Department of Health

DEPARTMENT OF HEALTH DESIGNATED ACADEMIC HEALTH SCIENCE CENTRE (AHSC)

2016/17 ANNUAL REPORT

Note: Please note this form should be completed in font no smaller than 10-point Arial.

1. ACADEMIC HEALTH SCIENCE CENTRE DETAILS

Name of the Department of Health Academic Health Science Centre:

Oxford Academic Health Science Centre (OxAHSC)

Contact details of the DH AHSC lead to whom any queries and feedback on this Annual Report will be referred:

Name: Sir John Bell

Job Title: Regius Professor/Chair, OxAHSC

Address: Richard Doll Building
Old Road Campus
Roosevelt Drive, Headington
Oxford OX3 7DG

E-mail: Regius@medsci.ox.ac.uk

Tel: 01865 289 782

2. OVERVIEW OF ACTIVITIES (no more than 4 pages)

Partnership Alignment. OxAHSC partners secured continued funding for the Oxford University Hospitals (OUH) BRC and in addition new funding was awarded for the Oxford Health (OH) BRC, recognising the strength of the alignment not only between Oxford Health and the University of Oxford (UoO) but reaching out to include Oxford Brookes University (OBU), opening novel insights and interventions in delivering mental health. OBU, OUH and OH have established the Oxford School of Nursing and Midwifery to provide clinically embedded and research led training and education. The School will also have support from the UoO through its Board and management groups. This represents alignment at all levels across all clinical delivery and research components of OxAHSC. All partners are now sharing and coordinating their Master Planning activities with respect to their estates in Headington and the surrounding area to ensure OxAHSC continues to create an academic health campus. The partners are exploring collaborations around computer science, policy and business research enabling an Oxford/Oxfordshire Health System perspective. The Oxford AHSN remains an essential partner in the dissemination of AHSC outputs and as an extended framework for strategic initiatives such as digital health. The UoO and OUH have throughout the past year been undertaking a joint exercise to review the performance and requirements of the OUH clinical divisions and service and identified services that benefit from a strong academic link/theme of work within them and in addition is seeing how this can be strengthened by more joint planning and recruitment between UoO and

