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Original Article

Dental public health capacity worldwide: Results of a global survey

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Abstract The World Federation of Public Health Associations' Oral Health Working Group (WFPHA OHWG) carried out a survey to establish the extent of global dental public health (DPH) capacity. Senior stakeholders in DPH completed 124 surveys, covering 73 countries and all WHO regions. The survey evaluated DPH workforce within the country, funding, education, current services, and integration between public health and DPH in countries across the world. In 62 per cent of countries, DPH is only partially integrated in the public health system, while in 25 per cent of countries it has not yet been formally integrated. DPH programs at Masters level are available in 44 per cent of countries. Over half of countries have 0 to 10 trained DPH professionals. Because both poor oral and general health share several common risk factors, DPH must be integrated into national health systems and budgets, with an emphasis on having trained DPH specialists available in every country to collaborate in healthcare policy and provision.

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Introduction

With oral conditions afflicting more than 3.9 billion people worldwide,¹ the world needs a strategic preventative and public health approach to managing oral diseases. Dental public health (DPH) is the “science and practice of preventing oral diseases, promoting oral health, and improving the quality of life through the organized efforts of society.”² DPH, a core aspect of community dentistry, provides leadership and skills in population-based dentistry, oral health surveillance, policy development, community-based prevention, and health



promotion.³ For the purpose of this paper, DPH does not include the practice of clinical dentistry provided in public (government) health clinics. The DPH workforce we refer to are clinical and nonclinical specialists involved in the upstream management of poor oral health at the population level.

Although DPH specialists traditionally lead oral health programs using a population-based common risk factor approach,⁴ DPH has become increasingly separated from the rest of public health. With increasing attention to noncommunicable diseases and to the importance of diet and sugar intake,^{5,6} a more coherent, coordinated public health approach must embrace DPH.

Health service integration is the unification of different health care activities that share common health goals.⁷ Because oral health and general health are intrinsically linked, DPH cannot be overlooked within general health policy. The World Health Organization (WHO) describes risk factors common to most oral diseases and systemic chronic diseases. These include tobacco use, diet, alcohol, hygiene, and stress.⁸ DPH and public health specialists must work collaboratively to tackle common risk factors and integrate oral health within public health systems. Integrated care generates better health outcomes at lower costs.⁹

Dental caries has a global prevalence of 35 per cent and, particularly worryingly, affects 60–90 per cent of school-aged children.^{1,10} Caries afflicts not only low- and middle income countries^{11,12} but also high-income countries, for example the United States, the United Kingdom, France, and Germany.^{13–15}

Dental disease can severely affect the quality of life of both children and adults.^{16,17} Severe oral infections can result in facial swellings and abscesses. They are the most frequent reason for hospitalization of young children.^{15,18} Severely decayed teeth impact on children's general health, nutrition, growth, and development causing pain, loss of sleep, learning disorders, and missed days of school.^{19–21}

Dental pain disrupts national economies. Estimates suggest that up to 40 million hours of work are lost annually to dental problems, causing productivity losses of around \$1 billion dollars.^{22,23} Poor oral health is therefore a critical, on-going public health challenge that must be taken seriously by every country.

These consequences of dental disease could be avoided if every country implemented promotive and preventive oral health strategies

on a national scale. Such a task requires the skills and co-ordination of a DPH educated specialist with expertise in population-based prevention and services, for example, one trained in public health practice who understands health care planning and service provision (typically having undertaken a recognized Masters/residency program in either public health or DPH).²⁴ These DPH specialists can apply their knowledge to overcome barriers and must also be skilled at lobbying and advocating change at both policy and grassroots level.²⁵ This is not an easy task; each country faces difficulties not only due to shortages of DPH specialists, but also to competing public health priorities.

The extent and function of the DPH workforce worldwide has not been studied formally. While DPH is a recognized specialty in dentistry, many countries lack health advisors educated and experienced in responding to the oral health epidemic. DPH specialists usually have Masters degrees in public health or Dental Public Health in addition to dental degrees. Their formal education often includes practical health planning experience. Typically, DPH specialists work within health systems in an advisory and/or health planning capacity or in academia.

