

<p>Institution: UNIVERSITY OF BIRMINGHAM</p> <hr/> <p>Unit of Assessment: UoA2</p> <hr/> <p>a. Overview</p> <p>Research at the University of Birmingham (UoB) is focused in two broad areas: (i) primary care & population health research; (ii) healthcare evaluation & methodology. Across UoA2 there is expertise in the main community focused clinical disciplines: public health, primary care and occupational medicine, and methodological expertise in biostatistics, health economics, clinical trials, evidence synthesis, medical ethics and qualitative research. UoB UoA2 has demonstrable capability and capacity in key disciplines, is located in a campus university with access to collaborators with expertise in 'sister' disciplines (e.g. mathematics, philosophy, psychology, social policy), has access to a large and socially diverse local population, and is located adjacent to one of the largest acute health care provider complexes in the country.</p> <p>Organisationally, UoA2 has two components, both in the College of Medical and Dental Sciences (MDS). The first comprises the School of Health & Population Sciences (HaPS) with 5 research units: Health Economics Unit (HEU, Roberts HoU); Occupational & Environmental Medicine (OEM, Ayres); Primary Care Clinical Sciences (PCCS, Fitzmaurice) incorporating the UKCRC fully-registered Primary Care Clinical Research and Trials Unit (PC-CRTU, Fitzmaurice); Public Health, Epidemiology & Biostatistics (PHEB, Jolly); and Medicine, Ethics, Society and History (MESH, Dawson). The second component is staff working within the NIHR supported, UKCRC fully-registered, College-wide Birmingham Clinical Trials Unit (BCTU, Deeks, Ives) which hosts one of five Royal College of Surgeons Surgical Trials Units. HaPS academic faculty comprises 67 academic staff (21 professorial, 35 SL/reader, 11 lecturer), 75 research fellows, 82 research associates, 11 teaching fellows/tutors, and 107 support staff. A substantial number of project officers and research associates are employed to support the portfolio of externally-funded research activity. The total number of staff in HaPS is around 340, with around 50 staff in BCTU.</p> <p>UoA2 hosts national and regional activities including the national NIHR Horizon Scanning Centre (Stevens), NIHR Birmingham and Black Country Collaboration for Leadership in Applied Health Research and Care (CLAHRC BBC, Lilford), the MRC Midlands Hub for Trials Methodology Research (MHTMR), and the regional centre (Thomas) and local hub (Gill) for the NIHR West Midlands Research Design Service (RDS). Primary Care Clinical Sciences is a founder member of the National School for Primary Care Research (NSPCR) (Fitzmaurice (lead); Calvert, Daley, Gill, Greenfield, Hodgkinson, Holder, Marshall). PCCS also hosts the regional hub and Central England spoke of the Primary Care Research Network.</p> <hr/> <p>b. Research strategy</p> <p>Strategic aims and their achievement</p> <p><u>Vision</u></p> <p>A starting point for the research strategy within UoB UoA2 is its vision: <i>Research aims to be world-leading in terms of its originality and distinctiveness, significance and rigour. The overall research objective is to develop and promote excellence in the health and population sciences with the ultimate goal of improving human health and wellbeing. In achieving this objective, we will strive to develop and maintain a vibrant, dynamic environment that will attract and retain the very best researchers for whom we will provide world-class infrastructure, resources and training.</i></p> <p><u>Strategic aims in light of changes to the research environment</u></p> <p>A strategic aim during this REF period has been to add value by bringing together strong existing departments into a single School. The School environment aims to improve collaboration and cross-disciplinary working, reduce duplication of core activities (e.g. statistics), and improve career development opportunities. The move was facilitated by the 2008 University reorganisation with its new College/School based structure and reduced role for departments. Nevertheless, the School retains a prominent and distinctive Primary Care Clinical Sciences department commensurate with membership of the NSPCR. The overall University environment has also changed with a clearer Strategic Framework and increased investment in research infrastructure to facilitate cross-University, multi-disciplinary</p>
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collaboration. A further strategic focus has been to increase world leading and internationally competitive outputs.

Research groupings and themes

Although staff are managerially based in units, these units do not restrict areas of research. Within UoA2 there are nine strong research themes with international profiles that include individuals from across the research groupings. Five are broadly clustered under 'Primary Care & Population Health Research' and four under 'Healthcare Evaluation & Methodology'. [For the purposes of REF 2 staff are broadly allocated to three groupings of (i) public health and epidemiology, (ii) health services research, and (iii) primary care, which reflect both their discipline and research themes.]

Primary Care & Population Health Research (including epidemiology)

Behavioural Medicine: (leads, **Adab, Daley, Jolly**; contributors, **Cheng, Farley, Frew, Hemming**). The research focus is around exercise, weight control and obesity prevention, particularly developing and evaluating interventions. Key research has focused on impact of: physical activity on blood pressure in children (Knowles et al, Hypertension, 2013), maternal exercise in breastfed babies (Daley et al, Pediatrics, 2012), interventions in pregnancy on maternal weight (Thangaratinam et al, BMJ, 2012), weight reduction programmes (Jolly et al, BMJ, 2011) and giving up smoking on weight gain (Aubin et al, BMJ, 2012).

