

Institution: University of Leeds (UoL)

Unit of Assessment: 3

1. Unit context and structure, research and impact strategy

The UoL return for UoA3 comprises 63.1 FTE staff from the Faculty of Medicine and Health (FMH): 29.4 FTE aligned to **Nursing and Allied Health** (N&AH) with 17.6 FTE from the School of Healthcare (SoH) and 11.8 FTE from the School of Medicine (SoM); while 33.7 FTE are aligned to **Dentistry** in the School of Dentistry (SoD). **N&AH** focusses on applied health research making a positive difference to the lives of people using and working in health and social care. **Dentistry** focusses on applied and translational research for patient benefit underpinned by a broad range of basic science (Figure 1). They are separate units with overlapping strategies, but both grounded on recognised research leadership and strengths, delivering interdisciplinary research (IDR) in teams at all levels, ensuring vitality and future sustainability. Underpinning all activities is our commitment to academic excellence - embedded within a culture which values equality, diversity and inclusivity, as evidenced by our Gold and Silver Athena SWAN awards.



Figure 1: Organisational structures supporting our Research & Impact Strategy

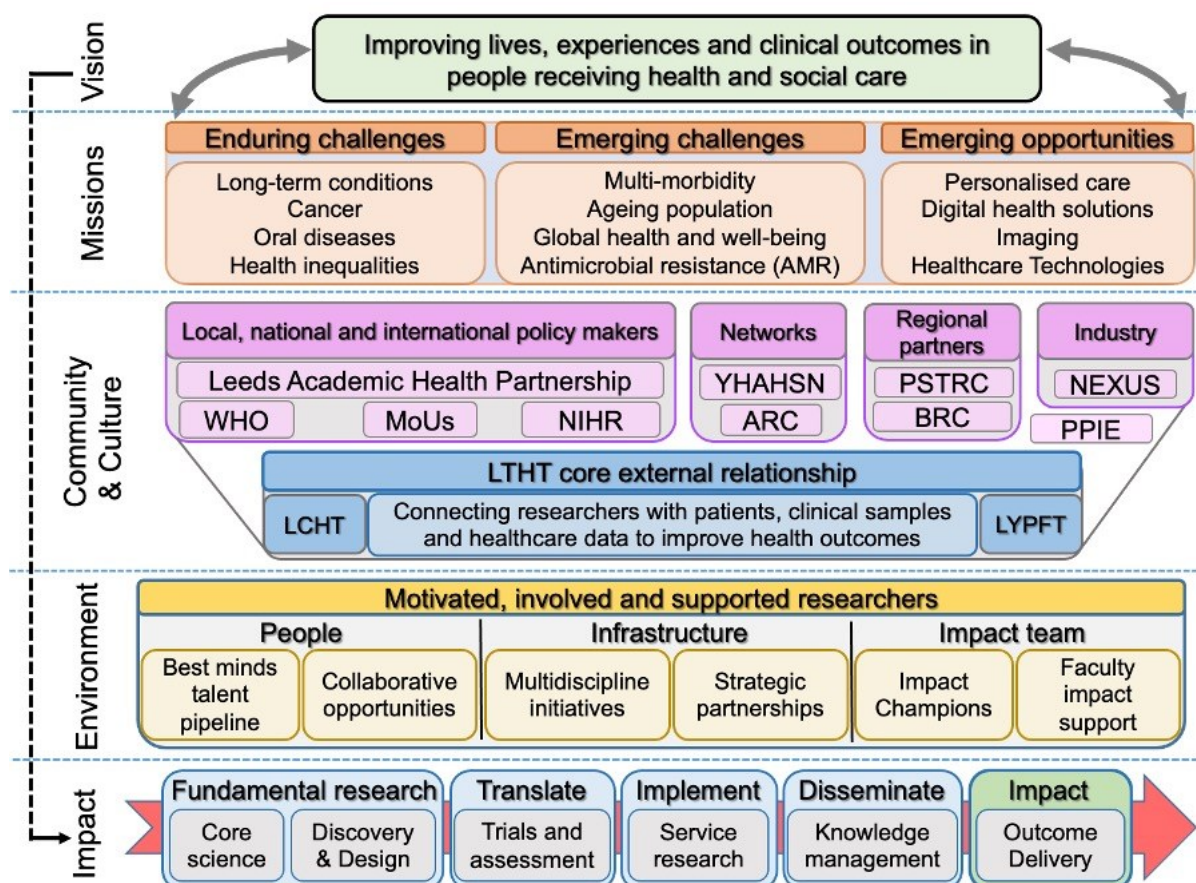
Our campus infrastructure lies at the heart of the Leeds City Region (population: 3m), is an engine within the Northern Powerhouse (10.2m), and acts as a national and international hub for research activity. Our NHS partners, centres, and platforms support our clinical and academic leaders to deliver research in systemic and oral health, social care, and healthcare technologies (Figure 1). These structures help sustain our long-term plans for improved patient care, and ensure a highly trained and skilled workforce.

Key headlines during the REF period include:

- Delivery of high-impact research across our themes, with total external grant award value of £81.5m of which the UoA3 share was £26.8m;
- 1353 publications: 36% in top 10% journals and 41% with international co-authors;
- Significant investment in 41 new academic staff;
- Twenty-two clinical academic fellowships, which for N&AH (n=17) was nationally the second highest awards to Universities/Trusts;
- COVID-19: Publications (14 N&AH; 14 Dentistry); £1.6m successful grants (96% NIHR);
- Two staff awarded Queen's Honours;
- Significant investment of infrastructure (over £36m) providing modernised laboratories, workspaces and well-equipped PGR facilities.

Research and Impact (R&I) Strategy

Our vision is to improve lives, experiences and clinical outcomes in people receiving health and social care (Figure 2).



Key: WHO: World Health Organization; MoUs: Memoranda of Understanding; YHAHSN: Yorkshire & Humber Academic Health Science Network; PPIE: Patient & Public Involvement & Engagement; Figure 1 provides all other abbreviations.

Figure 2: Research & Impact Strategy Map

We use interdisciplinary collaboration to tackle enduring and emerging challenges, while maximising new opportunities beyond REF2021. We follow the principles of the 'Open Science Framework' around integrity and reproducibility of scientific research using pre-registration, data archiving, sharing ([Research Data Leeds](#)), and open access publishing. Effective translation of our research happens in collaboration with external stakeholders, targeting our investments towards important strategic partnerships to co-produce research impact with the end-users (Figure 2).

A key UoL strength enabling impact is its access to a large, diverse community via NHS trusts, care services, and local authorities. Impact culture is fostered through School academic 'Impact Champions' (with experience of generating impact) and a Faculty impact support team. To develop and produce impact we:

- Encourage researchers to embed impact in all project stages including implementation into grant applications and knowledge transfer activities with our strategic partners;
- Engage early career researchers (ECRs) and postgraduate researchers (PGRs) to increase their knowledge and engagement with impact through workshops and senior academic mentorship;
- Leverage UoL investment for building IDR culture (*REF5a*), through a 'Crucible' programme and pump-priming funds to establish or consolidate links with our key centres and platforms;
- Provide cross-disciplinary training on developing impact goals, creating impact through public engagement, and the planning, recording and evaluation of impact supported by our impact team.

Nursing and Allied Health

Our goal was to grow as a leading centre of excellence in applied health and social care research, education, innovation and knowledge transfer. Over the REF period, we have succeeded by:

- **Continued expansion of research capacity and activity.** We have invested and recruited research talent across all levels (Section 2) ensuring a vibrant community with clear career progression and sustainability. We are nurturing and growing our next generation of clinical academics, partly supported through our success with seventeen Health Education England (HEE)/NIHR clinical academic fellowships which included: one Senior Clinical Lectureship; six Clinical Lectureships; ten Clinical Doctoral Research Fellowships (CDRF). We support one Wellcome Trust Fellowship; two NIHR Advanced Fellowships; two NIHR Development Skills Enhancement Awards; three NIHR Doctoral Research Fellowships; seven Pre-Doctoral Clinical Academic Fellowships (PCAFs); and two NIHR School for Social Care Research Development Awards. We also have three NIHR Senior Investigators.
- **Increased number, value, duration, and diversity of research grants.** Our award value for REF2021 is £18.6m and represents a wider portfolio of grants, totalling £12.1m from NIHR (e.g. HTA, HS&DR, PGfAR). We have been successful with charity and industry/commercial funding (e.g. Yorkshire Cancer Research, Versus Arthritis and Pfizer, Totalling: £4.0m). Our individualised mentorship and support have resulted in average annual doctoral fellowship funding increasing by 294%, from £138k to £406k in REF2021.
- **Integration of research and knowledge transfer activities.** Our aim is to ensure rapid, significant and far-reaching impact from our research (Section 4). Engaging and working with practitioners and patients is at the forefront of our strategy. Key users and beneficiaries include: patients and carers; UK policy makers, including NICE, NHS England and NHS Improvement, Department of Health; Professional bodies, including Royal College of Nursing, Royal College of Psychiatry, and the Royal Pharmaceutical Society; regulators, including the Nursing and Midwifery Council, Health and Care Professions Council, General Pharmaceutical Council and Care Quality Commission; service providers; commissioners and industry. We have strengthened and increased our

strategic partnerships and collaborations, to enable wider and far-reaching impact. We developed new partnerships e.g. with care homes through 'Nurturing Innovation in Care Home Excellence in Leeds' ([NICHE-Leeds](#)), to improve quality of care and services for care home residents. NICHE-Leeds uses and generates evidence to address the questions that matter to people who live, and work, in care homes. This work has been cited in the NHS England 2020 guide '[Leading the acceleration of evidence into practice](#)'. We increased our leadership and involvement in networks e.g. [YHAHSN](#); [NIHR ARC YH](#).

