Institution: University of East Anglia

Unit of Assessment: 2 - Public health, health services research and primary care

a. Overview

Since RAE2008, UOA 2 at UEA has held £36M in research grants (increasing from £11M in 2008 to £22M in 2012), established 6 new chairs (including the first chairs in Public Health Economics in the UK as well as one in Health Geography), led the Norfolk and Suffolk hub of the NIHR Research Design Service for East of England, set up Health Economics Consulting, and helped establish and run the Norwich Clinical Trials Unit which has achieved full registration with the UK Clinical Research Collaboration (CRC).

The 15 researchers (14 FTE) submitted to UOA 2 are mostly based in the Population Health and Primary Care Department at Norwich Medical School (NMS). In REF2014 NMS is returning 50 staff, principally across three units of assessment (UOAs 1, 2 and 6). Norwich Medical School was founded in 2002. It has grown substantially since RAE2008, building on our existing strengths in public health, health services and nutrition research, establishing new areas of research that reflect the strengths of the Norwich Research Park, investing in relevant infrastructure, expanding academic clinical medicine, engaging with the NIHR integrated academic training programme and the NHS to build capacity within the school, and holding £83M in research grants. NMS is one of 3 Schools in the Faculty of Medicine and Health Sciences.

The Population Health and Primary Care Department was founded in NMS in 2011 and consists of five groups (Primary Care, Epidemiology, Health Economics, Medical Statistics and Health Evidence Synthesis). Our research typically involves members of several groups, as well as members of other NMS departments, other UEA schools, and UK or international collaborators. It combines methodological expertise in interdisciplinary health services research (HSR), health economics, epidemiology and medical statistics, with expert knowledge in clinical, public health and health service fields. International health, public health economics and health geography are distinctive research areas.

b. Research strategy

The overarching goal of **Norwich Medical School** research strategy since 2008 has been to establish a translational medicine research programme linking the fundamental biological science in the University and Norwich Research Park (NRP) with improvements in population health and patient care, validated by randomised trials, economic evaluation and other health services research. The NRP consists of six partners: UEA, the Norfolk and Norwich University Hospital (NNUH), the Sainsbury Laboratory, and three BBSRC-funded Institutes (John Innes Centre, the Institute for Food Research and the Genome Analysis Centre). Since 2010 NMS has strengthened its organisation of research by establishing a director of research (who is deputy head of school), a research committee, grant application review committees and, in the NNUH, a director of research and development at hospital board level, and a research committee. This strategy provides the basis for UOA 2 research.

The purpose of **public health, health services and primary care research** at UEA is to improve the health of community-based and patient populations in the UK and internationally, by advancing knowledge about causes of health and illness, and by improving health care. Our strategic aim is to leverage our methodological strengths by collaborating within UEA and with external experts, so as to increase our core funding and capacity, and to carry out high impact research. Our health services and primary care research is focused on identifying factors impairing the quality of care in the UK and other countries, and on identifying health technologies and ways of delivering them that are effective, efficient, equitable and acceptable. Our epidemiological research is focused on understanding the influences of social and geographic environments, physical activity, infection, and nutrition on population health, and usually includes biological research such as genetics, biochemistry and microbiology. Our implementation strategy is discussed in the impact template and case studies. In this section we show how research methods have been applied so as to achieve these aims, and then outline our research strategy for the next five years.

Randomised controlled trials: A cornerstone of our research is evaluation of the effectiveness and cost effectiveness of health care and public health interventions with clinical trials, especially randomised controlled trials (RCTs) of complex non-pharmacological health service interventions. The 15 researchers submitted to UOA 2 have completed and published results of 30 RCTs since 2008. These are typically large scale pragmatic RCTs, assessing effectiveness in realistic situations with widespread implementation. Most RCTs are complemented by, and integrated with, economic and qualitative evaluations. We also carry out methodological research on statistical methods for randomised trials, such as methods for effect size estimation (Shepstone) and analysis of cluster randomised trial data (Clark, Bachmann). For example:

