine compared with those reporting interest in other specialties (88% vs. 81%, $\chi^2 P = 0.32$).

Discussion

This was the first study using data from the FMHS Tracking Project. Despite the relatively small numbers of students and availability of data from only one exit cohort, it was possible to answer the study questions, and to make other observations.

The major finding from the study was how important undergraduate learning experiences are in the career choice of Auckland students. Evidence for this emerged in two ways. First, exit students rated a positive experience during a clinical attachment or a positive role model as the top two factors influencing career choice, only then followed by the flexibility inherent in that specialty. Second, there was a significantly higher level of interest in general medicine in exit students than in the entry cohorts. Nearly half of entry students were undecided about this specialty at the beginning of medical school. This is concordant with the notion that

the specialty of general medicine is not well-understood by the public and may suffer in comparison with specialties such as dermatology, emergency medicine, or radiology.^{176, 177}

On the other hand, over 75% of students at exit had an interest in general medicine as a future career choice. Students in the Auckland programme have three general medicine attachments (in years 3, 4 and 6) with much of the formal clinical skills teaching in the programme undertaken by general physicians in collaboration with patients in general medical wards. General physicians also feature among the medical school leaders and provide a significant number of lectures and tutorials. Thus, Auckland students have abundant opportunity to observe role models and assess general medicine as a career choice. Over 80% of students indicated that clinical attachments were important in this choice of career. A conclusion is that if students had not had these experiences, the level of interest at exit would not have been as high as it was.

In Part 2, I found that only 40% of women medical graduates had made a definite career choice by the time of graduation,⁹³ with similar proportions noted in other NZ studies involving both sexes.^{178, 35} Thus, the provision of quality experiences on general medicine attachments for undergraduates to raise the awareness of general medicine as a specialty, needs to be built upon at the intern and registrar levels to ensure that trainees remain attracted to, and not dissuaded from, vocational training in this area. In some regions of Australia and the USA, the increasing popularity of medical subspecialisation has seen a move away from general medicine as a career choice or, indeed, the opportunity to experience work in general medical services alongside general physicians. To date, this has not been so much of an issue for NZ, which has a largely public health system with secondary acute general medical services in all the larger hospitals. Most PGY1s and physician trainees experience significant time working in general medicine units with an increasing proportion of physician trainees dual training in both general medicine and a medical subspecialty.⁹

For exit students, there was an association between having a positive experience in an attachment and reporting either *some* or *strong interest* in a specialty. However, those registering *no interest* in general medicine were more likely than those with *some* or *strong interest* to report that their clinical attachment had *little / no effect* on their career intentions. Only five students reported a *significantly negative* effect of the clinical attachment on their decision whether to pursue a given specialty. This suggested that, for many students, the possibility of a general medicine career is raised or reinforced by their attachments, but for the students who have already made up their mind to head in another direction, there may be other reasons for this choice. The wording of the question may have proved difficult for students, especially where they indicated *no interest*, so this finding needs to be interpreted with caution. Nevertheless, that so few students identified the general medicine attachment as having a negative impact on their career choice underscores the ongoing acceptability of general medicine as a training context for students, regardless of specialty they plan enter.

An important and novel finding was that students registering interest in a career in general medicine were highly likely (>95%) to report interest in pursuing another medical subspecialty, but were no more likely than other exit students to indicate interest in other generalist areas, such as general practice. To my knowledge this has not been reported before, although the difference between general medicine practice in the USA, where it is both a primary and secondary specialty, and NZ, where it is a secondary (consultant) specialty means this might not have been studied. The finding suggests that traditional scopes of vocational training and practice predominate in students' minds, with 'generalism' being seen as a subset of the major discipline groups. There does not seem to be a drive to care for the 'whole person' or undifferentiated nature of practice, no matter what.

Another finding was that students at exit seem capable of perceiving differences between disciplines and among the branches within a discipline; arguably this would have been impossible without a range of experiences and role models upon which to draw. This observation has implications for workforce development as to what kind of generalists are needed most for the NZ health care system, and consequently, how they should be trained. One of the most strongly-supported recommendations at a 2009 recent multipartite medical workforce conference in Sydney sponsored by MDANZ was that state and commonwealth [including NZ] governments and medical colleges develop clear policies and strategies to promote generalist training pathways by the end of 2010.¹⁰ Because of the emphasis on primary care in NZ, general practitioners will always remain the most numerous of the generalist specialists, however, I would like to see this recommendation lend weight to prioritisation of equitable training pathways for those who wish to be consultant generalists in surgical, medical and other disciplines.

Women were not more likely than men to be interested in general medicine, nor was there any gender difference in preferred location of practice. There was a tendency for more women than men to indicate flexibility in training was an important consideration in their career decision-making process, although the difference was not statistically significant ($P = 0.16$). In the women graduates study reported in Part 2, flexibility was reported by women to be very important in career choice.⁹⁴ Thus, it is likely that the relatively small sample size of the present study contributed to the lack of statistical significance in this comparison (Type 2 error); further investigation into this trend is warranted. Moreover, the extent to which a general medicine career is 'flexible' is probably not well-understood by students who would see general physicians in the same way as other hospital specialists, and usually working full-time. Overall, students of both genders at exit reported positive role models were significant factors in influencing career choices. This is in contrast to the previous study showing female doctors after graduation do not see role models as particularly important influences.⁹⁴ This is a notable contrast. It may reflect the importance of timing of exposure to role models, or that the early effect of role models to raise career interest is subsequently outweighed by other more powerful factors, such as the nature of training and work in the specialty, or maintaining a family-work balance.

As there was more interest in general medicine at exit than at entry, there is potential for curriculum design and clinical experiences to promote the 'making' of general physicians; however, whether this is true for other better-known specialties is unknown. Another unknown is the timing and number of general medicine attachments and exposures to role models needed to stimulate a general medicine career. These questions should be answerable from the MSOD project eventually, as this project allows comparisons across medical schools with different curricula. The amount of curriculum time allocated to specific clinical attachments and specialties of teachers are directly under the control of a medical school. Based on this study, decisions about learning experiences for students made by medical schools are likely to have an impact on workforce development. Medical school leaders need to be aware of the potential positive and negative consequences of changes in the balance of curricular activities on the future workforce.

Study 2 Increasing student interest in General Practice in New Zealand

Given the importance of general practice to the NZ health system, the interest among Auckland students in this career was a clear priority for study. Moreover, concerns had been expressed that student experiences during the programme, and teacher opinions, might be turning students away from general practice.⁴²

Dr David Bourke was a Clinical Medical Education Fellow, as well as a physician trainee, while undertaking this study in 2009. This study appeared in the NZ Medical Journal in 2010,¹⁵⁷ along with an accompanying editorial.

Background

In New Zealand and globally, health care outcomes continue to be jeopardised by shortages in the general practitioner (GP) workforce. In 2008, a third of the total NZ medical workforce were GPs (3,435 / 10,552 or 32.5%),² although others reported involvement in other primary care activities such as family planning and accident and medical practice. The proportion of GPs has been stable in recent years; however it masks vulnerability in this workforce. The GP recruitment rate is currently lower than the leaving rate with almost one third of GPs, mostly male, intending to retire or emigrate in the next five years,¹⁷⁹ compared with about a quarter of GPs in the UK.¹⁸⁰ Over 40% of NZ GPs are international medical graduates; this factor is associated with a lower likelihood of staying in NZ in the longer term.² Over the past eight years the average number of hours worked by GPs, on average, has fallen from 42 to 38 per week.¹⁷⁹ General practice is a popular specialty for women doctors in NZ. As women work about seven hours fewer per week than their male counterparts,² shortages will be further exacerbated as the proportion of women in general practice approaches 50%.

Recently, the Medical Training Board noted in its report that 'of special importance is the need to direct much more of the medical school intake of the future into general practice.'¹ As reported in Part 1, specific initiatives to address doctor shortages in NZ are underway:

- since 2004 there have been 40 extra places per year allocated to rural origin medical students;
- up to 300 new student places will be created over the next few years;
- the number of funded general practitioner registrar training places has increased;
- in 2009 the NZ government offered \$30,000 financial incentives to graduates who work in hard-to-staff regions during the first two postgraduate years followed by training in general practice, general medicine, general surgery, psychiatry or pathology in their third.¹³⁷

Whether or not these will increase the proportion of doctors in general practice remains to be seen.

Aim

This study had two aims:

- To identify medical student characteristics associated with a greater or lesser interest in general practice;
- To compare levels of interest in general practice between entry and exit cohorts, and explore possible reasons for any difference.

Participants

Three entry cohorts (2006-2008), and three exit cohorts (2006-2008) from the FMHS Tracking Project were studied.

Full fee-paying international students were excluded from the comparison of career choices of those from within and outside of Auckland.

Results

Response rates averaged 82% (397 students) in the three entry cohorts and 79% (322) in the three exit cohorts.

The levels of interest in a general practice career of students in the entry cohort as a whole and in the graduate, MAPAS and ROMPE admission subgroups are shown in Table 12.

Table 12 Levels of interest in general practice at entry, overall and by entry pathway - number (%)

	<i>Strong interest</i>	<i>Some interest</i>	<i>No interest</i>	Comparison with others in entry cohort χ^2
Entry Cohort	157 (40%)	129 (33%)	102 (26%)	
ROMPE	31 (61%)	10 (20%)	10 (20%)	$P = 0.006$
MAPAS	32 (52%)	13 (21%)	17 (27%)	$P = 0.059$
Graduates	41 (51%)	21 (26%)	19 (23%)	$P = 0.102$

Of the 397 entry students, 187 (47%) were born in a foreign country, including the 21 (5%) who were international full-fee paying students. The countries of birth of those born overseas are shown Table 13. The proportion of domestic students not born in Australia or NZ was 160/376 or 42.5%. Regardless of admission category, a *strong interest* in a career in general practice was significantly more likely in students born in NZ, those with English the main language spoken at home, and students from outside Auckland. These data are shown in Table 14.

Table 13 Place of birth of medical students not born in NZ

Country/Region	No.	% of total cohort
South Africa/Africa	20	5.0
Malaysia	19	4.8
China	18	4.5
Korea	17	4.3
USA and Canada	14	3.5
Middle East	14	3.5
India	12	3.0
Taiwan	12	3.0
Sri Lanka	11	2.8
Mainland Europe	11	2.8
Hong Kong	10	2.5
United Kingdom	10	2.5
Pacific Islands	7	1.8
Other South East Asia	6	1.5
Australia	6	1.5
Total	187	47.1%

Table 14 Levels of interest in general practice by birthplace, address in NZ and language spoken at home - number (%)

Characteristic	<i>Strong interest</i>	<i>Some interest</i>	<i>No interest</i>	Comparison χ^2
NZ-born	99 (47%)	60 (29%)	51 (24%)	$P = 0.005$
Born outside NZ	58 (31%)	70 (37%)	59 (32%)	
English main language at home address	61 (48%)	28 (22%)	39 (30%)	$P = 0.006$
English not main language at home address	81 (34%)	89 (37%)	71 (29%)	
From out of Auckland	127 (44%)	87 (30%)	74 (26%)	$P = 0.011$
From Auckland	30 (27%)	43 (40%)	36 (33%)	

A comparison of the levels of interest at entry and exit, by gender, is shown in Table 15. Factors at exit such as marital status and having children were not associated with the level of interest in general practice. Levels of interest in general practice in exiting students were significantly lower than in students at entry ($P = 0.003$).

Table 15 Levels of interest in general practice at entry and exit, overall and by gender - number (%)

	Strong interest	Some interest	No interest	Gender comparison χ^2
Entry (all)	157 (40%)	129 (33%)	102 (26%)	
Female (54%)	100 (48%)	61 (29%)	48 (23%)	$P = 0.006$
Male (46%)	57 (32%)	68 (38%)	54 (30%)	
Exit (all)	89 (29%)	136 (44%)	83 (27%)	
Female (63%)	61 (32%)	90 (47%)	42 (22%)	$P = 0.027$
Male (37%)	28 (24%)	46 (40%)	41 (36%)	

Students at entry indicated a *strong interest* in four disciplines on average, with exiting students, three disciplines, but the range was wide. At entry, general practice was the fourth most popular specialty of the 18 listed; behind medical subspecialties, general surgery and surgery subspecialties. At exit, it was second only to medicine subspecialties.

In response to the exit survey question, ‘please rate the extent to which your interest in the discipline [general practice] was determined by your clinical attachment’, 172/315 (55%) of students reported a *positive effect* of the general practice attachment on their career choice, 96/315 (30%) *little or no effect*, and 47/315 (15%) a *negative effect*.

Students were asked in another question to ‘rate the importance of selected factors on their career choices’. A comparison of how students with a *strong interest* in general practice and those with *no interest* rated each of the factors is shown in Table 16. Compared with those with *no interest* in general practice, students with a *strong interest* were significantly more likely to rate ‘flexibility’, and ‘area of need in health system’ as important factors in career choice, and ‘experiences in lectures / teaching’ as less important. The other differences were not significant.

Table 16 Comparison between students with strong and no interest in general practice: effects of factors on career choice

Students with <i>strong interest</i> in general practice (n =92)				Students with <i>no interest</i> in general practice (n =92)				
Factors affecting career choice	Positive Effect	Little/ No Effect	Negative Effect	Positive Effect	Little/ No Effect	Negative Effect	Gamma	P
Positive experience during clinical attachments	88	4	0	91	1	0	-0.61	0.17
Flexibility of specialty	87	5	0	67	23	2	0.73	< 0.001
Positive experience of lectures/teaching	53	39	0	67	25	0	-0.33	0.03
Medical role models	76	14	2	84	8	0	-0.38	0.07
Area of need in health care	47	43	2	34	54	4	0.28	0.04
Remuneration available	32	58	2	29	58	5	0.11	0.15
Friend/Family in area	21	67	4	16	69	7	0.19	0.23
Extent of student debt	8	73	11	9	70	13	0.028	0.868

Discussion

Exactly 40% of medical students entering the Auckland programme from 2006-2008 signalled a *strong interest* in general practice. Over the same time period, the proportion of graduating students expressing a *strong interest* was 29%. Just over a quarter of both the entry and the exit cohorts reported *no interest* in a GP career. As the data are not paired, there is a possibility that cohort bias may contribute to the apparent decrease in interest. For example, the introduction of the rural origin pathway from 2004 may have prompted a greater interest in a general practice career outside urban centres in the entry cohort, but not the exit cohort.

Allowing for differences in definitions and study methods, the proportion of graduating Auckland students with a *strong interest* in general practice is consistent with the levels of interest shown by UK and Australian medical students. On average, a quarter of medical graduates in the United Kingdom (UK) list general practice as their first choice of career; however, this varies by medical school from 12 to 32%.¹⁸¹ A recent report from Australia suggests 25% of graduates anticipate working as a GP, with interest levels increasing.¹⁸² The levels in

Australasia are higher than seen in the USA where the proportion of medical students interested in a GP career dropped from 35.6% in 1999 to 21.5% in 2002.¹⁸³ Two recent surveys of NZ senior medical students and junior doctors (which did not include students in the current study) found the proportions intending to work in general practice were 16%³⁵ and 30%¹⁷⁸ respectively, although there were differences between the studies in how the question was asked. The former study was of Auckland graduates only. Based on these data the proportion of recent Auckland graduates strongly interested in general practice is not likely to exceed 30%. Even if all these students entered general practice, this is below the proportion needed for the future NZ workforce ... likely to be closer to 50% of all recent graduates.

This study offers insights into what might increase further the proportion of medical graduates predisposed to entering general practice. These are considered broadly under student and curriculum factors. It needs to be borne in mind that with respect to choice of a rural career – most often in general practice – student background has been shown repeatedly to be a determinant up to three times more powerful than curriculum experience.^{74, 170}

Students

There were definable subgroups of Auckland students with greater or lesser interest in general practice. Students with a *strong interest* were more likely to have been born in NZ, to speak English as a primary language at home, and to have come from outside the major metropolitan centre, Auckland. At entry, nearly two thirds of ROMPE students had a *strong interest* in general practice, as did half of the graduates and MAPAS students. The findings for the Auckland ROMPE students and those outside urban centres are consistent with other data from Australia and NZ showing a strong relationship among rural background, intention to work outside major centres and generalist career intent.^{184, 156}

There were higher levels of interest among MAPAS students, but this did not reach statistical significance. This may be a Type 2 error based on small numbers, as current Māori and Pacific doctors are more likely to work in general practice than in other disciplines.² As indicated in Part 1, it is well-accepted that increasing the number of Māori and Pacific students is a priority based on the grounds of equity of access to a medical education.⁴¹ These data suggest they are more likely to work in areas of need; providing support for initiatives to increase the proportion of these students in the medical student cohort.

With respect to graduates, the findings are consistent with others: graduates may have greater interest in general practice at entry than their peers, but their career paths ultimately prove similar to other doctors.¹⁸⁵ Results from a large follow-up study of UK trained doctors suggested that increasing the number of graduate students would not increase the number of GPs significantly.¹⁸⁶ Whether or not NZ should have a graduate entry medical school is still a subject of debate; however, findings such as this one do not support such an endeavour, if increasing the number of GPs in NZ is the primary aim. Moreover, there may be a negative

impact on recruitment of Māori and Pacific students to medical programmes because of the need to complete a prior degree.⁴¹ In the Part 2 study, only one Māori women doctor of nine had a prior degree.

At both entry and exit, women had significantly higher levels of interest in general practice than their male peers. Furthermore, a desire for flexibility was the strongest differentiating factor in career choice between those with a *strong interest* in general practice and those with *no interest*. These are not new findings: historically, general practice has been the career choice for a higher proportion of women than men, and the first choice for women. The Part 2 study showed that women doctors are prepared to trade some career aspiration for career flexibility.⁹⁴ Given the biological and social realities for women with children,⁹⁰ promotion of the flexibility of training and the career opportunities in general practice seem paramount. One major advantage, yet seldom mentioned, is the possibility of working closer to home or children's schools. Student debt and levels of remuneration were not important factors in the career choices of Auckland students, despite the fact that student fees are over \$10,000 per year.

A major and unexpected finding was that such a high proportion of domestic students in the Auckland programme was born outside NZ, with South Africa and Asian countries being the most common regions of origin. Furthermore, data from the FMHS Tracking Project confirm that over 60% of medical students at the Auckland school come from the Auckland urban area where there has been rapid diversification in the population in recent years. In 2006, about one third of Auckland's population of 1.3 million had been born overseas, and only 64% of the Auckland population identified as New Zealand European or 'New Zealander' compared with 76% in 1991.¹⁸⁷ This is, though, consistent with the experience of other similar urban schools. Only half of the students in a longitudinal study of medical graduates from Western Australia in the 1980's were born in Australia.⁷¹ The proportion of overseas-born medical students in the FMHS Tracking Project is similar to that reported in Australian medical schools in the 1990s¹⁸⁸ with both being approximately double the proportion of overseas-born domestic students reported in the UK.¹⁸⁹ The rapid increase in ethnic diversity in Australian medical schools has been attributed to disproportionately high academic achievement in first-generation migrant-origin offspring, and globalisation of the tertiary education system.¹⁸⁸ Overseas-born medical students in the UK are less likely to indicate an interest in general practice, with one explanation being the low prestige of general practice in developing countries.¹⁸⁹

These findings might be seen as an argument to reduce the numbers of overseas-born students selected for the programme on the basis they are less likely to indicate a *strong interest* in a career in general practice. It should, though, be noted that the majority of overseas-born domestic medical students are NZ citizens. As such, they have demonstrated commitment to this country, and are subject to the same rights as other citizens. A subsequent analysis of career choice of overseas-born students, by whether they were citizens or permanent residents, found no evidence that permanent resident students were more likely to want to leave NZ as soon as they graduated from medical school.¹⁹⁰ At this stage, I would argue that the evidence is yet not

strong enough to limit this group of students – two thirds of students born overseas have at least *some interest* in general practice. An area for further research is comparison of the specialty and location of practice of overseas-born but NZ graduate doctors, with that of doctors both born and receiving their medical education in NZ.

An alternative strategy might, instead, increase the pool of students from rural and regional New Zealand. Based on data from this study and others,^{170, 191} this would immediately increase the proportion of students interested in general practice.

Curriculum

The determinants of a student career choice in general practice are complex.¹⁹² A recent review found factors intrinsic to the student to be the most important, although external factors such as learning experiences and serendipitous events, especially advice that general practice is a career of ‘last resort’, have an impact.¹⁹² Student interest varies through medical school, and not all students with a strong interest in general practice will eventually enter it. One study reported that only 30% of those initially interested in primary care remained interested at all three time points in the curriculum, compared with 68% of those interested in non-primary specialties.¹⁹³ In that study, the proportion interested in primary care declined from 44% at entry to 32% in the final year.¹⁹³

In contrast to many other specialties, an early preference for general practice is reported to be highly predictive of final career destination.^{20, 36, 77} Furthermore, the proportion of a cohort preferring general practice tends to increase with time after graduation especially for women.^{77, 93} Thus the level of interest at exit seen in this study may prove to be an underestimate of the proportion of Auckland graduates that will eventually become general practitioners.

Concerns have been raised regarding systematic bias in the medical education continuum towards careers in non-primary care fields.¹⁹⁴ While this may contribute to the lower levels of interest in general practice seen at exit, a negative effect of a general practice attachment itself on career choice was reported by 15% of students in this study. It was not possible to determine why this was, but the importance of GPs appearing optimistic about their specialty in their interactions with students cannot be overstated.¹⁹⁵ Students and junior doctors are particularly susceptible to forces in the immediate environment.¹⁹⁶ It is notable that a reduction in interest in a generalist specialty between entry and exit was seen in this study, whereas the opposite was seen in the Study 1 that looked at career determinants for general medicine. Moreover, only 5% of students in that study reported a negative effect of the general medicine attachment on that career choice. As the curriculum has not changed much in recent years, this supports a conclusion of differential effects of curriculum on specialty choices, depending on the specialty. Once the FMHS Tracking Project is mature, it will be seen which students switch in their preferences, and the part that clinical attachments and other factors play in this switch.

