ORIGINAL ARTICLE

International Dental Journal 2014; 64 (Suppl. 2): 1–11

doi: 10.1111/idj.12126

Rationale for the prevention of oral diseases in primary health care: an international collaborative study in oral health education

Denis M. Bourgeois[1], Prathip Phantumvanit[2], Juan Carlos Llodra[1], Virginie Horn[3], Monica Carlile[4] and Jean-Luc Eiselé[3]

[1]*Faculty of Dentistry, Laboratory Health- Individual – Society (SIS, E.A. 4129), Université Claude Bernard Lyon 1, Lyon, France;* [2]*Thammasat University, Bangkok, Thailand;* [3]*FDI World Dental Federation, Geneva, Switzerland;* [4]*Unilever Oral Care, London, UK.*

Ensuring that members of society are healthy and reaching their full potential requires the prevention of oral diseases through the promotion of oral health and well-being. The present article identifies the best policy conditions of effective public health and primary care integration and the actors who promote and sustain these efforts. In this review, arguments and recommendations are provided to introduce an oral health collaborative promotion programme called Live.Learn.Laugh. phase 2, arising from an unique partnership between FDI World Dental Federation, the global company Unilever plc and an international network of National Dental Associations, health-care centres, schools and educators populations.

Key words: *Oral health, health policies, health promotion, primary health care, international programme, public–private partnership*

BACKGROUND

International development and cooperation on health

The Millennium Development Goals (MDG) represent an unprecedented global consensus about measures to reduce poverty. The eight goals address targets to: increase income; reduce hunger; achieve universal primary education; eliminate gender inequality; reduce maternal and child mortality; reverse the spread of human immunodeficiency virus (HIV)/acquired immune-deficiency syndrome (AIDS), tuberculosis, and malaria; reverse the loss of natural resources and biodiversity; and improve access to water, sanitation and good housing[1]. However, the burden of non-communicable diseases (NCDs) is increasing in low-income and middle-income countries, contributing to poverty and becoming a major barrier in the development of strategies to achieve the MDGs[2]. Effective actions proposed to reduce NCD inequalities include: equitable early-childhood development programmes and education; removal of barriers to secure employment in disadvantaged groups; comprehensive strategies for tobacco and alcohol control and for dietary salt reduction that target low socio-economic status groups; universal, financially and physically accessible, high-quality primary care for delivery of preventive interventions and for early detection and treatment of NCDs; and universal insurance and other mechanisms to remove financial barriers to health care[3]. Strengthening health systems is now considered as key to achieving the MDGs[4]. It is also a key challenge to improve the delivery of cost-effective interventions in primary health care and thus achieve the vision of the Alma-Ata Declaration[5].

The recently formed NCD Alliance is a positive initiative for cooperation among international non-governmental organisations (NGO), of all relevant sectors and stakeholders, to achieve common goals for NCDs[6]. Alliance for action is recommended to strengthen the performance of all existing actors while expanding space and energy for fresh actors[7]. The main objective is to generate and apply high-quality knowledge to promote, restore and/or maintain the health of populations[8] and to develop innovative technologies and approaches[9]. If effective interventions exist for

many priority health problems in low-income countries, part of the challenge is to get existing and emerging knowledge about more (and less) effective strategies into practice[1].

Rationale for oral diseases in primary health care

Primary health care is defined as being 'essential health care' based on scientifically proven interventions. The broader approach for primary health care is seen as encompassing equitable distribution, community participation, an emphasis on prevention, the use of appropriate technology and the involvement of a diverse range of health and other departments[10]. The World Health Organisation (WHO) encourages research to develop efficient methods to strengthen primary health care and connect this action to the overall improvement of the health system. Importantly, WHO, under Margaret Chan's effective leadership and together with her regional directors, has reaffirmed its commitment to primary health care[11]. Despite their popularity, limited evidence is available to support community-wide interventions based on primary health care for the primary prevention of NCDs through multiple risk factor intervention. To meet the challenge of chronic diseases, primary health care will have to be strengthened substantially. More evidence is needed about the cost-effectiveness of prevention and treatment strategies. Processes and outcomes should be financially and logistically feasible[12]. Implementation of the immediate priority treatment interventions needs a functioning health-care system and a stepwise approach[13].

The health sector might be expected to be a finely tuned enterprise, utilising its corporate knowledge in a constant process of critically reviewing and improving its activities and processes. But in recent years, new means of capturing, managing and exchanging data have created new opportunities beyond current approaches, whilst ever-increasing pressures on health systems have produced strengthened incentives to consider them[14].

FDI World Dental Federation – The Live.Learn.Laugh. phase 2 programme

FDI World Dental Federation's commitment to 'leading the world to optimal oral health' is all the more relevant today, particularly in emerging countries[15]. FDI's policy objectives are based on various actions: encouraging access to health care; improving overall health; and reducing inequalities by encouraging use of health care and addressing common risk factors. The implementation of a new paradigm for caries management is necessary for the profession to respond effectively to changing population health needs. Thus, the FDI Global Caries Initiative – a 10-year programme – aims to develop and encourage implementation of a new paradigm for caries management, one that would contribute to a common vision of health[16]. There are a number of challenges associated with oral health. It is faced with constraints and lacks long-term funding and the appropriate structures and management to take steps to strengthen capacities for optimising its activities[17].

