Institution: University of Glasgow
Unit of Assessment: Unit 3, Allied Health Professions, Dentistry, Nursing and Pharmacy
a. Context

Awareness of the national imperatives relating to health improvement and delivery of oral health care services, with particular reference to health inequalities, has provided clear research focus in relation to impact. Thus, the **strategy** of the Dental School over the course of the assessment period has been to conduct translational research in areas that align with Government priorities, providing robust and timely evidence that informs policy and practices which will support improvement in population health and wellbeing, reduce health inequalities and enhance patient safety. The Unit has also achieved success through knowledge transfer to a Scottish SME and to UK businesses such as GSK. This strategy has resulted in a wide range of user groups, beneficiaries and audiences for our research, including:

- The public and patients (improved child dental health and patient safety)
- Health policy makers locally (Health Boards and Local Authority Education Departments), nationally (Scottish Government / Chief Dental Officer; Public Health England), and internationally (e.g. New Zealand Government Health Department); health service managers and health care professionals (General Dental Practitioners, Dental Care Professionals, Public Health Nurses and other care workers)
- User groups (e.g. Childsmile families, nursery and primary school teachers)
- Scottish SMEs (knowledge transfer) and the pharmaceutical industry (e.g. GlaxoSmithKline Oral Healthcare)

There are three areas of activity within our two research groups. which have achieved significant impact in relation to **Health** and **Public Policy & Services** during the assessment period:

➢ **Child Oral Health Improvement**

The Community Oral Health (COH) Group provided research evidence which directly informed the development of the Scottish Government's national child oral health improvement programme, Childsmile (www.child-smile.org.uk), launched in 2006. Supported by the Scottish Government, the Group has provided on-going robust mixed-methods evaluation of the programme (**Macpherson, Conway**), influencing the methodology of roll-out across the country, with resultant incorporation of the programme into both the NHS dental service for Scotland (2011) and the generic universal Child Health Surveillance system assessments (2012-2013). Critically, the work of the Group has provided evidence of the positive impact of the national universal nursery toothbrushing component of Childsmile on improved child oral health at both Health Board and national levels, also demonstrating, through novel use of tests of inequality (**McMahon**), a reduction in dental health inequality over the time period. The work has, therefore, had major reach and significance, delivering a positive impact on cohorts of infants across Scotland, with major improvement in oral health occurring over the relevant time period. The positive outcomes have been used in evidence to the Department of Health in Wales to support the expansion of a similar programme of child oral health improvement and also to Public Health England as they develop national guidance for Local Authorities in relation to child oral health improvement programmes. In 2012, **Macpherson** was invited to New Zealand to present research evidence to inform development of a new national child oral health strategy.

➢ **Instrument Decontamination**

The Infection & Immunity (I&I) Group has a long history of research on the theme of health care acquired infection and surgical instrument decontamination procedures, resulting in close interactions with both the profession and UK Health Departments (**Bagg**). Concerns relating to prion transmission in dentistry prompted an approach from the Scottish Government in 2001, which subsequently provided significant funding for the world's largest and most comprehensive observational study of instrument decontamination processes ever undertaken in primary care dentistry (**Smith**). The outcomes revealed serious shortcomings in general dental practice, with major implications for patient safety. The Group has also pursued a strategy of laboratory based research to quantify more accurately the risks of infection transmission through contaminated dental instruments and to identify practical measures to mitigate them. The extensive published

data generated has underpinned new guidance and legislation issued by all the UK health departments, particularly in relation to the requirement for Local Decontamination Units and wider adoption of single use instruments. This enhanced patient safety has been welcomed and the revised advice in official guidance documents has now become normalised and accepted as representing standard best practice.

- **Managing biofilm infections**

The growing appreciation of microbial biofilms in clinical medicine has created a paradigm shift in both development and testing of antimicrobial agents. The I&I Group has engaged with a Scottish SME (Blu-Test) to facilitate transfer of new technologies related to biofilm biology via a Knowledge Transfer Partnership (KTP) led by the Government Technology Strategy Board (**Ramage**). Through work with this company, the Group has commercialised assays, resulting in the recruitment of a University appointed KTP Associate, now embedded within the company. This has generated income (£150,000) and has strengthened interaction with their end user GSK, a company which has provided significant funding (£0.5m) to the I&I research group within the REF period. Moreover, through public engagement activities in collaboration with industry the group has provided education on the role of biofilm infections and their management to health professionals in intensive care, haematology and hospital pharmacy units throughout the UK via 'road shows'.

b. Approach to impact

Part of the rationale behind focusing our research strategy around the two core themes of COH and I&I is to ensure that the research questions are framed around significant healthcare challenges and that the outputs have external impact. Our funded programmes on both child oral health improvement and infection control have been responses to major healthcare issues with significant political context, whilst the studies in biofilm biology are directed at the global problem of antimicrobial drug resistance. A strength of the close and regular interaction between our senior researchers and policymakers at a national level, in particular the Chief Dental Officer, is that both groups are involved in the entire process of research direction and impact generation, ensuring that many of the outputs are responsive to political imperatives. In addition to high level interaction at Government level, there is also significant articulation with Health Boards, service providers and users to develop approaches to programme development and evaluation.

