The Future Oral and Dental Workforce for England

Liberating human resources to serve the population across the life-course

7th March 2019

Foreword

Human resources are central to healthcare. Within England we have the most professionalised oral and dental workforce in the world, which is valued by patients. In addition to dentists we have are six groups of Dental Care Professional (DCP), all of which are regulated by the United Kingdom (UK) General Dental Council (GDC). Recognising the scope of dentistry, we have thirteen dental specialties and associated training programmes. Furthermore, there is the opportunity for registered dentists and DCPs to develop extended skills, whilst remaining generalists. Of course, members of the wider health and social care teams may also play an important role in supporting oral health. We have much to be proud of in these developments, which provide a solid platform for meeting population and patient health needs through health improvement and excellent healthcare. Our population is changing and it important that we plan to ensure that we have the right size and shape of workforce for the future, in the right places, with the right skills values and behaviours.

It has been my great pleasure to lead this review and I would like to acknowledge all members of the Dental Workforce Advisory Group for England (DWAG) together with the many colleagues and organisations which have supported this work. Examining future workforce requirements has involved taking a high-level qualitative and needs-led approach, focused on population health. Together, we share the view that the health workforce in England should continue to be shaped to serve the changing population in successive decades in line with HEE workforce principles. In planning for the future, we must ensure our workforce is equipped, and enabled, to serve the population in new ways across the life-course whilst remaining flexible to work across organisations and adapt to change. Different models of care will be required at different stages in life. Systems change, based on clear principles and sound evidence requires effective leadership and robust data on which to make decisions nationally and locally. Additionally, we must continue to push the boundaries of knowledge through high quality research that influences health, healthcare and health systems and continue to tackle the wider determinants of health.

As we seek to shape the future workforce to 2040 in light of the recent education and training review on *Advancing Dental Care* (1)and the *NHS Long Term Plan* (2), we have a great opportunity to ensure integrating working so that 'everyone gets the best start in life', we deliver 'world-class care for major health problems', and support people to 'age well'. Our journey must focus on the interests of patients and the public to ensure they receive high quality, preventively orientated contemporary care across their life-course, working in partnership with patients themselves.

We must not underestimate the challenge of meeting the oral health needs of an expanding and ageing population with increasing demands. Yet we should not be daunted by the challenge either but take this opportunity to shape our workforce to ensure that it is fit for the future. This is not a detailed road map, rather a broad canvas to shape future thinking and action. It will be up to all of us to work on the detail. It is my desire that as we work together with confidence and creativity to liberate the future workforce to serve population and patients across the life-course from birth to end well.

Prof Jenny Gallagher MBE, Chair of DWAG, Health Education England
Newland-Pedley Professor of Oral Health Strategy/Hon Consultant in Dental Public Health
Dean for International Affairs, Faculty of Dentistry, Oral & Craniofacial Sciences, King's College London

Glossary of Terms

ACS	Accountable Care Systems
CDT	Clinical Dental Technician
DCT	Dental Core Trainee
DCP	Dental Care Professional
DFT	Dental Foundation Training
DES	Dentists with Extended Skills (formerly Dentists with a Special Interest)
dmft	decayed, missing and filled primary teeth (
DMFT	decayed, missing and filled secondary teeth
DWAG	Dental Workforce Advisory Group
FD	Foundation Dentist
GA	General Anaesthetic
GDC	General Dental Council
GDS	General Dental Services
GP	General Practitioner
HEE	Health Education England
HEFCE	Higher Education Funding Council for England (now The Office of Students)
HRH	Human Resources for Health
HROH	Human Resources for Oral Health
HV	Health Visitor
LWABs	Local Workforce Advisory Boards
MCN	Managed Clinical Network
MECC	Make Every Contact Count for Health
NCD	Non-communicable disease
NHS	National Health Service
NHSE	National Health Service England
PHE	Public Health England
PDS	Personal Dental Services
PN	Practice Nurse
SCD	Special Care Dentistry
Specialist	On specialist list held by the regulatory body, which for dentistry is the GDC
Specialised	Additional expertise in an area of dentistry (but not a specialist)
STPs	Sustainability and Transformation Partnerships
WHO	World Health Organization
UOA	Unit of Activity
UK	United Kingdom

Executive summary

1. **Introduction:** Health Education England [HEE] is mandated to ensure that the oral and dental workforce of today, and tomorrow, has the right numbers, skills, values and behaviours, at the right time, and in the right place (3). People are living longer, and the population of England is both ageing and expanding. The 'NHS five year forward view' (4), and recent 'Long-term Plan' (2), together with Public Health England [PHE] advice (5, 6), highlight the need to promote health and well-being and the supporting evidence base for action as part of contemporary holistic care. Furthermore, HEE's recent report *Advancing Dental Care: Education and Training Review* highlights the need to look at careers differently (1).

2. **DWAG:** The **Dental Workforce Advisory Group for England** was established in 2015 and charged with undertaking a rapid review of the workforce required up to 2040, with the emphasis on meeting population needs.

3. **Aim:** The aim of this initiative was to provide expert advice on oral health workforce requirements, to serve the population of England across the life-course, up to 2040.

4. **Methods:** Our approach involved a qualitative review of the needs of the population across the life-course, exploring how they may be met together with addressing current and future perceived challenges. During two day-workshops, supported by short-term working groups, we explored how the oral health needs of the English population should be met in future, and the nature of workforce requirements, drawing on current evidence and expert opinion. The workshops involved members of DWAG, professional leaders, policy makers and patient representation.

5. **Current position:** The United Kingdom [UK] has seven professional groups working in dentistry, registered with the General Dental Council. There are currently some 30,000 dentists and 40,000 dental care professionals: dental nurses, dental hygienists, dental therapists, clinical dental technicians, dental technicians and orthodontic therapists registered to an address in England. To practice dentistry, individuals must be registered or in training. Each professional group has the opportunity for professional development, gaining extended skills and taking on other roles. Dentists can also progress to pursue a specialist career in one of 13 dental specialties.

6. **Drivers for change:** Key drivers were examined across the following categories: demographic and oral health trends; social, political, economic and environmental influences; technology and innovation; expectations of patients and staff; and, current and future service models.

7. **Workforce principles**: We agreed that the oral and dental workforce could, and should, be developed to operate in line with the following **HEE principles** outlined in *Framework 15 (7)*:
   i. The oral and dental workforce will support and enable people and their carers to look after their own health and well-being, to prevent ill health, and to be active partners in managing their own care.
   ii. The oral and dental workforce will have the skills, values and behaviours and capability to provide co-productive and traditional models of care as appropriate and be able to adapt to new ways of working.
   iii. The oral and dental workforce will have the adaptable skills responsive to evidence and innovation to enable 'whole person' care, developing and utilising proven effective practice, adopting modern technologies, and using data intelligently to manage care.
   iv. The oral and dental workforce will have the skills, values, behaviours and support to provide safe, high-quality, integrated care wherever and whenever the patient is, at all times and in all settings driven by patient rather than professional needs.
   v. The oral and dental workforce will have the highest levels of knowledge, skills and professionalism, coupled with care, compassion and the ability to communicate effectively at times of basic human need when people can be at their most vulnerable, consistent with the National Health Service [NHS] Constitution.

8. **Life-course themes** embraced effective self-care, together with timely access to high quality preventively orientated professional care, delivered in a co-ordinated manner and in strengthened health system. This involves *starting well* from birth, *keeping well* through the school years; *maintaining well* through adult life whilst planning for the longer term, and *sustaining well* into older age to *end well*.

9. **Key challenges** to be overcome included:

   - Serving a changing population across the life-course;
   - Equipping the population in relation to self-care and appropriate use of dental care;
   - Oral and dental workforce transformation;
   - Health systems strengthening;
   - Interprofessional education and training of dental professionals;
   - Education and training of health and social care professionals;
   - Research and innovation in support of health and healthcare;
   - The importance of oral health and integration with general health;
   - Working with a diverse market of dental providers;
   - Monitoring population oral health, together with systems and workforce;
   - Professionalism and governance
   - Innovative funding mechanisms; and
   - Effective communication.

10. Conclusions:

10.1 The UK is a global leader in the **diversification** and **professionalisation** of our oral and dental workforce**,** ensuring that all dental professionals are registered with a single regulator, the General Dental Council. Our establishment of **integrated governance,** together with increasing emphasis on team working and skills extension, provides a strong platform to meet future oral and dental needs in England.

10.2 **Shaping care to population need** is important across the **life-course**. Oral diseases remain prevalent, and inequalities marked in our expanding, ageing population. Whilst much oral and dental disease can be prevented by action at individual, community and societal levels, supported by an appropriately educated and trained workforce; a significant body of disease and its sequelae will always still need to be managed and treated effectively. The focus should be on **Starting well** from birth; **Keeping well** through school years **Maintaining well** through adult life, and **Sustaining well** into older age to end well.

10.3 Pivotal to maintaining and improving oral health, the general population and patients should be supported in **effective daily self-care**, ensuring **access to professional care** in a timely manner.

10.4 As the oral health workforce extends beyond dentistry, **health and social care professionals** also have responsibilities for oral health. Health and social care policies should therefore reflect the importance of holistic care. And the workforce should therefore be supported by education and training.

10.5 **New models of care** are required. High quality preventively oriented dental care should be delivered by **dental teams** in a professional manner and involve **managed clinical networks of care** across organisations and systems, underpinned by effective leadership and professionalism locally and nationally.

10.6 Our **health systems** should enable the workforce to use their basic and extended skills, deliver evidence-informed high-quality care, in a professional manner, supported by appropriate funding models. **Systems strengthen**ing is also required across health and into social care; this should provide dental team members with the opportunity to integrate with wider health and social care teams to provide care for vulnerable groups, throughout life, in a range of settings. The opportunity provided by forthcoming NHS contract reform is timely in facilitating new funding models.

10.7 **Education and training** play a significant role in preparing the oral and dental workforce to fulfil their roles whilst keeping up-to-date. **Interprofessional education** should be embraced by educators to underpin innovative approaches to service delivery and support care across the life-course. This will enhance key elements of leadership, management, professionalism, communication, and high-quality clinical care.

10.8 High-quality **research and innovation** are fundamental to underpin the delivery of oral and dental care for patients, health service delivery and organisation, and

promotion of oral health. Oral and dental research should therefore be considered a priority for funding agencies as research findings influence and inform change, including workforce reform.

10.9 Robust data are required to inform change. Population oral health should be **surveyed** regularly, health service activity **monitored,** dental workforce capacity and capability **reviewed,** and **modelled**, to support future workforce education and supply.

10.10 Looking forwards, we need to **liberate the workforce** to facilitate the necessary developments and continue to shape it over time to serve population needs. This requires courage, creativity and collaboration to move our workforce from good to great.

11. Recommendations for action:

To best serve our expanding and ageing population with diverse oral health needs, across the life-course, we require careful strategic planning, education and service development, underpinned by research to support our workforce:

Planning and monitoring

13.1 **Monitoring** of population oral health needs is required across the life-course, both cross-sectional and longitudinal, to inform decision making about future workforce needs and models of care.

13.2 **Robust data** should be collected routinely to ensure effective monitoring of oral and dental care, health outcomes and the dental workforce capacity. This should occur nationally, and locally, across all sectors of care.

13.3 HEE, NHSE and PHE collaboration will be required to **model the workforce in relation to population demography and need** on a regular basis. This will involve exploring future scenarios of care, using operational research techniques, to inform discussion and decision making at national and local level. Ideally, this should involve horizon scanning of the forces for change, be reviewed regularly and updated at least every five years.

13.4 Workforce distribution is required to be **equitable** and ensure that inequalities in oral health are addressed, not further compounded by lack of workforce capacity. Modelling of capacity and capability will be required through contemporary organisations from Sustainability and Transformation Partnerships [STPs] at local level, particularly for primary oral and dental care, through to Managed Clinical Networks [MCNs] and local professional networks [LPNs] for more specialised care.

Education

13.5 The Office of Students (formerly HEFCE) and HEE should work with educational and training providers to ensure that there is **sufficient capacity and capability of members of the dental team** being trained, informed by trends in population oral and dental needs.

13.6 HEE **commissioners of clinical training placements** of the health workforce will need to **work with partners in a market-led system** to support future needs such as:

- Increase in DCP student numbers, ensuring their training is integrated with dental students in preparation for effective team working and meeting the needs of all sections of the population.
- Alignment of DCP training programmes where practicable to wider NHSE and government targets related to workforce development, such as apprenticeships.
- Dental professionals (from dentists to dental nurses) should be enabled to expand their scope of practice during their careers and gain extended skills in line with population and patient health needs and demands for care.
- Current and future patterns of need should inform specialist training numbers. Clinical academic requirements should ensure that there is an effective academic base to deliver research and education.
- Workforce education and training to deliver training that focuses on supporting population and patient needs across the life-course.
- Induction of all dental providers to the health system which includes HEE workforce principles and the importance of developing opportunities for change and new models of care across the health and social care system.
- Leadership training and development for oral health professionals in primary, secondary, tertiary care and academia.

13.7 Universities supported by the Office for Students and HEE should ensure **sufficient educators** who can support the development of future health professionals, in an integrated manner, and in line with guidance.

13.8 HEE, NHSE and PHE to support **education and learning for health and social care professionals** to maximise efficiency and ensure that staff are appropriately educated and trained to promote oral health and facilitate access to oral healthcare. Opportunities presented through advancing educational and related **technology**, to include e-learning should, thus, be used to ensure that all health and social care professionals are aware of the importance of preventive care, behaviour change approaches, links between general and oral health, the importance of early dental attendance, and key public health messages tackling common risk factors and the benefits of optimal fluoride use.

13.9 PHE and educational establishments should educate all healthcare professionals to **make every contact count for oral health** – ensuring regular updating of the

scientific evidence on preventing oral disease, supported by effective dissemination across health and social care.

13.10 HEE, universities, education commissioners, care providers and Royal Colleges should play an important role in supporting workforce development and transformation to ensure **extended skills development** (dentists and DCPs) is available, together with **specialist training**.

13.11 The principle of **Leadership for change** is important across dentistry and should be actively developed and resourced, across all branches of the workforce and sectors of healthcare, together with professional and academic organisations.

Service at population and individual levels

13.12 National organisations, professional associations and dental champions are required to actively **work with traditional and social media** to promote oral health and evidence-based self-care including timely access to professional care.

13.13 **NHS contract reform** is required to play a key role in support of workforce utilisation for oral health across the life-course including the following:

- Developing payment systems which support new models of care for oral health
- Developing business models that facilitate use of the wider dental team skill mix and enable different models of care
- Ensuring NHS *performer* status for dental hygienists, dental therapists and clinical dental technicians to enable them to see patients directly within he NHS
- Improving morale amongst clinical staff, particularly those providing the majority of NHS dental care
- Facilitating pathways of care across services and organisational boundaries
- Supporting innovation to enable the delivery of oral and dental care outside traditional dental practice settings
- Ensuring evidence-based prevention of oral disease across the life-course.

13.14 **NHS and social care systems strengthening** should ensure that oral health is included in the assessment and daily care of vulnerable groups, along with access to regular professional oral and dental care.

13.15 Dental schools and other educational establishments for dental professionals should collaborate on **interprofessional education and training** supported by the GDC *Preparing for Practice* outcomes guidance across the four domains: clinical, communication, professionalism, leadership and management.

13.16 The NHSE '**dental care offer**' to the public should be made explicit, together with the importance of timely dental access to care.

13.17 Effective **governance** mechanisms for the health workforce should remain integrated across the dental team. It should also support extended skills development amongst dental professionals and be robust enough to facilitate innovation.

13.18 Delivery of **high-quality evidence-informed care** by all providers should emphasise clinical prevention, and high quality care doing things 'once and well', even if more expensive in the short-term, as representing an investment for future health.

13.19 **Innovations in addressing inequity** in health should be the responsibility of everyone from national to local level. Local organisations such as Local Professional Networks [LPNs], Sustainability and Transformation Partnerships [STPs] and Accountable Care Systems [ACSs] working with Dental Public Health leaders have an important role to play in highlighting inequity and facilitating change, as do providers and individual professionals.

Research and Innovation

13.20 Universities supported by research funding agencies to be facilitated to deliver **cutting edge research** to promote health, manage disease and disability, and ensure good health outcomes from care. A deeper understanding of the links between general and oral health is required, together with systems of effective and cost-effective care.

13.21 **Research and innovation** are pivotal to support the workforce to deliver high quality oral and dental care, facilitate effective patient management, shape new models of care, system redesign and facilitate equitable access to health and care for the nation.

Main Report

1. Introduction

The National Health Service for England [NHSE] is seeking to build a sustainable future (4), recognising the importance of radical reform which embraces prevention, promotes self-care and delivers quality care in support of public health. This will require innovation and local flexibility, with barriers between services broken down. It will require an engaged and integrated workforce across health and social care.

Health Education England (HEE) exists for one reason only: 'to support the delivery of excellent healthcare and health improvement to the patients and public of England by ensuring that the workforce of today and tomorrow has the right numbers, skills, values and behaviours, at the right time and in the right place' (3).

Increasing importance is being placed on the health workforce, as evidenced by the Human Resources for Health 2030 strategy from the World Health Organization (8). Progress towards achieving Universal Health Coverage (9), and the United National [UN] Sustainable Development Goals [STGs] (10), requires 'equitable access to health workers within strengthened health systems'. Human Resources for Health [HRH] form a core element of health systems; their availability, accessibility, quality and performance directly impact on the effectiveness and equity of health care services (11).

Human Resources for Oral Health [HROH] comprise all oral and dental professionals, together with members of the wider health and social care workforce, who can make significant contributions to oral health. The non-communicable oral and dental diseases share common risk factors including diet, hygiene, tobacco use cessation, and limiting alcohol intake; thus, there is the potential for dental professionals to support general health and for other health and social care professionals to support oral health.

The oral and dental workforce is regulated at the United Kingdom [UK] level by the General Dental Council (12); with freedom of movement across the four UK countries. We have the most professionalised dental workforce in the world as a result of a series of changes over the last decade and a half; most notably the registration of all members of the dental team with the GDC (13), with alignment of the standards for the dental team (14), based on scope of practice (15), and tied to educational outcomes (16). Patients have direct access to Dental Care Professionals [DCPs], notably dental therapists, dental hygienists and clinical dental technicians (17), within the private sector. Specialist listing currently involves 13 dental specialties established to advance quality care. We have much to be proud of in this regard, as these developments provide a solid base for harnessing a diverse workforce in support of health.

Oral and dental care in England is largely provided in primary dental care settings involving 80-90% of dental professionals. NICE guidance recommends risk-based dental attendance patterns for everyone: children are advised to attend at least once every 12 months; and'

adults at least once every 24 months (18), with frequency dependent upon risk of disease. Oral and dental diseases are more easily managed when identified early; whereas if patients wait until symptoms appear, outcomes are worse.

It is some time since the last full dental workforce review published in 2004 (19). That review recommended an expansion of workforce capacity to meet the needs of the population. A number of reports from the former Centre for Workforce Intelligence (CfWI) relating to sections of the dental workforce (20-22).

