Institution: University of Bedfordshire
Unit of Assessment: UoA3
1. Unit context and structure, research and impact strategy

Unit context and structure:

UoA3 brings together a team of researchers committed to real-world health research and impact, providing information that has influenced policy and practice at national and international levels. The REF2014 submission to UoA3 incorporated researchers from three main groups - health, health psychology and biomedicine. We have built upon this interdisciplinary approach in UoA3 by recruiting additional research-active staff across two research institutes – the Institute for Health Research (IHR) and the Institute of Biomedical and Environmental Science and Technology (iBEST). This has been enabled by significant improvements in our research infrastructure and facilities – three healthcare simulation centres across our campuses, a STEM building with a range of laboratories and training resources; and significant grants from the National Institute for Health Research Public Health Research Programme, and the European Union's Horizon 2020 Programme.

The Institute for Health Research (IHR) (http://www.beds.ac.uk/research-ref/ihr)
IHR was launched in 1994 and is committed to carrying out real-world research, providing information that can influence policy and practice. It is at the forefront of applied health research with achievements that include hosting the Teenage Knowledge Pregnancy Exchange (TKPE) on behalf of Public Health England (PHE). The IHR has been recognised in part of Universities UK's MadeAtUni campaign, launched in 2019. In the Nation's Lifesavers, the University of Bedfordshire is named for its work in training doctors, nurses and NHS staff as one of the top 100 ways universities are saving lives and making a life-changing difference to health and wellbeing. IHR Director, Professor Gurch Randhawa, is cited in the campaign to increase organ donation amongst BAME communities. The global impact of Prof Radhawa's research is also acknowledged in assisting NHS Blood & Transplant to host the first-ever Faith & Organ Donation Summit.

The primary aims of the IHR are:

- ❏ To engage in collaborative research locally, regionally, nationally and internationally.
- ❏ To create research partnerships with purchasers and providers of healthcare, with the professions, industry and the independent sector.
- ❏ To promote and co-ordinate health-related research across the university.
- ❏ To enhance research skills in the community through the provision of quality educational programmes.

The IHR has three main research groupings: the Maternal & Child Health Research Centre; the Research Centre for Health Organisation & Delivery; and the Organ Donation & Transplant Research Centre. IHR is also a core partner of the National Institute for Health Research (NIHR) East of England Research Design Service, providing advice and support to NHS and social care staff in developing research grant applications. The IHR is a facilitator of the UK Faculty of Public Health's Accredited Practitioner Programme; and an expert advisor to the National Institute for Health & Care Excellence. IHR is a member of the UK's Inequalities in Health Alliance.

The IHR manages its portfolio of activities via its Institute Board, which meets five times a year. The IHR operates its own ethics panel - which is accountable to the board and the university Research Ethics Committee, and chaired by Dr Yannis Pappas (Reader in Health Services Delivery & Organisation) - assisted by a range of IHR researchers. It meets three to four times a year and considers approximately 50 applications each year from staff and postgraduate research students.

The Institute of Biomedical and Environmental Science and Technology (iBEST) (http://www.beds.ac.uk/research-ref/ibest)

iBEST is an interdisciplinary institute with two major research areas – biomedical science and environmental science. All academic staff in the School of Life Sciences are affiliated to the research institute, along with staff from other areas of the university with complementary research expertise and interests. This provides excellent opportunities for cross-disciplinary collaborative research activities in the context of the sustainability of health, food and the environment. This is facilitated through continued investment by the university to develop the laboratory infrastructure and core facilities. QR funding provides further support to staff research development, which underpins the development and delivery of high-quality postgraduate research programmes. The development and delivery of our research, enterprise and scholarly work is overseen by the iBEST Board, which typically meets three times a year. iBEST has developed strong collaborations with academics in other institutions and also institutes at the university, including the Institute of Health Research (IHR), Institute of Sport and Physical Activity Research (ISPAR), and Institute of Research in Applicable Computing (IRAC).

Researchers affiliated to iBEST have expertise in a range of areas that span cell biology, biochemistry, immunology, microbiology, molecular biology, genetics, genomics, proteomics and bioinformatics that are predominantly laboratory-based. iBEST's research efforts in biomedical science align with two thematic areas:

(i) Health and wellbeing;
(ii) Disease and ageing.

Our research in these thematic areas aims to gain new insights into the cellular and molecular-level processes of pathologies such as cancer, asthma, and diabetes, enabling the identification of new targets and biomarkers that underpin the development of novel therapies. An exemplar is our research in the immunology area led by Dr Anna Furmanski, focusing on immune cell development, allergy and asthma (with UCL) to investigate whether we can identify and manipulate factors in the lung that worsen immune responses in asthma. This area has also led to broader collaborative research on immune responses to exercise (with Dr Hough, Nottingham Trent) and identifying barriers to genetic testing (PhD programme with Dr Puthussery, IHR).

The overall goal of our research in the biomedicine area is to improve the diagnosis and outcome of patients suffering from disease. In turn, the insights we gain will be translated to develop new technologies and therapeutic strategies to improve preventative medicine and patient care. In this way, iBEST has a closely synergistic relationship to the research activity of its sister research institute, IHR.

Research and impact strategy
The UoA3 research strategy since 2013:

The UoA3 REF submission in 2014 outlined the research strategy to:

I. *Further increase postgraduate research student numbers*.
II. *Enhance our profiles as centres of international research*.
III. *Stimulate external income streams.*
IV. *Further expand the research groups and increase collaboration.*

The REF2014 outcomes reinforced the need to focus on the above four areas to further develop and strengthen our research environment components whilst building on the excellence of research outputs and impact. Significant progress has been made in these four areas:

i) Further increase in postgraduate research student numbers

The research institutes have developed dedicated PhD schools that focus on recruiting high-quality students to undertake study on research topics synergistic with staff research interests. Bespoke postgraduate student training is offered to students, and dedicated facilities and resources are available (see https://www.beds.ac.uk/ihr/ihr-phd-school/). The development of high-quality postgraduate taught programmes has also helped provide feeder routes for many of our current students. IHR has taken the strategic decision to utilise some of its Quality Related (QR) budget allocation to invest in a series of match-funded PhD studentships in partnership with external funders. External funding has been secured at local, national, and international levels to support research studentships that directly impact policy and practice. The sources of this funding include Autistica, Luton Flying Start, Luton Borough Council, Luton Public Health, Total Wellbeing Luton, Luton CCG, Letchworth Centre for Healthy Ageing, Keech Hospice Care, and NHS Blood & Transplant. Also, 100% externally funded studentships have been secured from the Steel Charitable Trust, the Libyan Government, and the Saudi Ministry of Health.

