Structural Determinants and Children's Oral Health: A Cross-National Study

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Supplementary Appendix 1: Details of the individual studies

Australia

A cross-sectional epidemiological study was conducted involving a sample of 8-to-13-year-old schoolchildren in South Australia in 2002/03. All participants completed the long-form $CPQ_{11-14.}$ Information on dental caries experience was obtained from the School Dental Services electronic data management system. Ethical approval was given by The University of Adelaide Human Research Ethics Committee. Further details of the study may be found in Do *et al* (2008)[1].

Brazil

In 2009, a cross-sectional study was conducted of 11-to-14-year-old schoolchildren in public and private schools from 13 municipalities in the Midwest Region of the Brazilian Southern State of Santa Catarina. All participants completed the short-form CPQ_{11-14} and were examined using standard oral epidemiological methods[2] (World Health Organization, 1997). The reproducibility of clinical diagnosis was tested through duplicate examinations on 10% of the sample by each of the examiners; this showed kappa values (both intra- and inter-examiner) greater than 0.8, calculated on a tooth-by-tooth basis. The project obtained approval from the Ethics Committee of the Universidade do Oeste de Santa Catarina. Further details of the study may be found in Traebert *et al* (2012)[3].

Brunei

A cross-sectional epidemiological survey of Year-6 schoolchildren (aged 10 to 14) attending the nine Government primary schools in Brunei Zone II (Brunei-Muara district) was conducted in 2010. A Malay version of the short-form CPQ was derived through a forward–backward translation process, then piloted and adapted. All participants completed the Malay short-form CPQ_{11-14} and were examined using the WHO protocol. For intra-examiner reliability, the intraclass correlation coefficient for DMFS was 0.99; for inter-examiner reliability, it was 0.99. Ethical approval was obtained from the Medical and Health Research and Ethics Committee of the Brunei Ministry of Health. Further details of the study may be found in Mohamad *et al* (2013)[4].

Cambodia

A consecutive clinical convenience sample was obtained of 8-to-14-year-old children who received treatment from One-2-One charitable trust's mobile dental clinics in four provinces (Battambang, Phnom Penh, Takeo, and Kampong Thom). All participants completed the short-form CPQ_{11-14} and were examined using the WHO protocol. For intra-examiner reliability, the intraclass correlation co-efficient for DMFT was 0.98; for inter-examiner reliability, it was 0.98. Ethics approval was granted by the Universiti Malaya ethics committee. Further details of the study may be found in Turton *et al* (2015)[5].

Germany

During the annual dental public health examinations conducted from September 2007 until April 2008, 1,498 11-14-year-old students were recruited from a midsize town in Germany (Wernigerode in Saxonia-Anhalt). All participants completed the German long-form version of the CPQ_{11-14} and were examined using the WHO protocol. The study was approved by the Institutional Review Board of the University of Leipzig. Further details of the study may be found in Bekes *et al* (2012)[6].

Hong Kong

The data were collected in an oral health survey conducted by the Department of Health of the Hong Kong SAR Government in 2001 in order to assess the oral health of 12-year-old school children, using a random sample of 542 individuals. A total of 26 schools was systematically selected from all local secondary schools in a database provided by the Education Department, and 18 schools agreed to participate. All children had been born in 1988 and were 12 years old. A maximum of 50 children were selectively sampled from each of the selected schools. All participants completed the long-form CPQ_{11-14} and were examined by a trained and calibrated examiner using the WHO survey protocol. For dental caries experience, the kappa value was 0.94. Further details of the study may be found in Lau *et al* (2009)[7].

Malaysia

The data came from a cohort study of 12-13-year-old children examined at secondary schools in Banting district, Selangor. Multistage probability sampling was used to sample the children. All participants completed the long-form CPQ_{11-14} and were examined by a trained and calibrated examiner using the WHO survey protocol. The project was approved by the University of Sheffield and the Economic Planning Unit, Prime Minister's Office, Government of Malaysia. Further details of the study may be found in Baker *et al* (2010)[8].

Mexico

A cross-sectional study was conducted of 12-to-14-year-old schoolchildren attending public schools in a peri-urban community in a low-income area. All participants completed the long-form $CPQ_{11-14.}$ The examiners used the WHO criteria and obtained a kappa of 0.87 for the presence of dental caries. Ethical approval was given by the Dental School of the National Autonomous University of Mexico (Mexico City). Further details of the study may be found in del Carmen Aguilar-Diaz *et al* (2013)[9].

New Zealand 1

A cross-sectional epidemiological survey was conducted of all 12- and 13-year-old children attending intermediate schools in Dunedin in 2010. All participants completed the short-form CPQ_{11-14} and were examined using the WHO protocol. For intra-examiner reliability, the intraclass correlation coefficient for DMFS was 0.96; for inter-examiner reliability, it was 0.97. Ethical approval was obtained from the Lower South Ethics Committee. Further details of the study may be found in Foster Page *et al* (2013)[10].