The footprint of general practice in the Auckland programme has remained constant since 2000, apart from the introduction of a Year 5 regional-rural pathway for 20 volunteer students from 2008.¹⁹⁷ Students undertake general practice attachments in each of Years 4 (4 weeks), 5 (2 weeks) and 6 (6 weeks). The Year 4 and 6 attachments are further subdivided into urban and rural components. The optimum undergraduate student experience (e.g. timing, length, curriculum, and environment) for promotion of a general practice career is not well-characterised, especially in those students who do not have a *strong interest* to start with. Evidence is mounting that to stimulate a career in rural general practice, an attachment needs to be at least a month long,^{191, 198} but much of the evidence comes from rural immersion programmes, for which students have self-selected. Fewer and longer primary care attachments in urban areas may be better than repeated short ones, but this needs further study. Resourcing of attachments is another consideration. Others have suggested engaging students in general practice interest groups throughout their programme is beneficial.¹⁹⁹

Medical schools have been challenged to ensure a greater proportion of medical graduates enter general practice. The students enrolled in the FMHS Tracking Project will become specialists between 2012 and 2020; NZ needs all those signalling a *strong interest* in general practice to enter it, and many more. This study confirmed that both student factors and curriculum factors are important in influencing interest in a general practice career.

Medical schools need to ensure general practice is viewed by students and trainees as attractive compared with other medical disciplines. In NZ, very few doctors have an opportunity to work in primary care settings in PGY1 and 2, prior to entering a vocational training scheme. As the majority of medical graduates make their specialty choice in the first two years post-graduation,^{35, 113} this is an opportunity missed. However, to be effective in orientation towards a general practice career rather than away from it, quality experiences with positive role models are required.²⁰⁰

An immediate consideration is increasing the numbers of domestic students who are Māori or from Pacific Islands, from outside Auckland, or from rural areas. Additionally, promotion of the positive aspects of general practice, such as the diversity of patients and ability to develop long term doctor-patient relationships, and the flexibility inherent in a general practice career are important.²⁰⁰ General practice must be seen as a 'good job to do' compared with the increasing number of alternatives. 'Building the confidence of medical students and doctors in training in the extended significance of general practice in the health service'¹ is a challenge for every level of the health and education systems. These will require synergy of effort among medical schools, the RNZCGP, DHBs, MCNZ and the new Ministry of Health workforce agencies.

Study 3 Characteristics of University of Auckland medical students intending to work in the regional-rural setting

At the time of this study in 2008, pressure was mounting on NZ medical schools to produce graduates disposed to work outside cities, especially in general practice. Dr Tom Pasley was a Clinical Medical Education Fellow and PGY3 doctor intending to work in medicine or emergency medicine. The study was published in the New Zealand Medical Journal in 2009.¹⁵⁶

Background

In NZ there is a particular shortage of rural general practitioners (GPs) and further losses anticipated. A recent workforce survey estimated a third of rural GPs were intending to leave their rural practice within 5 years.²⁰¹ Many rural GPs in NZ are working with doctor/patient ratios of over 1:2000, above the 'alert' level set by the Ministry of Health.²⁰² With the ageing rural population, feminisation of the medical workforce, and generational changes in expectations for work-life balance, a significantly larger number of doctors will likely be needed to replace the full-time, and mainly male, doctors that are leaving rural practice.

In 2005, only 43% of rural GPs were NZ-trained,²⁰¹ highlighting the strong reliance on international medical graduates, and the lack of NZ graduates choosing rural medicine. There are limited data on the number of specialists working in rural hospitals. Nixon et al²⁰³ stated that of the 120 doctors working in rural hospitals around NZ, almost all were either general practitioners or Medical Officers of Special Scale (experienced doctors who are not members of a specialist college), with only a small number being surgeons, physicians, or emergency medicine specialists.

A study from the Christchurch School of Medicine found only 1% of students with definite intention to practise rurally, while another 10% likely to.²⁰⁴ A survey of just under 2000 medical students in Canada, with a higher proportion of people living rurally than in NZ, found 11% of students intend working in rural communities.²⁰⁵ When Auckland medical graduates from years PGY2-PGY5 (n = 210) were asked about their likely location ten years hence, over half anticipated living in a large city (population > 250,000), a quarter in a city (100,000 to 250,000), but only 1% of men and 7% of women expected to live in an area of under 20,000 people.³⁵ This gender difference was not statistically significant.

Strategies used by medical schools to tackle rural workforce shortages include admitting students from a rural background and introducing rural-orientated curricula. In 2000, the University of Otago Dunedin School of Medicine introduced a seven week rural placement for their 5th year students. Participation in the rural attachment had a strongly positive effect on the attitudes of students towards a career in rural general practice.²⁰⁶ In the same year, the medical school at Auckland introduced a rural component into each of the Year 4 and Year 6 general practice attachments.

Students from a rural background are relatively under-represented in medical schools.²⁰⁷ A systematic review of 12 studies²⁰⁸ showed that the likelihood of working rurally is over twice as high in doctors coming from a rural background than an urban one. Based on evidence from that study and elsewhere,¹⁷⁰ the Rural Origin Medical Preferential Entry (ROMPE) scheme was introduced.⁴⁵ Starting in 2004, this scheme allocated 20 new undergraduate places to each of the Auckland and Otago medical schools for students who met one of three criteria:

- Have undertaken their pre-secondary education whilst living in a rural area;
- Have spent at least 3 years at a secondary school in a rural area;
- Any other applicant who considers they may be eligible.

For the purposes of the ROMPE programme, 'rural' includes towns with populations of less than 20,000. To my knowledge, the rationale for the population cut-off of 20,000 for the ROMPE programme has not been published.

NZ is one of the most highly urbanised countries in the world, with 86% percent of its population living in an urban area (defined as a population > 1,000).²⁰⁹ This continues to rise as population growth is occurring mainly in urban areas.²⁰⁹ While the proportion of the population living in urban areas in NZ is similar to Australia, there are major differences in how the two countries classify major urban centres: in NZ this is a population of 30,000 or more, whereas in Australia, this is 100,000 or more.²⁰⁹ In NZ, a city is an urban centre with a population > 50,000.²¹⁰ Moreover, there is no internationally-agreed definition of 'rural.'²¹¹ This raises the possibility that literature reports from Australia and beyond about 'rural' students and 'rural' programmes may pertain to sites that in NZ would be considered 'regional' or even 'urban'. While there has been considerable emphasis on shortages of rural general practitioners, regional hospitals are also vulnerable to specialist workforce shortages,⁹ and doctors in these hospitals would not consider themselves as 'rural.' Given the shortages of workforce in regional, as well as rural areas of NZ, the FMHS Tracking Project, and, indeed, the FMHS as a whole, deliberately use the term 'regional-rural' to emphasise the importance of the workforce serving the NZ population living outside major cities.

The FMHS Tracking Project exit survey includes questions on intended region of practice following graduation. The exit questionnaire also asks about relationship status and dependent children. Students are asked whether they intended to practice in either a 'city' or 'regional-rural' community, or are 'undecided'. Data on student ethnicity was subsequently obtained from the student administration system.

Aim

The aim was to identify the graduating Auckland medical students interested in working in regional-rural settings in the long term; then to compare characteristics of this group with those of medical students intending to work in a city.

Participants

Two exit cohorts (2006 and 2007) from the FMHS Tracking Project were studied. Students who were 'undecided' about their career destination were not included in the analysis. As the first ROMPE students completed their final year only in 2008, they were not yet eligible for this study.

Results

The response rate was 88% (n=115) in the 2006 exit survey and 53% (n=71) in the 2007 exit survey, for an average response rate of 71% (n=186).

Practice location

Overall, 58% (n=108) of exit students indicated an intention to work in a city, 15% (n=27) to work in a regional-rural setting and 27% (n=51) were undecided. This is shown in Figure 14.

Figure 14 Intended career location of exit students in 2006 and 2007

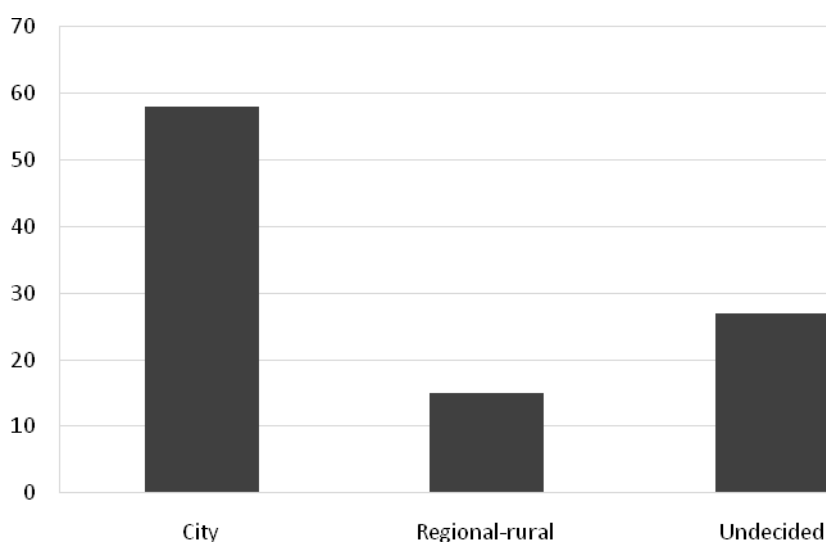


Table 17 shows that the majority (55%) of all graduating students from 2006 and 2007 took PGY1 jobs in the greater Auckland region, however, some moved to other parts of NZ. Eighty percent planned to undertake their internship in the upper North Island, the area primarily served by the Auckland school.

Gender

Fifty nine percent (n=16) of respondents intending to work in a regional-rural setting were female and 41% (n=11) were male. There was no significant difference between the gender composition of the regional-rural group compared with those intending to work in the city ($P = 0.5$).

Table 17 Destination of graduating Auckland medical students for their PGY1 year

Location	All students (%)
Northland	4
Auckland	55
Waikato	10
Bay of Plenty	8
Gisborne	1
Taranaki	2
Hawke's Bay	4
Manawatu/Wanganui	3
Wellington/Hutt/Wairarapa	2
Tasman	0
Nelson	1
Marlborough	3
Canterbury	1
Otago	1
Southland	1
Westland	0
Australia	4
Other overseas	1

Ethnicity

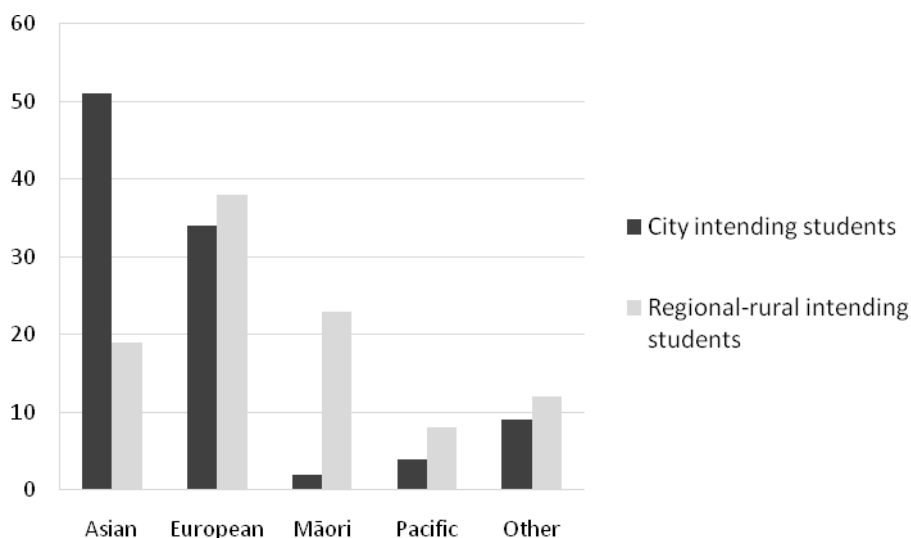
Ethnicity was recorded for 26 of the 27 respondents intending to work in a regional-rural setting, and by 92 of the 108 respondents intending to work in a city. The ethnicities of these students are shown in Figure 15. Only five Asian students intended to work in a regional-rural environment compared with 47 who wished to work in the city ($P = 0.02$). In contrast, more Māori students intended to work rurally ($n=6$) than in a city ($n=2$, $P < 0.05$). There were no significant differences among the other three ethnic groups ($P = 0.5$).

Dependent children/relationships

Small numbers of graduating students had children, and there were no significant effects of children or partners on location of practice. Five of those intending to work in a regional-rural setting had dependent children compared with three of students intending to work in the city (Fisher's exact test, $P = 0.10$). Of the 27

students intending to work in a regional-rural setting, 40% (n=11) were married or in a de-facto relationship compared to 20% (n=22) of students intending to go to a city ($P = 0.12$).

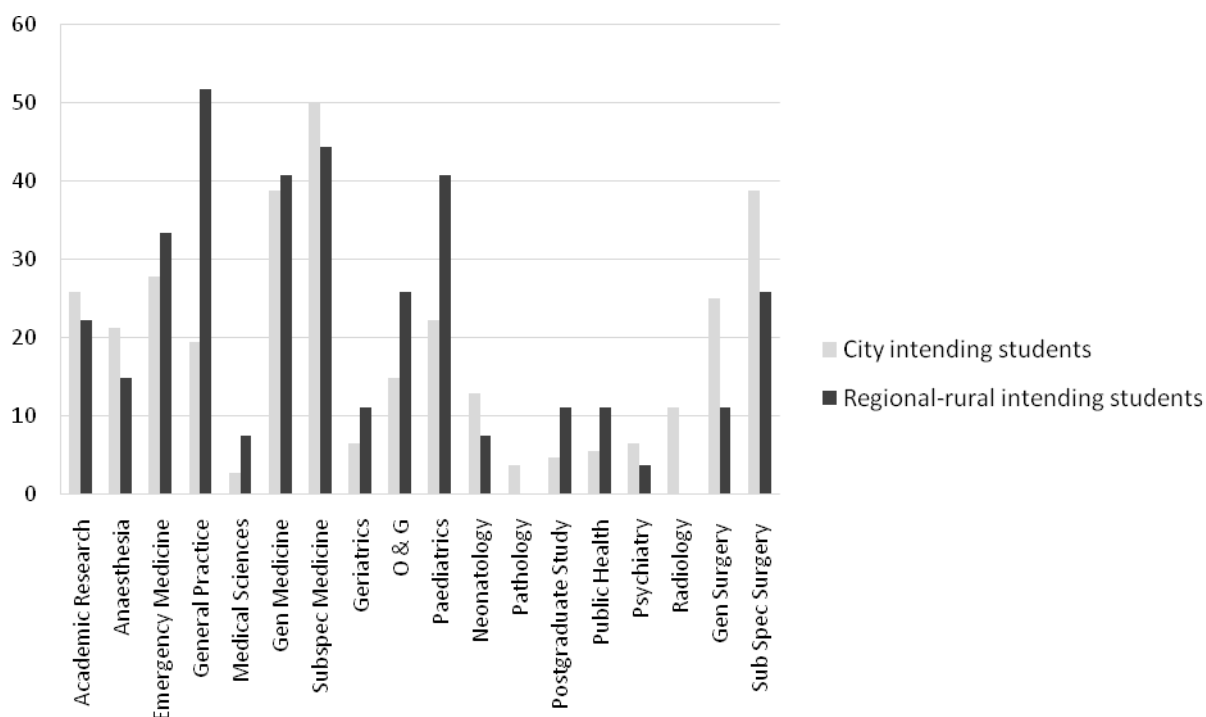
Figure 15 Distribution of student ethnicity (regional-rural intentions vs. city intentions)



Career intentions

Participants were asked to state whether they had *strong interest*, *some interest*, or *no interest* in each of 18 careers. An analysis of career intention by location is shown in Figure 16.

Figure 16 Comparison of percentages of students with *strong interest* in each specialty by whether intending to work in a city or a regional-rural area



Those intending to practise in regional-rural settings were significantly more likely to have *strong interest* in general practice ($P < 0.05$) compared with students intending to work in the city. Regional-rural intending students had greater interest in paediatrics and O&G and decreased interest in specialty and general surgery that city-intending students but this did not reach statistical significance. On the other hand, a comparison using only those specialties where more than 20% of all students expressed a *strong interest* (academic research, anaesthesia, emergency, general practice, general medicine, subspecialty medicine, O & G, paediatrics, general and subspecialty surgery) showed there were significant differences in the distribution of specialty preferences ($\chi^2 P = 0.00017$).

None of those interested in working in a regional-rural setting expressed a strong interest in pathology or radiology, and only one regional-rural student expressed an interest in psychiatry.

Factors influencing career choice

In the exit survey, participants rated eight factors as to whether they had a *significant positive effect*, *little/no effect*, or *significant negative effect* on their career choice. Although this study included an additional exit cohort, students' ratings of the influencing factors were similar to those reported in Study 1 on general physicians. Furthermore, there was no significant difference between the regional-rural and the city-intending groups in how students rated these influencing factors.

Discussion

Over an eighth of The University of Auckland medical graduates students intend to work in a regional-rural setting in the longer term. Accepting that definitions may vary, this is consistent with other comparable studies. In addition, the relatively large proportion of students undecided on career setting at exit from the programme suggests there is room to increase the proportion through formative early postgraduate experiences or other incentives. Medical students rate positive experiences on clinical attachments and role models as important factors in future career choice. There is no reason to think this would be any different for junior doctors if more regional or rural attachments were to become available. Graduates who had spent two years in a rural clinical school in Australia reported significantly higher degrees of interest in a rural career as did those currently working as a junior doctor in a non-urban location.⁷⁵ There are limitations to making these opportunities more widespread. Effective educational supervision away from traditional tertiary teaching hospitals places further demands on a workforce that is already under threat. It is also relatively expensive.⁷⁶ Care needs to be taken to ensure that regional-rural placements are used optimally, and learners and supervisors are well-supported by the various stakeholders in medical student and junior doctor training.

There were some indications as to which students are likely to prefer regional-rural practice. The proportion of Māori students interested in regional-rural practice at exit from the programme is significantly higher than the number of Māori students interested in working in a city setting, although it is not possible to determine the

reasons for this difference. This is, however, an important finding in workforce terms. Māori in New Zealand have lower life expectancies on average than non Māori.^{4, 212} Additionally, Māori rates of GP utilisation are significantly lower than those of non-Māori, suggesting that geographical and cultural issues are significant barriers to access.²¹³ These issues might be addressed with an increase in rural Māori GPs – at this stage, Māori make up 16% of the total rural population,³ yet only 3% of rural doctors.²⁰¹

The present study did not include any students selected via the ROMPE pathway, nor did it include Auckland students who have undertaken the Year 5 Pūkawakawa regional-rural immersion scheme in Northland that started in 2008. The first students from each of these initiatives were first eligible to complete an exit survey in 2008 and 2009 respectively. Consequently, this study served as a baseline against which to evaluate any additional value of these endeavours in workforce terms, as well as providing support for the recent decision to increase the number of places available to students from rural areas.

Since this study was completed, a preliminary analysis of the FMHS Tracking project exit survey career intentions of ROMPE students has been conducted on the two cohorts that started in 2004 and 2005. Only 23 of the 40 eligible students have completed an exit questionnaire (57%). Several students have yet to complete the programme as they have taken time out from their studies. Of the 23 respondents, ten plan to work in a regional-rural setting, ten remain undecided and three plan to work in an urban setting. Ten have a *strong interest* in general practice, ten *some interest*, and three *no interest*. These data suggest that the ROMPE students are predisposed to enter general practice in regional-rural settings; however, it is too early to tell for certain. Even though it was based on relatively small numbers, this study suggests that students who intend to work rurally have different career preferences to those who intend to work in an urban setting, with the greatest differential seen in intentions for a career in the specialty of general practice.

In contrast, a low proportion of Asian students expressed intentions to work rurally. This is consistent with the Rural Workforce Survey of 2005 which showed low numbers of Asian doctors in NZ rural practice.²⁰¹ A rural health tracking survey from Australia found that medical students of Asian descent are more likely to want to work in a city and less likely to want to work rurally than any other ethnicity.²¹⁴ Another long term tracking study of Western Australian medical graduates students of non-European descent to be 70% less likely to work in rural areas.⁷¹ Previously, in Study 2,¹⁵⁷ it was shown that overseas-born students have less interest in a general practice career. Taken together, these findings suggest a review into how well current selection tools and pathways deliver sufficient numbers of students with the predisposition to enter general practice or rural practice.

Availability of child care, schooling, and partner employment, are important considerations for doctors considering rural careers, and may affect women more than men.^{215, 216} These factors, though, are beyond the influence of a medical school. The current study found that the percentage of those intending to work in a rural community that was female (59%) was similar to the proportion of females in the class as a whole (62%).

This is in contrast to previous work showing women less likely to work in rural areas, but concordant with a recent survey of NZ's rural workforce which showed an increasing proportion of women entering rural medicine.²⁰¹ Most medical students will not yet have the challenges of balancing needs of children and career, so the timing of this question may have a bearing on how students responded.