- The ELEVATE trial, which was a major pragmatic trial carried out in UK general practices, showed that leukotrines were not effective in treating uncontrolled asthma in adults (Harvey, Shepstone).
- The SCOOP trial (MRC, £3.8M) is currently evaluating the effect of osteoporosis screening in prevention of fractures among 12000 women in the UK (Shepstone, Harvey, Howe).
- MATREX was the only RCT ever to evaluate the effectiveness of chest physiotherapy in treating acute exacerbations of chronic obstructive pulmonary disease, and showed that this cornerstone of hospital physiotherapy was neither effective nor cost effective (Harvey, Shepstone, Clark, Barton, Bachmann).
- The PALSA PLUS and MRC-funded STRETCH trials were cluster randomised trials of primary HIV care across an entire South African province (Barton, Bachmann), demonstrating effective educational methods to improve the quality of HIV/AIDS care, as detailed in our impact case study.
- The BECCA trial showed that an intervention based on befriending frail elderly adults after discharge from hospital was ineffective (Harvey, Shepstone).
- The ARISSA trial showed that using asthma registers in primary care did not reduce asthma exacerbations but reduced health care costs (Barton, Howe, Harvey).
- The PRACTISE trial of an intervention in Dutch hospitals to increase thrombolysis after acute stroke found that it was effective and would improve outcomes and reduce costs (Niessen).
- A RCT showed that booklet-based vestibular rehabilitation for chronic dizziness in primary care is effective and cost effective in improving patient reported outcomes (Turner).
- A RCT comparing five methods of managing urinary tract infections in primary care showed similar effects on symptoms, but that dipstick testing reduced antibiotic use and could be cost effective (Turner).

Evidence synthesis and meta-analysis: We have outstanding expertise in methods for quantitative synthesis of research evidence, including meta-analysis of RCT and epidemiological data (Song; Loke). We have advanced methodology in indirect comparison meta-analysis, applied to interventions for which head-to-head comparisons of interventions are inadequate or not available (Song, Clark, Bachmann). For example:

- A systematic review of interventions to prevent smoking relapse identified US trials of educational interventions that prevented relapse (Song), leading to the SHARPISH RCT (funded by NIHR Health Technology Assessment) in the UK (Song, Bachmann, Barton, Clark).
- Two systematic reviews and meta-analyses showed that inhaled anticholinergic drugs were associated with risks of major cardiovascular events and pneumonia in COPD patients (Loke).
- A systematic review and meta-analysis found a 52% increased risk of mortality associated with tiotropium mist inhaler in patients with chronic obstructive pulmonary disease (Loke).
- A methodological study found no difference in meta-analyses of adverse effects data derived from randomised controlled trials as compared to observational studies (Loke).

Observational studies of effectiveness, quality and safety of health care: When RCTs are not feasible we carry out quasi-experimental and patient cohort studies, aimed at investigating and minimising biases inherent in observational studies of effectiveness. For example:

- Cohort studies of HIV-infected patients in South Africa, showed high death rates while awaiting treatment but highly effective antiretroviral treatment (Bachmann).
- A cohort study of patients from eight English stroke centres is currently comparing the outcomes of different models of organising stroke care (Barton, Bachmann).
- A cohort study of diabetic retinopathy screening followed 20,000 patients for up to 16 years and showed that screening yield was dropping but could be safely increased by increasing screening intervals in low risk patients (Bachmann).

Other observational studies have used original methods to identify problems with the quality of care in community-based populations. For example:

- Health care quality assessment in the English Longitudinal Study of Ageing showed that care for medical conditions was better than for geriatric conditions, and that care quality was surprisingly equitable (Steel, Bachmann).
- Analysis of primary care medical records showed that implementation of the Quality Outcomes Framework to pay GPs was associated with improvements in care for patients with funded conditions but not for patients with unfunded conditions (Steel).
- Geographical research on access to cancer services showed that patients living further away were less likely to receive recommended treatments but that their survival did not differ (Jones).

