

Institution: Lancaster University

Unit of Assessment: 3 Allied Health Professions, Dentistry, Nursing and Pharmacy

a. Overview

Described as a '**transformational project**' in the University's Strategic Plan (2009-15), the Faculty of Health and Medicine (FHM) was established in August 2008 to create a new and integrated structure for research at Lancaster University. FHM has fused previously separate groupings in biomedical science, health research and clinical medicine, 60% of whose research was rated as at least 3* (world leading or internationally excellent) in RAE2008. In only 5 years we have created an environment that: supports and promotes the highest quality research; encourages outstanding academic staff to come to, and remain at, Lancaster; and shapes practice and policy here and abroad.

Research in the Faculty transcends the three research departments (Biomedical & Life Sciences; Health Research; and Lancaster Medical School). Our research is organised around six main clusters: **1. Ageing; 2. Biostatistics; 3. Cancer; 4. Infectious Diseases; 5. Mental Health; and 6. Public Health.** Evidence for the vitality and sustainability of our research environment and these clusters is presented below.

From its inception, research in FHM has been **multidisciplinary** in approach, and this has been enabled and enhanced over the last five years by a £19.5 million investment in outstanding laboratory facilities and newly-refurbished office accommodation (resulting in the co-location of all staff), and an accompanying 49% expansion in total staff numbers from a baseline FTE of 104.1 (48 individual category A academic staff, 45.2 FTE) to the current staffing level of 154.9 FTE (83 academic staff, 76.6 FTE, 69% increase). The number of registered postgraduate research students (PhD/Doctorate/MSc by Research) has increased from 34 to 270 on 31/7/13, this including 54 full-time PhD students and 174 on our new part-time PhD programmes. Our annual research spend has increased from £2.1 million in 2008/09 to £2.9 million in 2012/13, and our awarded grants for 2012/13 amount to £4 million. Our total volume of research outputs during the REF period includes 1049 journal articles, 39 books, and 110 book chapters.

Although the HE sector has become extremely volatile, Lancaster University in general, and FHM in particular, has been very successful in expanding its activities on the back of strong income performance (consistently generating income more than 40% over expenditure, the financial model on which the university operates). Current projections indicate that maintaining this growth remains feasible and sustainable over the next REF period, which should realise more than 100 academic staff by REF2020 - *more than double our initial numbers in 2008.*

The research environment has achieved considerable improvement during the assessment period. In RAE2008, part of the former Departments of Biological Sciences and Medical Education were returned to UoA12 Allied Health Professions and Studies; the (then) Institute for Health Research was returned to UoA40 Social Work and Social Policy & Administration; and part of the Department of Mathematics and Statistics to UoA22 Statistics and Operational Research. Staff previously returned in these separate UoAs have now come together in FHM, and our submission to UoA3 is almost wholly congruent with FHM. This integration is a step-change since 2008.

b. Research strategy

The overall *mission* of FHM highlights the promotion of outstanding biomedical, clinical and social scientific research, reinforcing our position as a sustained centre for research excellence, and fostering national and international links. Our research strategy has included, and continues to include, the following *four elements*:

- Developing, recruiting, and retaining *world class academic staff*, thereby building on our success in RAE2008 and further strengthening the six main research clusters;
- Growing and maintaining *diverse income streams* and ensuring that we have the *investment in infrastructure* to support our research;

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- Sustaining existing and developing new *doctoral programmes* in areas of significant research strength;
- Ensuring that our research informs, and is informed by, key stakeholders, in particular embedding a strong *user voice* in much of the research we undertake.

Elaborating on these:

First, our strategy has been to make targeted appointments to academic posts during the REF period in *an explicit attempt to enhance the six research clusters*. Examples at Professorial level include Hölscher (ageing and neurodegenerative disease), Bates and Sinkins (infectious disease) and Hollingsworth (public health/health economics). At Senior Lecturer level we have appointed McDermott, Reilly and Walshe to support public health and palliative care. In the last 3 years we have also recruited 24 Lecturers whose careers we intend to develop through to the next REF. We will maintain and if possible grow all our existing research areas (and nurture the accompanying researchers), but the following are priorities for further expansion: healthy ageing and age-related diseases, palliative care, psychological treatments for mental health disorders, health economics, bioinformatics and pharmacology (the latter in collaboration with Lancaster's Chemistry department).

Second, we have continued to grow the value of our awarded grants, which amounted to over £20 million during the REF period, of which 32% has come from NHS and other health bodies, 20% from Research Councils, 20% from charities, 11% from EU, 6% from government and 5% from industry, as well as substantial philanthropic donations. We have put in place mechanisms to develop and support research grant applications and to maximise the prospects of success. These include: employing a Research Officer to alert colleagues to research opportunities; a research grant writing review process to maximise the chances of success; and networking events among colleagues (supported by the Faculty's Staff Development Fund) inside and outside the Faculty, to forge collaborations to both generate new knowledge in and impact on health policy and practice. The Faculty also manages departmental bids to the University for major items of equipment (detailed in section d) and has been involved at all stages in the refurbishment of new and state-of-the-art laboratory facilities for incoming academic staff. To stimulate new research opportunities regular Faculty-wide research colloquia are organised, including internal and external speakers, from both biomedical and social science backgrounds. Topics have focused on our main research areas but generic topics have included talks from significant figures engaged in NIHR agenda-setting; for example Professor Tom Walley (Director of the Health Technology Assessment programme); Dr Louise Wood (Head of Innovation and Industry, Department of Health); and Professor David Croisdale-Appleby (Chairman, Skills For Care). We run annual colloquia ('Spotlight on Health and Medicine') that bring together speakers from across the University to share their research in a multidisciplinary setting.