The survey relied on the students' own interpretations of 'city' and 'regional-rural' – no definitions were used. While this may be regarded as a limitation, it could be argued that, as all Auckland students have experiences in rural general practice during their medical programme, with some to regional hospitals, they would have a working understanding of these categories. Most who indicated a 'city' preference are working in Auckland in PGY1, suggesting that students in the study linked 'city' with metropolitan or major centre. By default, anything outside this would be 'regional-rural'. Furthermore, the internal consistency in the responses given in this study – the majority of graduating students intending to work in a regional-rural setting were interested in general practice, with this proportion higher than their 'city' intending colleagues – suggests that students understood the categories. While there is the possibility of both Type 1 and Type 2 errors because of the small numbers in some subgroups, the power to draw accurate conclusions will increase as data from more cohorts are included.

ROMPE students are also eligible for the Pūkawakawa programme. Over time, the relative effects of student characteristics, entry pathway and curriculum will be discernable. In the meantime, the medical school in 2010 made a decision to increase both the ROMPE and the MAPAS quotas, and to review the criteria for selection under the ROMPE pathway. Appropriately, in my view, this includes a redefinition of what constitutes 'rural'.

Study 4 The relationship between decile score of secondary school, the size of town of origin and career intentions of New Zealand medical students

This medical school is considering whether or not introducing a specific affirmative action pathway for students from lower socioeconomic backgrounds would have a beneficial effect on the future workforce.

While a medical student on a summer studentship, Dr Clinton Mitchell had shown how the FMHS Tracking Project might be linked to the MCNZ registration database. He completed a Masters in Education after his MBChB, and intends undertaking doctoral studies in medical education, as well as continuing with physician training. This study was conducted in 2009 while Clinton was a Clinical Medical Education Fellow. It was strengthened by the collaboration with Dr Boaz Shulruf from the CMHSE. Boaz has a background in education, epidemiology and statistical modelling, with an interest in student progression from high school to tertiary education. The study was published in the NZ Journal of Primary Health Care in 2010.¹⁵⁸

Background

Historically, medical students come from upper socioeconomic groups. Nearly 30 years ago, McManus identified that around 80% of UK medical students came from the upper social classes (I and II), and this could not be satisfactorily explained by coming from medical families or social class differences in intellectual ability.⁵² Data from the University of Otago from 1987 to 2000 shows a remarkably stable pattern with around 13% having one parent as a doctor and about 63% at least one university-educated parent.⁵⁰ Admissions data from the first 25 years of the Auckland programme is similar – 13% of students had a medical parent, with 59% a university-educated parent.¹⁶⁰

A highly competitive admissions process favours those from more advantaged educational and socio economic backgrounds. On the other hand, as outlined in Part 1, there are calls for the medical student body to be sufficiently diverse to meet the needs of the communities it serves.⁴⁰ There are two main grounds on which to support this approach: the first is based on the principle of social justice and equity of access for minority groups; the second, because a student population that looks more like the community it serves is more likely to address broader health needs.^{54,55} A study of the practice registers of black and Hispanic doctors in California, for example, found that doctors from these minority groups were more likely to take care of patients from their own ethnic groups as well as uninsured and Medicaid patients.⁵⁶ While the career intentions of Māori and Pacific students have not been studied specifically, there is a suggestion from the studies in Part 2 and 3 of this thesis that they will more likely than other students to enter general practice or work rurally. However, the responsibility for care of specific groups of patients cannot fall solely on doctors who have come from those backgrounds – all doctors must possess skills and attitudes to address inequities in health care delivery.⁴⁶

For around forty years, Māori and Pacific medical student affirmative admission schemes at the two NZ medical schools have aimed to redress the lack of indigenous doctors in the NZ workforce. In 2004, a rural origin scheme was established to help address rural workforce shortages. In the UK in recent years, a number of innovative, yet expensive, efforts have made medical school places available to students from lower socioeconomic groups. King's College London has developed an extended participation programme for an additional 50 students, the main aim of which is to afford intelligent, well-motivated students from poor inner city schools the opportunity to become doctors.²¹⁷ Students undertake a decompressed initial three year programme instead of the usual two, before integrating with the main student body for the final three clinical years. Other models to enhance participation of minority groups are outreach to schools, pipeline programmes, pre-medical programmes (summer schools), and bridging courses between universities and affiliated medical schools.^{50, 54, 55, 218} Few studies have reported on the career choices and pathways of individuals from low socioeconomic communities.

The Medical Training Board has recommended an increase in medical student numbers in order to move towards self-sufficiency.¹³⁴ This provided an opportunity to investigate whether or not there should be a third affirmative action pathway into medical schools in NZ. The hypothesis was that students from low decile schools or a rural origin would be more likely to signal an interest in general practice or other specialties practised in regional and rural settings.

Aim

To study the relationship between medical student career intention at entry to medical school and secondary school decile rating or size of the town of origin.

Participants

Three entry cohorts (2006 to 2008) from the FMHS Tracking Project were studied.

Methods

In the entry questionnaire, students reported their region of origin in NZ and the size of town, divided into major city (population >100,000), provincial centre (10,000 – 100,000), or small town (<10,000). They also nominated the secondary school they had attended for the majority of their schooling. Every census year the NZ Ministry of Education compiles a 'decile' score of every school in New Zealand.²¹⁹ A decile score indicates the 'extent to which the school draws students from low socioeconomic communities', drawing on five measures of socioeconomic status: household income, occupation of parents, household crowding, education qualifications of parents, and income support of parents. Theoretically, decile 1 schools are those with the highest proportion of students from low socioeconomic communities; decile 10 schools are those with the lowest proportion of these students. Attrition rates in low decile schools are higher than their higher decile neighbours. Given this differential attrition rate, the number of students in higher decile schools exceeds those in low deciles, particularly in years 12 and 13²²⁰ which are necessary to meet university entrance requirements.

The secondary schools attended by the medical students were organised into one of three groups: deciles 1-3 (low), 4-8 (middle) or 9-10 (high). The choice of these arbitrary categories was made in an attempt to equalise the numbers in the 'high' decile group and the other two groups combined, and to provide a surrogate scale for assessing the effect of socioeconomic status.

The careers in which students indicated an interest were analysed both by high school decile and by size of town of origin. In contrast to the earlier studies in this Part, this study was concerned with any level of interest (being the *some* and *strong interest* categories combined), rather than just *strong interest*. As this study only looked at entry cohorts, this was done to increase the numbers of evaluable questionnaires by including the 2006 surveys in which students could indicate only *interest* or *no interest* in each specialty. The odds of a student having an 'interest' was the number of students showing an 'interest' in a specific career divided by the remaining number in that cohort (taken as 'did not choose'). Odds ratios (OR) were calculated, with the odds in the cohort of interest being divided by the odds in the remaining cohorts. 95% confidence intervals were determined and instances where the OR value +/- 95% confidence intervals did not include 1.00 were deemed significant. Other techniques included logistic regression and cross tabulation. Statistical analyses were prepared using SPSS version 14 for Windows (© SPSS Inc., 1993-2007).

Results

Responses were received from 397 medical students (82% return rate). Of this cohort, 51 sets of data were excluded where the secondary school attended by the student was overseas or the New Zealand Correspondence School, as no school decile rating was available. This gave a total sample size of 346.

The numbers and proportions of students in each category are shown in Table 18 and Figure 17. These distributions differed significantly (gamma 0.53, $P < 0.01$).

Table 18 Numbers (%) of students from schools in each of the three decile groups with size of town of origin

Decile	Small Town	Provincial Centre	Major City	TOTAL
Low	9 (2.6)	5 (1.4)	15 (4.3)	29 (8.4)
Middle	17 (4.9)	30 (8.7)	81 (23.4)	128 (37.0)
High	13 (3.8)	12 (3.5)	164 (47.4)	189 (54.6)
TOTAL	39 (11.3)	47 (13.6)	260 (75.1)	346 (100%)

Figure 17 Student distribution by school decile group and size of town of origin

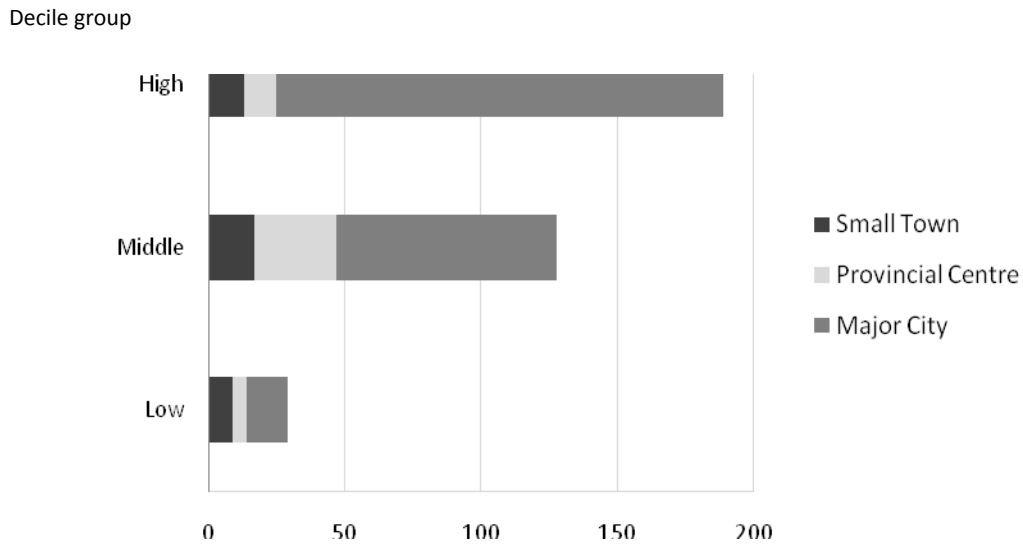
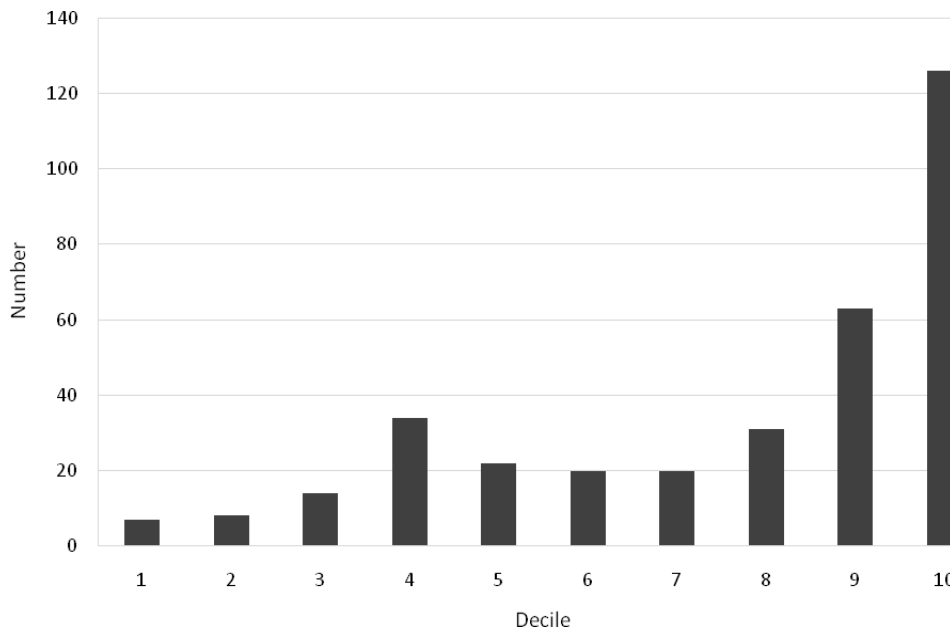


Figure 18 shows there were medical students from secondary schools in every decile from 1 to 10, with a marked preponderance of students from decile 9 and 10 schools. The average decile of schools for students from a major city was 8.1, compared with 6.4 and 6.3 for students from provincial centres and small towns, respectively.

Figure 18 Numbers of students from each school decile



The origin of the students by region and size of town in NZ appears in Figure 19. By far the largest number of city-origin students came from Auckland, although Hamilton, Wellington and Christchurch were also

represented. Over the three year period of the study, medical students came from 120 schools throughout New Zealand. Twenty-one schools have contributed five or more students, with the maximum being 20 students from one school. Of these 21 schools, nineteen are within the Auckland region. The median number of students from each school in this study is 1.

Figure 19 Origin of Auckland medical students by regions of New Zealand and size of town (C. Mitchell, with permission)



Overall, students made a mean of 9.75 expressions of interest – being either *some* or *strong interest* – from the possible 18 career choices. Students from lower decile schools and smaller towns tended to make fewer choices although this reached significance for town size (one way ANOVA, $P = 0.011$), but not decile group (one way ANOVA, $P = 0.051$). These data are shown in Tables 19 and 20.

Table 19 Mean number of specialties (SD) in which students expressed interest, by decile group

Decile Group	Number of expressions of interest
Low	9.14 (6.10)
Middle	8.83 (5.84)
High	10.35 (5.30)

Table 20 Mean number of specialties (SD) in which students expressed interest, by size of town of origin

Town of origin	Number of expressions of interest
Small town	7.79 (5.86)
Provincial centre	8.45 (5.91)
Major city	10.20 (5.44)

When the data of students from small towns and provincial centres were combined together, students from major cities made more choices (10.20 (SD 5.9) vs. 8.15 (SD 5.9); *t* test, *P* < 0.01). When data of students from low and middle decile groups were combined together, students from major cities made more choices (10.35 (SD 5.30) vs. 8.89 (SD 5.87); *t* test, *P* = 0.015).

To measure the interaction of school decile and town of origin on expressions of interest, logistic regression models were established for each specialty. In each model the dependent variable was the specialty (interest/no interest), and the independent variables were the school decile and town of origin (where the reference was high decile and major city respectively). Given that the questionnaire allowed students to indicate an interest in any or all specialties, it was assumed that there was no interference from the choice of one specialty on another. Overall, there was no major consistent effect of school decile or town of origin on student career choices (Nagelkerke R^2 < 0.06 across all models). Nonetheless, there were some differences seen in the patterns of choice among students from different backgrounds. These are presented in Figures 20 to 23.

In these figures, if the confidence interval for the odds ratio overlaps 1, there is no statistically significant difference between the two groups. If the confidence interval does not overlap 1, there is a statistically significant effect: to the left the first-named group being less likely to choose the specialty; to the right, the first-named group being more likely to choose it.

Figure 20 Odds of students from low decile schools choosing a particular specialty compared with those from high decile schools

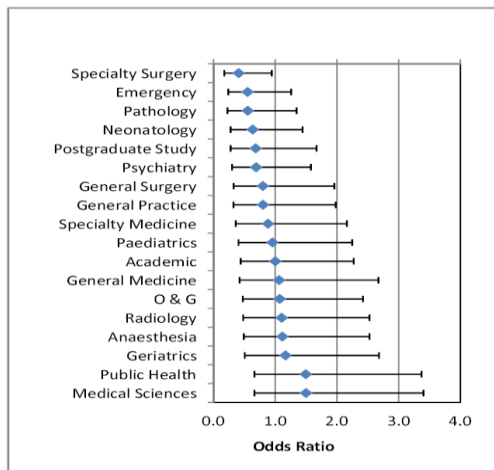


Figure 21 Odds of students from middle decile schools choosing a particular specialty compared with those from high decile schools

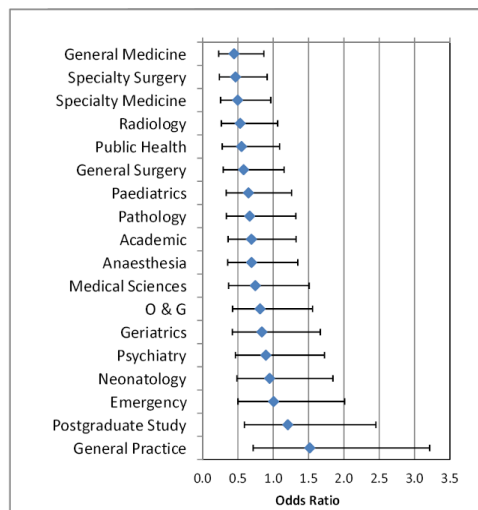


Figure 22 Odds of students from small towns choosing a particular specialty compared with those from major cities

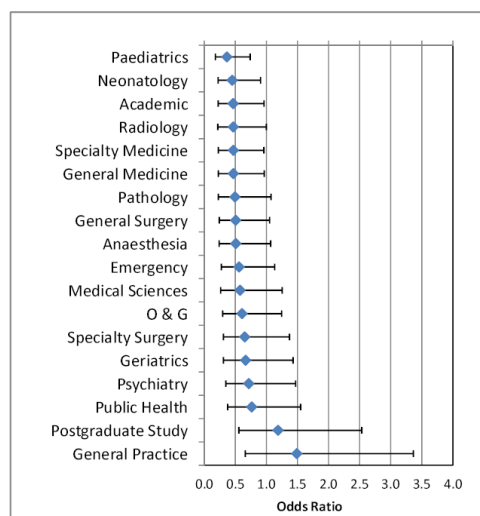
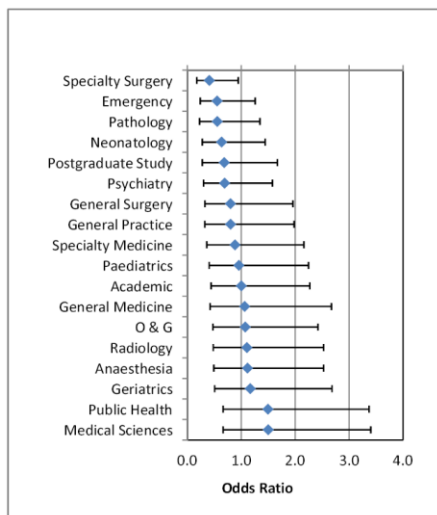
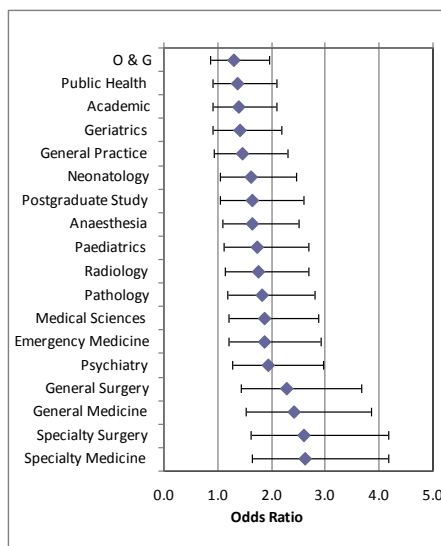


Figure 23 Odds of students from provincial centres choosing a particular specialty compared with those from major cities



The largest single group of students came from a high decile school in a major city (n = 164, 47.4%). As previous analyses suggested their decisions might be different to those in other groups, an analysis comparing that particular group with the remaining groups (n = 200, 52.6%) was then conducted. This showed that students from high decile high schools in a major city were more likely to signal an interest in most specialties than all other students combined (Figure 24). Moreover, they were over twice as likely as other students to signal an interest in medicine and surgery and respective subspecialties.

Figure 24 Odds of students from high decile schools in major cities choosing a particular specialty compared with those from all other areas and deciles



Discussion

This is first study in NZ to examine whether or not socioeconomic status has a bearing on career intentions of medical students. A major finding was that, for medical students entering the Auckland medical programme who had attended a secondary school in NZ, a strong relationship existed between the decile of that

secondary school and size of town of origin. The average decile of the schools of 'major city' students was two decile points higher than their provincial or small town counterparts. Each of these variables in turn was associated with a relatively minor effect on intended medical career choices at the time of entry to medical school.

The majority of students came from the greater Auckland region and the upper North Island; 19 of the 21 schools that had the highest numbers of students admitted to the programme were in the Auckland region. Given that half of the NZ population lives north of Taupo, and that the University of Otago is based in Dunedin with clinical schools in Dunedin, Christchurch and Wellington; the student catchment was much as expected.

There was a wide range of secondary school of origin. This was in contrast to a common view that most students in the Auckland programme come from a limited number of city schools in Auckland. Furthermore, over 11% of students came from areas with a population of 10,000 or less. To put these findings in context, a 2002 study from the University of Otago found that 84.5% of their students came from main urban areas, while only 2.9% came from rural areas.²⁰⁷ Assuming the two schools have similar student profiles and the definitions are comparable, this observation may be an indication that the ROMPE pathway introduced in 2004 is having the desired effect on diversification.

With the limitation that the decile of a high school can at most be an approximation of the socioeconomic status of an individual student, it was encouraging that 45% of students in the study reported they did not attend decile 9 or 10 schools. Decile 9 and 10 students make up 30% of year 13 students in NZ, because of differential attrition rates (Boaz Shulruf CMHSE, personal communication, 2009). This leaves about 70% of year 13 students from decile 1-8 schools, showing that there is still a disparity, although not as marked as might have been anticipated from the earlier literature. The University of Auckland now selects students after at least one year at university for a number of reasons; one being that this allows capable students to compete for medical school places on relatively even terms, regardless of socioeconomic status and location of high school. The present study suggests this strategy may be having an effect.

Thompson and Subich²²¹ recently discerned that social status was predictive of 'career decision self-efficacy,' extending upon their previous findings that the range and implementation of choices was also affected by social status.²²² At the opposite end of the spectrum, students perceiving themselves as having greater economic resources compared with their peers reported more certainty and comfort with career choices.²²¹ A different effect was seen with the cohorts of students in this study. NZ domestic students entering medical school in Auckland appear enthusiastic about the range open to them; on average, students rated an interest in nearly 10 of the 18 options available to them. Students from lower decile schools, provincial centres and small towns made fewer choices than those from high decile schools in major cities. The implication of this finding is not yet clear and there are several possible explanations. There may be a lack of awareness in the former groups of the potential careers within medicines; or deliberate strategies used by students from larger

towns/higher deciles to keep many options open. An alternative hypothesis is that students from lower decile schools or smaller towns may be more definite about what they do and do not want to do in medicine.

