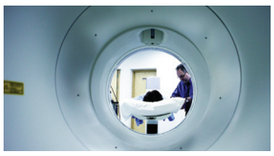
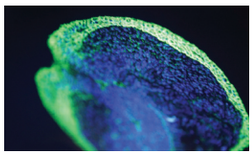
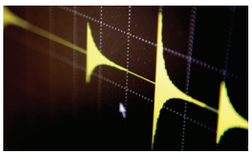
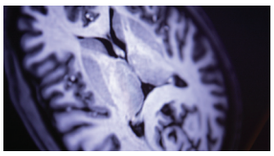
MANCHESTER 1824
The University of Manchester

Faculty of Medical and Human Sciences

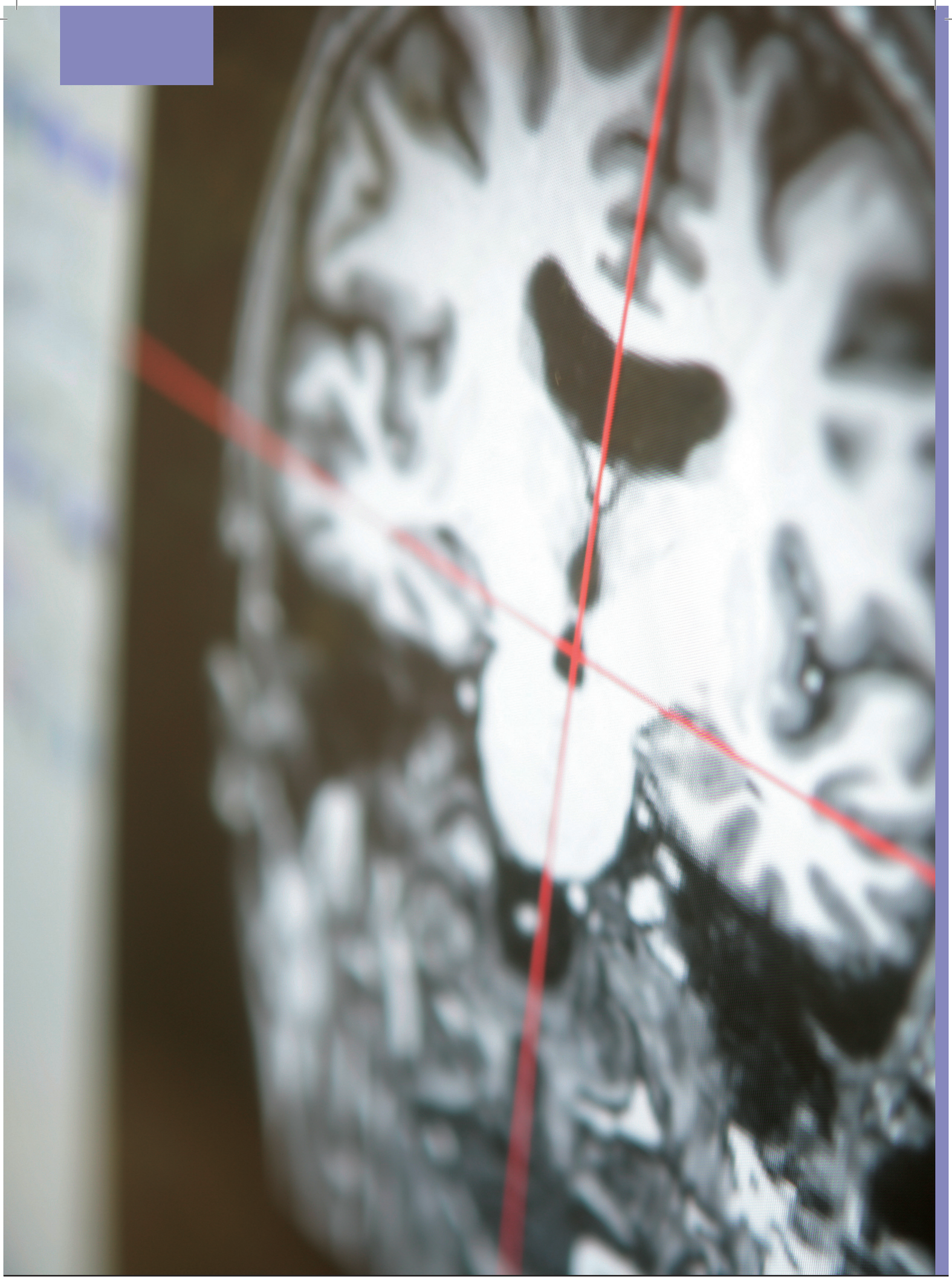





Institute of Population Health

Prospectus 2013 and Five Year Strategic Plan



Contents

Foreword

The Institute of Population Health was established in August 2012 to enable The University of Manchester to realise its full potential as an internationally esteemed centre for research and education in the field of health and population science. This document provides an overview of the Institute in 2013 and outlines its strategy for development over the coming years.

The Institute, working in concert with the wider University, has the breadth of expertise needed to tackle issues of global importance in the field of population health. Our job is to harness and coordinate people's efforts to generate a step-change in performance and impact that would not otherwise be possible. While there is much to be done if we are to achieve our ambitious objectives, the Institute has developed a clear sense of direction and momentum in its first year of operation. Our strategic plans will be further refined and elaborated with the assistance of an external expert panel, led by Sir John Pattison, which will undertake a review the Institute in the autumn of 2013.

Bonnie Sibbald
Director, Institute of Population Health
The University of Manchester

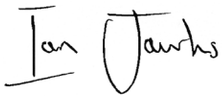
Dean's introduction

I am delighted to introduce the 2013 prospectus for the Institute of Population Health in the Faculty of Medical and Human Sciences at The University of Manchester. Our Faculty has now implemented a new strategy and structure which is intended to transform our contribution to research and education in medicine and health. We aim to build on the reputation of Manchester as a world leading centre for biomedical sciences and their clinical application.

The Faculty and the Institute of Population Health are committed to achieving excellence through an ethos of collegiate and collaborative working involving all of our Faculty Schools and Institutes and the highest quality interactions with other University of Manchester Faculties, our NHS partners via MAHSC (Manchester Academic Health Science Centre) and our broader higher education and NHS partners in the new GM-AHSN (Greater Manchester Academic Health Science Network).

Importantly the Institute of Population Health is part of a matrix structure (Figure 1) which is deliberately designed to break down barriers and encourage cross cutting interactions with staff in other Schools and Institutes. Staff are encouraged to affiliate to other Faculty structures and a high level of interaction is being achieved as illustrated in Figure 2. This type of cross linking is crucial to achieving the full benefits for education and research of our unusual breadth of health disciplines.

This document provides an overview of the Institute in 2013 and is work in progress. In the near future the Institute will host a visit by an international external advisory panel to help guide further developments and provide. The Institute already has a set of truly outstanding achievements and excellent staff but we have a lot more to do to achieve our ambitious objectives. I am grateful to all of the academic and support staff in the Institute for their contribution to the success to date and further plans.



Ian Jacobs
Dean, Faculty of Medical and Human Sciences
Vice President, The University of Manchester
Director of Manchester Academic Health Science Centre
Professor of Cancer and Women's Health

Faculty of Medical and Human Sciences Structure

Matrix of six Faculty Institutes and five Faculty Schools intended to facilitate cross cutting interactions

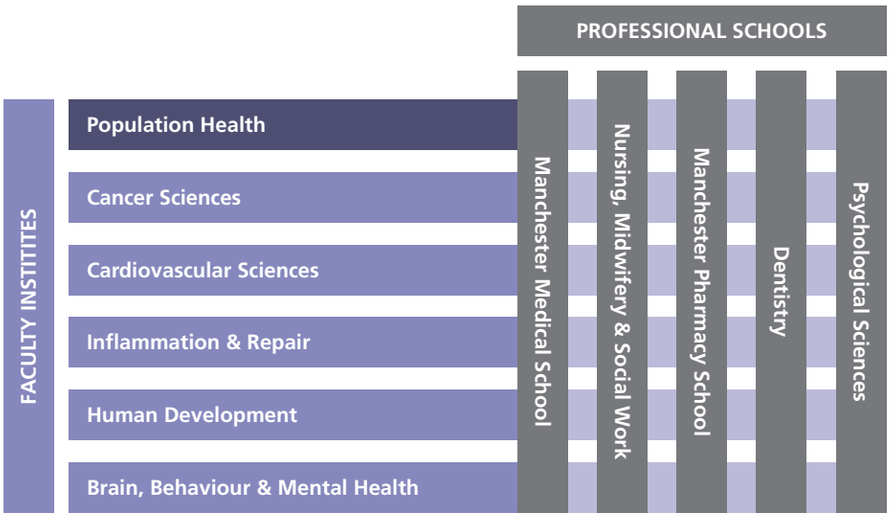


Figure 1
Faculty Structure – matrix of six Faculty Institutes and five Faculty Schools intended to facilitate cross-cutting interactions.

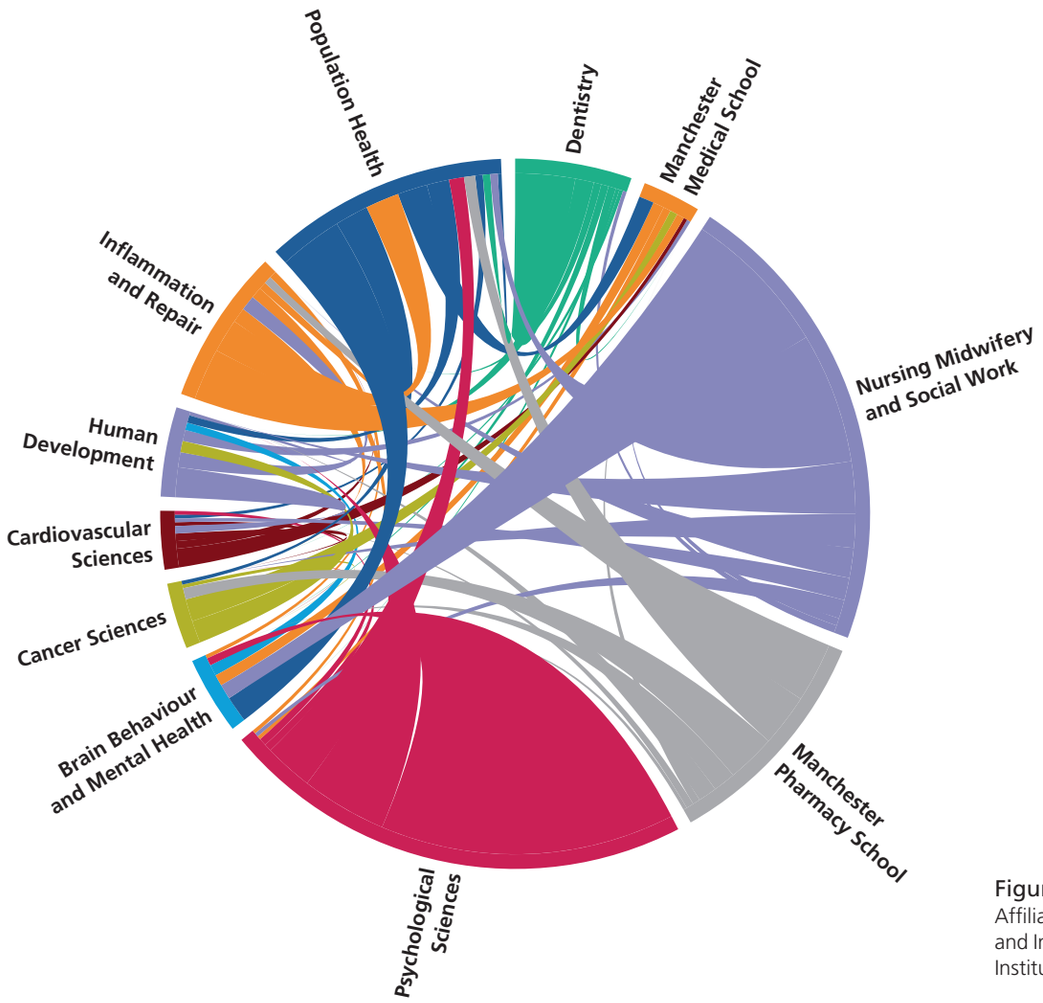


Figure 2
Affiliations across Faculty Schools and Institutes (showing the School/ Institute providing the affiliation)

The University and Faculty

Our Academic and Support staff in the Faculty of Medical and Human Sciences (FMHS) number over 2,000 and work to deliver three core priorities:

- Development and delivery of the highest quality education and training for health professionals and scientists.
- Conducting outstanding, world leading research in the biomedical and health sciences
- Social Responsibility to make a contribution to the 'greater good'.

Our University has a tradition of world-leading innovation which has led to a stepwise improvement in the health, wealth and wellbeing of populations across the world since the industrial revolution. Sitting at the heart of the City of Manchester, which is a global hub, excelling in arts, music, sport and commerce, the University is a beacon for research and education with a deep commitment to the economic transformation of Manchester and the North West of England. Tracing its origins back to John Dalton's Mechanic's Institute and John Owen's philanthropic desire to educate the local population, The University of Manchester was England's first 'civic' and now its largest campus-based university. No fewer than 25 Nobel Laureates have worked at the University and since the merger of the Victoria University of Manchester with UMIST in 2004 we have delivered in excess of 1,600 invention disclosures and formed 17 new companies attracting £117 million in third party benefit, demonstrating a formidable track record of commercialisation.