Cancer Survivorship: (lead **Hawkins**, contributors **Cheng, Frobisher, Reulen**). This programme investigates risks and causes of adverse health and social outcomes in survivors of cancer diagnosed in childhood or young adulthood. It has influenced NHS screening policy. Research uses three large cohorts: the British Childhood Cancer Survivor Study, the Teenage and Young Adult Cancer Survivor Study and the FP-7 funded PanCareSurFup cohort. Key achievements include the first identification of principal causes of premature death amongst childhood cancer survivors as subsequent primary cancers and circulatory problems (Reulen et al, JAMA, 2010), and the particular cancers involved (Reulen et al, JAMA, 2011).

Cardiovascular Disease: (lead **Fitzmaurice**, collaborators **Barton, Calvert, Cheng, Deeks, Gill, Hodgkinson, Holder, Jowett, Marshall, Moore, Riley, Thomas**). This primary care led programme aims to improve cardiovascular health. Key publications have been on: stroke prevention (Sheppard et al, BMJ, 2012); management of hypertension (Hodgkinson et al, BMJ, 2011; Lovibond et al, Lancet, 2011); self-management of oral anticoagulation (McCahon et al, Family Practice, 2010; Jowett et al, Stroke, 2011); and the E-Echoes study showing that prevalence of heart failure is comparable in hard to reach ethnic population groups to the rest of the population. Important links have been developed with Iran (Tehran University of Medical Sciences) where the first fully powered RCT of a Polypill to reduce cardiovascular events is being undertaken.

Maternal & Infant Health: (lead **MacArthur**, contributors **Daley, Daniels, Jolly, Kenyon, Lancashire, Middleton, Maneseki-Holland, Roberts**). This programme aims to improve health and care of women and infants during and after pregnancy and birth. It includes cohort studies to establish risk factors, RCTs to test potentially effective interventions, and systematic reviews. Trials and systematic reviews have shown there is currently no good evidence to support a universal peer support service to **increase** breastfeeding initiation (MacArthur et al, BMJ, 2009; Ingram et al, CMAJ, 2010), but evidence of effectiveness for breastfeeding **continuation** (Jolly et al, BMJ, 2012). A 12 year longitudinal study, the largest, longest postpartum study worldwide on pelvic floor disorders, showed new associations between childbirth-related incontinence and delivery mode history (MacArthur et al, BJOG, 2011; MacArthur et al, BJOG, 2012). Systematic reviews/meta-analyses of the impacts of traditional birth attendants and other interventions on perinatal and maternal mortality have shown benefits (Wilson et al, BMJ, 2011). On-going work is on lay workers in maternity care (NIHR CLAHRC), prolapse prevention (RCOG), position with epidural in 2nd stage labour (NIHR), and maternal health post-birth (NIHR NSPCR; NHMRC).

Respiratory Disease: (leads **Adab, Fitzmaurice**; contributors **Ayres, Barton, Cheng, Greenfield, Jolly, Jordan, Jowett, Lam, Marsh, Moore, Riley**). The focus is to advance understanding of COPD and improve care and outcomes through linked studies and systematic reviews. There is also work on occupational asthma and smoking. Work has drawn on the Guangzhou Biobank Cohort to develop better understanding of COPD risk factors (Lam et al, Chest, 2010; Loerbroks et al, Annals of Behavioural Medicine, 2012) and is establishing the

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largest COPD disease cohort in primary care (Jordan et al, Thorax, 2010; Haroon et al, BJGP, 2013) as a platform for future interventions. Research on occupational asthma costs (Ayres et al, Thorax, 2011) has helped to improve workplace exposures; research on asthma admissions following the smoking ban in Scotland (Mackay et al, NEJM, 2010) influenced bans elsewhere.

Healthcare Evaluation & Methodology

Biostatistics & Test Evaluation: (leads **Deeks, Riley**; contributors **Davenport, Daniels, Middleton, Takwoingi**). UoB has rapidly become a UK and international centre for methodology, primary and secondary test research. The focus is on test evaluation (MRC, NIHR) including involvement in the PROGRESS Group (MRC). The group works closely with the ***HTA & Economic Modelling*** research programme and the clinical trials units. Important outputs include systematic reviews and methods for assessing the impact of tests on patients (Ferrante di Ruffano et al, BMJ) and designs for test accuracy studies (Takwoingi et al, Ann Int Med). The group leads international activity to introduce test accuracy reviews into the Cochrane Library, provides research support for test reviews to NIHR-funded UK Cochrane Review groups and has hosted three international methodology symposia.