OUH to set out a pathway to excellence. **Progress of the Themes. Theme 1: Big Data and Clinical Informatics.** The Big Data Institute has now opened to welcome research groups and provide collaborative research space which will support our work on clinical informatics, information governance and big data analytics and these include ongoing and planned projects such as understanding the influence of molecular pathology and response to checkpoint blocking immunotherapy on clinical progression of early oesophageal cancer, digital Health approaches to management of chronic disease using EHR, smartphone-enabled sensors/cameras, EHR and machine learning, development of clinically applicable algorithms for patient stratification in inflammatory bowel disease, assessing the impact of (often silent) atrial fibrillation on cardiovascular, stroke, and vascular dementia diseases and using combined clinical and genomic data to identify emergence of infection threats. Oxford Health NHS Foundation Trust and Oxford University Hospital NHS Foundation Trust within the AHSC partnership have been designated as Global Digital Exemplars to champion the use of digital technology to drive radical improvements in the care of patients and are paving the way in the use of digital technology in the NHS, embracing digital health on a daily basis to support patient care. Oxford Health initiatives have included offering patients remote consultations using videoconferencing facilities such as Skype and FaceTime, electronic patient notes available via iPad from anywhere at any time, signposting to online wellbeing and mental health therapies and using and recommending apps such as True Colours to support patients' self-management and recovery. The exemplar has allowed Oxford University Hospitals to accelerate the opportunities that digital technology offers, in line with the ambition of the NHS to be paper-free at the point of care. The Trust has been acknowledged to be one of the most advanced NHS trusts for implementing electronic patient records (EPR), with over 1.2 million daily transactions via EPR. Administering more than 20,000 drugs every day using electronic prescribing and medicines administration, and having recently introduced a new state-of-the-art digital imaging system. **Theme 2: Building NHS, university and industry relationships.** This theme has made strong progress during the year across its key objectives: Construction on the BioEscalator is proceeding steadily, although the completion date has been put back to H1 2019. This project still remains on target. During the year a number of major partnerships have been signed. The first is with Novo Nordisk for a £115M research centre. The second is through the creation of Lab282 in collaboration with Evotec, OSI and Celgene. This has led to the creation of a £13M fund for identifying new opportunities. A third collaboration with KCP Partners in cannabinoids for pain, cancer and inflammation has secured £10M. This workstream is well on track to meet the Theme objectives of 4 partnerships with mid-cap companies. The SGC has received £300k in funding from the Oxford Martin School for a collaboration with the Oxford AHSN and the Office of Health Economics. This will explore new R&D models, identify alternative strategies to IP protection and quantify benefits of open research. Discussions are underway with a number of academic centres across the UK to develop a new drug discovery platform focusing on developing new medicines for ageing. Sir David Cooksey Fellowships are intended to bridge two major gaps in healthcare translation. It is hoped that the Fellowship programme will unlock the potential of the world leading research in Oxford across the OxAHSC partnership, to deliver patient benefit and investor outcomes. The research areas selected for the initial cadre of Fellows are Cell and Gene Therapy, Big Data/Digital Health and Medical Devices. **Theme 3: Modulating the Immune Response for Patient Benefit**. Significant progress has been made in the identification of novel targets for chronic inflammatory disease. Teams at the KIR and TGU have identified Oncostatin M (OSM) as a potential therapeutic target for inflammatory bowel disease (IBD). Patients with IBD have higher OSM concentrations in their intestine, suggesting that blocking OSM make work as a treatment for IBD. Interestingly, patients with high concentrations of OSM were shown to respond poorly to anti-TNF therapy, the current most-effective IBD therapy. The stratification of patients is a key aim of this theme and the Gastro-Enterology and Mucosal Immunity NIHR Oxford-BRC theme is proving instrumental in this area. Professor Simon Travis is leading a programme of real-time data collection in ulcerative colitis to relate fluctuations in disease activity with the biology of the disease. True Colours-ulcerative colitis (TCUC) is a comprehensive real-time web-based programme for patients with UC. It monitors multiple parameters via electronic questionnaires: symptoms, quality of life (QoL), outcomes and demographic permitting personalised treatment guidance. Proteomic and metabolomics analysis of serial biological samples collected over 6 months from patients is planned. Vaccine development is a strength and recently Vaccitech was launched to further develop a universal flu vaccine that is showing promise in clinical trials. Vaccitech is also developing a clinical stage therapeutic vaccine for prostate cancer. Groups within the Human Immunology Unit, Nuffield Department of Surgical Sciences and Department of Oncology are utilising this vaccine production expertise and working to develop novel anti-tumour therapies that harness the immune system. A Wellcome Trust ISSF enabled the initiation of the Oxford Viromics Pipeline, which aims to analyse human virus-containing samples by high-throughput sequencing. The applications for this Pipeline include routine diagnostics, disease characterisation and pathogen discovery. To facilitate coordination of the

