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Do health systems cover the mouth? Comparing dental care coverage for older adults in eight jurisdictions☆

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ABSTRACT

Oral health is an important component of general health, yet there is limited financial protection for the costs of oral health care in many countries. This study compares public dental care coverage in a selection of jurisdictions: Australia (New South Wales), Canada (Alberta), England, France, Germany, Italy, Sweden, and the United States. Drawing on the WHO Universal Coverage Cube, we compare breadth (who is covered), depth (share of total costs covered), and scope (services covered), with a focus on adults aged 65 and older. We worked with local experts to populate templates to provide detailed and comparable descriptions of dental care coverage in their jurisdictions. Overall most jurisdictions offer public dental coverage for basic services (exams, x-rays, simple fillings) within four general types of coverage models: 1) deep public coverage for a subset of the older adult population based on strict eligibility criteria: Canada (Alberta), Australia (New South Wales) and Italy; 2) universal but shallow coverage of the older adult population: England, France, Sweden; 3) universal, and predominantly deep coverage for older adults: Germany; and 4) shallow coverage available only to some subgroups of older adults in the United States. Due to the limited availability of comparable data within and across jurisdictions, further research would benefit from standardized data collection initiatives for oral health measures.

1. Introduction

Oral health is an important component of general health and overall well-being [1]. Untreated and poorly managed oral diseases, such as tooth decay and periodontal (gum) disease, can impact nutritional intake and increase bacteria levels and inflammation; these factors play a role in systemic inflammation and overall health outcomes [2]. Tooth decay and gum disease can lead to pain and infection, which can negatively impact an individual's quality of life [1]. These conditions are largely preventable through population and individual health promotion strategies, including community water fluoridation, and regular oral hygiene. Further, routine access to primary oral health care enables early detection and management of oral diseases, and can mitigate the negative impacts of poor oral health on individuals and families, and potentially avoidable costs to the health care system and society [3,4].

Financial protection against the cost of dental care services varies widely across and within high-income countries. Among 11 high-income countries, the United States and Canada had the highest percentages of the population that report skipping dental care or a dental check-up because of cost according to the 2016 Commonwealth Fund International Health Policy Survey, with sig-

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nificant disparities by income. An estimated 45% of Americans with lower-than-median income and 40% of Canadians with lower-than-median income reported skipping dental care due to costs, compared to 21% of higher income Americans and 17% of higher income Canadians [5]. Cost barriers also exist in France and Sweden, where nearly one quarter of respondents reported skipping dental care due to costs [5]. In Europe, cost barriers to dental care for adults and older adults appear to be more pronounced in Italy, France, and Sweden compared to Germany and the United Kingdom [6,7]. Although cost barriers may be lower in the United Kingdom than in other countries on average, significant geographic and socioeconomic inequalities in both access to dental care and oral health outcomes are still present [8]. Thus, it is not surprising that there has been international interest in strengthening dental care coverage programs aimed to better meet the oral health needs of populations [9–12]. Currently, most high-income countries provide some form of dental care coverage for children and youth, with variation in the extent of coverage available to adult and older adult populations [13].

There are at least two reasons to focus on dental care coverage for older adults. First, people are living longer while also retaining most of their own teeth. This trend increases the lifetime risk of tooth decay and gum disease, which are associated with other existing chronic conditions [3]. For example, poor oral health is more prevalent in patients with diabetic complications (e.g., neuropathy) compared to those without [14]. Also, poor oral health among older people can affect their ability to chew and eat, which can worsen their overall nutritional intake [15]. Second, in some countries such as Australia, Canada, and the United States, the working-age population relies heavily on private insurance to help cover the costs of dental care, with dental coverage strongly tied to employment-based dental insurance. In the United States, for example, loss of dental coverage among older adults has been associated with no longer seeking dental care services [16].

The role of public coverage in protecting against the costs of dental care services for older adults aged 65 years and older is not well known. While international comparisons on dental care outcomes and inequalities have been conducted for adults and older adults [6,17–20], there has been minimal attempt to use the characteristics of public dental care coverage as basis for comparison [21,22]. Further, there has been no study to our knowledge that has described the models of dental care coverage for this age group across a range of high-income countries. This paper aims to provide a description and mapping of public dental care coverage models in a range of comparable jurisdictions with a focus on older adults (individuals 65 years and older).

2. Methods

2.1. Conceptual framework

To describe and compare public dental care coverage models for community-dwelling (non-institutionalized) adults aged 65 and older across jurisdictions, coverage models were described according to the three core features of the WHO Coverage Cube framework (Fig. 1); these include: (i) breadth - older adult populations (≥65 years old) eligible for publicly funded dental care programs; (ii) depth - the share of the total costs that are borne by the government/public payer; and (iii) scope - the range of services covered under publicly funded dental care programs. Within the coverage cube framework, the gaps outside the breadth, depth, and scope of public dental care coverage may be covered in part with private (mostly voluntary) dental insurance, and the remainder would be from out of pocket payments (including both direct payments for services not included in any public coverage model, and cost sharing for services that are not fully publicly funded). Due to extensive variation in the role of private dental insurance plans across jurisdictions, we do not review or compare models of private insurance coverage in this paper.