Health Technology Assessment (HTA) & Economic Modelling: (leads **Barton, Moore**; contributors **Andronis, Deeks, Girling, Hemming, Ives, Jowett, Lilford, Riley, Roberts, Stevens, Sutton**). This cross school theme has a strong track record in evidence synthesis and economic modelling, using techniques to minimise bias and make explicit uncertainties. It includes the Horizon Scanning Centre (**Stevens**) which supplies timely information about emerging health technologies. Applied work has conducted NICE technology assessments (e.g. Birmingham Rheumatoid Arthritis Model (see Impact case study)), contributed to NIHR funded research and identified emerging public health topics. Methodological research includes work on panoramic meta-analysis (**Hemming, Lilford**) and indirect comparisons (**Deeks, Lilford**).

Service Design & Delivery: (lead **Lilford**, contributors **Calvert, Deeks, England, Girling, Lester, Maneseki-Holland, Riley, Shaw**). This theme aims to develop new methods in evaluating service organisation and delivery, and also focuses on quality of care. It incorporates the CLAHRC research. Key work includes design of step-wedge cluster studies, service delivery research relating to patient safety including the evaluation of standardised mortality ratios (Mohammed et al, BMJ, 2009; Benning et al, BMJ, 2011), developing techniques around pricing and investing in medical devices, health economics in relation to the supply side (Girling et al, Health Econ, 2012) and developing new concepts in patient reported outcome measures (Calvert, JAMA, 2013). Service changes, e.g. strengthening care pathways in youth mental health, have resulted from the CLAHRC programme.

Wellbeing & Capability: (lead **Coast**; contributors **Al-Janabi, Bailey, Barton, Diwaker, Roberts**). This theme is developing methodology for economic evaluation in complex settings where broader assessments of costs and outcomes are required, within sound theoretical frameworks particularly including Sen's Capability Approach. Major activities include the MRC-funded development of the first instruments designed to measure capability for economic evaluation (Al-Janabi et al, QoLR, 2012; Coast et al, SSM, 2008), ERC-funded work on measuring capability at end of life and work on informal care. ICECAP measures are being used in Australia, Canada, USA, Netherlands; in the UK they are recommended for use in social care evaluation by both SCIE and NICE.

Development, promotion and dissemination of research

Applied research is conducted with the aim of directly achieving individual health and wellbeing, and health system benefits. Methodological research has the same ultimate benefit but is achieved through improving methods for future study. The two areas are seen as moving forward iteratively within the UoA, with individual applied studies providing both information for decision-making and a context and vehicle for methodological work, and methodological work informing future applied studies to improve the data available to decision-makers. A good example is the synergy between the evidence synthesis and modelling work within ***HTA & Economic Modelling*** and the work of the ***Cardiovascular Disease*** and ***Respiratory Disease*** themes. The opportunity to participate in both applied and methodological work is seen as vital in extending staff expertise and capacity and in enhancing potential for world-leading research.

Applied work is, often, user-initiated, with clinicians – including both public health and

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primary care clinicians within HaPS, and external collaborators – identifying research issues that will provide greatest potential benefit to patients and other clients within the NHS. The design of studies and/or their distinctive elements (for example economic assessment) is then generally led from within HaPS, for example work by **Roberts** within the *Maternal & Infant Health* programme on the cost-effectiveness of pulse oximetry to screen for heart disorders in newborns (Arch Dis Child, 2012). Resultant studies are both clinically and methodologically strong. Applied work is focused where UoA2 has research strengths and expertise, and includes both systematic review and major primary research.

Current methodological research focuses on particular aspects of method where HaPS has significant expertise, such as *Biostatistics & Test Evaluation* and *Wellbeing & Capability*, and which can be utilised in innovative ways to make progress on difficult issues, for example, design of test accuracy studies, or estimating broader benefits from health care intervention. The primary research focus is those areas of health and social care where the methodological and practical challenges associated with acquiring evidence are greatest and, consequently, current evidence about aetiology, effectiveness, efficiency and acceptability is weakest. Such areas include public health interventions, interventions at end of life, and diagnostic tests.

High quality, peer-review publications are sought for all research findings. Publications are targeted to maximise dissemination to appropriate groups. Where possible, general medical journals with high impact factors (e.g. NEJM, JAMA, Lancet, BMJ) are targeted for applied research findings, and key disciplinary journals such as Social Science and Medicine for methodological papers. Research findings are also disseminated through active engagement with wider public and policy agendas; the Impact Template gives full details.