immunology, infection and inflammation research activities, various University departments and Oxford AHSC contributed to the creation of the Immunology@Oxford Network. The initiation of the I@O Network will bring the considerable immunology, infection and inflammation community together to facilitate the sharing of resources and expertise and further enhance and promote immunology research. Specifically, the I@O Network will be instrumental in responding to strategic initiatives and calls from major funders, fostering collaborations with external partners and highlighting the significant impact of immunology research at Oxford. **Theme 4: Managing the Epidemic of Chronic Disease**. Researchers at The George Institute, UK, have collaborated with the Oxford Martin School at University of Oxford on a major new programme looking at how Machine Intelligence can be used to treat chronic disease. The Deep Medicine programme, supported by a £1m grant from the Oxford Martin School will use some of the largest and most complex biomedical data sets that have ever been collected to gain insights into complex chronic disease patterns, risk trajectories and treatment effects. Deep Medicine will seek to provide empirical evidence for the value of applying data mining, modelling and machine learning techniques to biomedical data. The programme will develop solutions, such as software for clinical decision support, that brings this knowledge into practice, in order to help clinicians to manage their patient's health more efficiently and, subsequently, improving people's lives. The collaboration will be led by Prof. Kazem Rahimi, Dr Reza Khorshidi and Abel Perez. The OxAHSC has a strong body of work in the primary care sector to address the emerging pressures around the treatment of chronic disease and long term health conditions. Additionally, a Gender and Health Research Programme has been established to use large biomedical data sets to investigate differences between men and women in the causes of chronic diseases such as coronary heart disease, as well as gender differences in access to and outcomes of medical care. The objective is to generate evidence on which healthcare solutions can be developed. This collaboration is funded by the British Heart Foundation and the UK Medical Research Council. We continue to build on the use of digital tools by patients to better manage their health in areas such as online management and evaluation of blood pressure and text message reminders for the management of Type 1 diabetes. In addition there are projects looking at changing people's behaviour and the culture to either prevent or treat serious disease such as evaluating online consultations eg. Using Skype. Related to this, the Behavioural Medicine Research Group in Oxford are evaluating how GPs can support patients to manage their own weight for example. These studies include the DROPLET, BWeL and WRAP. **Theme 5: Emerging Infection**: The results of clinical trials of treatments for Ebola were published, we continued our development of novel methodological approaches to the conduct of clinical trials in outbreak settings. Our pan-European study of the pathogenesis of acute respiratory infections (ARI) is now recruiting in 30 hospitals and 20 primary care sites across eight countries. With >500 patients already enrolled, this is the largest study to date of the pathogenesis of ARI. The UK Public Health Rapid Support Team (PH RST) was launched on 1st November 2017 and Oxford is leading several operational research projects and one team member has been deployed under WHO to support the control of an outbreak of acute watery diarrhoea in Africa. In 2017 we launched the training curriculum on Clinical REsearch During Outbreaks (CREDO) in partnership with WHO and held the first training workshop in Uganda. Professor Horby was elected Chair of the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC). In collaboration with the Chinese Centres for Disease Control, data has been collected on over 6,000 children admitted to hospital with Hand, Foot and Mouth disease. This large dataset is being analysed to identify children who may benefit from early interventions to prevent complications. The Jenner Institute is using replication-deficient viral vectors to develop vaccines against multiple emerging pathogens. Vaccines against Middle East Respiratory Syndrome (MERS), Rift Valley Fever Virus (RVF), Zika and Chikungunya are currently being manufactured in preparation for Phase I trials, with others in pre-clinical development. Each of the vaccines will be tested first in a human clinical trial in Oxford before further trials taking place elsewhere. The MERS vaccine programme has partners in Saudi Arabia and will test the vaccine in camels as well as in humans. The RVF programme will move into clinical studies in Uganda, and is also being tested in livestock. Further work in collaboration with the Pirbright Institute will undertake studies to define the optimum dose to use in livestock, as well as extended safety testing which is required for the vaccine to be licensed for use in livestock. Work demonstrating the role of quinolones in the Clostridium difficile epidemic in the UK was published in the Lancet Infectious Diseases. This work demonstrated that quinolone selection played a crucial role in selecting hospital-restricted lineages, which led to an epidemic rise in C. *difficile* disease peaking in 2007. The epidemic was controlled by a large ~ 40 reduction in quinolone usage across the UK. This provided strong evidence for minimising the use of quinolones to control epidemics of C. difficile caused by quinolone resistant hospital strains. Progress is being made in identifying the genomics variation conferring antituberculosis drug resistance in TB. A global consortium, CRyPTIC (http://modmedmicro.nsms.ox.ac.uk/cryptic/) being led out of Oxford is progressing well having completed a validation of a new easy to use a 96 well microtitre tray drug susceptibility test for 14 antituberculosis