There were few strong and consistent patterns in the intended careers of medical students at entry, when categorised by school decile and town of origin. Some of this may be due to the fact there were relatively small numbers of students in the survey but a wide range of choices available. It is likely that students would have a limited knowledge about many specialties at entry and choice was therefore not well-informed. Despite this, students from high decile schools in major cities were over twice as likely to signal an interest in medicine and/or surgery and their subspecialties, than were other students. One explanation is that this group of students made more choices overall, thus increasing the likelihood of all the individual choices. There was not, though, consistency in this effect. For five of the 18 specialties, including the clinical specialties of geriatrics, general practice and O&G, there were no significant differences in preferences among any of the student subgroup in this study.

As was found in Study 2 of this Part, nearly three quarters (72%) of students at entry indicated an interest in general practice, a priority specialty area in New Zealand as in most countries in the world. Areas in New Zealand with high chronic disease burdens are over-represented with low decile schools, and underserved by GPs. For example, in Manukau 65.5% of schools are decile 4 or below.²² In the Counties-Manukau DHB there are 280 general practitioners for every 100,000 population, compared with 425 for the same population in the Auckland DHB.²²³ Vaglum found that students interested in a career in family medicine at entry to medical school were motivated by status/security – more so than for any other career. They postulated that students coming from a lower ‘social origin’ may be more aware of a change in status or security that accompanies being a doctor and thus be more likely to enter general practice.²²⁴ This present study, though, does not support this notion – students from all groups signalled an interest in general practice similarly. Plausible reasons for differences in study findings include the lack of a strong social class structure in NZ, and the relative valuing of general practice careers in NZ; both in terms of remuneration, and recognition as specialists in their own right.

This study looked at student career intentions at entry. Others have shown that only a minority of students (45%) correctly identified their later actual choice of specialty prior to their first day of lectures.²²⁵ Fewer than half of the women medical graduates from the University of Auckland report having determined their career at the end of medical school.⁹³ Time will allow the testing of the hypotheses generated from this study that students from smaller centres or lower decile schools are more accurate in their predictions of career choices, and whether or not students from high decile city schools are twice as likely to become New Zealand’s future physicians and surgeons.

A strategy of seeking to ‘grow our own’ health professionals seems appropriate. Zayas reinforces the concept of ‘nurturing local talent’, and opines that professionals practising in their home communities are more

cognisant and sensitive to local needs.²²⁶ To do this will require overcoming the perception that students from lower socioeconomic groups identify medical school as 'culturally alien and 'posh'; few consider they have any chance of ever gaining a place'.²¹⁸

Selection processes and pathways must continue to enhance the prospects of a medical career for students from outer metropolitan areas and beyond, and from lower decile schools. Since 1999, the FMHS has had a Certificate of Health Sciences bridging programme between school and first year at university, for students identifying as Māori or Pacific, along with a school outreach initiative, Whakapiki Ake. It is beyond the scope of the current thesis to determine the extent to which these initiatives, or indeed, the rural origin pathway, have increased representation from lower decile schools.

Given that half the NZ population lives in the upper half of the North Island, recruitment and educational strategies for the University of Auckland might, as a priority, target outer metropolitan, regional and rural schools in this region. In so doing, medicine as a career might be promoted more widely, and high school students encouraged in development of the strong science base needed for medicine. Purposes of affirmative entry pathways are to broaden opportunities for under-represented students and to help shape the future workforce. Because of the strong relationship between the school decile and rurality identified in this study, an increase in the proportion of students from outside major cities, and not just rural areas, in the rural origin pathway would have the corollary of more students coming from lower decile schools. It does not seem necessary, based on these data, to have another specific pathway. The evidence already shows that rural students are more likely to return to their rural origins.²⁰⁸ I would agree with Ip and McManus that there is little evidence yet of a relationship between having more students from lower socioeconomic groups and better servicing of patients with the greatest health need.²²⁷

Study 5 **Patterns of student loan debt in Auckland medical students**

Since the time of the major increase in fees in the late 1990's, medical student debt has been the topic of ongoing controversy, including the extent to which it affects junior doctor career choice and decisions to leave NZ. My work in Part 2 had raised the question as to whether student loans would have greater impacts on some students than others, particularly women, and those looking to work in less well-remunerated specialties. This study was published in the New Zealand Medical Journal in 2008.¹⁴¹

Background

In October 2001 a series of articles on medical student debt in NZ was published.^{204, 228, 229} These found the average predicted debt at the time of graduation (including all sources except house mortgages) was between \$60,000 and \$70,000, with a significant correlation between size of this debt and intentions to practise medicine overseas.²²⁸ The mean debt was over double the median annual wage at that time.²³⁰

In the FMHS Tracking Project exit survey, students report their current NZ Government Student Loan (NZGSL) at the time of the survey, by selecting from a table arranged in \$15,000 increments. This estimates the burden of debt that is attributable to loans incurred for the purpose of fee-paying and course-related costs. Medical students in NZ do have debts other than a NZGSL, such as credit card debt and finance company loans; however, these are not enquired about. In the 2007 academic year, the annual medical school fees paid by NZ domestic students were \$11,340 (Medical Programme Directorate, University of Auckland, personal communication, October 2007).

Despite an increasingly feminised workforce, there is a lack of information about the differing burdens of debt experienced by males and females entering the profession. Owing to the tendency for medical women to enter less well-remunerated specialties, and increased chances of interrupted practice⁹² concerns about differential debt levels in women and minority groups had been raised.^{228, 231} On the other hand, Study 1 in this Part suggests debt to be a significant influence on career choice for only 11% of Auckland students,¹⁵⁵ with 74% reporting 'no effect' on this decision. The stated career intentions of those reporting a 'significant effect' of student loan debt on their future career choice did not differ significantly from the reported intentions of either the total exit cohort or those who stated that their loans would have 'no effect' on career decisions.

Aim

To quantify the current level of actual student loan debt in University of Auckland medical students at the time of graduation, and to investigate potential variations in the debt burden between the genders and individuals of different ethnicities. A secondary aim was to investigate whether or not trends regarding student loan debt that were identified in earlier studies were still evident.

Participants

One exit cohort (2006) from the FMHS Tracking Project was studied.

Although international students are invited to complete the exit surveys, their responses were excluded from the analysis of the student loan data. International students are not eligible to apply for a NZGSL; hence these students indicated loan totals of zero. There were 14 (12.2%) international students in the exit study cohort.

Results

Response rate

The response rate for the exit survey in 2006 was 88% (n=115). Females made up 61% (n=70) of the study respondents. The ethnic distribution of the study population is shown in Table 21.

Table 21 Ethnicity of students in the 2006 exit cohort

Ethnicity	% of study population
Asian	35%
NZ European / Pakeha	34%
Pacific Island people	6%
Māori	5%
Other / Not specified	20%

Total NZGSL at graduation

Eighty eight of the 101 (87%) NZ resident students reported that they had taken out a NZGSL to cover their studies, with 13 students (13%) reporting that their NZGSL at the time of graduation was nil.

Over 73% of all NZ resident students (n=74) reported that their total NZGSL at graduation was over \$45,000, with 33% reporting that their NZGSL would total over \$75,000. A NZGSL of greater than \$90,000 was reported by 13 (13%) of these students. The following was noted of the students who were NZGSL-free:

- 81% were female (c.f. 61% in total study population, $\chi^2 P = 0.07$);
- No more likely to be 'mature' or graduate students;
- No more likely to be in part-time work;
- No more likely to report financial support from their parents;
- More likely to report an intention to work in a regional-rural setting (25% versus 13.9% for all students, $\chi^2 P = 0.039$).

A conservative average total NZGSL of all non-international students was \$55,660. However, excluding the students who reported having no NZGSL, the 'average' loan rose to \$63,880. Some form of financial support from their parents during their medical school training was reported by 86% all graduating students.

Gender and debt

The NZGSL data were analysed according to gender. While only 7% of all men in the NZ resident exit cohort had not taken out a student loan, 21% of all women in this group indicated that they were student loan-free at the time of graduation ($\chi^2 P = 0.049$).

In addition to being more likely to have a NZGSL, males had higher loans than their female counterparts. Whereas 17 (27%) of NZ resident female exit students had loans under a total of \$30,000, only 4 (8%) of males in this group had a NZGSL total under this amount ($\chi^2 P = 0.035$). Furthermore, although 14.5% of female students indicated a total NZGSL of \$75,000-\$89,999, 21% of all male students in this cohort reported a NZGSL of this size. This difference between males and females in the \$75,000-\$89,999 category was not statistically significant ($\chi^2 P = 0.11$).

Ethnicity and debt

In this cohort, there was no suggestion that Māori, Pacific Island, or other 'minority' ethnicities were over-represented among the students with considerable NZGSL debt, or that they were under-represented in the group with no NZGSL. Even though Māori made up 5% of the total cohort, nearly 8% of the students with no student loan were Māori. Of those with a loan totalling over \$75,000, only 6% identified themselves as Māori.

Pacific Island students, 6% of the total cohort, are over-represented amongst those with no student loan; 23% of those who were NZGSL-free were of Pacific Island descent. The proportion of Pacific students with a loan over \$75,000 was 6%.

Discussion

The majority of University of Auckland medical graduates accumulate a significant student debt, with the average student loan at graduation in 2006 over \$55,000. Because this study looked only at NZGSL debt, the estimated average debt is lower than that seen in the 2001 studies that estimated total debt, including debt from other sources.²²⁸ The size of the debt needs to be placed in the context of the income of newly-qualified doctors in NZ, which in 2009 was a median of \$75,200, with this nearly three times higher than the starting salary of a humanities graduate.²³²

The consequences of these levels of debt on medical student career decisions are still not completely known; no study has tracked students for long enough to determine career destination. In Study 1 it was reported that relatively few students (11%, 13 students) reported that the debt from their student loan would significantly influence their specialty choice, with almost three-quarters of students in this cohort indicating that it will have 'no effect' on this decision. This initial figure is in keeping with that of a similar study from Gill et al in 2001, in which 16% of students at the Christchurch School of Medicine reported that their level of debt would be a 'strong motivator' influencing decisions around career choices.^{204, 107} However, it should be noted that a nationwide study of PGY1 doctors found that a significant number of respondents (43%) indicated that their

student debt would impact on decisions around specialty selection.²³³ The study participants in the nationwide PGY1 survey were in a position where they were actually required to make payments on their loans, while those in the 2001 survey²²⁹ and the current study remain within the relatively 'protected' environment of the medical school. Thus the timing of a survey on loans, or how the survey is presented by the investigators, may each have an impact on how the participants respond.

There were several limitations to this study: NZGSL amounts were not independently verified; furthermore, the data has been obtained from only one student cohort with relatively small numbers, raising the possibility of Type 1 and Type 2 errors. There is also the possibility that students may have under- or over-estimated their loan debt through a drive to produce a favourable response that is in keeping either with the altruistic nature of the medical profession, or peer expectations (social desirability bias²³⁴). However, this is not thought likely as surveys were analysed anonymously. If anything, students may have over-estimated their debt as they have tended to be open and forthright when discussing the impact of their loans on their lives and career intentions.^{228, 229, 235} The findings with respect to level and impact of debt were somewhat reassuring, as ongoing concerns exist within the profession that debt will force graduates into higher paying careers that may not necessarily be those most needed by the NZ health system.

Despite the limitations, clear differences were observed in the borrowing habits of male and female medical students. In contrast to the hypothesis, and the concerns voiced by women participants in Part 2 of this thesis, this study found female medical students were significantly more likely to be free of a student loan at the time of graduation, and, as a group, to have lower total loans than their male counterparts. The reasons for these findings are unclear, with little available information in the international literature around the relative borrowing habits of males and females. There was no significant difference between women and men in terms of reported parental financial support, engagement in part-time work during medical school, or availability of savings funds. Few women received spousal financial support. One hypothesis is, therefore, that women are more wary of the future burden of debt than men; being less likely to add to the loan without significant consideration or need. This warrants further investigation. There may be a link with the findings in Part 2 in that first, women's income and career satisfaction were not closely related; and second, significant numbers of women work in careers with relatively low incomes. However, it needs restating that the women subjects in the Part 2 study were not subject to the level of fees current students face.

The level and impact of debt did not suggest a differential or inequitable effect of debt on minority student groups. The overall distribution of the ethnicities in the loan-free population was essentially as per the total exit cohort. This was also true of the ethnicity of the students whose loans were greater than \$60,000 suggesting that Māori and Pacific Island students have loans of similar sizes to students from other backgrounds. Indeed, Pacific Island students made up nearly one-quarter (23%) of the students with no student loan, despite only representing 6% of the total study population. These findings are in contrast to

results from an earlier study at this medical school, where it was suggested that Māori and Pacific Island students would bear a significantly higher level of student debt.²²⁸ The discrepancies between the 2001 study and these findings could be explained by more scholarships being available to Māori and Pacific Island students. The differences may also be due to the fact that the 2001 study looked at all sources of student debt, while this survey concentrated solely on NZGSL debt. These findings require verification on a larger sample.

Study 6 Differences in medical student career intentions by gender

Part 2 of this thesis argued that careers and career decision-making differed for men and women, with potential impacts on the shape of the future workforce. Dr Harriet Cheng, Clinical Medical Education Fellow, and Dr Boaz Shulruf assisted in the data analysis for this study. Harriet was another Auckland medical graduate, now in physician training.

Background

Since the early 1990s, the proportion of women in medical schools in NZ has equalled or exceeded that of men.⁸⁵
⁹² This rise in numbers is reflected in the proportion of women house officers in New Zealand (56%), but women still represent only 39% of the NZ workforce overall.² GPs currently make up around a third of the NZ medical workforce, with other specialists making up another third, and the remainder, doctors in training or in non-specialist roles.² While the proportion of women doctors in NZ is close to the international average of 40%, because there was a lower proportion of women in the NZ workforce to start with, feminisation of the NZ medical workforce has been occurring at a faster rate than elsewhere.^{12, 105}

The pattern of medical women's participation in health care systems has been described as segregated horizontally (women concentrated in certain areas of work) and vertically (women underrepresented at higher levels of the professions).¹⁰⁵ A finding of the study in Part 2 of this thesis was that the greatest proportion of Auckland women graduates was in general practice (42%), with this consistent with other studies,^{93, 94, 103, 105} and in excess of the expected proportions based on the workforce.¹⁰⁹ The segregation of women remains evident in the most recent NZ workforce data from 2008.² Even though for 15 years, over half of medical students have been women, they comprised 43% of general practitioners but only 26% of other specialists.²

Reasons for a higher concentration of women in primary care and the slower progression to consultant status in other specialties were discussed in Part 2. In brief, for many, general practice is a positive choice as it may best allow women to balance a medical career and family life,¹⁰³ and has intrinsic appeal by its generalist nature and opportunities for patient interaction.⁷⁷ On the other hand, the adverse demands of postgraduate education and the nature of medical work in other specialties such as surgery, may have an impact upon career choices of women;^{102, 236} significant numbers of women move from training in a hospital specialty into general practice.^{36, 77, 94} In this respect, general practice may be a negative choice for those who have had to move away from original career intentions because other training systems could not accommodate their needs.^{94, 105}

The study in Part 2, along with others of women in the medical workforce,^{85, 103, 104} reported upon those actually in practice. As a consequence, this does not provide an accurate representation of career interest; only those in the specialty area at the time were counted, being those who had managed to complete the

training and continue working.⁹⁴ If career-decision making is positively based on interest, and fit with lifestyle, at the end of medical school women and men might be assumed to have similar interests. After all, they have undergone the same selection processes and curriculum. Furthermore, because the average age of medical women at the birth of their first child is 31, the majority of women medical students will not have had their children by the time they graduate.⁹³ Thus, they will not yet have been challenged by the pressure of balancing family and work demands,⁸⁵ the most crucial factor in career choice and progression.¹²¹ Part 1 raised yet another consideration; recently-graduated male doctors may seek a better work-life balance than in the past.

Aim

To determine if there were differences by gender in the levels of interest in specialties at the time of graduation from medical school.

Participants

Four exit cohorts from the FMHS Tracking Project (2006 to 2009) were studied.

Methods

Data obtained from the exit surveys were entered into an Excel spreadsheet and later transferred to SPSS for statistical analysis. Question 3 in the exit survey (see Appendix 3) asked students to rate their level of interest in each of 18 specialties as *strong*, *some* or *no interest*. Analyses of responses to this question were conducted in two ways: first, the number and proportion of students with a *strong interest* in each specialty by gender were calculated. Second, an 'interest score' for each specialty for each student was calculated by assigning 1 point for *no interest*, 2 points for *some interest*, or 3 points for *strong interest*. The mean score for women and men was calculated for each specialty. A higher mean score indicated an increased interest in the specialty.

Differences between the responses of male and female students were compared. For categorical variables, *P* values were calculated using the Chi-square test. For continuous variables, *P* values were calculated using *t*-tests. A *P* value of less than 0.05 was taken as significant.

Results

The overall survey response rate was 81% (*n* = 467). Seventeen students were excluded as their gender could not be determined from the information given, yielding a study population of 450 (78%) of graduates from 2006 to 2009. Women were more likely to respond to the survey than men (*P* = 0.032).

The study population as a percentage of the total male and female graduates each year is shown in Table 22. The average numbers of expressions of *strong*, *some* or *no interest* in a specialty were similar for women and men. These are shown in Table 23.

Table 22 Study population by year and gender, with percentage of the total eligible population in brackets

	2006	2007	2008	2009	Total
Women (%)	70 (92)	44 (56)	81 (91)	74 (86)	269 (82)
Men (%)	44 (80)	26 (48)	48 (79)	63 (84)	181 (74)
Total (%)	114 (87)	70 (53)	129 (86)	137 (85)	450 (78)

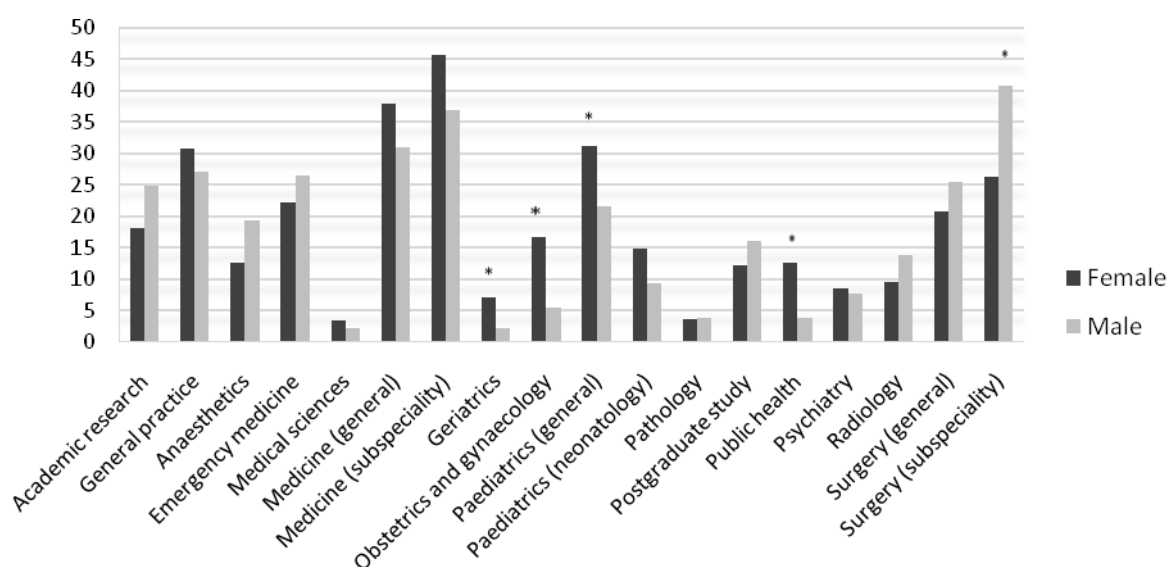
Table 23 Number and level of expressions of interest per student, mean (SD)

	Strong interest	Some interest	No interest
Women	3.33 (1.83)	5.97 (2.54)	8.06 (3.02)
Men	3.18 (2.04)	5.80 (3.05)	8.39 (3.66)

Comparison of proportions of students with a strong interest in a specialty by gender

The percentages of male and female exiting students that reported a *strong interest* in each of the 18 specialties are shown in Figure 25. As students could indicate a *strong interest* in as many specialties as they wished, the totals exceed 100%. The specialties where the differences between genders were statistically significant are marked with an asterisk. There were significantly more women than men with a *strong interest* in geriatrics, O&G, paediatrics and public health, with more men than women with *strong interest* only in surgical subspecialties.

Figure 25 Comparison between genders of the percentage of students with a *strong interest* in each specialty



The same data, this time showing the numbers of each gender with a *strong interest* (from a total of 269 women and 181 men), is shown in Table 24, with the exact P values for the comparison.

Table 24 Numbers of students with a *strong interest* in each specialty at exit from the programme, by gender

Specialty	Women	Men	Comparison χ^2
Academic research	49	45	$P = 0.0983$
Anaesthetics	34	35	$P = 0.0618$
Emergency medicine	60	48	$P = 0.3131$
General practice	83	49	$P = 0.4004$
Medical sciences	9	4	$P = 0.5752$
Medicine (general)	102	56	$P = 0.1234$
Medicine (subspecialty)	123	67	$P = 0.0797$
Geriatrics	19	4	$P = 0.0274$
O&G	45	10	$P = 0.0004$
Paediatrics (general)	84	39	$P = 0.0241$
Paediatrics (neonatology)	40	17	$P = 0.1113$
Pathology	10	7	$P = 1$
Postgraduate study	33	29	$P = 0.2673$
Public health	34	7	$P = 0.0013$
Psychiatry	23	14	$P = 0.8617$
Radiology	26	25	$P = 0.1764$
Surgery (general)	56	46	$P = 0.2539$
Surgery (subspecialty)	71	74	$P = 0.0014$

Mean level of interest in a specialty by gender

The mean interest scores for each specialty overall, and by gender, are shown in Table 25. This analysis took into account expressions of *some interest* as well as *strong interest*, finding the highest levels of student interest at exit from the programme in a career in subspecialty medicine, general medicine or general practice. The lowest levels of interest were seen in pathology, medical sciences and geriatrics.