IHR has introduced a comprehensive postgraduate training programme to ensure students are equipped to navigate doctoral studies and developed and implemented a postgraduate conference travel and attendance policy to ensure postgraduate students are aware of the support available to them when presenting at national and international conferences. These significant improvements in our student environment have contributed to a >300% increase in the number of PhD completions since REF2014, rising from nine in the previous period to 29.7 in the current REF2021 period.

iBEST continues to attract motivated postgraduate research (PGR) students, both nationally and internationally. Our PGR students receive training and support throughout their programme. This includes workshops on presentation and analysis of published research and work-in-progress presentations by students and staff seminars on research techniques and methodologies. These workshops mainly focus on developing the professional research skills and broader employability attributes of our PGR students. PGR completions in iBEST from 2015 include seven PhDs with fivein Biomedicine. Our successful PhD students have found post-doctoral employment in academia and industry.

iBEST researchers also co-supervise PhD programmes at external institutions and other research institutes at the University as exemplified below:

- Dr McDermott: primary supervisor to LIDo PhD student based at KCL (2015 – 2019; £ 79,967) through a research collaboration with the London Interdisciplinary Doctoral Training Programme (BBSRC funded LIDo-DTP), student awarded in 2020.
- Dr Furmanski: 2nd supervisor to PhD student 1 at UCL, awarded in 2017; joint primary supervisor to PhD student 2 at UCL, awarded in 2018. Co-supervision of PhD student with IHR (with Puthussery).

ii) Enhance our profile as centres of international research

We continue to attract and develop our research staff within the IHR & iBEST research institutes and to influence policy and practice at local, national and international levels. This is enabled by:

1) Engaging in joint research and publication with healthcare organisations

2) Encouraging proposals for funded PhD studentships from staff in healthcare organisations

3) Serving on the research/advisory boards of key local, regional, national and international healthcare organisations

4) Securing new and/or extending research funding with healthcare organisations

5) Demonstrating to other influential publicly and privately funded healthcare organisations and ministries of health the value of the university's applied approach to health-related research. Notable examples include:

- Dr Chris Papadopoulos being co-applicant of an EU Commission Horizon 2020 project - *Culture aware robots and environmental systems for elderly support*;
- Dr Shuby Puthussery being a co-applicant for Department for International Development commissioned review - Effectiveness of nutrition interventions in low and middle-income countries;
- Professor Randhawa being commissioned on a range of organ donation projects by organisations such as Organització Catalana de Trasplantaments (OCATT) in Spain, and the MOHAN Foundation in India.
- As a result of the aforementioned mapping work with the MOHAN Foundation in India; the University have co-funded a PhD Studentship with MOHAN Foundation, utilising our Global Challenges Research Fund (GCRF) monies to improve research capacity and capability in India on the topic of organ donation (Supervisors Prof Gurch Randhawa & Dr Erica Cook).
- Dr Shaobo Zhou's research project with Chinese partner Prof. Ying Ma (School of Food Science, Harbin Institute of Technology) on 'Milk source MFG-E8 regulates overexpression of β-amyloid protein through inhibition of activated-microglia proliferation', funded by the National Natural Science Foundation, China.
- Dr Tom Osborne invited participation in a public health-oriented workshop "towards a new generation of arsenic removal technologies" in Kolkata, India, September 2018, sponsored by the British Council and the Royal Society of Chemistry.
- Dr Lindsay McDermott was a co-applicant of a successful bid to BBSRC for UCL capital equipment fund for dual-wavelength, analytical ultracentrifuge to determine protein shape and size, May 2018. To be housed at UCL, serving London and the Home Counties, guaranteeing access for iBEST projects and facilitating further development of collaborative research).
- Dr Robin Maytum's successful joint bid to Innovate UK by the Life Sciences Group (Bedford based SME) to develop a 'viral inactivation transportation medium' in the context of the COVID19 pandemic testing (approximate overall budget £50,000).

iii) Stimulate external income streams

The significant success of IHR in research grant acquisition over the period has been complemented by considerable success with the establishment of the international centre of excellence, Teenage Pregnancy Knowledge Exchange (100% funded by Public Health England). The staff within IBEST have begun to add to this success (e.g. BBSRC, Innovate UK, British Council, Royal Society of Chemistry, Asthma UK, Animal Free Research UK, and Daiwa Foundation). Grant income has emanated from a range of sources – European Commission, Department of Health, Public Health England, WHO, NIHR, Health Education England, etc. The IHR are currently co-hosting the NIHR East of England Research Design Service and successfully re-tendered for the 2018-2023 contract.

IHR has taken the strategic decision to utilise some of its Quality Related (QR) budget allocation to invest in a series of match-funded pilot research projects in partnership with external funders. A notable example is the ‘Development of the E-PLAYS (Enhancing Pragmatic Language skills for Young children with Social communication impairment)’ research work led by Dr Suzanne Murphy. Dr Murphy obtained a grant from the Harpur Trust (Murphy, S. Harpur Trust, £16,226. 'Supporting Social Skills for Collaboration (SSSCo)', 2010 – 2011), this small grant was supplemented by £8000 from the University of Bedfordshire QR budget. This project led to two publications (Murphy et al, 2014a, 2014b) reporting an initial piece of work developing a prototype of the E-PLAYS game in collaboration with children, teachers and speech and language therapists and preliminary testing. The prototype was tested on 32 children and showed a signal of efficacy. Following this, Dr Murphy successfully applied to NIHR Research for Patient Benefit funding stream for a feasibility study (2016) for £252,000. This bid was successful and was completed in 2019, with two articles (Murphy et al 2019, 2020) reporting the result Dr Murphy has subsequently applied for a grant of £1.4m in 2020 from the NIHR Public Health Research funding stream, which was successfully funded in March 2021.