Since then, dentistry has been through a period of significant additional changes, most notably the following:

- **Workforce expansion:** this involved increased numbers admitted to dentistry (2005-12) and dental hygiene/therapy education (2005-); active international recruitment of dentists in mid-2000s; and, a period of significant internal migration from Europe, particularly EEA countries (23, 24). More recently, in response to rapidly increasing dentist numbers, student numbers admitted to dentistry were reduced by 10% in 2013, whilst dental hygiene-therapy numbers have remained stable (20-22).
- **Workforce diversification and regulation:** seven members of the dental team are being trained nationally and now registered with the GDC. Dental nurses form the largest group (24). The potential for patients to *directly access* to dental care professionals (17), dental hygienists, dental therapists and clinical dental technicians. Whilst this has been used in the private sector, these dental professionals do not have performer status within the NHS. The scope of practice of dental team members has been formalised (15), including gaining *extended skills* for dentists and DCPs (25-27).
- **Higher education funding and student intake:** the funding of higher education has fundamentally changed, with university students paying higher levels of tuition fees, thus emerging with higher levels of debt, despite NHS bursaries being available for some students. Applications to dentistry dropped following the introduction of £9,000 annual university fees in 2012, but had recovered by 2014 (28). Dental students remain largely from higher social groups, as are their medical counterparts, with some evidence that dentistry may be attracting a higher proportion of females than both medicine and university generally (28).
- **Fundamental reform of the NHS dental contract:** reforms in 2006, followed by a review of NHS dentistry commissioned by the Secretary of State for Health (29), led to piloting of new models of primary dental care (30), with current work on prototype models (31). Wider reform of health and social care, included the creation of Health Education England (embracing the former Deaneries) and Public Health England (32).
- **Piloting and planning of dental care pathways:** within the NHS there has been collaborative work on care pathways to facilitate patient access to more specialised and specialist care (33-37).
- **Changing business landscape of dentistry:** local NHS commissioning arrangements and freedom to create 'incorporate' has changed the business of

dentistry, such that there are fewer providers of dental care and larger practices and groups of practices (38). This means that the vast majority of the workforce will work for organisations, rather than run a business in future.
- **Paradigm shifts in healthcare:** increasing emphasis on health improvement, including Making Every Contact Count for Health [MECC] agenda across health care(39); and, in dentistry facilitated by successive editions of Delivering Better Oral Health, a toolkit for prevention from 2007 onwards (5).
- **Concerns regarding morale and use of skills:** concerns over the morale of all members of the dental team, particularly those delivering high levels of NHS dental care (40). Deskilling of dentists in primary care working under current regulations (41). Evidence of under-use of skill mix with particular relevance to the business model for dentistry (42-44), whilst research suggests the potential for greater skill mix use (45-47); yet the current level of DCP use within our health systems remains unknown.

The Higher Education Funding Council for England [HEFCE], now the 'Office for Students', oversees the commissioning of education and training of dental students supported by student fees and national investment. Health Education England has responsibility for Dental SIFT (the Service Increment for Teaching, to cover the clinical training for dental students). HEE also commissions Foundation Training, Core Dental Training and specialist training for dentists, as well as dental hygiene and dental hygiene/therapy training, together with some dental technician and dental nurse training; the latter is largely linked to dental hospitals.

The training of dental care professionals, most notably dental nurses, is undergoing reform in adherence with the government's new apprenticeship schemes (48). Additionally, there are new training schemes for dental nurses emerging with combined practice and hospital training, enabling them to gain wide experience through working in a variety of settings(49).

As we go to publish this report there have been a number of significant changes to the funding and delivery of dental hygiene therapy (50). First, in line with the government's revised healthcare education funding system, as of 1 August 2018, the majority of dental hygiene and therapy (DHDT) courses are no longer funded via HEE bursaries as they are within the university sector (50). All new undergraduate dental hygiene and dental therapy students on such programmes are required to access the national student loan system. Second, HEE has harmonised dental hygiene and dental therapy placement funding across England, to align with the non-medical placement tariffs. Third, The Office for Students has revalued the teaching tariff for DHDT to Price Group A, aligning DHDT to the clinical years of courses in medicine, dentistry and veterinary science.

HEE has undertaken extensive work in relation to the healthcare workforce. The following five principles underpin workforce aspirations for England:

- The workforce will support and enable people and their carers to look after their own health and well-being, to prevent ill health, and be active partners in their own care.

- The workforce will have the skills, values and behaviours, and capability to provide co-productive and traditional models of care as appropriate and be able to adapt to new ways of working.
- The workforce will have the adaptable skills responsive to evidence and innovation to enable ‘whole person’ care, developing and utilising proven effective practice, adopting new technology, and using data intelligently to manage care.
- The workforce will have the skills, values, behaviours and support to provide safe, high quality, integrated care wherever and whenever the patient is, at all times and in all settings driven by patient rather than professional needs.
- The workforce will have the highest levels of knowledge, skills and professionalism, coupled with care, compassion and the ability to communicate effectively at times of basic human need when people can be their most vulnerable, consistent with the NHS Constitution.

HEE, 2015 (51)

Given the pace of change nationally and the importance of taking a long-term view, The Health Education England Advisory Group on Dentistry established a sub-group in 2015 with the purpose of advising on the future workforce, the Dental Workforce Advisory Group which will be referred to as DWAG (Appendix 1). This report sets out to answer the following questions, drawing on a breadth of expertise within the dental professions, and beyond, to provide a broad view on the direction of travel. We have endeavoured to answer the following questions for England, providing a broad overview:

- What are the population needs across key sections of the life-course?
- How can we best support population oral health over the life-course?
- Based on what we know now, what is the shape of workforce we require to meet current and future population health needs?
- What challenges exist and what should we do to address these challenges and enable our workforce to best serve the population in delivering contemporary care?

It is important to be clear about what this DWAG report does *not* address. It does *not* predict how many dentists or dental care professionals we require for the future. The focus of this work has intentionally been qualitative to identify the range of issues requiring due consideration and paint a broad canvas based on the knowledge and expertise of informed individuals from a range of backgrounds. Consideration of numbers will require detailed analysis and modelling, based on much stronger evidence of workforce capacity which is currently not available. We need an ongoing understanding of the relationship between the registered workforce and workforce capacity than exists currently, rather than relying on one-off surveys. This report should be read in conjunction with the recently published Advancing Dental Care (1), and the NHS Long Term Plan (2), to ensure that future decision making is informed by population needs.

2. Aim of review

The Dental Workforce Advisory Group [DWAG] was tasked with providing advice on the future shape, and nature, of the dental workforce to serve population oral health needs to 2040. It was agreed to take a population health perspective across the life-course and explore qualitatively what would be the *optimal* or *desired future* to best serve the population.

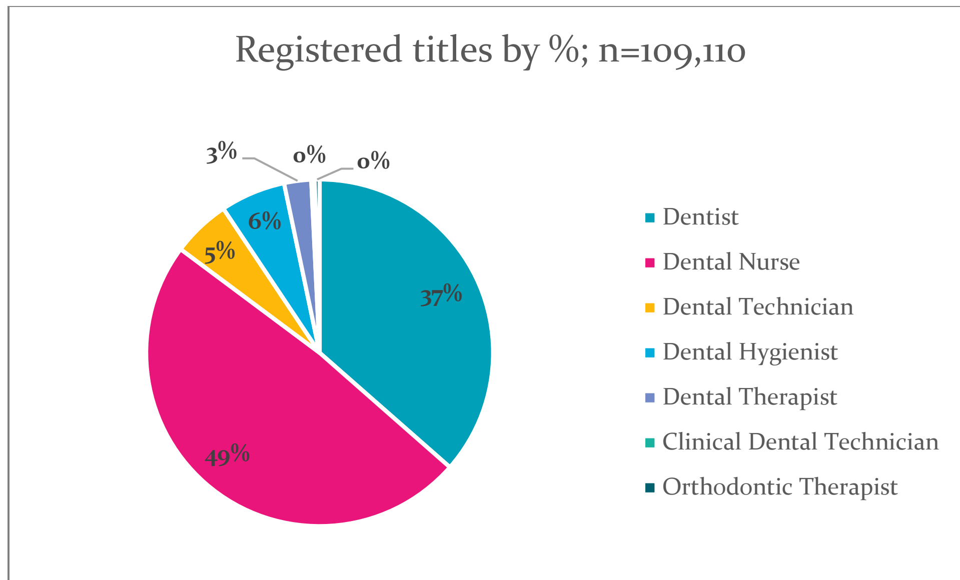
3. Review Methods

Our approach involved a qualitative review of the needs of the population across the life-course, exploring how they may be met together with addressing current and future perceived challenges. We used Isaksen and Dorval's *Creative Approaches to Problem Solving* (52), to guide the process drawing on current evidence and expert opinion, focusing on desired futures (53), to meet population health needs. Our work involved short-term working groups considering sub-sections of the population by age-profile and two day-workshops facilitated by HEE. The workshops comprised members of DWAG, professional leaders, policy makers and patient representation. A list of the people who contributed to the process may be found in Appendix 2. DWAG members reviewed the findings in 2018.

4. Current position: Where are we now?

4.1 REGISTERED UK WORKFORCE

The UK leads the world in having a professionalised dental workforce. First, since 2008, seven different types of dental professional have been approved to practise dentistry (Figure 4.1; Table 4.1). Second, their governance is integrated as they all must register with the UK General Dental Council or be in a programme of training. The majority (78%) of dental professionals have a registered address in England. Figure 4.1 provides an overview of these professional groups



Source: GDC 15th May 2017 *Note: some overlap across DCP groups*

Figure 4.1: Dental Registrant Titles in the UK, May 2017

There are over forty thousand dentists registered in the UK (Table 4.1). This represents a significant rise from December 2008, when the new registrant lists were finalised. Of the professional groups registered, the largest group are dental nurses, representing just over half of all registrants. Clinical dental technicians represent the smallest group with just over 350 registrants. Although orthodontic therapists are also a small group, they are growing in capacity and there is now one orthodontic therapist for every four orthodontists (24).

Table 4.1 UK GDC Registrants, 2008-19

	December 2008	May 2017	December 2018	March 2019
Registration Type	**UK Count**	**UK Count**	**UK Count**	**UK Count**
Dentist	**32,281**	**40,261**	**42,088**	**40,976**
Dental Care Professionals	**56,880**	**69,767**	**70,009**	**70,659**
Dental Nurse	42,959	57,340	57,907	58,523
Dental Hygienist	5,160	7,004	7,269	7,325
Dental Technician	7,460	6,242	5,921	5,929
Dental Therapist	1,164	2,954	3,309	3,373
Clinical Dental Technician	100	358	368	368
Orthodontic Therapist	16	535	628	642
Total on Register	**91,548**	**110,028**	**112097**	**111,635**

Note: Dental Professionals may be on more than one register

Source: GDC 31 December 2008; 15th May 2017; Dec 2018, March 2019

The UK is a net importer of dentists; around 17% of the dentists in 2015 registered with the GDC, having qualified in other parts of the European Economic Area, approximately 11% of whom qualified outside Europe. In contrast, almost all Dental Care Professionals have trained within the UK. Whilst the number of professionals registered with the UK General Dental Council at any one time is apparent, there is limited evidence of their actual contribution to the workforce in each of the four nations making up the UK (54).

4.2 EDUCATION AND TRAINING

Undergraduate dental students are educated and trained in 11 institutions within England (55). The numbers entering university in England are capped, with just over 800 currently entering per year with a ratio of about three applicants to one accepted applicant for dentistry (56). Only 5% of places have traditionally been available to overseas students in comparison with medicine with 10% in England.

Dental Care Professionals [DPCs] receive education and training in a range of facilities, with most dental hygiene-therapy and dental hygiene courses based in universities (schools/academies) and/or dental hospitals.

Dental Hygienists are trained in three institutions linked to universities and/or dental hospitals, whilst 15 in England provide Dental Hygiene/Therapy to diploma or degree level in a combined course (57). Training in the private sector has not proved sustainable. Three training providers, whilst within the public sector, are not part of a dental school. Outreach training is increasingly a feature of contemporary programmes whereby some, or all, of their time is spent in general dental practice and community settings.

There are nine Dental Technician programmes nationally (58). Clinical Dental Technician training in England was established in Kent by HEE (London and South East), with a smaller number of students also educated and trained at the University of Central Lancashire (59).

There are presently six locations in England that offer a course in orthodontic therapy, lasting eleven to twelve months, and leading to a Diploma in Orthodontic Therapy (60).

Whilst a small number of dental nurse training positions exist in dental hospitals, the vast majority are trained by private providers, supported by further education colleges. Trainee dental nurses are employed in primary care settings in parallel with their job as a trainee nurse in dental practice, and take examinations regulated by the GDC (61), to obtain a national award.

Dental hygienists, therapists and nurses have traditionally been almost exclusively female, whilst the dentist workforce is increasingly female (62). With the high rate of female graduates, females currently comprise 48% of the dentist workforce and will soon be in the majority. There are no contemporary data available on the relationship between the number of dentists and workforce capacity, with some evidence that many males as well as females anticipate working less than full time (63-68). The same problem exists for dental care professionals, with some evidence suggesting that they contribute less clinical time, on average, to the workforce (54).

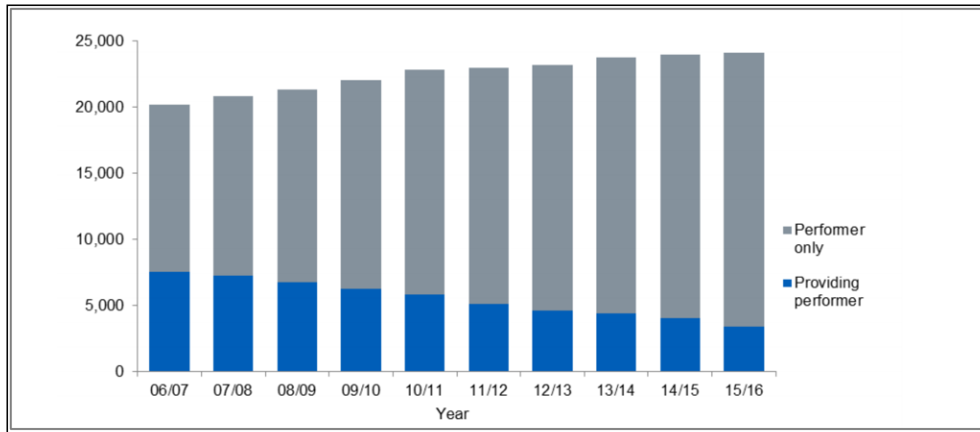
4.3 NHS DENTISTRY

Annually over 28 million patients attend NHS dental services. In the 12 months up to 30th June 2016, 6.7 million child patients were seen by an NHS dentist in England; equating to 57.9 per cent of the child population (69). Children were most likely to receive a preventative (Fluoride Varnish Application) treatment (excluding examinations), with 4.1 million delivered during 2015/16; representing a 20.3 per cent (696,286) increase from 2014/15 (69). In the 24 month period ending 30th June 2016, 22.1 million adult patients were seen by an NHS dentist in England, representing 51.7 per cent of the adult population (69). Scale and Polish remains the most frequent recorded treatment delivered to adults following dental examination (69). The extent to which care is provided by dental care professionals within the dental team is unknown, although many of the common tasks are within their scope of practice (15).

4.4 NHS DENTAL WORKFORCE

Most dental professionals work in primary dental care and have a relationship with the NHS, whilst working in a mixed economy. Over 31,000 dentists (78%) are based at an address in England and, during the NHS financial year 2015/16, a record 24,089 were involved with the delivery of NHS activity through general dental services [GDS] and/or personal dental services [PDS] contracts. This represents a slight increase (0.6%) on 2014/15 (69), and about 77% of the dentists, based on their registered address.

Most dentists now work as part of larger teams delivering NHS care. In 2015/16, 85.7 per cent of these dentists in primary dental care were 'performer-only' dentists, having risen from 62.4% in 2006/07 (Figure 4.2). A minority (14.3%), therefore, are 'providing-performers' which means that they hold the NHS contract for the practice and are essentially the 'practical principal'; there has been a year-on-year reduction in the number and proportion of practice principals from 2006 (69). This evidently represents a major shift in the provision of dental care. As current NHS contracts are not time limited, it is, now increasingly difficult for recent graduates to be able to compete to gain contracts for care and establish an NHS practice. The direction of travel in England is firmly towards a smaller number of larger dental provider organisations in which dental professionals will work.



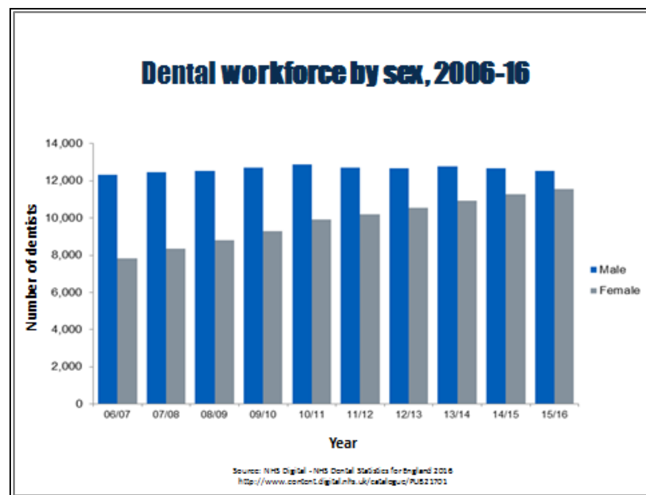
Source NHS Digital

Figure 4.2 Percentage of NHS England dentists by type, 2006/7-2015/16

The volume and proportion of NHS care provided will vary between, and within, practices and possibly over time, particularly for those working in general dental services.

Salaried dentists, working largely in trust services, represent over 3.6% of the NHS workforce (n-861).

In line with national trends, NHS dentistry is increasingly being delivered by females who are predicted to overtake males in the next few years. The NHS data for England are presented in Figure 4.3.



Source NHS Digital

Figure 4.3 NHS England Dental Workforce by gender, 2006/07 – 2015/16

4.5 SPECIALISTS

Dentistry has 13 different dental specialties. There are just fewer than three thousand listed specialist titles, which represents about one in eleven of the profession. There is some overlap between specialist lists and therefore the actual number of specialists is correspondingly lower. Of the registered dental specialists, 78 per cent have an address in England (Table 4.2). Our specialist titles cover patient groups (Paediatric Dentistry and Special Care) through to procedures (Orthodontics, Endodontics, Prosthodontics), diseases (Periodontology) and a population perspective on health and health services (Dental Public Health).

Table 4.2 Registered UK dental specialist titles, by country of domicile, 2015

Speciality	England	Rest of the UK	O'seas	Totals
Orthodontics	**1,009**	235	91	1,335
Oral Surgery	**561**	106	44	711
Prosthodontics	**252**	21	20	293
Endodontics	**233**	22	19	274
Periodontics	**211**	17	27	255
Special Care Dentistry	**196**	61	2	259
Paediatric Dentistry	**167**	50	7	224
Dental Public Health	**86**	27	3	116
Restorative dentistry	**50**	41	2	93
Oral Medicine	**48**	15	1	64
Oral and Maxillofacial Pathology	**25**	5		30
Oral and Maxillofacial Radiology	**20**	6	1	27
Oral Microbiology	**3**	2		5
Total Listed Titles	**2,861 (78%)**	608 (17%)	**217 (5%)**	**3,686 (100%)**

Note: Note: Specialists may be listed on more than one register

Source: GDC 2015

Clinical specialists work in a range of different settings taking referrals from primary care dentists, whilst Oral and Maxillofacial Pathology, Radiology and Microbiology are largely focused in dental schools and teaching hospitals supporting other specialists in care delivery. Dental Public Health provides population advice and strategic support to a range of health sector organisations on health, healthcare and health protection.

4.6 CLINICAL ACADEMICS

The training of dental students, and many DCPs, is focused on dental schools and hospitals, albeit current students experience 'outreach' to a range of settings. Clinical academic staffing has changed over the past decade; dental schools have significant, and growing, groups of clinical teachers and researchers who are from a range of science backgrounds (70).

Nationally, there is a paucity of clinical academics equipped to deliver research, education, specialist care and leadership in preparing the next workforce generation.