Each year we train over 400 doctors, 90 dentists, 150 pharmacists and 900 nurses, midwives and allied health professional staff. We are the largest supplier of healthcare graduates to the NHS within the North West of England but many of our graduates go on to deliver healthcare provision and scholarship in developed and developing health systems across the globe. Through the use of cutting edge technology, the highest quality workplace-learning environments and a highly trained educational faculty, we strive to deliver a personalised learning experience to each of our students so that they develop a real sense of identity and belonging to a world-class university. This in turn fully prepares them for life after graduation making the 'Manchester-made' graduate the first choice for healthcare employers. Our extensive postgraduate and continuing professional development programmes are hosted by our new Faculty Graduate School providing support and training to postgraduates undertaking a diverse range of study from short term professionally linked programmes through to research training in multidisciplinary areas. We believe that we are a complete resource for lifelong healthcare learning.

The scale, breadth and structure of our Faculty provide outstanding opportunities for basic biomedical research discoveries to be rapidly translated into effective new therapies with a strong emphasis on knowledge transfer and partnerships with industry. Our new matrix structure is designed to enhance opportunities for novel and multidisciplinary research (diagram). The matrix involves five schools (Medicine, Dentistry, Pharmacy, Psychological Sciences and Nursing, Midwifery & Social Work) and six research institutes (Cancer Sciences, Cardiovascular Sciences, Population Health, Brain, Behaviour & Mental Health, Human Development, Inflammation & Repair) with an emphasis on affiliation across these structures. The leadership team for each of the Institutes involves clinicians, basic scientists and healthcare researchers from both our own Faculty and our sister Faculty of Life Sciences. Our academics have the benefit of access to the large, stable population in the North West providing unique opportunities to study and address most causes of disease and deprivation. The opportunities are further enhanced by strong links to our partner Faculties (Humanities, Engineering, Physical Sciences, and Life Sciences) and the NHS through the Manchester Academic Health Science Centre (MAHSC). These partnerships facilitate rapid translation into practice and targeted biomedical, technological and psychosocial research based on clinical need.

In addition to our research and education activity, the Faculty is committed to make a major contribution to the greater good for society by contributing to solutions of the major challenges of the 21st century and the social and economic success of our local, national and global communities. We will ensure that social responsibility is embedded within all of our education and research activities, ensuring the highest ethical standards of professional practice from our staff and students. We are committed to equality and diversity in all our activities and to building on successful programmes such as the Manchester Access Programme which targets talented students from underrepresented backgrounds and a wide ranging global health programme which will help deliver sustainable capacity building within the health systems of developing economies.

Whether you are a visitor or a prospective student, staff member or collaborator, we hope that you will be engaged by the enthusiasm and vibrancy of our students and staff, our commitment to improving health and quality of life and the diversity of opportunity in research, and education that our Faculty has to offer.

Chapter 1

Overview

The Institute of Population Health is one of six institutes established by The University of Manchester Faculty of Medical and Human Sciences in August 2012 as part of a major reorganisation designed to transform research and education in medicine and health. The Institute is embedded within a matrix structure that promotes interdisciplinary research across the Schools of: Medicine; Dentistry; Nursing, Midwifery and Social Work; Pharmacy; and Psychological Sciences. Four cross-cutting research themes build on the interests and collective expertise of the Faculty: (a) ageing and the life course; (b) health and social inequalities; (c) prevention and screening; and (d) stratified and personalised health.

The Institute of Population Health brings the principal disciplines underpinning research in population health into a group of six Centres – Biostatistics, Epidemiology, Health Economics, Health Informatics, Imaging Sciences, and Primary Care. It employs more than 200 academic and research staff who, together with affiliate and honorary members, generate the critical mass and breadth of expertise needed to tackle issues of global importance in the field of population health. (See chapter 11 for more information about our organisation and management.)

Mission

Our mission is to improve population health and reduce inequalities in health through high quality research and education, and translate that expertise into improved health and wellbeing for people locally, nationally and internationally.

Research

We address issues of enduring importance where we are well placed to make a unique and tangible contribution to health improvement, building on the knowledge, interests and skills of our networks of staff. Our work is multi-disciplinary and driven by theory, building a body of knowledge that is more than the sum of its component parts.

We have seen major success in attracting new research funding in 2012/13. We were awarded new grants totalling £19.4 million.

Aims

Our aims are to:	
1. Improve people's health and reduce inequalities in health through:	• Improved understanding of the factors underpinning disease causation, progression, and response to treatment. • Innovations in healthcare policy, organisation and delivery, including screening and prevention. • Better tailoring of health interventions to the needs of the individual, including innovations in personalised / stratified medicine.
2. Advance research methodology in the fields of biostatistics, epidemiology, health economics, health informatics, and imaging science; and apply our advances to ensure Faculty research is of the highest possible quality. Key research topics include:	• Causal inference: A central objective of health research is to identify what factors or circumstances 'cause' a particular outcome of interest to occur. This topic draws together and further advances research into the methodologies – both quantitative and qualitative – that have been developed to identify causal factors, ranging from clinical trial design and analysis through to ethnographic studies. • Pattern recognition: Another central objective of health research is to identify 'patterns' in 'messy' datasets such as images, text, biobanks, and medical record systems. This topic draws together and further advances methodological research into pattern recognition. Developments in this field bring together a range of disciplines including computer science, informatics, biostatistics and psychology.

In pursuit of these aims:

- The Centre for Biostatistics:- leads methodological research, and provides statistical rigour to interdisciplinary research programmes across the Faculty. (chapter 2)
- The Centre for Epidemiology:- undertakes research into the distribution and determinants of health and disease in human populations for the betterment of health. (chapter 3)
- The Centre for Health Economics:- seeks to increase efficiency and equity in the production of health, through the development and application of economic theories and techniques. (chapter 4)
- The Centre for Health Informatics:- develops interdisciplinary technologies that harness data to deliver the right information to the right person in the right way, to inform health and care decision-making. (chapter 5)
- The Centre for Imaging Sciences:- improves the understanding of disease, its detection, management and treatment using state-of-the-art techniques and equipment in medical imaging and computer vision. (chapter 6)
- The Centre for Primary Care:- conducts research into healthcare policy, organisation and delivery relating to primary care, with a focus on quality and safety, the management of long-term conditions, and delivery of patient centred care. (chapter 7)

Key facilities

We recognise that researchers across the Faculty need access to methodology experts to sustain and advance research in diverse fields. We therefore coordinate and provide faculty-wide support services in biostatistics, health economics, health informatics, biobanking and imaging sciences.

The key facilities managed by us on behalf of The University of Manchester include:

- Biobanking
- Biomedical imaging
- MAHSC Clinical Trials Unit

See chapter 8 for more information about these facilities.

Education

Our vision is to provide high quality, world-class teaching in the population health sciences to students, drawing on our specialised knowledge and skills to broaden and enrich students' learning. (See chapter 9 for more information.)

We aim to:

- Continuously improve the quality of our teaching, fostering an attitude of ownership and engagement in respect of education throughout the Institute.
- Encourage within a greater proportion of graduates, the attitude and interest to pursue postgraduate training and research, and further career development within Population Health Sciences and cognate areas.
- Offer outstanding opportunities for postgraduate training in research.

Impact

We translate our knowledge and expertise into improved health and wellbeing for people locally, nationally and internationally, working in partnership with the: Manchester Academic Health Science Centre (MAHSC); the National Institute for Heath Research (NIHR) Collaboration for Leadership in Applied Health and Care (CLAHRC) for Greater Manchester; and the Greater Manchester Academic Health Science Network (AHSN).

The impact of research undertaken by the Institute is felt nationally and internationally. Key achievements include:

- Development of model-based analysis of medical images
- Improving quality of care through general practice accreditation
- Improving treatment targeting in drug addiction
- Improving occupational health
- Assessment of patient experience of NHS primary care services
- Development of needs-based formulae for distributing NHS resources
- Improving quality of care through pay-for-performance
- Skills training on suicide risk management (STORM)
- Innovations in statistical methodology for clinical trials

See chapter 10 for more information about these impacts.

Organisation and management

A team of more than 100 people provides excellent Professional Support Services to the Institute. Our expected turnover in 2012/13 is £27 million, with a predicted contribution to The University of Manchester of nearly £7 million. (See chapter 11 for more information.)

Chapter 2

Centre for Biostatistics

Aims

- To provide methodological strength and statistical rigour to interdisciplinary (collaborative) clinical and health care research programmes across all the Institutes in the Faculty; and to lead methodological research that is motivated by and fully complementary to the Faculty's interdisciplinary research collaborations.
- To provide statistical training and support to existing and proposed projects, based on excellence in statistical methodology at all stages of research, from study design through data collection, analysis and publication. In this way, to facilitate the winning of major clinical research grants and the placing of publications in the most highly esteemed academic journals; and to provide high quality educational and training activities for the Faculty's undergraduate/ postgraduate students and research workers.

Expertise

The Centre staff have a wide range of methodological interests and strengths including: modern statistical approaches to causal inference; the design and analysis of randomised trials and other clinical experiments (including the evaluation of complex interventions); the design and analysis of epidemiological and other observational studies; the management and analysis of large e-health data sets; complex statistical modelling, including the use of Bayesian methods, with applications to high-dimensional biomarker data and clustered or correlated outcomes arising from measurements repeated over time (including repeated events or interventions) and interventions being provided to groups of participants rather than individuals; measurement error evaluation and modelling; genetic epidemiology; survival, event-history and frailty models.

Staff in the Centre lead their own programmes of research, as well as leading the statistical input to multidisciplinary research programmes and grants generated through the Centre's wide network of local, national and international collaborative links. At The University of Manchester, Centre staff have particularly strong links with the Institute of Brain, Behaviour and Mental Health and the Institute of Cancer, but also work closely with researchers across the Faculty. New recruits in 2012/13 include Professor Carlo Berzuini whose focus is on biomarker evaluation in cancer research. Planned recruits include a new Chair in Biostatistics to support the development of the MAHSC Clinical Trials Unit (see chapter 8).

Research

Understanding the causes of disease, progression and response to treatment

This comprises the design and analysis of epidemiological and other observational studies (including e-health records), together with development and application of the complex modelling techniques needed to explore the data and draw valid inferences concerning both patterns of association and the direction and strength of causal influences. The key here is the threat to the validity arising from design errors (selection effects), confounding and measurement error. Another important aspect of this work is the development and evaluation of the performance of sophisticated clinical diagnostic and prediction models to be used, for example, in studies of the natural history of chronic diseases, the discovery and validation of prognostic and predictive biomarkers, the validation of potential disease markers in screening, and in clinical decision making (e.g. whether to intervene surgically, treat medically, or watch and wait). Increasingly, this work will involve the evaluation of vast high-dimensional arrays of potential biomarkers arising from genetic/genomic, proteomic and image data. The methodological challenge is to bridge the gap between the advanced statistical methodology now available and the areas of ongoing research into genomics/genetics and other areas of molecular medicine.

There are two areas of planned work:-

1. Drawing valid causal inferences from observational data, including formally-designed epidemiological studies, routinely collected patient data, and unstructured observational cohorts.

There is an increasing trend towards large e-health databases, often containing detailed longitudinal data on the individual care provided to millions of patients. These represent a potentially powerful resource for research into disease causation, detection and treatment. However, many unanswered questions exist about how to make optimum use of e-health datasets, given uncertainties around issues of data quality, completeness, and methods of analysis, and our methodological research has a particular focus on these. This is one of the themes of the new MRC Health e-Research Centre (HeRC) which engages other Centres in the Institute, other Institutes and Schools in the Faculty and extends to Universities across the North of England. Of particular concern are problems arising from both measured and unmeasured confounding and measurement error. Methods for confounding will include the use of propensity scores, instrumental variables (possibly including Mendelian randomisation) and the development of formal sampling strategies to obtain data from e-health databases that (other than randomisation) closely emulates the design of a controlled clinical trial. Head-to-head comparisons of the most promising approaches to confounding will be undertaken, using both actual and simulated (where confounding can be systematically controlled) e-health data. Another important challenge to valid causal inference from epidemiological and other observational data sets is the frequently unacknowledged problem of measurement error – the Centre has particular expertise and interests in measurement error evaluation and measurement error modelling.

2. Design and analysis of randomised clinical trials and systematic reviews to evaluate efficacy and/or effectiveness – for interventions, both simple and complex, including treatment, screening and prevention, healthcare management and public health.

Methodological considerations will include non-adherence to randomised treatments, missing outcome data and lack of independence of individuals' and/or repeated outcomes (as in cluster-randomised trials, for example, or the evaluation of group therapies, and use of embryo-level data in trials of assisted conception). Infrastructural and methodological developments will take place through close collaboration with the new MAHSC Clinical Trials Unit (chapter 8) and our membership of the MRC North West Hub for Trials Methodology Research. The methodological work will also encompass the valid combination in a systematic review of data from multiple trials (meta-analysis and meta-regression), building on the strengths of the Cochrane Oral Health Group in the School of Dentistry and the University's Evidence Synthesis Research Network in which the National Institute for Care Excellence (NICE) is an active partner.

Tailoring health interventions to individual needs: personalised/stratified medicine

A key focus of our work will be the design and analysis of randomised clinical trials for efficacy and mechanisms evaluation (EME) in personalised stratified medicine. This is one of the Faculty's key cross-cutting themes and is the focus of our commitment to the work of the MRC North West Hub for Trials Methodology Research. We have recently proposed a randomised clinical trial design to fully incorporate genetic and other biomarker information in the evaluation of treatment-effect mechanisms in stratified therapies. This is a Biomarker-Stratified EME design (the BS EME trial). The rationale for the BS EME trial design is the following:

1. Stratified therapies and treatment-effect mechanisms evaluation are inextricably linked, and

2. Stratification without corresponding mechanisms evaluation lacks credibility.

In addition, there are the following technical (statistical) justifications:

3. In the presence of the almost certain mediator-outcome confounding (e.g. common causes arising from the prognostic characteristics of the patient), mechanisms evaluation is dependent on stratification for its validity;

4. Both stratification and treatment-effect mediation can be evaluated using a marker stratified trial design together with detailed baseline measurement of all known prognostic markers/covariates;

5. Direct and indirect (mediated) effects should be estimated through the use of instrumental variable methods (the instrumental variable being the predictive marker by treatment interaction) together with adjustments for all know prognostic markers (confounders) – the latter adjustments contributing to increased precision (as in a conventional analysis of treatment effects) rather than bias reduction.