Diagnostic accuracy and screening: We have carried out clinical epidemiological evaluations of the effectiveness and accuracy of diagnostic technologies and screening programmes, such as diabetic retinopathy screening, osteoporosis screening (SCOOP RCT), and diagnosis of pre-diabetes (Norfolk Diabetes Prevention Study RCT, £2M NIHR programme grant funding (Bachmann, Barton, Clark, Niessen).

Health economics: The Health Economics Group, established in 1995, is one of only a few significant health economics groups in the UK and the only group in the East of England. Since RAE2008 its continuing strengths have been recognised by: (1) annual NHS funding of £300K for a unique programme of research in public health economics; (2) responsibility for the health economics component of the Cambridge-led Centre for Excellence in Diet and Physical Activity Research; (3) a steady stream of nationally funded economic evaluations; (4) five years of funding to provide the health economics input and deputy directorship (Barton) to the NIHR East of England Research Design Service; and (5) the Behaviour and Health Research Unit established in collaboration with Cambridge University (Department of Health, £5M). Funding for (1), (2) and (4) has recently been renewed. Barton leads the health economics theme of the recently awarded Collaboration for Leadership in Applied Health Research and Care (CLAHRC East), a joint bid with Cambridge University (£1.5M funding to UEA). Our health economics research includes:

Economic evaluation: Most health economic studies are cost effectiveness analyses alongside RCTs, using individual data on outcomes, resource use, and costs of illness and health care. For example:

- A dietary intervention plus strengthening exercises was found to be cost effective for individuals with knee pain (Barton). A methodological component of the study showed that using EQ-5D or SF-6D instruments to value outcomes resulted in different treatment options being cost-effective at the £20,000 per QALY threshold (Barton, Sach).
- Two RCTs of cataract surgery in women with mild visual problems showed that cataract surgery in this population is unlikely to be cost effective in the short term but if a longer term perspective is taken cataract surgery is likely to be cost-effective (Sach).
- The ELEVATE and MATREX trials both showed that treatments were no more effective than their comparators, so that cost differences were crucial in decisions about implementation.
- An RCT of secondary prevention of coronary heart disease and heart failure in primary care showed that it improved outcomes and increased costs, but could be cost effective (Turner).

Economics of public health: This research covers: (1) social and economic consequences of health and health behaviours; (2) socio-economic inequalities in, and determinants of, health and health

behaviours; and (3) the economic evaluation of public health interventions, including rigorous econometric modelling to strengthen causal inferences (Suhrcke, Niessen). For example:

- An international econometric study showed how cardiovascular disease mortality influences economic growth in high income countries (Suhrcke).
- A highly cited study demonstrated the health effects of economic recessions in European Union member countries (Suhrcke).
- Several studies in various countries showed how social capital influences health (Suhrcke).

Epidemiology: Our epidemiological research is focused on health effects of diet and activity, and on musculoskeletal and infectious disease, It is largely based in major cohorts such as EPIC (EU Prospective Investigation on Diet and Cancer) Norfolk, Norfolk Osteoarthritis Registry and Twins UK (a twins registry) in the UK, and the US Nurses' Health Study, Health Professionals' Follow-up Study, and Framingham. UEA has particular epidemiological expertise in:

- *Geographical epidemiology* investigating the effects of physical and social environments on disease risk and health behaviour, especially physical activity, diet and obesity (Jones).
- *Infectious disease epidemiology*, especially of emerging infections linked to environmental factors (Hunter). This is mostly focused on the spread of infection by drinking water, and also recreational water contact (impact case study REF3b), and food and zoonotic diseases. Hunter has conducted cohort, case-control and other epidemiological studies in the UK, Europe and developing countries. He is the PI of a €9M EU programme grant on better methods for monitoring drinking water quality countries. This research is integrated with the multidisciplinary Microbes in Norwich (MICRON) consortium which bridges the Norwich Research Park.
- *Paediatric and perinatal epidemiology*, identifying risk factors for a congenital and inherited conditions, cerebral palsy and pre-term birth (Platt).
- *Nutritional epidemiology*, focusing on micronutrients and genetics, integrating biological research, cohort studies, randomised trials and meta-analyses which is being submitted to UOA 6.