2.2. Jurisdictions and target population

We selected eight countries to compare public dental care coverage models for community-dwelling older adults (≥65 years old): Australia, Canada, England, France, Germany, Italy, Sweden, and the United States. Our selection considered (i) high-income countries that are members of the OECD that are frequently compared and included in international data sources and surveys; and (ii) variation in health system funding and organizational models [23]. (See Supplemental Table 1 for some comparative data on health system and dental care spending and utilization). In France, a reform to dental care that is in the early stages of implementation will reduce out-of-pocket payments for several dental care services [24]; the data collected for this study reflect the situation as of June 2020. In three of the countries in our study – Canada, Australia, and United States – we focus on one sub-national jurisdiction given health and dental coverage varies widely across provinces and states. In Canada, publicly funded dental programs and services are organized at the provincial/territorial level; they are largely designed to fill in the gaps not covered through employment-based benefit plans which generally cover basic dental services. Alberta, Ontario (as of November 2019), Newfoundland and Labrador, and Yukon Territory are the only jurisdictions in Canada with publicly funded dental programs specifically targeting older adults [25,26]. We selected Alberta for inclusion in this study as it has the longest-standing public dental care program for older adults compared to other provinces and territories [25]. In Australia, public dental care receives funding from both the state and Commonwealth (federal) governments, and state and territory governments are at liberty to take different approaches to providing publicly funded dental care [10]. In this study, we include the most populous state in Australia: New South Wales. Finally, in the United States, public dental care coverage for some older adults is provided through both federal (Medicare) and/or state (Medicaid) programs. We describe dental coverage available through Medicare based on two coverage streams: traditional Medicare and Medicare Advantage, and we describe the Medicaid program in California, the most populous state in the United States.

We focused on adults 65 and older who live independently in communities (community-dwelling) and who access dental care services through fixed or mobile dental clinics; we do not include adults living in institutions (e.g., nursing homes, long-term care facilities, or aged-care homes), older adults who receive dental services in their home (e.g., domiciliary care or home care), or older adults who have public dental coverage based on special status (e.g., eligible veterans in Australia, Canada and United States, Indigenous specific coverage models such as the Non-Insured Health Benefits in Canada, and Indian Health Services in the United States). We focused on non-emergency dental care services provided in out-patient dental settings (dental clinics).

2.3. Data collection and synthesis

We collected information on public dental care coverage models for community-dwelling older adults (≥65 years old) from local content experts in eight jurisdictions, publicly available resources, and peer-reviewed publications. First, we developed data collection templates guided by the WHO Coverage Cube framework (Fig. 1). Members of the research team and local experts compiled dental care system characteristics from publicly available resources on national, provincial and/or territorial government websites and

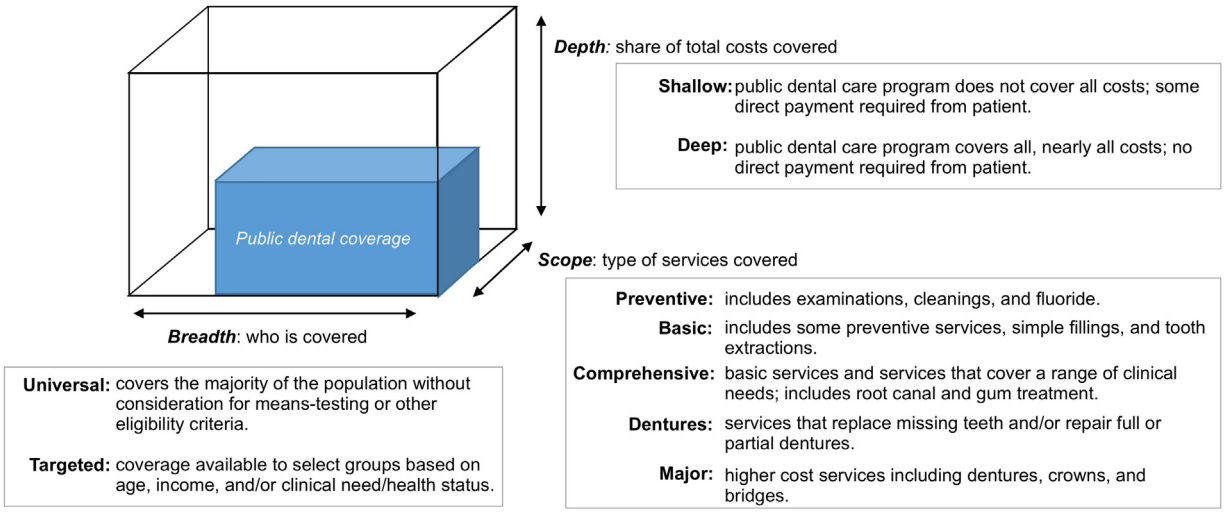

Fig. 1. Dimensions of coverage for public dental care models. Notes: Adapted from the World Health Organization Coverage cube framework (World Health Organization. Chapter 2: Primary Health Care-Now More Than Ever. In: World Health Report 2008 [Internet]. 2008. p. 41–60. Available from: https://www.who.int/whr/2008/08_chap3_en.pdf?ua=1). The scope of service coverage is described according to private insurance package groupings in Canada across multiple private insurers that belong to national organization - Canada Life and Health Insurance Association.

from a series of oral health reports published in the *British Dental Journal* [27–30]. We obtained estimates of health and dental care spending in each jurisdiction from the Organisation for Economic Cooperation and Development (OECD) [31]. For Italy, dental spending information was not reported in the OECD Health Statistics database and was provided by local experts. We then carried out a literature review to supplement the data collected from local experts and from OECD with an aim to identify studies that described, compared, and/or evaluated dental care programs for adults in the eight jurisdictions. Data on all elements were verified by local content experts in each jurisdiction (completed templates for each jurisdiction are available upon request). Our synthesis offers an overview of publicly funded dental coverage programs and does not capture some key features of dental coverage programs that may vary across the jurisdictions. These include information on whether there are frequency restrictions and limitations on service coverage, and details on the amount of co-payments or variation in coverage within jurisdictions if they exist.