Dentistry

Our vision is to use IDR collaborative working to understand the fundamental mechanisms of disease, particularly musculoskeletal (including dental), to identify and treat early, improve outcomes, restore function, and address the needs for prevention. Through greater integration of our two groups in basic and clinical research, since REF2014 we have:

- Increased interdisciplinary research** leading to high quality outputs in clinical trials, clinical data mining, dental public health prevention, tissue engineering, acellular scaffolds, dental materials, stem cells, high resolution imaging and modelling of oral biofilms, along with new inter-faculty collaborations with the physical sciences (e.g. Food Science, Physics, Computer Science). The Wellcome/EPSRC Centre of Excellence in Medical Engineering ([WELMEC](#)) and EPSRC Centres for Doctoral Training (CDT) in [Tissue Engineering and Regenerative Medicine](#) (TERM) and [Molecular Scale Engineering](#) were key to new research directions in biomedical engineering. The [MedTech IKC](#) is now supporting development of this fundamental research towards application. Increased interdisciplinarity has enabled establishment of a translational pipeline (TRL1 to 6/7) from basic science through to patient and public benefit. Newer initiatives that we are capitalising upon include: [LIDA](#) (and its [Centre for Immersive Technologies](#), CfIT); the [BCMR](#), and the [NBIC](#). We provide leadership for two networks: understanding and controlling biofilms (the Leeds Biofilm Network) and anti-microbial resistance (AMR@Leeds).
- Expanded clinical research activity** through investment in the [Dental Translational and Clinical Research Unit](#) (DenTCRU) facility (£1.2m Wellcome Trust) and leadership in cross-disciplinary clinical dental research. This yielded high quality outputs and impact through robust trial design and implementation. It increased capacity and capability, enabling investment in seven more support staff (including four dental nurses, dental hygiene therapist, two trial managers) to deliver a broad portfolio of national-scale trials. Data for the Oral & Dental Health portfolio from the NIHR Open Data Platform ranks patient recruitment for Yorkshire & Humberside 1st in both the UK (19%) and England (23%), with LTHT ranked 3rd in UK for interventional studies (2013-2020). We have extended oral health to multi-morbidity including rheumatoid arthritis (RA), multiple sclerosis (MS), cardiovascular disease (CVD) and provide national leadership through PROSpECT (Periodontal Research On Multi-morbidity and Systemic Health CSG and Consortium). Digital Dentistry emerged as a new strategically important direction, pump-primed via three EPSRC Impact Accelerator Awards.
- Recruited a new generation of researchers** through strategic appointments and succession planning for key senior staff, and increased PGR recruitment (34%) since REF2014, ensuring a vibrant, sustainable research environment. One-quarter of research active staff are early career academics, including three Academic Clinical Lecturers (ACLs), maintaining experience at all levels. The WELMEC programme trained high-calibre independent researchers: three were retained by the SoD as basic science lecturers and one as a tenure-track University Academic Fellow (UAF) who will transition to associate professor at the end of the fellowship.

Achievements during REF period**Notation:****Returned staff*****Leavers/retired staff***

Non-returned staff (secondment/early career)

Returned staff in other UoAs

Outputs: [UOA3-XXX]

Impact Case Study: **ICS#UOA3-X*****Nursing and Allied Health*****Long-term conditions**

'Skins and Wounds' (**Nixon, Coleman, Nelson, O'Meara**, Adderley, UoA2 colleagues) has a long-standing track record of attracting funding and successful interdisciplinary collaborations. Programmes of work and achievements include:

- Diabetic foot ulcer infection [UOA3-1753, UOA3-1754] (HTA CODIFI £0.4m/HTA CODIFI 2 £2.06m); treatment (HTA MIDFUT £1.8m) including a Cochrane review of the evidence of dressings for treating foot ulcers [UOA3-2865];
- Prevention of pressure ulcers [UOA3-1431] (NIHR PGfAR PURPOSE £2.0m) which has improved our understanding of risk factors [UOA3-2234]; developed tools to improve clinical risk assessment; and compared mattress effectiveness [UOA3-1433] (HTA PRESSURE 2 £1.8m); and venous leg ulcer healing (partner HTA VenUS IV trial).

Translation into impact is evidenced through **ICS#UOA3-1** and the active involvement of **Nixon** and **Coleman** in '[Stop the Pressure](#)' initiatives to improve pressure ulcer prevention at national and international levels; with Adderley (on secondment) initiating the national '[Legs Matter](#)' campaign and providing evidence at a House of Lords consultation meeting.

'*Musculoskeletal*' (**Keenan, McHugh, Redmond, Siddle, Alcacer-Pitarch**) focusses on improving services and treatments for patients with musculoskeletal conditions, the leading contributor to disability worldwide [UOA3-1583, UOA3-1870, UOA3-3076]. We are integral to the NIHR BRC (£6.7m), and work across the University and with musculoskeletal clinicians. Our programmes of work include:

- Digital health: Evaluation and implementation of electronic-rehabilitation programmes for chronic knee pain (with UoAs1&4, Versus Arthritis £238k); and Developing a Virtual Knee School (with UoA1, NIHR £350k);
- Novel treatment approaches: 'Peer mentorship' for self-management of osteoarthritis (NIHR RfPB £249k); and a multi-centre study determining effectiveness of orthotics for treatment of symptomatic flat feet in children (partner with University of York, NIHR HTA).

Our foot and ankle studies have led to improvements in podiatry by: developing the 'Foot Posture Index' and transforming how foot posture is measured; increasing the evidence-base for podiatry interventions [UOA3-1361, UOA3-1582]; and developing a common measure of quality of life for people with systemic scleroderma [UOA3-2091 with UoA1].

'*Pain and Quality of Life in Cancer*' (**Velikova, Stark, Kind, Harley, Wright, Absolom, Boele**) focusses on improving outcomes and management of patients with cancer, and led to:

- Resource developments (with UoAs1&2): A toolkit (booklet/DVD) for patients and families for tackling cancer pain [UOA3-1229] (BMA Patient Information awards 2016: highly commended); the 'Chronic Cancer Experiences Questionnaire' [UOA3-1788]; and

an integrated platform for patient self-report and management of adverse events during cancer [UOA3-2206] (Yorkshire Cancer UK £498k);

- Addressing the impact of cancer (with UoAs1&2): The largest UK survey of men with prostate cancer reporting on quality of life and functional outcomes [UOA3-1530] leading to a change in clinical practice; a better understanding of psychosocial outcomes following colorectal and glioma (brain) cancers [UOA3-1528, UOA3-1529, UOA3-1531, UOA3-3608]; the identification of the risks of specific subsequent primary neoplasms after each type of adolescent and young adult cancer [UOA3-1559]; the identification in teenage and young adults (TYA) of different outcomes in care dependent upon location of treatment and the professionals involved [UOA3-4664] (partner NIHR PGfAR 'BRIGHTLIGHT'); and how social integration of TYA is impacted by a cancer diagnosis (ESRC £800k);
- Treatments for cancers (with UoAs1&2): Testing of drug treatments for breast cancer [UOA3-1492, UOA3-1493] and ovarian cancer [UOA3-1560, UOA3-1561], highlighting the effects on quality of life [UOA3-1491, UOA3-1562].

As evidenced in **ICS#UOA3-2**, our research has led to improvements in quality of life across cancer care and **ICS#UOA3-3** provides evidence of research into TYA cancer services - enabling improvements in survival, confidence, and quality of life. Our research underpinned implementation of NHS policy via specialised NHS TYA cancer services (**Stark** with UoAs1&2).

Mental Health (**Baker, Hughes, O'Hara, House, Clibbens, Russell**, Berzins) focusses on ensuring safe, effective and therapeutic mental health care, and has led to:

- Development and testing of interventions to: reduce self-harm [UOA3-650]; standardise therapeutic assessment and related therapy (NIHR PGfAR £2.5m); prevent post-stroke depression and promote recovery of function by recommending against the routine use of fluoxetine [UOA3-649]; reduce smoking in people with serious mental illness [UOA3-3901]; and prevent blood-borne virus risk behaviours in those who inject drugs [UOA3-3903];
- Increasing safety: in acute mental health wards (NIHR HS&DR £811K); through involving patients [UOA3-2152] and enhancing involvement of patients and families in serious incident investigations (NIHR HS&DR £816k); by identifying successful interventions to reduce restrictive interventions in adult, child and learning disability institutional settings (NIHR HS&DR (3 awards-£761k) and in crisis mental health services (NIHR HS&DR £269k); and through understanding the factors associated with seclusion in adult Inpatient Mental Health Services [UOA3-3069];
- Improvements in mental health services in: liaison psychiatry (NIHR HS&DR £1.1m) and treatment models (NIHR HTA £589k); those with serious mental health and alcohol/drug conditions (NIHR HTA £558k); self-harm and suicidality in young people who identify as lesbian, gay, bisexual, transgender or queer (Policy Research Programme), and their support needs (partner with University of Lancaster NIHR HS&DR); the effectiveness of sexual assault referral centres (NIHR HS&DR £1.16m).

Maternal, Child and Family Health

'**Maternal Health**' (**McGowan, Tennant, Stacey, Shloim**) focusses on improving pregnancy outcomes. **Stacey** with colleagues in New Zealand confirmed that supine going-to-sleep position was associated with late stillbirth and a modifiable risk [UOA3-2636, UOA3-2637]. It resulted in Tommy's Charity launching a public health campaign '[Sleep on Side](#)'. **Tennant's** work identified the risk of serious adverse pregnancy outcomes in women with pre-existing diabetes [UOA3-1655] and showed that the risk of stillbirth in gestational diabetes is mitigated by effective screening and diagnosis [UOA3-1659]. Collaboration with the Universities of York and Sheffield has increased awareness of fathers' perinatal mental health and the lack of support and services for them [UOA3-2942] - issues now being tackled by [NHS England](#).

'**Child and Family Health**' (**Bekker, Milnes, Smith, Horne, Rodriguez**) focusses on supporting families to self-manage long-term conditions [UOA3-841, UOA3-3061], and developing and testing interventions to enable informed healthcare decisions. An MMR patient decision aid was

shown to be an efficient way to help parents make decisions to vaccinate their children [UOA3-1230]. **Bekker** developed and tested the [Dialysis Decision Aid](#) (DDA) [UOA3-1231] which has informed subsequent kidney care policy and dialysis decision aid development in the UK and internationally. Kidney Research UK disseminated the DDA from 2015; each year about a third of UK kidney units embed it within their service and 1000+ patients directly access it. The DDA is the endorsed 'best practice' for meeting clinical guidance when treating patients with chronic kidney disease in the UK, and internationally.

Medicines Optimisation (Aldred, Zaidi, Kennedy, Daffu-O'Reilly) focusses on developing and testing complex interventions for the safe and effective use of medicines in high-risk populations, particularly older people in care homes and people with heart failure. Multi-centred, randomised controlled trials are currently underway following the successful completion of intervention development and feasibility studies which include:

- [Care Homes Independent Pharmacist Prescribing Study](#) (CHIPPS) (PI for Yorkshire NIHR PGfAR £1.98m);
- [Improving the Safety and Continuity of Medicines Management at Care Transitions](#) (ISCOMAT) (partner NIHR PGfAR).

The arising impact is recognised internationally as evidenced in **ICS#UOA3-4**.