The development of these systems to improve dental health and innovation is often hindered by shortcomings relating to management, regulations, funding or capacities. The unpredictable nature of research funding is a problem that affects most low- and middle-income countries, which have little money, an underdeveloped infrastructure and few health-care workers[18]. International project management and the summarising, validation and management of information also leave much to be desired. Public health actions have shown that individual, professional and community measures are effective in the prevention of most oral diseases[19]. Local and international organisations, donors and financial backers usually collect a vast amount of information; however, much of this is lost or little known, either because it is never published or because it is released in informal publications that are difficult to access. Finally, it should be stressed that the level of involvement from oral health development partners is generally low.

The Live.Learn.Laugh. (LLL) phase 2 programme was launched in 2010 through a public–private partnership between FDI and Unilever, with a single, focused goal of measurably improving oral health by encouraging twice-daily brushing with fluoride toothpaste. Its objectives and organisation are similar to those of a pilot programme, providing quality innovative information concerning health-promotion models. It includes a multi-sector, international and long-term partnership programme over three years and is a development model, which can resolve the highlighted problems. It aims to facilitate decision making based on factual information. It is also part of a process of setting up an original central structure and a decentralised, unified and efficient organisation. Scientifically supervised by a panel of academics, 29 National Dental Associations, in collaboration with local Unilever Oral Care brands in 27 countries, have set up oral health-promotion programmes supported by health ministries, school structures, oral health professionals and volunteers. These standardised programmes are original in that they are structured by setting up three categories of health promotion on an international scale.

New concepts may lead to innovative actions with a direct impact on diagnosis, prevention and treatment, but also on the ethical and social aspects of the

disease[20]. The LLL phase 2 programme aims to draw up and recommend strategies for already available or new health-promotion interventions to improve access to and use of these interventions by populations. It is characterised by the need to adopt innovative approaches and/or ensure that interventions implemented in health-care facilities, schools or the community are effective. It focuses in particular on a practical and acceptable objective[21]. In a bid to enhance operational systems, it also seeks to acquire knowledge about interventions, strategies and tools in order to improve the quality or coverage of health systems and translate convincing data into everyday practices[22]. This knowledge will be in three areas of research: the research subject; the users of the research results; and the usefulness of the research results.

As an international applied research programme, LLL phase 2 requires (in addition to wide-scale centralised coordination) the following: the identification, awareness-raising and training of qualified personnel who are confident in their abilities and are efficiently managed; appropriate funding with transparent and controllable methods for fund allocation; and well-funded research institutions and networks. Its main challenges are to convey and standardise, as far as possible, existing dental disease-prevention knowledge in action programmes for industrialised and developing countries[23]. It describes all the formal methods that transform promising ideas into practical solutions for improving health. WHO international collaborative studies and other international studies of social factors in dental caries, using the same methodology as used in Programme ICSII in 1990, provide empirical evidence of social inequality in oral health across countries and across oral health-care systems[24].

INTERNATIONAL HEALTH POLICIES: LIVE.LEARN.LAUGH. PROGRAMME

Public health policy underwent substantial transformation during the latter half of the 20th century. The importance of public health was slowly recognised over the period spanning 1970 to 2000 with the publication of several reports from different organisations, mainly WHO.

Investing in health

The Bamako Initiative (1987) aimed to increase access to primary health care in Africa and Asia by raising the effectiveness, efficiency, financial viability and equity of health services whilst providing a 'minimum package' of essential health services at basic health units[25]. Recognised by the international community as a genuine innovation that was capable of tackling the health challenges faced by developing countries, the Bamako Initiative was a set of political reforms drawn up in response to the rapid decline of health-care systems in the 1970s and 1980s. The financial participation of users of health services, by means of user fees, was regarded as a way to improve community participation and access to primary health care in locations where health systems were weak and underfunded[26]. However, the Bamako Initiative was found to be limited in terms of achieving health-improvement objectives for populations. Support for the principle of 'user pays' seems to have faded. Production and dissemination of evidence, as well as certain advocacy networks, may have contributed to this change in discourse[27]. The current priority is research that enables actions to be tailored to the populations and supports any decisions in their favour with a view to promoting health[28].

Health promotion

The Ottawa Charter (1986) lists five strategies for health promotion: the drawing up of public policies promoting health; the creation of supportive environments; the strengthening of community action; and the improvement of personal skills and the re-orientation of health-care services. Health promotion was central to achieving health goals internationally. It helped to clarify the types of actions needed: that individuals need to be provided with the supportive environment and economic resources to be able to lead healthy lives[29]. Health promotion involves the effective and concrete participation of the community in setting priorities, making decisions and drawing up and implementing strategies with the aim of achieving better health. Such multi-sector action is integral for creating conducive environments to support healthy behaviours[30].

Oral health promotion requires personal efforts and professional care, as well as actions within the population. By setting up the LLL programme with Unilever, FDI is playing its role in coordinating and promoting research to improve the health of populations. It is a project of faith in health promotion as actors working in isolation cannot tackle health challenges successfully. The synergy produced through collaboration is seen as vital. Research is needed to identify factors and processes that promote, as well as inhibit, the production of synergistic outcomes[31].

This partnership aims to improve the impact of investments on institutions and populations as well as to propose mechanisms tailored to needs and priorities within the scope of national health research strategies[32]. It also aims to reinforce research governance in countries by supporting and developing efficient research systems capable of promoting health, science, technology and innovation. Fundamentally, it is a

long-term skills-reinforcement programme focusing on creating tools and practical methods tailored to the requirements of each country.

Integrated approach

The integration of health into all policies, accompanied by inter-sector action and collaboration, is a promising approach for boosting accountability relating to health in other sectors and the promotion of health equity and the existence of integrating and productive societies. The main focus of WHO's worldwide strategy to combat chronic NCDs is reduction of exposure to the main risk factors.