Staff attend research grant-bidding workshops offered to health and social care professionals and academics across Bedfordshire by the IHR-hosted Research Design Service.

iv) Further expansion of the research groups and increased collaboration

The coherence of the IHR research groups has been developed into three research centres: the Maternal & Child Health Research Centre; the Research Centre for Health Organisation & Delivery; and the Organ Donation & Transplant Research Centre. An emphasis will continue to be placed on recruiting research-active staff to each institute and to expand the scope of our research outputs. A significant feature of the development strategy will be to develop further inter-group research programmes, such as our recent programme focussing upon healthy ageing. We have developed this in two specific areas – early years and older people.

Early Years

IHR has developed a partnership approach with Luton Borough Council and carried out a series of research studies in child health, investing in a joint research fellow post to evaluate the Luton Flying Start programme (0-5 years old). This also resulted in a jointly funded PhD studentship, examining the role of fathers in child development. Prof Randhawa is also a co-applicant of a National Institute for Health Research-funded study (£3.7m) from the Public Health Research programme, Evaluation of the Ultra-Low Emission Zone, and its impact on child health (Children's health in London & Luton – CHILL study).

Older People

The university has invested in the appointment of a Professor in Health & Ageing, Professor David Hewson. Prof Hewson has established a research programme related to frailty among older people:

- Barriers and facilitators to frailty screening in primary care;
- Evaluation of the Luton Frailty Framework.
- Ethnic differences in screening thresholds for frailty and sarcopenia;
- Hard-to-reach populations and healthy ageing.
- Development of an instrumented screening tool for sarcopenia.
- Resistance training for older people with frailty and sarcopenia;
- Exercise by stealth – golf on prescription for frail older people.

This work has been enabled by a range of local - Luton Clinical Commissioning Group; Cambridge Community Services NHS Trust; Luton and Dunstable University Hospital; Buckinghamshire Healthcare; Letchworth Centre for Healthy Ageing; and international - All India Institute of Medical Sciences (New Delhi); Indian Institute of Technology Jodhpur; the Asian Centre for Medical Education, Research and Innovation (Jodhpur); and Dev Sanskriti Vishwavidyalaya (Haridwar) – collaborations. ; Funding has been secured to support a number of PhD students on the Frailty Research Programme.

Dr Papadopoulos, Prof Hewson & Prof Randhawa were the UK evaluation leads for an EU-funded Horizon 2020 project, 'CARESSES' (Culture-Aware Robots and Environmental Sensor Systems for Elderly Support). The project is motivated by the fact that ageing populations worldwide are placing health systems under increasing pressure. Elderly care robots may be a means of relieving that pressure in hospitals and care homes and a way to improve care delivery at home and promote independent living for the elderly.

Dr Emma Wilkinson leads a programme of research relating to diabetes, older people and diversity.

Dr Lindsay McDermott leads biochemistry research on zinc alpha2 glycoprotein (ZAG), a fat-depleting protein found in blood plasma. This research investigating the fatty acid-binding of ZAG has the potential to contribute to the development of NHS nutritional therapies for treating obesity and type 2 diabetes.

2. People

i. Staffing strategy and staff development

The research groups within this submission continue to attract and retain top researchers. Since 2013, IHR has recruited a full-time professor in health & ageing (Hewson) to develop a new research programme related to healthy ageing. Alongside this, several research-active staff have been promoted internally to reader roles or senior/principal lecturer roles (Cook, Pappas, Papadopoulos, Ali and Murphy). iBEST has recruited several research-active staff (Basheer, McDermott, Furmanski, Cami-Kobeci, Janganan, Law, Bajpe, and Diakogiannaki). Following a University of Bedfordshire-funded pilot initiative, Public Health England has invested in establishing the Teenage Pregnancy Knowledge Exchange, advising the UK Government and the World Health Organisation on research-informed policy-making, led by internationally renowned Alison Hadley (WHO advisor). https://www.beds.ac.uk/knowledgeexchange

All academic staff hold PhD degrees and are expected to evidence a portfolio of outputs in research and enterprise. iBEST is continuing to build through the recruitment of post-doctoral research staff and developing core facilities to support our research labs. Recent appointments have been catalysed by the £40m investment in a STEM building that includes state-of-the-art laboratories for biomedical science. Funds are available for staff to attend national and international research meetings to stimulate collaboration, and have used schemes such as Erasmus to promote the exchange of students and staff with research centres overseas.

This strategy is complemented by direct investment in additional staff and research students across the unit. By developing a national and international reputation in key research areas, the university has been successful in recruiting research-active staff from institutions such as Imperial College, York Medical School, Leeds Medical School, and Public Health England. Such investment in staffing enables our research teams to work in partnership with practitioners and policymakers and to promote greater collaboration with external stakeholders.

In terms of staff development, the university enables a vibrant research culture. All health-related research staff and students have access to the NIHR East of England Research Design Services Training Workshops on bid writing and writing for publication. The IHR introduced a research mentoring scheme for all healthcare academics in 2016/17 https://www.beds.ac.uk/ihr/research-mentorship-scheme/; alongside an early & mid-career development programme.

There is also a bi-monthly staff development programme that provides a forum for the discussion of staff research projects, progress with grant funding, impact opportunities, forthcoming conference presentations and other developmental activities. The programme is designed specifically to enhance the research competence of all staff in the team, especially that of early career researchers. Staff are actively encouraged to present papers at national and international conferences, and £25,000 is currently budgeted to support this annually. IHR has also taken the strategic decision to utilise some of its Quality Related (QR) budget allocation to invest in a series of match-funded pilot research projects in partnership with external funders.

The university follows a formal annual review process during which all staff are reviewed twice in each academic year by a senior manager and more frequently in their first year. At review meetings, development activities are jointly identified to support staff in areas where they feel they might benefit from short external courses or training. Objectives for the past year are evaluated, challenges in the past year considered, and the ways that development activities in that year have contributed to their practice are discussed. Personal and departmental priorities for the coming year are established, and ways to overcome possible obstacles are considered.