In dental schools, undergraduate education in DPH is often cursory. There is a greater focus on clinical skills. Dentists in advisory capacities do, therefore, need additional education in DPH, at least at Masters level. Furthermore, the limited number of dental schools in many countries constitutes an additional barrier to training in DPH expertise.

The World Federation of Public Health Associations (WFPHA) is an international, nongovernmental organization of national public health associations. Its mission is to promote and protect global public health.²⁶ In 2012, the WFPHA established an Oral Health Working Group (OHWG) in response to the need to raise the profile of oral health as an inseparable part of public health. Since then, the OHWG has, in a series of resolutions passed by the WFPHA General Assembly, advocated for better global oral health.

The OHWG, taking note of poor DPH capacity worldwide, designed and distributed a global survey. While data on DPH capacity are available for some high-income countries, information is partial or totally missing for many parts of the world.^{27,28} Until now, published data on the breadth and scope of the DPH workforce worldwide were incomplete. Our survey, although modest, is a landmark effort to study global DPH capacity.

Through our survey, we have tried to describe the global capacity and extent of the DPH workforce, existing national DPH



infrastructures, and their integration within national health systems in addition to DPH education resources worldwide. With the data generated from the survey, OHWG members wanted to create a solid base to advocate for better global oral health.

We present the key information obtained from the global survey and place it within the wider context of a pressing public health issue. The results in this article have been distilled from a larger database of survey responses. They form part of a Committee Report by the WFPHA OHWG on the global DPH situation. Selected survey results presented in the article are available in a visual format at <http://www.wfpha.org/oral-health-wg#global-survey>.

Methods

The WFPHA OHWG examined the global situation and collected data on DPH capacity worldwide. In 2013, the group designed a quantitative survey (see Online Appendix). It was initially piloted in selected countries. The survey, approved by the WFPHA Governing Council, was then published online (at < surveymonkey.com >). OHWG members created a global list of senior stakeholders in DPH. The list included *chief dental officers*, deans of dental faculties, and presidents of dental associations, covering all WHO regions and most countries worldwide. (A chief dental officer is a government official who heads the dental services for a country, giving advice on all matters relating to oral health.)²⁹

By email between July 2013 and July 2014, we invited up to 3 oral health stakeholders per country to complete the survey. If more than 1 stakeholder answered the survey for the same country, we selected the most senior stakeholder for our analysis as they were most likely to have access to workforce and planning data. We assumed that all respondents would possess the same information about the content of the educational programs covered in the survey because of their roles within the dental field in their respective countries.

The survey consisted of the following sections:

- National recognition of DPH (*recognition of DPH as a specialty of dentistry by the government, organized dental associations, or by other bodies such as dental councils or public health associations*),



- DPH workforce infrastructure (*incorporation of service provision, policies, and oral health professionals with education and experience in public health, working with or in Ministries of Health to develop oral health promotion, policies, and programs*),
- DPH integration (*within the national health system & government budget*), and
- DPH in dental school curricula (*in undergraduate and postgraduate curricula*).

We analyzed the quantitative data gathered by SurveyMonkey. First, we analyzed all responses together and then by WHO region or by income. (Regions: AFR: African region; AMR: region of the Americas; EMR: Eastern Mediterranean region; EUR: European region; SEAR: South-East Asia region, and WPR: Western Pacific region) (Gross National Income (GNI) per capita: LIC: low-income countries; LMIC: lower-middle income countries, UMIC: upper-middle income

Table 1: Summary overview of WHO region specifics

AFR	Specific DPH priority service: integration of oral health in general public health policy Up to 30 per cent of AFR countries with dental schools 14 per cent of AFR countries with Masters in DPH (vs global mean of 44 per cent)
AMR	Specific DPH priority service: community intervention Up to 30 per cent of AMR countries with dental schools
EMR	Specific DPH priority service: R&D 30 per cent of EMR countries with little DPH integration in the public health system
EUR	Specific DPH priority service: surveillance and evaluation 40 per cent of EUR countries with little DPH integration in the public health system
SEAR	86 per cent of SEAR countries with Masters in DPH (v. global mean of about 50 per cent)
WPR	40 per cent of WPR countries with little DPH integration in the public health system Up to 30 per cent of WPR countries with dental schools