3. Results

3.1. Breadth of coverage: who is covered?

Among the eight included jurisdictions, there are two general models for breadth of public dental care coverage for older adults, which we summarize as 1) universal population (all older adults are covered) and 2) targeted population (only older adults who meet an eligibility criterion are covered). Among the jurisdictions examined, four countries include a basket of dental care services within their broader statutory health system on a universal population basis thus covering all older adults (England, Germany, France, Sweden). The remaining jurisdictions do not include dental care coverage for older adults in their statutory health systems and public dental coverage for seniors is only available for targeted groups that meet specific eligibility criteria (Alberta, New South Wales, Italy, and the United States). Thus, in the second group of jurisdictions, there is a stark difference between health care, which is offered to (virtually) all older adults, and dental care, which is only available for some. This distinction becomes apparent when we compare the public/private mix of financing that makes up total health spending with dental health spending. Comparable spending data are only available for the general population (we cannot isolate spending for older adults only), and they are only reported at national level (we cannot isolate sub-national jurisdictions such as provinces and states). It is clear that in Canada, Australia and Italy, health care is mostly publicly funded, yet dental care is predominantly privately funded (with a combination of out-of-pocket payments and private insurance) (See Fig. 2) [[31,32]]. The United States is the exception, where private finance makes up a significant share of both total dental care and total health care spending (though if we were to isolate the public share of total health care funding for the population aged 65 years and older, this would be much higher than for the whole population, at roughly two-thirds of total spending [34]). We categorize these four jurisdictions as "targeted" in their breadth of coverage given that only a targeted subset of older adults is covered in the public dental care program; thus, public funds are aimed at specific population subgroups. Fig. 2 shows that the share of public funding for total dental spending is generally lower than for total health spending in the four countries with universal population coverage for dental care, but the difference is less pronounced than in the other four countries with only targeted coverage programs.

Among the jurisdictions for which only a subset of older adults is eligible for public coverage, there is some consistency in the criteria used to define eligibility. Table 1 describes the eligibility criteria for public coverage in the four jurisdictions that have "targeted" population coverage: United States, Alberta, New South Wales, and Italy. In the United States, nearly all older adults are eligible for Medicare, which is a federal program that covers the costs of hospital and physician services as well as prescription drugs. However, under Medicare, coverage for dental care services is only available to subgroups of the older adult population who either choose a Medicare Advantage plan that includes dental benefits, or are eligible for state Medicaid coverage. Older adults who are not enrolled in these plans can purchase a stand-alone/supplemental coverage plan [35]. Approximately one-third of individuals who are eligible for Medicare enroll in Medicare Advantage. Through Medicare Advantage, enrollees have the option to choose a plan that includes dental benefits, where approximately 60 % of enrollees do so [12,36]. In California, an estimated 2.6 million adults age 65 years and older (or roughly 47% of all seniors in that state) were enrolled in a Medicare Advantage plan in 2018 [37]. Nearly all Medicare Advantage plans in California provide the option of obtaining dental coverage, although normally this entails an additional monthly