Third, our goal has been to increase research student recruitment and this has been accomplished in the main by developing a range of part-time PhD programmes (Mental Health, Palliative Care, Public Health, and Organisational Health & Well-Being) for students in employment, and by the continued buoyancy of our Doctorate in Clinical Psychology and full-time PhD programmes. New appointments (Cowlshaw, Dodd, Limmer, Reilly, and Walshe during the last two years) have been made that underpin these very innovative and successful professional doctoral programmes (which recruit globally). We will consolidate these programmes but also expand numbers of research students in laboratory-based biomedicine. To this end, in 2012-13 we released funding to support recruitment of 6 additional PhD students; another 6 have recently started in 2013-14, with a commitment to continue recruitment at the same level.

Fourth, since our strategy involves engagement with stakeholders outside FHM we have put in place mechanisms (notably, our Clinical Research Hub, a partnership with local NHS Trusts) to ensure that our research addresses the knowledge exchange and impact agenda. FHM *leads* the University's Public Engagement Strategy, acknowledging that we embed user involvement in much of our health and social care research. We have established and supported Partnership Groups to ensure users' views influence our work. We include people affected by disabilities and limiting illnesses through participatory, user-led and action research projects, actively recruiting such people as research assistants on projects. In our Spectrum Centre for Mental Health Research the

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core funded team includes a service user researcher who helps to set the research agenda. This post ensures involvement at all stages of our research, including dissemination.

The overall research strategy in FHM is led by the Associate Dean for Research (Bates) and is managed via the Faculty Research Committee; this includes members from each department and elected representatives of early career staff and postgraduate research students.

Research clusters

The strategy outlined above involves providing continuing strong support to sustain the **six research clusters of critical mass** within FHM. Each of these clusters:

- addresses issues of national and international importance in health and biomedicine;
- delivers research excellence;
- reflects the multidisciplinary nature of our research portfolio.

While many of our submitted staff are associated with a single research cluster the 'boundaries' between these groups are deliberately porous and we encourage cross-fertilisation and the sharing of expertise and ideas.

The research clusters are as follows:

1. Ageing:

- i) Mechanisms of normal ageing using *Drosophila* as a genetically tractable model system (Broughton, Clancy, Shirras)
- ii) Age-related diseases, including neurodegenerative, joint and eye diseases (Allsop, Crawford, Dawson, Fullwood, Goodacre, Hölscher, Lauder, Owen-Lynch, Sünram-Lea)
- iii) Supportive and end of life care (Bingley, Froggatt, Payne, Preston, Turner, Walshe)
- iv) Place, health and well-being of ageing populations (Bingley, Gatrell, Milligan, Simpson)

Ageing research is given additional visibility by the **Centre for Ageing Research (C4AR)**, a formally recognised Lancaster University Research Centre (directed by Milligan) that involves researchers from across the University. Milligan has particular interests in 'healthy ageing' and enjoys close research links with Age UK. C4AR is researching links between ageing and technologies to support older people at home (the EU EFORTT project and research funded by the N8 with Leeds and Liverpool Universities). The Centre hosted an international conference in September 2012, with keynote addresses from several distinguished speakers.

Our biomedical scientists are engaged in innovative research on development of biomarkers and potential treatments for age-related diseases; for example, Hölscher is leading a clinical trial on people with Alzheimer's disease that is exploring the neuroprotective effects of a drug (liraglutide) presently used as a treatment for type 2 diabetes. Psychologist Sünram-Lea's research aims to identify the role of glucose and insulin in senile dementia (Alzheimer's disease). Lauder investigates glycosaminoglycans (GAGs) and the proteoglycans (PGs) to which they are attached, and examines the normal age-related and abnormal changes in the structure of human GAGs; such data may provide early markers of damage and disease, especially in osteoarthritis.

This group has generated significant funding and accompanying outputs. For example, Allsop has had substantial funding under EU Frameworks 6 and 7 for three projects: 'Early, differential and progressive blood and cerebrospinal fluid test for neurodegenerative dementia' (NEUROSCREEN: 2007-09); a Marie Curie Training Network (11 collaborating EU partners) on 'Alpha-synuclein-related brain diseases' (NEURASYN: 2010-13); and 'Nanoparticles for the diagnosis and therapy of Alzheimer's disease' (NAD; 2008-13). He held an MRC grant (with Manchester University and Lancashire Teaching Hospitals Foundation NHS Trust) on the 'Development of α -synuclein as a diagnostic marker for Parkinson's disease' (2007-11). Fullwood's co-authored paper in *Nature Protocols* in 2010 is in the top 10 most cited papers in that journal during the 2010-12 period; a "breakthrough" paper, it is adding significantly to biological/biomedical infrared spectroscopy.

Researchers in the **International Observatory on End of Life Care (IOELC)** – see also under

Cancer below - have continued to be influential, producing compelling evidence for the Worldwide Palliative Care Alliance on access to services and resources (including pain medication). Payne, Froggatt and Preston are Co-investigators on several EU FP7 grants, for example: Access to opioid medication in Europe (ATOME); patient-centred integrated chronic disease care (InSupC); a cluster randomised controlled trial on advance care planning (ACTION); and the effectiveness of palliative care for older people in long-term care facilities in Europe (the 'PACE' study).

2. Biostatistics:

- i) Novel spatial statistical modelling and analytical methods (Diggle, Taylor, B.)
- ii) Epidemiology of infectious and non-communicable diseases (Diggle, Gatherer, Keegan, Taylor, B.)
- iii) Research design and statistical analysis (Berridge, Hart, Lancaster, G.)