Future research strategy: Our future research strategy will be integrated with the research strategy of ***Norwich Medical School*** as a whole. Over the next 5 years NMS will:

- Consolidate the translational pathway for science developed on the NRP, from microbiology and genetics to epidemiology, randomised trials and other HSR.
- Consolidate the Clinical Research Facility on one site on the Norwich Research Park.
- Continue to develop epidemiology using our established links with cohorts and health services research in the School's priority areas (nutrition, gastroenterology, infectious disease, and musculoskeletal disease).

All of these priorities match our future strategy in ***public health, health services and primary care research***. In particular we will:

- Develop, implement and evaluate innovative ways of strengthening health services in primary care and chronic disease management. An exemplar of international significance is the £1.2M NIH-funded CONCORD trial of primary care for depression in people with HIV in South Africa, being launched in late 2013.
- Build our research programme in diet, physical activity and diabetes prevention, for example through the Centre for Excellence in Diet and Physical Activity Research.
- Integrate our epidemiological research on determinants of health and illness with HSR on effective and cost effective methods of prevention and treatment within and beyond health services.
- Carry out pragmatic trials of complex organisational and behaviour change interventions, especially in primary care, and strengthening the underlying health psychology, organisational, qualitative, economic evaluation and public health economic research.

- Continue to expand our international research in infectious disease and nutritional epidemiology, public health economics, and primary care HSR.

c. People, including:

i. Staffing strategy and staff development

This submission includes 14 FTE researchers. The continuing expansion of NMS has combined active recruitment of research leaders with career development and promotion of existing staff. Academic staff working in UOA 2 areas include clinical academics, mainly in public health, general practice and dietetics, and non-clinical academics, mainly epidemiologists, medical statisticians, health economists and other social scientists. Clinical academics have honorary employment contracts with local NHS Trusts. Similarly, research active NHS-employed clinicians have honorary contracts with UEA. These arrangements help to ensure the practical relevance of our research, and access to patients and community-based populations, as detailed in REF 3a.

UEA is committed to supporting the personal, professional and career development of contract research staff. A Research Staff Working Group, chaired by PVC for research, oversees implementation of the Concordat to Support the Career Development of Researchers. Departmental 'Research Staff Coordinators' act as points of contact and mentors for research staff. In September 2012 UEA was awarded the Human Resources Excellence in Research Award from the European Commission.

UEA's Single Equality Action Plan sets out equality and diversity policies. These are implemented proactively by the Equality and Diversity Committee. Information on relevant characteristics of staff and student populations is provided by an Equality and Diversity Officer and helps to ensure that equality and diversity considerations are taken into account in decision making. Good employment practice for women scientists is promoted: in 2012 UEA achieved Athena Swan Bronze status. Gold status is the long-term aim of the Medical School.

Continuing professional development is central to our staffing strategy. Individuals' career development needs, including training, work experience and promotion, are assessed at and between annual appraisals. Staff are encouraged to attend targeted conferences and short courses, with funding from UEA and from research grants. UEA's Centre for Staff Education Development provides a wide range of free short courses. The Department holds fortnightly research seminars for staff and students, complementing research seminar programmes run by the Faculty of Medicine and Health Sciences, the East Anglia Research Synthesis Group, and Medical School seminars at the Norfolk and Norwich University Hospital.

ii. Research students

UEA has a thriving community of postgraduate research (PGR) students who are integrated into research programmes. PGR student recruitment to NMS is managed by the Faculty of Medicine and Health Sciences Graduate school. Doctoral research students initially register for MPhil and transfer to PhD after a year of study, after written presentation of their progress, which is then assessed annually. MPhil and PhD candidates are encouraged to undertake appropriate modules of the various taught Masters courses provided by the Faculty. Additionally, MPhil/PhD students are required to attend a series of lectures and workshops on core research methods provided by research leaders in the Faculty. Each student is supervised by a panel of supervisors, and the primary supervisor is required to have already supervised successful doctoral research.