Women had significantly higher interest levels than men in general medicine, subspecialty medicine, geriatrics, O&G, paediatrics, neonatology and public health. On the other hand, men had significantly more interest than women in radiology, general surgery and subspecialty surgery. Differences among women's and men's level of interest in general practice and other specialties were not statistically significant.

Table 25 Mean level of interest in each specialty, ordered by overall interest score

Specialty	Overall	Women	Men	Comparison
Subspecialty Medicine	2.29	2.36	2.18	<i>P</i> = 0.009
General Medicine	2.15	2.22	2.05	<i>P</i> = 0.019
General Practice	2.03	2.07	1.98	<i>P</i> = 0.196
Emergency Medicine	1.98	1.97	1.99	<i>P</i> = 0.682
Academic Research	1.92	1.87	1.99	<i>P</i> = 0.77
Paediatrics	1.95	2.07	1.76	<i>P</i> = <0.001
Subspecialty Surgery	1.90	1.76	2.10	<i>P</i> = <0.001
General Surgery	1.79	1.71	1.92	<i>P</i> = 0.006
Postgraduate Study	1.78	1.76	1.81	<i>P</i> = 0.512
Anaesthetics	1.65	1.60	1.71	<i>P</i> = 0.119
Neonatology	1.60	1.69	1.47	<i>P</i> = 0.001
Radiology	1.58	1.53	1.66	<i>P</i> = 0.048
O&G	1.56	1.69	1.37	<i>P</i> = <0.001
Public Health	1.46	1.51	1.38	<i>P</i> = 0.039
Psychiatry	1.46	1.45	1.47	<i>P</i> = 0.768
Geriatrics	1.39	1.46	1.28	<i>P</i> = 0.002
Medical Sciences	1.25	1.22	1.28	<i>P</i> = 0.263
Pathology	1.18	1.16	1.21	<i>P</i> = 0.292

Discussion

In this study of four recent cohorts of students at exit from the medical programme in Auckland, there were significant differences in the patterns of career interest among women and men. Women have significantly higher interest levels than men in general medicine, subspecialty medicine, geriatrics, O&G, paediatrics, neonatology and public health, with men having significantly more interest than women in radiology, general surgery and subspecialty surgery. If the analysis is restricted just to expressions of *strong interest*, there are gender differences seen only in geriatrics, O&G, paediatrics, public health and specialty surgery. This may be a

Type 2 error based on smaller numbers in the *strong interest* category, or else there may be differences between women and men in terms of how they keep their options open for the future. The latter does not seem to be the case based on the observation that, on exit from the medical programme, women and men have a *strong interest* in, on average, 3 specialties, and *no interest* in 8. Women were more likely to complete an exit survey, however there is no plausible reason to think that this would have affected the results considerably.

While the pattern of interest across the range of specialties differs by gender, it should be noted there were still significant numbers of women and men interested in every specialty, even in the surgical subspecialties which, traditionally, have been male-dominated. The pattern of preferences observed in this study has similarities to the distribution of women doctors in specialty training NZ-wide. Currently in NZ there are more women than men training in general practice, O&G, paediatrics, pathology, and public health medicine, with the only specialty with over 20 trainees where there is marked under-representation being orthopaedic surgery (5%).² While it is unknown whether these women will complete their training at the same rate as their male colleagues, these data suggest medical students come across women role models in nearly every specialty during their undergraduate years.

The preferences of women for O&G and paediatrics have been reported by others,^{121, 130, 237} yet these are both specialties with intensive training programmes and acute care commitments. The lack of flexibility must be balanced by a greater intrinsic appeal for women than for men, however, some later tempering of interest is likely. In the UK, many women who expressed an interest in one of these specialties at one year after medical school eventually ended up in general practice.³⁶ There are smaller total numbers interested in geriatrics and in public health, but with a marked gender difference. The former may be a reflection of women's interest in medical specialties generally (see below). The latter was also a finding of the Part 2 study,⁹³ but has not otherwise been reported in the literature. The relatively flexible training programme and predictable hours in public health may be attractive to some women, but coming at the expense of patient interaction.

The historical predilection for a greater proportion of women to choose a general practice career was not evident in students at exit from this medical school. In these four cohorts, there was no statistically significant gender effect on the level of interest in general practice by either analysis. In Study 2 of Part 3 of this thesis, an analysis based on data from the first three entry and exit cohorts had found that women at both entry and exit had significantly higher levels of interest in general practice than did men.¹⁵⁷ There were, though, slight methodological differences between the studies. In the earlier study, the categorical analysis included students with both *some* and *strong interest*, where this study counted only those with *strong interest*. Additionally, the present study included a second analysis quantifying the average level of interest by using a numerical scale. This analysis found that if there is any difference in overall interest levels at exit, it is small. An explanation is that the majority of students keep the option of general practice open at the time of exit from

medical school, but subsequently, women are more likely to move towards a career in general practice, whereas men stay with their original choices. Over time, evidence from the FMHS tracking project will show whether or not current women medical students are different from their predecessors in being able to continue on into their desired areas of specialty practice in similar proportions to men.

The reasons for the disproportionately high levels of interest of women students in a career in a general medicine, geriatrics or another medical subspecialty, were not discernable from this study. Clearly female medical students see these careers as interesting and sufficiently flexible, even though, in NZ, practice is largely hospital-based with after-hours commitments. Curriculum experiences and role models may have assisted in students gaining this view. Clinical attachments have been shown to be important determinants of a career interest;¹⁵⁵ students in the Auckland programme have three general medicine attachments, two in subspecialty medicine and one in geriatrics. Assuming that a large proportion of the women expressing a *strong interest* in a medical specialty enter it in a timely fashion, the proportion of women physicians might be anticipated to rise relatively quickly, and faster than in other specialties. This has implications for the RACP and the employing health services to ensure female trainees and physicians may participate as fully as possible in these demanding specialties.

In conclusion, there are differences by gender in the patterns of career interest of current male and female medical students at the time of exit from medical school. Does this matter? I would contend the answer depends on the degree of the difference, and the reasons for it. It has been argued that women's career-decision making is a result of balancing the appeal of the career with the limitations imposed by the system to that career.⁶² Specialties such as paediatrics and O&G have greater intrinsic appeal to women.^{77, 85} However, when there are important barriers that limit access to any group of graduates, these need to be mitigated. Every vocational area needs specialists drawn from a range of backgrounds; a diversified workforce has a greater chance of meeting the health needs of populations.^{55, 46} Moreover, women tend to have influence in a specialty only if they make up over a quarter of doctors in that specialty area.⁷⁷ As the proportion of women doctors grows, fostering women into medical leadership roles will be needed in every area of medicine.⁸⁵ If a specialty career is foregone permanently because of an inability to dovetail training and child-raising commitments in the short term^{90, 92} this may lead to disenchantment for the women themselves, waste precious training resources, and exacerbate shortages of local specialists, as predicted by Heslop over 15 years ago.¹⁰²

Study 7 Specialties of interest of Auckland students compared with the NZ medical workforce as a whole

Recent medical graduates will be entering the specialist workforce in 6 to 10 years. The FMHS Tracking project allows the opportunity to determine systematically and prospectively what cohorts of medical students are interested in as a whole, at the time of that interest. This importance of this is twofold: first, to inform predictions of the NZ workforce in years ahead; second, to better understand determinants and timing of career choice.

This final study examines data on the distribution of specialty choices of Auckland students at the time of graduation.

Background

The ideal future workforce distribution for NZ is not defined. However, implications may be drawn from the pattern seen in the current workforce² and trends identified in recent medical workforce reports.^{1, 15, 96} Increases in health care demand created by the ageing population mandate more doctors with skills to cope with patients with chronic or complex diseases. It has been estimated that up to half of recent medical school intakes will need to be involved in some form of primary care.¹ In addition to general practice, higher proportions of doctors might be anticipated in adult medicine, surgery, and psychiatry, but not in paediatrics or obstetrics.¹

In 2009, the NZ government announced \$30,000 scholarships for medical graduates prepared to work for two years in health board areas with shortages then go on to specialty training in one of five discipline areas – general practice, general medicine, general surgery, pathology or psychiatry.²⁷ In Study 2 of this Part it was reported that the level of student interest in general practice, while similar or better than those in other countries, would be insufficient for NZ's future needs.¹⁵⁶ How well does the level of student career interest over the whole cohort match that of the current workforce and, in particular, the five specialty priority areas identified by the government?

Aim

To compare patterns of medical student interest with the current NZ specialist workforce distribution, including trainees, in 2008.²

Participants

Four exit cohorts from the FMHS Tracking Project (2006 to 2009) were studied.

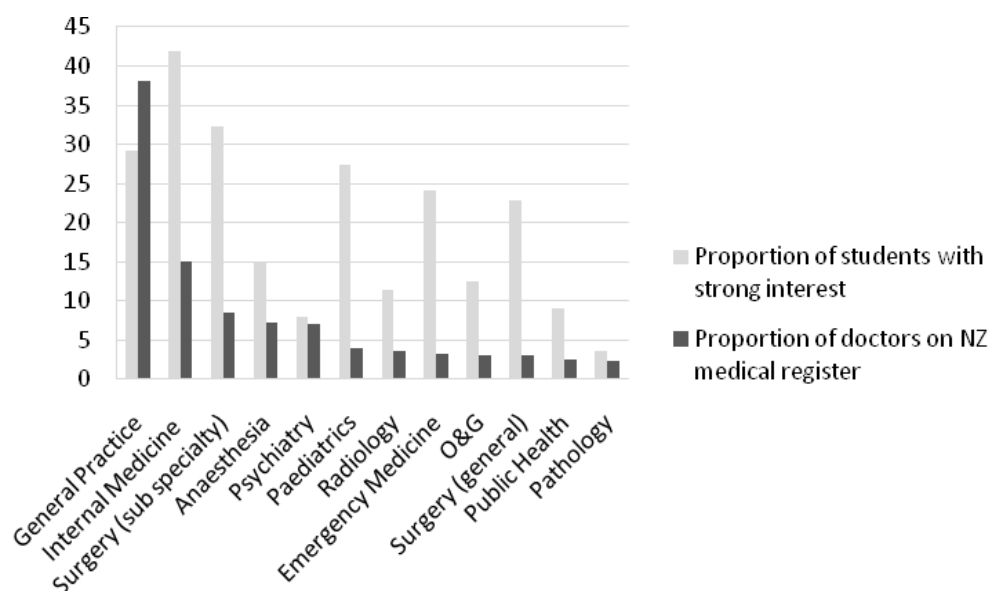
Results

The proportion of students with a *strong interest* in a specialty was compared with that reported for the proportion of NZ trainees and specialists working in corresponding areas in 2008.² These data are shown in Figure 26 arranged according to decreasing order of workforce frequency. An analysis based on specialties

where the proportion of doctors in the workforce exceeded 3%, found the distributions were significantly different ($\chi^2 = 32.9$, d.f. 7, $P < 0.0001$).

As the list of MCNZ vocational specialties differs slightly from those in the FMHS Tracking Project, direct comparisons were not possible in all areas. In the category 'General Practice,' I included those working in general practice, accident and medical practice, primary care, family planning, and sports medicine, as there are overlaps among these community-based specialties. This was by far the largest workforce at over 38%. As General Medicine is not recorded by MCNZ as a separate vocational category, the physician workforces in dermatology, as well as internal, palliative, breast, sexual health, occupation, rehabilitation, intensive care, and genetic medicine, were counted as being in 'Internal Medicine', with this compared with medical student interest in Medicine (subspecialty).

Figure 26 Proportion of students with a *strong interest* at exit in a specialty compared with current proportions of specialists in NZ



The levels of interest of students in the five priority areas were then compared to the current NZ workforce; this is shown in Table 26. Over half of students at exit had *some* or *strong interest* in general practice, internal medicine or general surgery, with a third expressing *some* or *strong interest* in psychiatry, and a tenth in pathology. The proportions of students with a *strong interest* across the specialties differed significantly from the current workforce ($\chi^2 = 19.1$, d.f. 4, $P = 0.001$). General practice was the only specialty for which the proportion of students with a *strong interest* was lower than the proportion of GPs in the NZ medical workforce. The levels of *strong interest* in psychiatry and pathology just exceeded the current proportions of these specialists in the workforce in 2008, but for internal medicine and general surgery, the proportion of students interested was far higher than the proportion of doctors in the current workforce.

Table 26 Level of Auckland interest at exit in the priority areas compared with current proportions on MCNZ register

	General Practice	Internal Medicine	General Surgery	Psychiatry	Pathology
<i>Strong Interest</i>	29.12%	35.12%	22.91%	7.92%	3.64%
<i>Some Interest</i>	42.18%	41.97%	32.33%	27.84%	9.64%
<i>No Interest</i>	26.55%	20.56%	42.61%	61.24%	83.73%
NZ workforce proportions (house officers excluded) ²	38.1%	15.1%	3.0%	7.0%	2.3%

Discussion

The most important finding from this study is the persisting relative deficit in student interest in general practice at the time of exit from medical school. This confirmed the result of Study 2 of this Part,¹⁵⁷ showing that the proportion with a *strong interest* remains at just under 30%. The present study also raised the possibility of insufficient student interest in psychiatry and pathology. The government decision to include these in the list of priority areas for incentive payments appears well-placed, given that it is not known what student characteristics or curriculum experiences predispose to careers in these specialties.⁴¹ On the other hand, there appears to be more than enough student interest at exit from the Auckland medical programme to provide future the specialist workforce in all other major specialty areas, including medicine and surgery. If it is assumed that even half of those doctors in internal medicine practise some form of general medicine (say 7% of doctors), the proportion of students with a *strong interest* (35%) still far exceeds this.

The second major finding of this study relates to the high levels of student interest in a specialty medicine career in the early part of this millennium. Even though there are differences in how data are collected – particularly in how many specialties respondents may indicate an interest – this is consistent with other recent NZ studies. In 2000, 25% of final year medical students from the University of Otago’s Christchurch school indicated their first choice of career was in internal medicine, compared with 22% in a surgical specialty (22%) and 16% in general practice (16%).²⁰⁴ A study of final year students and those in postgraduate years one to four also confirmed internal medicine and its related specialties to be the most popular career intentions.¹⁷⁸ There have been two surveys of career intentions of Auckland medical students and junior doctors. In 2004, Adair and Tuck asked Auckland graduates in years PGY2 to 5 to indicate where they would be working in ten years time.³⁵ The most popular preferences were for internal medicine (21%), general practice (16%), surgery (15%) and anaesthetics (12%). A study comparing the intended careers of nearly 3,000 Canadian medical students from 11 schools with the proportions of doctors in the Canadian workforce, found the levels of student

interest highest in internal medicine and subspecialties,²³⁸ and a similar mismatch with the general practitioner workforce to what was seen in the present study.

Even though the predictive validity of a statement of *some* or *strong interest* in a career at exit is not yet known for this student population, some conclusions may be drawn. There is a relationship between the strength of career preference and eventual career destination: about three quarters of UK PGY1 doctors who had expressed a definite preference were working in that area 10 years after graduation.³⁶ On the other hand, looking backwards at choices made once doctors were in their careers, there was considerable variation among the specialties in how well PGY1 doctors had predicted their eventual area of practice.³⁶ For PGY1 doctors, a definite choice of general practice was associated with the highest likelihood (65%) of being in that specialty 10 years hence, whereas, general practice was also the beneficiary of the greatest shifts from those who had initially chosen a hospital specialty, especially medicine and surgery.³⁶ Hence, even though there is a concerning low level of *strong interest* in general practice at exit from medical school, evidence suggests this will increase over time.

The levels of student interest in internal medicine and surgery, particularly subspecialty areas, appears in excess of demand. Certainly, it will be in excess of the training places available. While data from the women graduates' study in Part 2, and other authors, suggest this excess of interest will be tempered eventually, with resultant shifts to general practice, less-haphazard workforce development approaches seem indicated. These would guide and support students and junior doctors towards making positive choices towards general practice and primary care, as early as possible.

Strengths and limitations of the FMHS Tracking Project and its data

So far, this Part contains a description of the establishment of the FMHS Tracking Project, and reports of seven studies using data from this source. Some study strengths and weaknesses have been pointed out already; however, there are some that are common to all the studies. Furthermore, the conduct of the studies and their assembly in this body of work, allow a greater appreciation of the strengths and limitations of such databases.

Strengths

A major strength is that the FMHS Tracking Project is multi-professional, with a strong and rigorous governance structure and established processes. For the first time, the FMHS is obtaining systematic long-term data about how its medical students take their place in the NZ workforce. The fact that a FMHS Tracking Project was established at the FMHS, with ongoing sponsorship from the Dean, is an important signal to students and stakeholders that the workforce development mission of the FMHS is taken seriously.

The importance of values of a medical school in the creation of the future workforce is seldom touched upon in the literature, although is likely to be important. There are differences among medical schools in the profile of career preferences of their graduates.¹⁸¹ Goldacre and Lambert cite several contextual factors that may account for this variation: student choice; selection policies; curricular emphasis on particular specialties, and more subtly, how specialties are portrayed.¹⁸¹ The Auckland students believe exposure to role models and curriculum time are important determinants of career.¹⁵⁵ Indirectly, these opportunities are a reflection of medical school culture, and where a medical school has chosen to concentrate its resources. I have a concern that MSOD concentrates too much on student characteristics and curriculum, paying less attention to the mission and environment of each medical school. The FMHS Tracking Project has an advantage over MSOD in that it has an exit survey in which student perceptions of impacts of events during medical school are recorded. This is quantitative and relatively simplistic, but, at least, it points to areas where qualitative approaches might be directed to answer the question, 'why'. For MSOD, this could be studied through the use of qualitative techniques such as narrative enquiry of the schools' documents or the school accreditation reports produced regularly by the AMC.

The FMHS Tracking Project has provided programme leaders in the FMHS with data, as well as a forum within which to discuss how the FMHS and other medical schools ensure they are graduating health professionals for current and future needs. The prospective and iterative data collection provides a robust base on which to link student data with the MCNZ register and now with MSOD project, the world's first comprehensive international medical student tracking project. The latter will have the power to compare across medical schools and countries. As the FMHS Tracking Project matures and links with other Australasian schools strengthen through MSOD, hopes are high that stakeholders in medical workforce development will work together more closely to ensure the medical education continuum that starts with selection, remains aligned

with workforce needs. Data from the FMHS and the MSOD projects will be the only way to answer important workforce questions such as how curriculum and student characteristics interact, the optimum configuration of clinical attachments for promoting a career (e.g. in general practice), and the predictive validity of student intentions with respect to eventual practice.¹⁸⁴

The FMHS Tracking Project continues to accumulate data on cohorts of entry and exit students data; the latest being the 2010 entry cohort. Some of the outputs have already been useful to the school, for example, in guiding decisions as to what categories of students should have preference for the additional medical student places funded by the NZ government. Now that it is maturing, it is a relatively simple task to provide rapid responses to questions, and to validate perceptions of stakeholders. Furthermore, most research projects are interesting, informative and achievable for research fellows on short term contracts.

Limitations

1) Lack of long term outcome data

The most obvious limitation of the FMHS Tracking Project is that paired comparisons between the entry and exit groups will not be possible until the first entry cohort (2006) qualifies at the end of 2010. Even though selection policies, student demographics, the medical curriculum and the health system have remained relatively stable over the last five years, there is still the potential for cohort bias when comparisons are made between responses of entry students with those of exit students. Once individual student data is paired, this will remove much of the inter-cohort variability; a much clearer picture will emerge as to how student choices change over time, and the interplay among student factors and curriculum.

A second limitation is that it assesses students' intentions – not all of the students who intend working in a career or location will end up there. The extent to which students' intentions match eventual scope of practice is not well-studied, especially in the longer term. North American studies, now twenty years old, found that even if interested in several specialties, students were more accurate than not in predicting eventual career choice during medical school.^{238, 239} The graduate medical women's study reported in Part 2 of this thesis found the final decision is most often made in the early postgraduate years. This is not that surprising given the need to choose jobs and commit to a postgraduate training scheme around that time. In a study that has been running since 1974, Goldacre et al found that career intentions matched eventual practice for only 54% of PGY1 doctors, with this rising to 70% of doctors by 3 years post graduation.³⁶ Three quarters of doctors who expressed a 'definite' career intention in PGY1 ended up in that specialty; however, only 28% of them were certain enough to record a definite intention.³⁶ This finding supports the FMHS Tracking project plan to include a supplementary question in the exit survey from 2010 as to the most preferred career.

Intentions, therefore, give a rough approximation of the shape of the future workforce, with the exception that increasing numbers will shift to general practice over time. As it matures, the FMHS Tracking Project will allow quantification of the extent to which intentions match reality for each specialty, thus allowing more

certainty in assertions about contributions of Auckland students to the future NZ medical workforce, and earlier warning of any likely deficiencies.

2) Time lag

Depending on specialty, the 2006 exiting students could become vocationally registered in 2012 at the earliest. This is a long time to wait to answer important workforce questions. By that time, the curriculum and selection policies will have changed, albeit guided by some data presented in this thesis. Given the rapid changes in the nature of health care, there will be new external drivers, and it will be difficult to identify with certainty that any changes in graduates' medical careers occurred directly as a result of actions taken by a medical school. In this complex adaptive environment, it is, though, difficult to imagine any other strategy being more fruitful in evaluation than systematic monitoring and research into student career choices and workforce outcomes, as in the FMHS Tracking Project. My view is that this has the best hope of being able to detect changes early enough, and in sufficient detail, to link back to medical school policies and inform future directions.