Statistical and epidemiological research (led by Diggle – one of Lancaster's Distinguished Professors) plays a dual role within the faculty. While statistical design and analysis arises in, and informs, many areas of our health-related research, the group also undertakes methodological research into the analysis of longitudinal and spatial variation in health outcomes, and leads important applied research projects in environmental epidemiology in both resource-rich and resource-poor countries. Diggle's grants from the National Science Foundation in the US (\$2.5 million, with Yale and the Oswaldo Cruz Foundation, Brazil), from MRC (£4.3 million, with 4 other Universities), and Public Health England (£5.2 million, with two other Universities) have generated insights on the incidence of leptospirosis in Brazil, and campylobacter and other infections in the UK. Our strategy has therefore been to encourage and support the highest-quality methodological *and* applied research.

Our medical statisticians intersect closely with members of other research groups. For example, a large grant (2010-13: £947k, £111k to G Lancaster) from the NIHR HTA Programme has examined the impact of combined positron emission tomography with computerized tomography scanning in the diagnosis and management of pancreatic cancer. G. Lancaster has also collaborated with our public health learning disabilities group (Emerson) in researching autistic spectrum disorders.

3. Cancer:

- i) DNA damage and repair mechanisms (Allinson, McMillan, Taylor E,)
- ii) Signalling mechanisms in normal and cancerous tissue (Copeland, Parkin)
- iii) Supportive and end of life care for those with cancer (Brearley, Grinyer, Payne, Thomas, Walshe)

Research here focuses on key aspects of the molecular and cellular biology of cancer including: cellular effects of exposure to carcinogens and ultraviolet light, DNA repair mechanisms, cell cycle control, and the molecular events behind leukaemia. As a distinguished cancer biologist, McMillan has, since 2006, played a key role for the Health Protection Agency in advising on the health impacts of ionising radiation. Funding from the North West Cancer Research Fund has supported both Allinson and Copeland during the REF period and enabled researchers to examine factors involved in the repair of highly mutagenic DNA double strand breaks.

In our palliative care group Marie Curie Cancer Care funded a study on how people care for relatives or friends who die at home, and this is informing the NHS End of Life programme. Grinyer's research has informed policies of the Teenage Cancer Trust. The International Observatory on End of Life Care has been strengthened by the arrival of Walshe (Editor of *Palliative Medicine*) and this group has had considerable grant success from several sources. For example, Walshe is Co-I on a Dimpleby Cancer Care research grant (2011-14: with Manchester and Liverpool Universities) on maintaining psychological well-being in the advanced stages of cancer. Lancaster University also played a significant role in the Cancer Experiences Collaborative, a high-impact research programme funded by the National Cancer Research Institute (NCRI: 2006-12).

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4. Infectious disease:

- i) Parasitology and tropical infectious diseases (Bates, Diggle, Dillon, Ginger, Grant, Sinkins, Urbaniak)
- ii) Environmental and gastro-intestinal microbiology (Parry, Pickup, Rigby)

Our research group on infectious disease encompasses both parasitology and microbiology, ranging from vector-borne diseases to environmental pathogens. This includes experimental work on organisms causing leishmaniasis and trypanosomiasis (major burdens of ill-health and disability in resource-poor countries), the ecology of waterborne pathogens, and the application of spatial analysis to predict the environmental distribution of pathogens. Sinkins is the Lead Investigator of an international EU-FP7 network on malaria: 'AnoPopAge' (€1,000,000 awarded; 2009-12) and his work has shown that certain strains of *Wolbachia* bacteria inhibit the transmission of mosquito-borne viruses. Bates and Dillon have extensive contacts in Brazil, Ghana and Thailand, and our research strategy involves strong support for relationship-building with UF Minas Gerais (Belo Horizonte) and the Brazilian National Institute of Science and Technology (Molecular Entomology).

Pickup's laboratory has identified a number of diverse environmental routes for human exposure to a zoonotic bacterial pathogen that is a potential trigger for Crohn's disease and has shown that it is widely distributed in the environment. He was a key participant in the project 'Lost in Translation', a cross-disciplinary analysis of knowledge exchange in animal disease management (NERC-RELU; 2008-2011).

We conduct research into the role of intestinal bacterial fauna in inflammatory bowel disease and cannabinoids as therapeutic agents for IBD. Rigby has a New Investigator research grant from MRC (£460k) on how the renewal of epithelial cells lining the intestine is regulated, and as an early career researcher is collaborating with colleagues at Cornell, North Carolina, and Imperial College.

5. Mental Health:

- i) Psychological treatments for bipolar disorder (Dodd, Jones, Lobban)
- ii) Prevention, community and therapeutic approaches in clinical psychology (Alcock, Cowlshaw, Dawson, Eccles, Fletcher, Murray, Reilly, Simpson)

Key research areas range from bipolar disorder (in the Faculty's high-profile **Spectrum Centre**, led by Jones and Lobban), to chronic neurological conditions that cause disability and ill-health. Spectrum takes a lifespan approach to the understanding and psychological treatment of bipolar disorder and related conditions. Its aim is to develop an evidence base to improve access and choice for service users and relatives. Current work includes RCT studies ranging from intensive group and individual therapy, to novel web-based approaches to prevention of relapse and parenting support for individuals with bipolar disorder. Since its creation in 2008 Spectrum has been awarded over £5million in research funding, published over 70 research papers and run 9 RCTs of new therapies for bipolar - a unique achievement in this area. Methodological expertise spans both qualitative and quantitative research methods and there is a strong emphasis on cognitive processes and interventions. Major grants include: NIHR programme grants of £1,998k, £1,977k, and £1,400k for: Psychological Approaches to Understanding and Promoting Recovery from Psychosis (2007-2012 Jones Co-PI); Practical Approaches to Identifying Risk, Reducing Relapse, Addressing Anxiety, and Substance Use and Evaluating Suicidality in bipolar disorder (PARADES 2008-2013, Jones CI, Lobban PI); and H.E.L.P.E.R. Programme (HEalthy Living and Prevention of Early Relapse: 2007-12). All of these engage service users throughout the research process, from development of the grants through to dissemination.