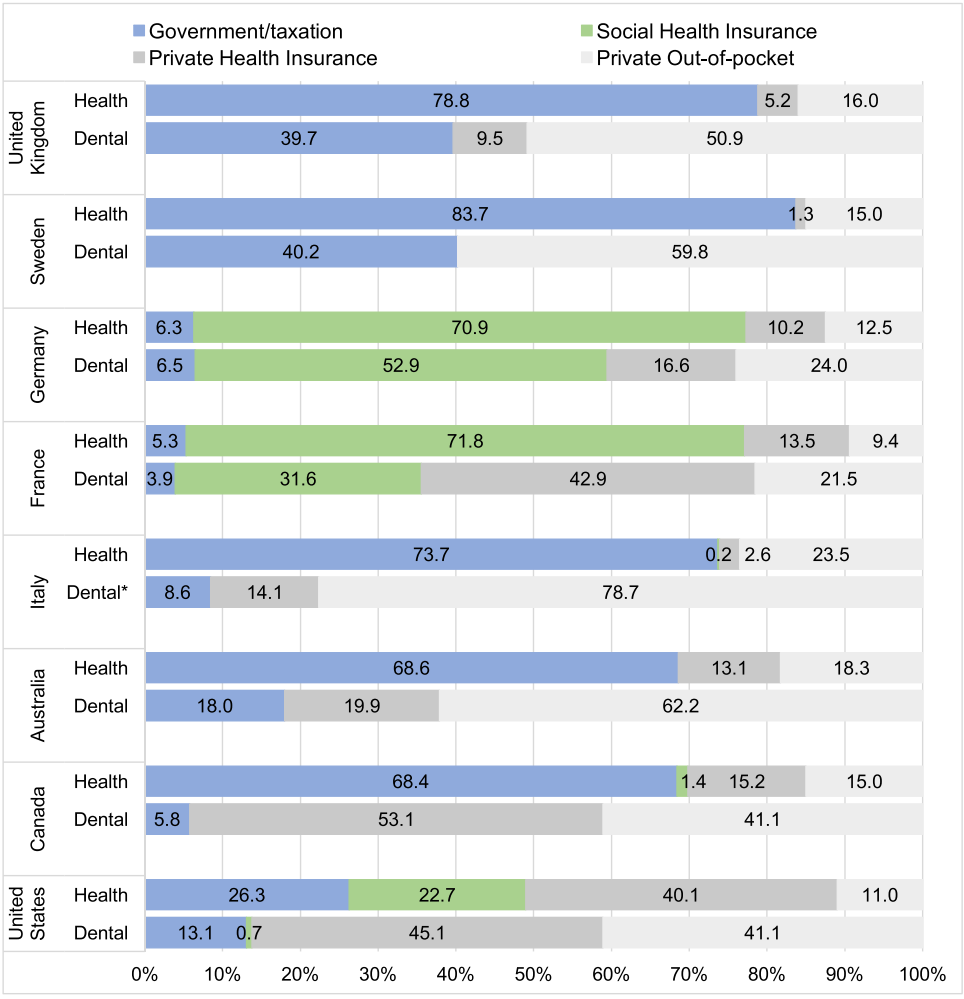

Fig. 2. Sources of funding total health and dental care across included jurisdictions (2017 or latest available year).
Source: OECD Health Statistics 2019(31); *Italian estimate provided separately [32]. Notes: Private insurance includes both voluntary and compulsory private insurance, which are reported separately in OECD Health Statistics. The data do not permit separation of spending by age group, so we refer to the entire population.

fee. Older adults who are not enrolled in Medicare Advantage plans, but who are dually eligible for Medicare and Medicaid (low-income status), are eligible for dental service coverage only in some states. In California, dental care is included in the Medicaid Program, called Medi-Cal, which covered 23% of Californian seniors in 2017 [38]. Taking the two public programs together, in California, between one half and two-thirds of seniors have some form of public dental coverage, though this is likely an overestimate since some seniors could be covered in both programs.

Alberta and New South Wales both offer targeted public coverage to older adults who meet specific low-income criteria, and in Italy the criteria consider both income and health conditions. In Alberta, the income threshold is set at a level that means roughly less than half of the population of adults age 65 years and older in the province would be eligible for any public coverage [39]. In New South Wales, the income criteria for that state's public dental care are defined by two Commonwealth (national) programs: the Commonwealth Seniors Health Card and the Pensioner Concession Card. Approximately 10 % and 60 % of residents 65 years and older in New South Wales have access to a Commonwealth Seniors Health Card or Pensioner Concession Card, respectively, and may be eligible for public dental care coverage [40,41]. In Italy, there is a broader set of eligibility criteria than in the other jurisdictions, these include low-income, socio-economic vulnerability, and specific health conditions (health vulnerability), which, taken together, means that roughly 25% of older adults (age 65 years and older) are eligible for some public dental coverage through the National Health Service.

3.2. *Scope of coverage: which dental services are covered?*

The second dimension of coverage – scope – is added to the comparison of dental coverage across the eight jurisdictions in Table 2. Most jurisdictions included in this study commit to a minimum scope of basic dental care services within their public programs that include routine and preventive dental care, such as exams, x-rays, scaling, fillings, and tooth extractions (Table 2). While basic dental care services are covered in the public programs we review, the one exception is fluoride, a low-cost, preventive treatment, which is not included or routinely covered in the public programs in four jurisdictions (Alberta, Italy, France and Germany).

In the United States, there is variation in the scope of public coverage available depending on the program. The two main programs are through Medicaid for lower income older adults dually eligible for Medicare and Medicaid, and Medicare Advantage. For the former group, the scope of coverage depends on state Medicaid dental policies; this ranges from emergency only care, limited care, to comprehensive service coverage [12]. The state-run program in California (Medi-Cal) provides comprehensive scope of coverage. The scope of dental coverage for Medicare Advantage enrollees varies widely by the particular Medicare Advantage plan in which

Table 1
Breadth of coverage: eligibility criteria for targeted public dental care coverage for individuals ≥65 years old in four jurisdictions.

	Overview of eligibility criteria
United States (Medicare)	• Income: dually eligible for Medicare and Medicaid (i.e. low income) in a state providing optional dental benefits. In California (Medi-Cal), the income threshold is set at 138% of the federal poverty line.
United States (Medicare Advantage)	• Choice: joins a Medicare Advantage plan that includes dental care.
Alberta (Canada)	• Income: not earn more than the following established program thresholds: CA$27,690 (single) or CA$55,380 (couple) for 100% coverage; and CA$27,690 to CA$31,675 (single) or CA$55,380 to CA$63,350 (couple) for partial (10–99%) coverage.[a]
New South Wales (Australia)	• Income: eligible for the *Commonwealth Seniors Health Card* (e.g., not earn more than established program thresholds), or the *Pensioners Concession Card.* [b]
Italy	• Income: declaration of financial hardship; OR • Clinical need: certificate of systemic disease or disability.[c]

[a] Based on 2019 income thresholds [1]. In 2018 the average individual income for seniors in Alberta was CA$44,100, and the median income was CA$32,200 (Statistics Canada 2020). This means about nearly half of all seniors in Alberta receive some public dental coverage.
[b] The annual income threshold for the Commonwealth Seniors Health Card for older adults age 60 years and older is: AU$55,808 (single); AU$89,290 (couples); AU$111,616 (couples separated by illness, respite care or prison). Eligibility for the Pensioners Concession Card is receiving any of the following Commonwealth payments for more than 9 months: JobSeeker Payment; Parenting Payment partnered, Partner Allowance, Sickness Allowance, Special Benefit, or Widow Allowance.
[c] In Italy, the income and clinical needs criteria apply both to the older population (65 years and older) and to the general population (all ages). Roughly 25% of the 65 years and older population would meet these criteria. The specific criteria vary by region. For example, in the Lombardy region, the low-income threshold is determined by a yearly pension below €11,500 for a family of two.

the person enrolls. These plans range from no dental coverage (40% of all enrollees), preventive only (exams and cleanings) (19% of all enrollees), comprehensive coverage (42% of enrollees), with some plans providing coverage of major services such as dentures [12].