For this work, we have assembled a team of clinical Project Partners at The University of Manchester from each Institute in the Faculty of Medical and Human Sciences. They will advise us to ensure that the methodology and trial designs pursued in this work are grounded and applicable to areas of clinical importance. Shôn Lewis is Professor of Adult Psychiatry, Director of the Institute of Brain, Behaviour and Mental Health and an investigator on the consortium for treatment refractory schizophrenia in response to the MRC stratified medicine call. Chris Griffiths is Professor of Dermatology, Centre lead for the Centre of Dermatology in the Institute of Inflammation and Repair and is PI of the Psoriasis Stratification to Optimise Relevant Therapy (PSORT) consortium in response to the MRC stratified medicine call. Caroline Dive is Professor of Pharmacology and Pharmacy and Andrew Renehan is a Clinical Senior Lecturer (Hunterian Professor 2011/2012), both based in the Centre for Personalised Therapy in the Institute of Cancer Sciences and Paterson Institute for Cancer Research. Pippa Tyrrell is Professor of Stroke Medicine and Steve Hopkins is Honorary Reader, both based in the Centre for Vascular and Stroke in the Institute of Cardiovascular Sciences.

Methodology research
Underpinning all our work in collaborative clinical and healthcare research is a vibrant programme of MRC-funded methodological research that is primarily focussed on modern statistical and econometric approaches to causal inference (one of the two methodological priorities of the Institute). These methodological developments have application in the interpretation of routinely collected medical records (as in e-health), formally designed epidemiological studies and quasi experiments, and, in particular, inferences concerning treatment-effect mechanisms (mediation) in randomised controlled trials and their application to the development of personalised (stratified) health care. As well as the MRC North West Hub for Trials Methodology Research, we have important collaborations with Centre for Mathematical Sciences and the MRC Biostatistics Unit (University of Cambridge), the Institute of Psychiatry (King's College, London) and with the Harvard School of Public Health.

Education and training

We lead and support the Evidence Based Medicine (EBM) programme of the medical undergraduate programme.

We provide a vibrant PhD training programme in biostatistics that will be supported by the development of a MSc in Biostatistics (led by the Centre for Biostatistics). This will compete with the best courses elsewhere, encourage the most promising young statisticians to undertake post-graduate research at Manchester, and provide methodological training for PhD students and young research workers as part of their academic and professional development. We additionally lead the development and implementation of the statistical components of postgraduate courses across the Faculty, including the Masters in Public Health and MSc in Occupational Medicine/Hygiene.

The North West region's NIHR Research Design Service (RDS) is led from within the Centre, providing support for research and fellowship applications, including research design, methodology, statistics, public involvement, bid writing, putting a team together and critical review, as well as workshops on particular funding streams. The Centre has also initiated a series of "outreach" workshops focussing on specialised methodologies applicable to the development of the Faculty's cross-cutting themes (such as personalised or stratified medicine). The Centre will pursue the possibilities for the provision of applied biostatistics training via University College for Interdisciplinary Learning, including the development of easily accessible relevant web-based materials.

Social responsibility

We will always be aware that it is our social responsibility to ensure that patients and other participants being recruited to clinical research projects are not being recruited to statistically-flawed or inefficient studies; and to ensure, as far as possible, that our clinical and healthcare research collaborators are drawing valid and robust inferences and are avoiding making claims that are not justified by the evidence.

Our role as collaborators and advisors in applied clinical and healthcare research programmes is to ensure best practice in project design, statistical analysis and the interpretation and presentation of the results. This role is supplemented by our commitment to the Research Design Service and a series of training workshops and seminars to update biostatisticians and others on developments in the field (especially those arising from our own methodological research).

Centre for Epidemiology

Aims

- To undertake nationally and internationally important research into the distribution and determinants of health and disease in human populations for the betterment of health.
- To be at the international leading edge in postgraduate teaching in public and occupational health.

Expertise

In the field of population health, we investigate the factors determining disease causation, progression, and response to treatment, applying epidemiology approaches to the analysis of integrated biological and clinical data generated through:-

- The Centre for Integrated Genomic Medical Research (CIGMR) – an internationally recognised centre for biobanking with expertise in genetic epidemiology and in-house resource infrastructure to enable high quality research on diseases that have a complex gene/environment basis.
- The National Drug Evidence Centre (NDEC) – a government funded research centre for substance misuse, underpinned by a unique database linking clinical and criminal justice information on substance misusers.
- The Centre for Occupational and Environmental Health (COEH) – which has expertise in occupational and environmental health, and maintains a unique national longitudinal database reporting on occupational health problems presenting to general practitioners and specialist physicians, known as The Health and Occupation Research Network (THOR).
- The Trauma Audit Research Network (TARN) – which maintains the national NHS dataset on patients presenting to English hospitals with major trauma.
- The Manchester Urban Collaboration on Health (MUCH) – which leads on global and local public health research projects in cities, funded through the European Commission, the NHS and the World Health Organisation.

Staff in the Centre lead their own programmes of research, as well as leading the epidemiological input to multidisciplinary research programmes and grants generated through the Centre's wide network of local, national and international collaborative links. At The University of Manchester, Centre staff work most closely with the Institutes of Inflammation and Repair, Human Development, and Cancer, and the Manchester Institute of Biotechnology. New recruits in 2012/13 include Professor Ken Muir whose focus is on cancer research. Planned appointments include a new chair and other academic staff to support the development of public health research and education.

Research

In addition to our existing strengths, and in keeping with the Faculty-wide strategic aims, we plan to expand our work in the fields of:

Understanding the causes of disease, progression and response to treatment

We will expand our research studying the effects of both the genome and the exposome (e.g. air pollution and radiation exposures) on the causation of cancer, inflammatory and other chronic diseases using cohort and other designs as well as observational epidemiology. Our Centre and other components of the Institute of Population Health are collaborating in these areas together with our NHS health partners such Salford Royal NHS Foundation Trust and Salford Clinical Commissioning Group. Particularly within our Faculty we will work with all disease focused groups where they require an epidemiological input: Pharmacy especially in terms of stratified medicine and pharmaco-vigilance, Nursing and Midwifery regarding prevention, Psychology with respect to social and lifestyle factors as determinants of health outcomes as well as investigation of the implications and communication of risk stratification and genetic profiling.

Innovations in healthcare policy, organisation and delivery: prevention and screening

We have developed a strategy to reinvigorate public health research and education in the University that builds on our existing skills and resources, and those of our partners in the NHS and Public Health England. This will reverse a decade-long trend of disinvestment in public health within the University and support our mission to improve population health and reduce inequalities in health locally, regionally and internationally. We believe that public health research is focused too much on the determinants of population health, rather than the development, evaluation and implementation of interventions to improve public health. The University is uniquely well placed to address this imbalance through high quality multidisciplinary research targeted to improving the environment – both social and physical – of urban neighbourhoods in ways that promote healthier lifestyles and population wellbeing.

Our collaborations will be with the providers of public health services within Public Health England; national and regional health bodies; and government (Department of Health, Home Office, Health and Safety Executive). Together with our NHS Health providers within MAHSC (including the Global Health Initiative) and the developing Greater Manchester Academic Health Science Network (GM AHSN) and particularly with Salford primary and secondary care, we will pursue the opportunity to utilise electronic integrated health records.

We will work with the Department of Health, the various sections of Public Health England which will include the Health Protection Agency, National Treatment Agency and National Commissioning Board for the prevention of infectious diseases and environmental hazards, vaccine delivery and development, prevention of harm from substance abuse, and health services prevention research for effective commissioning. Both at a UK national level and at an international level we will monitor, and evaluate preventive strategies to improve urban health (e.g. through MUCH) and work related health (e.g. through the MODERNET consortium, funded by the EU).

Tailoring health interventions to individual needs: personalised/stratified medicine

Novel approaches in understanding the underlying clinical and genetic heterogeneity within common and important diseases represent a new opportunity for the delivery of safer and more effective healthcare. This applies both to predicting risks of the presence of disease, co-morbidities and/or progression and to providing optimal and safe drugs and treatments. Such "stratified medicine" approaches are now developing through new high throughput molecular technologies, epidemiological, statistical and data mining strategies and the drive toward developing integrated health record systems and e-health initiatives. Further wider collaborations both nationally (e.g. ICR and Cambridge and others) and internationally (e.g. Karolinska, Sweden, Harvard, Boston and others) will allow us to fully evaluate targeted and personalised approaches to screening for diseases such as arthritis and cancer. We shall pursue research into chemoprevention and chemo-delay.

Methodology research

As appropriate we will work with our NHS collaborators, UK Biobank and with University colleagues in the Manchester Institute of Biotechnology (MIB), clinical genetics, Centre for Advanced Discovery and Experimental Therapeutics (CADET) and the Christie hospital / Paterson Institute to identify and develop the clinical utility of genetic, protein, metabolite and imaging biomarkers to deliver our research objectives in Population Health including population based screening. Wider collaboration will allow us to fully evaluate all emerging approaches to the proper and full integration of different types of markers and their appropriate use in defining and using "risk" based approaches to maximise population benefit.

To support these programmes of work we will:-

- Work in partnership with the Centre for Health Informatics to create networks across the University and outside organisations – academic, NHS, industrial – that will develop and maintain large longitudinal datasets, integrating biological with clinical information.
- Apply for large-scale long term funding from relevant Research Councils, government departments, and private sector industries to develop, maintain and exploit our unique data assets in partnerships such as that with the Centre for Health Informatics.
- Ensure our research is rigorous and high quality, contributing to and drawing upon advances in epidemiological research methodology in partnerships such as that with the Centre for Biostatistics and Centre for Health Informatics.

Education and training

- Working with the Manchester Medical School, we aim to lead national curriculum standards for public health, occupational health and epidemiology teaching, and ensure the quality of that teaching is outstanding as evidenced by student feedback.
- We will develop a 4 year PhD in Epidemiology including a first year training programme in all areas of epidemiological research, and explore the potential for implementing a Doctorate in Public/Population Health (DPH).
- We will widen the base of the Masters in Public Health (MPH) teaching and continue to develop new markets as well as pedagogic innovations in the Masters in Public Health and the Masters in Occupational Health (Medicine and Hygiene) courses, and will work to support Continuing Professional Development, primarily in the fields of public and occupational health. We will draw upon the leading edge teaching and training methodologies we have developed in the Masters programmes, and other activities such as the Innovative Medicines Initiative European Medicines Research Training Network (IMI EMTRAIN).

Social responsibility

- We will support public engagement with research through leadership of the MAHSC Citizen Scientist programme which enables members of the public to find and enlist in relevant clinical research studies.
- We will mobilise knowledge from our research to inform policy and practice - locally, nationally and internationally – through MAHSC and the emergent Greater Manchester AHSN.
- We will work in partnership with private sector industries to develop research intensive partnerships that advance scientific knowledge and lead to the development of spin-out companies. An important focus will be the development of biomarkers of disease, of premorbid damage and of exposure. CIGMR and collaborators in Salford Royal are working in partnership with GSK to investigate pharmacogenetic and other biomarkers that may be of relevance in the stratification and treatment response in COPD. Similarly relationships are currently being developed with Regeneron (one of the world's largest Biotech companies working in this area) and Theravance. Other private companies have also expressed their interest to support evaluation of further biomarkers within our planned programme of work including for example, Sanofi Aventis and Urosens.

Chapter 4

Centre for Health Economics

Aims

To increase the efficiency and equity of the production and restoration of health, through the development and application of economic theories and techniques to health behaviours, interventions, and health and social care systems.

Expertise

Health economics involves the development and application of economic methods for studying the production of health, illness and recovery in populations and the consumption of health care services. It furthers understanding of the behaviour of individuals and health care providers and compares alternative uses of health care resources to improve the health of individuals, patient groups and populations.

Establishment of expertise in health economics is a longstanding Faculty priority. Capacity has grown rapidly in the last five years and there are now 30 health economists at Manchester. This has been achieved through strategic appointments, a step-change in applications for grants and fellowships, and vigorous capacity-building. Manchester has received funding for ten fellowships in health economics (5 from Research Councils and 5 from NIHR) over the last three years. Nine health economists have begun their PhDs at Manchester in the last two years.

The formation of a Centre for Health Economics provides a concentration of expertise and a critical mass to support the development of coherent research programmes and careers, as well as continuing collaboration with colleagues in other disciplines. New recruits in 2012/13 include Brenda Gannon who will lead the Centre's contribution to the Faculty's cross-cutting theme on ageing and life course, and further collaboration with the School of Social Sciences. Planned recruits include a new chair in health economics to support the development of the MAHSC Clinical Trials Unit (see chapter 8).

Establishing Manchester's reputation for health economics has involved a number of strategies including:

- ***Building esteem*** through targeted applications to join funding bodies (Board members for NIHR HS&DR, HTA Clinical Evaluation and Trials, and Rapid Trials Programmes, and panel members for NIHR Programme Grants for Applied Research), journal editorships (Health Economics, Social Science and Medicine, Value in Health), and accepting invitations as international speakers
- ***Raising profile*** through publications in leading journals, a large volume of presentations at the national and international health economics conferences, and organising the national health economics association.
- ***Extending international collaborative links*** through NIH and EU grants, and hosting international PhD students.