3) Limitations of outcome data

As the FMHS Tracking Project is currently set up, the workforce outcomes are specialty and location of practice in NZ. At best, these are surrogates for improved patient and community health, which would serve as the ultimate tests of effectiveness of any workforce intervention.²⁴⁰ Student data is to be linked to MCNZ data on vocational scope of practice and location. Currently, the information available from the MCNZ registration database is limited to: whether or not doctors are on the NZ register (i.e. have an annual practising certificate); the type of registration (and specialty, if vocationally registered); and a postal, residential or workplace address. This level of detail does not show if, or where, a doctor is working in NZ – only that they remain on the medical register. The MCNZ collects data on employer, average hours of practice and location; however, to obtain this information would require an extension of the agreement between the FMHS and MCNZ. An additional problem is that, while General Surgery is listed as a specific vocational scope, General Medicine is not, making it difficult to monitor this priority workforce.

Recently, another potential avenue opened for tracking individual medical students into the workforce. Through a Statistics NZ project, the Linked Employer-Employee Database (LEED), it is now possible to link university administrative data, including student achievement, with longitudinal employment and income data on individual workers.¹⁴ More specifically, national student numbers, names, and dates of birth could be combined with information on income taken from employers' monthly schedules on wage and salary income earners, or income from self-employment. The database also holds information on income from benefits, compensation payments, paid parental leave, and student allowances. This data source has potential to provide independent and robust information on whether medical graduates are earning in NZ, by whom they are employed, any relationship of earning to student loans, and whether or not graduates took parental leave. Additionally, it may prove a way to track the outcomes of students who do not complete medical school, or those who applied and were not successful in the selection process. This information may prove useful in

career counseling of individual students, and in providing data to further validate selection and assessment policies. Clearly there would be significant ethical considerations, however, Statistics New Zealand or other neutral agents might do the linking, then provide researchers with anonymised collated student outcome data.

4) The questionnaire

Other limitations relate to the questionnaire itself. The questionnaire had to provide a coherent, practical minimum data set that suited a range of health professional programmes. The questionnaire has face validity, and is similar to other workforce surveys. Consequently, it was not subjected to further validity testing. It has proved necessary to change the wording of the questions over time: for example, changes have been made to reflect the sizes of towns; the list of vocational scopes; and to meet specific MSOD requirements. The governance group considers any amendments to questions carefully, in order to retain as much consistency with previous cohorts as possible. In effect, this means balancing the requests of the various stakeholders. The underlying principle is to try and compare 'like with like' as far as possible into the longer term. Question changes should not undermine the worth of earlier data; the main benefit of which comes as follow-up data is added in years hence.

The questionnaire seems acceptable to students, although this has not been studied. It is quick to complete (less than 10 minutes), and students have little problem with providing answers to questions. Those that do respond tend to fill it out completely. For many questions, the number of boxes (three) on the response scale might be considered too few to be reliable – greater reliability is seen with 5 to 7 boxes.²⁴¹ However, this is a workforce survey, rather than evaluation of satisfaction with a learning activity, for example. The survey designers, including myself, were keen to have large and understandable categories and were not interested in minor differences. Students seem to have little problem identifying whether they have *no*, *some*, or *strong interest* in a specialty at a particular time. It is too soon to have established the predictive validity of a statement of either *interest* or *strong interest* with respect to any career. Until that is determined, it is likely that the current scale of three responses will be maintained.

Recruitment

A high recruitment rate is another requirement for robust long-term tracking. The FMHS Tracking Project is voluntary rather than compulsory, so a range of methods is used to increase response rates. The return rates have been satisfactory so far, ranging from 53%-96%, but leaving room for improvement, especially for the exit survey. There is no universally-agreed acceptable minimum return rate on which to base conclusions from a written survey, however. The acceptable rate depends on the homogeneity of the study group (accept a lower response rate) and the extent to which the non-responders introduce bias (accept a higher response rate). A review in the management literature suggests that a return rate for a mailed survey of 55% is acceptable.²⁴² Ideally, rates of 95% or higher would be desirable from a workforce tracking perspective. Conclusions regarding smaller specialties (e.g. pathology) or groups of students (e.g. ROMPE) might be susceptible to the

impact of non-responder bias. Measures such as greater promotion, on-line options, and systematic follow up of students who finish their programme later than others, are being explored to increase the response rates. Other checks that might be undertaken to assess the reliability of the data are internal consistency of responses and comparisons of cohort responses serially over time.

5) Ethnicity

The largest number of Auckland medical students now identify with the ethnicity category, 'Asian.' I contend this is too broad. It may disguise important differences in career decision-making among students, for example, from eastern Asia, the Indian subcontinent and the Middle East. The solution is outside the ambit of the FMHS to solve alone. It would involve representation to the central university to change the way it records student ethnicity.

6) Sampling bias

Any research involving medical students was conducted only upon the students who were admitted into medical school using the current selection policies. Therefore, the findings may not be as applicable to those who were eligible, but not admitted as a result of the extreme pressure on the medical school places available. Would these unsuccessful applicants have the same career intentions, and if not, how would they vary? This might be answerable by getting all those eligible but not selected for medical school, to answer an entry questionnaire, to assess if there are significant differences in intentions between those selected and those not. Once the predictive validity of a statement of career interest, or the odds ratios of a certain student group entering that specialty (for example, general practice), are better established, these data might be used to further refine selection mechanisms to weight for the desired student mix.

7) Sustainability

The final limitation is the capacity to continue this programme of research for the longer term. The studies reported in this thesis are the only ones conducted to date using medical student data from the FMHS Tracking Project data. They have been conducted in a fairly haphazard fashion, being fitted in around other academic and clinical commitments, the interests and capacity of research students, and availability of statistical support. Despite these limitations, there have been significant and pragmatic findings made already into how the medical students at one NZ school will participate in the future NZ medical workforce. In order to optimise medical workforce development, the main stakeholders, including medical schools, need ready access to data and the shortest possible feedback loops.

Furthermore, high level support from the Ministry of Health would be needed if further linking of the FMHS Tracking Project, student databases, MCNZ registration databases, and LEED, were to be conducted to develop a comprehensive overview, individual or collectively, of the continuum from the start of tertiary education to retirement of NZ educated doctors. Any study linking these databases would need to be carefully structured to ensure anonymity of individuals. For all these reasons, the FMHS Tracking Project now needs to establish a

more systematic and sophisticated research platform than previously, including dedicated, long-term programme funding and personnel.

Part 4 – Synthesis and Conclusions – Te Whakamutunga

I am leaving this story when it is quite unfinished. There are still a thousand and one steps to take.

Adam Nicolson²⁴³

Medical workforce development encompasses education and training, but does so with knowledge of the capacity and demands of the system within which it occurs. This thesis studied aspects of medical workforce development in the early part of the 21st century, from the perspective of a medical programme director, using data from students and graduates from the medical programme at The University of Auckland, New Zealand. Within a paradigm of post-positivism, a range of studies was designed, conducted and reported.

Part 1 introduced the context of the study, its rationale and its methodology; Part 2 described a study into the work and life experiences of Auckland women medical graduates, and how women make career choices; Part 3 described the establishment of the FMHS Tracking Project, and reports of the first seven studies using data from this project. The studies in Part 2 related to how women participate in the workforce and make career decisions. Those in Part 3 looked at how the composition of the student body, and their educational experiences, impact upon the future careers of those students; then questioned whether or not these were well-matched with future health needs. Underpinning both Parts was the desire that ‘no medical student is wasted,’ either because of barriers to participation, or insufficient predisposition of students to engage in careers needed by the NZ health system.

This research programme has been personally significant in several ways. First, many of the women in the study in Part 2 appreciated the opportunity to share their stories, in the hope of improving the situation for others. Second, my greater understanding of the lives of medical women in NZ led to enhanced self-confidence and a more informed stance from which to teach, counsel, mentor and supervise my own students and junior doctors. The lessons learned continue to be invaluable in my work with other minority groups, such as MAPAS. Third, the work gave me opportunities to disseminate findings more widely through publications,^{92-94, 152, 41, 158} presentations at careers symposia, conferences, university and hospital meetings. I believe the expertise gained through this research has contributed greatly to my effectiveness in education development or workforce development with the RACP, IMSANZ and the AMC. It has allowed me to provide evidence-based advice to stakeholders in medical workforce development, locally and overseas. Fourth, it led directly to interactions with other researchers, some of whom incorporated parts of the surveys into their own studies.^{35,}

¹³³ These interactions have been formative in understanding ways that researchers in the humanities, management and education approach their work.

Finally, writing this thesis for submission for an MD has afforded me the opportunity to integrate knowledge gleaned from disparate activities, including programme leadership, research studies and involvement in the FMHS Tracking Project and MSOD, into one document. Through the additional reflection required for a thesis, what is 'near certain' has been confirmed and recorded, but what is not, framed into other questions to progress the NZ medical workforce development agenda in the years ahead. The process has led me to a much greater appreciation of the roles of medical schools in workforce development, and the major impact of decisions made by one medical school in NZ upon the future specialist medical workforce in this country.

Major findings and future research questions

The results of each study were discussed in some depth within Parts 2 and 3, along with reflections on the strengths and weaknesses of the research. This section now summarises the major findings of the whole programme of research, organised into four pragmatic themes. The discussion under each theme emphasises the contributions to workforce development within the ambit of a medical school, for example, selection and curriculum design, and areas for further research.

While a medical school has an important early influence on the workforce through selection and education, it has little direct impact on its graduates once they leave. Even if medical students are to be primed to take on the specialist roles needed in the health system, these must continue to appear attractive when compared with others available. For completeness, and to assist others, I have taken the liberty of incorporating questions and proposals that involve other stakeholders that emerged as important; either from the studies or the literature reviews. Data sources from which answers may be obtained are indicated in brackets. The questions and suggestions for pilots might contribute to a list of priorities for the NZ medical workforce research agenda in the upcoming years.

1. Improving the match between student intentions and workforce requirements

General practice or practice in a regional-rural area

These are discussed together, as interest levels in these two scopes of practice were found to be closely related; students interested in practice in a regional-rural setting are much more likely to be interested in a general practice career, although the converse is not as well-established.

In NZ workforce terms, the most important finding of this thesis is that an insufficient proportion of the Auckland medical student body plans to enter general practice at exit from the medical programme. About 30% of graduates have expressed a *strong interest*; a quarter has *no interest*; with the remainder, *some interest* in general practice. The level of interest in general practice is insufficient for the current workforce, let alone to produce the increased numbers of GPs required in the near future. Additionally, there is not sufficient student interest in working outside a major centre: over half of exiting students intending to work in a major city; 15% in a regional-rural setting; with the remainder, undecided. These observations are not specific to this

medical school – Auckland students have levels of interest similar or greater to other reports in the literature. Possible factors contributing to the shortfalls, and how they may be addressed, were discussed in Studies 2 and 3 of Part 3.

Studies worldwide find consistently that students from rural backgrounds are two to three times more likely to work in that setting.^{74, 170} Thus, increasing the proportion of rural students is one of the most effective ways to increase rural doctors, most of whom will become GPs. On the other hand, most rural doctors are not from rural backgrounds.²¹⁵ For urban-born doctors, who make up the majority of the medical school class, curriculum exposure is the main way that medical schools may stimulate an interest in working rurally.

The women graduates' study, and FMHS Tracking Project studies, each found that the over-representation of women in general practice observed in earlier studies in Australia and NZ^{35, 71, 103} is slowly changing. The level of interest in general practice among female students only slightly exceeds that of their male colleagues. Nonetheless, it is still the specialty in which, by far, the majority of medical women will work. My data suggest that, even if there are shifts of doctors from other specialties towards general practice in postgraduate years, the effect does not seem large enough to make up the shortfall of GPs, now or in the future. This begs the question if the training systems and work of medicine and surgery are becoming more accommodating for women combining training with family responsibilities, will the GP workforce not be even more jeopardised than it is already?

Consequently, I propose that urgent measures need to be taken at this medical school to do what it is within its realm to promote general practice as a career among Auckland students. My studies give some insights as to what may assist in this regard:

First, there are subsets of students with significantly greater or lesser levels of interest in general practice than their colleagues. Students from rural backgrounds, indigenous students, or those from outside Auckland, have a greater interest in working in regional-rural areas, and in general practice. Nearly half of domestic medical students were not born in New Zealand. These students have greater interest than others in working in medical subspecialties, with less interest in working in general practice, or outside Auckland. Students of Asian ethnicity (including Indian) are less likely to work in a regional-rural setting. An immediate increase in the proportion of students interested in general practice or regional-rural practice would occur if the proportion of domestic students admitted from outside Auckland, especially from rural areas, was increased. Similarly, increasing the proportion of MAPAS students would have the same effect. Increasing the numbers of women further in the hope they will preferentially enter general practice, is not likely to be politically tenable. Given they work slightly fewer hours per week on average, and may be less likely to work outside a major centre, this would not fully address the GP workforce shortages.

Second, clinical attachments and role models are seen as important determinants of career choices by students. Study 1 showed that it is possible to increase interest in general medicine through positive exposures during undergraduate medical education. On the other hand, Study 2 showed that interest in a general practice career drops during medical school with 15% of students reporting a negative effect of the clinical attachment in general practice on career choice. The FMHS might review how GPs and the work they do are promoted to students, to ensure that students see this career in the best possible light, and are not dissuaded.

Third, career flexibility was seen as very important in the women graduates' study, and was significantly more important factor in career choice for students with a strong interest in a general practice career than other students. Moreover, new generations of students will be keen to work more flexibly and to have predictable work hours. Career advice during medical school to selectively promote these advantages of training and working in general practice seem in order.

Research questions emerged that appear important for medical workforce development in general practice or practice in a regional-rural area. These are presented in no specific order, along with an indication of the source from which answers might be ascertained:

- How individual student interest in general practice or in practice in regional-rural areas varies through a medical programme? (FMHS Tracking Project)
- What factors deter Auckland students from a general practice career? (qualitative study)
- What factors attract students to work in outer metropolitan areas? For example, are students who are born in an outer city suburb more likely to work there in either primary care or hospital practice? (FMHS Tracking Project)
- What is the optimum footprint of general practice attachment(s) in a medical programme to promote this career? This would include timing of exposure to GP role models, timing of clinical attachment, sequencing with other attachments, or length of attachment(s). (MSOD)
- Which students are the best 'bet' in workforce terms to allocate to expensive regional-rural and general practice attachments? (FMHS Tracking Project, MSOD)

Other areas of workforce need

My studies suggest that greater levels of student interest are needed in psychiatry and pathology as careers. The numbers in these specialties in the NZ workforce are far smaller than in general practice and, for this reason, an in-depth analysis of student or curriculum factors important in these career choices is yet to be performed. Moreover, the literature has not suggested any demographic groups more likely to pursue these

careers.⁴¹ Apart from exploring the FMHS Tracking Project data for any significant differences in the characteristics of students interested in these careers, compared with other students, the medical school might continue to monitor student interest; yet, being mindful to promote these careers. At the very least, students should not be dissuaded. An illustrative example occurred in 2002, when medical student attendance at autopsies was prohibited by NZ coroners.²⁴⁴ Most students find autopsies to be useful learning activities, with participation mentioned by students as an important recruiting strategy to this specialty.^{244, 245} Fortunately, the situation has now been reversed.

The national peak workforce bodies in Australia and NZ have advocated a return to 'generalism' as a way to meet health needs. Levels of Auckland student interest in general medicine, general surgery and general pediatrics, appeared more than sufficient for future needs, especially in paediatrics, where that proportion of the population is not increasing. The levels of interest shown by students in these careers may be a reflection of the current curriculum structure at Auckland, or the presence of strong role models, as none of these specialties is particularly flexible or predictable in terms of training or work.

The high level of interest of Auckland students in both general and subspecialty medicine may be contributing to the trend for NZ physicians to 'dual train' in both general medicine and another subspecialty. In March 2010 the majority of RACP advanced trainees (173/256, or 68%) was dual training (RACP NZ office, personal communication, 2010). This approach lengthens training by 6 to 18 months. Just why this path is so popular is not known, but the model has been promoted by the RACP and senior physicians, including some at the University of Auckland. Trainees reportedly see this as a viable way to enhance skills and employability. This phenomenon is vastly different to the situation in Australia, where there are far fewer general medicine trainees, with even fewer in a dual training pathway. While NZ has managed to maintain a strong generalist approach, it must heed the lessons from Australia, where subspecialties have become relatively more attractive because of the greater remuneration on offer.⁹ An additional problem in evaluating whether or not there are sufficient general physicians is that the MCNZ does not report on this category of doctors specifically. Rather, general physicians are included in the category of internal medicine, along with all the other medical subspecialists.

An intriguing finding was that 'generalism' was not a philosophy of care that transcended traditional vocational discipline boundaries, at least in the eyes of medical students. For example, those who had a *strong interest* in general medicine were not more interested in general practice. Virtually all interested in general medicine were also interested in a medical subspecialty. My conclusion is that for students, the traditional medical disciplines such as medicine and surgery are seen as the most obvious categories for early career decision making, with 'generalism' a sub-category within these. This is not surprising, given that senior students learn in clinical departments of the FMHS and a health system organised along traditional discipline lines. As the health system adapts to provide healthcare across traditional discipline boundaries,²⁴⁶ or across

primary, secondary and tertiary care interfaces, students will be increasingly exposed to integrated care settings. These may help validate to students the importance of 'generalism.'

2. Improving the match between the medical student body and the community it serves

The FMHS and its medical programme serve predominantly that half of the NZ population in the top half of the North Island (above Taupo). Currently, the medical student body reflects more the metropolitan Auckland population, characterised by over-representation of Asian and overseas-born students. Comparisons with the graduate womens' study, and an earlier report from the medical programme,⁵¹ confirm that the increase in the proportion of Asian students is a relatively recent phenomenon. Furthermore, there is continuing under-representation of Pakeha and Māori, albeit improving. Even though the proportion of Pacific students is similar to NZ population percentages, there remains under-representation, given the very small number of Pacific doctors compared with the high proportion of Pacific peoples in the Auckland region. The proportion of women has been stable for many years at just over 50%, which is likely to be a politically acceptable level.

I have assumed throughout this thesis that it is undesirable to have wide discrepancies between proportions of selected subgroups of doctors in the workforce and the population, but just how much discrepancy is acceptable? This is the topic of a wider discussion addressing the extent to which student demographics must resemble the population, to provide ideal care. If they are to match, which population should serve as the reference point? Another consideration is whether NZ medical schools should be obliged to train enough doctors to help developing countries, as well as serving local communities.

There is a high degree of acceptance for the MAPAS and ROMPE affirmative pathways that allow access to medical training for students who may otherwise not be selected in a highly competitive admissions process.^{35,}
⁴⁰ Given the career aspirations of these students, diversification through these two pathways has enhanced the likelihood that Auckland students as a whole will meet the needs of the community served by the medical school. Additionally, increasing the proportions of students entering via MAPAS and ROMPE will, over time, result in a medical student body that is more representative of the population of the whole upper North Island and less of metropolitan Auckland.

Because of the relatively low number of applicants meeting the current criteria for the ROMPE pathway, the Auckland medical school is considering broadening the definition of 'rural' for the ROMPE pathway to reflect current Statistics NZ categories, and allow more students from upper North Island regions access to medical training (M Barrow, personal communication, 2010). Other benefits of widening the definition of 'rural' would be reduced pressure on selection for the standard pathway places, and may allow better comparisons with other countries to be made.

A notable finding was that eighty percent of Auckland graduates undertake their PGY1 year in the upper half of the North Island, with 25% outside greater Auckland. This suggests opportunities exist for stakeholders to

further promote to graduates the advantages of specific medical careers located within the community served by the Auckland programme.

Little is known of the career structures of Māori and Pacific doctors in NZ. This was not a topic of study in this thesis, but is an important area of future research. In the course of my studies, I have found the following that may be of relevance to future workforce development or research:

61% of MAPAS students had a *strong interest* in general practice at entry, the highest of any demographic group;

Māori students at exit are more likely than other students to signal an interest in working in a regional-rural setting;

Over a third of Auckland women medical graduates in public health were Māori or from Pacific Islands;

Several Māori women reported pressure to work in particular areas, or to act as role models for other young Māori women;

Māori or Pacific students who may be in medical schools in Australia are identifiable neither through the MSOD nor the FMHS Tracking Project;

Neither Māori nor students from Pacific Islands report a greater debt burden than other students.

I found little evidence that opening another affirmative action pathway for students from lower socioeconomic areas would be of benefit in workforce terms. There is a strong relationship between the decile of a secondary school and size of town of origin. Students from lower decile schools do not have any major differences in career intentions compared to those from higher decile schools. In contrast, those from rural areas are more likely to be interested in general practice. Increasing the number of students entering via the ROMPE and MAPAS pathways will result in a greater proportion of students from lower decile schools with more certainty of workforce benefits, without the need for another pathway. Having greater proportions of student from these groups will temper the excess levels of interest in careers in medicine or surgery, seen in students admitted from high decile schools in city areas.