An integrated chronic illness-prevention approach implies a reduction in risk factors and the active involvement and participation from communities in decision making about their health and the implementation of consensual strategies, which involves the pooling of resources. Experience from high-income countries that have been able to control NCDs shows that responses must be comprehensive and multi-sector, integrating health promotion and prevention and treatment strategies, and involving the community as well as the health sector. Such a multifaceted approach requires well-functioning health systems. WHO has established the Chronic Disease Action Group to encourage, support and monitor action on the implementation of evidence-based efforts to promote global, regional and national action to prevent and control chronic diseases[33]. Service integration is often seen as a key element of primary health care. There is promising, although limited, evidence on the effects of strategies to increase integration of primary health-care services. Cochrane Database reviews found limited evidence, from four studies, on the effects of strategies for integrating primary health-care services at the point of delivery, from comparisons between integrated and vertical approaches to delivering services[34].

Following WHO's recommendations, the LLL phase 2 programme provided technical assistance and guidance in the design, implementation and evaluation of demonstration projects on evidence at community level throughout the six WHO regions. It contributed to the exchange of experiences among countries and shared lessons learned from experience. Publications of the results take a critical look at the strengths, weaknesses, opportunities and difficulties of conducting such a broad programme within a global membership-based NGO.

Political declaration on social determinants of health

At the WHO World Conference on Social Determinants of Health (Rio de Janeiro, Brazil October 2011) it was acknowledged that better governance for health and development would involve the development of comprehensive research programmes and surveys to determine policies and actions, strengthening international cooperation to share experiences on policies and strategies aimed at reducing health inequities through action on the social determinants of health. Furthermore, it was agreed that progress would be monitored and accountability increased by promoting research on the links between social determinants and equity of health results and by focusing on evaluating the effectiveness of actions.

The LLL phase 2 programme asked developing countries to combine efforts with industrialised countries through international partnerships based on high-priority oral health problems. The programme was designed and implemented with the participation of all players, particularly policy-makers, decision-makers and oral health teams, which is 'generally lacking'. Toothbrushing twice daily with fluoride toothpaste is the major indicator used to evaluate the efficiency of the programme. Data on social determinants were collected as part of the process.

Declaration on the sharing of knowledge and data

A Ministerial Conference on Research for Health in the African Region, the Algier's Declaration, organised by WHO Regional Office for Africa in June 2008, highlighted the institutional, infrastructural and regulatory shortcomings that prevent quality research from being carried out in public health fields, products from being developed, operational research from being carried out, widespread access to the appropriate tools from being provided and a good cost–efficiency ratio from being achieved. There is a need for appropriate platforms for sharing knowledge and evidence more efficiently in order to clarify professional policies and practices to produce a positive impact on the health of our populations and a need to make appropriate investments and offer incentives in the field of research and development.

Since the 1990s, the evidence-based approach has gained interest, particularly in the area of political decision-making[35]. Research is not only a key tool for improving health services, it is also a source of inspiration for public health. The approved health measures for the population provide a unique perspective in the drawing up of public health policy. They provide governments and national and international NGOs with convincing data to determine priorities for research, development, policies and funding[36]. As a result, the people in charge of management and the health policy need factual information in order to make wise decisions about the programmes and general policy.

The foundations of the LLL phase 2 programme require technically sound investments from credible

scientific institutions with a certain level of independence. However, the multi-sector nature of oral health requires a cross-sector response to succeed. FDI's website (http://www.fdiworldental.org/fdi-at-work/livelearnlaugh/about-lll.aspx) provides public visibility of the programme and FDI's mandate, which, through in-depth analyses, can help to strengthen health systems through research, analysis and political advice[37].

Oral health recommendations in public health

In several reports, WHO has stated the directives and actions required to improve oral health, whilst various resolutions of the World Health Assembly and regional committees highlight the role of oral health in the health and well-being of the community[38]. Fluoride toothpaste, education about dental health for children and mothers, and then other adults and at-risk populations, through a process of integrated health promotion to school and health-care settings, by qualified personnel and an active dental profession, are the cornerstone of good oral health.

The LLL phase 2 programme is based firmly on these foundations and is inspired by WHO recommendations and resolutions on oral health over the last few decades. Namely:

- Resolutions WHA22.30, WHA28.64 and WHA31.50, which concern fluoridation and oral health. The latest recommendation concerning the use of fluoride toothpaste was: 'As fluoride toothpaste is an effective way of combating tooth decay, every effort must be made to develop products which are affordable for developing countries'. The use of fluoride toothpaste is a public health measure. Resolution WHA36.14 (1983) recommended that the member states follow existing health strategies when drawing up their national oral health strategy, which was supported 6 years later by resolution WHA42.39 (1989) that approved oral health promotion as an integral part of health for all by 2000.
- Finally, and no doubt the most discussed of all, is resolution WHA60.17 (2007) on oral health. This stresses the need to incorporate oral health-promotion and oral disease-prevention programmes into chronic disease-integrated care and prevention programmes.

In addition to these global-scale resolutions, there are regional-scale recommendations, which take into account specific factors, for example:

- The Conference of Chiefs of Dental Health Services in the African Region and the Regional Experts Committee on Oral Health (1969; 1978) recommended the creation of services based on the principles of public health.
- WHO, FDI and the International Association of Dental Research jointly prepared new objectives including, among others, the seeking of balance between health information, oral health priorities and systems, health promotion and socio-environmental conditions[23].
- Workshop AFR/ORH/07.1 (2007) pays particular attention to vulnerable groups and the negative consequences of risk factors. It encourages research with the aim of providing factual proof of the efficiency and cost of oral health actions.
- FDI Vision 2020 (2012) offers a unique opportunity to tackle global challenges faced by the profession and to achieve the objective of optimal oral health. One of its five main elements is to encourage fundamental research and technology.