The Centre has particular expertise in the econometric analysis of administrative and survey datasets, health technology assessment, valuation of the benefits of technologies, evaluation of complex health and social care interventions, and programme evaluation.

Staff in the Centre lead their own programmes of research, as well as leading the economic input to multi-disciplinary research programmes and grants. The Centre has a wide network of local, national and international collaborative links. At The University of Manchester, there are strong collaborative links with Economics in the School of Social Sciences, with whom we hold joint grants, undertake joint PhD supervision, and host joint conferences. Within the Faculty, Centre staff work most closely with: the Centre for Primary Care; the Centre for Biostatistics; the Institute of Brain, Behaviour and Mental Health; the Institute of Human Development; the Institute of Inflammation and Repair; and the School of Dentistry.

Chapter 4

Research

The Centre's research focuses on methodological innovation, both theoretical and applied. We adapt and develop economic methods and apply them to important health and health care issues. The Centre's research has a very diverse funding base, including the MRC and ESRC, most of the NIHR research programmes, the Department of Health, and the EU.

Our research considers the production of health and social care (health technology assessment, resource allocation, pay-for-performance and workforce planning) and the production and consumption of health (health behaviours and outcomes), with a particular focus on health inequalities.

Currently, the work of the team is focused on two main themes. These are areas of expertise for individuals in the Centre staff and a strength of the Faculty more broadly, and have clear links to the new Faculty structures and cross-cutting themes, which will guide our future strategy.

Labour, distribution and organisation

Under this theme, current topics include:

- Workforce planning and determinants of labour supply
- Equity in healthcare and geographical resource allocation
- Incentives and provider performance

These topics are primarily analysed through the development and application of econometric techniques, the use of administrative and survey data and through non-experimental evaluations of major healthcare reforms.

Valuation and evaluation

Under this theme, our research concentrates on:

- Measurement and valuation of preferences for the benefits of interventions
- Variations in, and determinants of, health and social care costs and benefits

The emphasis is on causal analysis of complex interventions to meet complex needs and on less regulated (mainly 'diagnostic') services. The research focuses in two clinical areas: mental health; and chronic complex conditions, including genetic conditions. This work contributes to the Faculty's cross-cutting themes on: stratified and personalised health; and prevention and screening.

Education and training

The Centre is active in postgraduate training.

- We lead a module in health economics on the Masters in Public Health;
- We are leading the development of a Masters in the Economics of Health in the School of Social Sciences
- We supervise 4-5 Masters dissertations each year for students on the Economics programme at Manchester and on the MSc in Health Economics at the University of York.

Social responsibility

A key priority for the Centre is the translation of the knowledge gained from our research to improve health care practice and policy and further public and professional understanding of health economics. We work closely with the National Institute for Health and Care Excellence (NICE) to ensure that our evaluation findings inform their guidelines and recommendations for the NHS. Work we have been commissioned to undertake by the Department of Health underpins the funding formula that they use to ensure that budgets for local organisations are equitable and address health inequalities, their national pay negotiations with GPs and their use of financial incentives.

Chapter 5

Centre for Health Informatics

Aims

- To develop and apply computational methods to harness 'big' health data enabling timely research across larger, more heterogeneous populations, involving more researchers.
- To develop technologies supporting health and care decision-making by delivering the right information, to the right people, in the right way, at the right time.
- To build capacity in health informatics.

Expertise

Informatics is the science of information, the practice of information processing, and the engineering of information systems. Informatics studies the structure, algorithms, behaviour, and interactions of natural and artificial systems that store, process, access, and communicate information. In addition, it studies human-computer interaction. It both develops its own conceptual and theoretical foundations and utilises foundations developed in other fields. The study of informatics has computational, biological, cognitive and social aspects.

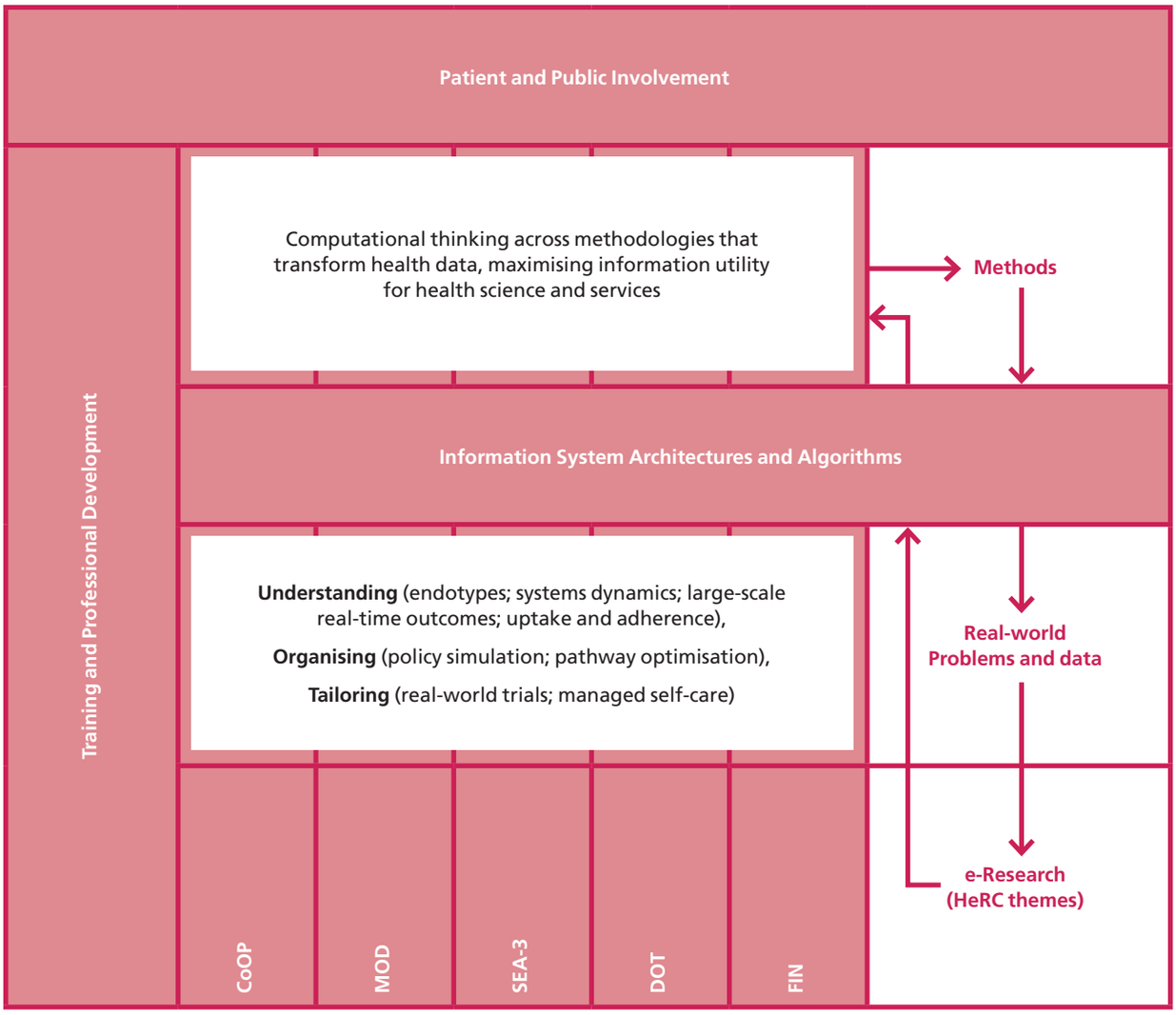
Health informatics focuses on maximising the utility of information for supporting decisions about health and care at individual and population levels. Those decisions may be made in the conduct of health science, in developing healthcare services or in delivering care. The utility of information is key – for example, a statistical model providing the maximum measurement of uncertainty may have low utility if it is too complex to inform the intended audience. Understanding the optimal information is inherently interdisciplinary. The Centre nurtures working across disciplines through co-location and collaboration of researchers from different methodological backgrounds, such as computer science, software engineering, mathematics / statistics, epidemiology, economics, health psychology and sociology. Applications of the Centre's methodology are driven by collaborating clinicians, public health professionals, healthcare managers, patient organisations and businesses.

Staff in the Centre lead programmes of research in informatics methodology, as well as leading the informatics input to multi-disciplinary research programmes and grants through the Centre's wide network of local, national and international collaborative links. The Centre founded the Northwest Institute for Bio-Health Informatics (NIBHI) and its NHS-based software/services group Northwest eHealth. Following the award of a programme/centre grant by a MRC-led consortium in 2012, NIBHI has evolved into the Health e-Research Centre (HeRC) and extended its geographical coverage to North England, in partnership with the Universities of Liverpool, York, Lancaster and Sheffield. In 2013 HeRC linked with similar centres in London, Scotland and Wales to form the national Farr Institute for Health Informatics Research. Capacity building is central to the HeRC/Farr mission.

New recruits in 2012/13 include Mattia Prosperi and Matt Sperrin whose focus is on statistical machine learning using computer science and mathematics approaches respectively. Planned recruitment for 2013/14 includes a new Chair or Senior Lecturer in Health Informatics, ten further research staff and five PhD students.

Research

Our research is organised around the HeRC programme. The figure below illustrates the spectrum of research and how it inter-links:-



CoOP (cooperative observation with patients)
The scientific challenge is to understand how patients and clinicians co-produce healthcare information. The engineering challenge is to understand how information systems might facilitate managed self-care. Current activities include 'm-health' projects using mobile technologies to capture longitudinal data from patients and use analyses of the data to support patient-clinician communication.

MOD (missed opportunities detector)
The scientific challenge is to identify opportunities for prevention and early intervention using population-wide healthcare data. The engineering challenge is to harness linked data across healthcare systems in a continuous sense-making process facilitated by novel professional social networking methods. Current activities include: the GM CLAHRC (Health Systems) care pathway analysis work; the NIHR Greater Manchester Primary Care Patient Safety Translational Research Centre programme; and modelling of coronary revascularisation outcomes from national audit datasets.

SEA-3 (scalable endotypes of asthma, allergies and andrology)
The scientific challenge is to identify latent classes of subjects who appear to have different risk factors or treatment outcomes attributable to discrete underlying mechanisms – so called 'endotypes'. The engineering challenge is to develop tractable computation of very large probability spaces around putative models being shaped by people with methodological or applied expertise. Current activities employ machine learning methods combined with classical biostatistical modelling to shape hypotheses about endotypes, applied to asthma, allergies and cardiovascular disease.

DOT (diabesity outcomes translator)
The scientific challenge is to characterise treatment outcomes in heterogeneous populations using observational data. The engineering challenge is to enable unified and flexible modelling across observational medical research running concurrently in different populations. Current activities focus on resolving the cancer risks of diabetes medication and obesity, over which confusion reigns in the literature. The methodological activities include novel ways to handle time varying exposures and confounding by treatment indication.

FIN (trials feasibility improvement network)
The scientific challenge is to improve recruitment and retention in clinical trials, and to capture the fuller picture of drug effects post-licensing. The engineering challenge is to harness large-scale healthcare data for: rapid assessment of clinical trial protocols, and analysis of 'real-world' medication outcomes. Current activities include on-going development and evaluation of the FARSITE system for rapid feasibility assessment of trial protocols using primary care data, and recruitment of participants with optimal engagement of attending clinicians – extending to capture of patient-reported outcomes.

The engineering work in the Centre leads to prototype software architectures and algorithms/tools, complementing its scientific work on methodology and applied research. In order to deliver direct benefit to patients and communities through its engineering the Centre has spun out a service division, Northwest eHealth, in partnership with the NHS. In addition, industrial partners exploit intellectual property from the Centre. This pathway to implementation is driven along the Institute and Faculty cross-cutting areas as follows:-

Understanding the causes of disease, progression and response to treatment
SEA3 paves the way for new prevention strategies by identifying sub-groups of the population who might have modifiable risks. CoOP provides new routes for prevention and early intervention by engaging with citizens/patients directly in self-monitoring health. MOD identifies missed opportunities for prevention and early intervention at the population level.

Innovations in healthcare policy, organisation and delivery: inequalities in health
MOD centres on identifying sub-groups of patients who have unintended outcomes. This work provides a platform for population-wide healthcare equity analysis.

Tailoring health interventions to individual needs: personalised/stratified medicine
SEA3 provides new methodology for identifying treatment targets specific to sub-groups of patients with discrete pathophysiologic mechanisms in respect of treatment outcomes. DOT and MOD together test a framework for stratifying healthcare on more accurate and timely evidence afforded by large-scale, dynamic modelling of clinical outcomes. FIN provides a more efficient and effective mechanism for delivering current clinical trials and developing an environment for future 'adaptive licensing' of medicines.

Education and Training

The Centre provides learning materials and research project placements for undergraduates. In addition to specific education about informatics, the Centre supports undergraduate learning in biostatistics and public health. For postgraduates there is a wide range of training available, from short courses to a Masters programme that will be launched in 2014. Over two thousand people from academia, NHS, industry and government have gone through these courses over the past seven years. The Centre is working closely with the Department of Health to plan training around the professionalisation of health informatics. At the centre of our activities is doctoral training in health informatics, which through HeRC will form a doctoral training network across North England.

Social responsibility

The Centre is committed to a programme of informatics that advances public health. Projects are prioritised by how much potential health gain they can deliver. The two key areas for enabling social responsibility are: 1) promoting the trustworthy reuse of health data; and 2) enabling citizens to self-organise and 'crowd-source' health.