Cowlshaw's primary area of research is in the field of problem and pathological gambling (including effective treatments and psychiatric comorbidity with gambling disorders). Reilly is Co-I on a collaborative NIHR Programme Grant ('PARTNERS2': 2013-18) to develop and pilot a trial of primary care-based collaborative care for people with serious mental illness. Simpson and Murray both investigate the emotional and health care needs of people with Parkinson's and Alzheimer's disease; the work of these researchers intersects closely with colleagues in the Ageing cluster. The new North West Mental Health Alliance (including Lancaster, Manchester and Liverpool Universities) will support the development of large multidisciplinary Research Council grants.

6. Public Health:

- i) Health equity and knowledge exchange (Holland, Limmer, McDermott, Popay)
- ii) Intellectual and physical disabilities (Emerson, Hatton, Robertson, Thomas)
- iii) Health economics (Hollingsworth, Zucchelli)

We have long-standing interests in social determinants of health. As part of the NICE National Public Health Collaborating Centre on Community Engagement we undertook an extensive review of the evidence on the impact of community engagement in initiatives aiming to address the social determinants of health in order to inform the work of NICE. Popay has undertaken a number of innovative systematic reviews of qualitative research evidence and of findings from studies involving a range of methods. With colleagues from City University and the Universities of York and Glasgow she has developed guidance on the conduct of narrative synthesis.

The new Liverpool and Lancaster Collaboration for Public Health Research (LiLaC) is the vehicle for Lancaster's membership of the NIHR School for Public Health Research (of which Popay is Deputy Director); Hatton and Limmer are on the LiLaC management group. LiLaC is a key part of the NIHR Collaboration for Applied Health Research and Care (CLAHRC) in the NW Coast area. Popay is Director of Engagement for the CLAHRC as well as leading a programme of work on health inequalities with local authorities around the region.

Public Health research activity also includes work on intellectual and physical disabilities, health equity and community engagement, and health economics. Hatton is involved in a randomized controlled trial of a behavioural activation programme for adults with intellectual disabilities and depression, funded by the NIHR Health Technology Assessment (HTA) Programme (2013-16: £1.2 million) and led an Evaluation of the Aiming High for Disabled Children Short Break Pathfinder Programme (2009-11: £622k) funded by the former Department of Children, Families and Schools, in which Robertson was also involved. One of the group's papers (Emerson, G. Lancaster, Berridge) won the international research prize (2010) from the Australian Society for the Study of Intellectual Disability, highlighting its potential to improve quality of life. We have invested in a new Chair in Health Economics (Hollingsworth) and an associated Lectureship and have an arrangement with Liverpool University to host a Research Fellow whose position they fund. Working on economic determinants of health, and evaluation of service interventions, this group is a source of expertise across the local and regional health economy, connects closely to Lancaster's outstanding Management School, and engages with other research clusters (such as Ageing and Mental Health). Colleagues in Public Health work closely with those in other Faculties. For example, Thomas leads the Centre for Disability Research (CeDR) that involves colleagues in the Department of Sociology.

It would be misleading to suggest that all 70 colleagues submitted to REF 'fit' neatly into one of these six clusters; *but the vast majority do*. Of those doing other important work we highlight research on: bone disease (A. Taylor); patient safety in the operating theatre (Goodwin); the donation of umbilical cord blood for stem cell therapies (Machin); and the composition of placentas of mothers with pre-eclampsia (Ockleford). While our strategy will continue to strengthen the six main research clusters we value high-quality research in other fields relating to health and medicine.

c. People, including:

i. Staffing strategy and staff development

There have been 48 new academic appointments in FHM over the REF period (7 Professors, 6 SLs, 35 Lecturers), and in keeping with our growth strategy these are either established scholars or those whose trajectories suggest they will continue to contribute to research of the highest quality. 13 staff have left for appointments elsewhere or retired (and 3 are being returned in other UoAs). Our strategy has been to make appointments that sustain and expand our 6 research clusters and has therefore involved recruiting from several disciplines: biochemistry; economics; nursing; parasitology, psychology; and public health. Recruitment has been both international (e.g. from Monash University, Australia and the University of North Carolina, USA) and from highly ranked institutions and research groups in the UK (Bath, Dundee, Glasgow, Liverpool, Manchester,

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Strathclyde, UCL, Ulster and York). The Dean (Gatrell) chairs appointment panels for all new members of (non-Professorial) academic staff and ensures that scrupulous attention is given to maximising equality of opportunity.

The Faculty was successful in its application for an Athena Swan Bronze Award (operated by The Equality Challenge Unit) in 2012 and we plan (with encouragement from the assessing panel) to submit for a Silver award before the end of 2013. Feedback was that 'the direction of travel is positive' and that 'the proportion of female staff looks good in comparison to national data presented'. As part of our commitment to fairness and transparency in staff development, and to position ourselves for an Athena Swan Silver award, we have hosted workshops for staff seeking promotion from Grade 7 to 8 and to Senior Lecturer. Others are planned in 2013-14 for those seeking promotion to Professor.