Unresolved questions include:

- Do careers and career locations of ROMPE graduates differ from those of other students? More specifically, do ROMPE students who enter rural or general practice stay there? (FMHS Tracking Project, MCNZ, MSOD)
- Do careers and career locations of Māori and Pacific graduates differ from those of other students? If so, in what way? (Tracking Project, MCNZ) Are there other ways the medical

school could better support the transition of indigenous doctors from medical programme to workforce. (Qualitative study)

- What are the factors that determine a medical career located in the outer metropolitan areas of Auckland?
- Are any groups of Auckland students more likely to stay in NZ, or in the upper North Island? (MSOD, MCNZ)

3. Building upon how students and doctors in NZ make career decisions

In Part 3, Studies 1 and 2 confirmed that students in the Auckland programme believe that positive experiences during clinical attachments have the greatest impact on their career decision making, with role models and flexibility also important. This finding behooves an emphasis by medical schools on curriculum design that both helps students with skills acquisition and guides workforce development. Curriculum time balance, and the range of clinical role models to which students are exposed, might be considered as to how they affect student orientation to areas of health need. This may be a challenge to get right; factors in career decision-making are likely to be different for different specialties. Women surgeons, as a group, are more definite about their career earlier;⁹⁴ furthermore, Studies 1 and 2 showed there was a difference between general medicine and general practice in how student interest develops over the course of the programme. Moreover, it was shown in Part 2 that for women after graduation, the nature of the work in the specialty, in terms of interest and flexibility, emerged as more important factors in career choice than role models. A simple heuristic might be: 'whatever experience a student or junior doctor has, it should be a positive one educationally and in stimulating career choice.' On the other hand, a medical programme has limits on curriculum time. Attachments in more highly-specialised areas with no workforce shortages might reasonably be offered only as optional components, if at all.

The study of women graduates in Part 2 confirmed others' findings that a minority of students makes their final decision on specialty before finishing their medical degree. Additionally, the FMHS Tracking Project studies in Part 3 showed Auckland students have *some interest* in 10 specialties at entry, and 9 at exit on average. They have a *strong interest* in 4 specialties at entry and 3 at exit, with no gender difference. This suggests there is still considerable plasticity in career choice at exit; in this regard, Auckland students are similar to medical students elsewhere. Career decision making is a dynamic, rather than a deliberate or iterative process; there remains potential to influence career direction in the critical early postgraduate period.^{8, 247} In the Part 2 study, significant numbers of women switched from medicine or surgery training to general practice. It would be of interest for workforce planning to know if this holds for men too, and what the other main career shifts are.

The current situation of an open market and discontinuous employment is not conducive to strategic medical workforce development. Workforce-wise, a governance structure that coordinates efforts nationally might offer better tracking of graduates, fewer losses, and more efficient (streamlined) progression to specialist level for competent doctors. Additionally, this body could develop work experiences and career support aimed towards priority careers. Through their understanding of students, stakeholders and pedagogy, medical schools would appear to have much to offer such as structure. Any directorate would need to be established with due care, as country-wide changes in the structure and governance of the PGY1 and 2 periods may have unanticipated effects on the career choices and geographic distribution of doctors. In 2004, Japan introduced a mandatory 2 year training system and national doctor-to-facility matching.²⁴⁸ While this had the beneficial effect of decreasing numbers training in academic centres from 70% to 34%, and improved geographic match of trainees with the population, it was associated with fewer doctors training in general medicine, general surgery and O&G; each a primary care specialty in Japan. Furthermore, the Modernising Medical Careers initiative in the UK, while well-intentioned educationally and governance-wise, had unexpected adverse workforce effects.³²

Even though debt levels are high among medical students, this does not seem to be a factor in career decision making for most. This is a consistent finding, reproduced in students and graduates of both NZ medical schools.^{35, 229, 94} Study 5 showed that women and indigenous students are not at more disadvantage from debt than others. The wider implications of the burden of medical school debt – both for the individual doctors and the professional as a whole – remain uncertain. Despite the students' assertions of a lack of impact of debt on decision-making, the recent financial incentives offered by the government appear to offer hope of some workforce benefit.¹³⁷ It is, though, unknown how many taking up the scholarships had already made career plans to work in the specified areas; or if they were from Auckland, Otago, or were IMGs.

In Study 1, the proportion of students indicating that area of health need was an important determinant of their career choice was 44%. It is my personal impression that despite predictions, current generations of medical students are as altruistic as their predecessors; however, this finding needs to be better understood. A major challenge relates to the balance of incentives after graduation. Valuing and rewarding health professionals working in lower profile, yet sorely needed areas of health, above the subspecialist ('crack troops') currently engaged in a 'futile battle to ward off death', requires the health system 'to be turned on its head'.²⁴⁹

Many questions will be answerable only when the same students have completed FMHS Tracking Project entry and exit questionnaires (end of 2010), or exiting students have been in the workplace long enough to have earned vocational registration (2012 onwards).

Important questions to answer so that future workforce estimations are better informed are:

- What is the predictive validity of an expression of interest of a student in any specialty, or location of practice, at entry or exit? (FMHS Tracking Project, MSOD)
- How and when do student and junior doctor choices change? (FMHS Tracking Project)
- What does the average lifetime career profile for women and men in any particular specialty look like in NZ in 2010? (This project would require tracking of individuals using MCNZ annual workforce survey data on specialty, employment, location, hours worked per weeks, and time away from work or overseas)

Given that much current medical career counselling is opportunistic, supplemented by one-off sessions organised by specific health services or specialties keen to recruit, there seems need for a pilot initiative of iterative and neutral career counselling for senior medical students and junior doctors. I would suggest this is based on workforce development principles, and be a role of medical schools jointly with any national training directorate. Findings from this thesis, and the FMHS Tracking Project as it continues, would inform this initiative.

4. Enhancing participation of women in the medical workforce

As discussed above, the most important research finding of work in this thesis is the relatively low proportion of students interested in a general practice career compared with current or future workforce needs. The second major finding is that there is room to increase further the contribution of women to the medical workforce in NZ. The lives of women doctors outside medicine have been remarkably consistent over decades, and unlikely to change. Thus, to increase the participation in the workforce of 50% of NZ's doctors must involve changes in the public system training and work practices to take into account the reality of medical women's lives.⁹⁰

Training and work practices have to be flexible enough to accommodate decreases and increases in an individual's participation. As part-time work, or time away from work, are often temporary phases, it is imperative that health and education stakeholders, including medical schools, are mindful of the bigger workforce picture; they must not make decisions that result in permanent loss of time or human potential to the health system. Having access to quality child-care, with more continuous employment available to junior women doctors, may help in their participation. Other suggestions include tracking those not currently working, and facilitating re-entry of women to the workforce at a mutually agreeable time. These are not features of the current health system; instead, they might be functions of a local or national training directorate.

Studies 2 and 6 confirmed that women in NZ make career choices differently from men – most valuing flexibility nearly as highly as they value interest. This needs to be more widely understood and supported. There remains a delay in women reaching specialist levels in NZ public clinical and academic settings, with this

not just a result of part-time training. Moreover, the traditional measures of 'success' in medicine such as degrees, papers published or committee chairmanship do not sit well either with a more feminised workforce or one to meet current health needs. I would call for these to be revisited. On the other hand, local support systems to help women reach consultant hood and other leadership positions may offer benefits in NZ, as they have overseas.

There were more male than female medical students indicating a *strong interest* in surgical specialties. Moreover, the only training programme in which women remain seriously under-represented is orthopaedics, a surgical subspecialty. In other specialties, the proportion of women trainees is rising steadily. If they are to attract more women, surgical specialties might look at how they are perceived by women, and at how training and work might be made more flexible and predictable. In contrast, O&G has a large proportion of women and high levels of women student interest; yet, it is characterised by having surgical components and unpredictable work hours.

The current generation of male medical students rates flexibility highly. Thus, the need to make training and work practices more flexible to attract women might be predicted to have benefits for men as well. Moreover, the hours worked by male doctors are decreasing. As a consequence, the contribution to workforce shortages of a more feminised workforce is likely to be lower than predicted. What will work well for women may work equally well for men seeking better work-life balance.

There are implications for a medical school in these findings. One is in the way the programme is constructed to allow female students time out and facilitated re-entry after, for example, childbirth or other family commitments. At present, this is managed on a case-by-case basis, usually by decompressing the programme so that one academic year is taken over two years. Recently the university demanded that students pay full fees for each of those years. (FMHS student services, personal communication, 2009) This provides a barrier to women students having children, along with major adverse financial consequences if they do so. Given the length and demanding nature of specialist training, the choice of having a child while a medical student may be preferable to some.

Another implication relates to what is taught to students about combining a medical job and family. This topic would fit well within a personal development course for students, as well as within dedicated career counselling sessions.

To explore further findings in this theme will require engagement of stakeholders other than medical schools. The answers to the following questions would be informative in a workforce development sense:

- What part-time medical training jobs are currently made available in DHBs? How are part-time staff employed, supported and tracked? (DHBs, HWNZ)

- What childcare arrangements are available for medical staff? (DHBs, PHOs, GPs)
- How do the cohort remainder rates compare among specialty of training programme? (MCNZ, Colleges) Is there a gender difference?
- What are the relative proportions of women in private practice vs. public practice by specialty compared with men? (MCNZ)
- How do colleges compare in terms of flexibility of requirements of specialist training programmes for needs of women trainees? (Colleges)

Several pilot initiatives have been mentioned during the course of this thesis. Medical schools might assist in the design, delivery and evaluation of these pilot initiatives:

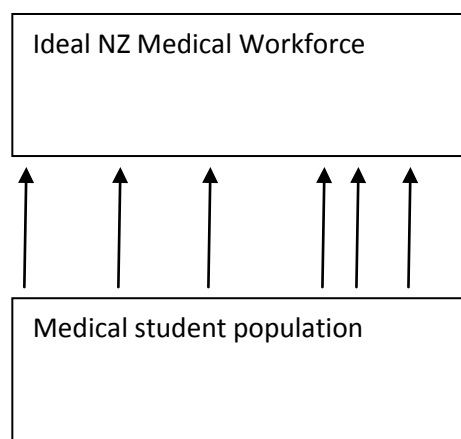
- Whether schemes to mentor women over the time of child raising, with assistance to re-enter the workforce, aid in retention and progression of women doctors;
- Whether a local initiative to support medical women to senior positions can be established, and is effective;
- Whether having a defined proportion of part-time training jobs available in DHBs helps in retention of doctors.

A model of medical workforce development for medical schools

The outcome

If it were quantifiable, the ultimate success of a medical school would be proof that the whole community it serves has the best possible health as a result of its presence. This thesis used instead a surrogate outcome – an ideal workforce for health needs – with which to examine the role of a medical school in relation to development of that workforce. This makes the assumption that an ideal workforce will result in optimal health, but testing that was outside the scope of this thesis. The studies in the literature reviewed for this thesis used a range of other outcomes: these included ‘dropouts’; career progression; research outputs; satisfaction with medicine as a career; likelihood of entering a particular location or specialty of practice; or whether or not a subject of disciplinary proceedings. I would contend these are all related in some way to the notion of development of an ideal workforce as described on Page 1; however, none yields the full picture.

The aspirational goal of a perfect match between the student body and the ideal workforce was proposed in Figure 1 and is reproduced below. My thesis has argued that, in the ideal situation, every medical student in this population would end up in NZ; in a specialist role needed in the NZ health system.



Many of the influences that affect the relationship between students in a medical programme and the workforce have been discussed in this thesis; with the diagram of limited use as it stands. Is it possible then to represent the complexity of the development of the ideal NZ medical workforce in steps and processes that are measurable, manageable, and hence, amenable to change?

Workforce orientation of medical student cohorts

The major findings of the research programme fell naturally into four broad themes: the match between medical student intentions and workforce; the match between the medical student body and the community; how doctors make career decisions; and barriers to participation in the workforce. It is plausible that each of these is an important consideration in any medical workforce development strategy; being the process leading to the outcome of an ideal workforce. These themes might inform the design of a simple conceptual model to

represent the complexity of the whole of medical workforce development from the perspective of a medical school.

Attempts to explain how factors such as student attributes and curricula interact to produce workforce effects are starting to be made locally. Table 27 shows an adaptation of a four quadrant model of the workforce outcomes of graduates, from 1997 to 2005, from the Flinders parallel community curriculum in South Australia.⁷⁸ This study had limitations in that only 53% (46 of 86) of the graduates responded, and it was retrospective; however, it proved explanatory in showing there were four equally-sized, but distinct, student groups (Quadrants 1-4). These were nicknamed respectively by the authors: ‘the true believers’; ‘the convertibles’; ‘the frustrated’; and ‘the metro docs’.

Whether or not students were able to predict their career path before the rural immersion is not known. If they were, this would suggest that Quadrant 4 students might be a lower priority for admission to rural programmes, with Quadrant 2, higher.

Table 27 Model of categories of students undertaking a rural immersion programme

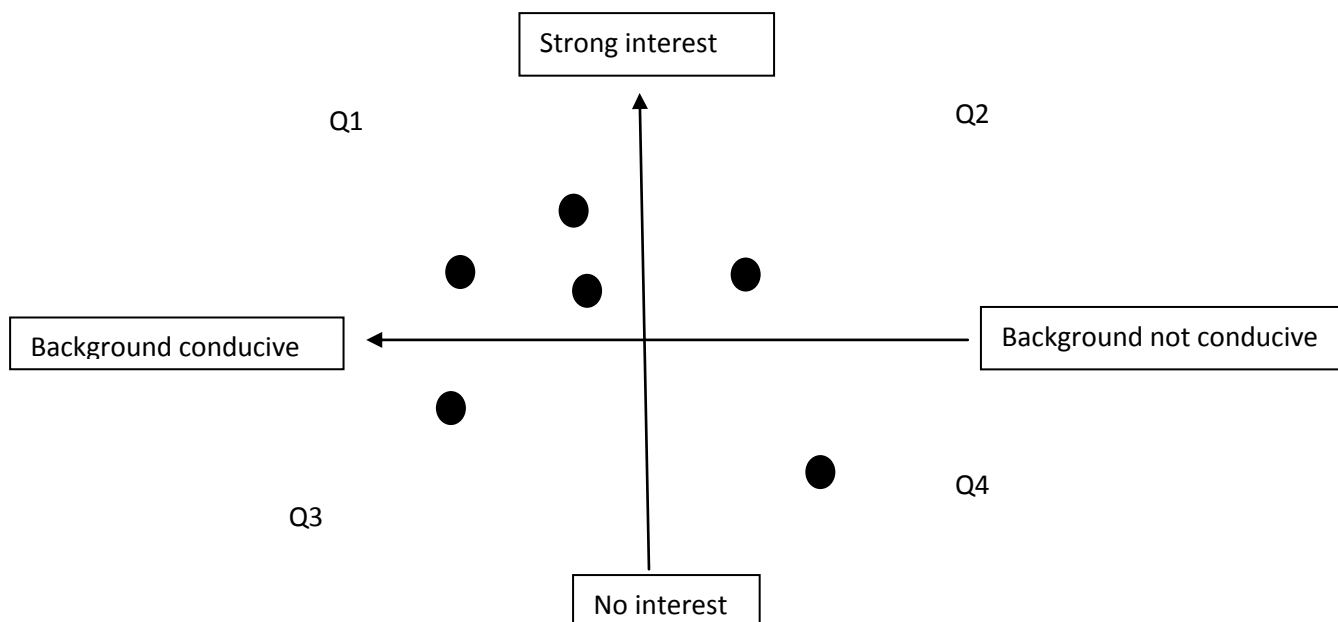
	Rural background	Urban background
Rural career path	Quadrant 1 28%, n = 13	Quadrant 2 26%, n = 12
Urban career path	Quadrant 3 24%, n = 11	Quadrant 4 22%, n = 10

The underlying concepts in the above model might be extended into another four quadrant model looking at the match between a whole medical school cohort and a priority specialty workforce. I have called this concept, ‘workforce orientation’. Each student already has demographic data recorded on university systems, and signals a level of interest in a specialty as part of the FMHS Tracking Project. Once career outcome data are known, it would theoretically be possible to plot a point estimate for each student, represented by a large dot, on a graph with two continuous axes, as shown in Figure 27. The x-axis represents student background (conductive – not conducive) and the y-axis, interest (strong interest – no interest). The graph is purposely aligned with the table above, so that the top left quadrant contains students with the most conducive backgrounds and highest levels of interest. The axes need not be continuous; instead, they could be categorical, from least likely to most likely.

Medical school cohorts will have students in each Quadrant. If a school is to produce graduates for priority specialty areas in the absence of any major external incentives, such as limits on other options, legal measures, financial or other inducements, it would be desirable that more students fall into Quadrant 1, with fewer in Quadrant 4. A quick visual check would, therefore, show how many students lie outside Quadrant 1; areas

where potential exists to improve policies and processes. Selection procedures might be evaluated as to how they recruit students for Quadrants 1 and 3 (conductive background); curriculum experiences and career promotion could be tailored to moving students from Quadrant 3 to Quadrant 1.

Figure 27 Workforce orientation model for a cohort of medical students



For this model to be applicable to the student body as a whole, requires quantification of how conducive each student background is to a priority career. The longitudinal tracking projects offer some hope that this could eventually be done. For example, a modelling exercise, based on data from over 6,000 MSOD entry questionnaires completed by Australasian medical students, was reported recently.¹⁸⁴ With logistic regression, the effects of individual characteristics in predicting the outcome of rural practice intention were studied. The statistically significant independent student factors in the model included: a rural background; holding a scholarship (but not a bonded arrangement); and intentions of generalist practice. The model had an area under the receiver operator characteristics curve of 0.86, and was reproducible. For the model outlined in Figure 27, once each student's data is plotted onto the graph, least squares models could be developed to obtain a quantitative measure of the workforce orientation of the whole student cohort, as judged by interest and aptitude.

This simple 'workforce orientation' model provides a framework for conceptualising how the policies and processes of medical schools may be made more favourable to workforce development. In one sense, the model is static in that it forces an assessment of the level of workforce orientation of a cohort of students at one time; however, it might also be dynamic, driving medical schools to review continuously how well they are fulfilling social contracts. The paradigm is applicable to more than just medical schools ... careers are still being decided upon during PGY1 and 2, and during vocational training. The bodies responsible for these parts of the

medical education continuum must also be more mindful of how they shape the entire future medical workforce.

A model of enhancement of medical workforce development

There are distinct populations of students and doctors in training, defined largely by stage of training. These populations of students and doctors might be regarded as being in compartments. Moreover, they come from the NZ community, will serve it as the specialist workforce, and be patients themselves. Therefore, I believe the community should be one of the compartments.

There are two other important compartments of students or doctors:

- those ‘temporarily out’ of the system. Included in this compartment are students or doctors on leave, or working less than full-time, but with the potential and desire to return to work full-time. A workforce development approach would facilitate re-entry of these doctors.
- those ‘lost’ from the NZ system. These students or doctors have low, or no, potential to return to the NZ system. They may have left medicine for whatever reason, have moved overseas, or become disenchanted with a medical career. The best workforce development approach might be to minimise these losses.

Compartment models are used in various sciences, including pharmacology where they are used to model drug distribution. Another example is nosokinetics – literally ‘disease movement’ – the science of modelling patient flows through the health system.²⁵⁰ Nosokinetics as a science emerged in the 1990s, in response to increasing pressure on hospital services created by the demands of an ageing population. The science draws on epidemiology, mathematics, management and clinical medicine. It has a NZ flavour with some strong proponents based in Dunedin. I propose that this type of approach might also be applied to the supply-side of the equation: namely, to education and deployment of doctors within the health system, to meet increased demands.

An integrated NZ medical workforce enhancement model is shown in Figure 28. The basis is formed by the compartments described above, with key flows between compartments represented by black arrows. Crosses are drawn at points where flows out of the system should be minimised. These flows occur from within or between compartments. Plususes show the directions of flow in the training system to be maximised.


The numbers of students or doctors in each compartment, and many of the flows, are finite and predictable; moreso than in nosokinetics. For example, the number of students entering medical school each year is known. Furthermore, work for this thesis identified other quantities useful in workforce planning that could start to inform modelling. Dropout rates of students in the reviewed literature were 10% or higher, but for Auckland domestic students the rate is nearer to 5% (Medical Programme Directorate, personal

communication, 2009). Women comprise just over 50% of medical students and house officers in NZ. Around 75% have children at some stage, and about 25% will be single. Women with children will have an average of just over 2 children. For every child born, the time out of the workforce is 6 months, plus another 20 months of part-time work. As more evidence becomes available through longitudinal tracking studies and the answers from workforce research as suggested earlier in this part, quantification of other flows will be possible.