HeRC's CHIP-SET programme provides open software tools for local health communities to build 'eLabs' to help them gain insights about their local healthcare from large collections of data. Where a NHS organisation or other trusted public service cannot afford to employ sufficient analysts they will be able to 'borrow strength' from a federation of eLab connected experts in due course.

HeRC's CoOP theme provides new routes for citizens to participate in healthcare, addressing the digital-divide, building social capital, and bridging patient-clinician communication barriers with new ways to interact.

Chapter 6

Centre for Imaging Sciences

Aim

To improve the understanding of disease, its detection, management and treatment through multi-disciplinary research using state-of-the-art techniques and equipment in medical imaging and computer vision.

Expertise

In the Centre for Imaging Science, physicists, chemists, computer scientists and clinical researchers work together to develop new methods and apply cutting edge imaging and computational techniques for the understanding of disease, its management and treatment. We use state-of-the-art Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) equipment (including a cyclotron and radiochemistry facilities) and other imaging information including video, photographic and microscopic data, on patients, normal volunteers and pre-clinical models, and apply novel computer algorithms to understand and interpret medical imaging data. The Centre's research combines expertise in physics, maths, computing, chemistry, bioscience and clinical medicine to develop new ideas and applications, leading to a high academic profile and also industrial collaborations and a number of successful spin-out companies.

Strong collaborations are in place with clinical and non-clinical researchers in the areas of neuroscience and mental health, oncology, musculoskeletal, respiratory and cardiovascular medicine, maternal and foetal health and endocrinology. The Centre has close collaborations (joint papers, grants and students) with all 5 of the other Faculty Institutes, with 3 of the 4 Professional Schools (Pharmacy, Dentistry and Psychological Sciences), with the Faculty of Life Sciences and joint appointments with the School of Computer Science. In 2012/13 we strengthened our expertise in radiology through the appointment of Richard Hodgson as a Reader in Musculoskeletal Radiology and through a CRUK Clinician Scientist Award to James O'Connor.

The Centre also manages human and animal whole body imaging on four sites for the University. See chapter 8 for more information about out imaging facilities.

Research

Understanding the causes of disease, progression and response to treatment

Imaging research aims to discover, develop and validate imaging biomarkers of disease progression and response to treatment, which are evident before there are overt morphological or clinical effects. We have a track record in the use of dynamic contrast enhanced MRI to show changes in tumour vasculature following treatment providing evidence of effective anti-angiogenic therapy (Jackson, Parker, O'Connor). In Alzheimer's disease we have a programme of work using PET and MR spectroscopy (Herholz, Hinz, Williams) to identify markers of disease progression in man and animal models which offer potential to aid in evaluation of disease-modifying therapies. We also have a developing programme of research using both PET and MRI to study drug delivery and mechanisms of therapeutic resistance (Jackson, Asselin, Herholz, Waterton, Naish).

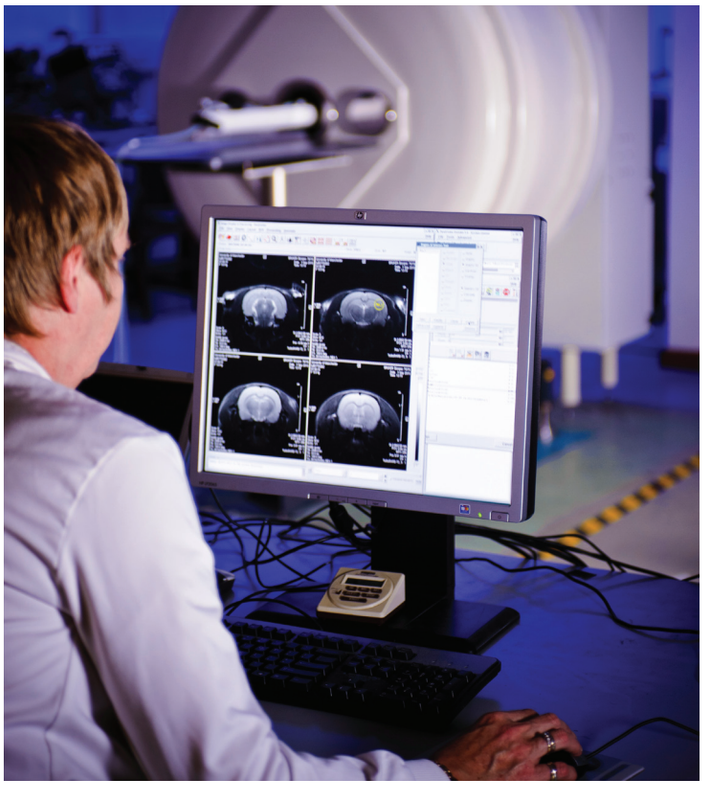
In addition to direct application in disease settings, we also apply many of these techniques to understand normal tissues – for example working on imaging methods to characterise brain plasticity associated with learning and memory (Parkes, Parker). Such approaches underpin long term ambitions to allow the effects of disease to be better identified and characterised via a more detailed understanding of human tissue function.

Innovations in healthcare policy, organisation and delivery

We apply computer vision techniques to improve the efficiency of breast cancer screening. Astley and Taylor have a long track record in computer-aided diagnosis of mammograms, working with radiologists and medical equipment companies to improve throughput and accuracy in reading mammograms. Similar methods are applied to retinography and capillary nailfold analysis, providing a paradigm in which routine, cheaply acquired images provide a rich data source for computer based analysis and disease diagnosis. Another example is the use of dental radiographs to diagnose osteoporosis (Graham in collaboration with the Dental School). In addition we have a program of research (Stivaros in collaboration with Computer Science) aimed at developing decision support systems for clinical radiological diagnosis and image-based patient management. A long term programme of research into the automatic detection of vertebral fractures (Cootes, Adams) is about to be trialled in a local hospital as a way of helping radiologists detect early signs of osteoporosis.

Tailoring health interventions to individual needs: personalised/stratified medicine

New therapies for difficult-to-treat diseases, including neurological/psychological disorders and cancer, are expensive, not effective in all patients and are often associated with significant unpleasant side-effects. The MRI techniques developed and applied in the Centre to monitor response to therapy provide a much earlier indication of efficacy than traditional radiological assessment. For example, research in the Centre to improve imaging techniques will provide methods to personalise and stratify treatment choice based on underlying tumour biology revealed through functional imaging (Jackson, Parker, Jayson, Waterton, Thacker). In another example, pharmacological-challenge MRI has revealed differences in the brain's response to SSRI administration between subjects displaying different polymorphisms of the serotonin-transporter gene (Williams with BBMH). Investigations of this type will lead to personalised pharmacology, in which expression of specific polymorphisms can be linked to biological function. Generic antibody and antibody fragment radiolabelling approaches are being developed as PET imaging biomarkers of individualised disease progression and treatment response (Prenant, Brown, McMahon, K.Williams).



Methodology research

A core activity of the Centre is continual innovation to increase the scope and reach of whole body imaging to improve its contribution to health: examples include new radio-tracers for PET to image hypoxia, oxidative damage, immune response and their roles in radiotherapy (McMahon, Brown, Boutin, Herholz, Asselin, Hinz); generic approaches to the radiolabelling of cells to study immune cell trafficking in inflammatory disease (Prenant, Brown, McMahon, K. Williams); and improved methods for PET and MRI data acquisition, processing, image interpretation and kinetic modelling (Matthews, Hinz, Asselin, Jackson, Thacker, Parker, Parkes, Rose, Williams, Naish). The Computer Vision group develops methods for automatically extracting useful information from large datasets of medical images (Cootes, Twining, Taylor). For example, robust and accurate techniques for model matching (Cootes) are being used to locate structures such as the femur, the tibia and the joints in the hand in radiographs. The group has also developed state of the art techniques for tracking faces, which are being used to monitor human behaviour, such as that of drivers (Cootes).

Education and training

Members of the Centre contribute to medical undergraduate teaching through project supervision (Year 4 and students undertaking intercalated BSc's), delivery of a limited number of Problem Based Learning sessions and lectures on the pre-med course, Portfolio Tutoring and interviewing. Dr Sue Astley (Reader in Medical Imaging) is the Manchester Medical School Lead for intercalating degrees. The Centre also recognises the importance of introducing physical science undergraduates to the possibilities of a career in medical research or clinical service delivery and thus runs a Years 3/4 module for undergraduate physics students on 'Physics and Computing in Medicine and Biology', led by Parker with contributions from Naish and Mathews. To complement this and provide a route into a PhD or medical physics training programmes for engineering and science graduates, a new MSc course on Medical Imaging was introduced in 2012. Nearly every academic member of staff in the Centre contributes to this, led by Dr. Jim Graham, through management, module leadership, teaching, project supervision and assessment. This course is also offered to intercalating medical students. In the first year of the course we have one Manchester medical student and one overseas qualified medic. The Centre has a good record in PhD supervision to which all academic members of staff contribute.

Social responsibility

Members of the Centre are leading contributors to the public engagement and outreach activities of the Biomedical Imaging Institute (Director – Parker), which undertakes events at the Museum of Science and Industry and the Whitworth Hall. See www.bii.manchester.ac.uk/PublicEngagement/PublicEngagement.pdf for a description of activities in 2011, in which members of the Centre feature prominently.

There is also a strong record going back over 20 years in exploitation of intellectual property through industrial collaboration and spin-out companies. Recently of note is the development of MRI methods for better diagnosis, stratification and monitoring of chronic lung diseases such as COPD and asthma, leading to a number of patents and a successful spin-out company, Bioxydyn, in 2009 (Parker and Naish). In Computer Vision algorithms derived from the work of Cootes and Taylor led to a spin-out company, Imorphics Ltd. in 2002. They have recently won two international competitions for medical image segmentation. More information about these activities is provided in chapter 10.

Chapter 7

Centre for Primary Care

Aims

- To conduct high quality research into primary care, with a focus on quality and safety, the management of long-term conditions, the organisation and delivery of services, and the impact of national-level policy.
- To have a demonstrable impact on the organisation and provision of primary care nationally and internationally, and on the development of policy relating to primary care.
- To provide a high quality environment for the development of research capacity in primary care.

Expertise

The Centre for Primary Care is acknowledged internationally to be one of the UK's leading research centres for policy research in primary care. The Centre was ranked 2nd in the UK in the last national Research Assessment Exercise, and was a founder member of the prestigious NIHR School for Primary Care Research, a collaboration of 8 leading primary care departments in England. The Centre hosts the NIHR Greater Manchester Primary Care Patient Safety Translational Research Centre, the Department of Health Policy Research Unit for NHS Commissioning, and leads the NIHR CLAHRC for Greater Manchester. The work of the Centre is supported by a truly multidisciplinary staff including general practitioners, psychiatrists, sociologists, psychologists, statisticians and health services researchers.

Staff in the Centre lead their own programmes of research, as well as leading primary care input to multidisciplinary research programmes and grants generated through the Centre's wide network of local, national and international collaborative links. At The University of Manchester, Centre staff work most closely with the Institute of Brain Behaviour and Mental Health, the Schools of Dentistry, Nursing and Psychology, and the Manchester Business School.

In the past 2 years the Centre has seen three of its outstanding research chairs move to other universities (Chew Graham, Lester, Rogers) and a fourth will retire this year (Gask). Hence the Centre is now on a drive to attract new talent to maintain its international prominence in research. Recruitment is now underway for a chair in general practice and a chair in primary care mental health.

Research

Research in the Centre is organised around three themes of high relevance to the delivery of care in the UK and internationally:

- Quality and Safety – with a focus on quality indicators and quality improvement, patient safety, and the role of incentives.
- Health policy, politics and organisation – with a focus on commissioning and contracting in the NHS and on the organisation and delivery of services.
- Long-term conditions – with a focus on multimorbidity and mental health, health technology assessment, and patient health and illness experience.

We have made major contributions to the development and evaluation of a range of high profile innovations in the NHS in each of these core areas. More information about these impacts is provided in chapter 10. Below, we highlight the links between our core research themes, and Institute of Population Health priority areasv.

Innovations in healthcare policy, organisation and delivery

The Centre for Primary Care will make a major contribution to the Institute cross-cutting research objective around innovations in healthcare policy, organisation and delivery, with a focus on their impact on inequalities in health and health care. We have been at the forefront of the development and evaluation of several high profile innovations in the NHS, including the General Medical Services contract and the use of indicators to improve quality of care; implementation of large scale patient-centred NHS surveys; and new health technologies such as collaborative care and telehealth. Our continuing work on policy around NHS commissioning has the potential to inform the implementation of these radical new arrangements to the benefit of staff and patients. Our policy related work also involves developing collaboration with the School of Dentistry.

Tailoring health interventions to individual needs

The Centre for Primary Care has an excellent track record in the understanding of patient priorities and experience in health care. We have used our expertise to both inform high level policy around the assessment of patient experience (including large scale patient-centred NHS surveys), as well as ensuring that patient experience is used to better tailor health interventions to the needs of the individual, through improved design and evaluation. Our extensive investment in systems to support patient and public involvement also contributes to these endeavours.

Methodology research

The Centre for Primary Care has a long history of delivery of randomised controlled trials and the use of research from a number of disciplines to explore issues of causal inference in such trials, in areas of high relevance such as innovative treatments for mental health problems and new service delivery models for long-term conditions. Statisticians working in the Centre for Primary Care are now managed by the Centre for Biostatistics, which will provide additional opportunities for collaboration and methodological development in this area.

In collaboration with the Centre for Health Informatics, the Centre for Primary Care will use its extensive expertise in the analysis of large scale primary care databases. This will include more extensive use of the Clinical Practice Research Datalink to explore the effect of financial incentives on the quality of care, and inequalities in care, for conditions included and excluded from local/national incentive schemes. All these have significant relevance worldwide.