Table 2: Summary of the subcategory specifics according to GNI

HIC	Up to 100 trained professionals working in academia in up to 30 per cent of HIC Specific DPH priority service: R&D 40 per cent of HIC with little DPH integration in the public health system 50 per cent of HIC with Masters in DPH 30 per cent integration of DPH into the curricula of medicine, nursing, and public health (vs global mean of about 50 per cent)
UMIC	Up to 100 trained professionals working in academia in up to 30 per cent of UMIC 50 per cent of UMIC with Masters in DPH
LMIC	50 per cent of LMIC with Masters in DPH
LIC	Specific DPH priority service: advocacy and policy development 27 per cent of LIC with Masters in DPH (vs global mean of about 50 per cent)



countries; HIC: high-income countries).³⁰ When appropriate, we highlight income, regional, or country data in the text. Summary overviews according to WHO regions and GNI are reported in Tables 1 and 2.

Here are the countries by region from which we received responses:

AFR	Montserrat	Sweden
Botswana	United States	Turkey
Ethiopia	Uruguay	United Kingdom
Gambia, The	EMR	SEAR
Ghana	Bahrain	Bangladesh
Kenya	Egypt	India
Malawi	Iran	Indonesia
Niger	Iraq	Nepal
Nigeria	Kuwait	Thailand
Senegal	Oman	Timor-Leste
Sierra Leone	Pakistan	WPR
South Africa	Qatar	American Samoa
Sudan	Saudi Arabia	Australia
Tanzania	EUR	Cambodia
Uganda	Albania	China
Zambia	Azerbaijan	Cook Islands
Zimbabwe	Bulgaria	Fiji
AMR	Denmark	Hong Kong
Barbados	Estonia	Japan
Belize	Finland	Malaysia
Brazil	Hungary	Mongolia
Canada	Portugal	New Zealand
Colombia	Romania	Solomon Islands
Cuba	Serbia and	South Korea
Haiti	Montenegro	Vanuatu
Jamaica	Slovenia	Vietnam
Mexico	Spain	

We calculated the percentages reported in each session using the number of answers (countries) for each specific question. The data collected do not aim to provide an exhaustive scientific analysis of the situation in all countries, but rather provide initial insights about the need to have increased numbers of DPH specialists worldwide to assist in the development of more organized health care systems that embrace oral health.

Results

We received 124 completed surveys from 73 countries and all WHO regions. Twenty-one percent of responses came from African and European regions, followed by 19 per cent from Western Pacific, 16 per cent the Americas, 14 per cent the Eastern Mediterranean, and 9 per cent from the South-East Asia region. Most of the respondents worked in academia (52 per cent) or for government/Ministries of Health (38 per cent), and had a degree in DPH (51 per cent), dental surgery (34 per cent), and/or public health (25 per cent).

National recognition of DPH

Governments, dental associations, and other bodies such as dental councils or public health associations recognize DPH as a dental specialty in 63, 70, and 47 per cent of countries, respectively. In at least 20 per cent of countries, DPH is recognized as a subspecialty of several DPH-related disciplines, such as community dentistry, dental medicine, and public health.

DPH workforce infrastructure

Over half of countries have fewer than 10 trained DPH professionals working in direct oral health care/service delivery, in academia, or in local, state, county, or national government, including federally qualified health centers/government-funded health centers (56, 62, and 65 per cent, respectively). Globally, countries with 11 to 50 trained DPH professionals amount to around 14 per cent. The percentage of countries with trained DPH professionals is around 14 per cent with 11 to 50 professionals and around 6 per cent for countries with 51 to 100 DPH professionals. Analysis by GNI revealed that the number of



trained professionals grows with an increase in income. Up to 30 per cent of UMIC and HIC had at least 100 DPH professionals in academia.