Sustaining an active and vital research culture, and multi-disciplinary research

An active and vital research culture in part comes from factors discussed elsewhere in this document: the security for staff that comes with achieving substantial research funding (section D), the sense of achievement that arises from success in achieving high quality publication (above), the sense of being part of something larger, that is generated through local, national and international collaboration (section E). There are also aspects of strategy within UoA2 that more directly focus on generating an active and vibrant research culture. There has been a move to increase the number of cross-school activities, whilst retaining the in-depth activities of individual units. Cross-school activities include a weekly seminar series and research themed meetings run on a poster format; recent meetings have included *Cardiovascular Disease*, *Biostatistics & Test Evaluation* and *Maternal & Infant Health*. More focused journal clubs and seminar series are open to all and generally run at lunch times to increase access. These include: health economics journal club (fortnightly) and external seminar series (monthly), 'brown bag lunch' qualitative research meeting (monthly), history of medicine seminar (fortnightly), evidence synthesis journal club (monthly). Part of maintaining an active and vibrant research culture is also to celebrate research successes. This happens through a number of routes. Within HaPS, the Head of School produces a weekly newsletter ('Good News Friday') celebrating the achievements of staff at all levels, and circulated to senior College/University staff. The College celebrates the best paper and grant each month. Individual units highlight achievements through internal and external newsletters. The positive environment within UoA2 is emphasised by feedback to the School following the 2011 Staff Survey, which showed staff in HaPS to be highly committed and motivated (86% 'motivated to contribute more than normally required'; 92% 'willing to go the extra mile')

Future strategic aims and goals for research

The UoA plans to proceed with structural changes that enhance what has been achieved to date, by bringing together the elements of HaPS that contribute to UoA2 with the clinical trials units elsewhere in the College to form a single Institute of Applied Health Research where all cognate disciplines are co-located within one research environment. This shift will require further integration of new areas of expertise in relation to trials, and continued strengthening of whole school activities designed to further facilitate joint working. It will also require changes to physical location of staff. UoA2 staff are currently located in seven buildings across campus and a priority is to work with the University to increase co-location. The UoA will also move towards conducting public health trials, responding to the Cabinet Office report calling for more

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policy relevant trials covering social services, education and criminology.

More generally, UoB UoA2 will continue to target resources towards research programmes where there is, or is potential for, world-leading and internationally relevant research (section C). New areas of research investment will be carefully selected in response to identified national priorities and/or innovative ideas generated through the extension of cross-University collaborations (section E). Plans for developing, promoting and disseminating research will proceed as currently, with the addition of specific aspects related to increasing impact, detailed in the Impact Template. Specific plans for individual programmes are outlined below, indicating the sustainability of these research areas:

Behavioural Medicine has already achieved significant research funding into the next REF period for major trials in childhood obesity prevention (NIHR) and interventions for weight management (NRPI) and a research programme in rehabilitation enablement. There are plans for work relating to pregnancy and weight, and interventions to maintain behaviour change. Underpinning the Cancer Survivorship programme are major grants, including FP-7 funding. Plans here include extending the 'outcomes' and 'exposures' available to two of the cohorts through using patient electronic record linkage to link to Hospital Episode Statistics (and equivalents) and other sources such as the Blood and Marrow Transplantation Registries. There will also be linked randomised intervention studies of different models of care. Future work within the Cardiovascular Disease programme will focus particularly on venous thrombosis and oral anticoagulation, areas where funding has already been secured into the next REF period and where a further programme grant is currently under consideration. HaPS staff have a world-class portfolio of research in Maternal & Infant Health. A new Centre for Women's and Children's Health in the University (**MacArthur**, deputy director) with colleagues in Clinical and Experimental Medicine, MDS, will bring together researchers in obstetric and neonatal care, child health, genetics and parenting. This chimes with national policies informed by the Marmot Review highlighting the importance of the period from pre-conception to 5 years in improving health and reducing social inequality. Other plans include continuation of CLAHRC projects through the newly funded CLAHRC-WM (West Midlands), 20 year follow up of the postpartum cohort of pelvic floor disorders, and evaluation of maternity care provision in response to NIHR and international priorities. The sustainability of the Respiratory Diseases programme into the next period is also assured through a critical mass of staff across the disciplines, key infrastructure in terms of cohorts, and a recent NIHR programme grant focusing on COPD in primary care. With Mathematics, the Biostatistics & Test Evaluation programme has plans to develop a Centre for Biostatistics. New work in the HTA & Economic Modelling programme will focus on the model-building process, combining qualitative methods with expertise in modelling to develop improved methods in this area. Future work on Service Design & Delivery will link particularly to plans in the newly awarded CLAHRC-WM bid which has four service and two cross-cutting themes (maternity and child health; prevention and early detection in youth mental health; prevention and detection; chronic diseases; implementation and organisation studies; and research methods). Current ERC funding provides a platform for work on Wellbeing & Capability, and the particular foci of this programme will be to continue research in end of life care and informal care, and to develop capability measurement in children.

c. People

Staffing strategy and staff development

Sustainable staff structure

There has been reorientation of funding within HaPS, with strategic focus on core support to methodological work and to major research programmes. This increases the sustainability of the staff structure for generating world-leading research underpinned by appropriate disciplinary expertise. Strategic investment in methodology includes a new chair in public health ethics (Dawson), two new senior posts in health economics (**Jowett, Roberts**), increased core funding for established posts in health economics and biostatistics (**Barton, Coast, Frew, Hemming, Riley**). Strategic investment within key research programmes has included core funding for Maternal & Infant Health (**Kenyon, Maneski-Holland**), and Cancer Survivorship (**Frobisher, Reulen**). The sustainability of the staff structure has also been enhanced by improving links between activities within UoA2. For example, links between HaPS and BCTU have been strengthened by appointing **Deeks** (joint research lead for HaPS) as BCTU Director and the focus of newly-appointed qualitative staff (Jones, Lindenmeyer) will be on enhancing trials

based activity. This strategic investment will continue into the next REF period.