These quantitative estimates are important to ensure sufficient numbers of doctors enter the specialist workforce. The qualitative aspects are equally important; having well-trained doctors providing the 'right care', in the 'right location.'¹

Examples of qualitative approaches to enhance the medical workforce have been identified in this thesis. These are represented by the numbers upon the plusses in the enhancement model on the next page:

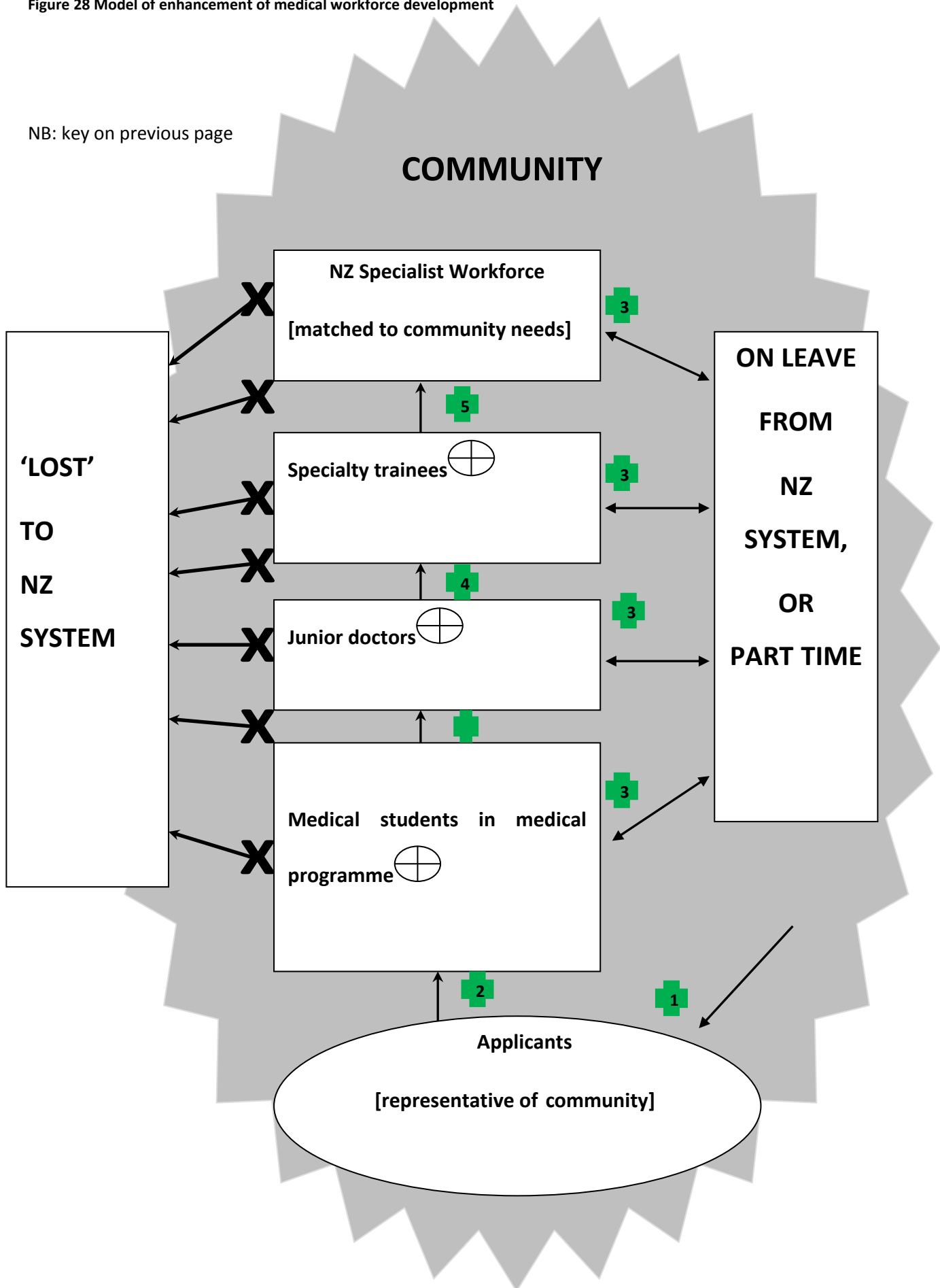
1. applicant pool to include more MAPAS and rural students;
2. selection of more MAPAS and rural students;
3. removal of barriers to women returning to full-time training or work;
4. more women entering surgical specialties;
5. acceleration of the rate women achieve consultanthood and leadership positions.

The symbol  appears in the enhancement model of Figure 28, superimposed upon the compartments to which it has most relevance. It represents the dynamic processes of recruitment, selection, educational activities and career promotion that were inherent in the 'workforce orientation' model outlined in Figure 27. Qualitatively, this serves to remind those managing each compartment to 'produce' the maximal number of students or doctors with aptitude and interest to enter priority specialties. Quantitatively, it may eventually be possible to make an estimate of 'NZ workforce orientation' of the students or doctors in any compartment to factor into a compartment model.

This workforce enhancement model summarises the key elements of medical workforce development from my perspective at one NZ medical school – informed by my research and experience. It is the first time that an integrated system has been laid out that takes into account the outcome of a notional ideal workforce, and all the compartments of import, including the community and medical students, involved in its development. Providing enough detail to be useful, without oversimplifying the steps that need to be taken, it is hoped this enhancement model serves as a framework for medical workforce development, within which stakeholders cooperate to consider how student and doctor numbers, their education and training, and, finally, their participation in the ideal workforce, are optimised.

Figure 28 Model of enhancement of medical workforce development

NB: key on previous page



Conclusion

NZ has a reputation for excellence in medical education and training, and cost-effectiveness of its health system. Like other Western countries, it is facing an immediate and major medical workforce crisis that is set to last for years. As few medical students as possible must be lost from the system; it is estimated that up to half will be needed in primary care settings in NZ. When faced with major medical workforce shortages, there are few options in the short term. These are: attracting doctors back into the health sector; reducing losses; improving productivity; or increasing immigration of doctors.⁹⁶ I suggest there may be gains made through the careful addressing of the first three of these; thus reducing NZ's reliance on the fourth. Given there will be such a long lead time until the recent increases in student numbers result in more specialists, there seems no alternative.

To date, medical workforce initiatives have been concentrated at a relatively high level, and in broad terms. They have been largely quantitative; such as increasing student numbers. My thesis has filled in some of the gaps in the understanding of how health and education systems may join to produce the future medical workforce. It has described ways in which one NZ medical school is responding to the challenges; justified endeavours already undertaken; and clarified ways in which medical schools, more widely, may contribute to the development of the ideal future medical workforce. Furthermore, insights gained through the conduct of studies, using data from students and graduates of this medical programme, have pointed to other areas of potential gain in workforce terms.

A medical workforce enhancement model has been described that outlines an integrated framework within which to synergise efforts of medical schools and others, towards a common purpose.

NZ must be the healthiest place in the world to live and work; for all its peoples.

He tāngata, he tāngata, he tāngata.

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Appendix 1 Survey of Female Graduates from the Auckland School of Medicine (1974 - 1998)

Section One: Demography & Work Pattern

1. Age (years):
2. Main ethnic group identified with (please circle)

European	Maori	Pacific Island	Asian
Indian	Other		

 (please specify):
3. Year completed Medical School: 19.....
4. Qualifications prior to Medical School:
5. Have you or are you training to be a specialist? Yes / No

If Yes: a) Specialty(s)
b) Qualification(s)
6. Please estimate, for the past 5 years, your average work hours per week and average yearly income:

Year	Average hours per week	Average yearly income (optional)
2000		
1999		
1998		
1997		
1996		

7. Please indicate your major type of practice (please circle):

Private	Hospital	University	Other
---------	----------	------------	-------------
8. Have you ever worked part time? Yes / No

If Yes :

 - a) Approximate hours per week:
 - b) How many years worked part time?
 - c) Did you job share? Yes / No

9. Do you feel that time out of the workforce / working part time has or may affect your career progression? Yes / No

If yes, in what way(s)?

Section Two: Personal Circumstances

10. Are you currently in a long-term relationship? Yes / No

- If Yes: a) Partner's occupation:
- b) Partner's hours worked per week:
- c) Do you feel you spend enough time together? Yes / No / Neutral
- d) Do you consider your job to come second to your partner's? Yes / No

If Yes, please explain:

11. Please estimate the number of hours per week spent on each of the household tasks listed:

	Myself	Partner	Extended family	Paid Employment	Other -----
Cooking					
Cleaning					
Gardening					
Bill payments					
Shopping					

12. Do you have any children? Yes / No

- If Yes : a) Number of children:

b) Ages:

c) Your age at the birth of your first child (years):

d) Did you take maternity leave after the birth of your children? Yes / No

e) Did you return to work part time after the birth of your children? Yes / No

	Months out of work force	Months spent working part-time
Child 1
Child 2
Child 3
Other Children
Total

f) Do you consider yourself the primary caregiver for your children? Yes / No / Equally Shared

g) Please estimate the percentage contribution (in an average week) to childcare activities (should total 100%). Please note, paid employment does not include school, but does include preschool, crèche and nannies.

	Myself	Partner	Extended family	Paid employment	Other -----
Caregiving					

13. Do you intend to have (more) children? Yes / No / Unsure

Section Three: Influences on Career Choice

What was your preferred medical occupation:

a) Before beginning Medical School? Undecided /

b) During Medical School? Undecided /

c) At Graduation? Undecided /

15. d) What is your area of practice currently?

Please indicate the influence on your career choice of the following factors (please circle response, leaving those that do not apply).

1 = not at all 5 = neutral 9 = very strongly

16. Compatibility with family responsibilities	1	2	3	4	5	6	7	8	9
Compatibility with partner's job	1	2	3	4	5	6	7	8	9
Women role models in the field	1	2	3	4	5	6	7	8	9
Role models in general	1	2	3	4	5	6	7	8	9
Mentors	1	2	3	4	5	6	7	8	9
Intellectual challenge	1	2	3	4	5	6	7	8	9
Interest and enjoyment	1	2	3	4	5	6	7	8	9
Encouragement from others to enter field	1	2	3	4	5	6	7	8	9
Lack of sexual harassment / supportive environment	1	2	3	4	5	6	7	8	9
Financial reasons	1	2	3	4	5	6	7	8	9
Positive experiences during undergraduate training	1	2	3	4	5	6	7	8	9
Variety within job	1	2	3	4	5	6	7	8	9
Flexible working hours	1	2	3	4	5	6	7	8	9
Regular working hours	1	2	3	4	5	6	7	8	9
Lack of "on call" duties	1	2	3	4	5	6	7	8	9
Option of part-time training	1	2	3	4	5	6	7	8	9
Opportunities to take periods of time off	1	2	3	4	5	6	7	8	9
Ease of re-entry after time off	1	2	3	4	5	6	7	8	9
Job security	1	2	3	4	5	6	7	8	9
Other (please specify)	1	2	3	4	5	6	7	8	9

What, in your opinion, are the major factors influencing career choice amongst women medical graduates?

Section Four: Job Satisfaction

17. Would you choose your current occupation if you could start again?

Yes / No

If No, why not?

18. Please rank the following:

1 = minimal 5 = neutral 9 = maximal

Current job enjoyment / satisfaction	1	2	3	4	5	6	7	8	9
Impact of job on family life	1	2	3	4	5	6	7	8	9
Impact of job on timing and number of children	1	2	3	4	5	6	7	8	9
Impact of family on career choice	1	2	3	4	5	6	7	8	9

19. Do you have any other comments you would like to make with regards to this study?

Thank you very much for your time & effort in answering this questionnaire

Appendix 2 FMHS Tracking Project Entrance Questionnaire 2010



Tracking Health Professional Students and Graduates Entrance Questionnaire for Medical Students 2010

Given Name: _____ Family Name: _____

Student ID: _____

1. In which country were you born? (Please tick one) New Zealand <input type="checkbox"/> Australia <input type="checkbox"/> Other _____ <small>Please specify</small>			
2. If born overseas, in what year did you come to New Zealand to reside or study? _____			
3. Do you speak a language other than English at your principal home address? Yes <input type="checkbox"/> _____ No <input type="checkbox"/> <small>Please specify what language/s</small>			
4. Over the past 12 years, how many years has your principal home address in New Zealand been outside (more than 1/2hr drive from) a major urban area? (i.e. Auckland, Wellington, Christchurch, Dunedin, Hamilton, Tauranga) _____			
5. If you have lived in New Zealand for a year or more, please indicate the type of location, in New Zealand, you have lived the longest? (Please tick one)			
Small town/ community (0-10,000) <small>e.g. Huntly, Dannevirke, Gore</small>	<input type="checkbox"/>	Town (10,000-25,000) <small>e.g. Levin, Whakatana, Oamaru</small>	<input type="checkbox"/>
		Provincial centre (25,000-100,000) <small>e.g. New Plymouth, Whangarei, Nelson</small>	<input type="checkbox"/>
			Major urban centre (>100,000) <small>e.g. Auckland, Wellington, Dunedin, Christchurch, Hamilton, Tauranga</small>
			<input type="checkbox"/>
6. In which region is your home city/town located? (Please tick one)			
Northland	<input type="checkbox"/>	Hawkes Bay	<input type="checkbox"/>
Auckland	<input type="checkbox"/>	Manawatu/Wanganui	<input type="checkbox"/>
Waikato/Taupo	<input type="checkbox"/>	Wellington/Hutt Valley/ Wairarapa	<input type="checkbox"/>
Bay of Plenty	<input type="checkbox"/>	Tasman	<input type="checkbox"/>
Gisborne	<input type="checkbox"/>	Nelson	<input type="checkbox"/>
Taranaki	<input type="checkbox"/>	Marlborough	<input type="checkbox"/>
			Canterbury <input type="checkbox"/> Otago <input type="checkbox"/> Southland <input type="checkbox"/> Westland <input type="checkbox"/> Overseas – please specify: _____
7. Name of home town: _____ Name of street and suburb: _____			

8.1 Number of years of secondary schooling in New Zealand outside a major urban centre:
(i.e. Auckland, Wellington, Christchurch, Dunedin, Hamilton, Tauranga): _____ years
 Did not attend secondary school in New Zealand

8.2 Name of secondary school attended (for majority of schooling): _____

8.3 How many years did you attend this secondary school? _____

8.4 Did you attend this school for your final year of secondary school?
 Yes No

8.5 If NO, what was the name of your secondary school for your final year at school in New Zealand? _____

8.6 Do you consider yourself to come from a rural background?
 Yes No

9. What is the main occupation of your mother and father, or caregiver?
Please be specific in your description: e.g. primary teacher, secondary school principal, office manager, retail manager, accounts clerk, company accountant, chemical engineer, sheep farmer, etc.

Mother _____

Father _____

Other caregiver/guardian _____

10. What was your main occupation during the year prior to entry to this programme? (If you completed OLYI count this as part of your programme)

Secondary school student Salary/Wage earner

Tertiary student Other

11. Previous tertiary education:
Please list the details in the table below if you have completed a university degree(s)

Name of completed degree/s (in full)	Year of completion	Name of university (in full)
1.		
2.		
3.		
4.		

Not applicable

12. If you were a fulltime salary or wage earner prior to entry to this programme, what was your previous employment?

My occupation was: _____

Not applicable

13. Preferred location of future medical practice: on completion of your basic medical degree, where would you most like to practice medicine? (Please tick one)

Northland	<input type="checkbox"/>	Hawkes Bay	<input type="checkbox"/>	Canterbury	<input type="checkbox"/>
Auckland	<input type="checkbox"/>	Manawatu/Wanganui	<input type="checkbox"/>	Otago	<input type="checkbox"/>
Waikato/Taupo	<input type="checkbox"/>	Wellington/Hutt Valley/Wairarapa	<input type="checkbox"/>	Southland	<input type="checkbox"/>
Bay of Plenty	<input type="checkbox"/>	Tasman	<input type="checkbox"/>	Westland	<input type="checkbox"/>
Gisborne	<input type="checkbox"/>	Nelson	<input type="checkbox"/>	Overseas – please specify:	
Taranaki	<input type="checkbox"/>	Marlborough	<input type="checkbox"/>		_____

14. Please indicate the type of location in New Zealand which would be your preferred location of future medical practice: (Please tick one)

Small town/ community (0-10,000)	<input type="checkbox"/>	Town (10,000-25,000)	<input type="checkbox"/>	Provincial centre (25,000-100,000)	<input type="checkbox"/>	Major urban centre (>100,000)	<input type="checkbox"/>
e.g. Huntly, Dannevirke, Gore		e.g. Levin, Whakatane, Oamaru		e.g. New Plymouth, Whangarei, Nelson		e.g. Auckland, Wellington, Dunedin, Christchurch, Hamilton, Tauranga	

15. For each of the following medical disciplines please rate your interest as a potential career choice: (Please rate each discipline)

	Strong Interest	Some Interest	No Interest
Academic/Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anaesthesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General Practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical Sciences (non clinical) (e.g. anatomy, physiology etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medicine (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medicine (sub specialty) (e.g. cardiology, occupational medicine etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geriatrics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obstetrics and Gynaecology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paediatrics (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paediatrics (neonatology)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pathology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public Health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychiatry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery (sub specialty) (e.g. ophthalmology, orthopaedics, urology etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____ Please specify	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Of the areas listed in Q15 please indicate the top 3 areas of medicine you are most interested in pursuing: (1 being the area of highest interest)

1. _____

2. _____

3. _____

Not yet decided

17. As part of your medical career are you interested in becoming involved in:

	Yes	No	Undecided
Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. What is the main source of financial support you have accessed and anticipate accessing during the course of your programme? (Please tick one)

Support from parents	<input type="checkbox"/>	Partner's income	<input type="checkbox"/>
Student loan	<input type="checkbox"/>	Savings/Trust fund	<input type="checkbox"/>
Student allowance	<input type="checkbox"/>	Scholarship	<input type="checkbox"/>
Employment (part-time, full-time, casual or vacation)	<input type="checkbox"/>	Other _____	<input type="checkbox"/>

Please specify

19. Other sources of income support: (Please tick all that apply)

Support from parents	<input type="checkbox"/>	Partner's income	<input type="checkbox"/>
Student loan	<input type="checkbox"/>	Savings/Trust fund	<input type="checkbox"/>
Student allowance	<input type="checkbox"/>	Scholarship	<input type="checkbox"/>
Employment (part-time, full-time, casual or vacation)	<input type="checkbox"/>	Other _____	<input type="checkbox"/>

Please specify

20.1 What is your current family status?

Single	<input type="checkbox"/>	Married/Living with partner	<input type="checkbox"/>
Divorced/Separated	<input type="checkbox"/>	Widowed	<input type="checkbox"/>

20.2 If you selected 'Married/Living with partner' for Q20.1, please state the occupation of your partner:

20.3 Please state number of children under 16 years of age: (Please enter 0 if you have no children)

20.4 Please state number of other dependents for whose care you are financially contributing: (Please enter 0 if you have no dependents)

Thank you for taking the time to complete this survey.

Appendix 3 FMHS Tracking Project Exit Questionnaire 2009



Tracking Health Professional Students and Graduates Exit Questionnaire for Final Year Medical Students 2009

Given Name: _____ Family Name: _____ Student ID: _____

1. Where are you planning to work following graduation? (Please tick one)			
Northland	<input type="checkbox"/>	Taranaki	<input type="checkbox"/>
Auckland	<input type="checkbox"/>	Hawkes Bay	<input type="checkbox"/>
Waikato (incl Taupo)	<input type="checkbox"/>	Manawatu/Wanganui	<input type="checkbox"/>
Bay of Plenty	<input type="checkbox"/>	Wellington/Hutt/Wairarapa	<input type="checkbox"/>
Gisborne	<input type="checkbox"/>	Tasman	<input type="checkbox"/>
		Nelson	<input type="checkbox"/>
		Marlborough	<input type="checkbox"/>
		Canterbury	<input type="checkbox"/>
		Otago	<input type="checkbox"/>
		Southland	<input type="checkbox"/>
		West Coast	<input type="checkbox"/>
		Other NZ	<input type="checkbox"/>
		Australia	<input type="checkbox"/>
		Other overseas	<input type="checkbox"/>
		Unknown	<input type="checkbox"/>

2. In what kind of community do you intend to work in the long term? (Please tick one)			
City	<input type="checkbox"/>	Regional/Rural	<input type="checkbox"/>
		Undecided	<input type="checkbox"/>

3. For each of the following medical disciplines please rate your interest as a potential career choice: (Please rate each discipline)			
	Strong Interest	Some Interest	No Interest
Academic/Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anaesthesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General Practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical Sciences (non clinical) (e.g. anatomy, physiology etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medicine (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medicine (sub specialty) (e.g. cardiology, occupational medicine etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geriatrics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obstetrics and Gynaecology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paediatrics (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paediatrics (neonatology)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pathology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postgraduate Study	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public Health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychiatry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery (sub specialty) (e.g. ophthalmology, orthopaedics, ENT surgery etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____ Please specify	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Please rate the extent to which the following factors are important in your career choice: (Please rate each factor)			
	<i>A significant positive effect</i>	<i>Little or no effect</i>	<i>A significant negative effect</i>
Positive experiences during clinical attachments, including locality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Positive experiences of lectures and other formal teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Area of need in health care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Family members and/or friends who work in the field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The extent of your student debt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The remuneration available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical role models you have encountered in your training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility (e.g. working hours, compatibility with family/lifestyle, option of part-time training)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____ Please specify	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. For each of the following, please rate the extent to which your interest in the discipline as a career choice was determined by your clinical attachment(s): (Please rate each discipline)			
	<i>A significant positive effect</i>	<i>Little or no effect</i>	<i>A significant negative effect</i>
Anaesthesia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Medicine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General Practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medicine (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medicine (sub specialty) (e.g. cardiology, oncology etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geriatrics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obstetrics and Gynaecology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paediatrics (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paediatrics (neonatology)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychiatry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery (general)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surgery (sub specialty) (e.g. ophthalmology, orthopaedics, ENT surgery etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6(a) What is your current family status?			
Single	<input type="checkbox"/>	Married/Living with partner	<input type="checkbox"/>
6(b) Do you have dependent children?			
Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
5. What sources of financial support have you accessed during your programme?			
<i>(Please tick all that apply)</i>			
Support from parents	<input type="checkbox"/>	Partner's income	<input type="checkbox"/>
Student loan	<input type="checkbox"/>	Savings/Trust fund	<input type="checkbox"/>
Student allowance	<input type="checkbox"/>	Scholarship	<input type="checkbox"/>
Part-time employment	<input type="checkbox"/>	Other _____	<input type="checkbox"/>
		<i>Please specify</i>	
6. Please indicate total amount borrowed on your student loan: (Please tick one)			
\$0	<input type="checkbox"/>	\$45,000-\$59,999	<input type="checkbox"/>
\$1-\$14,999	<input type="checkbox"/>	\$60,000-\$74,999	<input type="checkbox"/>
\$15,000-\$29,999	<input type="checkbox"/>	\$75,000-\$89,999	<input type="checkbox"/>
\$30,000-\$44,999	<input type="checkbox"/>	\$90,000 or more	<input type="checkbox"/>

Thank you for taking the time to complete this survey.