drugs. These centres have started processing > 30,000 isolates, doing 14 drug susceptibility testing and whole genome sequencing. The analysis of the first 10,000 WGS TB isolates demonstrates that susceptibility to the four first line drugs, INH, rifampicin, pyrazinamide and ethambutol can be reliably predicted with > 98% accuracy (presented ECCMID 2017 in Vienna). We published the first demonstration of reliable antimicrobial resistance prediction from whole genome sequence in Neisseria gonorrhoeae. Other very substantial work is ongoing investigating the reservoirs of resistance in Enterobacteriaceae including carbapenemase resistance. This work is studying the contribution of patients, antibiotic use, hospital environment, animals, aquatic/riverine and sewage in the emergence and spread of multi-resistance. T**heme 6: Cognitive Health.** In 2016-2017, the Cognitive Health theme was focused on the successful application for an NIHR Oxford Health Biomedical Research Centre focused on dementia and mental health. The Oxford Health BRC will build on partnership that is determined to deliver new therapies meet the challenge of the global burden of mental illness. The partnership of the University and NHS Trust are very well placed to deliver benefits for patients with early phase translational research and experimental medicine uniquely integrated and co-located with later phase clinical research and care to support widespread implementation in the NHS and elsewhere, benefiting thousands of patients. Examples include psychological treatments for anxiety and eating disorders and digital systems for measuring outcomes and facilitating self-management such as True Colours. The new BRC will promote the use of digital and other new technologies to produce scalable solutions with global application and will transform our discovery science into new treatments and diagnostic tools, delivery. The theme has created a pipeline to deliver new therapies developed through our dedicated trial infrastructure. Examples include the identification of psychological mechanisms and new treatments for anxiety, sleep, psychotic, depressive and fatigue therapeutic approaches; informatics-driven identification of a novel lithium mimetic, ebselen, now in early phase trials. Current externally-funded experimental medicine programmes includes Wellcome Trust, MRC, NIHR and MQ funded programmes in psychological treatment development, EU-funded informatics-driven drug discovery (EMIF), innovative early phase adaptive trials in dementia (EPAD), development of novel human cellular assays using stem cell lines for drug discovery in bipolar disorder, psychosis and dementia (StemBANCC), and WT Strategic Awards in immunology, circadian neuroscience, neuropsychiatry, dementia, mood instability and neuroimaging. We have developed molecular biomarkers for Alzheimer's disease that have been patented, licensed and commercialised for research with large scale clinical validation underway. We have developed methods for assessing brain connectivity sensitive in people at-risk of neurodegenerative disease, together with proteomic, transcriptomics and metabolomics biomarkers that are predictive of conversion from mild cognitive impairment to dementia. We have retooled well characterised cohorts that are pre-consented for recontact for experimental medicine studies. Many of these are national, but led or co-led from Oxford and include the MRC Dementias Platform UK (including UK BioBank); the OXTEXT and Bipolar Disorder Research Network (n=6000) cohorts; the Improving Access to Psychological Treatment (IAPT) programme that treats >530,000 people with depression/anxiety each year with 97% routine outcome data. We have national leadership in clinical informatics (NIHR CRIS system nationally live this year); European leadership in platform integration (European Medical Informatics Framework; IMI-EMIF). The Oxford NIHR Cognitive Health Clinical Research Facility (CH-CRF) successfully renewed its funding and continues to be a single managed entity hosted by Oxford University Hospitals NHS Foundation Trust in partnership with Oxford Health NHS Foundation Trust across three sites - John Radcliffe Hospital, Warneford Hospital, and University Department of Experimental Psychology. Due to the success of this and the BRC funding into the AHSC, the core CH-CRF funding has attracted leveraged support from our NHS providers to increase the space available to the CH-CRF in Oxford. **Contribution to economic growth.** The table below sets out the number of spin-outs created during the AHSC timeframe.