Progression and supervision of doctoral research is quality assured at Faculty level. We also offer an MRes in Health Research, based on in-depth research without taught modules and aimed at intercalating medical students. There is a Faculty-wide programme of seminars on students' work in progress, and an annual PGR conference, in which students present and discuss their work. In 2010 the Norwich Academic Training Office was established to organise the NIHR Integrated Academic Training Programme, which includes 10 academic clinical fellows in general practice and public health.

d. Income, infrastructure and facilities

Income: Since 2008 the Population Health and Primary Care Department has held £36M of external research funding from: NIHR (£13.9M), other NHS bodies and Department of Health

(£9.6M), Medical Research Council (£5.1M), Economic and Social Research Council, Biotechnology and Biological Sciences Research Council, European Commission, charities such as the Wellcome Trust and Arthritis Research UK, European Union, World Bank, World Health Organisation, Department for International Development, the Global Fund to fight AIDS, Tuberculosis and Malaria, and the European Centre for Disease Prevention and Control.

Infrastructure: Our Department includes the *Norfolk and Suffolk* hub of the NIHR-funded East of England *Research Design Service,* providing methodological expertise in health services research, epidemiology, qualitative research, systematic reviews, and medical statistics for Norfolk and Suffolk, and in health economics for the entire East of England. It is primarily aimed at supporting NHS researchers but is integrated into the department with staff appointed as UEA faculty.

UEA and the Norfolk and Norwich University Hospital (NNUH) jointly run the UK CRC registered *Norwich Clinical Trials Unit* (CTU) and a Clinical Research Facility (CRF) which has space in the Medical School and at the NNUH. Staff from the Population Health and Primary Care Department have leadership roles in the CTU supporting the Director (Swart, UOA 1), with Shepstone and Barton as statistical and health economics experts as well as CTU Management Committee members. Most of our UK-based RCTs are run though the CTU, which provides expertise in study design and analysis, remote electronic data capture for patient registration, randomisation, and data management. NNUH was recently appointed to host the NIHR Clinical Research Network (Eastern) which will cover the whole of East Anglia including Cambridge with UEA leadership. NNUH has substantial clinical research facilities, including a newly installed 3T magnetic resonance scanner dedicated to clinical research.

The ***Norwich Research Park*** infrastructure of particular importance to UOA 2 are the BBSRC Genome Analysis Centre and the microbiological research facilities co-ordinated through Microbes in Norwich, supporting our epidemiological research in infectious and musculoskeletal disease and nutrition

Health Economics Consulting is a UEA Enterprise which makes our health economics expertise available to external clients and generates funds to re-invest in research. Its services include health technology assessment, health service commissioning, public health economics, training and costing, and is based in the Population Health and Primary Care Department.

Our research is supported by UEA's Information Technology and Computing Services, which provides excellent generic computing and facilitates access to specialist research software. There is also a high performance cluster for computationally intensive work such as our simulation modelling (e.g. for statistical methodological research) and our statistical analysis of large data sets (e.g. Clinical Practice Research Datalink and Hospital Episode Statistics). UEA's computer network is integrated with UEA Library, providing instant access to >7000 journals. UEA Library subscribes to most journals needed, and is complemented by a reciprocal arrangement providing access to the NNUH library, including the NHS Electronic Library and its journals.

Accounting and legal support for research is provided by UEA's Research and Enterprise Service. This service includes budgeting for grant proposals, collation and submission of grant applications, contracting for research grants and monitoring income and expenditure.

e. Collaboration or contribution to the discipline or research base

International health research leadership and collaborations include*:*

- Bachmann co-leads an MRC- and NIH-funded HSR programme at the University of Cape Town Medical School where he is Honorary Professor of Medicine; the South African MRC, KCL Institute of Psychiatry and Harvard School of Public Health are long term collaborators.
- Hunter collaborates on epidemiological research on water borne infection internationally, including being PI/Coordinator of a €9 million EU FP7 grant. He has joint research programmes with several NGOs including Médicins Sans Frontières, and with Tshwane University of Technology, South Africa where he is Professor Extraordinaire. He was member of the European Centre for Disease Control Expert Panel on Climate Change; and the joint task force of the United Nations Economic Commission for Europe and the WHO Regional Office for Europe; and expert advisor to Food Standards Agency, and US Environment

Protection Agency.