There is increasing emphasis on interprofessional education (71-73), as highlighted by the General Dental Council in *Preparing for Practice* (16), which outlines dental team outcomes across four domains: clinical, communication, leadership and management, and professionalism.

5. Drivers for Change

We recognise that we are planning for an uncertain future and it is necessary to take account of the global drivers for change as outlined by HEE (51), together with changing patterns of oral health, across the following five categories:

a. Demographics and oral health
b. Technology and innovation
c. Social, political, economic and environmental contextual influences
d. Current and future service models
e. Expectations of patients and staff

6. Population Demography and Oral Health

The UK population is around 64.6 million people, the majority of whom (54.3M) live in England (74). The population profile is presented in Table 6.1 below.

6.1 POPULATION PROJECTIONS

Population change is affected by four key factors: birth and death rates, immigration and emigration (75). Overall growth of around 16.5% is anticipated in the UK to 2039 (74). However, the rate and pattern is predicted to vary, with London growing at a higher rate than the rest of the country (circa 20%). In addition, differential growth is anticipated between urban and rural areas, with the former predicted to grow faster and larger over time. Thus, in future, the rural population of England is expected to be older, and more socially deprived. The most notable population change will be the expansion of adults aged over 75 years (89.8%) and especially those aged 85 years and over (137.5%). This has the biggest implications for the future workforce, as most of these people now retain some natural teeth, have multiple co-morbidities and become at increased risk of developing oral and dental disease.

As people are living longer, they can expect to be working longer. England, therefore, increasingly has at least four generations in the workforce. There is limited evidence of professional workforce patterns in dentistry; however, many dentists choose to phase down their working week in their later years. Looking to the future, as retirement age formally increases for many in the workforce, it could be anticipated that many will work later in life before retiring.

Table 6.1 Population projections for England to 2039

Ages	2014	2019	2024	2029	2034	2039	% inc 2014 to 2039
0-14	9,676,377	10,240,681	10,507,869	10,534,879	10,588,838	10,627,838	9.8
15-29	10,555,753	10,464,727	10,406,343	10,750,979	11,280,081	11,548,544	9.4
30-44	10,810,617	10,978,691	11,556,994	11,624,590	11,363,584	11,305,084	4.6
45-59	10,822,232	11,246,331	10,873,223	10,664,865	10,791,982	11,367,105	5.0
60-74	8,076,804	8,686,399	9,194,903	10,018,548	10,434,357	10,131,619	25.4
over 75	4,374,835	4,849,498	5,856,957	6,594,168	7,341,304	8,301,333	89.8
75-84	3,099,319	3,414,310	4,155,098	4,542,130	4,659,169	5,272,283	70.1
85 and over	1,275,516	1,435,188	1,701,859	2,052,038	2,682,135	3,029,050	137.5
All ages	**54,316,618**	**56,466,327**	**58,396,289**	**60,188,029**	**61,800,146**	**63,281,523**	**16.5**
Children (0-19)	12,907,331	13,296,061	13,907,891	14,156,818	14,173,677	14,294,476	10.7
Working age (16-64)	34,475,354	35,176,905	35,711,733	36,083,731	36,256,241	36,743,193	6.6
Categories							
0-4	3,430,957	3,407,486	3,489,664	3,472,321	3,461,648	3,528,253	2.8
5-17	8,160,744	8,645,797	9,097,972	9,226,745	9,281,937	9,290,123	13.8
18-64	33,187,209	33,982,369	34,327,601	34,620,041	34,820,839	35,279,707	6.3
65+	9,537,708	10,430,675	11,481,052	12,868,922	14,235,722	15,183,440	59.2
All ages	**54,316,618**	**56,466,327**	**58,396,289**	**60,188,029**	**61,800,146**	**63,281,523**	**16.5**

Source: Projected Population, 2014 ONS, 2015 (74)

6.2 ORAL HEALTH

The overall aim of dental professionals is to support oral health and well-being, and treat disease effectively for the population. Historically, much professional time has been dedicated to the treatment of disease, whereas contemporary care involves management of disease risks, with a view to maintaining health, both oral and general. As defined by the World Dental Federation [FDI]:

> *Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence, and without pain, discomfort and disease of the craniofacial complex*. (76)

Additionally, oral health is considered

> *"a fundamental component of health and physical and mental well-being"* (76)

And that it:

> *"exists along a continuum influenced by the values and attitudes of individuals and communities; reflects the physiological, social and psychological attributes that are essential to the quality of life; is influenced by the individual's changing experiences, perceptions, expectations and ability to adapt to circumstances"* (76).

Whilst there has been significant improvement in oral health nationally, nonetheless, almost all the population will experience oral and dental diseases at some stage in their lives, the most common being dental caries (tooth decay) and periodontal diseases (gum disease). Both are leading non-communicable diseases recognised in the global burden of disease (77). Additionally, oral and mucosal conditions, from cancers through to infections, pathological tooth wear, trauma, and craniofacial disorders contribute to poor oral health, as well as the sequelae of disease management. Restorations do not last forever and need to be replaced; tooth wear and fractures increase with age. The major biological impact of untreated oral conditions is mouth pain and infection which impact on health and well-being. Social inequalities in oral health and impact of disease are very clear (78, 79), and require action by the workforce to minimise their effect. This may involve delivering care differently and in alternative locations. Further improvement is possible, and should, therefore, be sought as part of managing disease, and risk of disease, in a contemporary manner across healthcare.

6.3 RISK FACTORS FOR POOR HEALTH

The challenge and responsibility of reducing disease risk as much as possible. To achieve a long and healthy life, is shared by individuals, whole populations, healthcare providers and their governments. Oral and dental diseases share many common risk factors with other non-communicable diseases, involving: diet, hygiene, tobacco and alcohol use. Thus, dental team members can play an active role in tackling these behavioural factors at individual level(5), whilst a range of other programmes and initiatives are in place at community and population levels to address common risk factors and tackle the wider determinants of health (80-85). Furthermore, as people age, live with chronic disease, including cancers, and take multiple medications, this can bring additional risk of oral disease.

6.4 PATIENT DEMAND FOR CARE

Dental care provision in England involves a mixed economy, focused in primary dental care. NHS dental care is widely available. Most general dental practices provide both NHS and private care in a manner which has traditionally been demand-led. Over recent decades there has been an expanding private sector largely used by the adult population; however, most care continues to be provided within the NHS. The latest national data suggests that almost 70% of children access dental care, predominately within the NHS over a two-year period and 50% of adults, with a further 27% of the adult population reporting to use private dental care (86).

Patient satisfaction with NHS dental care is higher than for some time (87). There is clear evidence from NHS dental pilots, and other research, that the public are open to being cared for by the wider dental team and willing to attend other practices for more specialised care

(26, 27). Whilst care is increasingly available outside of traditional working hours, calls for a seven-day service will place further demands on providers (88).

Care largely falls into two categories: self-care and professional care. Both, should be supported by wider action to promote health at all levels (89), and reduce inequity (90, 91). It is important to note that public health action and personalised disease prevention underpin high quality treatment. Dental care provision is essentially demand-led, which can work well for proactive health seeking individuals, particularly those able to access dental care during routine working hours, when most care is delivered.

6.5 LOOKING TO THE FUTURE

The following four sections recognise drivers for change and their influence. They focus on ideal care to support and maintain oral health across four broad seasons of the life-course, starting with pre-school children aged 0-4 years and moving through to older people aged 65 years and over.

START WELL

'Let's start at the very beginning'

0-4 years

7. Pre-school children: 0-4 years

7.1 INTRODUCTION

Children under five years of age account for 6.3 per cent (3.43M) of the population in England (74). This age-group is forecast to rise by only 2.8 per cent over the next two decades to 3.528 million, with the rate of change depending largely on birth rates.

Parents and carers play a key role in their child's oral health. At this stage they, and their children, receive support across the wider health and social care system. Prenatally, parents have close relationships with health professionals, most notably general medical practitioners [GPs] and midwives. Postnatally, they have frequent links with both health and social care in the early years of a child's life, accessing health visitors and GPs within the health sector. For many, child minders, nurseries, nursery schools, and children's centres form part of their social interaction, and increasingly so, due to the availability of subsidised places. Overall, families with young children in England have particularly strong links across health and social care during these early years.

7.2 ORAL HEALTH NEEDS

Normally children start life with good oral health. As teeth appear in the mouth, from around six months of age, they are at risk of tooth decay which can occur very quickly in some children. The national survey of 3-year-old children conducted by Public Health England [PHE] in 2013 suggests that 12 per cent of three-year-old children had experience of obvious dental decay (caries into dentine), having one or more teeth that were decayed (to dentinal level), extracted or filled because of caries ($d_3mft>0$). These children had on average three teeth affected by decay into dentine. Across the English regions, estimates ranged from 8 per cent in the East of England to 15 per cent in the East Midlands (92). Dental caries follows patterns of deprivation; 19 per cent of the prevalence and 25 per cent of the severity were explained by deprivation (92).

7.3 ACCESS TO PRIMARY DENTAL CARE IN PRIMARY CARE SETTINGS

NHS dental care is free for children, and whilst most are users of NHS dental services during their school years, the uptake of care in children aged under five years has traditionally been low, with only 33 per cent of children aged under five years attended a dentist, ranging from 21% of one-year-olds to 56 per cent of five-year-olds in the 12-month period up to March 2017. Looking at the data over a longer period, only 37.8 per cent accessed services in the 24-month period up to March 2017. Many children do not visit a dentist until disease is well established, or they are in pain and require admission to hospital (93). Early dental attendance has not traditionally been encouraged by dental practices or sought by parents and carers; however, most children have visited a dentist by the time they enter school (94). National and local inequalities in oral health and uptake of care are also evident.

Limited specialist care is available in primary care settings currently, and largely focused in community dental services.

7.4 ACCESS TO HOSPITAL (SPECIALIST) CARE IN SECONDARY CARE SETTINGS

Pre-school children requiring surgical management of dental caries, i.e. removal of teeth, generally require access to hospital for removal of one or more teeth. This approach is common in young children who are pre-cooperative and those with high levels of dental caries or who have experienced trauma to their teeth and jaws (95, 96). Their dental care is delivered by a range of dental professionals, notably hospital specialist paediatric dentists, special care dentists and oral surgeons and, in certain locations, community dentists. Tooth extraction was the sixth most common procedure in hospital for children under 5 years of age, and the most common reason for hospital admission for children aged 5 to 9 years old. There were ten thousand admissions amongst children aged 0-4 years old in England in 2014/15 for dental extractions, which represents 0.3 per cent of the population group, the majority of which have 'dental caries' as the primary diagnosis (97).

7.5 KEY CHALLENGES

Young children, aged below five years, are more at risk of developing **dental caries** than other childhood conditions due to multiple influences. An important approach at this age is for the health and social care workforce to support parents and carers to provide a healthy diet from birth, introduce good oral hygiene practices once teeth appear using fluoride toothpaste of an appropriate strength at least twice daily, and encourage early dental attendance, where advice and care should be available in line with the evidence (5). There is a common misconception in society that 'baby teeth do not matter'; however, this is the time when dietary preferences and oral hygiene practices are established, and early childhood caries can develop. The volume of care needs to be expanded to enable **all** young children and their parents/carers to gain support and ensure the best start in life (98).

7.6 FUTURE ACTION REQUIRED

a. **Promotion of oral health** from birth is key to supporting parents in 'starting well'. This requires leadership from dental professionals, together with the involvement of health and social care professionals including midwives, health visitors, general practitioners and nursery workers providing support to parents and carers (99).
b. **Prevention** of oral disease requires that good dietary and oral hygiene practices are established early in life, along with access to optimal levels of fluoride, in line with the contemporary and strengthening evidence base (99, 100).
c. At societal level, there is also a need to recognise and embrace the fact that '***baby teeth matter***' (101). This is the time in life when patterns of eating and drinking, and hygiene become established**.** This may helpfully be supported by parent champions and other personnel**.**
d. Dental professionals can play a positive role from birth onwards (5); however, this requires early dental attendance. **Early dental attendance** should therefore become the norm; however, this requires a paradigm shift in public thinking. Additionally, all members of the dental team, including practice staff, including receptionists who work closely with all patients, should be trained and supported to ensure that parents are

encouraged to access dental care early in their child's life. It is ideal to access dental care by the age of one year as, during this period, dental care is free for mothers.

e. Within dentistry, there is the opportunity to use the dental team **skill mix** to support prevention in practice so parents with very young children find a dental 'home' to receive early prevention. The potential for patients to have **direct access to dental therapists and dental hygienists** should be explored for this age-group.
f. **Health personnel** (health visitors, school nurses, general practitioners, practice nurses) are tasked with making every contact count for health. Oral health messages should be clear, given the prevalence of oral disease and the importance of giving every child the best start in life. This has time and capacity implications; thus, this workforce may need to be expanded.
g. **Consistent messages** should be available across all health and social care providers, emphasising that baby teeth do matter. Key messages should be delivered to parents of young children across a range of settings: GP surgeries, nurseries, children's centres, via relevant health workers. Parents will require support in integrating healthy practices into daily living within a more supportive environment.
h. Oral health should therefore be included in **training curricula** of a range of health and social care staff. This includes midwives, health visitors, doctors, practice nurses, school nurses, nursery workers and children's centre staff. Additionally, continuing professional development for existing staff could be provided through nationally developed training packages using e-learning technology.
i. Parents should be supported in ensuring high quality daily care for their child's oral health; whilst recognising that the **wider determinants of health** also need to be addressed. Vulnerable groups will require additional support to achieve and maintain oral health.
j. In delivering care, dental teams may need to work outside of traditional dental settings so that oral health promotion and fluoride varnish applications are provided in locations such as supermarkets to help these parents. This requires team members to be willing to work in a **flexible** and **innovative** manner.
k. Although the proportion of young children in the population is not expected to expand greatly, modest additional resources will be required to support **maintenance of oral health** through this period from across health and social care, as well as from primary dental care. As an increased number of 0-4-year-olds attend a dental setting, there must be a **skilled dental workforce** willing, and able, to deliver regular care in line with the contemporary evidence base. This will include using **non-surgical approaches** to caries management at an earlier stage in the disease process.
l. Further research is required to understand **early childhood caries** and model the contribution of **risk and protective factors** across different populations within England, and their delivery to inform more effective prevention and care.
m. Whilst the emphasis should be on promoting parental-care at home and building the wider oral health workforce across health and social care, there may need to be more specialised paediatric dental expertise in primary care. Dentists with extended skills in paediatric dentistry may be needed, willing, and able, to treat young children.
n. Implementation of **commissioning pathways** through consultant-led MCNs and Local Professional Networks [LPNs] will be required in relation to local oral health needs.

o. Consultant-led **managed clinical networks [MCNs] for children** will be important in the delivery of care, involving a range of team members including dentists with extended skills [DES]. Equitable and timely access to expertise will be vitally important, with care provided in primary care settings where possible.
p. For children with acute or extensive needs, there should be a clear safety net **specialist paediatric dental service** in secondary care settings, with the skills to deliver care under general anaesthetic or sedation, particularly when children are pre-co-operative or medically compromised. This will remain a valuable resource, as untreated dental caries has major implications for general health and well-being. Some will require this service, even those who have acquired dental caries in their early years in other countries. Given population demographic predictions, it is not expected that additional specialist paediatric dentists will be required. The workforce, however, should be maintained at a level whereby children who do require swift access to specialist and emergency care can do so in an acceptable time-period.
q. Some **expansion in the dental practice workforce** will be required to meet the needs of all children under five years of age, as many are currently not accessing care. This should be achieved, using the wider dental team including **extended role dental nurses.**
r. Traditionally, it has not been financially attractive through **the national remuneration system** for dentists to dedicate most of their time to treating children; however, should a practitioner choose to extend their skills in the care of young children, or children in general, this should be recognised and supported financially. Furthermore, dentists with extended skills may be required to support care as an alternative to specialists. This is important ingredient in supporting the development of **new models of care,** harnessing workforce skills and expertise**.** Remuneration of routine dental care for young children should enable practices to use the skill mix of the dental team.
s. **Effective commissioning of care for children,** across health and social care, will be key to achieving innovative change, together with dental contract reform. Providers will require contracts that support delivery of care by a dental team willing, and able, to focus on children's care as part of a wider network.

KEEP WELL

‘Motivate to care for a changing dentition’

5 to 18 years

8. Schoolchildren: 5 up to 18 years

8.1 INTRODUCTION

This section of the population, aged from five up to 18 years, is engaged in education, the majority of which is provided by the state. All young people nationally are required to be in full-time education, or apprenticeships, from 16-18 years. This is the period in life when children make their transition from primary to secondary dentition, i.e. from baby to adult teeth, so there is *theoretically* a 'second chance' to have good oral health; however, the evidence suggests that children with decay in their primary teeth are also likely to have decay in their adult teeth and progress along trajectories depending on their risk (102).

8.2 POPULATION

This age-group currently accounts for 15 per cent of the total population (8.16M) in England (74). This section of the population is expected to rise in volume by approximately 13.8 per cent to 9.29M in 2039, with regional variation, whilst remaining at 15 per cent of the total. London is the area of highest predicted growth in schoolchildren.

Approximately 6 per cent of this age-group (0.8 million) has a disability and/or impairment (mainly neurodevelopmental and mental health conditions) which represents a 16 per cent increase over the past 5 years (103). A significant increase in children with disability/impairment and chronic complex medical conditions is expected in future because of the successes of wider healthcare initiatives (104).

8.3 ORAL HEALTH NEEDS

School-age children are at risk of dental caries and may develop early gum disease (gingivitis which is reversible) through poor oral hygiene control, with a very small minority having signs of more severe gum disease (Figure 8.1). Additionally, some children will have a need for orthodontic treatment whilst less common conditions include trauma and tooth wear, thus a wider range of conditions require active management in this age-group.

The oral health of children on entry to school at 5 years appears to be improving (99, 105). There has been a general trend downwards in the level of dental caries in recent years, both in terms of the proportion of children with caries into dentine but also the average number of teeth affected. However, analysis of trends must recognise that methods of obtaining consent for surveys and the recording of disease have also changed (Figure 8.2). Consistent reporting confirms that needs are greater in areas of social deprivation. For example, 41 per cent of the variation in decay levels in local authorities at five years of age is explained by differences in deprivation (99).