Many public programs also provide comprehensive coverage, which includes root canal therapy (all eight jurisdictions), and periodontal treatment (management of gum disease) (in all but Alberta and France). There is also some coverage for major services, such as crowns and bridges, and dentures, which are often higher cost procedures; all three of these major services are covered in the public programs we reviewed except Alberta and Italy. No public program covers esthetic services. Overall the narrowest scope is seen in Alberta, followed closely by Italy.

3.3. *Depth of coverage: how much of the costs are covered?*

Across the eight jurisdictions, the depth of dental coverage for most dental services ranges from shallow (i.e., the public program covers only part of the total costs) to deep (the public program covers most or all of the total costs). Where there is shallow coverage, the remaining costs may be paid directly by patients through out of pocket payments or private (voluntary) dental insurance.

Three of the four jurisdictions with universal population coverage of older adults offer shallow coverage for basic dental services (England, Sweden, and France), with deep coverage in Germany. In England, unlike other health services where there is full financial protection, for dental care, adult patients of all ages pay part of the costs in the form of a flat fee for a course of treatment (in 2019 the fee was £22.70 or roughly 27 Euros for Band 1 services including preventive examination and diagnosis, and £62.10, or 75 Euros, for Band 2 services which includes some basic services such as fillings but also some more expensive services such as root canal, tooth extraction) [42]. In Sweden, individuals aged 65 years and older receive a fixed annual subsidy (or allowance) of 600 SEK (57 Euros) to be used toward preventive dental care, and then they pay any amount that exceeds this value. Patients can use this general dental allowance for examinations, preventive treatments and any other dental care that entitles them to state dental support. In addition, there is an allowance of 600 SEK (57 Euros) every 6 months towards preventive dental care for patients of all ages (including seniors age 65 years and older) who are diagnosed with a major disease with implications for oral health (e.g., dry mouth due to radiation, Crohn's disease, severe diabetes). Thus, dental care is covered differently from other health services like primary care and specialist care visits, for which there are fixed co-payments instead of allowances [43]. In addition to the annual subsidy (allowance) for preventive dental care in Sweden, there is catastrophic coverage

Table 2
Overview of the scope of public dental coverage available to individuals ≥65 years old across eight jurisdictions.

		Comprehensive services								Major services		
		Basic services										Esthetic
		Preventive services				Simple Fillings	Tooth extractions	Root canal	Periodontal (gum) treatment	Crowns & bridges	Dentures	
		Routine exams	Routine x-rays	Scaling	Fluoride							
Targeted (sub-set of older adults)	US Medicare/Medicaid[a]	√	√	√	√	√	√	√	√	√	√	–
	US Medicare Advantage[b]	√	√	√	√	√	√	√	√	√	√	–
	Canada (Alberta)	√	√	√	–	√	√	√	–	–	√	–
	Australia (NSW)	√	√	√	√	√	√	√	√	√	√	–
	Italy	√	√	√	–	√	√	√	√	–	–	–
Universal (all older adults)	England	√	√	√	√	√	√	√	√	√	√	–
	Sweden	√	√	√	√	√	√	√	√	√	√	–
	France	√	√	√	–	√	√	√	-	√	√	–
	Germany[c]	√	√	√	–	√	√	√	√	√	√	–

Note: √ indicates coverage is available, - indicates not covered. This table does not capture frequency limitations, discretions, or depth of coverage for services. Preventive services include routine exams, routine x-rays, scaling, fluoride; Basic services include preventive services, simple fillings and tooth extractions; Comprehensive services include basic services, root canal treatment, and periodontal(gum treatment); Major services include crowns, bridges, and dentures.
[a] The scope of coverage varies widely across US states so we focus here on Medi-Cal, the Medicaid program in California.
[b] The scope of dental coverage for Medicare Advantage enrollees is the same regardless of income or clinical need criteria.
[c] Fluoride is not routinely covered for adults in Germany; they are only covered in certain cases.

for other dental services. For dental care costs above the allowance, patients pay themselves out of pocket up to 3000 SEK in a year (about 284 Euros), patients then pay 50% of the costs up to 15,000 SEK (1420 Euros), and they pay only 15% of costs above 15,000 SEK (1420 Euros). In addition, in Sweden there are references prices for dental care which place limits on coverage for patients, whereby there is no public coverage of service or treatment costs that exceed a fixed reference price for that service or treatment [44]. In France, patients contribute in the form of 30% co-insurance [33]with these costs often covered by private insurance, as with all other health (non-dental) services [33]. In Germany, the full cost of basic dental care services that follow a defined standard of treatment is covered by the statutory social health insurance (SHI) system, as with other health services.

Among these four jurisdictions with universal population dental coverage, coverage is shallow for major services, such as crowns and bridges, and dentures. In England, these services are considered as part of "Band 3" course of treatment for which there is a co-payment of £256.50 (roughly 290 Euros). In France and Sweden, major services are subject to the same cost sharing arrangements as for basic services described above. Dental care reforms in France that are currently under way will remove out-of-pocket payments for major dental services and therefore will change the depth of coverage for these services in France from shallow to deep, once these are fully implemented in 2023 [24]. In Germany, while basic services are fully covered (when the patient follows the defined standard of treatment), there is shallow coverage of prosthetic treatments (e.g. crowns, dentures). For those who have defined clinical indications, they receive a fixed subsidy of 50% for standard care treatment by SHI for major services, with higher fixed subsidies available for individuals who visit the dentist for regular preventive care and dental examinations. The same amount of fixed subsidy is paid by SHI (levied on the costs of standard care) even if individuals choose a different treatment option than what is defined as standard care. This in turn means that choosing a different treatment (e.g. higher quality materials) may lead to higher out-of-pocket costs (or these may be covered by complementary private insurance). The subsidy is set to increase to 60% of the costs of standard care in October 2020.