The Centre for Primary Care also has extensive expertise in the use of social and psychological sciences in the development and evaluation of 'complex interventions' in health and social care. This work has involved extensive collaboration with the School of Nursing and the Institute of Brain, Behaviour and Mental Health, and a range of external collaborators. New senior staff appointments in the Centre for Health Psychology in the School of Psychological Sciences will allow us to further develop our existing links. We also have a track record in the development of qualitative methodologies for the study of organisations, in particular the use of observational and ethnographic methods.

Education and training

The Centre provides high quality training in research for students at Masters and Doctoral level, and contributes to medical undergraduate teaching through research project supervision, the delivery of lectures, and student mentoring. The Centre developed and leads two popular modules – Primary care, Qualitative research methods- for the Masters in Public Health and Masters in Research programmes, and contributes to the teaching of 5 other modules. Centre members supervise 10-15 masters dissertations per year.

Social responsibility

The applied nature of our work means that the Faculty strategic priority around social responsibility is a core aspect of our mission. In collaboration with other University partners (such as the Manchester Business School) and our wider NHS links (through MAHSC, CLAHRC and the NIHR Greater Manchester Primary Care Patient Safety Translational Research Centre), we conduct research on the implementation of knowledge, and ensure that research forms the basis of large scale implementation projects for the benefit of NHS patients locally and nationally.

We also place high priority on issues of patient and public involvement in research. We host the PRIMER patient group (www.population-health.manchester.ac.uk/primer/) which works with researchers to ensure there is adequate patient and public involvement in research and assists in the design and delivery of research projects. Patient and public involvement is a key priority of the new NIHR Greater Manchester Primary Care Patient Safety Translational Research Centre which has assigned 10% of its budget for this purpose. Professor Aneez Esmail in the Centre for Primary Care is Associate Vice President for Social Responsibility and Equality and Diversity.

Chapter 8

Key Facilities

The Institute recognises that researchers across the Faculty need access to methodology experts to sustain and advance research in diverse fields. We therefore coordinate and provide faculty-wide support services in biostatistics, health economics, health informatics, biobanking and imaging sciences.

Linking support service functions to strong academic teams ensures practitioners are able to draw on and contribute to leading edge advances in health science methodology. Concentrating the people who provide support services within a single team also improves research efficiency - making it easier to manage workload surges and ebbs in particular projects or programmes – as well as offering practitioners the opportunity to engage in more interesting and varied work.

The key facilities managed by the Institute on behalf of The University of Manchester, include:

- Biobanking
- Biomedical imaging
- MAHSC Clinical Trials Unit

Biobanking

The Centre for Integrated Genomic Medical Research (CIGMR) provides genetic epidemiology expertise, industry-standard laboratory facilities and access to biological samples from well phenotyped patients and controls recruited through large national and international longitudinal studies. This enables fully integrated research to be carried out in one place. CIGMR manages 30 extensive collections of 50 sample types including a major public-private partnership collection in asthma funded by IMI, the MRC's UK DNA Banking Network, numerous collections in which Manchester investigators are participants and it partners with the University of Liverpool to house the UK DNA Archive for Companion Animals.

Biobanking and genomic-based technologies are central to the development of Stratified Medicine which is a priority area for investment by the Technology Strategy Board (TSB) of the Department for Business, Industry and Development. The TSB funds CIGMR as a participant in the STRATUM project that is scoping a national public-private partnership biobanking network to underpin Stratified Medicine. This project includes an internal collaboration with Manchester Business School and externally with AstraZeneca and GSK. The TSB's projected budget to develop Stratified Medicine is in excess of £200 million.

CIGMR has the expertise to take advantage of these investment opportunities and to facilitate the development and adoption of Stratified Medicine locally and regionally. The key area of facilitation is in biobanking. To realise this, The University of Manchester will need actively to promote networking for sample and data management across the University and partner NHS trusts in the Manchester Academic Health Science Centre and beyond. The networks need to provide visibility and accessibility to quality-managed samples and interoperable data sets drawn from patient records and experimental results.

Biomedical Imaging

Biomedical imaging, particularly human imaging in clinical research has been a strategic priority for the University. Multimillion pound investment from the University, MRC, BBSRC, NIHR, Wellcome Trust and industry has provided world class whole-body imaging facilities for clinical and pre-clinical research into human disease, its management, diagnosis and treatment. These are managed on behalf of the University by the Institute of Population Health. We operate research-dedicated state-of-the-art scanners for both Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI). High field (3 Tesla) MRI is available at the Wellcome Trust Clinical Research Facility on the Central Trust site and at Salford Royal Foundation Trust while 1.5T MRI is situated at the Wolfson Molecular Imaging Centre (WMIC) on the Christie Hospital site. WMIC also houses a human whole-body combined PET / Computed Tomography (CT) scanner, a high resolution human brain PET scanner, a pre-clinical PET/CT and a fully equipped cyclotron/radiochemistry suite. With 16 hot-cells for radio-isotope synthesis, the WMIC is matched in the UK only by the (former) GSK Imaging Centre in London in terms of PET radio-synthesis capability. In addition there is a small animal pre-clinical 7 Tesla MRI scanner in the Stopford Building. These facilities underpin research mainly in the Faculty of Medical and Human Sciences and the Faculty of Life Sciences with significant recent success in major grants from the Wellcome Trust, MRC, NIHR and EU FP7 programmes. We have a mix of leading methodological development (based mainly in the IPH Centre for Imaging Science) and numerous high impact areas of application - unmatched by any other UK centre. Our activities span basic and clinical research in neuroscience, oncology, musculoskeletal, cardiovascular and respiratory medicine, and foetal and maternal health. This is underpinned by expertise in MR physics, mathematics and computer science, all of which enhance the competitiveness of MR-related biomedical science and have a substantial impact of their own.

MAHSC Clinical Trials Unit

Clinical trials are integral to research that aims to improve people's health and wellbeing. Major funders of research – such as the MRC, the NIHR, industry, and charitable health associations - increasingly demand that the trials which they fund are managed and administered in association with a UKCRN-registered Clinical Trials Unit (CTU). Access to a high quality, low cost UKCRN-registered CTU is therefore critical to clinical research, both commercial and non-commercial. At present, the University and its partner NHS organisations have considerable expertise and investment in clinical trials activity but this is insufficiently well developed and coordinated to meet growing academic and commercial demands. The Manchester Academic Health Science Centre has therefore agreed to establish a MAHSC CTU that will harness existing resources and attract new investment to create a world class facility for clinical trials research and delivery. This will be built through development of the Christie Trials Coordination Unit (CTCU) which currently is the only UKCRC registered trials unit in Greater Manchester. The MAHSC CTU will in turn link to clinical trials facilities across the North West Region, through a Northwest Regional Clinical Trials Collaborative led by the University of Liverpool, to improve clinical trial quality and efficiency across the region.

The mission of the MAHSC CTU is:

- To establish the CTU as a nationally and internationally recognised centre of excellence in the design, development and management of non-commercial clinical trials and associated development of collaboration with industry.
- In collaboration with the University's Institute of Population Health and other researchers across the region, to develop cutting edge methodological expertise within the CTU and establish the Unit as a nationally-leading and internationally-recognised hub for methodological research.

To achieve these aims, the MAHSC CTU will coordinate and further develop existing clinical trial resources across Greater Manchester. This includes clinical trials facilities at the Christie Hospital, Central Manchester University Hospital and University Hospital of South Manchester, in addition to the Healing Foundation Centre established by The University of Manchester to advance the understanding of wound healing and tissue regeneration. The University of Manchester input into the MAHSC CTU will be coordinated through the Institute. This will comprise of high quality advice on the design and analysis of clinical trials – encompassing both quantitative and qualitative research methodologies – from the Centres for Biostatistics, Health Economics and Primary Care, in partnership with the NIHR Regional Design Service (RDS).

In order to deliver services of the highest quality, the CTU will also support research into the wide range of methodologies underpinning clinical trial design, conduct and analysis. Trials methodology research in The University of Manchester will be coordinated through the Centre for Biostatistics and further developed through new investment in two new chairs: one in health economics and one in biostatistics. Members of the Institute joined the University of Liverpool to bid successfully in 2013 for funding to extend the MRC North West Hub for Trials Methodology Research that will drive further research into clinical trials methodologies.

Patient and public involvement in trials will be facilitated through the work of the MAHSC Citizen Scientist initiative, led from the Centre for Epidemiology, which enables members of the public to find and enlist in relevant clinical research studies.

Chapter 9

Education and Training

Education and training are the principal ways in which we mobilise knowledge from research to improve population health and wellbeing. Our vision is to provide high quality, world-class teaching in the population health sciences to students, drawing on our specialised knowledge and skills to broaden and enrich students' learning.

We aim to:-

- Continuously improve the quality of our teaching, fostering an attitude of ownership and engagement in respect of education throughout the Institute.
- Encourage within a greater proportion of graduates, the attitude and interest to pursue postgraduate training and research, and further career development within population health sciences.
- Offer outstanding opportunities for postgraduate training in research.

Undergraduate Teaching

While our primary commitment is to education in medicine, we also contribute to education in fields outside medicine that reflect the knowledge and interests of our staff. These activities are important to introduce students in other disciplines to the possibilities of careers in applied health research.

With regard to undergraduate teaching in medicine, our primary aims are to:-

- Improve the quality of the Manchester medical graduate (in the subject areas relevant to population health) with a 'fitness for purpose' as far into the future as it is reasonable to project.
- Make education in 'Population Health' an internationally recognisable hallmark of the Manchester medical graduate.
- Foster an attitude of ownership and engagement in respect of medical undergraduate education throughout the Institute.
- Encourage within a greater proportion of Manchester medical graduates, the attitude and interest to pursue postgraduate training and research, and further career development within Population Health Sciences and cognate areas.

The high concentration of non-medical, non-clinical academic staff in the Institute makes it challenging for us to realise these aims. We are therefore working to achieve better alignment between the research and professional strengths of Institute academics and the needs of the undergraduate medical teaching curriculum. This work will be led and supported by a new Director of Undergraduate Education for the Institute.

Postgraduate Training

The Institute provides two outstanding Masters programmes that use the latest methods in distributed learning to meet the needs of health professionals worldwide. The Masters courses in Occupational Health (Medicine and Hygiene) are delivered through blended learning; while the Masters in Public Health is taught entirely by distance learning. Teaching online is enhanced by captured lectures, audio and video files, as well as remote 'real time' face to face contact with students. Both programmes offer students a wide range of relevant awards – full Masters programmes, postgraduate diplomas, certificates, single units and continuing professional development – that reflect the varied needs of our target groups.

The programmes are taught predominantly by staff from with the Institute of Population Health, actively drawing on the expertise of our epidemiologists, biostatisticians, health economists, public health and primary care research specialists. Occupational Medicine and Hygiene courses are delivered with the close support of a rich and productive group of honorary subject specialists who teach on the programme and support new curriculum development. Resources like 'EELAB' (Electronic Experiential learning, Audit and Benchmarking) are also used to integrate up to the minute research into the taught programme in Occupational Medicine. The quality and flexibility of the MRes – Primary Care – attracts Academic Clinical Fellows (ACF's) from all around the country as well as locally.

The Public Health and Primary Care programmes have sister courses running in Dentistry and Pharmacy, which enable students to access a wide range of appropriate teaching while retaining a speciality focus. The Masters in Public Health is launching a new unit this year on 'Emergency planning and resilience training' written entirely by staff from the Greater Manchester Resilience team, and delivered through the programme to students as well as being made available for CPD (Continuing Professional Development) for Manchester public health professionals.

Blended and distance learning delivery enables us to broaden our recruiting base and access students in Europe, North America and Australasia. Equally important, it also enables us to bring a first class University of Manchester education to students in low and middle income countries in sub Saharan Africa, the Middle East and Asia. Many of these students are self supporting, but the course also has scholarships available for the most able students from Nigeria (10), Tanzania (5), Uganda (10 current 5 completed) and Rwanda (2) funded through the University 'Equity and Merit' scheme as well as the Association of Commonwealth Universities.

The competition in the teaching market means that innovation is crucial. In the last two years, Occupational Medicine and Hygiene have also offered a bespoke version of the programme in Dubai, with local support from the Manchester Business School. Recruitment to the Masters in Public Health has diversified over recent years to include a wider range of clinicians, health promotion staff, researchers and managers, which reflects the changes in public health in the UK.

Both programmes generate considerable fee income (and for EU students a substantial HEFCE income) and continually seek to enhance efficiency as well as quality to ensure that they maintain a healthy return on investment. A recent Faculty costing exercise showed that both programmes continue to demonstrate a good profit.

The Institute aims to develop further opportunities for PGT activity; and to capitalise on existing modules to expand CPD (Continuing Professional Development) activities from existing programmes and develop day courses. There are opportunities within the emerging international premium industry markets for occupational health programmes in the Centre for Epidemiology where we already have considerable expertise in distance and blended learning.

Postgraduate Research

Doctoral students

The Institute has 105 postgraduate research students of which 74 are full time and 24 part time PhD students. Since August 2012, 21 PhD degrees have been awarded. We receive funding for studentships from the MRC, ESRC, EPSRC, and BBSRC. Strategic Studentships funded through the Faculty of Medical and Human Sciences are used to support promising students in developing applications to nationally competitive fellowship award bodies including the NIHR, Wellcome and MRC. Where these are successful the funding is reinvested to support new students to make applications.