People, Systems and Services (Spilsbury, Thompson, Randell, Devi, Haunch) focusses on understanding how people work in (and experience) systems and services, evaluating ways of improving those systems and services, and enabling the workforce to meet increasing demand and changing demography. We have increased understanding of the impact of novel robotic surgery on teamwork in the operating theatre (NIHR HS&DR £351k) (ICS UoAs1&2) and the effectiveness of the interfaces for navigating datasets of gigapixel images [UOA3-2377 with UoAs 1,11,12], leading to the Leeds Virtual Microscope (LVM); enabling pathologists to diagnose cancer and other diseases from digital slides; and commercialising LVM with a major laboratory vendor (Roche-Ventana; ICS in UoA1). Other notable examples include:

- Evaluating a quality dashboard designed to support clinical teams and managers (NIHR HS&DR £889k);
- Exploring the effects of computerised clinical decision support systems on N&AH performance and patient outcomes (NIHR HS&DR £250k);
- Investigating the relationship between staffing and quality in care homes (NIHR HS&DR £1m); and evaluating different models of GP service provision for care homes led by University of Newcastle (partner NIHR HS&DR);
- Evaluating NHS values-based recruitment, particularly its implementation (NIHR PRP £404k).

Dentistry

Oral and Musculoskeletal Sciences (OMS)

This group delivers fundamental and applied research within three themes containing basic science and clinical academics who collaborate extensively across the SoD and FMH, with researchers in UoAs1,6,8,9,10,32a and Universities in Europe, USA, Canada, Brazil and China.

'Biomimetalisation' (Al-Jawad, Brookes, Davies, Kirkham, Mighell, Thomson) encompasses skeletal tissue science from formation to destruction, and genotype to phenotype. A significant strength is inherited skeletal and dental pathologies research with particular focus on Amelogenesis imperfecta (Ai) [UOA3-1001, UOA3-154, UOA3-1004]. We hosted the highly influential Enamel_9 international conference for the first time outside the USA for 50 years (2016: NIH-funded). Molecular mechanistic studies reported the only disease mechanism for Ai [UOA3-25] while genetic profiling of families with Ai and related pathologies point to diverse inheritable drivers [UOA3-1002, UOA3-1003]. Structure studies utilising national X-ray facilities [UOA3-1310, UOA3-1311] complemented insights into peptide and protein action on enamel biomimetalisation both *in vivo* [UOA3-155] and *ex vivo* [UOA3-1309], creating new hierarchical biomimetic materials [UOA3-1308]. Enamel remineralisation was achieved through bioactive

self-assembling peptide (SAP) scaffolds, which are being modified to apply soft tissue regeneration [UOA3-1758]. Significant impact was translated for three new commercial products for tooth care (<https://www.credentis.com/en/innovation-science/>), following spin-out of the patent-protected SAP technology pre-2014 (**ICS#UOA3-5**).

Links to UoA9 facilitate nanoscale imaging of nanoparticle and biomolecular systems by atomic force microscopy (AFM) [UOA3-1094, UOA3-1095] as well as micro and nanobubble development for ultrasound targeted drug delivery [UOA3-2467, UOA3-2468] (**Peyman**). Quantitative MRI/PET imaging *in vivo* is applied for detection and diagnosis of non-oral diseases, e.g. CVD and cancer [UOA3-2858] (**Buckley, Tsoumpas**).

'Biomaterials & Tissue Engineering' (**Wood, El-Gendy, Feichtinger, Raif, Yang, Tronci**) targets the repair, regeneration or replacement of skeletal tissues. In collaboration with our clinical academics we focus on the maxillofacial and cranial regions of the skeleton, but our approaches are transferable to the broader musculoskeletal and wound care environment. Hard materials are investigated for dental repair/reconstruction [UOA3-2987] and soft biomaterials are developed as scaffolds for tissue engineering [UOA3-446]. Pluripotent stem cell differentiation [UOA3-1684], including dental pulp [UOA3-4316], and their interactions and proliferation in hydrogel constructs were investigated, demonstrating vasculogenesis [UOA3-2812]. Applications include bone [UOA3-1683] and dental pulp tissue engineering [UOA3-1685] and non-viral gene therapy for musculoskeletal regeneration [UOA3-2814]. Fundamental insights into mechanisms controlling the differentiation of dental pulp stem cells were gained to understand matrix mineralisation [UOA3-499, UOA3-2538]. Collagen hydrogel synthesis and characterisation [UOA3-442] for wound care [UOA3-443, UOA3-445] was facilitated by a key joint appointment (0.5FTE Tronci) with School of Design (UoA32a) through the [Clothworkers' Centre for Textile Materials Innovation for Healthcare](#).

'Microbiology & Cell Biology' (**Devine, Do, Kang, Meade, Tugnait**) aims to understand how biofilms contribute to oral health, the links between oral and systemic disease; and to develop novel approaches to control oral diseases (including cancer). Having observed an altered oral microbiome in patients with rheumatoid arthritis (RA) [UOA3-3705], we showed (with the BRC), for the first time, that a dysbiotic oral microbiome and increased incidence and severity of periodontal disease occur before the onset of RA, implicating the oral mucosae and subgingival biofilms in triggering development of RA [UOA3-502, UOA3-4247]. We have elucidated the compositions and transcriptomes of microbial communities associated with saliva, enamel and root caries [UOA3-2648]. Complex *in vitro* models and metagenomic analyses have demonstrated how endogenous and exogenous nutrients influence the development of dysbiotic oral biofilms [UOA3-503, UOA3-1251]. Novel *in silico* models (with UoA11) have supported ecological approaches to regulate biofilm development and pathogenicity [UOA3-500]. Our findings that commensal plaque bacteria down-regulate epithelial cell immune responses have provided a pathway for development of probiotic/prebiotic approaches to oral health (Colgate Palmolive Inc £652k). Other pursued novel antimicrobial and therapeutic approaches include fluorapatite coatings [UOA3-2647], nanoparticles [UOA3-1252, UOA3-3459], SAPs combined with antibiotics (EPSRC_IKC Proof-of-Concept (PoC)) and quorum sensing analogues (Newton Fellowship with UoA6). Links to UoA9 and AMR@Leeds are giving new opportunities in antimicrobial peptides [UOA3-3460, UOA3-3461] (**Ong**).

Applied Health and Clinical Translation (AHCT)

This group leads execution of our oral and dental translation strategy and delivers all clinically related research within three leading themes.

'Dental Public Health & Health Services Research' (**Douglas, Csikar, Serban, Vinnall-Collier**) utilises mixed methods research focussing on: oral health and prevention of oral diseases; caries management; orientation of services for health improvement; investigating and addressing inequalities; and primary care based research. [FICTION](#) (NIHR £2.9m), co-led by Leeds, is a multi-centre randomised control trial (RCT) of child caries management strategies for the primary teeth. The partnership includes most UK dental schools and 80 general dental

practices, and determined the economics and effectiveness of treatments for children, parents and dentists [UOA3-2342, UOA3-4350]. [ADVOCATE](#) “Added_Value_for_Oral_Care” (€6m Horizon 2020), a consortium of European partners, including the NHS, six universities, health insurers and bioinformatics companies, utilises evidence-based learning and patient data analysis from eight national databases. We lead WP2 European Inventory which establishes networks of stakeholders and public/patient groups investigating the barriers and facilitators to oral healthcare systems [UOA3-4436]. We are also a partner of the [INTERVAL](#) trial (NIHR £3.2m), a multi-centre, primary care based randomised controlled clinical trial comparing oral health outcomes associated with risk-based dental recall intervals.

‘*Dental Educational Research*’ (Manogue, **Keeling**) collaborates with UoA4 and the [CfIT](#) on the role of haptics in clinical dental education, housing the largest UK haptic dental training facility. PGR projects include communication, management and leadership, and haptic technology outcomes. These have shaped simulation within dental curriculums leading to a consensus statement on implementation, supported by the Association for Dental Education in Europe, signed by 20 European institutions and all UK dental schools. Our simulation exercises are used in all [Simodont](#) haptic instruments worldwide. The emerging theme of ‘*Digital Dentistry*’ generating 32 publications, developed our efficient and affordable dental model 3D scanner, and we lead a multicentre clinical trial (Dunhill Medical Trust £234k) of 3D printed dentures (with Manchester and Birmingham). Emerging impact (Section 4) evidences our vision as a leader for digital approaches to oral and maxillofacial surgery [UOA3-2444], including head and neck oncology.

‘*Translational and Clinical Research*’ (**Pavitt, Aggarwal, Al-Taie, Bani-Hani, Day, Drummond, Hyde, Kenny, Nattress, Tahmassebi, Wu**) delivers systematic reviews to identify clinical knowledge gaps, PoC, and feasibility trials through to phase 3 efficacy and effectiveness trials spanning the oral/dental translational pipeline. The clinical research is focused on improving oral health, specifically: caries and dental erosion, communication, dental trauma, prosthodontics, paediatrics, and links between periodontology and systemic health. Notable examples include: early life factors affecting eruption of primary dentition [UOA3-4416]; improvements in prosthodontics [UOA3-596]; and dental materials [UOA3-32, UOA3-2987].

Pain Management is a key area and includes the impact of chronic orofacial pain in trigeminal neuralgia associated with MS patients [UOA3-3143] (with UoA4 and UCL). The [IMPACCT](#) study (NIHR PGfAR £2m) improved palliative care for cancer patients through pain management and improved communication (with UoA2). The on-going ALABAMA trial (NIHR £2.5m) facilitates antimicrobial stewardship, investigating penicillin allergy testing to limit AMR (UoAs1&2). An umbrella review of prescribing antibiotics in primary dental care [UOA3-3524] complemented prescription reduction in urgent dental care (APTITUDE) through a NIHR DRF.

Since REF2014, we prioritised extrapolating the findings and tools developed for dental research to biomedicine in general. Consequently, the expertise within DenTCRU (Section 3) has contributed to large-scale, multi-centre, RCTs that have extended our portfolio to include major diseases with known or emerging links to oral disease. The MS-SMART (NIHR EME £2.9m) programme studied the efficacy of repurposed drugs for MS (with LTHT and UCL) and led to a paradigm shift [UOA3-2143, UOA3-2147] and further £3.8m NIHR funding (MS-STAT2 and CHARIOT-MS). Cardiovascular research with UoA1 utilised the first RCT longitudinal study with cardiac MRI (NIHR £1.13m), where CADERA studied links in early RA [UOA3-4456] and VINDICATE revealed positive effects of Vitamin D for chronic heart failure recovery [UOA3-2144]. The accuracy and timeliness of diagnosis of hospitalised patients with acute myocardial infarction has also been investigated [UOA3-3142, UOA3-3145], as well as effects of steroids on CVD risk in patients with inflammatory diseases, including RA [UOA3-4475].