In the four jurisdictions with targeted population coverage, the depth of coverage of basic dental care services range from shallow to deep (fully covered) for older adults who meet specific income or clinical criteria depending on their jurisdiction. In Alberta, there is deep coverage for basic services for the lowest income older adults, and shallow coverage for those who meet a slightly higher income threshold. However public coverage for all enrollees has a limit in Alberta: there is a maximum coverage of CAD $5000 (about 3400 Euros) over five years, and some services have frequency limits (e.g., one check-up examination per year). In New South Wales, there is deep coverage for basic and major services for eligible older adults who have a Commonwealth Seniors Health Card or Pensioners Concession Card with no pre-specified caps on coverage. In Italy, the depth of coverage available to eligible (targeted) adults varies from shallow to deep, since, as noted in the previous section, eligibility is restricted to particular health and socio-economic conditions, and co-payments may be required for some targeted groups for some services according to a mix of national and regional provisions [45]. For example, in Lombardy Region, there is deep coverage (no co-payment) for seniors with a yearly pension below €11,500 (for a family of two), or with other socio-economic (unemployed) and health vulnerabilities, and includes basic services (preventive visits, fillings, and scaling). In the United States, low-income older adults who are dually eligible for Medicare and Medicaid, or those who enroll in Medicare Advantage plans, sometimes receive shallow coverage (co-payments required) for dental services through these programs. In the Medicaid program in California, Medi-Cal, there is shallow depth of coverage because of the co-payments (US$1 per outpatient visit) and annual coverage limit of US$1800 per year (about 1500 Euros). Note that this coverage limit in California is a soft cap, as it can be exceeded in some circumstances deemed medically necessary with prior authorization. For major services, there is either no public coverage (e.g., for crowns and bridges in Alberta and Italy), or shallow coverage. An exception is New South Wales which has deep coverage for all eligible seniors.

3.3.1. *Extended depth of coverage for vulnerable populations*

Among the four jurisdictions with universal breadth of public dental coverage for older adults (England, France, Sweden, and Germany), there is extended depth of coverage for specific sub-groups of the population that are considered vulnerable (see Table 3). England and Germany provide extended (deep) coverage to all lower-income adults (e.g., those who receive income supports, or social assistance) and in France, it is provided to all adults with low-income (through one of three programs - cou*verture maladie universelle-complémentaire* (CMU-C), *aide à l'acquisition d'une complémentaire santé* (ACS) and *aide médicale de l'état* (AME)) or with specific long-term medical conditions [33]. Sweden considers age (65 years and older) as one of the criteria for extended coverage, whereas other jurisdictions set criteria that apply to adults of all ages. All adults in Sweden are eligible for subsidized dental care, but the amount of coverage varies by age group: individuals 24–29 years old and those 65 and older receive 600 SEK, roughly 57 Euros, per year, whereas individuals 30–64 years old receive 300 SEK, or 28.4 Euros, per year for preventive dental care [44].

4. Discussion

There is a considerable variation in the breadth, scope and depth of public dental coverage for older adults across eight comparable high-income jurisdictions. These coverage models fall into four broad categories: [1] deep public coverage of basic dental services for a subset of the older adult population defined based on strict eligibility criteria (Alberta, New South Wales and Italy) [2]; universal, shallow coverage of basic dental services for all older adults (England, France, Sweden) [3]; universal, deep coverage of basic dental services for all older adults (Germany); and [4] shallow coverage of basic services available to some subgroups of the population (for lower income older adults dually eligible for Medicare and Medicaid, e.g., in California, and for older adults in some Medicare Advantage plans in the United States). Within each of these categories, there are some variations, and nuances worth noting. Two jurisdictions place financial limits on the depth of coverage, with an annual (or 5-year) spending limit over which the costs are shifted onto individuals (Alberta, and Medi-Cal in the United States). Two jurisdictions impose standard, fixed fees per service item above which the costs are shifted to individuals if they choose a more costly service or provider (Germany and Sweden). In other jurisdictions, coverage is not limited by financial caps, but is rather through limited supply, whereby lengthy wait lists are used to limit patients from accessing the publicly funded dental care for which they are eligible (New South Wales, and Italy).

Among the eight jurisdictions included in this study, the models of public dental coverage relate to some extent to the main method of financing the health system. Dental care coverage is consistent with, and treated similarly to, other health services and included in the statutory benefits package only in the two social insurance-financed systems – France and Germany. In France, a reform to dental care that is in the early stages of implementation aims to increase public coverage, and reduce out-of-pocket payments, for

Table 3
Overview of the depth of public dental coverage available to individuals ≥65 years old across eight jurisdictions.