The UoA has always had a strong awareness of the importance of developing and retaining new staff, but the importance of this has been emphasised during this REF period by the departure of a core of senior professorial staff. During 2011-12 UoB UoA2 lost eight research-active professors for reasons including retirement, ill health and change of institution. Primary care has been particularly affected and a strategy focusing on recruiting young researchers on a rapid career trajectory has been successfully implemented. Although there is national lack of capacity within methodological disciplines and consequent difficulties in appointing internationally excellent staff, the relatively high number of such staff within UoB UoA2 aids the UoA's strategic focus on 'growing our own staff' from more junior levels. HaPS aims to expand the training of non-clinical and clinical research students, postdoctoral researchers and research fellows both to attain recognition as an international centre of excellence in research training and to generate future senior capacity. Retaining the strongest of our early and mid-career researchers is a central element of the future research strategy.

The UoA fosters an active programme of capacity-building for researchers, evidenced by success in MRC (e.g. **Al-Janabi**, also awarded Birmingham Fellowship), Wellcome (e.g. **Diwakar**), NIHR (e.g. **Andronis, Daley, Jordan, Reulen, Takwoingi**) studentships/fellowships and ERC funding under the Ideas programme (e.g. **Coast**), with 27 members of the School having been awarded external Fellowships this REF period. Continued early identification of potential applicants and support in developing applications is an important future strategic goal.

Effective development and support of research work/Research career development

Each of the constituent units of UoA2 has a Head who line-manages unit staff. A number of cross-school positions are held by senior staff and designed to provide strategic leadership in research, teaching and learning, and staff development. HaPS School committees including the Executive Committee and committees for research, learning and teaching, and for early career researchers provide for discussion around strategic development in all of these areas.

In relation to personal career development, a new Performance and Development Review (PDR) scheme is being implemented. The UoA is now conducting compulsory formal review at least once every 12 months, with a dual focus on career/personal development of the individual and performance benchmarked for the discipline. The new PDR is the culmination of regular dialogue, thus ensuring greater on-going support.

All staff are encouraged to participate in learned societies, symposia, conferences and further training opportunities, and funds are built into funding applications as well as being available on a competitive basis through the School, College and University, to facilitate this.

Integration of clinical academics and NHS-employed active researchers

25 academic staff hold honorary consultant (including GP) contracts with local trusts. A number of staff (e.g. **Jolly, Marshall**) are dual qualified in both public health medicine and primary care. Such links facilitate development and evaluation of evidence-based local interventions and services, both also major components of our CLAHRC, thus producing more widely generalisable findings (e.g. **Jolly's** breastfeeding research and LightenUp study). Academic clinicians play major roles in training junior doctors with HaPS running the regional public health academic training programme, and offering a suite of placement options to enable trainees to experience clinical academia. These activities enhance the School's 'grow your own' policy with six current senior faculty having taken part in these placements, and a further five presently occupying clinical research fellow/lecturer positions.

Early Career Researchers (ECRs)

There are more than 100 individual researchers based within HaPS and BCTU who are pre-doctoral, post-doctoral or who would more formally be defined as ECRs using the REF definition. Within UoB's UoA2 these are all referred to as ECRs and it is in this sense that the term is used here. The University, College and School, have taken forward a number of activities to support the *Concordat to Support the Career Development of Researchers*. Within UoA2, ECRs are strongly encouraged to engage with the many opportunities to learn from colleagues such as journal clubs and writing weeks, thus to further their development within the relevant disciplines and research activities. Activities are conducted to encourage engagement from all staff members. ECRs are fully integrated into the PDR process.

ECRs are encouraged to engage with the wider College and University. The College PERCAT initiative - Postdoctoral/Early Researcher Career Development and Training – aims to foster a group identity among ECRs, provide training and careers advice, and promote ECR participation in decision making processes. The PERCAT group is run by academic staff and ECR representatives from each school. Training is provided through a programme of MasterClasses on diverse topics (such as career planning, funding, public engagement, intellectual property), as well as more in-depth scientific writing workshops run by Scriptoria. Through PERCAT, ECRs are encouraged to make use of the mentoring programme and there is a PERCAT website, bringing together opportunities available to ECRs. Small funding amounts are available on a competitive basis to ECRs through the College-wide Research Development Fund, as a way into starting to develop their own funding proposals. ECRs are also encouraged to engage, as with all staff, with the wider disciplines through attendance at conferences and symposia and participation in learned societies.