Child Dental Health at 5-, 12- and 15 Years in England, 2013

Dental caries (tooth decay)

- 31% of 5-yr-olds have obvious decay experience into dentine primary teeth whilst 13% have severe or extensive decay
  (*note* 49% of 5–yr-olds have any clinical decay experience which includes caries in enamel)
- 33% of 12-yr-olds have obvious decay experience in permanent teeth
- 44% of 15-yr-olds have obvious decay experience into dentine in permanent teeth; and 14% have severe or extensive decay
- (*note* 46% of 15-yr-olds have evidence of initial tooth decay which includes caries into enamel)
- Social inequalities in dental caries experience are evident at all key ages

Traumatic injuries

- 12% of 12-yr-olds have evidence of traumatic damage to permanent incisors
- 10% of 15-yr-olds have evidence of traumatic injury to permanent incisors

Enamel abnormalities

- 15% of 12-yr-olds have enamel defects in posterior teeth

Orthodontic need: mal-alignment of teeth and jaws

- 33% of 12-yr-olds have a professionally defined need for orthodontic treatment
- Social inequalities in unmet need are present in children aged 15 yrs

Anxiety related to dental care

- 14% of 12-yr-olds report having extreme dental anxiety
- 10% of 15-yr-olds report having extreme dental anxiety

Impact and pain

- 68% of 12-yr-olds and 65% of 15-yr-olds reported problems with their dental health in the past 12 months, of which having a sensitive tooth, was the most common
- 37% of parents reported their 5-yr-olds had experienced impact
- Children from low social groups were more likely to have reported impacts

Sources: 2013 CDHS England In. http://content.digital.nhs.uk/catalogue/PUB17137

Figure 8.1 Oral health of schoolchildren in England

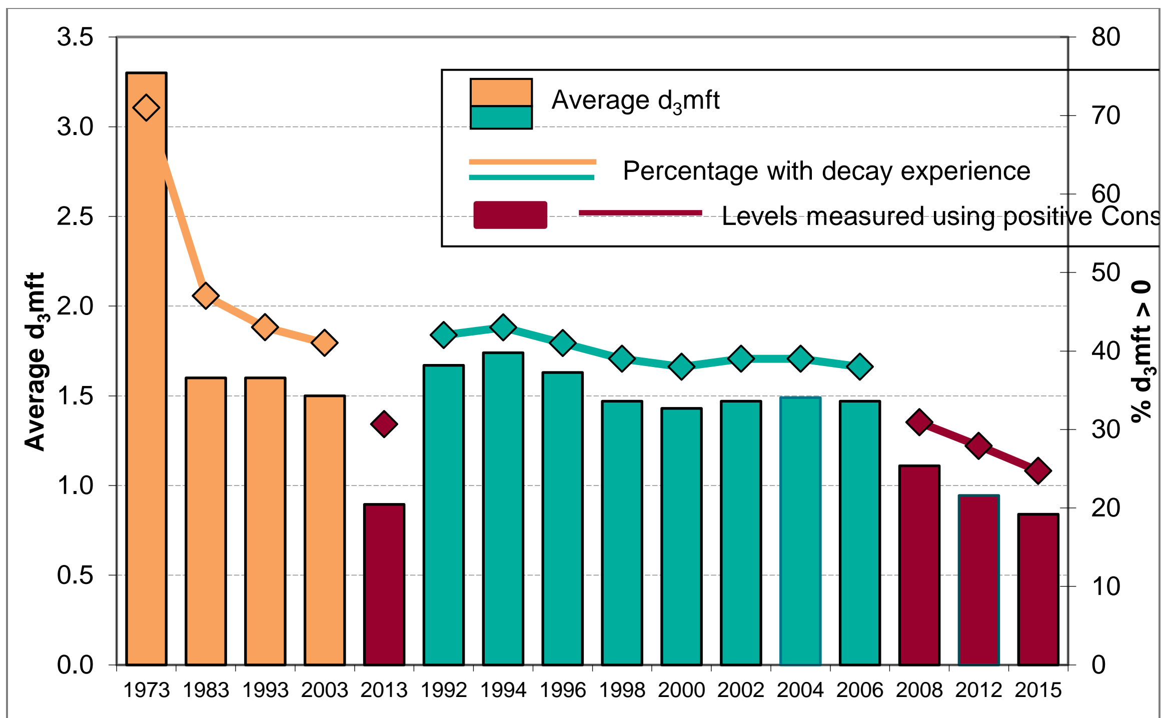


Figure 8.2 Results of dental surveys of five-year-olds in England from National Child Dental Health surveys and PHE Dental Public Health Epidemiology Programme surveys, 1973 to 2015

8.4 ACCESS TO PRIMARY CARE IN PRIMARY CARE SETTINGS

Annual dental attendance is recommended for all children as a minimum (18), with more frequent attendance indicated by risk. Few parents or children report never going to a dentist in the 2013 national survey 1-2 per cent by age group. In England, national survey data suggest that only 6 per cent of 5-year-olds and one per cent of 8-year-olds have never visited a dentist (94).

The most common item provided after dental examination was 'advice on oral care' received by 65 per cent of 15-year-olds through to 13 per cent of 5-year-olds; there was reported evidence that preventive treatments to teeth had been received by 29 per cent of 12-year-olds and 26 per cent of 15-year-olds.

Uptake of NHS care is best amongst schoolchildren; thus, providing the opportunity for preventive care, should families attend services regularly. During the preceding 12-month period to the end of March 2017, 68.7 per cent of this age-group had accessed an NHS dentist, with highest levels amongst children aged 7-13 years (≥70 per cent). Taking a longer view over 24 months to March 2017, over 83.7 per cent of children aged 5-17 years had accessed care. Uptake reduced with age, thereafter, dropping to 57 per cent amongst 17-year-olds. It is well recognised that children who most need dental care may attend less often and/or later in the disease process when intervention is required (93); hence, they are less likely to benefit from preventive care.

8.5 ACCESS TO SPECIALIST CARE IN PRIMARY/SECONDARY CARE SETTINGS

Specialist orthodontic care is provided in primary care settings in specialist practices as well as consultant-led services in hospitals, the majority of which is for young people in this age group. There were 4.2 million 'units of orthodontic assessment' [UOAs] carried out in 2015-16, 0.9 per cent (38,309), which is less than the previous year. There is regional variation in the level of care provision (86). Inequalities in access to orthodontic care are present amongst young people associated with deprivation.

8.6 ACCESS TO HOSPITAL (SPECIALIST) CARE IN SECONDARY CARE SETTINGS

A considerable number of children are admitted to hospital, usually under the care of paediatric or oral surgery consultants, with extraction of teeth being the most common reason for admission; 46,696 children in this age group were admitted to hospital for extractions under GA/sedation in 2014/15 (106), the most common reason being tooth decay and its sequelae. Initiatives to support prevention and health promotion amongst these families have proved a challenge (107).

Additionally, a small number will require the wider services of oral maxillofacial surgery consultants in conjunction with orthodontist and paediatric dentistry consultants as part of combined care for craniofacial disorders.

8.7 KEY CHALLENGES

Challenges are similar to those of pre-school children:

Prevention of oral and dental disease and **promotion of oral health** continue to be important in this age-group as they make the transition to an adult dentition from the age of six years onwards. This involves wider healthcare professionals, as well as all oral and dental professionals and personal/parental care.

Addressing inequalities and variation in health requires upstream policy action, and a range of evidence-based actions at societal and community levels.

Regular dental attendance in primary dental care settings should become the norm for all children, providing the opportunity for evidence-informed preventive care, and for disease to be detected early and managed conservatively.

Geographic variation in population growth and service availability needs to be addressed to facilitate equitable access to all aspects of care locally regionally through MCNs.

Supporting families who traditionally have been high users of GA and sedation for late stage management of dental caries will be a challenge and requires further research and supportive action.

Remuneration systems are required to support the delivery of child dental care in primary care settings and outside traditional settings in new models of care.

Workforce development to support new models of care, together with **contract reform** and **good commissioning,** will be required to achieve change.

8.8 FUTURE ACTION REQUIRED

Future action should build on, and be integrated with, that of pre-school children:

a. There was a clear view that **promotion of oral health** and **delivery of evidence-based preventive dentistry** is important in 'keeping well'. Prevention should underpin oral health care for all children, at all levels of care, with the aim of eventually reducing need in the child population overall.

b. There should be **integration** of care through use of other agencies to promote oral health and access to care, e.g. health visitors, school and community nurses, pharmacists and local authority education services. Teachers should also be aware of their important role in promoting health in general and oral health.

c. Within dentistry, the workforce may need to grow to meet all oral health needs with **full use of the workforce expertise**: primary dental care dentists, DCPs, dentists with extended skills [DES] and specialists. Paediatric dentistry and orthodontics are the two main specialties to support children and young people. Specialist services should be available across primary and secondary settings. Much routine work, however, particularly prevention, may be undertaken by DCPs.

d. Incentives to work in areas of social deprivation should be considered to **address inequalities in oral health.** It will be important to ensure delivery of care to those most in need by an appropriately trained workforce operating in the most relevant setting, minimising regional and social inequalities.

e. **Routine dental care** should be provided where possible by DCPs supported by dentists who are able and willing to provide contemporary evidence-based care for children, and for those who work in the NHS contracted to do so; some children may require access to dentists with extended skills [DES] or specialists in paediatric dentistry.

f. **Managed clinical networks** [MCNs] for children's dental care will involve a range of team members, including dentists with extended skills providing an extended range of care, and specialists, as part of a network within a geographical region (currently LPNs). This should include the provision of a range of adjunct services from behaviour management through to sedation services, and, where appropriate, admission for general anaesthetic [GA] in hospitals.

g. **Paediatric dentistry:** specialist care should be readily available to all those children whose oral health care needs cannot be met by a generalist or dentist with extended skills (Level 1 or Level 2 dental practitioner). This care should be overseen by the same MCNs as pre-school children.

h. **Orthodontic needs** are not expected to increase; nonetheless, there are likely to be changes in skill mix with greater team-working at practice level and use of orthodontic therapists. Orthodontists in practice should actively link with specialists and consultants in hospital settings in MCNs.

i. The number of **specialists** should match the needs of the local child population and include capacity for training and support of non-specialist practitioners as well as other dental professionals. Peripatetic specialist and consultant services may be more locally available within networks of care.

j. **Seamless care pathways** will be required between providers and from paediatric to adult services, especially for vulnerable groups with special needs or rare conditions.
k. **Integration** with other agencies will facilitate access to care and preventive advice, e.g. health visitors, school and community nurses, pharmacists and local authority education services.
l. New registrants should have the opportunity to engage with **new models of care** as part of their induction to the NHS.
m. NHS **contractual arrangements** within primary dental care should focus on supporting prevention, delivery of services by skill mix teams and use of an extended workforce.
n. Implementation of **commissioning pathways** through consultant-led MCNs and LPNs, working with STPs, is required according to regional needs. Effective **triaging** of referrals for hospital care in a timely manner; and, where appropriate, delivery in primary care settings.

MAINTAIN WELL

and PLAN for HEALTH

Adults

18-64 years

Continually at risk

9. Adults: 18-64 years

9.1 INTRODUCTION

Adults aged 18-64 years form the dominant section of the population and are to be found employed in the workplace, in education and training, or at home. Younger adults are increasingly expected to change jobs and workplaces more regularly, work across different settings, be increasingly technologically "savvy", use mobile technology to remain 'connected' and live longer lives (108). This has implications for when and how they use dental services in future.

9.2 POPULATION

There are currently 33.19 million adults of working age (18-65 years), comprising 61 per cent of the population; this age-group is anticipated to expand by 6.3 per cent to 35.28M, representing a fall of five percentage points to around 56 per cent of the population (74). Levels of disability in the adult population are increasing as healthcare improves. In 2012/13, 16 per cent of adults of working age (6.1 million) had a disability (103). Furthermore, co-morbidities are common with increasing age, particularly as many adults from middle-age onwards are living with chronic conditions and taking multiple medications.

9.3 ORAL HEALTH NEEDS

The vast majority of adults have experienced oral and dental diseases as shown in Figure 9.1 and remain at risk of these chronic progressive diseases (102), and their sequelae. Dental caries experience is still prevalent with 84 per cent of dentate adults having one or more fillings present in their mouths. Many more adults are keeping some or all their natural teeth such that only 6 per cent were edentulous; comparison with previous surveys shows that each decennial cohort has less tooth decay. None-the-less, 30 per cent of dentate adults had dental caries present and 8 per cent had unrestorable teeth. Longitudinal surveys confirm that dental caries is a progressive disease; in high income western countries there is evidence that adults gain one carious surface per year (109).

As people retain their teeth, they may be affected by periodontal diseases present in about half of adults, with nine per cent having some evidence of periodontitis; both conditions increasing with age (94). Inequity is marked in relation to edentulousness, dental caries and periodontal diseases (110). Whilst a range of less common additional conditions affect adults the number of people affected is still significant. Mouth cancer and most cancers of the head and neck increase with age, and these serious conditions are on the rise, notably oral and oropharyngeal cancers (111-113).

Looking to the future (Figure 9.2), we anticipate that more young people will enter adulthood with healthy mouths, and at the other end of the age spectrum, the proportion of the population requiring complete dentures is anticipated to reduce, with implications for care provision. Furthermore, within society there is increasing emphasis on aesthetics together with the realisation of what is possible through dentistry, creating increased demands for care such as cosmetic treatments, orthodontics, tooth whitening and dental implants, most of which are provided within the private sector.

Adult Dental Health in England, 2009

Overall oral health

- only 10% of adults had excellent oral health and they were more likely to be young and from less deprived backgrounds
- 22% of dentate adults had one or more urgent conditions in their mouth

Edentulousness

- 94% of all adults in England were dentate and 6% were edentate
- 13% had natural teeth and dentures

Natural and sound teeth

- 86% of dentate adults have 21 or more natural teeth (a functional dentition).
- dentate adults in England had an average of 18 sound and untreated teeth

Dental caries experience (tooth decay)

- over 80% of dentate adults had experienced dental caries
- 85% of dentate adults in England had at least one restored tooth.
- 30% of dentate adults had carious teeth present (crowns and roots)
- 8% of dentate adults in England had one or more teeth with unrestorable caries

Periodontal diseases

- 50% of dentate adults had loss of attachment and pocketing of 4mm or more
- 54% of dentate adults had bleeding on probing;
- 45% had pocketing of 4mm or more; increasing with age from 19% of 16-24yr olds through to 61% of 55-64-yr olds
- 9% had pocketing of 6mm or more; increasing with age from 1% of 16-24yr olds through to 16% of 55-64-yr olds
- 66% of dentate adults had visible plaque present on their teeth

Anxiety related to dental care

- 14% of 12-yr-olds report having extreme dental anxiety
- 10% of 15-yr-olds report having extreme dental anxiety

Impact and pain

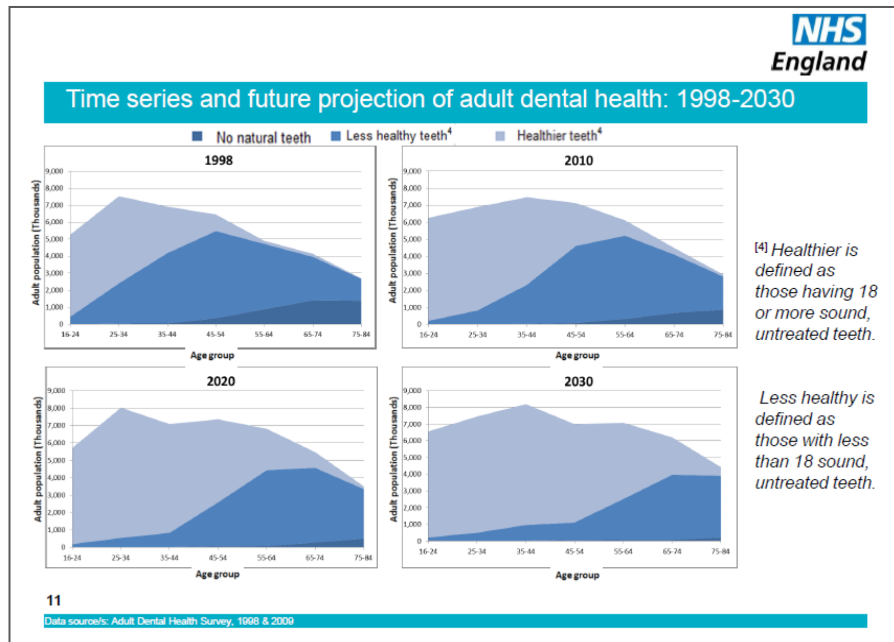
- Overall 9% of dentate adults in England reported feeling current pain related to their teeth
- 39% of dentate adults reported experiencing at least one problem concerning their oral health

Cancer diagnosis

- Risks of oral cancer increase from 60 yrs onwards, particularly amongst smokers

Sources: 2009 ADHS In. https://digital.nhs.uk/catalogue/PUB01086

Figure 9.1 Adult oral health in England



Source: NHS England (114)

Figure 9.2 Time Series: oral health projections for England

There is emerging evidence amongst adults of the association of common non-communicable diseases with oral health (115-118). A greater understanding of the nature of these associations and implications for care is required to support adults in retaining a functioning dentition, maintaining health and quality of life and planning well for future care. Furthermore, adults are increasingly interested in their own health (108), and many want to partner in how, when, and where care is delivered.

9.4 ACCESS TO DENTAL CARE:

Dental attendance is recommended at least once every two years for adults (18), with more frequent attendance based on risk assessment. Adults in England use a mixture of NHS and private dental care, with national survey data suggesting that the majority access NHS services as patients are required to make co-payments for NHS care (unless they have specific exemptions) (119), or pay fully for care privately or through insurance systems. Cost becomes a barrier to care for those on lower incomes and exacerbates inequity in oral health within society (110).

A total of 30 million patients was seen in the 24-month period to 30 June 2015; a 6.7 per cent increase on the March 2006 baseline but a 0.2 per cent decrease on the previous quarter (120). As of the end of March 2017, 39 per cent had accessed dental care in the preceding year, with higher levels amongst adults in their fifties (41-45%).

In the 2009 survey, 76 per cent adults reported attending at least once every two years (110). Sixty-one per cent of dentate adults in England reported attending the dentist for regular check-ups, whereas in London it was notably lower at 44 per cent. Nationally, 27 per cent reported attending only when they had trouble with their teeth. It is notable that only 2 per cent of adults reported never attending a dentist (110).

Twenty-seven per cent of dentate adults in England reported receiving private dental care during their last completed course of dental treatment, 46 per cent received NHS care, which they paid for, and 24 per cent received free NHS dental care (110). Overall, 70 per cent of dentate adults received NHS dental care at their last completed course of treatment (110).

9.5 KEY CHALLENGES

Maintaining oral health and **managing disease** remain important through adult life. For many this will involve identifying and managing risks of disease which may require behaviour change support. This requires a paradigm shift within society, with support and advice from healthcare professionals.

Access to primary dental care: adults use, and have benefitted from, the skills and expertise of the dental workforce and will require ongoing care throughout their life-course. Preventative care will be required to minimise risk and thus the consequent need for interventive care; and to support effective maintenance of any treatment delivered.

Inequity in oral health is further exacerbated by challenges in access to dental care; this is particularly apparent in areas of social deprivation and amongst vulnerable adults.

Complexity of clinical care: many of these patients have received complex dental care such as dental implants. These patients will require long-term maintenance and support. Many also have heavily restored dentitions including more complex dentistry (root fillings, crowns, bridges and implants) all of which present a challenge when further pathology, including fractures, means that an extraction is required. Failures associated with complex care, often provided privately, and sometimes abroad, through dental tourism, generally present to the NHS for remedial action. Thus, the workforce will need to be competent and skilled to manage adults of increasing complexity.

Access to specialised care, particularly the transition, for children requiring specialised care, from paediatric dentistry to special care dentistry and other specialities, represents a particular challenge. Throughout adult life, a proportion of adults will require occasional access to the services of one or more of the specialties which serve adults, either because of their dental or health status. This can include restorative dentistry (or the mono-specialties of prosthodontics, periodontics and endodontics) as well as oral surgery and special care dentistry, oral medicine, oral pathology and maxillofacial radiology.

Geographic variation in population growth and service availability is marked. Many dental specialties are focused around dental schools and hospitals, thus for populations remote from dental schools, and especially rural populations, access to specialised or specialist care represents a challenge.

Keeping up-to-date and demonstrating contemporary knowledge and skills will be important amongst health professionals. The workforce will need to be **competent and skilled** to manage adults of increasing **complexity** and be enabled to manage care over time, rather than merely focusing on 'cross-sectional' courses of care.