The top three DPH services provided are oral health promotion (81 per cent of countries), children's oral health (73 per cent) – including the provision of preventative and curative care programs for children – and education (teaching and training within academic settings – 64 per cent). In about 40 per cent of countries, DPH professionals are engaged in advocacy and policy development, community intervention, integration of oral health in general public health policy, research and development, and surveillance and evaluation. Developing guidelines and definitions for dental disease prevention and for dental practice are the next most common services (31 and 25 per cent of countries, respectively).

Our survey revealed that the top three services ranked very high regardless of regional or income analyses. AFR worked to integrate oral health into general public health policy. In AMR, there was a focus on community interventions, and in EMR the focus was on research and development. Surveillance and evaluation were targeted in EUR. LIC concentrated on advocacy and policy development. HIC attended to research and development.

In countries investing in advocacy and policy development for DPH, prevention of oral health diseases was the key policy domain in 71 per cent of countries. It ranked first in all WHO regions and income repartitions. Research for oral health, oral diseases in general, oral and public health integration, and the oral health workforce received attention in fewer countries (29 to 38 per cent).

Which populations received most attention? Children and youth (78 per cent), the whole community (47 per cent), and pregnant women (35 per cent). Slightly less attention was paid to rural, neglected, and the elderly populations (about one quarter of the countries).

DPH integration

In 62 per cent of countries, DPH is partially integrated into the public health system, while in 25 per cent of countries it has not yet been formally integrated. About 40 per cent of the responding countries from EUR and WPR and 30 per cent of EMR claimed to have little integration. HIC also reported little integration. In most countries



(82 per cent), 1–10 per cent of the national health budget is spent on DPH/oral health, and in 16 per cent of countries less than 1 per cent is allocated.

DPH teaching in dental curricula

Our survey found that 19 per cent of countries have no dental schools, while 44 per cent of countries have just 1–5 dental schools. The number of dental schools increases with country income. There are over 100 schools in some upper-middle income and high-income countries.

Up to 30 per cent of countries in the AFR, AMR, and WPR regions have no dental schools. Some countries within AMR, EMR, EUR, and SEAR have more schools. In particular, 150 schools exist in the Americas.

DPH programs at Masters level are available in 44 per cent of countries. Notably, only 14 per cent of countries within Africa offer DPH programs at Masters level, compared to SEAR where 86 per cent of countries provide these programs. Just 27 per cent of LIC offer Masters programs, while in the higher income groups, about half of the countries have schools offering such programs. Of all countries with DPH programs at the Masters level, 78 per cent offer 1 to 5 programs. In AFR, no country exceeds that number of programs. Among LIC, 18 per cent of countries offer 6 to 15 programs. Only India offers more than 31 programs.

We observed a partial integration of DPH into the curricula of medicine, nursing, and public health (51, 43, and 54 per cent of countries, respectively). HIC have less integration of DPH in these disciplines (around 30 per cent each).

Discussion

Our results suggest that DPH capacity must be increased worldwide to enable DPH to become an integrated part of general public health and of national and international health systems. Indeed, while DPH is recognized as a specialized area of dentistry in most countries, the practice of DPH has low priority. Most national public health systems have not integrated DPH.



Our study also highlights the increasing need for national health authorities and administrators to appreciate that oral health is an essential component of general health and quality of life. A lack of service integration can translate into poor oral health service provision and unmet oral health needs.⁹ Nevertheless, incorporating the direct and indirect impacts of poor oral health into medical care will be a challenge, particularly in LMIC, where general health care programs receive limited resources.

Notably, HIC appeared to have less integration of DPH in medicine, nursing, and public health curricula, most likely because HIC typically have more specialization and separation in areas of healthcare. Continuing unacceptable levels of dental disease globally (even within HIC) suggest that closer integration is required in all countries, regardless of income status. Moreover, we believe that compartmentalization of oral health may filter down to influence the attitudes of the general population.