New Zealand 2

A cross-sectional epidemiological survey was conducted of all 12- and 13-year-old children attending schools in Northland in 2008. All participants completed the short-form CPQ_{11-14} and were examined using the WHO protocol. For intra-examiner reliability, the intraclass correlation coefficient for DMFS was 1.00; for inter-examiner reliability, it was 0.98. Ethical approval for the study was obtained from the Northern Y Regional Ethics Committee. Further details of the study may be found in Foster Page *et al* (2008)[11].

New Zealand 3

A simple random sample of children in their 8^{th} year of schooling (and who were enrolled with the Taranaki school dental service) was selected from the four intermediate schools and invited to participate in 2003. All participants completed the long-form CPQ_{11-14} and were examined using the WHO protocol. For intra-examiner reliability, the intraclass correlation coefficient for DMFS was 0.94; for inter-examiner reliability, it was 0.93. Ethical approval was obtained from the Taranaki Ethics Committee. Further details of the study may be found in Foster Page *et al* (2005)[12].

Thailand 1

This was a sample of children (10-14 years) attending schools in Sriracha district, Chonburi province. Eight schools were purposively sampled to yield a range of social and economic groups and rural and

urban locations. All children within the age range at each school were invited to participate and completed the long-form CPQ_{11-14}; they were examined using the WHO protocol. The study was approved by the Ethical Review Committee for Research in Human Subjects: Ministry of Public Health, Thailand. Further details of the study may be found in Gururatana *et al* (2014)[13].

Thailand 2

These data were obtained from the baseline sample in a randomised control trial involving children (10-12 years old) examined at randomly selected primary schools in Khonkaen. All children within the age range at each school were invited to participate and completed the long-form CPQ_{11-14}; they were examined using the WHO protocol. The project was approved by the University of Sheffield and the Ethical Review Committee for Research in Human Subjects, Ministry of Public Health, Thailand. Further details of the study may be found in Nammontri *et al* (2012)[14].

United Kingdom 1

In Sheffield in 2003, a cross-sectional survey was conducted of children (11 and 14 years) attending for an examination at the orthodontic and paediatric dentistry clinics at a Dental Hospital and one General Dental Practice. A consecutive sample of children completed the long-form CPQ_{11-14} and were examined by calibrated examiners. Dental caries status was assessed at the D3 threshold using the British Association for the Study of Community Dentistry criteria (Pine *et al*, 1997). The project was approved by the South Sheffield Research Ethics Committee. Further details of the study may be found in Marshman *et al* (2005)[15].

United Kingdom 2

Baseline data were obtained from a longitudinal epidemiological survey conducted in 2007-08 with a convenience sample of schoolchildren aged 11-12 years attending seven publicly-funded schools in England. Ethical approval for the study was obtained from the School of Health and Related Research Ethics Committee on behalf of the University of Sheffield (February 2006), and permission was also obtained from the Local Education Authority of each area sampled. All participants completed the short-form CPQ_{11-14}. Caries experience was assessed by two examiners who were BASCD trained and calibrated (Pine *et al*, 1997)[16]. Further details of the study may be found in Benson *et al* (2015)[17].

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Supplementary Appendix 2. Information on structural determinants, definitions, indicators, measurement and data sources

Structural determinant	Definition	Indicator	Measurement	Data source	Year(s)
Governance	"the traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced, (b) the capacity of the government to effectively formulate and implement sound policies, and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them"	1. Freedom "encompasses two characteristics (1) political rights – these enable people to participate freely in the political process, which is the system by which the polity chooses policy makers and attempts to make binding decisions affecting the national, regional or local community. In a free society, this represents the right of all adults to vote and compete for public office, and for elective representatives to have a decisive vote on public policies; (2) civil liberties - the freedoms to develop views, institutions, and personal autonomy apart from the state" https://freedomhouse.org/report/methodology-freedom-world-2017	Freedom House annual survey employs two checklists: (1) political rights with sub-categories of electoral process, political pluralism and participation, functioning of government, and (2) civil liberties with sub-categories of freedom of expression and belief, associational and organisational rights, rule of law, personal autonomy and individual rights. Each country is assigned a numerical rating for each category. The raw points are converted to a 1-7 rating for both political rights and civil liberties. The combined average determines the final 'freedom status' for a country:	Freedom House https://freedomhouse.org/report-types/freedom-world	2000

	(The World Bank, 2010, p. 4)		<1-2.5 = free, 3.0-5.5 = partly free, 5.5-7.0=not free https://freedomhouse.org/report/methodology-freedom-world-2017		
		2. Political regime Classification of 202 countries political regimes as democracy and dictatorship. “Democracies are regimes in which governmental offices are filled as a consequence of contested elections and dictatorships are those in which they are not. Among democracies, there are parliamentary (only the legislature can remove the government), presidential (only the president can remove the government) and mixed or semi-presidential (the legislature can remove the government and there is a directly elected head of state). In dictatorships there are those that are monarchic (family and kin networks remove the government), military (the armed forces remove the government) and civilian (a residual category often characterised by the presence of a political party as the institution capable of determining the fate of existing governments)” (Cheibub et al., 2010, p. 97)	0 = parliamentary democracy 1 = presidential democracy 2 = civilian dictatorship 3 = royal dictatorship https://sites.google.com/site/joseantoniocheibub/datasets/democracy-and-dictatorship-revisited	https://sites.google.com/site/joseantoniocheibub/datasets/democracy-and-dictatorship-revisited	2000