9.6 FUTURE CARE

a. **Promotion of oral health** and **prevention of disease** remains important amongst adults for **effective self-care** and **maintenance of oral health.** For many this will involve identifying and managing risks of disease which may require behaviour change support to address oral health related behaviours. This requires the support of all health and social care professionals as well as the dental team.
b. The dental workforce will need to be **competent and skilled** to manage adults of increasing **complexity.** Adults use, and have benefitted from, the skills and expertise of the dental workforce and will require them throughout their life-course. Adults aged over 50 years who suffered high levels of dental caries, and have benefitted from extensive restorations, will particularly require careful maintenance and repair into older age. This will harness the skills of all dentists, supported by specialised or specialist dentistry for more complex patients.
c. Dentists may provide advanced and routine treatment for complex patients supported by a wider **collaborative dental team**, including using a mix of dental care professionals to support patient care.
d. **Effective disease management** will be required to reduce need will involve working across health and social care. Younger adults who have had good oral health as children, will need to be empowered to manage the risks of oral disease in later life. Ensuring access to preventative care may reduce complex needs for care in later life, and where complex care is provided, support its effective maintenance. Dental care professionals will play an important role in maintaining oral health with evidence-based prevention.
e. **Regular dental attendance**, with frequency based on risk should be encouraged; however, some adults will choose to attend less regularly.
f. **New models of care** should be developed across organisations, involving a mix of options across the levels of care using the wider dental team, dentists with extended skills, specialists and consultants. This is likely to require access to a range of specialist competencies including oral surgery, oral medicine, periodontology, prosthodontics and endodontics.
g. **Addressing inequalities** in oral health means that additional support and action will be required to promote health and facilitate access to dental care for vulnerable groups in an equitable manner. Models of care need to be well defined, and the care delivered should support reductions in inequity.
h. **Innovative** approaches will be required to address inequalities in health amongst vulnerable groups. Furthermore, **integrated care** will be required for groups needing special care dentistry.
i. All adults require access to routine dental care, whether they choose to use it occasionally or regularly. Everyone should have access to **specialised care pathways** as required.

SUSTAIN WELL

Through older age

To

END WELL

Older people

Even more at risk: requiring care and comfort

65 years and over

10. Older People: 65 years and over

10.1 INTRODUCTION

Older adults are the most rapidly growing population sub-group in England. This section of society has some of the greatest oral health needs, despite significant improvements in recent decades.

10.2 POPULATION

Demographic change will result in significant expansion of the population aged 65 years and over by 59 per cent to 15.2 million by 2039 (74); expanding from 18 to 24 per cent of the total population. However, within this group, there is variation, with the segment aged over 85 years of age projected to grow at the highest rate (137.5%) to 3.6 million by 2039.The 75-84 age-band is projected to rise by 70.1 per cent to 6.3 million, by mid-2039; the segment of adults aged 60-74 years is predicted to grow, but less rapidly, increasing by 25.4 per cent to 12 million people. Given that chronological age and biological age differ, it is important to recognise that adults in their last years of life will have significant health challenges; this has implications for the health workforce in general and the dental workforce in particular.

Older people spend most of their time in community settings and being active. As vulnerability increases, every effort is made to enable them to live independently for as long as possible. Thus, only a small minority (5-6%) live in care homes (121); however, this represents some of the most vulnerable members of this age-cohort. Nonetheless, even in the oldest age-group only 16 per cent of people aged 85 years and over in the UK live in care homes (121).

Amongst older adults living in the community, there is evidence that many require care, but their needs are not met. It is estimated that in England of the 2.8 million older people aged 65-89 with care related needs, 900,000 currently do not receive any formal support (122, 123).

10.3 ORAL HEALTH NEEDS

Good oral health is recognized as an essential component of active ageing nationally (121). One of the great successes for dentistry across the UK is that oral health has improved such that even amongst oldest adults (85 years and over), the majority have some natural teeth. However, denture wearing increases with age. Furthermore, adults in their later years have an increased risk of oral disease, notably dental caries, periodontal (gum) diseases, toothwear, oral and mucosal lesions, and head and neck cancer (Figure 10.1). Adults who have lost some or all their teeth may wear partial or complete dentures, which also need to be managed as they may impact on oral health. As with other age-groups, there is evidence of social inequity; older people from lower social groups are more likely to be edentulousness and have untreated decay (coronal caries) and have fewer sound and restored teeth (110).

Periodontal disease increases markedly with age. The last national survey reported that 60 per cent of 65-74-year-olds and 61 per cent 75-84-year olds in the UK had pocketing of 4mm or more. And some 14 per cent of 65-74 and 75-84-year olds and 15 per cent of 85+ had more severe disease as evidenced by periodontal pocketing of 6mm or more (110).

With the benefits of past dental care, many will have heavily restored dentitions, including complex advanced dentistry, such as implants which require maintenance and repair. In the worst case, they will require surgical removal. Importantly, as people age, they will have more co-morbidities and polypharmacy, which have implications for their oral health, self-care and professional care, and they are less likely than younger adults to rate their general health as good. The most challenging condition for older adults and dental professionals is cognitive decline and dementia (115, 124). Together, these will result in this group having significant, and rapidly changing oral health needs requiring active management. This has implications for older patient's ability to retain a functional dentition in support of their general health and well-being.

There is a significant body of evidence that older people have high levels of oral health needs as they become more vulnerable (125), most notable amongst residents of care homes (45, 125, 126). As the environment changes, albeit alongside established health behaviours, the risks to oral health increase. There is evidence that daily self-care/assisted care is not perceived as a priority and becomes increasingly difficult with cognitive decline (127).

Oral Health of Older People in England

Overall oral health

- Only 1% rate their oral health as excellent

Dentures

- Whilst 6% of adults are edentate, this rises to 31% in older adults
- There is variation by geography and edentulousness is much lower in London (2.8%) had natural teeth and dentures
- Wearing complete or partial dentures is common in over half of adults ≥75 years in both care homes and living in the community

Functional dentition (21 or more natural teeth)

- Only 40% of dentate adults aged 75-84 years have 21 or more natural teeth
- Only 53% of adults aged 85 years and over had natural teeth; of these, only 26% had a functional dentition, which represents 14% of this age group
- 80% of Londoners aged over 65 years retain a functional dentition

Dental caries experience (tooth decay)

- Dental caries is more common in older adults and higher amongst those living in care homes
- 40% of community living dentate older adults aged 75-64 years had dental caries experience
- Over 90% of older adults have exposed root surfaces at risk of decay and adults in the 75-84-year age-group have most evidence of root caries (just under one in five)
- The majority of older adults living in care homes have dental caries present

Periodontal diseases

- The majority of dentate older adults have periodontal disease; approximately 60% of 65-84-year-olds; and 40% in adults aged ≥85 years
- 14% of 65-74 and 75-84-year olds and 15% of dentate adults 85 years and over had more severe disease, as evidenced by periodontal pocketing of 6mm or more

Anxiety related to dental care

- Anxiety levels are lower than younger adults

Tooth wear

- Tooth surface loss – increases with age; a minority have pathological wear

Impact and pain

- Overall fewer dentate older adults in England reported feeling current pain related to their teeth, which decreased with age from 9% in 65-74-year-olds to 6% in 75-64-year-olds and 4% in people aged 85-years and above
- Higher proportions of older adults have one or more PUFA indicators: 8% in 75-84-year-olds and 10% in people 85 years and over, with higher levels in care homes.
- Adults over 75 years of age are less likely to rate their oral health as good: 59% of adults 75-84 years and 53% of adults aged 85 years and over rated their oral health as good
- Oral health impacts on quality of life: 41% of older adults living in the community identified that they had one or more oral health 'impact', occasionally, or more often

Cancer diagnosis

- Risks of head and neck cancer increase from the age of 60 years, particularly amongst smokers and rates of head and neck cancer are rising

Sources: 2009 ADHS In. https://digital.nhs.uk/catalogue/PUB01086
PHE & BASCD (2015) The oral health of older people in England and Wales. London PHE.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/489756/What_is_known_about_the_oral_health_of_older_people.pdf

Figure 10.1 Older Peoples' oral health in England

10.4 ACCESS TO CARE

Regular dental attendance is recommended for adults based on risk, with the maximum recommended interval being two years (18). As older adults have higher risks of oral disease, they are therefore likely to need to attend more frequently. Older people use NHS and private dental care.

In the 2009 UK Adult Dental Health Survey, over 80% of older dentate adults in each age-band reported attending a dentist within the last two years (110). Overall 78% of UK adults reported attending every two years with the NHS being the primary provider for 71% of this group, i.e. 50% overall. Cost (63%), and location (23%), were main reasons for using NHS dental care. Whilst just over one quarter of adults overall (27%) had utilised private dental care, rates increased with age; from 33% in 65-74-year-olds, to 38% in 75-84-year-olds and 44% in ≥85 years. Oldest adults were the greatest users of private dental care nationally of any age-group. The latter may be explained by the fact that the provision of dentures has increasingly moved to the private sector, and thus older adults, who are the section of society most likely to have lost natural teeth, will require this service.

NHSE data for the year ending March 2017 (120), suggest that 41.2% of adults aged over 65 years used NHS dental care in the previous 12 months and 50.5% in the previous 24 months. In the latter period, the greatest use was made by 69-70-year-olds, amongst whom over 62% had accessed care. In England, older adults are not exempt from making co-payments for dental care, with laboratory procedures such as dentures involving the highest patient charges. Overall, four-fifths of older adults were paying for, or contributing to, the cost of their dental care. Barriers to dental care are commonly reported as cost, fear, availability, accessibility and characteristics of the dentist and lack of perceived need (128).

Older people have traditionally held an allegiance to the NHS and an expectation that they should have access to NHS care, placing great value on the NHS brand (129). Adults in general report using private care because of a range of issues, the most common being that as their dentist has moved to the private sector, they are unable to find an NHS dentist or access private care because of quality issues. Only 1% reported receiving mixed NHS and private care.

There is some evidence that older people in residential care homes may be able to access routine primary dental care practitioners but that adults who are more vulnerable, particularly those living in nursing homes, are significantly more likely to need domiciliary care (126). However, the level of domiciliary care in England has reduced markedly under current commissioning arrangements and it may not be clear how to access domiciliary care for carers. Issues around transport and staff support have been reported by care home managers (126).

The odds of receiving treatment within a primary dental care setting have been shown to increase significantly with each increasing year of age amongst adults, when payment is not a barrier to care: 'partial dentures' (7%); 'scale and polish' (3.7%); 'tooth extraction' (3%), and 'instruction and advice' (3%) (130). Demand for all elements of dental care amongst older people is predicted to increase in future decades, except complete dentures (131).

10.5 KEY CHALLENGES:

Self-care becomes more difficult with increasing age. Frailty can limit older people's ability to carry out their usual daily activities, which may impact on their personal oral hygiene routine and diet. The majority of adults aged over 75 years are limited in their daily activities and the proportion who experience limitations has increased through the 1991, 2001 and 2011 census surveys (132). Manual dexterity, including tooth-brushing abilities, may be compromised by a range of long-term conditions including arthritis, Parkinson's disease and dementia; this has implications for oral health and its degeneration, which may occur rapidly unless there is good support from carers.

Assisted daily care: assistance with daily oral hygiene practices becomes vitally important as adults become frailer. Effective daily care also involves ensuring a healthy diet, low in sugar. Older people in care homes will have the assistance of paid carers. Thus, education and training are required for care institutions and carers within institutions. Current evidence suggests that the latter may not perceive oral health as important. Most older people, however, live in the community. A major contribution to the stability of the aged population is likely to be due to the increase in **unpaid carers**; there were an additional 600,000 unpaid carers in 2011 compared to 2001 (133). Given that unpaid care is likely to be provided by a spouse or family member, the increased longevity of men could be one reason for the fall in the numbers of women entering care homes. They also become part of our carer workforce and require education and support in providing effective daily care.

Access to professional dental care. The need for dental care increases with increasing age; however, this may not translate into demand. Thus, it will be important to address barriers to care and ensure that oral health needs and demands are met. It is well known that as we age, our mobility is compromised. This will result in reduced ability to attend practices. Frail older adults may require domiciliary dental care in their own home or a care home. Planning and delivery of care will also take longer than for able bodied adults.

Patient management: it is anticipated that as patient management for this diverse group becomes increasingly complex, it is less likely to be provided by the private sector. Whilst it is possible to divide this group into young-elderly (65-74 years), elderly (75-84 years), and older elderly people (≥85 years), chronological and biological age do not necessarily correspond. Increasing complexity of patient management is thus a feature of care which will define this age-group, particularly as the proportion aged 85 years and over increases.

Co-morbidities: there is emerging evidence of an association between non-communicable disease and oral health, including diabetes (118), and cardiovascular disease (134), albeit research evidence is limited to date. These conditions share common risk factors and may benefit from holistic care management. Comorbidities and their management have deleterious implications for oral health and the delivery of self-care and professional care. Patients therefore will need support across health and social care to maintain health. This will require education, management and support of the wider NHS and social care teams.

Dementia is very common, affecting one person in six over the age of 80, and 850,000 people aged 65 years or over in 2017 (123). If current trends continue and no action is taken, the number of people with dementia in the UK is forecast to increase to 1,14 million by 2025

and over 2.1 million by 2051; an increase of 40% over the next 12 years and of 156% over the next 38 years (123, 135). The association between dementia and oral health requires consideration (136). This has implications for examination and treatment of adults who lack the capacity to consent, may not be able to cooperate with dental treatment, or are dependent upon others to arrange dental appointments and provide oral hygiene measures.

Polypharmacy: older people are increasingly dependent upon prescription drugs. The most common side-effect of the 200 most-prescribed medications is dry mouth (137), which is a risk factor for dental caries and toothwear. Older people require assistance in managing their dry mouth without recourse to sugar-based products such as sweets, to stimulate salivary flow.

Complexity of clinical care: in addition to the above, many older adults have heavily restored dentitions, including more complex dentistry (root fillings, crowns, bridges and implants), all of which present a challenge when further pathology is diagnosed. Failures associated with complex care generally present to the NHS. Research suggests that after 8.5 years in situ, an important proportion (±60%) of implants presented biological complications; furthermore, a positive correlation was showed between age, periodontitis, absence of teeth, rough surfaces and peri-implantitis (138). Consequently, patients require careful and regular maintenance.

10.6 FUTURE CARE

We need to ensure that older adults are facilitated to sustain oral health into older age to end well. It is important that they can enjoy simple pleasures such as eating, drinking and socialising and are not left to suffer pain and discomfort in their later years, particularly at times of physical and cognitive decline. Thus, the aim should be to maintain and support health and maintain comfort in life through personal and professional care, retaining a functional dentition, where possible. Patients therefore will need support across health and social care to maintain health. This will require education, management and support of health and social care teams.

a. **Supporting self-care:** Promotion of oral health and prevention of disease remain vitally important amongst older adults. **Effective self-care** is fundamental to the **maintenance of oral health.** For many this will involve identifying and managing risks of disease which may require behaviour change support. This involves all health and social care professionals as well as the dental team. For those older adults who are more vulnerable, assistance with daily oral hygiene becomes very important. And ensuring a low sugar diet. Education and training is required for care institutions and carers within institutions.
b. **Access to professional care:** Ensuring **access to professional dental** care will require innovative solutions, including bringing care to patients in their vulnerable years. Older adults are increasingly likely to be isolated, particularly those in rural settings. This may involve delivering more domiciliary care using mobile clinics and/or portable equipment. Care should be equitably distributed to as not to increase inequalities.

c. **Addressing inequalities** in oral health means that additional support and action will be required to promote health and facilitate access to dental care for vulnerable groups in an equitable manner.
d. **New models of care:** Older people have multiple health appointments and would benefit from a **one-stop clinic** approach to healthcare, where possible. Developing, testing and scaling up of these services will be important. The oral and dental workforce should be well connected to the wider health and social care workforce. Oral health care could be integrated into wider healthcare more effectively. This has the potential to reduce the burden on patients and carers and improve well-being. Even the provision of a dental examination to identify what care is required, would be helpful. Ideally routine primary dental care should be available in a 'one-stop clinic', alongside other services.
e. **Networks of care** should be developed involving a mix of options across the levels of care using the wider dental team and dentists, dentists with extended skills and specialists/consultants in MCNs. This is likely to require an increase in special care dentistry, closely supported by other specialties such as oral surgery, oral medicine, periodontology, prosthodontics and endodontics, along with access to cancer teams and other experts as required.
f. **Workforce readiness:** Ensuring an **oral and dental workforce** that is available and equipped to provide dental care for adults in older age is required, across all aspects of oral and dental care. They need to be able to manage the additional physical, medical, psychological and social factors which impact on patient management and the delivery of care.
g. **Workforce capacity:** Older adults will require a higher volume of dental care and greater range than ever before, delivered by an appropriately trained and resourced workforce, confident in managing complex patients and providing the full range of care. This will harness the skills of all dentists and, when appropriate, draw on specialised or specialist dentistry. Furthermore, dental care professionals will play a key role in maintaining oral health with evidence-based prevention.
h. Dentists may provide advanced and routine treatment for complex patients supported by a wider **collaborative dental team** including a mix of dental care professionals supporting patient care. Dental hygienists can provide periodontal treatment and preventive care. Dental therapists (or dental hygiene-therapists), may potentially provide restorative treatment. Dental nurses may provide oral health education and instruction for patients and carers. Additionally, for those who have lost some or all their teeth, clinical dental technicians may provide dentures.
i. **Long-term planning** of oral health care should consider what will be easily maintained in the vulnerable years of life; this should form part of discussions with patients and/or carers, ideally before people become frail.
j. **Dependency** results with increasing age, and thus the health workforce will require skills and expertise to work with carers, family, and a wider group of health and social care professionals to meet the patient's best interests. Active support for carers should be provided in sustaining older people's oral health through this phase of life.

11. Life-course considerations

11.1 OPTIMAL CARE

Optimal care through life involves starting well. The benefits to wider health of doing so should not be under-estimated, given common risk factors for non-communicable diseases and their wider social determinants (139, 140). Dental decay, which is normally the first oral disease to present, may be considered a risk marker for poor diet and thus non-communicable disease. Table 11.1 provides an overview of the care required at each stage of life based on contemporary guidance (5, 18, 101, 141, 142).

Table 11.1 Overview of life-course prevention

		Routine Self-care includes*	Professional preventive care includes**	Other support includes
Start well: 0-4 years	Attend at least once annually	*Parent to receive appropriate support including* Hygiene: brushing at least twice daily Fluoride: tooth paste Diet: low sugar Feeding: early weaning to cup	Dental team provide check-ups with risk assessment Regular F varnish applications	Midwives Health visitors GPs Child-minders Nursery staff
Keep well: 5-17 years	Attend at least once annually	Hygiene: brushing at least twice daily Fluoride: tooth paste Diet: low sugar Avoid tobacco/alcohol	Dental team provide check-ups with risk assessment Regular F varnish applications	GPs Teachers School nurses etc.
Maintain well: 18-64 years	Attend at least once bi-annually	Hygiene: brushing at least twice daily Fluoride: tooth paste Diet: low sugar Avoid/cease tobacco Drink within safe levels	Dental team provide check-ups with risk assessment	Support from wider health and social care system for individuals with disabilities, etc
Sustain to end well: ≥65 years	Attend at least once annually	Hygiene: brushing at least twice daily Fluoride: tooth paste Diet: low sugar Avoid/cease tobacco Drink within safe levels	Dental team provide check-ups with risk assessment	Care home staff Nursing staff GPs Family carers Palliative care staff

Source: Adapted from PHE et al (2017) Delivering Better Oral Health: an evidence-based toolkit for prevention. London: Public Health England.

Note * Individuals at risk of disease will require additional support and care and
** Individuals with established disease will require appropriate management

An overview of the future health workforce requirements across the life-course is outlined in Table 11.2 overleaf.