Research students

Research students within UoA2 are registered through HaPS. At present 104 Postgraduate Researchers (PGRs) are registered in the School (71 Normally Registered, 31 Thesis Awaiting, 2 Leave of Absence). The School aims for a diverse portfolio of doctoral student-funding, including both doctoral fellowships (NIHR, Wellcome) and more traditional competitive studentships (CLAHRC, EU, MRC, NSPCR, School/College funding), and to attract the strongest students. The School Director of Graduate Studies (**Calvert**), supported by a School Graduate Studies Committee with staff and student representation, oversees recruitment and monitors progress and training needs within the School. University/College wide Quality Assurance processes for PGR students are implemented. Each PGR is appointed a minimum of two supervisors with relevant skills and expertise, and a mentor to provide pastoral care. Lead supervisors must have experience of supervision to successful completion. All supervision meetings are recorded in writing (GRS2 forms, also used to monitor attendance and ensure compliance with UK Border Agency regulations) and PGRs annually complete a reflective Development Needs Analysis. A formal review of PGR progress is undertaken each year in the form of a progress report (and transfer documentation where appropriate), a formal presentation and interview with a panel of senior academics. Individual feedback and, where necessary, supportive action is provided.

Generic research methods training is provided by MDS whilst more tailored training and support is provided by HaPS, including advanced statistics, HTA, qualitative research methods and clinical trials. Students are able, and encouraged, to access a diverse programme of University Graduate School developmental workshops, networking and training opportunities. They have won a number of awards at the University Graduate School Research Poster Conference, the Leading Academics Programme and the College Research Gala. Students are encouraged to participate in symposia and conferences and to undertake visits to international institutions; students, for example, have recently obtained funding through the Universitas 21 scheme for visits to University of Melbourne/Monash and University of British Columbia.

Recent developments have included: (i) a new HaPS induction process to complement the College induction (in response to student feedback); (ii) a PGR training guide; (iii) web based profiles for PGRs to improve visibility of students to potential new students and employers; and (iv) training and networking events for PGR students, including sessions responding to needs expressed by students on 'getting your work published', 'funding opportunities' and 'early career development' delivered by internal senior academics and external speakers (e.g. BMJ, NIHR). Student feedback is extremely positive. Currently, HaPS is actively seeking to build supervisory capacity with support for new supervisors. The School also plans to develop peer support for PGRs and will continue to hold networking and training events to support PGR needs.

Equality and Diversity

A vibrant and sustainable research culture arises in part from a sense of equality among diverse groups. The development of an inclusive culture where all staff and students are valued has been recognised in relation to gender by the award to MDS of an Athena SWAN bronze award. The UoA is very supportive of family friendly and flexible working practices, and

encouraging women in academic medicine; most women choose to return following maternity leave. HaPS has developed career development advice and assistance to increase the likelihood that promotions, reward and progression are more equitable and transparent. This advice and assistance is available for all staff but is advantageous to females who are less likely to self-initiate in terms of advancement. It is notable that many lead staff within the UoA are female, including the Head of HaPS, one of two joint research leads, the director of graduate studies, two of five heads of unit, and five of 12 involved in leading research themes. Many of these women also work part time (e.g. **Calvert**, director of graduate studies, 60-80% over the REF period; **Coast**, joint research lead, 70-90%; **Jolly**, head of PHEB, 60-100%; **Roberts**, head of HEU, 80-90%) emphasising the possibility of career progression both as a woman and one working part-time. Such role models are vital in generating an atmosphere where expectations of academic involvement and career progression are equal. Across UoA2 the proportion of women submitted is 51%, compared with the proportion of women in the UoA of 52%. For part-time workers (which include some men) these proportions are 27% and 23%.

d. Income, infrastructure and facilities

Research Income

There has been a sustained level of grant acquisition over the REF period with commensurate quality and quantity of outputs. Research themes are supported by large grants from NIHR, MRC and EU; significant NIHR funding (e.g. in venous thromboembolism, respiratory disease, obesity prevention in children) has been achieved across many areas of national priority, providing sustainable programmes of research into the future. Income has also been acquired to host national and regional activities. These include: the national NIHR Horizon Scanning Centre; NIHR Birmingham and Black Country CLAHRC and subsequent CLAHRC-West Midlands; the MRC MHTMR; and the regional centre and local hub for the NIHR West Midlands RDS. HaPS has received significant NIHR investment for clinical trials, health economics and primary care; the latter via Primary Care's membership of the NSPCR.