		3. Governance "Consists of the traditions and institutions by which authority in a country is exercised including the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for institutions that govern economic and social interactions among them" http://info.worldbank.org/governance/wgi/index.aspx#doc Six dimensions of governance; (1) voice and accountability –perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media, (2) political stability and absence of violence/terrorism – perceptions of the likelihood of political instability and/or politically-motivated violence, (3) government effectiveness – perception of the quality of public services, civil service, and the degree of its independence from political pressures, quality of policy formulation and implementation, and credibility of government's commitment to policies, (4) regulator quality – perception of the ability of government to formulate and implement	The six dimensions of governance are produced for 215 economies based on 32 individual data sources from a variety of survey institutes, think tanks, non-governmental agencies, international organisations, and private sector firms. The percentile rank among all countries is then calculated from 0 (lowest) to 1000 (highest) rank. Kaufman et al. (2010) http://info.worldbank.org/governance/wgi/index.aspx#doc	Worldwide Governance Indicators http://info.worldbank.org/governance/wgi/index.aspx#home	2000

		sound policies and regulations that permit and promote private sector development, (5) rule of law – perception of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence, and (6) control of corruption – perception of the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (Kaufman et al., 2010, p. 4)			
Macro-economic policy	The set of government rules and regulations to control or stimulate the aggregate indicators of an economy. Policies include fiscal, monetary, balance of payments and trade policies and underlying labour structures. Aggregate indicators involve national income, money	1. Employment to population ratio, 15+ years This ratio is the proportion of a country's population that is employed. Ages 15 and older are considered the working-age population. The data presented here are ILO estimates which are harmonised to ensure compatibility across countries. The estimates may differ from national estimates.	total % of the working population (modelled ILO estimate)	World Bank https://data.worldbank.org/indicator/SL.EMP.TOTL.SP.ZS?view=chart	2000

	supply, inflation, unemployment rate, growth rate, interest rate, and others.				
		2. GDP per capita, PPP Gross domestic product per capita based on purchasing power parity (PPP). This is GDP converted to international dollars using purchasing power parity rates. GDP at purchaser's practices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus subsidies. This therefore represents the incomes of countries in terms of equivalent purchasing power and thus controls for differences in cost of living across countries.	Current international $	World Bank https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?view=chart	2000
		3. GINI index Measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. It therefore represents a measure of inequality in income distribution.	Gini index is a measure of statistical dispersion which ranges from 0 where all values are the same (perfect equality – everyone has the same income) to 1 (maximum inequality) (World Bank estimate)	World Bank http://dataworldbank.org/data-catalog/all-the-ginis except data for NZ which was from: Perry (2007)	2000-2004

Social policy	The role of the state in the protection and promotion of economic and social well-being of citizens through education, health, housing, welfare and taxation.	1. Welfare regime "repeated systemic arrangements through which people seek livelihood security both for their own lives and for those of their children, descendents and elders" (Wood and Gough, 2006)	Wood and Gough's (2006) modified Esping-Andersen typology of 3 welfare types; conservative-corporatist, liberal, social democratic expanded to include informal and formal security regimes: 1 = welfare state regime – liberal 2 = welfare state regime – conservative-corporatist 3 = informal-security regime – productivist 4 = informal-security regime – liberal informal	Wood and Gough (2006) taxonomy of global welfare regimes	c. 2000
		2. Human Development Index (HDI) A composite measure developed by the United Nations representing three key dimensions of social policy – a long and healthy life, access to knowledge and a decent standard of living. http://hdr.undp.org/en/content/human-development-index-hdi	The HDI is the geometric mean of normalised indices for each of three dimensions: health (life expectancy at birth (years)), education (mean years of schooling for adults, 25+ years; expected years of schooling), standard of living (gross	United nations http://hdr.undp.org/en/content/human-development-index-hdi	2000

			national income per capita (PPP, $)). The indices are transformed to a scale from 0-1 with a score of 0.80+ (very high human development), 0-70-0.79 (high human development), 0.55-0.69 (medium human development) and below 0.55 (low human development). http://hdr.undp.org/sites/default/files/hdr2016_technical_notes_0.pdf		
Public policy	This is the spending on systems (rather than the performance of such systems) in areas such as education, medical care, water and sanitation	1. Health expenditure as % of government expenditure General government expenditure on health comprises the direct outlays earmarked for the enhancement of the health status of the population and/or the distribution of medical care goods and services among population	% of total government expenditure	World Bank https://data.worldbank.org/indicator/SH.XPD.PUBL.GX.ZS?view=chart	2000
		2. Out of pocket health expenditure Any direct outlay by households, including gratuities and in-kind payments, to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods	% of total expenditure on health	World Bank https://data.worldbank.org/indicator/SH.XP	2000

		and services whose primary intent is to contribute to the restoration and enhancement of health status of individuals or population groups. It is part of private health expenditure.		D.OOPC.TO.ZS?view=chart	

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