Our staffing strategy during the REF period has also involved 'growing our own' staff by: awarding indefinite contracts to early career academics who were originally appointed as researchers (Allinson, Bingley, Turner); promoting L/SL staff to personal chairs (e.g. Milligan); and by awarding HEFCE-funded posts to colleagues initially recruited via charitable donations (e.g. Payne, originally funded for 5 years by the charity Help the Hospices). Academic staff workload is monitored by each Head of Department. **Early career staff** are given lighter loads in order to assist them in developing a leading-edge research profile and engaging in our research strategy. Lancaster University has signed up to the Concordat to Support Early Career Researchers, and its action plan, based on a thorough internal analysis of our provision for researchers, sets out a timetable for action to be taken to ensure that the University fully meets its responsibilities under the Concordat. Its commitment to the Concordat has received European recognition in the form of the prestigious HR Excellence in Research award, acknowledging our alignment with the principles of the European Charter for Researchers and Code of Conduct for their Recruitment.

The Faculty has developed and adopted its own Contract Research Charter that sets out the responsibilities and rights of contract research staff, consistent with the principles of the national Concordat but including explicit guidelines on issues such as the right to time (10 working days each year) for personal academic development. An Early Career Researcher Group meets regularly to discuss issues of common interest, and receives financial support from the Research Committee to pay for external speakers. The Research Committee also manages a travel grant fund for attendance at conferences where research presentations are being made that gives priority to applications from early career researchers and to self-funded research students. New academic staff (SL and below) are subject to probationary agreements, and annual Performance and Development Reviews (PDRs) consider progress against objectives. Each early-career academic has a senior member of staff as a mentor during probation.

All academic staff can apply for one year's of sabbatical leave after seven years' service, with the option of taking one term's leave after seven terms. Applicants are required to detail their outline research plans, which are assessed by the HoD and Dean upon completion of leave. Since 2008 we have granted a total of 42 terms leave and this has been used productively. For example, Milligan spent sabbatical leave at the University of Auckland, further cementing her link with international colleagues working on healthy ageing. Froggatt's study leave in 2012-13 has further advanced strong links with an Austrian group researching long-term care for older people.

The Faculty is involved in the NIHR Integrated Academic Trainees scheme and was awarded Academic Clinical Fellowships and a Clinical Lectureship in 2012. A key strategic objective over the next 5 years is to develop clinical medicine and there will be senior academic appointments in the next 12 months with this in mind, together with matched investments by local NHS Trusts. Led by Goodacre, our Clinical Research Hub links the University to the NHS and to industry to support partnerships in research, innovation, CPD, professional development and knowledge exchange in health and medicine. It also links the University to the Academic Health Science Network (AHSN) and to the NIHR Clinical Research Network to deliver systems and processes for research governance. The Hub comprises 6 NHS Trusts in Lancashire and Cumbria and, together with research clusters (notably, the Spectrum Centre for Mental Health Research) facilitates honorary research appointments and secondments.

ii. Research students

At induction, all doctoral students are required to undertake a Development Needs Analysis (DNA), to assess their training needs. Students' DNAs are reassessed and updated during Annual Review Meetings to ensure individual training needs are being effectively met. Our research students benefit from training available at Departmental, Faculty/University and wider regional level. All students are members of the University's Graduate School, which coordinates the activities of the Faculty Graduate Schools, ensuring that research training aligns with the Researcher Development Framework. The Graduate School provides a focal point for the University's engagement with broader initiatives, including the ESRC North West Doctoral Training Centre and enterprise schools. This ensures our students receive specialist disciplinary training and lab-based skills (as appropriate), training in generic research skills and methods, including knowledge exchange and impact, and employability skills. Students also have the opportunity to undertake advanced methods training in specialist techniques. *Training in research ethics is compulsory* for all postgraduate research students.

To ensure the research training needs of our part-time and distance students are met, we provide a suite of on-line research training modules and encourage students to publish academic papers and/or submit a thesis in 'alternative format'. Training modules are supported by specialist expertise in on-line education to ensure effective delivery and integration; consequently, all first year students have free access to Epigeum, the online training resource which offers modules that include research methods, ethics and transferable skills (such as project management, career planning, and conference presentations). The delivery of research training, using a mix of face-to-face and online delivery, ensures our students are provided with effective research skills to undertake doctoral study and graduate with transferable skills to enhance their employability.

Supervisors are leading figures in their fields and are committed to delivering an experience that gives students the knowledge and skills to become future research leaders. From induction, to completion of their doctoral studies, our students are fully integrated into the research culture of the University. Funding is available to support research students to attend and present at conferences during their research studies. Departments run seminars and research events to develop students' research and presentation skills in a supportive environment. Part-time and distance students are integrated into this environment through the use of video-conferencing facilities, virtual chat rooms and webinars. Specific initiatives have included collaborating with the Vitae Northwest Hub (www.vitae.ac.uk) in hosting the Postgraduate Researchers in Science Medicine (PRISM) conference in 2010, showcasing biomedical and medical research across the North West.

We have been awarded a total of 6 ESRC CASE awards since 2008 (two are joint with the Management School). Partners are, or have been: Cumbria Partnership NHS Foundation Trust; Morecambe Bay NHS Foundation Trust; Blackburn-with-Darwen Local Authority (Public Health); and Natural England. In addition, University Hospitals Morecambe Bay NHS Foundation Trust has provided funding for up to six medical students per year to undertake a research-based Masters' degree, involving co-supervision between academics and research-active clinicians. These have led to co-authored publications. We have two BBSRC PhD students part-funded by industrial sponsors (Boots plc and Novartis). The EU FP7 EURO IMPACT project is a Marie Curie mobility training scheme and has funded 2 PhDs and a postdoctoral researcher; Lancaster colleagues have provided structured research methods training to the whole Consortium.