		Comprehensive services								Major services		
		Basic services						Root canal	Periodontal (gum) treatment	Crowns & bridges	Dentures	Esthetic
		Preventive services				Simple Fillings	Tooth extractions					
		Routine exams	Routine x-rays	Scaling	Fluoride							
Targeted population (sub-set of older adults)	US Medicaid (Medi-Cal)[a]	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	–
	US Medicare Advantage[b]	Deep	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	–
	Canada (Alberta)[c]	Deep	Deep	Deep	–	Deep	Deep	Deep	–	–	Shallow	–
	Australia (NSW)	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	–
	Italy	Deep	Deep	Deep	–	Deep	Deep	Deep	Deep	–	–	–
Universal population (all older adults)	England	Shallow + Deep	Shallow + Deep	Shallow + Deep	Shallow + Deep	Shallow + Deep	Shallow+ Deep	Shallow + Deep	Shallow+ Deep	Shallow + Deep	Shallow + Deep	–
	Sweden	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	–
	France	Shallow + Deep	Shallow + Deep	Shallow + Deep	–	Shallow + Deep	Shallow + Deep	Shallow + Deep	-	Shallow + Deep	Shallow + Deep	–
	Germany[d]	Deep	Deep	Deep	–	Deep	Deep	Deep	Deep	Shallow + Deep	Shallow + Deep	–

Note: - indicates not covered. Preventive services include routine exams, routine x-rays, scaling, fluoride; Basic services include preventive services, simple fillings and tooth extractions; Comprehensive services include basic services, root canal treatment, and periodontal(gum treatment); Major services include crowns, bridges, and dentures.

[a] This classification reflects the coverage for older adults dual eligible for Medicare and Medicaid in California (in Medi-Cal), and does not reflect the scope coverage for across all states. For example, the scope ranges from limited number of exams or cleanings; emergency services only; more extensive benefits with annual cap on benefits.

[b] The scope of dental coverage for Medicare Advantage enrollees is the same regardless of income or clinical need criteria.

[c] This "deep" classification in Alberta only pertains to the lowest income group for which there are no co-payments, and within the limit of CA$5000/5 years.

[d] Only for pre-defined basic standard care, see above; Coverage for major services is set at 50% (60% in October 2020) of total cost, and requires a substantial OOP co-payment. This coverage can increase for patients who make regular use of preventive services. Additional coverage is available to individuals who fulfill income criteria.

several dental care services [24]. In Germany, dental care services are a well-established component of health care, and, consequently, the benefit basket. This is reflected in the participation of the Federal Association of Dentists in the Federal Joint Committee, which decides the scope of coverage. It is therefore unlikely that dental care would be fully removed from the benefit catalogue. In contrast, in the tax-funded systems with universal dental coverage for all adults - England and Sweden, the depth of coverage and mechanism of finance are different for dental care than for other health services. In the English National Health Service (NHS), which does not have an explicitly defined benefits package, there has been a steady decline in the public financing of dental care since the early 1990s, as co-payments have increased since they were initially introduced shortly after the introduction of the NHS [46]. Germany recently passed a law extending public financing for dentures, crowns, and bridges from 50% of the defined cost of standard care treatment to 60% (this will take effect in October 2020), with even higher fixed subsidies in the case of regular preventive care and dental examinations. The remaining four jurisdictions provide dental coverage only to a subset of its population, thus treating it more like a safety net program than as part of the broader health coverage system. Interestingly, only in Germany is there an explicit attempt to use financial incentives (deeper coverage) to steer patients toward more preventive dental care seeking behaviours (e.g., check-ups). In Sweden, the use of allowances for preventive dental care may also incentivize annual preventive check-ups because there are no co-payments for dental costs within that allowance.

4.1. Population coverage for older adults

While the focus of this study is on older adults, it is important to note that three of the eight jurisdictions we include do not make any distinction to coverage for older adults compared to younger adults (France, Germany, England). Older age is one of the criterion for determining coverage in the other five jurisdictions we include (United States, Sweden, Italy, Alberta, and New South Wales). The Medicare program in the United States is age-based: it covers the 65 years and older population along with some people with disabilities, and dental coverage is available for those that are low income and qualify for Medicaid, or those who opt for a specific Medicare Advantage plan that includes dental care. For the state of California, between half and two-thirds of the older adult population would be covered by either Medicaid (Medi-Cal) or Medicare Advantage. In Sweden, age is only considered as a criterion for the extended depth of coverage. In Italy, Alberta and New South Wales, the age criterion is combined with additional financial eligibility criteria.

4.2. Financial protection and the role of private insurance

There is some evidence from the literature to suggest that cost-barriers to dental care are lower on average in jurisdictions with universal population coverage that is shallow than those with targeted population coverage that is deep for a subset of older adults [6,7,47]. While jurisdictions with targeted population coverage provide deep coverage of some services to eligible older adults, the design of the coverage programs means that those ineligible for public coverage (e.g., with income that falls just above the threshold) may not be able to afford dental care costs.

Private (voluntary) insurance plays an important role in some jurisdictions in financing dental care for the general population, as noted in Fig. 2; it also plays a role in protecting older adults from the costs of dental care, in particular in Australia, France and the United States. In Australia, an estimated 46% of individuals aged 65 years and older have some level of private health insurance that covers dental care [46]. In the United States, nearly 8% of Medicare beneficiaries have private insurance that covers dental care, compared to 27% with coverage through Medicare Advantage or Medicaid which leaves 65% with no dental care coverage [12]. In the other countries, data on private insurance coverage is available only for the general population and so we are unable to estimate and compare coverage for the older population. For example, in France, nearly all individuals have voluntary health insurance (96%), covering the co-

insurance for health and dental services [48], which suggests that most older people hold this coverage as well. In other countries, private health insurance is less prevalent, e.g., less than 5% of the general population in Sweden, and about 11% of the general population the UK [48]. In Canada, private insurance is closely tied to employment and there is limited data on the dental care coverage of older adults, with survey data suggesting a decrease in employer coverage in this population over the decade 2005–2014 [49]. While some older adults will continue to be covered through their previous employers and some may choose to purchase an individual plan, others would pay out of pocket. Further comparative research on the breadth, depth and scope of private insurance coverage for dental care would help to shed light on the extent to which they provide financial protection for older adults.