DELIVERY OF LIVE.LEARN.LAUGH. PHASE 2 PROGRAMME FOR ORAL HEALTH MANAGEMENT IN PRIMARY HEALTH CARE

Global concept

Equitable and universal access to affordable and appropriate quality oral health services should be based on prevention-oriented services and multi-sector action, especially in relation to participatory health education and promotion[39]. Appropriate information should be provided to individuals, families and communities for the promotion of healthy oral-health behaviour and lifestyles. People should be involved in all stages of the development of oral health education, promotion and information materials. It is possible to develop public knowledge and practices on health promotion and prevention by implementing community health programmes. Good evidence shows that public health interventions are most effective when they are reinforced in several sites where people make choices about nutrition, physical activity, tobacco use and other lifestyle factors[40]. Child populations are likely to be heavily influenced by parental behaviour. Informing mothers on the benefits of appropriate oral health-promoting behaviours can significantly improve their confidence in managing the oral health of their children. The increased usage of fluoride-containing toothpaste in children has been strongly correlated with the decline in the prevalence and severity of dental caries. The frequency of brushing is important, with the current recommendation for good effect being twice daily. However, there are profound disparities in children's oral health in various countries, and among different regions within a given country, presumably based on disparities in healthy behaviours. Even if the most common oral diseases are preventable, a large proportion of the community still lacks sound

information, or does not benefit from, appropriate oral health-promoting actions. The development of appropriate oral health-promotion strategies is urgently needed to improve oral health behaviour and attitudes, especially for children from some ethnic minorities and for children from a poor socio-economic background.

Corporate sector and oral health community

Lack of resources, both in terms of contributors and financial support, is identified as the key problem in sustaining an NGO effort to examine effectiveness[41]. Technical, human and fiscal resource constraints are major impediments to the establishment of effective prevention and control programmes. Despite increasing awareness and commitment to address chronic disease, concrete actions by global partners to plan and implement cost-effective interventions are inadequate[42].

Robust partnerships linking dental industry and dental education have existed over long periods for mutual advancement and benefit. The dental industry helps oral health-care providers or the public directly to achieve appropriate oral health objectives, as well as those businesses that manufacture or supply goods and services to the education sector. They are financed either by the public health sector or by third parties, such as health insurance companies, or are sponsored by private organisations.

Public–private partnerships with large corporations offer potential benefits to the health sector, but many concerns have been raised, highlighting the need for appropriate safeguards. Whilst each party in a collaborative effort chooses to participate to advance its own objectives, the collaboration will be most effective if each participant also understands the objectives, capabilities and capacities of the other collaborators. Moreover, mutually beneficial collaboration arrangements are frequently complex and may differ significantly amongst differing regions, institutions and cultures[43].

The different roles and objectives of both sectors, the different operating environment of each sector and areas of common interest should be identified for collaboration[43]. Partnership and collaborating more effectively along the suggested lines should, almost certainly, generate mutually beneficial outcomes, whilst serving over the long term also to elevate the public's oral health status on a global basis. Collaborations and partnerships among various institutions are crucial in solving such problems[44]. The framework proposed offers a basis to identify and contrast research needs, projects and products at the international level and to identify the actors' agendas and their influence[45]. Recognising that, of necessity, corporations exist to make profit suggests that the relationship of responsible companies with the profession could often be looked at as a partnership in which both sides benefit.

There is often ambivalence in the way in which the oral health profession views the oral health-care industry. On the one hand, there are the sceptics who view corporate activities as suspect, calling into question the validity of industry-sponsored research and considering all promotional activities as self-serving. On the other hand, there are those who will evaluate research, whether industry sponsored or not, on its merits and appreciate corporate philanthropy that aims to give something back to the profession. In fact, at times the expectations of the amount of financial support available from the industry are markedly in excess of the actual profit gained from dental product sales[46].

Galea and McKee[47] proposed five tests that public policy makers may wish to apply when considering engaging in such a public–private partnership. First, are the core products and services provided by the corporation health enhancing or health damaging? In some cases, the answer is obvious, but the answers for others, such as food and alcohol, are contested. Second, do potential partners put their policies into practice in the settings where they can do so, namely their own workplaces? Third, are the corporate social responsibility activities of potential partners independently audited? Fourth, do potential partners make contributions to the general population rather than to narrow programmes of their choosing? Fifth, is the role of the partner confined to policy implementation rather than to policy development, which is ultimately the responsibility of government alone?

The primary challenge of such a private–public partnership project, LLL phase 2, is to facilitate the exchange of knowledge, programmes and expertise between oral health professionals and federated associations worldwide, thereby promoting higher standards in oral health through education in low-, middle- and high-income countries of the world[48]. FDI and Unilever have mutually enhanced their communications, networking and collaborations. The programme results will allow for sharing of expertise across borders and will open new areas of innovation and stimulate other developments, all contributing to increased efficiencies and improved health, to the ultimate benefit of society in general[41].

Importance of school and educational settings in promoting oral health

Good oral health is dependent on the establishment of the key behaviours of toothbrushing with fluoride toothpaste and controlling sugar snacking. Schools are ideal settings in which to reach children and adolescents and, through them, families and community

members[49]. At the global level, approximately 80% of children attend primary schools, although there are wide variations in school attendance between countries and gender. Schools remain an important setting, offering an efficient and effective way to reach over 1 billion children worldwide, and through them, families and community members[50]. School oral health school oral health programmes can offer health education, dental screenings, sealants and dental and preventive dental services[51].