Research students are encouraged to write for publication during their studies, and after. Particular successes here include (since 2008) 90 co-authored papers from research students in Clinical Psychology, where colleagues such as Simpson, Murray have been very active in nurturing the research careers of newly-qualified clinicians. Such research outputs appear in both clinical and academic journals and include: experiential research, clinical case reports, systematic reviews, and therapeutic evaluations. The students benefit from staff expertise in specific areas and therefore many of the articles relate to our research priorities of ageing and mental health. Many of the journals in which these papers have been published have high impact factors and some papers have become highly cited, several with over 25 citations since 2008. Examples include papers on cognitive behavioural therapy for people with Parkinson's disease, post-operative depression following heart surgery, and proneness to paranoia.

d. Income, infrastructure and facilities

During the REF period we have secured over £20 million in research funding that buttresses our research strategy.

Recognising that productive research collaborations are enhanced by physical proximity, and that for laboratory-based sciences ready access to research laboratories is required, the University has made a substantial investment in laboratory facilities (£12 million) and office accommodation (£7.5 million) over the REF period. The refurbished space was formally opened by Professor Ian Cumming (Chief Executive, Health Education England) in February 2013. Since 2008 the Faculty has invested £1.3 million in specialist research equipment and core facilities, including those for bioimaging (flow cytometer, confocal microscope, imaging platform) and for molecular biology (nanodrop spectrophotometer, real-time PCR systems), as well as refurbishment of Containment Level 3 laboratories and the Physiological Services Unit. These facilities have enabled us to attract and support outstanding academic staff and students.

We have close links with colleagues at the University of Liverpool and have supported a successful bid from the University of Liverpool Centre for Genome Research to MRC to fund a regional Next Generation Sequencing centre, providing access to state of the art NGS technology and bioinformatics resources. Cancer biologists have joined the Liverpool University Cancer Research UK Clinical Research Centre, which provides access to shared infrastructure and offering the opportunity to apply for collaborative CRUK research funding. Allsop is part of a £3 million EPSRC 'Critical Mass' grant that uses sophisticated scanning probe microscopy for early detection of disease. Some of our laboratory scientists access infrastructure resources at other UK universities, including: electron microscopy and tomography (Ginger, at Oxford); proteomics (Urbaniak, at Dundee). Our biomedical researchers are members of the BBSRC Doctoral Training Partnership for Food Security (with Surrey and Southampton) while health researchers are members of the North West ESRC Doctoral Training Centre (with Liverpool and Manchester universities). We referred earlier to collaborations with Liverpool on LiLaC and CLAHRC.

Our research has benefited from major recent philanthropic donations, despite the recession. These have included: Help the Hospices - £500,000 for the Chair in Hospice Studies (2007-12); an anonymous donation - £3 million to establish the Spectrum Centre; and the Bowland Trust (£2 million) to support Chairs in Biomedicine. Smaller donations (e.g. from the Sir John Fisher Foundation and the Peel Trust) have funded two lectureships, initially for three years. All these funders recognise that investment in FHM pays dividends in supporting world class research; indeed, the Spectrum donor has written that his investment was the best he had ever made.

The FHM Research Ethics Committee (FHMREC) requires that any research project being conducted by FHM staff and/or postgraduate students be submitted for ethical review if it involves human participants or ethical risk factors, and is not being reviewed externally. FHMREC members provide diverse perspectives and speciality knowledge. FHMREC collaborates with the University Research Ethics Committee, which provides final approval.

e. Collaboration or contribution to the discipline or research base

We respond actively and productively to both **national** and **international** priorities and initiatives and therefore contribute substantially to the vitality and sustainability of the research base and to the disciplines that support our research.

Nationally: During the REF planning period colleagues have played an active role in shaping major national initiatives. We led the creation of the Health Innovation and Education Cluster (HIEC) for Lancashire and Cumbria and we have played an active role in the development of the North West Coast Academic Health Science Network (AHSN); Gatrell is a member of the AHSN Board and Goodacre is now Medical Director. Together with Liverpool University, we were successful in a bid to establish a CLAHRC (Collaboration for Leadership in Applied Health Research and Care) covering the same NW Coast footprint; Popay is theme leader for a health equity strand and others (Jones, Lobban, Milligan) are involved in the mental health and health equity strands.

Lancaster University is part of the N8 consortium of research-intensive Universities in the north of England, and our Centre for Ageing Research is linked closely to this. McMillan is Chair of the Executive Management Committee for the N8 Universities. We are also part of the Northern Health Science Alliance, a confederation of the N8 Universities and eight partner NHS Trusts in the North. Since 'wealth creation' is at the heart of both the AHSN and NHSA we shall contribute to this national priority over the next five years.