4.3. Service coverage

In general, each jurisdiction covers a basic set of services within their public programs. Within these programs, most jurisdictions cover preventive services, such as dental exams, x-rays, and scaling, but four of eight (Alberta, Italy, France, and Germany) do not routinely cover fluoride treatments for older adults. Older adults are at greater risk of developing decay on dental root surfaces of their teeth, which can be prevented through regular professionally applied fluoride treatments [50]. In terms of comprehensive and major services, all public programs include some coverage for root canals, and most cover periodontal (gum) treatment, crowns and bridges, and dentures. The lack of public coverage for these services in some jurisdictions may be due to the risk of overtreatment, lack of evidence on the effectiveness of these treatments, and lack of clinical guidelines in dentistry [51,52]. It is important to note that while some public coverage is available for major services across most of the jurisdictions in this study, barriers to accessing these services may still exist. For example, prior approval and copayments may be required before services, such as crowns, root canal therapy, or dentures, can be rendered. Building on previous work from Eaton and colleagues (2018), case profiles and vignettes can be utilized to compare the types of care and services available for individuals with different clinical conditions and treatment needs [53]. This type of analysis can help describe the extent to which different coverage models address different dental diseases and conditions, such as tooth decay and/or gum disease.

4.4. Contextual and system-level considerations

While this study describes aspects of public dental care coverage models for older adults, there are several other factors that may affect the accessibility and effectiveness of dental care coverage. First, social and cultural factors, including language, education, and health literacy may impact access to care for particular subgroups of older adults (e.g., immigrants) [54]. Second, clinical needs and dental utilization patterns may differ between low- and high-income earning older adults [55], which would be important to consider when developing coverage models for subgroups of the population. Third, models of organization and delivery of dental care may impact access. There is some evidence that clinic setting may not impact access to care within public dental care programs: studies from Sweden and the United Kingdom suggest there does not appear to be differences in perceptions of quality of care or cost barriers to care for adults and older adults between public and private clinics [56,57]. Fourth, the method of paying dentists and delivery setting appears to impact outcomes: one study in Australia found that salaried dentists in public clinics are more cost effective and have lower overall costs than dentists in private clinics who are paid by FFS or vouchers; yet dentists in private clinics paid by vouchers were associated with higher volume of services provided than the other two payment and delivery models [58]. Payment reforms within public dental care models can also influence provider behaviours [59]. Finally, access to dental care is limited due to capacity and supply constraints within public dental care clinics and high demand for dental care in some jurisdictions. For example, only about 20% of individuals eligible for public dental coverage are able to receive dental care in Australia, which has led to long waiting times for care [10]. Thus, while the model of dental coverage in terms of its breadth, depth and scope likely impacts access to dental care and related oral health outcomes for older adults, there are many other system structures such as provider payment models, extent and type of out-of-pocket payments, supply and organizational factors that also impact financial protection and accessibility of dental care across and within these jurisdictions. These contextual and system-level factors impacting access to dental care warrant further attention.

4.5. Limitations and strengths

This review drew on publicly available information and contributions by local experts. There are limited data available on oral health outcomes, quality of dental care, dental visiting behaviours, and dental care utilization. There are no consistent or standardized oral health indicators to compare jurisdictions (OECD, World Bank, WHO and the European Union). Our comparisons relied largely on data collected directly from local experts, including members of our project team, and international surveys that had consistent methodology and that reported estimates for jurisdictions in our study. Dental care spending data were also not available for Italy and thus we relied on local sources, which may not be directly comparable to the OECD estimates. This review did not describe other key features of dental coverage programs that vary across the jurisdictions, such as non-financial barriers to access such as waiting times, continuity of care, or differences the delivery of dental care across public (e.g. government owned clinics) and private sectors. Finally, we did not compare the provider fees within and between dental service fee schedules of private and public systems. Many jurisdictions have private and public dental service fee schedules (e.g., in France, Sweden, and Canada) where the fees are higher in private compared to public fee guides. These aspects of dental care coverage could be topics for future research.

5. Conclusion

This study provides an in-depth comparison of the public coverage of dental care for older adults across a range of high-income jurisdictions. While older age is an important consideration in the design of public coverage in Alberta, New South Wales and the United States, several jurisdictions do not consider age as an eligibility criterion for public coverage (England, France, and Germany). Moreover, all jurisdictions we include, except Sweden, provide differential (e.g., extended depth) coverage for those who meet a specific low-income threshold. One of the priorities for improving oral health outcomes across countries is to integrate dental care services into the broader health system [60,61]. Our findings suggest that the level of integration may be more feasible in some countries than in others depending on the current approach to coverage that ranges from fully integrated into the benefits package to almost completely separate from the coverage of health care more broadly. Further research can test these patterns across a larger number of countries and test the impacts of these structural differences on access and oral health outcomes. Due to the limited availability of comparable data within and across jurisdictions, in particular those outside the European region, further research would benefit from standardized data collection initiatives for oral health mea-

sures. Future work should also consider the role of different system and provider-level factors (such as public/private delivery setting and provider skill-mix within public dental coverage models), the impacts of limited supply on access to care even among eligible individuals, and the extent to which cost-effectiveness or clinical effectiveness evidence informs decisions on which services are covered. Finally, there is a need to consider how models of public dental care coverage could enable the integration of oral health care with medical care to better meet the needs of the growing population of older adults with multiple health conditions.

Declaration of Competing Interest

None.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.healthpol.2020.06.015.

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