Staff progression and leave: At the annual review, staff aspirations and the training/professional development they might pursue over the longer term to support these aspirations are established. A

personal development plan for the next academic year is agreed on, as are opportunities for research and sabbatical leave and promotion within university guidelines (*Special Leave and Time Off Policy and Procedure*). The university has clear, transparent procedures for staff career progression at all stages of their careers (*Organisational Development and People Strategy 2013*), which research institutes follow. Since 2014, besides new recruitments, five staff members have been promoted - from senior lecturer to reader, senior lecturer to professor, senior lecturer to principal lecturer, post-doctoral research fellow to lecturer; and one from lecturer to senior lecturer.

Support for early career researchers: In addition to the Organisational Development & Training Unit Staff Development programme, early career researchers are supported and assisted by research institutes through a structured mentoring and career development programme (https://www.beds.ac.uk/ihr/research-mentorship-scheme/). Mentors take a particular interest in helping their mentees develop and maintain their research profile and activities. They can support mentees in several ways, including creating a research strategy, helping to transform ideas into research projects that could attract external research funding, time planning and management for achieving agreed targets, and advising how to boost integration of research into their teaching. Examples include:

- Dr Erica Cook completed her UoB MSc in Health Psychology in 2009 and took up a PhD studentship, jointly funded by NHS Direct. Upon completion of the PhD, she was appointed as a lecturer in September 2012. With support from other experienced members within the research groups, she has subsequently presented her research at a range of national and international conferences during her doctoral studies and after that. She has been supported in submitting journal articles and sourcing a book contract, as well as submitting bids for external grant income. Cook undertook project management of an evaluation of tele-health and tele-care services, funded by Cambridgeshire Community Services. Through her expanding research profile, publications, and research engagement, Cook has progressed from lecturer to senior lecturer in health psychology at the University of Bedfordshire.
- Dr Ali Tomlin completed an MSc in Neuroscience at the Institute of Psychiatry and took up a PhD at the Institute of Diabetes for Older People (IDOP) at the university. Upon submitting her PhD, she was appointed as a research fellow in IDOP to work on the EU-funded MID-Frail study. Tomlin was supported to build her research output profile and contribute to a research-informed curriculum. She is now a senior lecturer in psychology at UoB.
- Dr Vasiliki Tzouvara was supported to publish high-quality journals during her PhD, secured a research post before completion at King's College London and is now a lecturer there.
- Dr Rebecca Garcia took up a PhD studentship, fully funded by the Steel Charitable Trust. Upon completion of the PhD, she was appointed as a lecturer at UoB in 2017. She has published eight papers, has been mentored for grant application funding, and recently secured a senior lectureship at The Open University.
- Dr Catrin Pedder Jones took up a PhD studentship jointly funded by NHS Blood & Transplant. Upon completing the PhD, she had published four papers and was appointed as a researcher at the University of Cambridge.
- Dr Anne Marie Lodder took up a PhD studentship jointly funded by Autistica. Upon completing the PhD, she had published four papers and was appointed as a researcher at University College London.

Equal opportunities: The University of Bedfordshire is committed to creating and sustaining a positive and supportive working environment for our staff and an excellent teaching and learning experience for our students. Staff are valued and respected, and students are encouraged to thrive academically. The University's Equality and Diversity Policy and Strategy sets out several objectives that will guide our work in this crucial area and form the basis for measuring our progress. All research groups recruit, employ and promote staff strictly based on their suitability for the work to be performed. To this end, we ensure that no applicant or employee receives less favourable treatment on the grounds of gender, transgender, marital status, disability, creed, colour, race or ethnic origin,

age, sexual orientation, religion, faith or belief. All job applicants are asked to voluntarily provide the above information, which is not used for selection, is treated confidentially and is used only for monitoring the effectiveness of our equality and diversity policy.

The University's Staff Equality Networks provide an opportunity for interested staff to promote progress and good practice concerning equality, diversity and inclusion, and opportunities for peer support and development. There are currently three networks, inclusive and open to all staff:

The LGBTQ+ Network for Staff at the University - Bedfordshire recognises the importance of networks in creating a positive, safe and open working environment for staff; and have made a commitment to setting up an LGBTQ Staff network open to any staff member, regardless of their sexual orientation or gender identity. The aim of the network is to fully support LGBTQ staff to help the diverse University that we are to grow into an even better organisation that all staff are truly proud to work for and where students are proud to study. A place where everyone feels free to express themselves and can achieve their full potential.

The BAME Network for Staff at the University - The University of Bedfordshire's Black, Asian and Other Minority Ethnic (BAME) Staff Network aims to address the needs, priorities, and concerns of both academic and professional members of staff at the University from a Black, Asian or Other Minority Ethnic Group background. The purpose of the Network is to ensure BAME staff are represented in the workplace and to seek to address inequalities in recruitment, and the lack of support, or recognition to allow progress in the BAME staff's careers.

Disability Network - The Staff Disability Network has recently been established. It is a voluntary group that aims to be an inclusive network open to all staff members, not only those with a disability but also those with caring responsibilities, staff with restrictive and/or long-term health conditions, and/or those with an interest in disability issues (professional or otherwise). The overall mission of the Staff Disability Network is to provide a network of mutual support and a collective voice for staff with disabilities, restrictive health conditions and caring responsibilities in order to support the development of a positive culture for such staff at the University of Bedfordshire.