Primary schools provide a potential setting in which behavioural interventions can support children to develop independent and habitual healthy behaviours[52]. Children are particularly receptive during this period and the earlier that habits are established, the longer lasting the impact[53]. Schools can provide a supportive environment for promoting oral health. It is possible to develop public knowledge and practices on health promotion and prevention by implementing community health programmes.

More importantly, schools may be the only place for children at highest risk of dental disease to have access to oral health services. This is particularly true in many developing countries, where intervention is hampered by a lack of dental personnel. However, with adequate training, schoolteachers can play an important role in oral health activities.

Schools can also provide an important network and channel to the local community. Health-promotion activities can be targeted at the home and throughout the community by school personnel. Similarly, through the pupils, health-promotion messages can be passed on to other members of the family.

Preschool health programmes for oral health education should be created and maintained. The establishment of preventive oral-health programmes (which mainly include supervised daily toothbrushing with a fluoride toothpaste) in kindergarten on a regular basis has the potential to close the oral health gap in early childhood between advantaged and disadvantaged communities. It is an educational principle that in kindergarten young children develop their own abilities through playing and exercise. They are encouraged to enhance their knowledge through the completion of simple everyday tasks and are supported by teachers to plan, do and review such activities.

Early Education and Child Care (EECC) programmes provide settings in which children, especially those from low-income families, can be reached with health-promotion and disease-prevention activities[54]. Preventive oral-health programmes in kindergarten, centred on supervised toothbrushing, are generally started by dental professionals. Suitably trained staff members at the kindergartens then continue the programme of training and monitoring children for effective brushing with regular support through further visits from dental professionals. Partners that may be engaged include professional associations, dental, medical and allied professions and NGOs.

WHO strongly recommends evaluation of school oral health programmes so that the processes and outcomes of programmes may be documented and thereby experiences within and across countries can be shared[55]. However, while a number of well-known strategies are being applied, the full range of health-promoting actions is not being used globally. A greater emphasis on integrated health promotion is advised in place of narrower, disease- or project-specific approaches. Recommendations are made for improving this situation, for further research and for specifying an operational framework for sharing experiences and research[56]. Currently, there is insufficient evidence for efficacy of primary school-based behavioural interventions in reducing caries. There is limited evidence for the effectiveness of these interventions on plaque outcomes and on children's oral health knowledge acquisition. None of the included interventions were reported as being based on or derived from behavioural theory. There is a need for further high-quality research to utilise theory in the design and evaluation of interventions for changing oral health-related behaviours in children and their parents[51].

Importance of health professionals in promoting oral health

Integration of oral health promotion into general health care has been highly recommended by WHO. Primary-care physicians can – as part of their general health care – promote and contribute to improved oral health care. The management of health professionals can be considered a key element of effective stewardship and a *sine qua non* for attainment of health-system goals: improving health, responding to the legitimate expectation of the population and fairness of the contribution. The needs to be addressed using this strategy include equitable and universal access to affordable and appropriate quality oral health services based on a proper balance between personnel types and population needs. In order to strengthen research capacity and promote relevant research that responds to the oral health needs of communities, a research culture should be developed within national oral health programmes and the findings widely disseminated and used for planning purposes.

Methods of remuneration have been linked with the professional behaviour of primary care physicians. In dentistry, this can be exacerbated as clinicians operate their practices as businesses and take the full financial risk of the provision of services. The main methods for remunerating primary care dentists include fee-for-service, fixed salary and capitation payments.

Financial incentives within remuneration systems may produce changes to clinical activity undertaken by primary care dentists. However, the number of included studies is limited and the quality of the evidence from the two included studies was low/very low for all outcomes. Further experimental research in this area is highly recommended given the potential impact of financial incentives on clinical activity, and particular attention should be paid to the impact this has on patient outcomes[57].

Policies and practices for screening for oral diseases have profound implications for individuals, health systems and society as a whole. Early identification of children with asymptomatic and long-standing, latent oral disease is important in the primary oral care setting and is an essential component of an oral health programme. As a substantial proportion of people have undiagnosed caries, the emphasis on earlier identification creates the opportunity to provide the benefits of early intervention. Screening using an oral health examination combined with adequate follow-up oral health promotion can achieve major reductions in morbidity, especially in high-risk groups or individual children. Depending on the organisation of the educational and care system in each country, screening programmes may be carried out in schools or in other settings where the child population can be easily reached. It is therefore critical to support oral health promotion in school or in other community-based programmes that focus on early signs and symptoms of oral diseases.

Finally, it is necessary to concentrate efforts on assessing the severity of tooth decay and untreated caries in children and specific population groups in order to optimise the profitability of health programmes organised within the scope of policies aiming to reduce inequalities. Although the risks of carious lesions affect only a relatively small proportion of the population in certain industrialised countries, in others, their prevalence remains moderate or high.

Importance of mothers in promoting oral health

Oral diseases are, without doubt, related to behaviour. Although oral health knowledge does not necessarily relate to better health behaviour, it is considered to be an essential prerequisite. People who have assimilated this knowledge and feel a sense of personal control over their oral health are more likely to adopt self-care practices[58]. Oral health education given to mothers by general health staff is a valuable tool to prevent caries in infants and toddlers[59]. Parents are important role models who help shape children's development and influence their lifestyles. Parents are responsible for providing packed lunches and, in many developing countries, toothbrushes for their children to use in schools[60]. In many countries, a considerable number of children have limited knowledge of the causes and prevention of the most common oral disease. Similarly, mothers' oral health knowledge is generally poor, and schoolteachers' oral health knowledge, while better than that of the mothers, remains unsatisfactory.