Recent initiatives are driving forward the strategy in other areas. [HABIT](#) (MRC £145k) uses a cohort of families from deprived areas to optimise intervention by health visitors. The [BRIGHT Trial](#) (NIHR HTA £1.95m) with Dundee and Sheffield, is addressing the oral health of young

people in deprived areas across the UK, while the NIHR DRF OPTIMuM project (£315k) aims to improve management of dental trauma injury with a view to NHS wide adoption [UOA3-2594].

Future Research and Impact Strategy

Our strategies are synergised with UoL's 2020-25 strategy, which envisages a civic university with strong connections to the local, national and international communities in an increasingly dynamic globalised world. Our Faculty impact strategy also provides the mechanism by which we accelerate the translation process between research and societal impact. UoA3 will continue to lead and influence through our strategic collaborations and national and international leadership roles. We will respond to emerging and national research challenges (Figure 2). We are already leading five COVID-19 projects (funding beyond REF2021 >£1.6m) - with one NIHR project evaluating contact tracing in care homes using digital technology. We will seize opportunities in funding for global grand challenges, particularly ageing, digital economy and AMR, aligning with [FMH's mission](#) as a leading biomedical and health service research campus. We will leverage the UoL's International Strategy for increasing and diversifying our funding portfolio and PGR cohort.

Nursing & Allied Health aims to *undertake internationally excellent research that improves the lives, experiences and clinical outcomes of the people who receive healthcare in the UK*. Priority objectives include:

- Increasing income through longer and larger awards to improve research sustainability;
- Continuing to increase our NIHR external fellowships;
- Engaging with international stakeholders to develop transnational strategic partnerships, and promoting R&I with global influence to raise our international profile and reputation;
- Augmenting impact by:
 - Providing support and training to build on and develop new societal benefit;
 - Maximising the opportunity for local and international impact e.g. through [NICHE-Leeds](#) and [NIHR ARC YH](#);
 - Capitalising on advances in healthcare technology, data science and artificial intelligence (AI) - linking with wider UoL and LIDA initiatives;
 - Building upon our clinical academic research career pathways to link our research with implementation of policy and practice in the NHS;
 - Expanding our co-creation of research to ensure it meets stakeholder needs, which will include working with and expanding our networks to undertake research in and alongside the NHS and to improve dissemination and spread.

Dentistry aims to *improve oral health and quality of life throughout the lifespan for all societal groups through internationally excellent research and outreach*. Our strategy objectives will enhance collaboration and connectivity between the Basic and Dental Sciences and beyond, to span the translational pipeline from bench-patient-population. We will increase research income by targeting funding opportunities for multi-morbidity, AMR, medical technologies, digital dentistry and clinical trials. Priority objectives include:

- Maintaining the quality and critical-mass of OMS and investing in Digital Dentistry;
- Broadening the research base linking oral and systemic health - '*Putting the mouth back in the body*', maximising impact and PPIE through DenTCRU and the BRC;
- Growing our industrial portfolio through emerging partnerships for which spin-out companies and licences are under development with Engineering, Physics, Chemistry, Biological Sciences, Design;
- Leading initiatives with Postgraduate Deaneries allowing Dental Foundation dentists to participate in research;
- Enhancing our international profile and reputation through:
 - Developing strategic partnerships with overseas institutions/industry to enable high quality fundamental and clinical translational research;
 - Actively engaging with a broad range of international partners (including overseas governments, institutions, industry, and alumni), global HE networks, and learned professional societies.

2. People

Staffing Strategy and Development

To deliver research vitality and sustainability requires highly motivated, high-calibre staff. Our staffing strategy is built within a fair progression framework, shaped by our Equality, Diversity and Inclusion (EDI) commitments to:

- Retain, support and promote existing staff;
- Attract and recruit world leading researchers;
- Nurture and develop our ECRs for future leadership;
- Ensure equal opportunities across the career span for personal and professional development.

Recruitment and Retention

In line with our R&I strategy, we have focused on research capacity building and succession planning, through senior posts, appointments of ECRs, new strategic cross-faculty joint appointments (e.g. [Tronci](#)), and joint University/LTHT appointments (e.g. **Siddle**). As part of the 'Great Minds' programme ([REF5a](#)), we secured six competitive UAFs (**Absolom, Boele, Tennant, Feichtinger**; with **Ong** and **Peyman** as joint appointments between FMH and Faculty of Engineering & Physical Sciences. Increased research activity and income led to 45 research associates/fellows appointed (Table 1). Our appointments/promotions comprised 68% females and 32% males. Six percent of UoA3 staff promoted self-reported to be from BAME groups and 7% declared a disability.

N&AH: invested and recruited talent at all levels, including lecturer (e.g. Darwin, **Rodriguez, Stacey, Kennedy, Clibbens, Shloim, O'Meara, Smith**); associate professor (e.g. **Horne, Zaidi, Milnes, O'Hara, Alldred**) and professor (**Thompson, Spilsbury, Hughes, Baker, McHugh, Keenan**).

Dentistry: invested to ensure sustained growth and strength across themes through: OMS succession planning for the Chair in Oral Biology (**Kirkham** to **Al-Jawad**) and appointment of lecturers (**Davies, El-Gendy, Tronci**); three UAFs to expand IDR opportunities; Professorial recruitment in Paediatric Dentistry (**Drummond**) and clinical chairs in Paediatrics and Restorative Dentistry give leadership continuity to key areas.

Table 1: Appointment/Promotion Summary

Unit	N&AH			Dentistry		
	Recruited	Promoted	Total	Recruited	Promoted	Total
Professor	6	3	9	5	1	6
Associate Prof/Senior Lecturer	6	2	8	2	5	7
Lecturer (Grade7/8)	9	3	12	8	3	11
University Academic Fellow	3	-	3	3	-	3
Senior Research Fellow	1	1	2	0	-	0
Research Associate/Fellow	26	-	26	19	-	19

Training and Professional Development

Our '[Organisational Development & Professional Learning](#)' (ODPL) unit provides training for all staff while the '[Research & Innovation Service](#)' (RIS) holds courses on ethics, intellectual property, industrial collaborations and impact training ([REF5a](#)).

We have annual staff development reviews where staff are supported to plan their immediate and long-term personal development needs. To help with career development and succession planning we have:

- Developed staff to become independent researchers, gaining their own Principal Investigator funding: e.g. **N&AH: Clibbens, Rodriguez; Dentistry: Vinall-Collier, Wu;**

- Provided research secondments for part-time lecturers e.g. *N&AH*: Darwin;
- Developed three nurse trainee academic positions and supported seven *N&AH* and five Dentistry staff to do PhDs, supporting transition from clinical to academic careers;
- Supported secondments, sabbaticals and study leave e.g. *N&AH*: Adderley seconded to develop a 'National Wound Care Strategy' for NHS England.

Our annual 'Rewards & Recognition Scheme' provides discretionary payments for the outstanding performance of staff (44 awarded: 61% female; 39% male). All staff are supported to submit research bids, with pump-priming funds available for the preliminary research required to be competitive for external funding (e.g. SoH: 29 projects totalling £95K). All grant applications are reviewed internally by experienced staff prior to submission, providing formative feedback to enhance competitiveness. An FMH 'International Mobility Award Scheme' funded development of international collaborations e.g. *N&AH*: with Universities of La Trobe and Melbourne for research into sexual and mental health (resulting in a collaborative Australian Government National Health Research grant); developing research with staff working in care homes with Maastricht University, Netherlands (resulting in external funding); *Dentistry*: with the University of New South Wales (UNSW) in bone tissue engineering leading to trilateral partnership with UNSW and University of Otago, New Zealand.

To improve well-being, staff are encouraged to use UoL classes/support through the [Logik Centre](#) and have access to the (award-winning) University [Staff Counselling & Psychological Support Service](#). Examples of initiatives to improve well-being include: mental health support; campus walks for health benefits and viewing sustainability projects; and events for staff to come together for support and sharing of research ideas.

Development of Clinical Academics, Contract and Early Career Researchers

We have a clear pathway for non-medical clinical academics between the UoL and LTHT, supported by a Joint Clinical Academic Training Committee. We are proudly the first HEI/NHS partnership to develop a reciprocal agreement with the Regional NHS to honour terms and conditions for our health professionals on this pathway. In *N&AH*, we developed the role of the clinical academic midwife; and are supporting two specialist nurses from LTHT on the 70@70 'NIHR Senior Nurse & Midwife Research Leadership Programme' and seven PCAFs.

We are committed to the 'UK Concordat to Support the Development of Researchers'. Developments for ECRs include: being representatives on School and Faculty committees; recognition (payment/time off) for teaching and supervision; protected workloads; and specific career training and fellowship support. The 'Careers in Research Online Survey' (CROS) enables UoL to assess the development and well-being of its post-doctoral community. The 2017 CROS indicated that 92% of FMH research staff would recommend the UoL as an employer. Post-doctoral staff have a high awareness (82%) of how their research fits into their School and 82% are satisfied with the range of training and development opportunities.

A key UoA3 strength and focus is supporting ECRs to achieve their potential and research capacity development. Three ECRs were awarded 'Wellcome Institutional Strategic Support Funding'. By providing mentorship and a supportive environment to fulfil career aspirations, we have developed academic research staff from our PGRs (e.g. *N&AH*: **Shloim, Alcacer-Pitarch**; *Dentistry*: **Bani Hani, Al-Taie**) and from our post-doctoral fellows (e.g. *N&AH*: **Harley, Siddle** (with UoA2), **Randell**; *Dentistry*: **Davies, El-Gendy, Feichtinger, Tronci**). Dentistry also hosts a Newton Fellow from India with UoA6.

Bespoke training programmes support our clinical academics and our UAFs' transition to independence. From 2015-2018, a FMH 'Post-Doctoral Academy' provided one-to-one support with experienced academics for 43 ECRs, increasing our success with fellowship applications by a third (led by **McHugh**). We actively promote mentorship, e.g. *N&AH*: 37 staff in a formalised mentorship programme; *Dentistry*: all staff are offered mentoring, some mentors contributing to the Aurora leadership programme campus-wide (e.g. **Pavitt, Kirkham**). Our alumni provide

supportive initiatives for ECRs, e.g. four internships at NICE provided by the Deputy Chief Executive. Staff gained UoL awards for providing mentorship in impact development (*N&AH: Harley; Dentistry: Csikar, Vinall-Collier*).