Staff links with external partners: The research impact section of our submission evidences our effective and robust policy of liaising with local, regional, national and international healthcare provider organisations, business, industry and the public sector to ensure our work has maximum positive impact on policy and practice. Examples include the Department of Health, NHS England, Public Health England, NHS Blood & Transplant, Autistica, Advinia Healthcare, the UK Faculty of Public Health, NICE, Luton Flying Start, Luton Borough Council, Luton Public Health, Total Wellbeing Luton, Luton CCG, Letchworth Centre for Healthy Ageing, Keech Hospice Care, Steel Charitable Trust, the Libyan Government, the Saudi Ministry of Health, NIHR, and the Royal National Orthopaedic Hospital. Further examples from iBEST include: Life Sciences Group, Bio Nano Consulting, British Council, Asthma UK, Animal Free Research UK. These partnerships enable a range of opportunities, including PhD studentships and funded research projects, contributing to policy and practice development.

ii. Research students

PhD Recruitment: Since 2013, our recruitment of PhD students has been a key focus and stands at a completion of 29.7 students in the current REF period, a significant improvement upon the nine completions in the previous REF period, which has enhanced our national and international profile. Our students are funded by a range of international or national funding bodies. For example, IHR has been successful in securing either full funding or matched funding to support research studentships from Autistica, Luton Flying Start, the Steel Charitable Trust, Luton Borough Council, Keech Hospice, the Libyan Government, the Saudi Ministry of Health, and NHS Blood & Transplant. iBEST researchers also co-supervise PhD students at other institutions (e.g. UCL and KCL, LIDo-DTP).

Research Culture: In line with our increased staff and PhD student numbers, the groups' research culture has expanded its range and scope. Since 2013, research institutes have run an active research training programme which meets regularly and includes research-focussed training, talks and workshops from internationally renowned visitors, faculty and PhD students; see https://www.beds.ac.uk/ihr/ihr-phd-school/

In 2013, IHR developed and implemented an ambitious research student development plan to improve the research culture and the skills, confidence of and opportunities for our research students in the faculty. We actively use the VITAE framework to identify the range of skills development required for postgraduate students and then make provision from internal resources or provide access to external courses supported by QR funding. The pinnacle of the student development plan is a discipline-specific programme for personal and professional development. The programme was developed in close collaboration with our staff and the cohort of our students, who greatly contributed to its structure and content. Our students have been receiving research training from academic staff who are research-active and submitted in the latest REF. Each member of staff teaches in their area of expertise. However, our research student development plan offers much more than just training. Its overall aim is to create a culture of collaboration and belongingness, a liberal environment where ideas and people can grow confidently.

To meet this aim, the programme has four objectives:
1. Provide academic and institutional induction;
2. Enhance research-related skills;
3. Improve personal and professional skills;
4 Enhance opportunities for students, the faculty and the university.

Some of the activities and seminars as part of the research student development plan are shown below:

a. **Methods and Practices in Postgraduate Health Research :**

b. **Peer-assisted learning scheme (PALS) to strengthen acculturation, socialisation and cohesion - *'A buddy when you need it'***

c. **Seminars by recent graduates - '*Trust me I'm a Doctor':***

d. **Processes and policies in the institute and beyond - '*Getting the admin right':***

e. **From research question to thesis - '*A roadmap of my PhD':***

f. **Using IT and the library - '*These are my tools':***

In addition to learning enhancement opportunities, our research students are provided with opportunities for networking, external visibility, and skills development. Some of the events that we have developed for our research students include:

1. The IHR 3 Minute Talks (3MT) Research Student Symposia, which were held with great success. The 3MTis a development opportunity for research students to enhance their public communication skills. The events bring all our staff and research students together and support our efforts to foster the faculty's research community.

2. Research students have presented their work at an International Mental Health and Counselling Symposium that our faculty and the Institute for Health Research hosted during the visit of a delegation from Stetson University, Florida, United States.

3. Our postgraduate research students are allowed to present their work on the university's website: https://www.beds.ac.uk/ihr/ihr-phd-school/current-research-students-projects/ Furthermore, our faculty provides a dedicated study space for our students.

4. iBEST supports the delivery of PGR students' professional skills development workshops.

Our PhD leads hold regular meetings with research students and have set-aside 'surgery' time to meet with them individually on request. Research Institutes hold PhD student presentations where students have the opportunity to present their research to their own colleagues and faculty staff. These events allow students to receive feedback from their colleagues and academic staff and also get a sense of their own and others' progress. These activities have continued during the COVID19 pandemic via online methods to ensure students benefit from continued support and development.

Research students also have the opportunity to engage in working groups (Action Learning Sets), each comprising four to seven students who meet regularly to support one another in their learning. A professional facilitator leads the meeting and enables members to ask searching questions. In this supportive setting, the 'problem holder' is given time to reflect on potential actions. The set's power comes from the type of questions asked and the time for reflection given to the problem holder.

Implementation of the research student development plan has enhanced student engagement and participation. As a result, the quality of PP2/MPhil transfer seminars has increased, along with students' confidence, especially among those whose first language is not English. Research institutes in the faculty organised social gatherings in which students and staff convene to strengthen their relationships and celebrate progress and successes.

Equal opportunities: Our student body is highly diverse, demonstrating our commitment to equal opportunities. Completed PhD students (2014 to present) consist of students from eight different countries (Greece, Canada, Nigeria, Switzerland, India, Saudi Arabia, Libya, UK). The ratio of male to female in this group was 1:2. Our current overseas PhD students originate from various countries, including Georgia, Saudi Arabia, Australia, America, Poland, Jordan, Pakistan, the Netherlands, Greece, Sri Lanka, Thailand, and Hong Kong.

Research student links with external bodies: As mentioned above, IHR has been successful in securing a range of full and/or matched funding to support research studentships. iBEST research students participate in external events, such as workshops and visits, e.g. an 'early career research networking event' at GSK, Ware, a British Pharmacological Society meeting, and training at and research collaboration with Imperial College. Also, several recent students have sat on professional body committees, such as the British Psychological Society's Postgraduate Forum. The benefit of postgraduate research students working with funders on applied projects is immense. Students have the opportunity to spend at least one day per week in an applied environment at the forefront of healthcare delivery and policymaking. The students gain a set of professional skills that equip them for employment following their PhDs. All PhD studentship graduates have secured employment either before their PhD viva or within three months of being awarded it at a range of organisations, including the University of Cambridge, University College London, City University and the University of Bedfordshire.