Nature of research infrastructure

The location of UoB within Birmingham's mixed and diverse population and its partnership with the NHS allows exceptional access to patients and unique opportunities to assess cultural and ethnic differences in health care management, attitudes and access to healthcare. Birmingham's population (>5.5m) is accessible via large, well-managed NHS Trusts and primary care networks. A partnership with the local teaching hospital (UHBFT) through Birmingham Health Partners (BHP) ensures implementation of a joint research strategy, whilst reducing bureaucratic burden and managing NHS R&D. BHP is part of a broader network recently consolidated in the West Midlands Academic Health Science Network. The £12.8m Birmingham Wellcome Trust Clinical Research Facility is an outstanding example of the partnership's effectiveness, providing a platform for cutting edge translational research. Facilities now extend to include Birmingham Children's Hospital, and into the community via use of the 'Health Research Bus', a fully mobile clinical research facility to access patients in primary care. This partnership is an important element within the new CLAHRC funding.

UoB UoA2 provides strong support structures for clinical trials with the three UKCRC fully-registered Clinical Trials Units (BCTU; PC-CRTU; and the Cancer Research Clinical Trials Unit) brought together under the banner of the Birmingham Centre for Clinical Trials (BCCT) and supported by a comprehensive expert infrastructure in trial methodology, including the MHTMR.

Within UoA2 a research facilitator provides an interface between research groups and the wider College and University research and administration teams, enabling support for academics from initial funding application through project management, dissemination and eventual impact. The research facilitator belongs to a team of facilitators within the College Research & Knowledge Transfer Office. This office provides academics with a direct interface to the NHS, technology transfer infrastructure, public engagement support and strategic project management, ensuring that every researcher and each new research project proposal integrates and accesses pathways to impact as part of their on-going activity. There is also training for post-doctoral researchers in these activities. This office closely integrates with the University's Research and Innovation Services at institutional level, which provides a corporate level of strategic research engagement as well as professional support services for specialist research with particularly excellent support for EU funding. A College Strategic Research

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Committee, including senior and junior representation, meets monthly to report activity, discuss issues (e.g. public engagement, clinical trials activity) and make strategic decisions. Infrastructure and support relating to collaboration is detailed in section E.

Within the University, Library Services supports staff information resource needs and provides access to one of the largest academic libraries in the country with 2.7 million items and over 50,000 journals (electronic and print). This is a vital resource for research programmes within UoA2, particularly *HTA & Economic Modelling*.

Policy and practice in relation to research governance

All research aims to comply, as appropriate, with either relevant external regulatory frameworks or internal University processes. UoB operates a centralised ethical review process, applying to all staff and postgraduate student led research, beginning with submission of the online University Ethical Review of Research Self-Assessment Form, which indicates whether the research is subject to NHS National Research Ethics Service (NRES) or University review. There is a clear administrative structure around clinical research governance in UoB. The Research Governance Team provides day to day management of Sponsorship and ethical review issues across the University including research conducted outside the Research Governance Framework and the Medicines for Human Use (Clinical Trials) Regulations. Where there is agreed Sponsorship, the team provides support to clinical research, including research governance documentation, development of clinical site agreements, and insurance referrals. The Clinical Research Compliance Team's key responsibilities relate to clinical trials, including: developing University wide clinical trials policies and Standard Operating Procedures to ensure the trial is compliant with approved protocol/amendment(s), Good Clinical Practice (GCP) and regulatory requirements; monitoring, auditing and reviewing serious breaches; supporting University staff. The compliance team works closely with both BCTU and PC-CRTU.

e. Collaboration or contribution to the discipline or research base**Collaboration**

Collaboration and involvement with other disciplines is a large part of the vibrant research culture within UoA2. Almost all research programmes include individuals with different disciplinary expertise and multi-disciplinary working has been enhanced by the organisational changes. The University encourages cross-College working and collaboration. A new Institute for Advanced Studies (IAS) promotes interdisciplinary research by combining expertise from across the breadth of the University to address major cross-cutting themes that are important, relevant and timely; staff have been involved in themes including capability measurement, sexual health and medical termination of pregnancy. Staff are generally encouraged to actively pursue cross-College links, a recent example being the 'Nano Forum' set up by OEM for those across the University researching aspects of nanotechnology. Within MDS, Research Centres of Excellence (e.g. Centre for Obesity Research; Birmingham Centre for Clinical Trials), aim to maximise cross-disciplinary interactions around strategic areas of research strength.

UoA2 academics collaborate with colleagues from other Schools in MDS in a number of research areas. First, there are collaborations through interests in specific disease/health areas; for example obesity, respiratory disease, maternal and neonatal health. Second, and more recently, HaPS academics with expertise in applied health research methodologies (for example health economics, clinical trials, biostatistics, medical ethics, evidence synthesis) are forging new relationships with both basic and clinical scientists to move medical research from the laboratory via the bedside to the population. Examples include the newly formed NIHR Surgical Construction and Micro-biology Research Centre (**Lilford** co-ordinated application), BCTU, the on-going portfolio of work undertaken by CLAHRC and the Health Innovation Education Cluster. Third, HaPS is developing stronger links to other relevant academic units in the wider University including Environmental Sciences, Psychology, Philosophy, Sports & Exercise Science, Economics, History and Health Services Management Centre, ESRC Third Sector Research Centre and the Institute of Local Government Studies; new teaching programmes are being established with colleagues working in Economics and in Mathematics.