The Manchester Doctoral College oversees all aspects of the University's doctoral training and researcher development, integrating postgraduate research support with research career development at an institutional level. The Institute has a student forum in which students meet regularly to discuss issues of mutual interest. Each of the Institute's six Centres also has a postgraduate student representative who sits on the Institute's postgraduate education committee. Students' views/concerns are fed back into the Institute Senior Management Team through the Institute's Director for Postgraduate Education and prompt action taken to meet student needs.

The online progression monitoring system, eProg, provides all research students with clear direction on the critical milestones for their research degree. eProg records evidence of a student's engagement with training and progress, and allows students to export a file of their completed training and milestones to help with further personal development or to add to their CV. The system has been so successful that it has been commercialised under the name "Progress Platform" and contracts have already been signed with three other HEIs: City University London, the Institute of Cancer Research and Anglia Ruskin University.

The Researcher Development Framework is promoted as a skills audit to help postgraduate research students to map out their future development goals.

Chapter 10

Impact

Social responsibility is embedded in the mission of the Institute, the Faculty and the University. We are committed to make a major contribution to the greater good for society through our education and research.

The Institute's mission is to mobilise knowledge from research to improve population health and wellbeing locally, nationally and internationally. We have built strong alliances with local NHS providers and commissioners and used these alliances to effectively translate knowledge from research to improve patient care.

The alliances which have been central to this work are:-

- *Manchester Academic Health Science Centre (MAHSC)*
  The Institute works in partnership with the Haelo, a centre established at Salford Royal NHS Foundation Trust in 2012, to up-skill NHS staff in service improvement methods and accelerate the uptake of research into practice across Greater Manchester through MAHSC and the emergent Greater Manchester Academic Health Science Network (AHSN).
- *National Institute for Heath Research (NIHR) Collaboration for Leadership in Applied Health and Care (CLAHRC) for Greater Manchester*
  The Institute leads the CLAHRC which has successfully worked over 4 years with NHS trusts across Greater Manchester to improve health and care for people with long term vascular conditions.

The challenge going forward is to build on this success, renewing our CLAHRC contract when it ends in December 2013, and making best use of the new opportunities afforded by the –

- *NIHR Greater Manchester Primary Care Patient Safety Translational Research Centre.*
  The Institute leads the Centre, established in 2012 to develop and deploy innovations in patient safety in primary care.
- *Medical Research Council Health e-Research Centre (HeRC)*
  The Institute leads HeRC, established in 2013 to harness UK data for patient and community health benefit. HeRC will provide new informatics tools and training across North England and form a methodology hub in this discipline for the UK.

The impact of research undertaken by the Institute is felt nationally and internationally. Examples of major impacts are summarised below.

Model-based analysis of medical images

Sophisticated medical imaging methods have become ever more widely available, resulting in a flood of data and creating a demand for medical image analysis methods to extract information automatically. Image segmentation – identifying and extracting the boundaries (surfaces in 3D) of specific anatomical/pathological structures – is a key underpinning technology. Before our research, image segmentation applications were created in an ad hoc way, using application-specific algorithms that were labour-intensive to develop and often unreliable. We introduced a completely new paradigm, demonstrating that anatomical knowledge could be captured systematically from a training set of images, and used in an entirely generic way to locate structures of interest in new images, with high accuracy and reliability. The methods we developed have been very widely adopted, leading to both economic and healthcare impacts via both specialist small/medium size enterprises (SMEs) and multi-national companies in medical imaging, pharmaceuticals, and orthopaedics.

Key publications:

- Cootes TF, Cooper D, Taylor CJ and Graham J. Active Shape Models – Their Training and Application. Computer Vision and Image Understanding 1995; 61: 38-59.
- Cootes TF, Edwards GJ and Taylor CJ. Active Appearance Models. IEEE Pattern Analysis and Machine Intelligence 2001; 23: 681-685.
- Davies RH and Twining C, Cootes TF and Taylor CJ. A Minimum Description Length Approach to Statistical Shape Modelling. IEEE Transactions on Medical Imaging 2002; 21: 525-537.
- Twining CJ, Cootes TF, Marsland S, Petrovic V, Schestowitz R and Taylor CJ. A Unified Information-Theoretic Approach to Groupwise Non-rigid Registration and Model Building. Proc. Information Processing in Medical Imaging 2005; 3565: 1-14.
- Cootes TF, Twining CJ, Petrovic VS, Babalola KO and Taylor CJ. Computing Accurate Correspondences across Groups of Images. IEEE Pattern Analysis and Machine Intelligence 2010; 32: 1994-2005.
- Williams TG, Holmes AP, Waterton JC, Maciewicz RA, Hutchinson CE, Moots RJ, Nash AFP, Taylor CJ. Anatomically Corresponded Regional Analysis of Cartilage in Asymptomatic and Osteoarthritic Knees by Statistical Shape Modelling of the Bone. IEEE Transactions on Medical Imaging 2010; 29: 1541-1559.

Improving quality of care through general practice accreditation

Research conducted by the National Primary Care Research and Development Centre (NPCRDC) of The University of Manchester has shaped the design of national systems of accreditation for general practice in the UK, Europe and beyond. Accreditation systems set standards that reflect key aspects of the organisational systems and processes in general practice that are needed to ensure delivery of good quality care. Accreditation systems provide a kite mark of quality assurance and act as platform for supporting continuous quality improvement. NPCRDC developed indicators of quality in general practice structure and organisation, and demonstrated how they could be used effectively to improve quality. Working in partnership with health professional organisations, governmental organisations and other universities, NPCRDC used knowledge from the research to develop systems for general practice accreditation now used in the UK and across Europe.

Key publications:

- Campbell SM, Roland MO, Buetow S. Defining quality of care. Social Science and Medicine 2000; 51: 1611-1625.
- Campbell SM, Braspenning J, Hutchinson A, et al. Research methods used in developing and applying quality indicators in primary care. British Medical Journal 2003; 326: 816-819 / Quality and Safety in Health Care 2002; 11: 358-364.
- Engels Y, Campbell S, Dautzenberg M et al. Developing a framework of, and quality indicators for, general practice management in Europe. Family Practice 2005; 22: 215-222.
- Goetz K, Campbell SM, Steinhaeuser J et al. Does accreditation improve quality in primary care practices? Canadian Medical Association Journal 2011. DOI:10.1503/cmaj.110412.
- Campbell SM, Chauhan U, Lester HE. Primary Medical Care Provider Accreditation (PMCPA). Br J Gen Pract 2010; 60: 295-304

Treatment targeting in drug addiction

Analysis of case data has become critical to understanding problems of drug addiction. Our research has resulted in devising methods to measure the extent and nature of problem drug misuse and to inform treatment interventions and policy decisions. Our methods have been very widely adopted nationally and internationally. We have devised novel ways to link clinical and non-clinical datasets so as to gain better understanding of health and social capital.

Key publications:

- Tantam D, Donmall MC, Webster AJK and Strang J. Do general practitioners and general psychiatrists want to look after drug misusers? Evaluation of a non specialist treatment policy. British Journal of General Practice 1993; 43: 470-474.
- Seivewright N, Donmall MC and Daly C. Benzodiazepines in the Illicit Drugs Scene - The UK Picture and some Treatment Dilemmas. International Journal of Drug Policy 1993; 4: 42-48.
- Crabbe T and Donmall MC. The Optimal size of attributor for use with The University of Manchester Drug Misuse Database. Addiction 1996; 91: 1547-1550.
- Donmall MC. UK Monitoring of Problem Drug Users: the Drug Misuse Database – A System Based on Regional Centres. European Addiction Research 1999; 5: 185-190.
- Millar T, Craine N, Carnwath T and Donmall MC. The dynamics of heroin use: implications for intervention. Journal of Epidemiology and Community Health 2001; 55: 930-933.
- Meier P, Donmall M and McElduff P. Characteristics of drug users who do or do not have care of their children. Addiction 2004; 99: 955-961.

Improving occupational health

UK National Statistics are an important evidence base for Government and others, and hence for impact on the public and society. The Health and Occupation Research Network (THOR) contributes substantially to National Statistics, through the official statistics of the Health and Safety Executive (HSE), with research generated data (since 2002 in the current format, but with antecedents since 1993). This research output disseminated through National Statistics has helped Government and others to determine and prioritise risks to health from work at a UK wide level, target appropriate measures and evaluate the outcome resulting in a tangible impact on the prevention of ill-health.

Key publications:

- Meyer JD, Holt DL, Cherry N, McDonald JC. SWORD '98 surveillance of work-related and occupational respiratory disease in the UK. Occup Med 1990; 49: 485-9.
- Turner S, Carder M, van Tongeren MJ A, McNamee R, Lines S, Hussey LJ, Bolton A, Beck MH, Wilkinson M, Agius R. The incidence of occupational skin disease as reported to the health and occupation reporting (THOR) network between 2002 and 2005. British Journal Of Dermatology 2007; 157: 713-22.
- McNamee R, Carder M, Chen Y, Agius R. Measurement of trends in incidence of work-related skin and respiratory diseases, UK 1996-2005. Occup Environ Med 2008; 65(12): 808-14.
- O'Neill E, McNamee R, Agius R, Gittins M, Hussey LJ, Turner S. The validity and reliability of diagnoses of work-related mental ill-health. Occup Environ Med 2008; 65(11): 726-31.
- Hussey LJ, Turner S, Thorley KJ, McNamee R, Agius R. Work-related ill health in general practice, as reported to a UK-wide surveillance scheme. Br J Gen Pract 2008; 58(554): 637-40.
- Stocks SJ, McNamee R, Turner S, Carder M and Agius R. Has European Union legislation to reduce exposure to chromate in cement been effective in reducing the incidence of allergic contact dermatitis attributed to chromate in the UK? Occup Environ Med 2012; 69: 150-152.

Chapter 10

Assessment of patient experience of NHS primary care services

Improving patient experience of health services is a policy priority worldwide. The University of Manchester has conducted research on patient experience since 1995, leading to the development of a series of validated measures, designed to assess patient experience of quality of care in primary care, including access to care and the degree to which services are patient-centred. Our measures have been in routine use in the NHS since 2004, sent to samples of several million patients. The data has been used to provide incentives for the highest quality practices, and to inform policy makers about current care throughout the UK.

Key publications:

- Mead N, Bower P. Patient-centredness: a conceptual framework and review of the empirical literature. Soc Sci Med 2000; 51: 1087-1110.
- Chapple A, Campbell S, Rogers A, Roland M. Users' understanding of medical knowledge in general practice. Soc Sci Med 2001; 54: 1215-1224.
- Cheraghi-Sohi S, Bower P, Mead N, McDonald R, Whalley D, Roland M. Making sense of patient priorities: applying discrete choice methods in primary care using 'think aloud' technique. Fam Pract 2007; 24: 276-282.
- Cheraghi-Sohi S, Hole A, Mead N, et al. What patients want from a primary care consultation. A discrete choice experiment to identify patients' priorities. Ann Fam Med 2007; 6: 107-115.
- Ramsay J, Campbell J, Schroter S, Green J, Roland M. The General Practice Assessment Survey (GPAS): tests of data quality and measurement properties. Fam Pract 2000; 17: 372-379.
- Mead N, Bower P, Roland M. The General Practice Assessment Questionnaire (GPAQ) - Development and psychometric characteristics. BMC Family Practice 2008; 9:13
- Roland M, Elliott M, Lyratzopoulos G, et al. Reliability of patient responses in pay for performance schemes: analysis of national General Practitioner Patient Survey data in England. BMJ 2009; 339: b3851.
- Mead N, Roland M. Understanding why some ethnic minority patients evaluate medical care more negatively: cross-sectional analysis of a routine patient survey in English primary care. BMJ 2009; 339: b3450

Needs-based formulae for distributing NHS resources

The Department of Health seeks to distribute the NHS budget to local commissioning organisations to achieve equal access for equal need and reduce health inequalities. The formula upon which it bases this distribution must be evidence-based, robust and up-to-date. Applied econometric research undertaken at Manchester and commissioned by the Department of Health developed the methodology for setting budgets fairly and determined the content of the formula in use in England from 2008-date. Adoption of the findings of this research by government has led to a substantial redistribution of NHS funding between areas.

Key publications:

- Vallejo-Torres L, Morris S, Carr-Hill RA, Dixon P, Law MR, Rice N, Sutton M. Can regional resource shares be based only on prevalence data? An empirical investigation of the proportionality assumption. Social Science and Medicine 2009; 69(11): 1634-42.
- Elliott R, Sutton M, Ma A, Skåtun D, McConnachie A, Morris S, Rice N. The Role of the Staff MFF in Distributing NHS Funding: taking account of differences in local labour market conditions. Health Economics 2010; 19: 532-548.
- Morris S, Sutton M, Dixon P, Wildman J, Birch S, Raine R, Chandola T, Orr S, Jit M, Wolff J, Atkinson S, Marmot M. Research on the health inequalities elements of the NHS weighted capitation formula. Final Report. October 2010. Resource Allocation Research Paper 36.
- Sutton M, Whittaker W, Morris S, Glover G, Dusheiko M, Wildman J, Gravelle H, Burrows S, Simpson J, Fé-Rodríguez E, Birch S, Smith PCS. Report of the Resource Allocation for Mental health and Prescribing (RAMP) Project. Report to the Department of Health. December 2010. Resource Allocation Research Paper 36.