Table 11.2 Overview of future workforce requirements, by age, across the life-course

	Preschool 0-4 years	School children 5-17 years	Adults 18-64 years	Older people 65+ years
Who Personal	Parent/carer provides care	Parent/carer supports care Children themselves	Self-management mostly except for people with a disability who may need support	Self-management Carers/family supports or delivers management
Health care	Parents/carers and wider family MW, HV, GP, PN	HV, GP, PN	Additional support by family, nurses, etc for people with disabilities or medically compromised	Self-care, family/carers, nurses in palliative care, geriatric wards
Social care	Child minders, nursery nurses, teachers	Teachers in primary and secondary level education	Third level education Workplaces	Care workers in care homes Hospital staff
Dental care	DN(ES), DT, DH, DHT	DN(ES), DT, DH, DHT, OT	DN, DT, DH, DHT, CDT,	DN, DT, DH, DHT, CDTs
Specialised and Specialist dental care	Dentist, DES paediatrics Specialist: paediatrics *Supported by other specialised fields*	Dentist, DES paediatrics Specialist: paediatrics, orthodontics *Supported by other specialised fields*	Dentist, DES restorative Specialist: restorative/all mono-specialties, oral surgery, oral med, SCD, etc *Supported by other specialised disciplines*	Dentist, DES restorative Specialist: SCD, restorative/all monospecialties, oral surgery, oral med, etc. *Supported by other specialised disciplines*
What are key competencies for clinical dental care	Prevention/health promotion Evidence informed management of disease (mainly primary caries) Exodontia	Prevention/health promotion Evidence informed management of oral disease (mainly caries and craniofacial disorders), orthodontics, with some periodontics, exodontia.	Prevention/health promotion Evidence informed management of oral and dental diseases and conditions Extodontia and replacement	Prevention/health promotion Evidence informed management of oral and dental diseases and conditions Extodontia and replacement
	Professionalism, Leadership, Management, Communication, Diagnosis, Clinical, Prevention, Innovation, Teamworking Research, Education, Epidemiology			
Where	Hospital, GP surgery, nursery, shopping malls	Schools, GP practice, shopping malls	Universities, workplaces, GP surgery, etc.	Community groups, GP, Care homes, own homes, etc.
	Dental practice	Dental practice	Dental practice	Dental practice
When	Start dental attendance in first year of life	Regularly based on risk Emergency options required	Regularly based on risk Emergency options required	More regularly based on risk Emergency options required
	Review *at least* every 12 months based on risk and include 6-monthly fluoride varnish	Review *at least* every 12 months based on risk and include 6-monthly fluoride varnish	Review *at least* every 24 months based on risk	Review *at least* every 12 months based on risk
How	Promoting early dental attendance Parenting skills Using direct access, training more ES DNs and dentists Deliver preventive care in range of settings including non-traditional locations	Promote self-care Promote regular dental attendance Deliver preventive care in range of settings outside of dental practices, including non-traditional locations	Promoting self-care Promoting dental attendance – Clarity over what is NHS offer Dental team delivery MCNs for more specialised care CBT for anxious patients	Promoting self-care Promoting dental attendance – Clarity over what is NHS offer Dental team delivery MCNs for more specialised care CBT for anxious patients Mobile/domiciliary facilities
Why	**Start well**	**Keep well**	**Maintain well**	**Sustain well to end well**

Note: DES = dentists with Extended skills; DT = Dental Therapist; DH = Dental Hygienist; DNs = Dental Nurses; MW = Midwife; HV= Health Visitor; GP = General Practitioner; PN = Practice Nurse; CBT = Cognitive Behavioural Therapy; SCD = Special Care Dentistry

11.2 IN SUMMARY

Population oral health needs in England are diverse, and human resources for oral health will play a key role in supporting general health, as well as oral health and well-being. The workforce should involve all members of the oral and dental team, supported by wider health and social care professionals. This should therefore involve:

Shaping care to population need: whilst current models of care serve much of the population well, we need to continually plan for our expanding population with differing needs and persistent health inequalities which are intensified by challenges in relation to accessing care. It is increasingly important to address health inequalities and refresh paradigms of care, focusing on promoting health and ensuring greater levels of care delivery for vulnerable groups, particularly young children and older people.

Liberating the workforce to serve the population: legislative change across health and social care provides an opportunity to liberate the workforce to serve the population across and through the life-course using new innovative models of care within the oral and dental workforce. Furthermore, cross boundary working will be important to harness the wider health and social care workforce in promoting oral health as part of the agenda for making every contact count for health.

Moving from good to great: in summary, we are required to serve a growing population with diverse oral and dental needs from routine through to highly complex care. Across the breadth of our highly educated and trained oral and dental workforce, we would appear to have a good range of skills to deliver care and serve the population more effectively. Integration and connectedness across the workforce and across organisations will enhance our service of the population.

12 Overcoming the challenges

This section discusses the challenges anticipated by horizon scanning in preparation for the future and issues which require action (Figure 12.1). Addressing these challenges will enable us to build on many excellent developments, engage with the key features of workforce redesign nationally and internationally, and take the relevant opportunities presented by legislative reform.

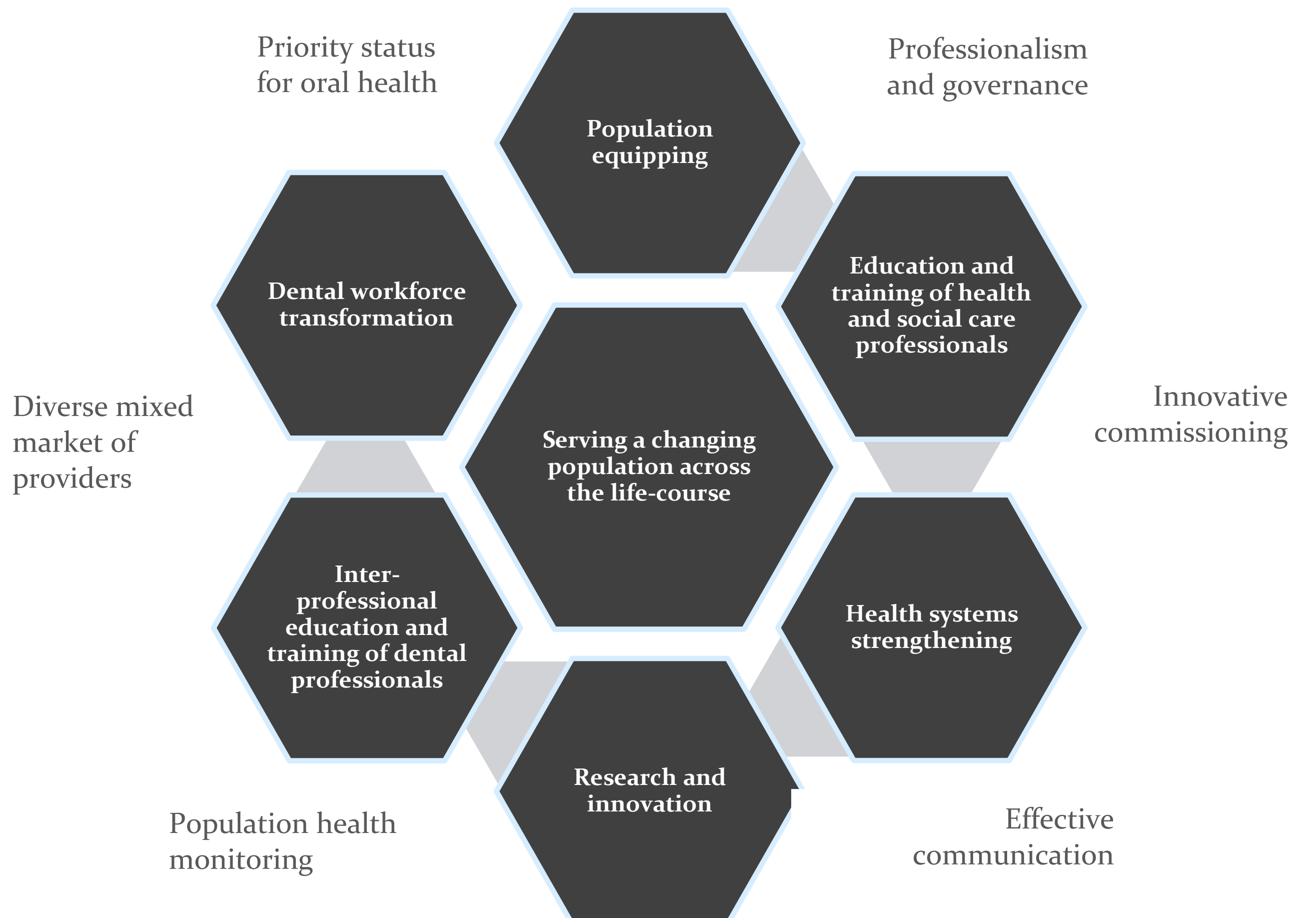


Figure 12.1 Key themes: to liberate the workforce in support of health across the life-course

12.1 SERVING A CHANGING POPULATION ACROSS THE LIFE-COURSE

Central to future workforce considerations is the recognition that we are serving a population that is both expanding and ageing, with diverse needs and expectations. Care should thus extend beyond merely one-off courses of dentistry, to consider long-term health across the life-course, including planning for the future. Furthermore, as research and technology are expanding the options for care, and healthcare models are evolving and diversifying, so we need to consider carefully what care should be provided, how, by whom, and where, along with what dental skills are required for the future. Given future complexities, individuals and services, however, need to retain a flexibility to ensure that we can effectively respond to change. There was a clear recognition that service and workforce design should, therefore, be ongoing to serve our changing population.

12.2 POPULATION EQUIPPING: PROMOTING SELF-CARE AND USE OF DENTAL CARE

Most patients nationally report being satisfied with their dental care. Effective self-care is important for oral and general health (4); and there is evidence from NHS contract reform pilots that patients welcome innovative evidence-based prevention as part of their dental visits (30).

We should increasingly work in a manner of mutual support to empower patients to take responsibility for their own oral health from the outset; and, in the case of children and vulnerable groups, their carers also.

The public increasingly need to be empowered to know what NHS dental care they are entitled to, where and when. This involves clarity over ‘the NHS offer’, when and how to access care in a timely manner, and what constitutes quality. Parents, in particular, should receive support for oral health, even before the birth of their child; evidence, however, suggests that information alone will not change behaviour and, without other action, may actually increase inequalities.

A greater understanding of how to navigate healthcare will also be required to facilitate patients, parents and carers, as models of care change. Additionally, greater awareness is needed of the roles and responsibilities of the dental team, and the potential for care to be delivered using a wider skill mix.

12.3 ORAL AND DENTAL WORKFORCE TRANSFORMATION

Across the UK we have transformed the oral and dental workforce over the past two decades. We need to liberate current and future dental professionals to deliver contemporary high quality oral and dental care in line with contemporary evidence and training.

This should enable dental professionals to take delight and pride in delivering excellent care and make every contact count for health. The workforce should be enabled to do so across a range of settings and not just be restricted to a dental surgery. Healthcare culture should enable a ‘can-do’ approach to workforce transformation to allow new roles to emerge,

particularly in providing care for vulnerable groups and across sectors of care. New ways of working are, thus, vital to enable oral health to be maintained and achieved in the context of general health and ensure that national oral and dental care is cutting-edge. Furthermore, we have the potential to support general health, and vice-versa, with integrated care.

Transformation is also required of the wider health and social care workforce to understand the importance of oral and dental disease and the importance of good self-care and management, and their consequent roles in the process. Integration of dental services across health and social care will be important in future, such as dental hygienists working in care homes to support personal care. New roles may possibly emerge as a result which will require appropriate regulation and systems strengthening as outlined below.

12.4 HEALTH SYSTEMS STRENGTHENING

Dentistry is largely based in primary care settings and delivered across multiple sites, which facilitates local access to care. There is a recognition within the NHS in general (4), and dentistry in particular, that we increasingly we need to manage systems or networks of care and not just organisations. This is clearly articulated in strategic dental specialty commissioning guidance (33), committed to developing care pathways which confirm that services need to be 'integrated around the need of patients'. Thus, NHS England, the commissioner of all NHS dental services, is taking steps to break down barriers in how care is provided between primary care and hospitals. This has implications for the range and volume of specialists and the training of dentists to specialist level or generalists with extended skills, and their ability to work with practitioners in primary dental care.

Networks of dental professionals should therefore provide care pathways for the delivery of primary, special-interest and specialist care across geographic areas. Models of care should be supported by NHS contracts that promote and encourage innovation and development. They should fully support the delivery of patient-centred, holistic, high-quality care. Advice on co-payments for patients need to be worked through with patient organisations so that it is clear who pays for what, when and how.

Future dental systems should consider models of care which extend outside the dental practice setting, involving skill mix team working and integrated care. Networking across organisations should occur for those requiring specialised care and for vulnerable groups, e.g. young children, frail older people, adults with disabilities, people with long-term conditions. These models of care may need to be tested in homes, care homes, and 'one-stop clinics' for vulnerable groups. Examples of good practice should be identified, shared and actively promoted. As we move towards a 7-day NHS service (88), this will become increasingly important.

Quality standards should be defined, agreed and practised; this involves 3-way discussions between the regulator, the profession and patients. However, systems should not be static – rather, they need to be able to integrate new developments and should include preventive care through to evidence-based procedures such as dental implants.

There are clear arguments that contemporary models of care should be co-produced with patients and professionals and tested for their sustainability and contribution to oral health

outcomes. Models of care will need to be supported by NHS contracts, commissioning guidance and processes.

12.5 INTERPROFESSIONAL EDUCATION AND TRAINING OF DENTAL PROFESSIONALS

Education and training of oral and dental professionals involved in the organisation and delivery of care should prepare the workforce for a changing world, with access to life-long, relevant, continuing professional development that is essential to keep up-to-date.

The current professionalised oral and dental workforce within the UK has much to offer the population. In future, interprofessional education and training, in the widest sense, will play a pivotal role in dentistry in support of both teamworking and networking.

'Important' skills-enhancement for the future includes flexibility, listening, clinical, prevention, leadership, change management, behaviour change, together with professionalism. Increasingly, skills in managing patients with multiple co-morbidities, including cognitive decline and dementia are required by all dental team members.

HEE and NHSE have a strong programme of foundation training, followed by opportunities for further professional development as Dental Core Trainees and Specialty Trainees. These new graduates and potentially future professional leaders should have early exposure in designing, delivering, and evaluating new models of care under the leadership of trainers, consultants and academics.

As many dental professionals now at least partially self-fund their education and training, by often taking a financial loan to gain their basic qualifications, future development of dentists with extended skills or specialists may be more difficult to finance. Furthermore, many current specialists did not go through traditional training pathways, so consideration should be given to maintaining appropriate levels of specialist skills in future.

Given the rapid expansion of knowledge and skills within oral and dental care, continuing professional development is increasingly important and topics should to be relevant to population needs to enable dental professionals to deliver contemporary evidence-informed care.

12.6 EDUCATION AND TRAINING OF HEALTH AND SOCIAL CARE PROFESSIONALS

In a wider sphere, education and training of health and social care personnel involved in the organisation and delivery of care should prepare professionals to deliver holistic care in an integrated manner. There should be a strong focus on promoting oral health and preventing oral disease, as well as understanding links between general and oral health and effective signposting to dental care services.

Educators will be required to deliver training and education of wider health and social care personnel. Whilst face-to-face education may be desirable, there may also be opportunities to use technology and e-learning to build capacity. Rather than multiple organisations duplicating efforts, consideration should be given to how this can be done once nationally, and updated regularly, ensuring that there is effective continuing professional development.

12.7 RESEARCH AND INNOVATION IN SUPPORT OF HEALTH AND HEALTHCARE

Ongoing high-quality research is required to underpin population and patient health. Research is required across all disciplines of dentistry and beyond, building a deeper understanding of health and disease, supporting the identification and management of disease, and risk of disease, more effectively. We need to ensure that oral health is integrated in longitudinal studies of health and ageing and build a better understanding of population and individual patient health, as well as the relationships between general and oral health. We require a robust evidence base for the delivery of innovative oral and dental care for patients across the life-course which is high quality, patient centred, safe and effective. This will include new approaches to care as we move towards a phase-down in the use of dental amalgam (143), and a wide range of new possibilities as we embrace innovation in this technological era.

The above necessitates a well-trained academic workforce to undertake oral and dental research from the laboratory bench to the population and to ensure that the findings are translated into practice in a timely manner. It is important that research is adequately funded to ensure it is high quality and, when published, has enough visibility to effect change.

12.8 IMPORTANCE OF ORAL HEALTH AND INTEGRATION WITH GENERAL HEALTH

Oral diseases are prevalent and impact on health and well-being; however, historically there is separation in relation to policies and practice. Oral health is an important priority and should be embedded in health and social care policy as well as health-related policy to ensure that the wider workforce is equipped to support oral health in a holistic manner. This will assist vulnerable groups in society and is particularly important as vulnerable groups tend to experience higher levels of oral health problems, co-morbidities and face challenges in gaining access to care.

We need a paradigm shift to reflect the importance of oral health in the delivery of holistic care and tackling non-communicable diseases which share common risk factors. Poor oral health in childhood may be a marker of poor general health. Additionally, patients with high levels of oral disease may also have other non-communicable diseases and benefit from integrated management of their health. Furthermore, dentists are increasingly able to monitor health and refer patients appropriately across the healthcare system.

12.9 WORKING WITH A DIVERSE MIXED MARKET OF DENTAL PROVIDERS

Oral and dental care is delivered by dental providers in a mixed market and a significantly changing healthcare economy. Most of dentistry is based in primary care and managed by an increasingly small number of providers. The growing role of corporate bodies and large 'groups of practices' mean that the market of primary care provision is changing. Whilst this means that commissioning can potentially become more streamlined, bigger organisations are potentially less flexible, in contrast to the need to work across organisations. This presents one of the greatest challenges to the workforce seeking to deliver new models of care, as effective future care delivery will require clinicians to work across organisations. Furthermore, it may provide a challenge to the retention of the workforce, particularly

recently qualified dentists who have no hope of establishing an NHS dental practice themselves. It is important that business and contract models support diversification, teamworking and innovation at practice and practitioner levels, and build clinical leadership, rather than maintaining traditional models of care. This will enable the development of dentists and dental care professionals with additional skills, e.g. dentists with extended skills in paediatric dentistry or special care dentistry within general dental practice.

Business models should develop to support quality care with a view to 'doing once' and 'doing it well' recognising that ensuring value for money does not always support the cheapest option. NHS contracts therefore need to have the flexibility to move beyond contemporary models of care .

The health workforce should therefore be trained and supported with the skills to work as health professionals within, and across, systems and organisations; whilst recognising the business of dentistry, they need to ensure support of patients is their main focus in delivering care professionally. The skills of DCPs can be harnessed effectively as part of the allied health professional network of the NHS.

12.10 MONITORING POPULATION ORAL HEALTH, SYSTEMS AND WORKFORCE

Monitoring population oral health in England through our national surveys has played an important role over the past decades in informing healthcare planning and delivery, including oral health promotion, and should continue to do so.

Health informatics is increasingly important as a resource to better understand patterns of health and care in society and links across services and systems, nationally and locally. The importance of linking oral and general health data becomes increasingly important, with researchers able to mine datasets for evidence on health and health outcomes.

Within health systems, evidence is required on who delivers what care in the dental team, why, and for whom, to better understand the appropriate use of workforce skill-mix. The national regulatory body should assist with ongoing data collection concerning the nature and contribution of the national workforce to service delivery and thus assist workforce intelligence with planning.

12.11 PROFESSIONALISM AND GOVERNANCE

Governance of dental professionals is increasingly important, particularly with the blurring of boundaries between dental professionals who share skills and expertise as well as the care of patients within teams and across organisations. Professionalism remains key to ensuring high quality care.

Opportunities to demonstrate professionalism through system redesign will underpin the trust placed by public, patients and government in the care structure. It should energise the workforce and support the retention of dental professionals who are enabled to use their skills and expertise in service of the population.