We have 'Research Development Networks' led by ECRs (including PGRs), enabling interdisciplinary links and assisting with career and academic progression. Sessions include: preparing for fellowships; developing project ideas; writing grants and publication. For our PCAFs, we established 10 seminars supporting them in developing their academic careers and doctoral fellowship applications. From our first cohort, all seven PCAFs submitted CDRF applications (five with UoL), with two being awarded. The UoL 'Crucible' programme has enabled ECRs (three from UoA3) to understand collaborative working through workshops and the opportunity to work on an interdisciplinary bid. We have 'Global Community Events' bringing together our international PGRs and researchers for networking and informal support.

Equality, Diversity and Inclusion (EDI)

The UoL is committed to addressing EDI issues in a supportive and professional working environment. We have an improved awareness of EDI through: mandatory training; working with the [UoL Equality Policy Unit](#); updating communication of policies; having EDI as a core agenda item in all committees; ensuring issues can be raised and addressed; and enabling staff to attend UoL diversity networks. We proudly achieved the first Athena SWAN Gold ever awarded to a School of Medicine (2019) and hold Silver awards for the SoH (2018) and SoD (2017). We have shown positive support for women, changing the culture and gender balance in senior management decision-making. We sponsor places on quality career development programmes such as 'Aurora', to support women with leadership aspirations in academia; and **Keenan** co-leads the [Leeds Female Leaders Network](#) (~800 members) in partnership with LTHT, with feedback/evaluations showing staff believed the network enhanced their career development.

We are aware that much is to be done across the sector and initiatives include:

- A BAME Reference group to drive activities including our framework of inclusive behaviours and conduct;
- Creation of a physical presence in Bradford (where there is high ethnic and socioeconomic diversity) by using Wolfson (WCAHR) to build a future channel of talent from underrepresented groups;
- A [LGBT and Staff Network](#);
- Professional and career development through a Faculty Academic Development Fund (£15K/award: four awarded) for all staff returning from long-term sickness or parental leave;
- Flexible working, including total hours and working from home;
- Extension of fixed-term contracts to the end of maternity leave to ensure support and access to redeployment;
- Career coaching for staff seeking promotion to improve the diversity at senior levels;
- Identifying and tackling intersectionality issues of gender, race and disability, to understand the impact on researcher development and progression;
- Creating parity and sustainability of career development for staff on fixed-term contracts through increasing time for contract researchers on personal development/training and creating permanent contracts where possible e.g. at end of fellowships.

Research Students

There were 194 (134.2 FTE) Research Doctoral Degree awards during the assessment period. In FMH, 15% of our PGRs have co-supervisors in other Faculties (including Transport Studies, Chemistry, Computing, Physics, Food Science, Engineering, Materials Science, Biology, Mathematics and Design) and other Universities (e.g. Manchester, Bradford, Edinburgh, Sheffield, York, QMUL). This yielded integration of our PGRs within the wider research community, benefiting their student experience through access to state-of-the-art facilities and high-quality IDR and industrial placements (e.g. CDT students).

PhD funding streams included:

- *Externally funded PhD Fellowships*: eight NIHR Doctoral Fellowships (Total award £2.84m with £781k attributed to UoA3); five UK Charity Funded fellowships (Kidney Research UK, Asthma UK, Breast Cancer Now, British Health Foundation (two)); and one ESRC fellowship;
- *International/Government funded scholarships*: five Indonesian Health Government; one Bangladesh Presidential Scholarship; eight Saudi Arabian Government; one China Scholarship Council;
- *NIHR PSTRC scholarships*: two;
- *Alumni Funding*: SoD gifted £262k to support four Frederick Hopper PhD scholarships with matched funding from SoD/UoL, and one MedTech PhD in Active Lives;
- *Internally funded PhD fellowships*: 32 funded, including *Leeds Doctoral Scholar Programme*: three awards; and *Leeds Anniversary Research Scholarships (REF5a)*: 11 of the 110 UoL awarded in UoA3;
- *EPSRC CDT TERM*: Dentistry supervised 22 PhD studentships within musculoskeletal tissue repair and regeneration;
- *Industrially Funded (Dentistry)*: one fully-funded (Colgate-Palmolive) and one BBSRC CASE award (GlaxoSmithKline, GSK);
- *Joint LTHT and SoH Clinical Academic PhD Fellowships*: (funded by [CLAHRC-YH](#)). Two PGR students provided with a high-quality training route into a clinical academic career and continue to strengthen links between LTHT and the University.

Our PGRs are members of UoA3's themes attending research meetings, school away days, and social meetings. PGRs have embedded representation on EDI and research committees. We support our PGRs with publishing and they co-authored 26% of our submitted outputs. PGRs have an individualised training and development plan supported by an additional £1k+/annum. They participate and present at School/Faculty research conferences and symposia. PhD monitoring is through 'GRAD', the UoL online system which records progression. The Leeds Doctoral College (LDC) brings together all UoL support services (e.g. library, IT, student support) to enhance the PGR journey. Access to a range of development opportunities and transferable skills training is provided by ODPL and LDC events. **Velikova** co-manages the [UKRI CDT in AI for Medical Diagnosis and Care](#) supporting PGRs in transforming cancer care through the application of AI, collaborating with School of Computing.

We have been working diligently to promote a supportive environment for our PGRs, the impact of which was captured in the 'Postgraduate Research Experience Surveys'. Research culture has been transformed from 2015, and satisfaction with supervision quality remains high (*N&AH*: 100% in 2017; 95% in 2019; *Dentistry*: 80% in 2017; 91% in 2019). Further improvements are focused on developing opportunities for PGRs and links to the wider research community, e.g. meetings with LTHT clinical staff, and global community events connecting students to intercultural and international activities.

Employability: Our UoL Careers Centre supports PGRs through: a career architect programme (careers beyond academic research), careers fairs, one-to-one mentorship, and a drop-in-service. We continue to support our PGRs both during and after completion of their PhDs, through publication writing and additional research opportunities e.g. five employed in *N&AH* as researchers/lecturers; promotion of Dentistry staff following PhD awards (two to Associate Professor). Examples of wider employment of our PGRs include: Research Programme Managers and Lead Consultant Nurses which have strengthened further our NHS collaborations; Professors in Dental Faculties (e.g. Manchester, Kuwait University and King Saud and King Khalid Universities, Saudi Arabia).

PGR Development: We have engaged with national, regional and University initiatives to support and develop our next generation of academic researchers and increase our PGRs, including:

- *Pre-doctoral fellowships*: PCAFs-seven awarded; one Royal College of Surgeons;

- *Research Internships*: We funded BRC/CLAHRC Post-Master's internships; HEE/NIHR Internships for clinical staff (two now awarded CDRFs); and Versus Arthritis research internships for N&AH clinicians to gain experience in musculoskeletal projects (six awards/£6k each);
- *Research Masters Programme*: Our NIHR funded *MSc in Clinical Research*, (2013-2018: 61 places) increased research skills and provided a platform to develop future clinical academics;
- *PGRs in Paediatric Dentistry*: 42 students have graduated from: *DPaedDent* (3-yrs FT), a doctoral programme delivering clinical training coupled with research embedded into clinical practice; the *Integrated MSc and PhD in Oral Sciences (Paediatric Dentistry)* 5-year programme with combined masters training and a clinically-related PhD project.

3. Income, infrastructure and facilities

Income

The award value for UoA3 is £26.8m with in period expenditure of £21.8m. Our average annual project and programme awards have increased by 27.7% from £3m in REF2014 to £3.83m in REF2021. Our portfolio of grants increased and diversified due to our transformational research strategy with significant investment in new staff and development of early career academics as independent investigators. During REF2021, we were awarded 423 grants with the majority of total funding from NIHR (40%) and UK charities (28%) (Figure 3). Our NIHR total external award value was £32.3m with UoA3 share of £14m. Research Council and EU funding increased over four-fold and seventeen-fold, respectively.

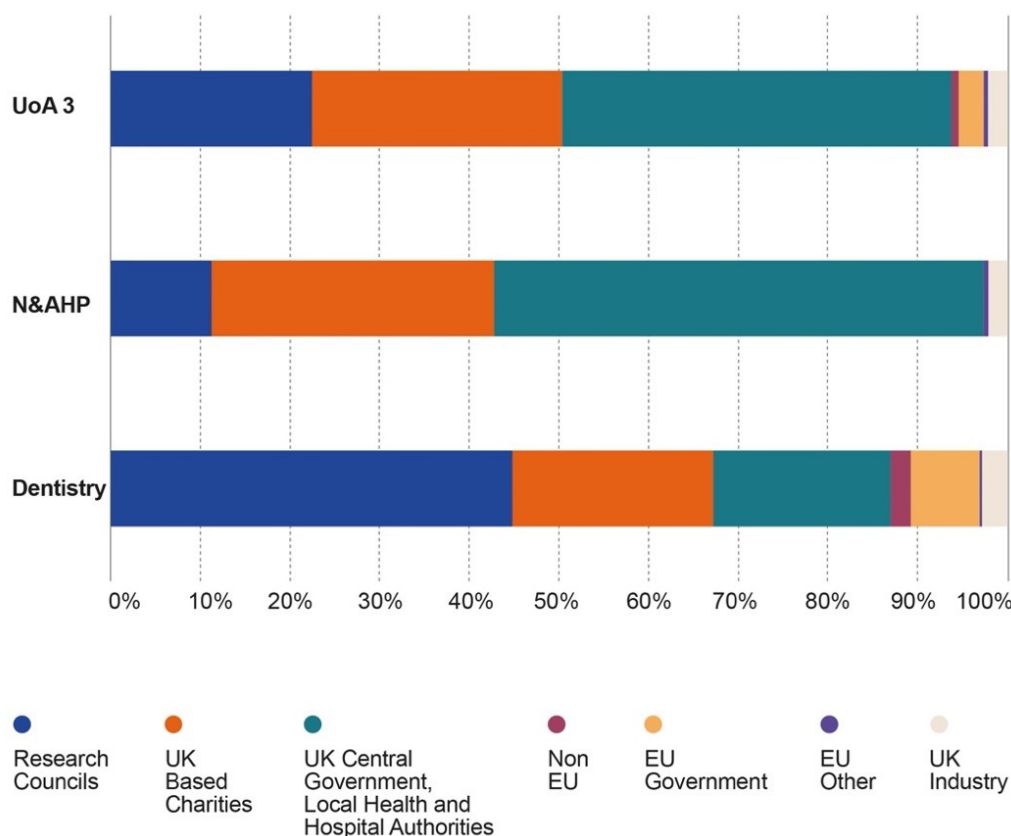


Figure 3: Research awards by HESA category

We built on the success of smaller projects, securing larger and longer term NIHR programme funding (e.g. **Allred**, CHIPPS; **Nixon**, PRESSURE 2; **House**, FReSHSTART; **Douglas** FICTION, **Pavitt**, ALABAMA, MS-SMART); and other NIHR project funding (e.g. **Baker**, **O'Hara**,

Nixon, House, Spilsbury, McHugh, Hughes, Nelson; Day, Douglas, Pavitt). Keenan was co-lead on the successful £6.7m NIHR BRC bid and **Douglas** a co-lead of ADVOCATE (€6m Horizon 2020 grant). **Day, Spilsbury, Thompson and O'Hara** were funded on CLAHRC-YH, with **Day** and **Spilsbury** co-applicants and funded on ARC YH.