Monitoring and support mechanisms: Postgraduate research students each receive a week-long induction by the Research Graduate School, covering all aspects of research practice, ethics, progression, research training and so on. They then receive an individual briefing and induction at IHR and iBEST and are inducted into the university and Research Institute's virtual learning environment - a central forum for communication and dissemination. The Research Graduate School facilitates and ensures regular contact between supervisors and students through a virtual

environment, which creates and stores records of learning and provides a platform for regular interaction between supervisors, supervisees and the Graduate School. Supervisors meet PhD students at least monthly, and outcomes are recorded. Each student has a second supervisor who joins the supervisory meeting at least once a term and completes a formal panel process of upgrade from MPhil to PhD, including a public presentation and discussion.

Preparing research students for future careers: Students benefit from a range of developmental opportunities, ranging from presentation skills, writing for publication and working with external healthcare organisations. As part of our efforts to develop research students' profiles and experience, staff encourage students to publish their research and present at conferences. The IHR PhD school has a published conference attendance policy and application process. Staff actively work with students in the preparation and publication of research articles. In the current REF period, over 90% of postgraduate students have published at least one article before submitting their PhD thesis.

3. Income, infrastructure and facilities

Research income: Across the groups within this submission, research income has risen dramatically in the last few years. In total, IHR and iBEST have accrued over £2.5 million in research funding over the reporting period. This demonstrates, in financial terms, the continued success of the research activity and recognition of its efficacy in national and international spheres. This income is used to further the groups' research aims, thus ensuring more significant impact and sustainability; investing, for example, in new staff and staff and student development. Funding is competitively secured from a range of sources – European Commission, Health Education England, Public Health England, the Department of Health, NHS Blood & Transplant, DFID, NIHR, Luton Flying Start, Luton Borough Council and the Royal National Orthopaedic Hospital, to name a few examples. Sources of iBEST research development funding include Innovate UK, British Council, Royal Society of Chemistry, Asthma UK, Animal Free Research UK, and Daiwa Foundation

Scholarly infrastructure: In 2013, the university invested in full access to ScienceDirect, enabling staff and students access to all of the key texts in health-related research. The university has also invested its REF2014 income towards a jointly funded research & evaluation post with Luton Flying Start and a series of match-funded PhD studentships. Since 2016, students have benefitted from the state-of-the-art, seven-storey £46m library at our Luton campus, which is open 24/7, where specialist support for researchers includes advice on OA options, mandate proposals, RDM guidance, research skills, enhanced use of Scopus, Web of Science and obtaining specialist collections. Recent developments in iBEST include a 50-seater computer simulation suite and an imaging suite that offers confocal microscopy. The University have also allocated some of its GCRF funding towards improving research capacity and capability in organ donation in India – a subject area in which IHR are recognised as international experts. IHR has also taken the strategic decision to utilise some of its Quality Related (QR) budget allocation to invest in a series of match-funded pilot research projects in partnership with external funders.

The University have also invested £50,000 into a project that seeks to establish authentic inter-professional learning experiences for the range of professions embodied in the Faculty of Health and Social Science. To create such a co-operative learning experience demands a sound pedagogical structure to enable different professions to learn together inter-professionally with learners from other professions. Constructing such learning experiences also requires physical resources that reproduce the authentic environment in which professions articulate and such inter-professional scenarios can be simulated.

Organisational and operational infrastructure supporting research: Across IHR and iBEST, there are dedicated and hot-desk workspaces for our PhD students.

In 2013, the new £30m postgraduate and research centre was completed, providing state-of-the-art teaching and seminar spaces and creating a hub for postgraduate activities. Organisational support

for postgraduate students is also provided by the Research and Graduate Studies' £42m STEM Building and three clinical skills and simulation centres in Luton, Bedford, and Aylesbury campuses.

Specialist facilities: The university has made a significant investment in developing both the infrastructure and core facilities required to develop and sustain biomedical science and healthcare practice research. Recent significant capital investments include:

a. Investing in three clinical skills and simulation suites within three campuses based at Luton, Bedford and Aylesbury. Clinical skills and simulated learning scenarios have been designed to provide invaluable learning opportunities to observe, develop and test how healthcare professionals work together and interact with their environment and equipment. Facilities in the simulation suite include:

- An adult ward with low fidelity nursing mannequins, including patient monitoring;
- An acute and critical care area that can be configured to represent accident and emergency, intensive therapy/high dependency or an obstetrics bay and consists of three bed spaces. This area is equipped with medium and high-fidelity mannequins, including a neonatal resuscitaire;
- A single bay that can be configured as an anaesthetic room, PACU bay or as a consulting/counselling room;
- A fully equipped operating theatre with a new touch screen, WATO EX-35 anaesthetic machine (Mindray), associated medical devices and equipment, scrub area, lay-up room and PACU area (including piped gas throughout);
- A student changing facility;
- Simulated living space.

The entire suite can be monitored by our integral HD audiovisual camera system (CAE Intuity) for the purpose of detailed debriefing, feedback and CPD recording.

b. Investing in a state-of-the-art, £42m STEM building, which is part of the University's wider vision to improve and redevelop its facilities and campuses through a £180m investment to enhance the student and staff experience. The new building provides:
    - More than 6000m2 of teaching space focused on science, technology, engineering and mathematics (STEM) subjects.
    - An outreach centre that is used by local schools and the general public to encourage STEM engagement with the wider community.
    - New state of the art laboratories include specialist containment labs, simulation spaces, analytical labs and a clean room facility.
    - Facilities designed to support a suite of courses, including Pharmaceutical Science, Pharmacology, and other subjects allied to Health, e.g. MSc Microbiology in Public Health.
    - Large, state of the art science and microbiology laboratories.
    - Specialist laboratories that host a bank of PCR machines, including QPCR, and high throughput DNA sequencing (Illumina) systems. Analytical kit includes AKTA, Fluidic One, HPLC, GCMS and FITR systems.
    - A new tissue culture facility, including multiple cell culture cabinets and incubators to support teaching and research in life sciences.
    - Freezer park with a range of -20 and -80 freezers to support long-term storage of a range of biological materials and an externally placed liquid nitrogen bio-storage facility.
    - Facilities designed to support a suite of courses including Forensic Science, IBMS accredited Biomedical Science, Biochemistry, Biological science, Microbiology.