Year	No of spin-outs	Companies	Total Raised
2014	5	NightstaRx, Genomics, Oxsonics, Deontics, OxSyBio	£68M
2015	5	iOx, Xerion Healthcare, OxEML, Orbit Discovery, Oxford Endovascular	£6M
2016	15	Zegami, Vaccitech, OMass, Oxstem, Oxford NanoImaging, EvOx, Argonaut, OcuLab, Oxford Impedance Diagnostics (+6)	£47M

2017(YTD)	3	ProMAPP, Scenic Biotech, SpyBiotech	£8M

Over 20 new companies have been launched with £130M in funds. This already significantly exceeds the AHSC target of 15 in 5 years from Oxford University alone. Major Industry collaboration:The University of Oxford entered into a £115m collaboration which will enable scientists from Novo Nordisk and the University of Oxford to collaborate to discover innovative approaches for treating type 2 diabetes. As part of the collaboration, Novo Nordisk is also investing in a new research centre on the premises of the University of Oxford. The centre will be built on the AHSCs growing biomedical campus in Headington. The collaboration will actively seek to encourage cross-fertilisation of ideas between academic researchers from the University of Oxford and researchers employed by Novo Nordisk with funds to sponsor the collaborative research. In addition, collaboration between the Kennedy Institute, the Department of Psychiatry and SomaLogic, who have developed a proteomic platform with unprecedented power for biomarker discovery, diagnostics and pharmaceutical development is well advanced with SomaLogic in the process of opening a SOMAscan assay service laboratory in Oxford. We also have strong links with GSK, UCB and Celgene who fund and collaborate on fellowships in translational inflammatory disease projects. Fruitful collaborations with Atopix are ongoing. **Development and delivery of an appropriate e-Health informatics platform;** The GDE proposal deliverables of OH and OUH are closely aligned which will lead to the creation of a GDE cluster across our region reflecting a whole systems exemplar. We already work closely together sharing a single unified network allowing health and social care staff across Oxfordshire to seamlessly and securely access resources. There is now a real opportunity to accelerate the interoperability of the EHRs in use in both organisations and onward digital interaction with GP and social care solutions – e.g., using Cerner's 'HealtheIntent' platform. For example an OUH EMIS/Cerner proposal delivering a platform will deliver a standards based approach supporting further integration across local and regional networks a normalised longitudinal patient record with medicines reconciliation between primary and acute settings (first in UK). All possible health and social care systems will be linked to provide universal access to the longitudinal record. Similarly OH is ensuring that the further development of its EPR will provide access to individual care records in real time by patients, the clinical workforce and the wider health and social care community (to include OUH and the primary care sector). Aligning and combining the vision of OUH and OH delivered success in receiving GDE funding which will now be used to implement these regional changes. The investment in e-Health will lead to the creation for a longitudinal health record for our patients which is expected to be highly valuable for research. GDE and BRC activities are aligned through the AHSC with outputs such as leveraging the resources of the Oxford BDI as an example. **Changes to the Governance of the AHSC.** This year we have had two changes to the membership of the AHSC Board. Professor Alastair Buchan has stepped down as the head of the Medical Sciences Division and from his role on the Board to help guide the UoO as a PVC through the UK's exit from the European Union. Prof. Buchan has been replaced as MSD Head by Prof. Chris Kennard who now also represents the UoO on the OxAHSC Board. Prof. June Girvin retired this year and Prof. Linda King, PVC for Research and Global Partnerships at OBU has replaced Prof. Girvin on the Board. We do not anticipate that these changes will negatively impact the activity of the partnership as the individuals have both had a role in the OxAHSC since its creation.

This form must be submitted, by e-mail, no later than **1pm Wednesday 31 May 2017** to Dr Joanna Topping (Joanna.topping@nihr.ac.uk). Please feel free to provide any other information you wish (in a separate annex) that demonstrates the progress made with your AHSC in 2016/17.

The Annual Report aims to capture progress against the stated objectives, specific themes and work programmes as set out in your application, in order for the Department of Health to be able to understand the overall progress of the AHSCs. However, please note that we will not be providing feedback on the AHSC Annual Reports.

A signed copy of this report should be sent no later than **7 June 2017**, to:

Dr Joanna Topping
NIHR Central Commissioning Facility
Grange House
15 Church Street
Twickenham TW1 3NL