We found Masters-level DPH programs available in fewer than half of the countries we analyzed. Dentists serving in advisory capacities likely require additional education in DPH (preferably at Masters level) because DPH in undergraduate education is often cursory, failing to instill a deeper grasp of health care planning and provision. Our results illustrate the lack of access to these programs for professionals in many LMIC, particularly within the African continent. To reduce the continuing reliance on external expertise, African countries need to develop appropriate internal DPH infrastructure.³¹ Nevertheless, simply lobbying for more DPH and MPH graduates will not necessarily improve poor oral health; graduates must be able to apply their knowledge practically and meaningfully within appropriate job positions, ideally working in an integrated health system.

While some countries have many dental schools, this does not necessarily translate into high-quality undergraduate and postgraduate DPH teaching. Conversely, low numbers of dental schools in countries across the world do not necessarily reflect poor DPH education overall, as some countries may simply be small in size. Our GNI analyses found more trained DPH professionals in higher income countries. This is not a surprising survey outcome; the disparity in highly trained health personnel between higher and lower income countries has been well documented.³² Moreover, some small countries have a high GNI and a small population, thus do not necessarily need a large DPH workforce.

Nevertheless, a lack of resources dedicated to dental education may reflect inappropriate oral health priorities within a country.

Last but not least, fewer than half of the countries saw a focus on advocacy and policy development as an effective means to improve DPH. Since its foundation, the OHWG has worked on policy guidance in the form of resolutions that may positively impact oral health of populations in diverse settings.²⁶

Based on the survey, in 2015, the OHWG developed a resolution on Dental Public Health Workforce Infrastructure, for the 14th World Congress of Public Health. The resolution highlighted the pressing need for adequate global DPH capacity and recommended that all countries develop a DPH infrastructure, consisting of oral health professionals with education and experience in public health, working with or within Ministries of Health to develop oral health promotion, policies, and programs. Passed by the World Congress, it also recommended DPH teaching in all dental school curricula.³³

As the WFPHA resolution asserts, governments must recruit trained DPH professionals to ensure efficient health management and resource allocation.³⁴ Many countries' health programs are led by clinicians who have little or no public health education.³⁵ Integration of oral health into general health services must occur rapidly. Within a few decades, 80 per cent of the world's aging population will reside in LMIC where there is limited access to healthcare, let alone to oral healthcare.³⁶ In these countries, integration of public health with oral health is even more vital because in some regions dental professionals are scarce and they cannot singlehandedly promote oral health. Community-based initiatives with an integrated focus will therefore become essential in promoting healthy lifestyles.

Based on the results of our study, we, the authors, make the following recommendations:

- (1) Governments must prioritize the integration of oral health into public health systems. This will enable better oral health awareness and sufficient service provision.
- (2) Governments should appoint a trained DPH specialist in every country to advise on national oral health policy. This will enable focussed and strategic leadership, advocacy, and health policy that leads to better oral health outcomes.



- (3) Governments and educational institutions must offer a greater number of DPH scholarships in the form of grants at the Masters level. Developing countries will be able to train DPH specialists, eliminating disparities between lower and higher income countries.
- (4) Global institutions must develop support networks for DPH, allowing specialists to collaborate, innovate, and assist each other in the shared global challenge to improve oral health. This will foster shared resources between regions and ultimately stronger programs for better oral health worldwide.

Our study has limitations: first, the survey respondents were self-reporting answers about their country's dental public health capacity. In some countries, the comprehension around dental public health as a specialty of dentistry may not have been as full as in other higher income countries, where the discipline has already been integrated into national health systems. Second, we had a good sample of countries, but as this survey is the first study of its kind, it should be considered a pilot and be expanded in the future.

Conclusion

Poor oral health is a critical public health issue that is relevant to every country. As both poor oral and general health share several common risk factors, the two should not be separated within general health agendas. DPH integration into national health systems and budgets is a priority. Trained DPH specialists should be available in every country to collaborate in healthcare planning.

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