- The STEM building is connected to current facilities within Life Sciences, which include additional teaching and research laboratories and a scene of crime simulation space.

Such core items of equipment enable research staff and students to embed a range of current and emerging research technologies within their research strategy. Expansion of life sciences laboratories and specialist facilities as part of the new STEM Building provides our researchers with the opportunity to develop and deliver projects that show commercial promise and will attract funding. Present examples include industry-linked projects with Bio Nano Consulting (Biosensors) and with the Life Science Group Innovate UK-funded' viral inactivation buffer' project associated with COVID19 testing.

4. Collaboration and contribution to the research base, economy and society

Wider influence or contributions to the discipline: In iBEST, our academics co-ordinate and contribute to collaborative research projects that focus on areas of heart and lung disease, cancer and infection with a range of national and international partners. The IHR supports a range of healthcare organisations to improve research capacity and capability. The IHR (Dr Suzanne Murphy) hosts the Bedfordshire hub of the East of England Research Design Service (RDS), which receives core funding from the NHS National Institute for Health Research (NIHR) to enhance research and development in primary care and NHS Trusts in Bedfordshire. The hub provides support to trusts - both those experienced and inexperienced in research - to enable them to apply for NHS research funding. The Royal National Orthopaedic Hospital also awarded the IHR (Dr Yannis Pappas) funding to host a three-year, 0.5 FTE research fellow post in health services research (commenced October 2013) to develop collaborative, externally-funded research bids. Luton Flying Start awarded the IHR (Professor Gurch Randhawa) funding to host a three-year, 0.5 FTE research and evaluation fellow, match-funded with 0.5 FTE funding from the university QR income. Live Well Luton also awarded the IHR (Dr Yannis Pappas) funding for an initial one-year, 0.7 FTE research fellow in health services research post (commenced October 2017) to carry out a one-year evaluation.

IHR's extensive public health expertise has contributed to supporting national efforts in relation to COVID19. Dr Nasreen Ali has been commissioned to undertake a study examining the impact of COVID19 among BAME communities – the Talk, Listen & Change project. Professor Gurch Randhawa was invited to join NHS England's Impact of COVID19 on NHS BAME Staff - Clinical Advisory Group and the Public Health England,/Joint Biosecurity Centre/NHS Test & Trace Non-Pharmaceutical Interventions Ethics Group. The Sikh Doctors Association approached Professor Randhawa to collaborate on testing the feasibility of a culturally competent COVID19 Personal Protective Equipment (PPE) solution for health and social care who have a beard - Singh R, Safri H, Singh S, Ubhi BS, Singh G, Alg G, Randhawa G, Gill S (2020) Under-mask beard cover (*Singh Thattha* technique) for donning respirator masks in COVID-19 patient care. Journal of Hospital Infection. https://doi.org/10.1016/j.jhin.2020.09.034 NHS England has commissioned Dr Chris Papadopoulos to undertake a rapid review on how best to support families with a child living with autism, post-diagnosis, to inform the new NHS Long-Term Plan, including within and beyond the COVID19 context.

Participation in peer-review process and editorships

All IHR staff engage in a range of peer activities, notable examples in IHR:

Ali - Editorial Board, Diversity in Health & Social Care Journal

Almeida - Appointed member of the Scientific Editorial Board of the Brazilian Journal *Interface: Comunicação, Saúde, Educação* (*Interface: Communication, Health and Education)* (**Associate Editor**).

Pappas
- Member, NIHR East of England Research for Patient Benefit Funding Committee
- Editorial Board Member Biomed Central since 2016

Wadd - Editorial Board Journal of Dual Diagnosis in Older Adults

Collaboration with external bodies and responsiveness to national & international priorities and initiatives

IHR is recognised for being at the forefront of health inequalities research and is a member of the Inequalities in Health Alliance that was formed as a policy response during COVID19 (https://www.theguardian.com/commentisfree/2020/oct/06/covid-19-still-worsening-health-inequality). Staff are involved in a range of collaborations reflecting the applied nature of research:

- **Ali**: Saudi Ministry of Health; Luton & Dunstable Hospital Maternity Transformation Board; Beds, Luton & Milton Keynes Maternity Strategy Group.
- **Almeida:** MIRL (Member of the Institute for Responsible Leadership) https://responsible-leadership.org/
- **Hadley**: As TPKE director, is contracted by Public Health England as the Government's Teenage Pregnancy Advisor. The TPKE Director is on the expert advisory group of the Tommy's teenage pregnancy and diet research group; the Fathers' Development Foundation; the Sex Education Forum; and the Association for Young People's Health.
- **Murphy**: Extensive work with the children's communication charity 'ICAN' (ican.org.uk) for the E-PLAYS study
- **Papadopoulos:**
  - European Commission expert evaluator on Public Health Best Practices award scheme
  - Member of the Council of Deans of Health Research Leads Network
  - Steering committee member of externally funded research projects, e.g. NIHR funded UCL STORM project
  - Social robotics consultant (Skills for Care, POST - Parliamentary Office of Science and Technology - UK Parliament, doteveryone think tank)
  - Autism Too Much Information campaign contributor
  - BBC Three Counties' Make a Difference' Awards 2019 judge
  - Founder and chair of the 'London Autism Group Charity' (registration number 1176341)
- **Pappas:**
  - Head of Faculty of Research and Knowledge Exchange in Buckinghamshire Health and Social Care Academy
  - The NIHR-funded study, WRAPPED Data and Ethics Steering Committee;
  - Public Health Academic Forum Executive Committee Public Health England (East of England)

- Course advisor on Evidence Based Practice at Charles University in Prague
- Specialist public health advisor on Innovate UK-funded study Track and Know
- Specialist public health advisor for Innovation Bridges-funded consultancy for Cansr.com;
- Specialist public health advisor to UKeMed for COVID19 teaching programme in Chinese Hospitals;
- External reviewer for research course periodic review validation, Staffordshire University.