Infrastructure and Facilities

Since 2014, FMH has invested £36m in workspaces to support laboratory-based, clinical and applied research (SoH £1.7m and SoD £5.6m). Larger PhD suites provide a vibrant research environment and excellent student experience, and ensure students are embedded into the research community. High quality, fit for purpose space maintained to a high standard has promoted staff well-being and provided an environment conducive to knowledge generation, scholarship and communication.

UoA3 staff are co-located across the main campus and within LTHT premises, providing access to key facilities and enhancing collaborations. N&AH are located in the SoH (Baines Wing) and SoM (Chapel Allerton Hospital & Worsley Building). Dentistry occupy space in the Worsley Building, which houses the [Leeds Dental Institute](#) (LDI), and the Wellcome Trust Brenner Building (WTBB) at St. James Teaching Hospital. OMS moved to WTBB in 2014 to high quality labs to be co-located with other SoM research institutes, providing access to shared facilities (e.g. Next-Gen-Sequencing, fluorescence-activated-cell-sorting).

The [Wolfson Centre for Applied Health Research](#) also provides access to its facilities for UoA3 staff. It is a new £3.1m facility launched by the Universities of Leeds and Bradford and BTHFT (with £1m matched by UoL), tackling health and social care priorities and with leading researchers in: 'Healthy Childhood' (**Day**), 'Healthy Ageing' (**Spilsbury**) and 'High Quality and Safe Care' (**O'Hara**).

We work closely with, and are supported by, the [NIHR Leeds BRC](#) (**Keenan**, Deputy Director); NIHR infrastructure established in 2008 to support translational research in priority areas of high disease burden and clinical need; £13m was awarded (2008-2017) based on the strong collaborative links and the foundation of excellence in musculoskeletal research, with a further £6.7m awarded (2017-2022).

[LIDA](#) has provided new opportunities, bringing together staff with interests in data science and analytics. In N&AH ground-breaking AI is driving digital pathology/imaging research [*UOA3-2377*]; and epidemiological research has demonstrated the risks of selection bias in childhood leukaemia [*UOA3-1658* with UoAs2&14] and the value of using new approaches to understand confounding in applied health research [*UOA3-1657*, *UOA3-4332* with UoAs1,2,14]. In Dentistry, cardiovascular research with UoAs1&2 investigates mortality from heart attacks, including COVID-19 [*UOA3-4476*], funded through a Turing Institute internship and two BHF awards.

The [Yorkshire & Humber National Patient Safety Translational Research Centre](#), funded by NIHR (£3m) engages staff and patients to deliver research that makes healthcare safer. From N&AH, **O'Hara** (co-applicant) leads the 'Patient Involvement in Patient Safety' theme with **Baker** as deputy lead. **Aldred** leads the 'Safe Use of Medicines' theme supported by **Zaidi**.

The [Leeds Clinical Trials Research Unit](#) is a UKCRC Registered CTU accredited with the National Cancer Research Institute (NCRI) with a national/international reputation for conducting multi-centre trials with clinicians, other trialists and methodologists. Specifically, it supports studies in N&AH [e.g. *UOA3-1432*, *UOA3-1434*] with **Nixon**, Deputy Director. Our Leeds research trials are delivered through the [NIHR Leeds Clinical Research Facility](#) (LCRF), hosted within the LTHT, which provides infrastructure to deliver over 100 early-stage, experimental or complex trials annually.

[DenTCRU](#) is an Oral & Dental Health hub of the LCRF, one of only two of the 23 NIHR CRFs to include dentistry. It is a state-of-the-art six chair facility with active links to the LDI, dedicated specimen handling facilities and access to our main laboratories. The strategic appointment of

Director **Pavitt** (2014; clinical trial methodologist), and **Wu** (2015; senior statistician providing robust statistical input for clinical trials, health data mining and linkage) together have led to increased translational activity and high quality clinical research.

The **BCMR** is an interdisciplinary institute cojoined with the new Schools of Physics and Computing, with 15,700m² fit for purpose space. Dentistry is integrated (Management Committee: **Al-Jawad**) ensuring augmentation of research in biomineralisation, biofilms and hard/soft materials, including hydrogels and cells. It houses the AFM facility (co-managed by **Thomson**) in ultra-low noise laboratories comprising seven state-of-the-art instruments with investment over £1.2m in period (Wellcome, BBSRC, EPSRC). An EPSRC facility experimental officer supports increased capacity of IDR across campus and beyond.

Laboratory equipment/facilities: SoD purchased £726k of new research equipment in period, all with dedicated technical support. Digital dentistry has complete 3D printing workflow kit, including two commercial 3D laboratory scanners, an intraoral scanner with associated milling machine, and a custom-made 3D scanner. OMS houses imaging using scanning electron microscopy (with elemental analysis), confocal scanning laser microscope and X-ray microtomography; tissue culture, proteomics and protein purification equipment and quartz crystal microbalance; microbiology laboratories with chemostats, constant depth film fermenters, anaerobic culture facilities; and full suite of mechanical testing facilities for hard/soft materials.

Our HTA-approved 'Skeletal Tissue Bank' enables researchers to access samples including teeth, bone, ligament, cartilage and stem cells. Computational collaborative work for health statistics and biofilm modelling utilise the UoL [High-Performance Computing](#) infrastructure. Synchrotron X-ray scattering of hard/soft materials at the Diamond Light Source, and the European Synchrotron Radiation Facility (ESRF), is accessed through peer-reviewed beamtime allocation. Medical physics utilises imaging kit within the UoL and LTHT including: six 1.5T and four 3T MRIs; two clinical PET/CT and one trimodal (PET/SPECT/CT) preclinical scanners.

Central support for R&I: A reorganisation of our FMH administrative infrastructure has provided: more effective financial, HR and contract advice; support for public engagement; a flexible approach to research management; and improved communication with funding bodies. Comprehensive support is provided by our Schools' research offices including induction for staff; advice and signposting for processes/services, budget monitoring; and liaison with Faculty-based services including, legal, purchasing, finance and HR. We are supported by three Faculty Research & Innovation Development Managers who also provide funding intelligence, grant management and facilitate collaborations. Effective communication between the [RIS](#) (housed within [NEXUS](#)) and NHS partners supports management of intellectual property rights. FMH provides ethics review processes to ensure compliance with the University's values-based policy on ethics, the NHS framework for ethical research and legislative requirements. A quality assurance team, jointly funded with LTHT, provides support and guidance for clinical trials governance.

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

Collaborations within the University

Our commitment to IDR is evidenced by our UoL collaborations described in previous sections. We collaborate with colleagues in: Engineering, Physics, Maths, Computer Science, Food Science, Psychology, Geography, Sociology, Biological Sciences, Data Analytics and Business. Key examples include: Design of new wound care products between the Schools of Design, Dentistry and Medicine; SAP hydrogels for cartilage repair [[UOA3-1758](#)]; biofilm modelling [[UOA3-500](#)]; rapid cell separation technology [[UOA3-26](#)]; and signalling mechanisms of stem cell migration [[UOA3-1684](#), [UOA3-1686](#)].

Regional/National Collaborations

Our [NHS partnerships](#) are shown in Figure 1. Specific examples include:

N&AH: Our clinical academics and researchers have joint contracts with the local NHS Trusts. We have one honorary Clinical Professor and three Associate Clinical Professors. Our Dame Kathleen Raven Clinical Chair of Nursing (**Thompson**) enables a direct strategic link to the Lead Senior Nurse for Research in LTHT and promotes integrated working and joint planning. A Joint Clinical Academic Committee (Chair-**Keenan**, member-**Thompson**) provides oversight to the development of clinical academic careers across the partnership. We employ one academic clinical midwife between LTHT and the SoH. **Siddle**, is the first Consultant Podiatrist at LTHT and Associate Professor at UoL, a novel clinical and academic role promoting joint working and building research capacity. Representation as a Non-Executive Director for LYPFT and Chair of the Quality committee (**Thompson** then **Baker**) has enhanced our research collaborations with this Trust and promoted best use of research to benefit the development of NHS services. We work closely with [Leeds Cancer Centre](#), one of the largest UK cancer care providers, with **Stark** as Clinical Lead.

Dentistry: We have six honorary consultant joint appointments with LTHT: four Clinical Professors, including Restorative (**Nattress**) and Paediatric Dentistry (**Drummond**); Oral Surgery (**Mighell**); and Applied Health & Translational Research (**Pavitt**). NHS clinical academics also make critical contributions to our research portfolio, e.g. Kanatas of the LDI has an Honorary Chair in Oral Maxillofacial Surgery, with 94 outputs in period including COVID-19 implications for head and neck cancer surgery.

Figure 1 also summarises our collaborative centres.

The [LAHP](#) improves health and well-being by driving innovation through collaboration. We contribute through the generation and translation of research knowledge, e.g. the partnership between the Leeds Care Home Providers Network and the University has improved the quality of those living and working in the long-term care sector (**Spilsbury**).

The [YHASN](#) supports and promotes adoption and spread of research in the NHS. N&AH staff support workstreams in: Healthy Ageing (**Spilsbury**); Patient Safety (**O'Hara**); Medicines Optimisation (**Aldred**, **Zaidi**) and Mental Health (**Baker**, **Hughes**).

UoA3 staff played major roles in [CLAHRC-YH](#) which included five-year NIHR-funded infrastructure (£11.5m with matched NHS partner funding) conducting quality applied research and evidence-based implementation. One project improved primary care management of frailty in older people (**Spilsbury**); **Thompson** and **O'Hara** were collaborators on the 'Evidence-based Transformation' theme; and **Hughes** and **Baker** were part of the 'Mental Health' theme which showed an improvement in the health and well-being of the YH population. In the new [NIHR ARC YH](#) (£9m), staff have major roles in programmes for N&AH: older people and frailty (**Spilsbury**); mental health and physical co-morbidity (**Hughes & Baker**); improvement science (**Thompson**); and Dentistry: healthy childhood, with Dental Lead through [Born-in-Bradford's Better Start](#) cohort (**Day**).