Professional regulation remains important to ensure public protection and enable the workforce to practise and control entry to, and exit from, lists. Regulation should not constrain innovation in care models; it will be important to understand the context in which individuals work as part of discussions relating to their professional development.

To underpin the trust of patients, registrants, colleagues, and the population there needs to be an upstream approach to performance management and appraisal to ensure that health professionals keep up-to-date on key subjects and revalidation is developed; an approach which has the support of the General Dental Council (144). This should enable the development of career long portfolios. Furthermore, NHS governance needs to be reviewed to facilitate new models of care within the NHS whereby dental hygienists, therapists and clinical dental technicians may see patients directly. To do so, of course, call for them to have an NHS 'performer number', that is clearance enabling them to see patients directly. Finally, as the number of dental NHS provider organisations reduces, organisational regulation could helpfully be aligned to reduce the burden on the health workforce.

12.12 INNOVATIVE COMMISSIONING

Innovative and integrated commissioning of services will be vital to facilitate systems' strengthening, develop new models of care and harness the workforce across organisations. This is required across primary to secondary and tertiary care, and also between health and social care. Commissioners of care will play an important role in facilitating change. To do so effectively then require knowledge of oral and dental care. Commissioners' induction should therefore help to build their knowledge base and the importance of working in partnership with providers, to develop, and test, new models of care.

12.13 EFFECTIVE COMMUNICATION

Traditional and social media play a key role in contemporary society. Thus, they have the potential to support paradigm shifts in population views and shape behaviours. Whilst 80-90% of people report being happy with their dental care, negative perceptions of the profession exist amongst the population. Such negative perceptions of the dental team should be challenged positively with examples of good practice.

Effective communication presents a challenge for dentistry as we move away from historical patterns of care and deliver a wide range of contemporary dental care, embrace skill mix in dental teams, integrate care across networks and use different patterns of recall based on risk, to serve the population.

The dental professions will need to develop, and promote, champions for oral health who have the skills to engage the wider population. This will involve working with a range of media to ensure that the public understand the importance of self-care in maintaining oral health and the benefits of dental attendance and have clear expectations of what dental services can and should deliver. Not only do they need to be aware that 'baby teeth do matter', when, and how they should attend a dentist, and the availability of preventive care, but receive clear advice on costs and responsibilities. Finally, effective communication, using contemporary health psychology will support behaviour change towards oral health.

12 Conclusions

12.1 The UK is a global leader in the **diversification** and **professionalisation** of our oral and dental workforce, ensuring that all dental professionals are registered with a single regulator, the General Dental Council. Our establishment of **integrated governance,** together with increasing emphasis on team working and skills extension, provides a strong platform to meet future oral and dental needs in England.

12.2 **Shaping care to population need** is important across the **life-course**. Oral diseases remain prevalent, and inequalities marked in our expanding, ageing population. Whilst much oral and dental disease can be prevented by action at individual, community and societal levels, supported by an appropriately educated and trained workforce; a significant body of disease and its sequelae will always still need to be managed and treated effectively. The focus should be on **Starting well** from birth; **Keeping well** through school years **Maintaining well** through adult life, and **Sustaining well** into older age to end well.

12.3 Pivotal to maintaining and improving oral health, the general population and patients should be supported in **effective daily self-care**, ensuring **access to professional care** in a timely manner.

12.4 As the oral health workforce extends beyond dentistry, **health and social care professionals** also have responsibilities for oral health. Health and social care policies should therefore reflect the importance of holistic care. And the workforce should therefore be supported by education and training.

12.5 **New models of care** are required. High quality preventively oriented dental care should be delivered by **dental teams** in a professional manner and involve **managed clinical networks of care** across organisations and systems, underpinned by effective leadership and professionalism locally and nationally.

12.6 Our **health systems** should enable the workforce to use their basic and extended skills, deliver evidence-informed high-quality care, in a professional manner, supported by appropriate funding models. **Systems strengthen**ing is also required across health and into social care; this should provide dental team members with the opportunity to integrate with wider health and social care teams to provide care for vulnerable groups, throughout life, in a range of settings. The opportunity provided by forthcoming NHS contract reform is timely in facilitating new funding models.

12.7 **Education and training** play a significant role in preparing the oral and dental workforce to fulfil their roles whilst keeping up-to-date. **Interprofessional education** should be embraced by educators to underpin innovative approaches to service delivery and support care across the life-course. This will enhance key elements of leadership, management, professionalism, communication, and high-quality clinical care.

12.8 High-quality **research and innovation** are fundamental to underpin the delivery of oral and dental care for patients, health service delivery and organisation, and

promotion of oral health. Oral and dental research should therefore be considered a priority for funding agencies as research findings influence and inform change, including workforce reform.

12.9 Robust data are required to inform change. Population oral health should be **surveyed** regularly, health service activity **monitored,** dental workforce capacity and capability **reviewed,** and **modelled**, to support future workforce commissioning and education.

12.10 Looking forwards, we need to **liberate the workforce** to facilitate the necessary developments and continue to shape it over time to serve population needs. This requires courage, creativity and collaboration to move our workforce from good to great.

13 Recommendations for action:

To best serve our expanding and ageing population with diverse oral health needs, across the life-course, we require careful planning, education and service development, underpinned by research to support our workforce. The findings of this review have implications for a range of organisations including government, regulators, NHS England, Public Health England, Social care, education and training commissioners and providers, dental providers (NHS and private, primary, secondary and tertiary), patients and the public

Planning and monitoring

13.22 **Monitoring** of population oral health needs is required across the life-course, both cross-sectional and longitudinal, to inform decision making about future workforce needs and models of care.

13.23 **Robust data** should be collected routinely to ensure effective monitoring of oral and dental care, health outcomes and the dental workforce capacity. This should occur nationally, and locally, across all sectors of care.

13.24 HEE, NHSE and PHE collaboration will be required to **model the workforce in relation to population demography and need** on a regular basis. This will involve exploring future scenarios of care, using operational research techniques, to inform discussion and decision making at national and local level. Ideally, this should involve horizon scanning of the forces for change, be reviewed regularly and updated at least every five years.

13.25 Workforce distribution is required to be **equitable** and ensure that inequalities in oral health are addressed, not further compounded by lack of workforce capacity. Modelling of capacity and capability will be required through contemporary organisations from Sustainability and Transformation Partnerships [STPs] at local level, particularly for primary oral and dental care, through to Managed Clinical Networks [MCNs] and local professional networks [LPNs] for more specialised care.

Education

13.26 The Office of Students (formerly HEFCE) and HEE should work with educational and training providers to ensure that there is **sufficient capacity and capability of members of the dental team** being trained, informed by trends in population oral and dental needs.

13.27 HEE **commissioners of education and training** of the health workforce will need to **work with partners in a market-led system** to support future needs such as:

- Increase in DCP student numbers, ensuring their training is integrated with dental students in preparation for effective team working and meeting the needs of all sections of the population.
- Alignment of DCP training programmes where practicable to wider NHSE and government targets related to workforce development, such as apprenticeships.
- Dental professionals (from dentists to dental nurses) should be enabled to expand their scope of practice during their careers and gain extended skills in line with population and patient health needs and demands for care.
- Current and future patterns of need should inform specialist training numbers. Clinical academic requirements should ensure that there is an effective academic base to deliver research and education.
- Workforce education and training to deliver training that focuses on supporting population and patient needs across the life-course.
- Induction of all dental providers to the health system which includes HEE workforce principles and the importance of developing opportunities for change and new models of care across the health and social care system.
- Leadership training and development for oral health professionals in primary, secondary, tertiary care and academia.

13.28 Universities supported by the Office for Students and HEE should ensure **sufficient educators** who can support the development of future health professionals, in an integrated manner, and in line with guidance.

13.29 HEE, NHSE and PHE to support **education and learning for health and social care professionals** to maximise efficiency and ensure that staff are appropriately educated and trained to promote oral health and facilitate access to oral healthcare. Opportunities presented through advancing educational and related **technology**, to include e-learning should, thus, be used to ensure that all health and social care professionals are aware of the importance of preventive care, behaviour change approaches, links between general and oral health, the importance of early dental attendance, and key public health messages tackling common risk factors and the benefits of optimal fluoride use.

13.30 PHE and educational establishments should educate all healthcare professionals to **make every contact count for oral health** – ensuring regular updating of the

scientific evidence on preventing oral disease, supported by effective dissemination across health and social care.

13.31 HEE, universities, education commissioners, care providers and Royal Colleges should play an important role in supporting workforce development and transformation to ensure **extended skills development** (dentists and DCPs) is available, together with **specialist training**.

13.32 The principle of **Leadership for change** is important across dentistry and should be actively developed and resourced, across all branches of the workforce and sectors of healthcare, together with professional and academic organisations.

Service at population and individual levels

13.33 National organisations, professional associations and dental champions are required to actively **work with traditional and social media** to promote oral health and evidence-based self-care including timely access to professional care.

13.34 **NHS contract reform** is required to play a key role in support of workforce utilisation for oral health across the life-course including the following:

- Developing payment systems which support new models of care for oral health
- Developing business models that facilitate use of the wider dental team skill mix and enable different models of care
- Ensuring NHS *performer* status for dental hygienists, dental therapists and clinical dental technicians to enable them to see patients directly within he NHS
- Improving morale amongst clinical staff, particularly those providing the majority of NHS dental care
- Facilitating pathways of care across services and organisational boundaries
- Supporting innovation to enable the delivery of oral and dental care outside traditional dental practice settings
- Ensuring evidence-based prevention of oral disease across the life-course.

13.35 **NHS and social care systems strengthening** should ensure that oral health is included in the assessment and daily care of vulnerable groups, along with access to regular professional oral and dental care.

13.36 Dental schools and other educational establishments for dental professionals should collaborate on **interprofessional education and training** supported by the GDC *Preparing for Practice* outcomes guidance across the four domains: clinical, communication, professionalism, leadership and management.

13.37 The NHSE '**dental care offer**' to the public should be made explicit, together with the importance of timely dental access to care.

13.38 Effective **governance** mechanisms for the health workforce should remain integrated across the dental team. It should also support extended skills development amongst dental professionals and be robust enough to facilitate innovation.

13.39 Delivery of **high-quality evidence-informed care** by all providers should emphasise clinical prevention, and high quality care doing things 'once and well', even if more expensive in the short-term, as representing an investment for future health.

13.40 **Innovations in addressing inequity** in health should be the responsibility of everyone from national to local level. Local organisations such as Local Professional Networks [LPNs], Sustainability and Transformation Partnerships [STPs] and Accountable Care Systems [ACSs] working with Dental Public Health leaders have an important role to play in highlighting inequity and facilitating change, as do providers and individual professionals.

Research and Innovation

13.41 Universities supported by research funding agencies to be facilitated to deliver **cutting edge research** to promote health, manage disease and disability, and ensure good health outcomes from care. A deeper understanding of the links between general and oral health is required, together with systems of effective and cost-effective care.

13.42 **Research and innovation** are pivotal to support the workforce to deliver high quality oral and dental care, facilitate effective patient management, shape new models of care, system redesign and facilitate equitable access to health and care for the nation.

References

1. Health Education England. Advancing Dental Care: Education and Training Review. London: Health Education England; 2018.

2. NHS England. NHS Long Term Plan. London: NHS England; 2019.

3. Health Education England. About Health Education England: HEE; 2015 [Available from: http://hee.nhs.uk/about/.

4. NHS England. The NHS Five Year Forward View: High quality care for all, now and for future generations. London: NHS England; 2014.

5. Public Health England, Department of Health, NHS England, British Association for the Study of Community Dentistry. Delivering better oral health: An evidence-based toolkit for prevention. London: Public Health England; 2017.

6. Public Health England. Local authorities improving oral health: commissioning better oral health for children and young people. London: Public Health England; 2014.

7. HEE. Health Education England Strategic Framework, 2014 -2029 (updated 2017). London: HEE; 2015.

8. World Health Organization. Global strategy on human resources for health: Workforce 2030 Geneva: WHO; 2016 [Available from: http://www.who.int/hrh/resources/pub_globstrathrh-2030/en/.

9. World Health Organization. Universal Health Coverage Geneva: WHO; 2018 [Available from: http://www.who.int/universal_health_coverage/en/.

10. United Nations. Sustainable development goals 2030 2015 [Available from: http://www.un.org/sustainabledevelopment/sustainable-development-goals/.

11. Global Health Workforce Alliance. Health Workforce 2030 Geneva: WHO; 2014 [Available from: http://www.who.int/workforcealliance/knowledge/resources/strategy_brochure9-20-14.pdf?ua=1.

12. General Dental Council. WHo we regulate London: GDC; 2015 [31.08.2015]. Available from: http://www.gdc-uk.org/Aboutus/Whoweregulate/Pages/default.aspx.

13. General Dental Council. The registration of Dental care professionals. London: General Dental Council; 2005 7th December 2005.

14. General Dental Council. Standards for the Dental Team. London: General Dental Council; 2013.

15. General Dental Council. Scope of Practice. Annual Report. London: General Dental Council; 2013.

16. General Dental Council. Preparing for practice: Dental team learning outcomes for registration. London: GDC; 2015.

17. General Dental Council. Direct Access London: General Dental Council; 2013 [Available from: http://www.gdc-uk.org/Newsandpublications/factsandfigures/Documents/Direct%20Access%20guidance%20UD%20May%202014.pdf.

18. NICE. Dental recall guidelines. National Institute for Health and Clinical Excellence; 2004. Report No.: CG019.

19. Department of Health. Report of the Primary Care Dental Workforce Review. London: Department of Health; 2004.

20. Centre for Workforce Intelligence. A Strategic Review of the Future Healthcare Workforce: informing medical and dental student intakes. London: CfWI; 2012.

21. Centre for Workforce Intelligence. A Strategic Review of the Future Dentistry Workforce: informing dental student intakes. London: CfWI; 2013.

22. Centre for Workforce Intelligence. Securing the future workforce supply: dental care professionals stocktake. London: CfWI; 2014.

23. Patel R, Eaton KA, Garcia A, Rincon V, Brooks J. An investigation into the numbers of dentists from 19 European Economic Area (EEA) member states currently registered to work in the United Kingdom and key differences between the practise of dentistry in the UK and their member states of origin. Br Dent J. 2011;211(3):133-7.

24. General Dental Council. UK GDC Registrants, May 2017. In: GDC, editor. London: GDC; 2017.

25. Al-Haboubi M, Eliyas S, Briggs PFA, Jones E, Rayan RR, Gallagher JE. Dentists with extended skills: the challenge of innovation. British Dental Journal. 2014;217(3):E6-E.

26. Ghotane SG, Al-Haboubi M, Kendall N, Robertson C, Gallagher JE. Dentists with enhanced skills (Special Interest) in Endodontics: gatekeepers views in London. BMC Oral Health. 2015;15(1):1-12.

27. Al-Haboubi M, Newton P, Gallagher JE. Meeting Patient and Professional Needs: Views of Stakeholders on a Training Initiative for DwSIs in Endodontics in London. Primary Dental Journal. 2016;5(2):54-65.

28. Gallagher JE, Calvert A, Niven V, Cabot L. Do high tuition fees make a difference? Characteristics of applicants to UK medical and dental schools before and after the introduction of high tuition fees in 2012. Br Dent J. 2017;222(3):181-90.

29. Steele J. Review of NHS Dental Services in England: an independent review. London: Department of Health; 2009.

30. Department of Health. NHS dental contract pilots – Learning after first two years of piloting. London: Department of Health England; 2014.

31. Department of Health. Dental Contract Reform: prototypes (overview document). London: Department of Health; 2015.

32. Healht and Social Care Act 2012, (2012).

33. NHS England. Guides for Commissioning Dental Specialities and their implementation London: NHS England; 2015 [Available from: https://www.england.nhs.uk/commissioning/primary-care-comm/dental/dental-specialities/.

34. NHS England. Introductory Guide for Commissioning Specialist Dentistry Services. London: NHS England; 2015.

35. NHS England. Guides for Commissioning Dental Specialities - Orthodontics. London: NHS England; 2015. Contract No.: 01.03.2017.

36. NHS England. Guides for Commissioning Dental Specialities - Oral Surgery and Oral Medicine. London: NHS England; 2015. Contract No.: 01.03.2017.

37. NHS England. Guides for Commissioning Dental Specialities - Special Care Dentistry. London: NHS England; 2015. Contract No.: 01.03.2017.

38. NHS Digital. NHS Dental Digital Statistics for England Dentistry 2015/16, annual report. 2016.

39. NHS, HEE. http://www.makingeverycontactcount.co.uk/ 2018 [

40. NHS Digital. Report examines UK dentists' morale and motivation. 2016.

41. Godson JH, Williams SA, Csikar JI, Bradley S, Rowbotham JS. Dental therapy in the United Kingdom: part 2. A survey of reported working practices. Br Dent J. 2009;207(9):417-23.

42. Harris R, Burnside G. The role of dental therapists working in four personal dental service pilots: type of patients seen, work undertaken and cost-effectiveness within the context of the dental practice. British Dental Journal. 2004;197(8):491-6.

43. Sun N, Harris RV. Models of practice organisation using dental therapists: English case studies. Br Dent J. 2011;211(3):E6-E.

44. Turner S, Ross M, Ibbetson R. Job satisfaction among dually qualified dental hygienist-therapists in UK primary care: a structural model. British dental journal. 2011;210(4):E5-E.

45. Monaghan NP, Morgan MZ. What proportion of dental care in care homes could be met by direct access to dental therapists or dental hygienists? Br Dent J. 2015;219(11):531-4.

46. Richards D. Hygiene-therapists could be used to screen for dental caries and periodontal disease. Evid Based Dent. 2015;16(4):116-7.

47. Wanyonyi KL, Radford DR, Harper PR, Gallagher JE. Alternative scenarios: harnessing mid-level providers and evidence-based practice in primary dental care in England through operational research. Hum Resour Health. 2015;13:78.

48. UK Government. Apprenticeships: UK Government; 2018 [Available from: https://www.gov.uk/topic/further-education-skills/apprenticeships.

49. Awojobi O, Movahedi S, Jones E, Gallagher JE. The evaluation of innovative dental nurse training pilot scheme. British dental journal. 2018;224(11):875-80.

50. Office for Students. Dental hygiene and dental therapy provision: January 2018: Office for Students; 2018 [updated 29th January 2019. Available from: https://www.officeforstudents.org.uk/media/1327/bd-2018-jan-61-dental-hygiene-and-dental-therapy-provision.pdf.

51. Health Education England. Health Education England Strategic Framework: Framework 15, 2014 - 2029: HEE; 2015 [Available from: http://hee.nhs.uk/.

52. Isaksen SG, Dorval KB, Treffinger DJ. Creative Approaches to Problem Solving: A Framework for Innovation and Change. 3rd ed. London: sage; 2011.

53. Garrett M. Health Futures Handbook. Geneva: World Health Organisation; 1999.

54. Robinson PB, Patrick A, Newton JT. Modelling the dental workforce supply in England. Sheffield: University of Sheffield; 2012.

55. General Dental Council. Dentistry Programmes and Qualificationns London: GDC; 2017 [11.12.2017]. Available from: https://www.gdc-uk.org/professionals/education/recent-inspections/inspections-dentistry.

56. Gallagher JE, Calvert A, Niven V, Cabot L. Do high tuition fees make a difference? Characteristics of applicants to UK medical and dental schools before and after the introduction of high tuition fees in 2012. British Dental Journal. 2017;222(3):181-90.

57. General Dental Council. Dentistry Programmes and Qualificationns: Dental Hygiene and Therapy London: GDC; 2017 [11.12.2017]. Available from: ttps://www.gdc-uk.org/professionals/education/recent-inspections/inspections-dental-therapy.