- Niessen is Director of the Centre for Control of Chronic Diseases in Bangladesh and Associate Professor in Public Health Economics in the Department of International Health, Johns Hopkins School of Public Health.
- Suhrcke is a member of the Scientific Advisory Council of the International Obesity Taskforce; during the REF period he has also been a member of the WHO Scientific Reference Group on Health Equity; the US Institute of Medicine Working Group on Preventing Cardiovascular Disease in Developing Countries; the OECD Expert Group on Economics of Prevention; and has chaired the Economics Task Group for the WHO European Review of Social Determinants and the Health Divide across Europe; he has led World Bank and WHO projects on the economics of chronic disease in China, Middle East and North Africa, Latin America and South Asia.

Academic collaboration within the UK include*:*

- The UKCRC funded *Centre for Diet and Activity Research* and the Department of Health funded *Behaviour and Health Research Unit* are both run jointly with Cambridge University, with UEA leading on health economics (Suhrcke, Niessen) and health geography (Jones). Additional collaborations with Cambridge include: an NIHR Programme Grant on development and evaluation of very brief interventions to increase physical activity in primary care; MRC NPRI-4 grants on (1) an RCT of primary care referral to a commercial weight loss provider; and (2) Establishing a Healthy Growth Trajectory from Birth: The Baby Milk Trial
- Within UEA, researchers submitted to UOA 2 collaborate with other academic researchers, especially medical specialists in internal medicine and microbiology in the Medicine Department (UOA 1), nutrition researchers in the Nutrition Department (UOA 6) and environmental scientists (UOA 7).

Contribution to the NHS and UK public health agencies include:

- *NHS National Institute for Health Research (NIHR)*: Loke chairs the Health Technology Assessment panel on Elective and Emergency Specialist Care, and Harvey for five years chaired the Research for Patient Benefit panel for East of England. Harvey is an NIHR Senior Investigator (renewed 2013) and a member of the NIHR Applied Fellowships committee. Our researchers are members of NIHR funding panels including: Health Services and Delivery (Steel), Programme Grants for Applied Research (Shepstone, Bachmann), Efficacy and Mechanism Evaluation (Shepstone), Themed Calls (Sach) and Research for Patient Benefit (Clark, Barton, Steel). As mentioned above, we manage the NIHR Research Design Service for the East of England, Norfolk and Suffolk.
- *National Institute for Health and Care Excellence (NICE)*: We are, or have been, members of NICE panels and Programme Development Groups (Sach: Public Health; Bachmann: Topic Selection for Acute and Chronic Conditions; Suhrcke: Pre-diabetes and Weight Management; Steel: Quality Outcomes Framework Indicators; Jones: Obesity) and carry out methodological research on evidence synthesis methods for use by NICE (Song)
- *NHS trusts and local authorities:* All of our clinical researchers have joint appointments or honorary employment contracts with local NHS trusts (Harvey, Bachmann, Hunter, Loke). We manage the Norwich Clinical Trials Unit jointly with the NNUH. We collaborate with Norfolk County Council and local public health departments.
- Our researchers have had lead roles in the NHS Norfolk and Suffolk *Comprehensive Local Research Network* (CLRN), including the Public Health (Harvey), Health Services Research (Bachmann) local speciality groups, and the *Primary Care Research Network* (Steel, Barton). We will continue this involvement with the *Local Clinical Research Network* (Eastern) which will be hosted by the Norfolk and Norwich University Hospital from April 2014 and cover the whole of East Anglia including Cambridge.