- **Puthussery**
  - World Health Organisation (WHO) Expert Group to Support Technical Guidance Development: Mother and New Born Health
  - UK Chief Medical Officer (UKCMO) postpartum physical activity guidelines Expert Group
  - UK Prevention Research Partnership
  - Luton Flying Start - Adverse Childhood Experiences (ACE) Working Group
  - National Research Mentor, Society for Social Medicine, UK
  - National Institute of Health Research (NIHR) Dissemination Centre College of Raters, UK

- **Randhawa's** work in IHR has informed both policy and practice. It has also led to his appointment to key national and international working groups reflecting both the research impact and collaborative approach to his work:
  - Honorary Public Health Academic Contract, Public Health England (Current);
  - Chairman, Transplant 2020 Stakeholder Group (Current);
  - Member, NHS England, Impact of COVID19 on NHS BAME Staff - Clinical Advisory Group (Current);
  - Member, Public Health England,/Joint Biosecurity Centre/NHS Test & Trace - Non-Pharmaceutical Interventions Ethics Group (Current);
  - Co-Chairman, European Working Party on Public Issues in Organ Donation (Current);
  - National Member, Black and Minority Ethnic Transplant Alliance (Current);
  - Expert Advisor, NICE Guidelines, National Institute for Health and Care (current)
  - Authority Member, Human Tissue Authority Board (until April 2016);
  - National member, UK Donation Ethics Committee (until April 2016).

- **Seddon** - Collaborations with Drink Wise Age Well and Dementia UK

- **Wadd**
  - Academic advisor to a high-level policy group for older adults and substance misuse, which includes MP's, representatives from the drinks industry and national statutory and voluntary sector organisations. The group provides advice to both the All-Party Parliamentary Group on Alcohol Harm and the All-Party Parliamentary Group on Ageing (2015-2020)
  - Collaboration Care Quality Commission improving practice concerning alcohol use in care homes (2020-)
  - Collaboration We Are With You, Addiction NI, Royal Voluntary Service, Developing A Caring Wales reducing alcohol harm in older adults (2015-)
  - Member Addictive Behaviour Co-Production Research Network (2017-)
  - Member European Substance Use and Addictive Behaviour Research Group (2015-)
  - Member British Society Gerontology's Special Interest Group Substance Use In Older Adults (2020-)
  - Member Society for the Study of Addiction (2011-)

- **Wilkinson** has served as a trustee of local carer support charity 'Carers in Bedfordshire' since 2014, then served as Chair of the Board of Trustees for three years from 2017 – 2020; currently Vice Chair.

Within iBEST, academics engage in a whole range of subject development activities, including engagement with professional bodies and learned societies, as well as external review of research at national and international levels.

Academic	Activity
Dr Anna Furmanski	Honorary Research Associate, UCL Institute of Child Health
Dr Shaobo Zhou	Collaborative projects with Jiamusi University, China.
Dr Thamarai Janganan	Collaboration with Prof Adrian Walmsley, School of Biosciences, Durham University, on the 'Characterisation of bacterial efflux pumps that confer resistance to antibiotics'
Dr Lindsay McDermott	Primary supervisor to LIDo PhD student based at Kings College London through a research collaboration with the London Interdisciplinary Doctoral Training Programme (LIDo-DTP), Completed 2020. Co-applicant on a BBSRC equipment grant to upgrade the existing UCL AUC (dual wavelength analytical ultracentrifuge to determine protein shape and size) facility serving London and the Home Counties (£363,407), guaranteeing access for iBEST-School of Life Sciences projects, 2018/19.
Dr Bushra Ahmed	A small grant from Daiwa Foundation with a collaborator in Japan.
Dr Robin Maytum	Successful joint Bid to Innovate UK by the Life Sciences Group (Bedford based SME) to develop a 'viral inactivation transportation medium' in the context of the COVID19pandemic testing, July 2020
Dr Tom Osborne	Consultancy with Bio Nano Consulting (SME, London & Rothamsted Research) in developing sensor(s) for environmental public health monitoring. 2019

iBEST-School of Life Sciences continues to host high-profile public lectures as part of our Science and Society Lecture series, attracting excellent participation from students and staff across the university and a wide range of external stakeholders, including students from local schools and colleges. These events include:

- Professor Jonathan Van-Tam MBE, Government Deputy Chief Medical Officer, 'Thinking the unthinkable: Influenza pandemic preparedness and response' (2019)
- Nobel Laureate in Physiology and Medicine, Sir Paul Nurse, 'Trust in Science' (2016)
- Prof Nicholas Talbot, Fellow of the Royal Society and Deputy Vice Chancellor, Research and Impact at Exeter University, 'Global food security' (2016)
- Alistair Kent OBE, Director, Genetic alliance-UK, 'Genomics: genetic and rare diseases and the problem of healthcare''(2014).

Media engagement

- Papadopoulos is regularly invited to speak on the EU-funded CARESSES study (Culture aware robots and environmental systems for elderly support). This study has attracted global interest with billions of views on various TV, radio, and print media outlets.
- Professor Randhawa is regularly invited to comment on organ donation and health policy issues and has appeared on a range of mainstream and specialist media, including BBC Newsnight, BBC News, Radio 4, BBC Radio 5 Live, BBC Look East, Zee TV, Islam TV Channel, Bangla TV Channel, Sangat TV (Sikh Channel), Hope TV (Black Christian Channel). Randhawa has also featured in a range of international media in relation to proposed changes to the law on organ donation.
- Hadley is regularly invited to comment on teenage pregnancy in a range of national and international media.

- More recently, Papadopoulos and Randhawa have been regular media commentators on TV and radio on managing the COVID19 pandemic and its impact on health inequalities. Papadopoulos has written four articles for the Spectator magazine, and Randhawa has written for the Guardian newspaper and two articles in the British Medical Journal.

- Dr Gerta Cami-Kobeci, researcher in iBEST with expertise in developing opioid analgesics, was invited and presented a short talk on the Albanian National Television about COVID19 and the relation with opioid addiction (2020).

- Dr Gerta Cami-Kobeci: Women's organisation ‘Our Voice’ in New York awarded Gerta "Woman of the year" for her contribution to pharmaceutical research science, in particular in the opioid field. The ceremony was held in Staten Island New York, on International Women's day, 8 March 2020.