Children are likely to be heavily influenced by their parents' behaviour. It is possible to develop public knowledge and practices on health promotion and prevention by implementing community health programmes. Even if the most common oral diseases are preventable, a large proportion of the community still lacks sound information or does not benefit from appropriate oral health-promoting actions. Informing mothers on the benefit of promoting appropriate oral health behaviours can significantly improve their confidence in managing the oral health of children.

The key to oral health promotion and disease prevention relies on anticipatory guidance and education of the parent, early detection and timely referral for appropriate intervention. As an integral component of overall health, this is accomplished best by the oral health provider to whom many women entrust their own health during pregnancy and their newborn's health during infancy and early childhood.

Maternal level of education has been closely associated with dental caries experience in their children. Women's knowledge about nutrition, prevention of dental caries and periodontal diseases are critical to their health and that of their infant. It is possible to develop public knowledge and practices on prevention by implementing a wide campaign of information and sensitisation among communities. Mothers are the best vehicles of information inside the family and in the community. Informing mothers on the disease, the risks and the appropriate health-promoting behaviours can significantly improve their capacity to prevent poor oral health in their children.

Fluorides as the principal component of oral health-promotion programmes

Good oral hygiene is of proven value in the prevention of periodontal disease and dental caries. The scientific literature reinforces the importance of daily toothbrushing with fluoridated toothpastes for preventing dental caries[61]. Strong evidence exists between the caries-preventive effect of daily use of fluoridated toothpaste and the prevention of dental caries[62]. The decision of what fluoride levels to use for children under six years of age should be balanced with the risk of fluorosis[63]. Using a fluoridated supplement with a high fluoride concentration in children under six years of age may increase the risk of fluorosis. Therefore, the provision of fluoride toothpaste is

considered as an effective community strategy for preventing tooth decay in the permanent teeth of children and young adults. Such strategies mainly concern high-risk groups who are socially and economically disadvantaged. Topical fluorides, in the form of toothpaste, mouth rinse, varnish and gel, are effective caries-preventive measures. However, there is uncertainty about the relative value of these interventions[64]. One Cochrane review[64] suggests a substantial caries-inhibiting effect of fluoride varnish in both permanent and primary teeth; however, the quality of the evidence was assessed as moderate, as it included mainly studies with high risk of bias, with considerable heterogeneity.

Fluoride toothpastes, in comparison with mouth rinses or gels, appear to have a similar degree of effectiveness for the prevention of dental caries in children. Acceptance is likely to be greater for fluoride toothpaste. Cochrane reviews of paediatric dentistry were of high quality. They provided strong evidence that topical fluoride treatments and sealants are effective for children and adolescents and thus should be implemented in practice. However, a substantial number of reviews yielded inconclusive evidence[65]. Evidence suggests that low-fluoride [<600 parts per million fluoride (p.p.m. F)] toothpastes provide less caries protection than do standard (1,000 p.p.m. F) or high (1,500 p.p.m. F) concentration formulations. However, low-fluoride toothpastes are appropriate for very young children (under seven years of age) at low caries risk, particularly if living in fluoridated areas. For other young children, higher concentrations of fluoride should be used. Small amounts of toothpaste are comparable in efficacy to large amounts. Cochrane reviews revealed that sealants are effective in high-risk children but information on the magnitude of the benefit of sealing in other conditions is scarce. The relative effectiveness of different types of sealants has yet to be established[65].

PERSPECTIVES

Three major health challenges of the next 20 years are advanced[66]. The *first domain* is the health challenges of vulnerable groups in low- and middle-income countries. Seventy per cent of the world's poor now live in middle-income countries rather than in low-income countries; thus achievement of the grand convergence will require attention to be focused on lower-income groups in rural subregions of middle-income countries and populations in low-income countries. The *second domain* is that a second demographic transition is occurring: a bulge in the adolescent band of the population pyramid[67]. This group will soon be entering adulthood and can be reached now with health-preventive interventions, vaccination and education to improve the quality of their life and health in the future. The *third domain* is the effect of medical expenditures on households and societies. As the GDP of low- and middle-income countries rises, health spending will inevitably increase, and these countries will need to take steps to prevent unproductive cost escalation. Prompted by the 20th anniversary of the 1993 World Development Report, a *Lancet* Commission revisited the case for investment in health and developed a new investment framework to achieve dramatic health gains by 2035[68]. NCD Alliance propose five overarching priority actions for the response to the crisis: leadership; prevention; treatment; international cooperation; and monitoring and accountability[3]. The priority interventions were chosen for their health effects, cost-effectiveness, low costs of implementation and political and financial feasibility. This approach aims to encourage policy-makers to take scientific evidence into consideration when developing new policies. International organisations, such as FDI, have undertaken to contribute to the production of knowledge, either through their own publications or through the co-financing of research in the academic world. It is certain that the work developed in phase 2 was only an intermediate step towards a better understanding related to the promotion of oral health strategies. At the end of this partnership, the susceptible elements issue from LLL phase 2 should contribute to a wider public health perspective.

Conflict of interest

Denis Bourgeois, Prathip Phantumvanit and Juan Carlos Llodra have received consultancy payments from FDI World Dental Federation. Jean-Luc Eiselé and Virginie Horn are employed by FDI World Dental Federation. Monica Carlile is employed by Unilever plc.