PROSpECT (**Pavitt**, Founding Chair) is the UK's first 'Oral & Dental Clinical Studies Group & Research Consortium', leading the national agenda for relationships between periodontal disease and systemic health outcomes e.g. RA, cancer, diabetes and CVD. It brings together NIHR, charities (BHF and Diabetes UK) and industry (GSK) and aligns with the [James Lind Alliance](#) research prioritisation, and is the first endorsed by the 'British Society for Oral and Dental Research' (BSODR).

Medical Technologies and Engineering are a UoL strength, where WELMEC (2009-15: Wellcome/EPSC £11.2m) focused on new types of regenerative intervention for musculoskeletal and cardiovascular systems. Dentistry's significant involvement included the EPSC TERM CDT and augmented research in hard and soft tissue engineering (**Kirkham**, **Davies**, **Feichtinger**, **Tronci**, **Raif**, **Wood**, **Yang**). The current EPSC [MedTech IKC](#) facilitates collaboration between companies, scientists and clinicians to accelerate commercial development. It is supporting translation of enamel SAP therapies (**ICS#UOA3-5**), including anti-

microbials for the oral cavity (**Davies**); gene-activated matrices and acellular scaffolds for cartilage regeneration (**Feichtinger**); collagen hydrogels for wound healing (**Tronci**, **Wood**); as well as impacts from Digital Dentistry (**Keeling**).

The **NBIC** is a BBSRC-Innovate IKC (2017) with industry-matched PoC funding. The UoL partnership is led by **Devine** and **Carr** (Design), who also lead the 'Leeds Biofilm Network' (2020) now with >60 academics from across campus and intersecting with AMR@Leeds (**Devine**, Steering Group member) and the [Leeds Institute of Fluid Dynamics](#).

We collaborate with multiple *UK academic institutions* through funded research projects and publications e.g. **BRIGHTLIGHT** (**Stark**) with researchers from London, Manchester, Birmingham and Southampton; **CHIPPs** study (**Aldred**) with researchers from East Anglia, Norwich, Aberdeen and Belfast; **FiCTION** project (**Douglas**) with Dundee and Newcastle, plus most UK dental schools.

International Collaborations

Our international collaborations have strengthened through ambitious partnering with high quality international institutions; and achieving far-reaching impact to the greatest number of stakeholders (Figure 4). Noteworthy examples include:

N&AH:

- Appointment of two visiting Professors (Maastricht, Sydney), strengthening our international research in care homes and medicines management;
- Developing research capacity and the research skills of 25 midwives from Indonesia through attending SoH research programmes;
- Building additional research and community links in Indonesia with funding to explore the effect of COVID-19 on women's experiences of pregnancy; also developing research capacity of two graduated international PGRs (**McGowan**);
- Leading the [Research Centre for Patient Involvement](#) at Aarhus University, Denmark (**Bekker**);
- Improving quality of care and services for care home residents through Netherlands-Leeds Living Lab research (**Spilsbury**);
- Developing electronic-rehabilitation programmes for chronic knee pain with the University of Melbourne (**McHugh**);
- Standardising therapeutic assessment and related therapy in repeated self-harm with the Université Catholique de Louvain (**House**).

Dentistry:

- Sharing our complex oral microbiome models for metagenomic studies with the National Institute for Cancer Research and Temple University, USA (**Devine**);
- Control of angiogenic gene expression of human gingival fibroblasts funded by New Zealand Dental Association [UOA3-3403] through Honorary Professorship at Otago (**Drummond**);
- Clinical assessment and genetic factor evidence gathering of enamel defects and pathologies in Khartoum State, Sudan (population: >5m) funded through the [Borrow Foundation](#), 2017-2022 (**Mighell**, **Day**);
- First imaging by AFM at the liquid-liquid interface of nanoparticle assembly, with X-ray studies at the ESRF, France [UOA3-1094] (**Thomson**);
- Determination of Heimler Syndrome as a peroxisome-biogenesis disorder, genetically linking Ai to other phenotype abnormalities. A multi-centre UK study with University of Antwerp, Belgium and Mohammed-V University, Morocco funded through Wellcome Trust and a Marie-Curie ITN [UOA3-1002] (**Mighell**).

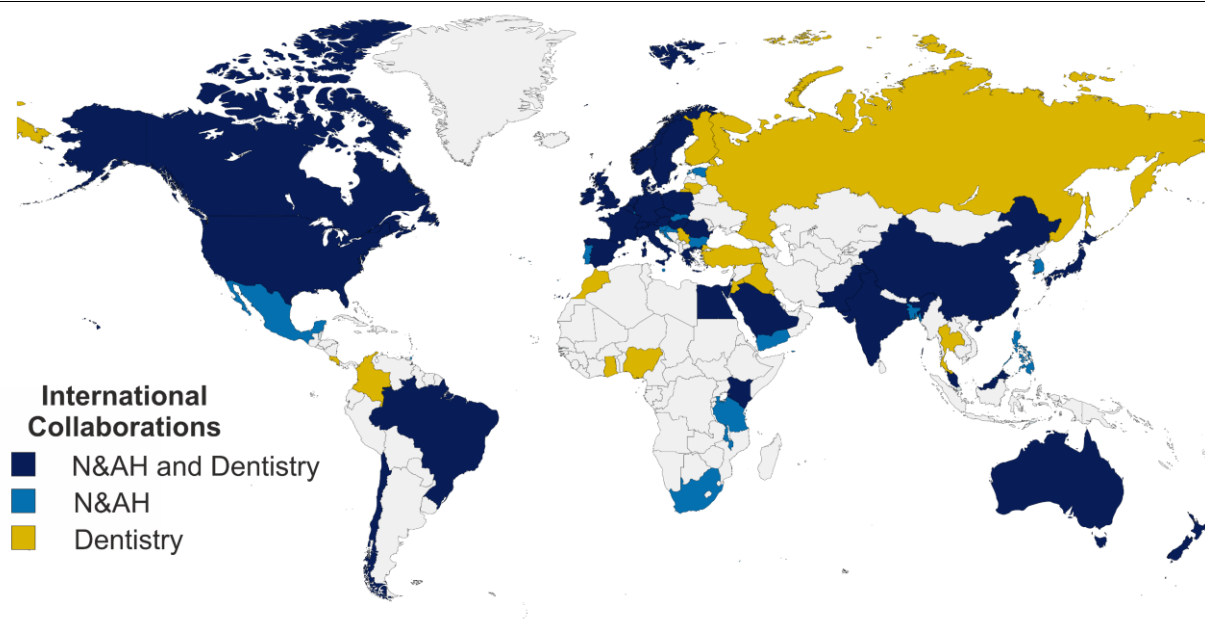


Figure 4: Global reach of UoA3 international collaborations

We have 12 Memoranda of Understanding (MoUs) with Universities resulting in strengthened international collaborations; research capacity development; and a 22% increase in international PGR students. Our MoUs include:

- *N&AH*: Universitas Muhammadiyah Surakarta, and UNISA University, Yogyakarta, Indonesia; Charles Stuart University Australia;
- *Dentistry*: Nanjing, Sichuan and Lanzhou Universities, China; Seoul National University; Osaka University and Michigan University. A UK-China British Council workshop cemented partnership with the West China School of Stomatology, Sichuan University, the leading Chinese SoD.

Industrial Collaborations

N&AH: Our industry funding was £225k. Collaborations include: Pfizer (online symptom monitoring for breast cancer, **Velikova**); PharmaMar (patient outcome research into sarcomas, **Stark**) and IQVIA (lung cancer patient-reported outcome measures, **Velikova**).

Dentistry: Industrial funding awards over £1.7m led to three licences and eight new patents, including amphiphilic peptides, collagen hydrogels, PET imaging method and a dental scanner. Collaborations include:

Regional/UK: Verna-Wright PDRA fellowship and studentship on tissue engineering of ligaments and cartilage with Xiros plc (**Raif**, £393k); Probiotics research supported by ADM Protexin, and BBSRC/GSK CASE studentship (**Devine**, £127k); Enamel remineralisation with GSK (**Al-Jawad**, £141k); 'Strong Teeth' initiative with Proctor & Gamble for oral health intervention targeting parents (**Day**, £321k).

International: Solvay Specialty Polymers (Belgian multi-national) have seen us outperform the USA site (for new dental clasps, **Nattress, Wood** £392k); Colgate-Palmolive, USA, continuous funding since 2010 (host microbe homeostasis, **Devine** £652k); Kanghui Medical Innovation, China (biomimetic scaffolds for enhancing osteointegration, **Yang**).

Patient and Public Involvement and Engagement (PPIE)

Our active PPIE groups are integral to our research. Our BRC PPIE Group includes over 200 members who assist in the prioritisation, design, conduct and dissemination of our musculoskeletal research. The group works closely with other patient organisations, including INVOLVE who have provided guidance in development of the group. The BRC has an Outreach Lead, who works with UoA3 to review research protocols and applications to promote

wider inclusion and access to our research participants, particularly in terms of underrepresented groups. All studies affiliated with the BRC are designed in partnership with the PPIE Group. Our N&AH musculoskeletal researchers have developed 23 funded projects (£2.4m) with the BRC PPIE group during REF2021.

Pavitt established the SMILE AIDER PPIE forum that ensures all SoD clinical research is reviewed and trials are co-produced to establish research prioritisation, maximise patient benefits and recruitment uptake. An academic lead for PPIE (**Smith**) leads our 'Service User and Carer Community' (30 members) and the 'Involvement Advisory Group' informing our nursing educational and research activities and providing a forum to discuss PPIE activities, including feedback on research activities. A University-wide forum (co-led by **Smith**) provides professional support for PPIE work in relation to teaching and research. **O'Hara** is a member of the Engagement & Advisory Board for 'The Healthcare Improvement Studies Institute', University of Cambridge.

Outreach Activities

- The UoL annual 'Be Curious' event (>1200 participants/annum) enables participation and wider research dissemination through engagement with our diverse regional community. We delivered sessions on: 'Your Grip Matters' getting visitors to test, learn exercises and improve hand grip strength; 'Big Mouth' showed children how to fix broken teeth, featuring on 'BBC's Operation Ouch' at the National Science and Media Museum, Bradford;
- An ESRC seminar series 'Re-imagining professionalism: towards co-production' highlighted the importance of co-production in the development of mental health services and research (**Baker**);
- **Pavitt** and **Keenan** have been involved in community initiatives to promote COVID-19 research and vaccine participation to socially disadvantaged communities/groups (BAME, older people, those with comorbidities);
- **Pavitt**, a UoL PPIE champion led an award-winning theatre/film production "Don't Smile" for awareness of Amelogenesis Imperfecta, which showcased at the 2019 NIHR CRF conference leading to a commissioning of "[COVID and Me](#)" and the sequel "COVID and Us";
- RAISED in Yorkshire (Research Activity in Schools Evaluating Dental health) is a community collaboration to involve under-represented, at-risk young people to provide exposure to oral health research, increasing students' confidence to inspire a new generation of dentists and researchers;
- Work for PHE supported discussion with homeless people to develop flexible commissioning for their dental care facilitated by a UoL engagement excellence fellowship (**Csikar**, **Vinall-Collier**);
- **Douglas** led WP2 of ADVOCATE, responsible for the delivery of the PPI elements for all six European countries. The stakeholders ranged from policy makers, general public, dental teams, academics and commercial partners, and informed barriers to dental service provision and oral disease prevention.