Improving quality of care through pay-for-performance

Research conducted by the National Primary Care Research and Development Centre (NPCRDC) of The University of Manchester has shaped the design of pay-for-performance schemes in primary health care in the UK and overseas. Specifically the NPCRDC developed methodologies to: 1) design and test new indicators of care quality; 2) revise and retire existing indicators; 3) structure the financial incentives awarded for indicator achievement to maximise quality improvement and minimise harm. These methodologies have been implemented by the National Institute for Health and Clinical Excellence (NICE) in the UK where they have generated improved clinical care and a reduction in inequalities in the quality of care for people with common chronic conditions (e.g. asthma, cardiovascular disease, diabetes) managed in general practice. More recently, research commissioned by NIHR and the Department of Health and led by the Centre for Health Economics has evaluated three pay-for-performance programmes for hospitals (Advancing Quality, Best Practice Tariffs, and the Commissioning for Quality and Innovation Framework). Findings from the research have been disseminated internationally where they have influenced pay-for-performance schemes in Germany and the United States of America.

Key publications:

- Campbell SM, Braspenning J, Hutchinson A, et al. Research methods used in developing and applying quality indicators in primary care. British Medical Journal 2003; 326: 816-819 / Quality and Safety in Health Care 2002; 11: 358-364.
- Campbell SM, Kontopantelis E, Hannon KL et al. Framework and indicator testing protocol for developing and piloting quality indicators for the UK Quality and Outcomes Framework. BMC Fam Pract 2011; 12(1): 85.
- Lester H, Schmittdiel S, Selby J, Fireman B, Campbell SM, Lee J. The impact of removing financially incentivised indicators on physician performance: longitudinal time series. BMJ 2010; 340: c1898.
- Reeves D, Doran T, Valderas JM et al. Updating clinical performance frameworks: developing a rationale for removing indicators. BMJ 2010; 340: c1717.
- Gravelle H, Sutton M, Ma A. Doctor behaviour under a pay for performance contract: treating, cheating and case finding? The Economic Journal 2010; 120: F129–F156.
- Doran T, Kontopantelis E, Fullwood C et al. Exempting dissenting patients from pay-for-performance schemes: a retrospective analysis of exception reporting in the UK Quality and Outcomes Framework. BMJ 2012; 344: e2405.
- Kontopantelis E, Doran T, Gravelle H, Goudie R, Siciliani L, Sutton M. Family Doctor Responses to Changes in Incentives for Influenza Immunization under the U.K. Quality and Outcomes Framework Pay-for-Performance Scheme. Health Services Research 2012; 47(3):1117-36.
- Sutton M, Nikolova S, Boaden R, Lester H, McDonald R, Roland MR. Association between Mortality and Hospital Pay for Performance in England. New England Journal of Medicine 2012; 367(19): 1821-1828.
- Kristensen S, McDonald R, Sutton M. Should pay-for-performance schemes be locally-designed? Evidence from the Commissioning for Quality and Innovation (CQUIN) Framework in England. Journal of Health Services Research & Policy, forthcoming.

Skills training on suicide risk management (STORM)

Prevention of suicide has been a major plank of UK government mental health policy in the last 15 years. Our group developed and evaluated a method of training a wide range of health professionals in suicide risk assessment and management skills. We then set up in 2003 a not-for-profit venture within The University of Manchester to offer cost effective, evidence based suicide prevention training across the British Isles while continuing to research education interventions in this field. In August 2011, STORM Skills Training was incorporated to continue the business and social impact activities of the STORM Project.

Key publications:

- Morriss R, Gask L & Battersby L. Teaching frontline health and voluntary workers to assess and manage suicidal patients. Journal of Affective Disorders 1999; 52: 77-83.
- Appleby L, Morriss R, Gask L, Green, G et al. An educational intervention for front-line health professionals in the assessment and management of suicidal patients (The STORM Project). Psychological Medicine 2000; 30: 805-812.
- Morriss R Gask L Webb R et al. The effects on suicide rates of an educational Intervention for front-line health professionals with suicidal patients (the STORM project) Psychological Medicine 2005; 35: 957-60.
- Gask L, Dixon C, Morriss R, Appleby L, Green G. Evaluating STORM skills training for managing people at risk of suicide. Journal of Advanced Nursing 2006; 54: 739-750.
- Hayes AJ, Shaw J, Lever-Green G, Parker D & Gask L. Improvements to Suicide Prevention Training for Prison Staff in England and Wales. Suicide and Life-Threatening Behaviour 2008; 38 (6): 708-713.
- Gask G, Lever-Green G, Hays R. Dissemination and implementation of suicide prevention training in one Scottish region. BMC Health Services Research 2008; 8: 246.

Chapter 10

Innovations in statistical methodology for clinical trials

A major focus of MRC funded methodological research in the Centre for Biostatistics is on efficacy and mechanisms evaluation (EME) in randomised trials. This aims to go beyond evaluating whether an intervention is effective to answer whether the treatment is efficacious, by considering the benefit of actually receiving treatment. It seeks to further understand treatments by asking what are the putative mechanisms through which they act and do these mechanisms explain treatment effect heterogeneity. The usual analysis methods have been dominated by decomposing total effects into direct and indirect effects using approaches from the social science literature. By pioneering approaches from the statistical causal inference literature, our new methods extend the traditional approaches and make explicit the underlying assumptions. These methods have so far been incorporated in five NIHR EME funded trials.

Key publications:

- Dunn G & Bentall R. Modelling treatment-effect heterogeneity in randomised controlled trials of complex interventions (psychological treatments). Statistics in Medicine, 2007; 26: 4719-4745.
- Emsley RA, Dunn G & White IR. Modelling mediation and moderation of treatment effects in randomised controlled trials of complex interventions. Statistical Methods in Medical Research 2010; 19(3): 237-270.
- Emsley RA & Dunn G. Evaluation of potential mediators in randomized trials of complex interventions (psychotherapies). In: Causal Inference: Statistical perspectives and applications. Eds: Berzuini C, Dawid P & Bernardinelli, L. Wiley, 2012.
- Dunn, Fowler, Rollinson, Freeman, Kuipers, Smith, Steel, Onwumere, Jolley, Garety & Bebbington. Effective elements of cognitive behaviour therapy for psychosis: results of a novel type of sub-group analysis based on principal stratification. Psychological Medicine 2012; 42: 1057-68.

EME Funded Trials:

- Ketamine augmentation of electroconvulsive therapy to improve outcomes in depression. PI: Anderson (Manchester).
- Dialectical Behaviour Therapy for Treatment-Resistant Depression: A Randomised Controlled Trial. PI: Lynch (Southampton).
- The effects of reducing worry in patients with persecutory delusions: an explanatory randomised controlled trial. PI: Freeman (Oxford).
- The Benefit of Minocycline on Negative Symptoms in Schizophrenia: Extent and Mechanisms. PI: Deakin (Manchester).
- Clinical efficacy of functional strength training for upper limb motor recovery early after stroke: neural correlates and prognostic indicators. PI: Pomeroy (East Anglia).

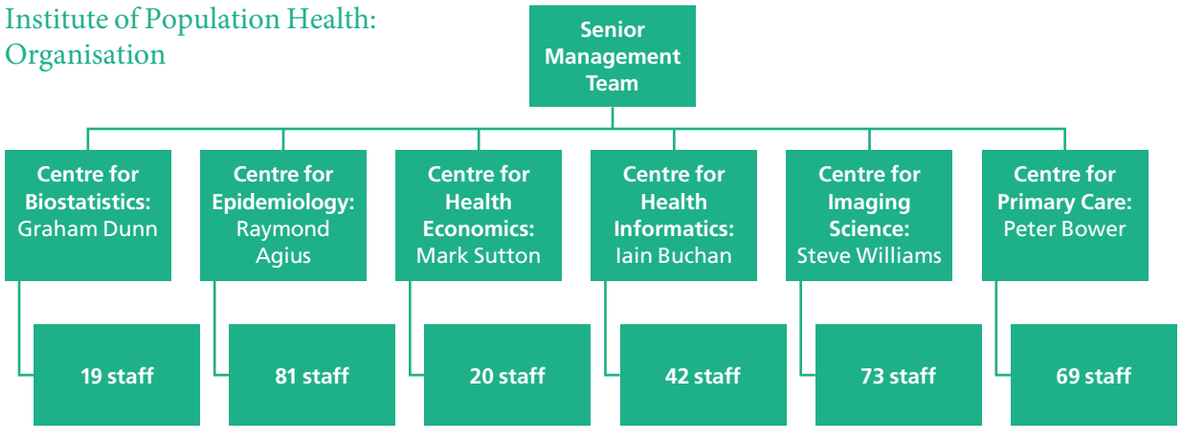
Chapter 11

Organisation and Management

The Institute of Population Health is one of six institutes established in August 2012 as part of a reorganisation of the Faculty of Medical and Human Sciences that is intended to transform our contribution to research and education in medicine and health. More information about the strategy and organisation of the Faculty is available in the Faculty's 2013 Prospectus and five year Strategic Plan.

The Institute is embedded within a matrix structure that promotes interdisciplinary research across the Schools of: Medicine; Dentistry; Nursing, Midwifery and Social Work; Pharmacy; and Psychological Sciences. Four cross-cutting research themes build on the interests and collective expertise of the Faculty's matrix of staff: (a) ageing and the life course; (b) health and social inequalities; (c) prevention and screening; and (d) stratified and personalised health.

Institute of Population Health: Organisation



Staff

Management
The Institute is led by the Director, Professor Bonnie Sibbald, and Deputy Director, Professor Matt Sutton. The Head of Administration is Lucy Crompton, the School Accountant is Ian Storer, and the Human Relations Director is Greg Pass.

Senior Management Team
The Director, Deputy, Centre Leads, Head of Administration, School Accountant, School Human Relations Director, Director for Undergraduate Education, and Director for Postgraduate Education make up the Institute's Senior Management Team. The team meets monthly to agree all matters relating to Institute policy and strategy.

Institute Board
The Institute Board comprises of all senior members of staff. It meets twice yearly to review performance and discuss operational matters.

Research
Research strategy is determined by the Senior Management Team in consultation with academic staff and external advisors.

Other functions
Professor Steve Williams represents the Institute on the Faculty Health and Safety Committee.

Education
The Director for Undergraduate Education is responsible for Institute policy and strategy in relation to undergraduate teaching, linking as appropriate to the Manchester Medical School. Plans are in place to appoint to this post.

The Director for Postgraduate Education is responsible for Institute policy and strategy in relation to the delivery of postgraduate teaching (linking to the Faculty Postgraduate Taught Research Committee), postgraduate research (linking to the Faculty Postgraduate Research Committee and the Faculty Postgraduate Research Degree Panel), and continuing professional development. Dr Andrew Povey is the Director for Postgraduate Education for the Institute. Supported by a number of PG tutors and trainers.

Chapter 11

Staff

There are 312 people line-managed in the Institute, including: 56 academic staff and 140 researchers; a number of specialist software and technical engineers; and 112 members of the Professional Support Services. There are 84 affiliated academic members of staff drawn from Schools in the Faculty of Medical and Human Sciences. In addition 158 honorary staff contribute actively to the Institute's programmes of teaching and research. The Institute has 60 full time and 19 part time postgraduate research students. A full list of our staff and affiliate members is available at: www.population-health.manchester.ac.uk/about-us/staff/

Staff training and development is important for the Institute. Through regularly scheduled meetings, all researchers have the opportunity to discuss and plan their career. For PhD students this is through progression monitoring (e-Prog); for research staff it is through the performance and development review process. For academic staff, we have implemented the 'performance enhancement' initiative developed by the Manchester Medical School which is already yielding benefits in terms of identifying the specific steps that individual academics will need to take to increase research income, produce high quality scientific papers, and enhance both undergraduate and postgraduate education. Where the need for additional training or support is identified, this is organised by line-managers/supervisors and its success reviewed at subsequent review meetings. Institute staff are additionally able to secure mentors through an initiative managed by the Manchester Medical School.

We work to ensure that research staff on fixed term contracts/fellowships are provided with the advice and support they need to sustain and further develop their academic careers. This forms part of the performance and development review process, and the mentoring schemes, described above. In addition, the University runs Research Staff Conference that provides up-to-date information and networking opportunities to research staff from across the University; and has developed a Concordat Implementation Plan to support the career progression of research staff. This received the Human Resource Excellence in Research Award from the European Commission. The University participated in the Careers Research Online Survey 2011 to find out the views of research staff and has incorporated the results into the Concordat Implementation Plan, especially through improving research staff representation on University committees. A Faculty Research Staff Handbook is distributed to ensure that all researchers are aware of the support available to them.

The Institute is committed to the national Athena Swan initiative which aims to promote equality for women in academic roles. The Institute is currently working with colleagues in the Medical School to secure a Bronze level award in 2013, and then plans to work towards the achievement of a Silver level award by 2015.

Space

The Institute occupies space in a number of buildings: specifically Jean McFarlane, Williamson, Stopford, and Ellen Wilkinson on the main campus; and the Wolfson Molecular Imaging Centre (WMIC) in Withington and the Salford Royal NHS Foundation Trust. The buildings occupied by the Institute are generally modern and well equipped. There is pressure on space in the Jean McFarlane Building that will be relieved by redevelopment of the Vaughan Building to accommodate the Centre for Health Informatics with the costs met through £1 million capital investment by the MRC to support HeRC.

Finance

The budget position for 2012/13 suggests a turnover of £27 million for the Institute, with a predicted contribution to The University of Manchester of nearly £7 million. The turnover for the Institute was £24.31 million of which £12.06 million came from external grants and contracts. There has been investment from the Faculty in a number of academic posts (some still in the process of being appointed). The challenge for the Institute will be to ensure that the new appointments and existing staff are supported to deliver the anticipated income required to cover the additional costs.


taxi
Mon - Fri
7 - 10am
4 - 7pm

The University of Manchester
Oxford Road
Manchester
M13 9PL

tel +44 (0)161 306 6000
www.manchester.ac.uk

Royal Charter Number RC000797
M801 09.13