REFERENCES

1. Waage J, Banerji R, Campbell O *et al.* The Millennium Development Goals: a cross-sectoral analysis and principles for goal setting after 2015. *Lancet* 2010 376: 991–1023.
2. Travis P, Bennett S, Haines A *et al.* Overcoming health-systems constraints to achieve the Millennium Development Goals. *Lancet* 2004 364: 900–906; Erratum in: *Lancet* 2005 365(9456): 294.
3. Beaglehole R, Bonita R, Horton R *et al.* Priority actions for the non-communicable disease crisis. *Lancet* 2011 377: 1438–1447.
4. Di Cesare M, Khang YH, Asaria P *et al.* Inequalities in non-communicable diseases and effective responses. *Lancet* 2013 381: 585–597.
5. Lewin S, Lavis JN, Oxman AD *et al.* Supporting the delivery of cost-effective interventions in primary health-care systems in low-income and middle-income countries: an overview of systematic reviews. *Lancet* 2008 372: 928–939.
6. Beaglehole R, Horton R. Chronic diseases must match global evidence. *Lancet* 2010 376: 1619–1621.
7. Chen L, Evans T, Anand S *et al.* Human resources for health: overcoming the crisis. *Lancet* 2004 364: 1984–1990.

8. WHO. *World Health Report 2004: Changing History*. Geneva: World Health Organization; 2004.
9. WHO. *World Health Report 2006: Working Together for Health*. Geneva: World Health Organization; 2006.
10. Walt G, Vaughan P. *An Introduction to the Primary Health care Approach in Developing Countries. A Review with Selected Annotated References*. London: London School of Hygiene and Tropical Medicine; 1981.
11. The Lancet. A renaissance in primary health care. *Lancet* 2008 372: 863.
12. Beaglehole R, Epping-Jordan J, Patel V *et al.* Improving the prevention and management of chronic disease in low-income and middle-income countries: a priority for primary health care. *Lancet* 2008 372: 940–949.
13. Epping-Jordan JE, Galea G, Tukuitonga C *et al.* Preventing chronic diseases: taking stepwise action. *Lancet* 2005 366: 1667–1671.
14. Friedman C, Rigby M. Conceptualising and creating a global learning health system. *Int J Med Inform* 2013 82: e63–e71.
15. Hescot P, China E, Bourgeois D *et al.* The FDI African Strategy for oral health: addressing the specific needs of the continent. *Int Dent J* 2013 63: 113–120.
16. Fisher J, Johnston S, Hewson N *et al.* FDI global caries initiative; implementing a paradigm shift in dental practice and the global policy context. *Int Dent J* 2012 62: 169–174.
17. Pang T. Complementary strategies for efficient use of knowledge for better health. *Lancet* 2003 361: 716.
18. The Lancet. Technologies for global health. *Lancet* 2012 380: 447.
19. Petersen PE. Challenges to improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. *Int Dent J* 2004 54(6 Suppl 1): 329–343.
20. World Health Organization. *The World Oral Health Report 2003. Continuous Improvement of Oral Health in the 21st Century – The Approach of the WHO Global Oral Health Programme*. Geneva: WHO; 2003.
21. Remme JH, Adam T, Becerra-Posada F *et al.* Defining research to improve health systems. *PLoS Med* 2010 7: e1001000.
22. Zachariah R, Reid T, Van den Bergh R *et al.* Applying the ICMJE authorship criteria to operational research in low-income countries: the need to engage programme managers and policy makers. *Trop Med Int Health* 2013 18: 1025–1028.
23. Petersen PE. Global policy for improvement of oral health in the 21st century – implications to oral health research of World Health Assembly 2007, World Health Organization. *Community Dent Oral Epidemiol* 2009 37: 1–8.
24. Petersen PE. Priorities for research for oral health in the 21st century – the approach of the WHO Global Oral Health Programme. *Community Dent Health* 2005 22: 71–74.
25. Knippenberg R, Alihonou E, Soucat A *et al.* Implementation of the Bamako Initiative: strategies in Benin and Guinea. *Int J Health Plann Manage* 1997 12(Suppl 1): S29–S47.
26. Robert E, Ridde V. Global health actors no longer in favor of user fees: a documentary study. *Global Health* 2013 9: 29.
27. Ridde V. Is the Bamako Initiative still relevant for West African health systems? *Int J Health Serv* 2011 41: 175–184.
28. Niessen LW, Grijseels EW, Rutten FF. The evidence-based approach in health policy and health care delivery. *Soc Sci Med* 2000 51: 859–869.
29. Irvine L, Elliott L, Wallace H *et al.* A review of major influences on current public health policy in developed countries in the second half of the 20th century. *J R Soc Promot Health* 2006 126: 73–78.
30. Mendis S. The policy agenda for prevention and control of non-communicable diseases. *Br Med Bull* 2010 96: 23–43.
31. Corbin JH, Mittelmark MB. Partnership lessons from the global programme for health promotion effectiveness: a case study. *Health Promot Int* 2008 23: 365–371.
32. WHO. *The WHO Strategy on Research for Health*. Geneva: World Health Organization; 2012.
33. Beaglehole R, Ebrahim S, Reddy S *et al.* Prevention of chronic diseases: a call to action. *Lancet* 2007 370: 2152–2157.
34. Briggs CJ, Garner P. Strategies for integrating primary health services in middle- and low-income countries at the point of delivery. *Cochrane Database Syst Rev* 2006 2: CD003318.
35. MacIntyre S. Evidence in the development of health policy. *Public Health* 2012 126: 217–219.
36. Marcenes W, Kassebaum NJ, Bernabé E *et al.* Global burden of oral conditions in 1990–2010: a systematic analysis. *J Dent Res* 2013 92: 592–597.
37. Bennett S, Corluka A, Doherty J *et al.* Approaches to developing the capacity of health policy analysis institutes: a comparative case study. *Health Res Policy Syst* 2012 10: 7.
38. Petersen PE. World Health Organization global policy for improvement of oral health – World Health Assembly 2007. *Int Dent J* 2008 58: 115–121.
39. World Health Organization. *Oral Health in the African Region: A Regional Strategy 1999–2008*. Brazzaville: WHO Regional Office for Africa; 2000.
40. Jepson RG, Harris FM, Platt S *et al.* The effectiveness of interventions to change six health behaviours: a review of reviews. *BMC Public Health* 2010 10: 538.
41. McQueen DV. The global programme on health promotion effectiveness (GPHPE): a bold concept with few resources. *Perspect Public Health* 2012 132: 115–119.
42. Alwan A, MacLean DR, Riley LM *et al.* Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. *Lancet* 2010 376: 1861–1868.
43. Alexander D, Clarkson J, Buchanan R *et al.* Exploring opportunities for collaboration between the corporate sector and the dental education community. *Eur J Dent Educ* 2008 12(Suppl 1): 64–73.
44. Yamalik N, Mersel A, Cavalle E *et al.* Collaboration between dental faculties and National Dental Associations (NDAs) within FDI World Dental Federation-European Regional Organization zone: an NDAs perspective. *Int Dent J* 2011 61: 307–313.
45. Gonzalez-Block MA. Health policy and systems research agendas in developing countries. *Health Res Policy Syst* 2004 2: 6.
46. Barnett ML. Oral health promotion by the oral health products industry: unrecognised and unappreciated? *Community Dent Health* 2008 25: 2–3.
47. Galea G, McKee M. Public-private partnerships with large corporations: setting the ground rules for better health. *Health Policy* 2014 115: 138–140.
48. De Vries J, Murtomaa H, Butler M *et al.* The global network on dental education: a new vision for IFDEA. *Eur J Dent Educ* 2008 12(Suppl 1): 167–175.
49. Bertness J, Holt K, editors. *Promoting Oral Health in Schools: A Resource Guide – April 2009*. Washington, DC: National Maternal and Child Oral Health Resource Center, Georgetown University; 2009.
50. World Health Organization. *The Status of School Health. Report of the School Health Working Group and the WHO Expert Committee on Comprehensive School Health Education and Promotion*. Geneva: WHO; 1996.
51. Cooper AM, O'Malley LA, Elison SN *et al.* Primary school-based behavioural interventions for preventing caries. *Cochrane Database Syst Rev* 2013 5: CD009378.