Policy

UoA3 staff continue to be involved in government policy. Examples include:

N&AH: Safer staffing with NHS England & NHS Improvement (**Baker**); police managing violence in people with mental health problems without force with College of Policing (**Baker**); developing a National Wound Care strategy for NHS England (Adderley); national guidance on medicines administration in care homes for Department of Health (DoH) (**Spilsbury**, **Aldred**, **Baker**); standards for Sexual Safety in Mental Health Inpatient Services with National Collaborating Centre for Mental Health and NHS Improvement (**Hughes**); setting standards on patient decision aid and shared decision-making developments for NICE and the International Patient

Decision Aids Standards collaboration (**Bekker**); leading the development of a national metric on quality of life for the cancer dashboard as part of National Cancer Strategy (**Velikova**).

Dentistry: Two policy debates and input into DoH Evidence and Learning Group, to directly influence new dental contract configuration (**Douglas, Pavitt**); impact of oral health on education to the Department for Education (**Day**); guidelines for digital orthodontic record keeping, published by the British Orthodontic Society (**Keeling**); evidence from ALADDIN study for phasing out mercury amalgam teeth fillings informed the Minamata Conference of Parties (Geneva 2019) and the Council of European Dentists (**Aggarwal, Vinall-Collier**); COVID-19 work: Advised WHO and PHE (**Douglas**), Cabinet Office Roundtable: Vaccine Registry (**Pavitt**), as well as cardiovascular impacts which fed into SAGE (**Wu**).

Emerging Impact

Our research continues to have a sustained impact on patients, health services, wider society and the economy. In addition to our submitted ICS, other notable exemplars include:

N&AH

- Developed the 'Foot Posture Index', transforming measurement of foot posture, providing high clinical utility, incorporated into undergraduate curricula internationally, leading to adoption by clinicians worldwide (**Redmond**);
- Dissemination from an implementation project 'REMAIN' is linked to 'OK Diabetes' being incorporated into both the 'NHS RightCare Pathway for Diabetes' in adults with a learning disability and the 'Diabetes UK' website as a training resource for commissioners and practitioners (**House**);
- Enabling services to support patients to make informed treatment decisions through the development of open-access research-led decision aids (**Bekker**):
 - [Treatment Decision Making and Relapsing Multiple Sclerosis](#)
 - [Cancer, Fertility and Me Patient Decision Aid](#).

Dentistry

- Improving oral health through shaping dental contract reform via incentive-driven commissioning and delivery of primary dental care [UOA3-2340, UOA3-2341] (INCENTIVE: NIHR-SDO award, £440k) (**Pavitt, Douglas**);
- Development of dental 3D scanning technology led to a patent (PCT/GB2015051316) and two licensing deals: for improved commercial instrumentation to the general dental market (GC Europe) and archiving digital dental casts (Arkive Dental). A new spin-out company based in UoL Nexus Centre (Mimetrek Solutions, 2020) with £650k investment to develop our scanner (**Keeling, Wood**);
- Genetic profiling for Amelogenesis Imperfecta led to a curated, open database (<http://dna2.leeds.ac.uk/LOVD/>) and direct impact on NHS patient care via the UK Genetic Testing Network: a first for clinical dentistry, defining patient pathways and raising standards of care (**Mighell**).

Influencing Research Strategy and Environment

We are involved in developing and influencing the UK and international research environment through membership of committees, editorial positions, funding panels and invited presentations (Table 2).

Table 2: Summary of contributions of UoA3 staff

	Honours/ Research prizes	Membership committees	Editorships/ Editorial boards	Research funding panels	Keynote presentations
N&AH	19	52	26	40	203
Dentistry	12	76	29	6	65
Total UoA3	31	128	55	46	268

Examples of:Honours and fellowships

Honours N&AH: Her Majesty's Honours, **Keenan** OBE (services to podiatry), **Nixon** MBE (services to pressure ulcer research);

NIHR Senior Investigators in N&AH: **Nixon, Keenan, Redmond**;

Fellowships in N&AH: Fellowship of The College of Podiatric Medicine (**Keenan**); Queen's Nurse Institute Fellow (**McHugh**); Alan Turing Fellow (**Tennant**).

Research prizes/awards

N&AH: Avedis Donabedian Outcomes Research Lifetime Achievement (**Kind**); Queen's Nurse (**Horne**); Royal Pharmaceutical Society, Pharmacy Research UK (**Aldred**); Mental Health Research Network-Outstanding Service User (**Baker**); Droitwich Lecture, British Society for Rheumatology (**Redmond**); International Researcher Mobility Award (**Boele**).

Dentistry: International Association of Dental Research (IADR) Senior Clinical Hatton prize (**Hyde**); Jens Andreasen Prize in Dental Trauma, International Association of Paediatric Dentistry (IAPD)(**Kenny**); IADR Joseph Lister Award (**Do**); Entrepreneurial Spark, NatWest (**Feichtinger**); John Zamet Memorial Prize in Periodontal Research (**Serban**); MS Society as Inspiration of the Year, NCCPE Engagement with Young People (**Pavitt**); Alan Wilson Memorial Prize, UK Society for Biomaterials (**Wood**).

Membership committees/advisory boards

N&AH: NIHR Academy Associate Dean-Infrastructure (**Keenan**); Chair, Versus Arthritis Fellowship Expert Group (**McHugh**); Chair, Wounds Research Network (**Nixon**); National Wound Strategy & European Pressure Ulcer Advisory Panel (**Nixon, Coleman**); NIHR Lead Training Advocate-Pharmacy (**Aldred**); Council of Deans Global Health Group (**McGowan**); Rheumatoid Arthritis NICE Guideline Committee (**Siddle**); Past Chair of EULAR standing committee for health professionals (**Redmond**); Honorary Secretary Society for Societal Medicine (**Tennant**); International Trustee, Society of Medical Decision Making, USA & The International Patient Decision Aid Collaboration Steering Group (**Bekker**); Mental Health Nursing Academics UK (**Baker, Hughes**); Chair, National Cancer Research Institute (**Velikova**); National Cancer Research Institute & Lead, European Network for TYA with Cancer (**Stark**); European Organisation of Neuro-Oncology Scientific/Gender issues & World Federation of Neuro-Oncology Societies (**Boele**); Chair, British Psychosocial Oncology Society (**Absolom**).

Dentistry: Faculty of General Dental Practitioners Research Advisory Board (**Aggarwal**); British Society for Oral and Dental Research (BSODR)(**Hyde, Wood**); Chair of Mineralised Tissue Group, BSODR (**Al-Jawad**); National Oral Health Promotion Research Group (**Csikar**); NIHR Clinical Research Network (CRN) National Speciality Lead for Oral & Dental Health, EUPATI Advisory Network, NIHR CRN Strategy Group for Medical Informatics & Data Linkage, MS Society CRN Strategy Group, NIHR CTU Strategic Advisory Committee (**Pavitt**); Better Start Bradford, Innovation management group (**Day**); President, British Association for Study of Community Dentistry (**Douglas**); IAPD board member (**Drummond**); Chair of Enamel 9 (**Kirkham**); Council of Microbiology Society (**Devine**); TERMIS EU (**Feichtinger**); Executive of Dental Council RCS Edinburgh (**Nattress**); Co-founder of Scanning Probe Microscopy Section of the Royal Microscopical Society (**Thomson**); BMA Multi-Specialty Working Group for Junior Doctors (**Serban**).

Editorships/Editorial board members

N&AH: *European Journal of Cancer* (**Velikova**); *Advances in Dual Diagnosis* (**Hughes**); *Psychosomatic Obstetrics and Gynecology* (**McGowan**); *PLoS One* (**Spilsbury**); *Health & Social Care in the Community* (**McHugh**); *Tissue Viability* (**Nixon**); *Evidence-Based Nursing* (**Smith**); *Clinical Pharmacist* (**Aldred**); *International Journal of Mental Health Nursing* (**Baker**); *Arthritis Care and Research* (**Redmond**); *Psycho-oncology* (**Absolom**).

Dentistry: *Frontiers in Bioengineering & Biotechnology* (**Al-Jawad**), *Nature Scientific Reports* (**Thomson, Do**); *Oral Microbiology* (**Devine**); *Oral Diseases* (**Do**); *Frontiers in Dental Medicine*

(**El-Gendy, Al-Jawad**); *European Cells and Materials* (**Feichtinger**); *Functional Biomaterials* (**Yang**); *European Journal of Prosthodontics and Restorative Dentistry* (**Keeling**); *Journal of Dental Science* (**Tahmassebi**).

Research funding panels

UoA3 staff membership for UK, European/Overseas funding panels (Tables 3 & 4).

Table 3: UK research funding panel membership

Panels	N&AH
NIHR	
COVID Recovery/Learning Research	Thompson
PGfAR	House
HTA	House, Nixon
HS&DR	Spilsbury, Milnes, Thompson
RfPB	Harley, Baker, Bekker, House
Senior Investigator	Nixon
Advanced Fellowship	Baker, McGowan, House
Doctoral Fellowship	McHugh
HEE/NIHR	
PCAF	Keenan
CDRF	Allred
Clinical Lectureships	Redmond, Hughes
Wellcome Trust Populations	House
Versus Arthritis	Redmond
Cancer Research UK	Tennant, Velikova
	Dentistry
NIHR In-Practice Fellowships	Aggarwal
MRC-NIHR EME	Pavitt
BBSRC (member & core committee B member)	Devine
UKRI Future Leaders Fellowship	Thomson

Table 4: European/Overseas research funding panel membership

Panels	N&AH
European Platform of Cancer Research	Velikova
French National Cancer Institute	Stark
Irish Health Board	McGowan, Thompson
Irish Cancer Society	Absolom
Cystic Fibrosis Ireland	Milnes
Applied Biomedical Research, Belgium Government	Redmond
National Medical Research Council, Singapore	Horne
Society for Epidemiological Research, USA	Tennant
	Dentistry
EU FP7 and Horizon 2020	Yang
National Natural Science Foundation of China	Yang