We have also adopted a policy of interaction with industry leaders and healthcare professionals to ensure that our developments in biofilm biology in particular support the creation of innovative oral hygiene products and anti-fungal agents capable of improving oral healthcare and management of systemic infection, as described above.

We widely disseminate the impact from our research through internal communications, external media and knowledge exchange to ensure that it provides maximum benefit to society both locally and further afield. This includes organising seminars and workshops on our approach to the development and evaluation of the national child oral health improvement programme and providing a comprehensive research section on the Childsmile website, with an impact log available to other researchers, health professionals, the education sector and the public.

Within Scotland, we have played a central role in establishing the Scottish Oral Health Research Collaboration. This facilitates the co-ordination of dental research across the country, focusing on research questions that are likely to generate impact, and providing critical mass to address key public health challenges into the future. A new administrative post funded by the Scottish Funding Council and based at the University of Glasgow has been established. The positive impact of the appointee within the first year is very evident, based on income generation and improving external collaborations. For example, the post has facilitated a recently funded study (**Conway, Bagg**) to evaluate the role of dental settings as recruitment centres for a large multi-centre study of the epidemiology of Human Papilloma Virus, the outputs of which will help to inform national vaccination strategy and which will be undertaken in conjunction with a patient advocacy group (The Throat Cancer Foundation) and an industrial partner (GSK).

c. Strategy and plans

Our strategy relating to impact aims is to ensure that all our research staff are equipped with the knowledge and skills to think beyond traditional academic outcomes and understand the

importance of effectively influencing pathways from research to external impact, for the benefit of society. This is being achieved by utilising the training and support available at University and College level, which has a Research and Business Development Team. This facilitates early stage research through to proof of concept and commercial impact, and provides expertise to staff on project management and other key deliverables. At a local level within our UoA we will continue to engage with the Technology Strategy Board, other current key industrial partners and SMEs to identify and facilitate clear pathways to impact (**Ramage**). Within the Dental School we have appointed a lead (**Sherriff**) to review and identify opportunities for generation of research impact, supported by our College infrastructure. Staff will be encouraged to attend relevant internal and external workshops and we will continue to support joint supervision of PhD students with industrial partners, ensuring they experience appropriate industrial placements.

We will further strengthen our publication strategy by building on and enhancing our use of websites, workshops / seminars and public engagement to ensure that the impact of our research is disseminated widely and can provide maximum benefit to public policy, services and health. For example, we encourage publication through Open Access forums, have created a dynamic website that is real-time responsive to our newest publications and impacts, showcase our research through a seminar series to engage with local health professionals, and support staff and PG attendance at local, national and international meetings to disseminate key outputs.

Additionally, we support PhD student involvement in public engagement, e.g. via 'lab on a lorry' visits to schools, STEM ambassadorship and Glasgow Science Festival Internships.

Our strategy for the future also includes broader interaction with international organisations including the World Health Organisation and Council of European Chief Dental Officers.

d. Relationship to case studies

Child Oral Health Programme:
This case study provides an example of how our approach to achieving impact, as outlined above, has influenced the development and implementation of a new national child preventive and anticipatory care-based dental service. Regular dissemination of our formative evaluation findings has influenced the on-going refinement of the programme, and interaction with senior Government officials and Health Boards has resulted in a partnership which has achieved the following:

- **Positive health outcomes:**
  - Major improvement in population child oral health and reduction in dental inequalities
- **Influencing national oral health policy:** Scotland, England, Wales, New Zealand
- **Service developments:**
  - Incorporation of Childsmile into the Statement of Dental Remuneration for general dental practitioners, resulting in widespread adoption of the programme.
  - Development of a multi-agency, early-years approach, via incorporation of Childsmile into Child Health Surveillance universal assessments at 6-8 weeks and 27-30 months.
  - Increased skill mix through development of community-based Dental Health Support Workers and Extended Duty Dental Nurses.

Decontamination:
This case study was a prime example of research undertaken in response to a Government priority (public health risk of iatrogenic vCJD transmission through dental instruments)

- The findings from the extensive observational survey of dental practices identified major deficiencies in processes.
- Results were fed back directly to the Scottish Government, prompting release of guidance and a clear but challenging timetable for practices to comply with requirements.

The findings also stimulated new training and support mechanisms through NHS Education for Scotland and release of significant Government funds for practice modifications to permit installation of Local Decontamination Units.