We have helped shape research and practice in all our 6 research clusters. For example, Payne has directed (2006-12) the Cancer Experiences Collaborative (CECo), a National Cancer Research Institute programme to improve the volume and quality of research in supportive and palliative care. This involved 5 UK universities and 26 other organisations, such as hospices, cancer centres, and charities. Grinyer's research on psychosocial aspects of teenage and young adult cancer was cited by Dr Ian Gibson MP in his capacity as Chair of the All-Party Group on Cancer. In our ageing cluster, Milligan sits on the Executive of Future North West – the regional forum on ageing supported by Age UK and the DH, and was Chair of the NHS Regional Public Health Taskforce on Mid-Life and Older Persons. In the public health cluster, Emerson and Hatton are co-directors (from 2010) of the Learning Disabilities Observatory, one of four specialist public health observatories funded by Public Health England. With £450k grant income to Lancaster for each of 5 years, LiLaC supports two research projects; an intervention ('Men in Sheds' – Milligan) to improve the health of older men; and modelling interventions to address inequalities in chronic disease (Diggle). In our Mental Health cluster the report 'Understanding Bipolar Disorder' for the British Psychological Society has been extensively endorsed, including by high-profile 'users' such as Stephen Fry. Lobban won the 2012 'People in Research' award from the regional Mental Health Research Network.

The Clinical Research Hub was established in 2010 to enable an increase in NHS/University/Industry collaborative research in health and medicine across Lancashire and Cumbria. This includes working with NHS partner Trusts across the region as well as with other key organisations including the NIHR Cumbria and Lancashire Comprehensive Local Research Network (CLRN) and the NIHR Research Design Service for the North West (NIHR RDS NW). The RDS is hosted by the Faculty, with Hatton as Regional co-Director; it provides advice on research design to researchers in the North West who are developing proposals for national, peer-reviewed funding competitions for applied health or social care research. This includes schemes such as the NIHR Research for Patient Benefit, Personal Awards Schemes and Programme Grants as well as opportunities from major funders such as the Medical Research Council (MRC) and charitable organisations such as The Wellcome Foundation.

Goodacre has held since 2007 a part-time role as Director of the Cumbria and Lancashire CLRN, managing an annual budget of £6.2 million. The CLRN has overseen a dramatic increase in numbers of people participating in research studies (over 164,000 in 2011-12). Spencer has collaborated in a successful (£242k) NIHR Research for Patient Benefit bid, led by Blackpool Teaching Hospitals NHS Foundation Trust, to conduct an RCT on blood filtration during heart bypass operations. Goodacre was involved (2008-12: £600k) in the NIHR Patient Safety Centre, with Professor Andrew Smith from the local NHS Trust.

Fullwood has a longstanding collaboration with the UK-based spectroscopy company Renishaw plc, via the BBSRC interchange scheme (2010-12). Goodacre's MRC project 2013-15 (£560k) on Acoustic Emission as a non-invasive biomarker for knee osteoarthritis links us with local NHS Trusts and the company Mistras Group Ltd. Sünram-Lea has worked with scientists at GlaxoSmithKline on food, nutrition and health, with a particular focus on reducing sugar content in energy drinks. Ockleford's work for the DEFRA Advisory Committee on Pesticides Adverse Health Effects Surveillance (PAHES) – and his particular expertise in potential human reproductive consequences - was recognised by the Parliamentary Under Secretary in 2013. McMillan is member of the Advisory Group on Ionising Radiation for the Health Protection Agency (since 2006), and chaired a sub-group that published a report on "Cardiovascular disease induced by ionising radiation" (2010). McMillan was a non-executive director in the Parliamentary Counsel Office (2008-11), which is part of the Cabinet Office, and is UK Panel Member for EU HR Excellence in Research Award (since 2011).

Diggle is President-elect of the Royal Statistical Society (RSS), and G. Lancaster is both an elected member of the Council of RSS and Chair of its Primary Health Care Study Group (from 2012).

Health and (bio)medical research with **user groups** in the UK is a highlight of our portfolio. Examples include:

- Collaborations between academics and homeless people in Morecambe on citizen-led innovation to create prototype communication tools to access prescription information and appointment details (Dillon, EPSRC-funded);
- Development and evaluation of methods to assess the impact of user involvement in health and social care research (Popay, MRC-funded);
- Recruitment of people with bipolar as core staff researchers on projects in the Spectrum Centre (Jones, Lobban). This led to an invitation to Downing Street in October 2009 for a launch on mental health research, and to appearances on national radio;
- User-led research, in the Cancer Experiences Collaborative, a forum that has continued after the end of the CECo project (Payne, Froggatt);
- The APPROACH study (Froggatt, NIHR Service Development and Organisation programme) on how care homes and health services can work together better.

Internationally: Our research clusters demonstrate influence and impact on the international stage. The International Observatory on End of Life Care is widely recognised for mapping global developments in palliative care. Its freely available Country Reports are used to inform national and international policy, for example in central and Eastern Europe (EU FP7, ATOME and EURO IMPACT studies). Payne is President of the European Association for Palliative Care (2011-14) - the first non-medic to assume that role - and leads task forces on Family Carers in Palliative Care and Psychologists in Palliative Care, thereby shaping European policy on palliative care. Froggatt co-leads the European Association for Palliative Care Taskforce on Long-term Care and Palliative Care for Older People. Payne is a board member of the Worldwide Palliative Care Alliance, and on the International Advisory Board for the All Ireland Institute for Hospice and Palliative Care. She has advised the Department of Health in Ireland, the State of Victoria in Australia, and undertaken advocacy work in the European Parliament. Grinyer's recent monograph *'Palliative & End of Life Care for Children & Young People: Home, Hospice, Hospital'* (2012) was recognised as 'Book of the Year' by the American Journal of Nursing.