The UoA has strong relationships with the local NHS: clinical staff hold honorary NHS contracts with a number of Trusts (most usually community-based trusts rather than acute Trusts), and HaPS is responsible for the academic training of postgraduate doctors working in general practice, public health and occupational health. In addition, HaPS has a large, and

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developing, CPD portfolio. **Stevens** is current Chair of the Birmingham and the Black Country Comprehensive Local Research Network. The new CLARHC-WM links with local authorities which have acquired responsibility for public health functions as well as NHS organisations across the West Midlands.

Support for external collaboration is provided through the University's Research and Innovation Services. All research themes have extensive national collaborations, too numerous to list. There is a formal external collaboration between HEU and the Arthritis Research Primary Care Centre at Keele University, providing opportunities to include health economics in studies at the forefront of musculoskeletal research. The new CLAHRC-WM includes formal collaboration with Warwick Business School and Keele University. A number of themes have developing international collaborations, with key collaborations including: Behavioural Medicine - University of Hong Kong (Macfarlane), University of Queensland (Brown); Cancer Survivorship - European collaborators through the FP-7 funded PanCareSurFup Cohort; Cardiovascular Disease - Barcelona Vascular Clinic (Montreal), University of Auckland (Doughty), McMaster (Douketis), Leiden University (Rosendaal); Maternal & Infant Health - Universities of Melbourne (Brown, Gunn), Toronto (Dennis), Otago (Wilson, Herbison), and AKU, Pakistan (Jokhio); Service Design & Delivery - University of Michigan (Hofer), RAND Health (Shakelle), Karolinska Institutet, Sweden (Ovretveit), University of New South Wales (Braithwaite); Wellbeing & Capability - Erasmus University Rotterdam (Brouwer, Hoefman, van Exel), University of Technology Sydney (Flynn), Monash (Lorgelly, Richardson).

Contribution to the discipline and wider research base

Staff contribute on an individual basis to the discipline and wider research base both nationally and internationally, bringing their particular expertise to a broad set of academic and policy endeavours. In the UK, there are contributions through the Royal Colleges, UK Government departments, NICE, research funding panels and external examination of doctoral students. At a national level, HaPS staff play significant roles in both professional and academic fora: **Gill** is RCGP Clinical Champion for Social Inclusion; **Kenyon** is member of the RCOG Research Committee; **Thomas** is Educational Associate at the GMC and the UK Medical Schools' representative on the UK Foundation Programme Office Rules Group. Staff undertake advisory roles to various UK Government departments, to Commissions, and to *ad hoc* Chief Medical Advisor Working Groups (e.g. **Ayres**, chair of DEFRA's Advisory Committee on Pesticides (ACP)). HaPS staff play significant roles in NICE with **Stevens** being Chair of the NICE Appraisal Committee and the NICE Methods Working Party, and others being members of advisory committees (**Cheng, Kenyon**). Staff contribute both to setting UK research priorities (**Kenyon**, NIHR maternity panel) and the evaluation of UK funding proposals, with many staff involved as grant reviewers for the major national funding bodies (AHRC, ESRC, MRC, NIHR, Wellcome) and some involved further as panel members (e.g. **Cheng, Deeks, Fitzmaurice, Frew, Gill, Roberts**). Two professors hold NIHR Senior Investigator awards (**Deeks, Lilford**).

Internationally staff contribute through overseas committees, journal editing, research funding panels and external examination. **Cheng** is Member of the Advisory Committee, Chinese Society of General Practice, China Medical Association; **Hawkins** is Scientific Advisor to the French, German and Japanese National Committees for follow-up of child / young adult cancer survivors. A number of senior staff are Journal Editors/Members of the Editorial Boards of major international journals (**Barton**, *Medical Decision Making*, **Coast**, *Social Science & Medicine*; **Deeks, Davenport, Takwoingi**, *Cochrane Library Diagnostic Test Reviews*; **Deeks, Riley**, BMJ; **Fitzmaurice**, *British Journal of Cardiology*; **Riley**, *Statistics in Medicine*) or have served as panel members for other country's research councils (e.g. **Coast**, Netherlands NWO). Staff have acted as External Examiners for Universities outside the UK (e.g. **Coast, Roberts**).

Contributions to the wider research base also arise from the involvement of the School in activities specifically designed to provide such contributions. Such activities include the work of the NIHR Horizon Scanning Centre (**Stevens**) which, through identifying emerging technologies, directly influences research priorities within the UK. The NIHR Horizon Scanning Centre both provides the first such centre and provides a model for other countries. These activities also include involvement in national collaborative activities such as the NSPCR and the MRC MHTMR which are specifically designed to develop the research base in a particular area.