58. General Dental Council. Dentistry Programmes and Qualificationns: Dental Technology London: GDC; 2017 [11.12.2017]. Available from: https://www.gdc-uk.org/professionals/education/recent-inspections/inspections-dental-tech.

59. General Dental Council. Dentistry Programmes and Qualificationns: Clinical Dental Technology London: GDC; 2017 [11.12.2017]. Available from: https://www.gdc-uk.org/professionals/education/recent-inspections/inspections-clinical-dt.

60. General Dental Council. Dentistry Programmes and Qualificationns: Orthodontic Therapy London: GDC; 2017 [11.12.2017]. Available from: https://www.gdc-uk.org/professionals/education/recent-inspections/inspections-ot.

61. General Dental Council. Dentistry Programmes and Qualificationns: Dental Nursing London: GDC; 2017 [11.12.2017]. Available from: https://www.gdc-uk.org/professionals/education/recent-inspections/inspections-dental-nursing.

62. General Dental Council. General Dental Council Annual report and accounts, 2016. London: GDC; 2017.

63. Gallagher JE, Clarke,W., Eaton, K., Wilson, N.H.F.,. Dentistry – a professional contained career in healthcare: a qualitative study of Vocational Dental Practitioners' professional expectations. BMC Oral Health. 2007;7(16).

64. Gallagher JE, Clarke W, Eaton K, Wilson NHF. Vocational Dental Practitioners' views on healthcare systems: a qualitative study. IADR; New Orleans2007.

65. Gallagher JE, Patel R, Donaldson N, Wilson NHF. Why dentistry: a quantitative study of final year dental students' views on their professional career? BMC Oral Health [Internet]. 2007 05.08.07; 7(7). Available from: http://www.biomedcentral.com/1472-6831/7/7.

66. Wilson NHF CW, Eaton KA, Gallagher JE,. Vocational Dental Practitioners' choice of professional career: a qualitative study. IADR; New Orleans2007.

67. Gallagher JE, Clarke W, Wilson NHF. Why dentistry: a qualitative study of final year dental students' views on their professional career? European Journal of Dental Education. 2008;12:89-98.

68. Gallagher JE, Clarke W, Wilson NHF. The emerging dental workforce: short-term expectations of, and influences on dental students graduating from a London Dental School in 2005. Primary Dental Care. 2008;15(3):91-101.

69. NHS Digital. NHS Dental Statistics England 2015-16. London: NHS Digital; 2016 23rd September.

70. Council DS. Factors in expanding the clinical academic workforce London: DSC; 2017 [Available from: http://www.dentalschoolscouncil.ac.uk/news/factors-expanding-clinical-academic-workforce/.

71. Morison S, Jenkins J. Sustained effects of interprofessional shared learning on student attitudes to communication and team working depend on shared learning opportunities on clinical placement as well as in the classroom. Medical Teacher. 2007;29:450-6.

72. Lewin S, Reeves S. Enacting 'team' and 'teamwork': Using Goffman's theory of impression management to illuminate interprofessional practice on hospital wards. Social Science & Medicine. 2011;72(10):1595-602.

73. Colonio Salazar FB, Andiappan M, Radford DR, Gallagher JE. Attitudes of the first cohort of student groups trained together at the University of Portsmouth Dental Academy towards dental interprofessional education. European Journal of Dental Education. 2016:n/a-n/a.

74. Office for National Statistics. National Population Projections: 2014-based Statistical Bulletin. London: ONS; 2015.

75. United Nations. World Population Prospects: The 2017 Revision. New York: United Nations; 2017.

76. Federation FWD. FDI's definition of oral health 2016 [Available from: http://www.fdiworldental.org/oral-health/vision-2020/a-new-definition-of-oral-health.aspx.

77. Murray CJL, Richards MA, Newton JN, Fenton KA, Anderson HR, Atkinson C, et al. UK health performance: findings of the Global Burden of Disease Study 2010. The Lancet. 2013.

78. HSCIC. Child Dental Health Survey: England, Wales and Northern Ireland. London: The Health and Social Care Information Centre; 2015.

79. The Information Centre for Health and Social Care. Theme 11. Adult Dental Health Survey 2009 England Key Findings London: The Health and Social Care Information Centre; 2011 [Available from: http://www.ic.nhs.uk/statistics-and-data-collections/primary-care/dentistry/adult-dental-health-survey-2009--summary-report-and-thematic-series.

80. Challacombe S, Chidzonga M, Glick M, Hodgson T, Magalhaes M, Shiboski C, et al. Global oral health inequalities: oral infections-challenges and approaches. Advances in dental research. 2011;23(2):227-36.

81. Jin LJ, Armitage GC, Klinge B, Lang NP, Tonetti M, Williams RC. Global oral health inequalities: task group--periodontal disease. Advances in dental research. 2011;23(2):221-6.

82. Johnson NW, Warnakulasuriya S, Gupta PC, Dimba E, Chindia M, Otoh EC, et al. Global oral health inequalities in incidence and outcomes for oral cancer: causes and solutions. Advances in dental research. 2011;23(2):237-46.

83. Mossey PA, Shaw WC, Munger RG, Murray JC, Murthy J, Little J. Global oral health inequalities: challenges in the prevention and management of orofacial clefts and potential solutions. Advances in dental research. 2011;23(2):247-58.

84. Pitts N, Amaechi B, Niederman R, Acevedo AM, Vianna R, Ganss C, et al. Global oral health inequalities: dental caries task group--research agenda. Advances in dental research. 2011;23(2):211-20.

85. Sheiham A, Alexander D, Cohen L, Marinho V, Moyses S, Petersen PE, et al. Global oral health inequalities: task group--implementation and delivery of oral health strategies. Advances in dental research. 2011;23(2):259-67.

86. HSCIC. NHS Dental Statistics, 2015/16. London: HSCIC; 2016.

87. Robertson R. Public satisfaction with the NHS and social care in 2016. Results and trends from the British Social Attitudes survey. London: The King's Fund; 2017.

88. England N. Seven Day Services in the NHS: NHS England; 2017 [12.11.2017]. Available from: https://improvement.nhs.uk/resources/seven-day-services/.

89. World Health Organization. Ottawa Charter. Ottawa: World Health Organization; 1986.

90. Marmot M. Fair Society Health Lives: Strategic Review of Health Inequalities in England post-2010. London: UCL Institution of Health Equity; 2010.

91. Marmot M, Bell R. Social determinants and dental health. Advances in dental research. 2011;23(2):201-6.

92. Public Health England. Dental public health epidemiology programme: Oral health survey of three-year-old children, 2013. London: Public Health England; 2014 September. Contract No.: 2014302.

93. Aljafari AK, Gallagher JE, Hosey MT. Failure on all fronts: general dental practitioners' views on promoting oral health in high caries risk children--a qualitative study. BMC Oral Health. 2015;15:45.

94. HSCIC. Child Dental Health Survey: England. London: The Health and Social Care Information Centre; 2015.

95. Hariharan S, Hosey MT, Bernabe E. Comparing the profile of child patients attending dental general anaesthesia and conscious sedation services. British dental journal. 2017;222(9):683-7.

96. Albadri SS, Lee S, Lee GT, Llewelyn R, Blinkhorn AS, Mackie IC. The use of general anaesthesia for the extraction of children's teeth. Results from two UK dental hospitals. European archives of paediatric dentistry : official journal of the European Academy of Paediatric Dentistry. 2006;7(2):110-5.

97. Dental health: extractions data [Internet]. NWPH Observatory. 2017. Available from: http://www.nwph.net/dentalhealth/Extractions.aspx.

98. Marmot M. Fair society, healthy lives. The Marmot review. 2010.

99. Public Health England. Health matters: child dental health: Public Health England; 2017 [Available from: https://www.gov.uk/government/publications/health-matters-child-dental-health/health-matters-child-dental-health.

100. Public Health England, Department of Health, NHS England, British Association for the Study of Community Dentistry. Delivering better oral health: An evidence-based toolkit for prevention. London: Public Health England; 2014.

101. NICE. NICE. 2016. [cited 2017 12.09.2017]. Available from: https://www.nice.org.uk/news/blog/baby-teeth-do-matter.

102. Broadbent JM, Thomson WM, Poulton R. Trajectory Patterns of Dental Caries Experience in the Permanent Dentition to the Fourth Decade of Life. Journal of Dental Research. 2008;87(1):69-72.

103. Trust P. Disability in the UK 2014: facts and figures. 2014.

104. Trust P. Disability in the UK 2016: facts and figures. 2016.

105. Public Health England. Dental Health: Local Authority Profiles – dental health of five-year-old children 2012: Dental Health Observatory; 2014 [Available from: http://www.nwph.net/dentalhealth/5yearProfiles.aspx.

106. England PH. Extractions Data: Admissions to hospital for extraction of one or more decayed primary or permanent teeth among 0-19 year-olds, 2011-14 2015 [Available from: http://www.nwph.net/dentalhealth/extractions.aspx.

107. Aljafari A, Gallagher JE, Hosey MT. Can oral health education be delivered to high-caries-risk children and their parents using a computer game? - A randomised controlled trial. International Journal of Paediatric Dentistry. 2017;27(6):476-85.

108. Sciences AoM. Improving the health of the public by 2040: optimising the research environment for a healthier, fairer future. London: The Acadaemy of Medical Sciences; 2016.

109. Broadbent JM, Page LAF, Thomson WM, Poulton R. Permanent dentition caries through the first half of life. Br Dent J. 2013;215(7):E12-E.

110. HSCIC. Adult Dental Health Survey 2009 - Summary report and thematic series [NS] London: The Health and Social Care Information Centre; 2011 [Available from: http://www.hscic.gov.uk/pubs/dentalsurveyfullreport09.

111. Tataru D, Mak V, Simo R, Davies EA, Gallagher JE. Trends in the epidemiology of head and neck cancer in London. Clinical Otolaryngology. 2017;42(1):104-14.

112. Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. Oral Oncology. 2009;45(4-5):309-16.

113. Conway DI, McKinney PA, McMahon AD, Ahrens W, Schmeisser N, Benhamou S, et al. Socioeconomic factors associated with risk of upper aerodigestive tract cancer in Europe. European Journal of Cancer. 2010;46(3):588-98.

114. NHS England. NHS Dental Care: a call to action London: NHS England; 2013 [Available from: https://www.england.nhs.uk/ourwork/qual-clin-lead/calltoaction/dental-call-to-action/.

115. Daly B, Thompsell A, Sharpling J, Rooney YM, Hillman L, Wanyonyi KL, et al. Evidence summary: the relationship between oral health and dementia. British dental journal. 2018;223(11):846-53.

116. Manger D, Walshaw M, Fitzgerald R, Doughty J, Wanyonyi KL, White S, et al. Evidence summary: the relationship between oral health and pulmonary disease. British dental journal. 2017;222(7):527-33.

117. Dietrich T, Webb I, Stenhouse L, Pattni A, Ready D, Wanyonyi KL, et al. Evidence summary: the relationship between oral and cardiovascular disease. British dental journal. 2017;222(5):381-5.

118. D'Aiuto F, Gable D, Syed Z, Allen Y, Wanyonyi KL, White S, et al. Evidence summary: The relationship between oral diseases and diabetes. Br Dent J. 2017;222(12):944-8.

119. Choices N. NHS dental charges explained 2015 [Available from: http://www.nhs.uk/NHSEngland/AboutNHSservices/dentists/Pages/nhs-dental-charges.aspx.

120. BSA. BSA Dental Attendance Data, 2015/16 and 2016/17. 2017.

121. PHE, BASCD. What is Known About the Oral Health of Older People in England and Wales. London: Public Health England; 2015.

122. Age UK. Research analysis using Marmot, M. et al., English Longitudinal Study of Ageing: Waves 0-6, 1998-

2013. 21st Edition. . Colchester, Essex: UK: UCL; 2013. Contract No.: Data Archive [distributor], July 2014. SN: 5050.

123. Age UK. Later Life in the United Kingdom, August 2017. London: Age UK; 2017. Contract No.: Data Archive [distributor], July 2014. SN: 5050.

124. Prince M, Albanese E, Guerchet M, Prina M. World Alzheimer Report 2014. Dementia and Risk Reduction. AN ANALYSIS OF PROTECTIVE AND MODIFIABLE FACTORS. London: Alzheimer's Disease International.

125. Dentistry PHEBAftSoC. What is Known About the Oral Health of Older People in England and Wales. A review of oral health surveys of older people. London: PHE; 2015.

126. Belsi A, Gonzalez-Maffe J, Jones K, Wright D, Gallagher JE. Care home managers' views of dental services for older people living in nursing and residential homes in inner city London. Community Dent Health. 2013;30(2):77-82.

127. Daly B, Thompsell A, Sharpling J, Rooney YM, Hillman L, Wanyonyi KL, et al. Evidence summary: the relationship between oral health and dementia. Br Dent J. 2017.

128. Borreani E, Wright D, Scambler S, Gallagher JE. Minimising barriers to dental care in older people. BMC Oral Health. 2008;8(7).

129. Borreani E, Jones K, Scambler S, Gallagher JE. Informing the debate on oral healthcare for older people: a qualitative study of older people's views on oral health and oral healthcare. Gerodontology. 2010;7:1-8.

130. Wanyonyi KL, Radford DR, Gallagher JE. Dental treatment in a state-funded primary dental care facility: contextual and individual predictors of treatment need? PloS one. 2017;12(1):e0169004.

131. Kleinman E, Harper PR, Gallagher JE. Trends in NHS Primary Dental Care for Older People in England: implications for the future. Gerodontology. 2009;26(3):193-201.

132. National Audit Office. 2011 UK Census. London: NAO; 2014.

133. General RbtCaA. Improving Dementia Services in England – an Interim Report. 2011. Contract No.: HC 82 Session 2009–2010.

134. Dietrich T, Webb I, Stenhouse L, Pattni A, Ready D, Wanyonyi KL, et al. Evidence summary: the relationship between oral and cardiovascular disease. British Dental Journal. 2017;222(5):381-5.

135. Alzheimer's Society. Dementia UK Update. London: Alzheimer's Society; 2014.

136. Daly B, Thompsell A, Sharpling J, Rooney YM, Hillman L, Wanyonyi KL, et al. Evidence summary: the relationship between oral health and dementia. Bdj. 2017;223:846.

137. Gueiros LA, Soares MSM, Leao JC. Impact of ageing and drug consumption on oral health. Gerodontology. 2009;26(4):297-301.

138. Marrone A, Lasserre J, Bercy P, Brecx MC. Prevalence and risk factors for peri-implant disease in Belgian adults. Clinical Oral Implants Research. 2013;24(8):934-40.

139. Sheiham A, Watt RG. The Common Risk Factor Approach: a rational basis for promoting oral health. Community Dentistry and Oral Epidemiology. 2000;28(6):399-406.

140. Watt RG, Sheiham A. Integrating the common risk factor approach into a social determinants framework. Community Dentistry and Oral Epidemiology [Internet]. 2012 14.07.2012.

141. NICE. London: NICE. 2015. [cited 2017 12.09.2017]. Available from: https://www.nice.org.uk/guidance/ng30/chapter/Recommendations#oral-health-advice-given-by-dentists-and-dental-care-professionals.

142. NICE. London: NICE. 2014. [cited 2017 12.09.2017]. Available from: https://www.nice.org.uk/guidance/ph55/resources/oral-health-local-authorities-and-partners-pdf-1996420085701.

143. United Nations. Minimata Convention on Mercury: United Nations; 2018 [Available from: http://www.mercuryconvention.org/.

144. General Dental Council. Shifting the Balance. London: GDC; 2017.

Appendix 1 Membership of DWAG and Terms of Reference

Name	Organisation / Title
Professor Jenny Gallagher MBE	Chair (Kings College London)
Sara Hurley	Chief Dental Officer for England
Helen Falcon	COPDEND Chair
Nicholas Taylor	COPDEND Chair
Sandra White (represented by Mel Catleugh)	Public Health England
Michaela O'Neil	British Society of Dental Hygiene & Therapy
Nigel Hunt	Faculty of Dental Surgery, Royal College of Surgeons, England
Judith Husband	British Dental Association
Sahima Hussain	NHS Employers
Derek Sprague	Director of Education and Quality HEE (SW)with responsibility for Dentistry
Dan Gioe	Deputy Head of Workforce Planning Directorate of Strategy & Planning
Paru Patel	Workforce Planning, Dentistry, HEE
Andrew Matthewman	Senior Education and Training Policy Manager, HEE
Derek Sprague (SW)	LETB 'geography' representative
Alex Baxter	Postgraduate Dental Dean HEE (East of England)
Stephen Lambert-Humble	Postgraduate Dental Dean HEE (Kent, Surrey and Sussex)
Malcom Smith	Postgraduate Dental Dean HEE (NE England)
Karen Elly	Postgraduate Dental Dean HEE (West Midlands)
Mike Burgess	HEE (NW) HEE Workforce Planners Network
Jennifer Field	HEE Head of Finance Strategy
Michael Wheeler	CfWI Dental Workforce Advisor
Invited member	
Calum Youngson	Chair: Dental Schools Council

Terms of Reference of the Dental Workforce Advisory Group

The Group will be called the HEE Dental Workforce Advisory Group

1. Purpose

1.1 To advise the Director of Strategy and Planning on the multi-professional dental workforce in England to ensure that the HEE can support future supply and demand of a range of dental professions in line with national education and training policy. Specifically, the group will advise the Director on

- the commissioning of dental foundation (including dental core trainees) and specialty training posts
- approaches to commissioning of Dental Care Professionals

In order to align training commissioners with the changing oral health needs of the population and the requirements of NHS England commissioners.

Offer general advice in relation to Human Resources for Oral Health and their contribution to General Health and the implications for wider workforce education.

1.2 The group will

- Provide expert advice on the multi-professional dental workforce.
- Support and promote HEE in developing data and intelligence to support the planning process.
- Operate within the terms and constraints of the single HEE planning process. Specifically the group will make recommendations on education commissions to the Director of Strategy and Planning in October of each year.
- Convene short life Task & Finish Groups as, when, and where, necessary.

2. Membership

2.1 The group will be chaired by an independent Chair, agreed by HEE.

2.2 Members may be asked to lead particular areas or pieces of work relating to the multi-professional dental workforce.

2.3 The group may invite other external participants to attend meetings to assist in fulfilling its role and to offer expertise on particular issues.

3. Meetings and Secretariat

3.1 The secretariat will be provided by HEE

3.2 Analytical support will be provided by HEE and the Centre for Workforce Intelligence

3.3 A formal minute and action note will be taken at each meeting and circulated to the group for review and action.

3.4 Meetings will take place in London where possible and if required meetings will be linked with Leeds by video link.

3.5 Facilities for participation via teleconference will also be made available for members.

3.6 The decision to cancel a meeting will be at the Chair's discretion.

4. Review

4.1 Membership and Terms of Reference will be reviewed annually in the first quarter of each calendar year.

Appendix 2. Wider Advisory Network

Life-course Working group Members Workshop 1

Richard Balmer
Paul Batchelor
Karl Bishop
Vanita Brookes
Mel Catleugh
John Darby
Susan Ellis
Stephen Fayle
Jenny Godson
Donna Hough
Mick Horton
Liz Jones
Jane Luker
Selina Master
Heather Pope
Stephen Lambert-Humble
Michaela O'Neill
Geraldine Russell
Claire Robertson
Helen Rodd
Margaret Ross
Nicholas Taylor
Mike Wheeler
Sandra White

Additional Experts Workshop 2
Patient Representative
Jane Dalgano, Dental Nursing
Fiona Sandom, Dental Therapy
Simon Gray, Clinical Dental Technology

Facilitator
Lisa Hughes, HEE