The appointment of new staff working on tropical diseases such as leishmaniasis and malaria (Bates, Sinkins, Dillon) is giving us a high profile in Brazil (Universidade Federal de Minas Gerais, the tenth highest ranked University in Latin America) and in Ghana (where we have staff exchanges with the Noguchi Memorial Institute for Medical Research in Accra, funded by Leverhulme and The Royal Society). Dillon is a 'Special Visiting Researcher' under Brazil's Science Without Borders programme; this aims to attract foreign researchers recognized internationally as leaders. Diggle has ongoing collaborations with WHO on infectious disease (onchocerciasis, meningitis), and with Fiocruz Research Foundation Brazil (leptospirosis). In our public health cluster Popay also works with Fiocruz on social determinants of health. She has been a Special Adviser on social exclusion and health inequalities with the WHO EURO region, contributing to its Health2020 review. She was Co-ordinator of the Global Social Exclusion Knowledge Network established by the WHO Commission on Social Determinants of Health. McDermott's work on LGBT Youth Suicide in Europe, with the Department of Psychology, University of Oslo (2008-12) is of considerable policy relevance, while her DH grant (2013-15) on LGBT Youth Suicide Prevention will provide the first national evidence on this topic. Emerson and Hollingsworth hold large grants (on intellectual disabilities and public health, respectively) from the Australian National Health & Medical Research Council, with colleagues at Sydney and Monash. Thomas has held an Australian Research Council grant (2011-13) on disability in rural Australia. In our ageing cluster, Fullwood has had a major international collaboration with Kyoto Prefectural Medical University, Japan, resulting in 8 joint authored papers during the REF period.

Participation in peer-review process: Diggle has been a member of the MRC Population and Systems Medicine Research Board (2008-11), and is Chair of the MRC Strategic Skills Fellowships Schemes Panel. Popay is a member of the panels for the MRC Methodology Research Programme and the NIHR Programme Funding for Applied Research. Hollingsworth is a member of the MRC Strategic Skills Fellowship Panel (2013-15) and Payne and Brearley are on the International Selection Review Panel for the Health Research Board of Ireland (2013-). Hatton, Jones and Milligan were members of the ESRC's Peer Review College (2010-12), Pickup is a member of the NERC Peer Review College (from 2012) and appointed to the EPSRC Peer Review College Core Panel, Bates and McMillan were members of the MRC's College of Experts (to 2010), all providing expert advice on grant applications. Hatton sits on the NIHR Doctoral Research Fellowships Panel. Jones is on the Advisory Board for MDF (Bipolar UK) and chairs the Special Interest Group on Bipolar Disorder for the British Association of Behavioural and Cognitive Psychotherapy. Allsop has been Chair of the Grant Awarding Panel for the Alzheimer's Society. Hatton has been a member of the NIHR selection panel for Doctoral Research Training Fellowships (2007-) and the Care Quality Commission (2006-11). Emerson sat on the Dilnot Commission on Funding Care and Support, and is an expert advisor to the WHO Functioning and Disability Reference Group (2010-). Fullwood has served (2010-11) on the Grant Allocation Panel for the Fight for Sight Charity. Pickup is a member of the Science panel of the European Centre for Disease Control, and the EU Panel on Risk Assessment for Water.

Fellowships and awards: Diggle holds adjunct/honorary Chairs at Johns Hopkins, Yale and Columbia (USA). Hollingsworth and Payne hold visiting Chairs at Monash (Australia) and Payne also at Trinity College Dublin. Emerson holds a visiting Professorship at the University of Sydney and was a Fellow of (and recipient of a Distinguished Career Award from) the International Association for the Scientific Study of Intellectual Disability in 2008. Popay was awarded a Fellowship (by distinction) of the Faculty of Public Health (2010). Hatton and Emerson are Fellows of the NIHR School for Social Care Research, and McMillan is a Fellow of the Society of Biology. Sinkins holds a Wellcome Trust Senior Research Fellowship in Basic Biomedical Science, renewed in 2011 for a second five year period (£961k awarded). Ginger was Royal Society University Research Fellow 2003-2011. Allinson (2006-11) and Copeland (2011-) have held five-year Independent Research Fellowships from the North West Cancer Research Fund. Reilly held a 3 year NIHR School for Primary Care Research Fellowship (Oct 2010-Sept 2013). Walshe was awarded Fellowship of the Queens Nursing Institute in 2012, in recognition of her contribution to community nursing.

Editorships: During the REF period we have edited, co-edited, or been Associate Editors of, **16 journals:** *Palliative Medicine* – Walshe is Editor-in-Chief; *Health & Place* – Milligan; *Journal of Applied Research in Intellectual Disabilities* – Hatton is joint Editor-in-Chief; *Disability & Society* – Hatton and Thomas; *Journal of Intellectual and Developmental Disability* – Emerson and Hatton; *American Journal on Intellectual and Developmental Disabilities* – Emerson; *Biostatistics* – Diggle; *Cytokine* – Goodacre; *Maternal & Child Nutrition* – Hart is Statistical Editor; *Progress in Palliative Care* – Payne; *BMC Palliative Care* – Payne and Preston; *Health Economics Letters* – Hollingsworth; *Psychology and Psychotherapy* - Jones and Lobban; ; *Frontiers in Developmental Psychology* – Alcock; *PLoS Neglected Tropical Diseases* – Bates; *PLoS One* – Hölscher. Colleagues have served on 22 editorial boards (Allsop, Broughton (2), Gattrell, Gatherer, Ginger (3), Hart, Lancaster, McDermott, McMillan, Milligan (2), Pickup, Payne (6), Thomas).

In conclusion, we reiterate that the *environment* in which our research takes place has been, and will continue to be: **focused** in specific clusters; **supportive** of all research staff and students; and **externally-facing**, whether around seeking to 'make a difference' internationally and nationally, or continuing to involving service users in much of what we do.