52. World Health Organization. *School Policy Framework. Implementation of the WHO Global Strategy on Diet, Physical Activity and Health*. Geneva: WHO; 2008.

53. Booth ML, Samdal O. Health-promoting schools in Australia: models and measurement. *Aust N Z J Public Health* 1997 21: 365–370.

54. Ashley M, Kranz BA, Rozier RG. Oral health content of early education and child care regulations and standards. *J Public Health Dent* 2011 71: 81–90.

55. Petersen PE, Kwan S. Evaluation of community-based oral health promotion and oral disease prevention-WHO recommendations for improved evidence in public health practice. *Community Dent Health* 2004 21(4 Suppl): 319–329.

56. Jürgensen N, Petersen PE. Promoting oral health of children through schools – results from a WHO global survey 2012. *Community Dent Health* 2013 30: 204–218.

57. Brocklehurst P, Price J, Glenny AM *et al.* The effect of different methods of remuneration on the behaviour of primary care dentists. *Cochrane Database Syst Rev* 2013 11: CD009853.

58. Pine CM, McGoldrick PM, Burnside G *et al.* An intervention to establish regular toothbrushing: understanding parents' beliefs and motivating children. *Int Dent J* 2000 50: 312–323.

59. Mohebbi SZ, Virtanen JI, Vahid-Golpayegani M *et al.* A cluster randomised trial of effectiveness of educational intervention in primary health care on early childhood caries. *Caries Res* 2009 43: 110–118.

60. Petersen PE, Nyandindi U, Kikwilu E *et al. Oral Health Status and Oral Health Behaviour of School Children, Teachers and Adults in Tanzania. Technical Report*. Geneva: WHO; 2002.

61. Twetman S, Axelsson S, Dahlgren H *et al.* Caries-preventive effect of fluoride toothpaste: a systematic review. *Acta Odontol Scand* 2003 61: 347–355.

62. Walsh T, Worthington HV, Glenny AM *et al.* Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2010 1: CD007868.

63. Rasines G. Using a fluoridated supplement with a high fluoride concentration in children aged under 6 years may increase the risk of fluorosis. *Evid Based Dent* 2010 11: 8–9.

64. Marinho VC, Worthington HV, Walsh T *et al.* Fluoride varnishes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2013 7: CD002279.

65. Ahovuo-Saloranta A, Forss H, Walsh T *et al.* Sealants for preventing dental decay in the permanent teeth. *Cochrane Database Syst Rev* 2013 3: CD001830.

66. Berkley S, Chan M, Dybul M *et al.* A healthy perspective: the post-2015 development agenda. *Lancet* 2013 381: 1076–1077.

67. Sawyer SM, Afifi RA, Bearinger LH *et al.* Adolescence: a foundation for future health. *Lancet* 2012 379: 1630–1640.

68. Jamison DT, Summers LH, Alleyne G *et al.* Global health 2035: a world converging within a generation. *Lancet* 2013 382: 1898–1955.

Correspondence to:
Professor Denis M. Bourgeois,
University Lyon 1,
11 Rue Paradin,
69008 Lyon, France.
Email: denis.bourgeois@univ-lyon1.fr