Sugar, Child Health, NCDs: Maternal and Child Oral Health Workshop

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Global Maternal and Child Oral Health Center
Seoul National University School of Dentistry

About you all:

https://forms.gle/vXiXpPtTV3cjXJAZ7

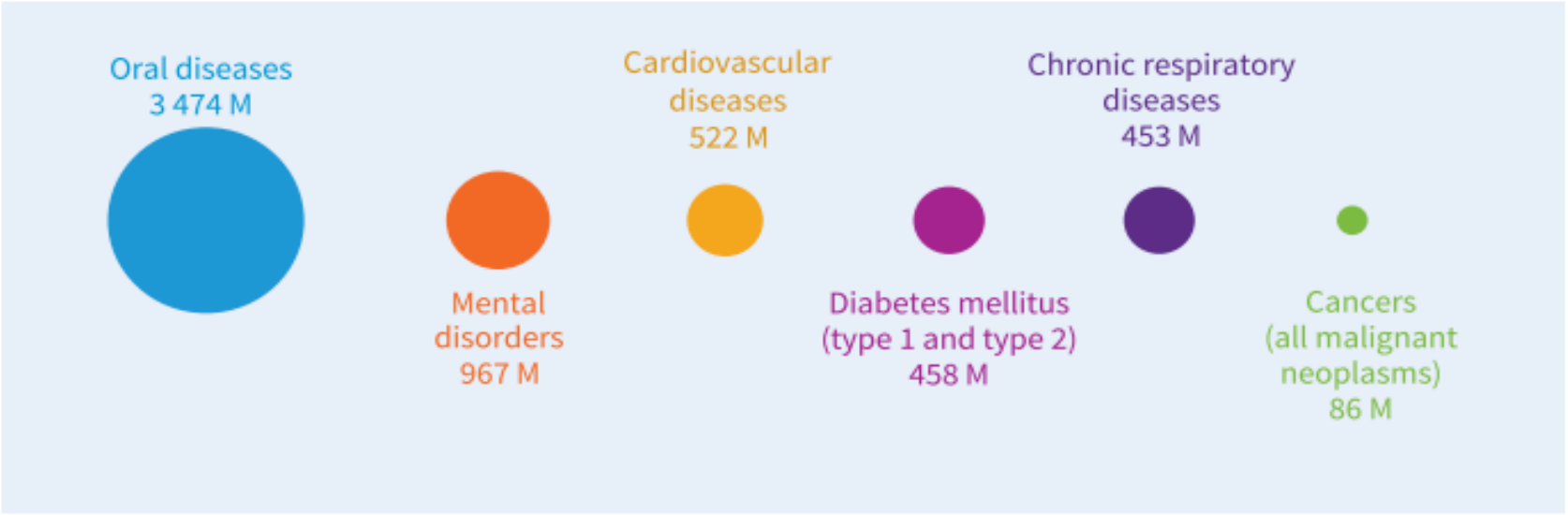
Fourth High-level Meeting of the UN General Assembly on the prevention and control of NCDs and the promotion of mental health and wellbeing (HLM4)

Political declaration of the fourth high-level meeting of the General Assembly on the prevention and control of noncommunicable diseases and the promotion of mental health and well-being, UN 2025

Global oral health burden

- Untreated dental caries (tooth decay) is the most prevalent condition (43% in primary teeth, 29% in permanent teeth)
- 3.5 billion people suffering from oral diseases globally (most of which are preventable).
- In 2019, oral diseases and conditions accounted for US$390 billion in direct costs

Fig. 2 Comparison of estimated global case numbers for selected NCDs



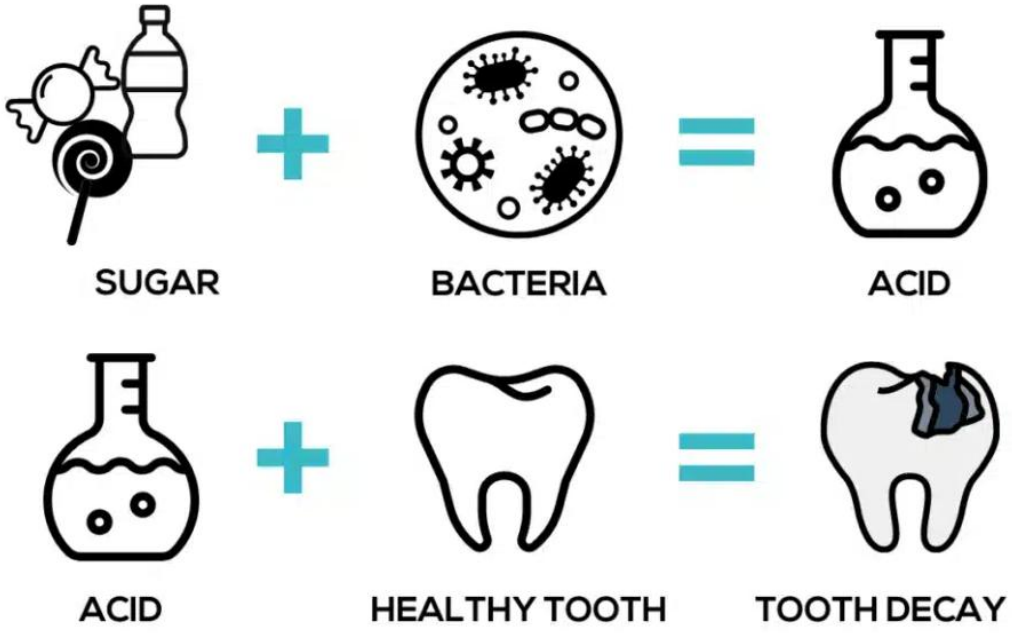
Note. Data are for all ages and both sexes from GBD 2019; oral diseases do not include lip and oral cavity cancer *(4)*. A standard method has been applied to incorporate the latest UN population estimates.

The combined estimated number of cases of oral diseases globally is about **1 billion higher than cases of all five main NCDs** (mental disorders, cardiovascular disease, diabetes mellitus, chronic respiratory diseases and cancers) combined.

Source: 2022 WHO Global Oral Health Report

Dental Caries (tooth decay)

Untreated dental caries (tooth decay) in permanent teeth is among the most common health conditions, and that oral diseases … can **contribute to other NCDs;**

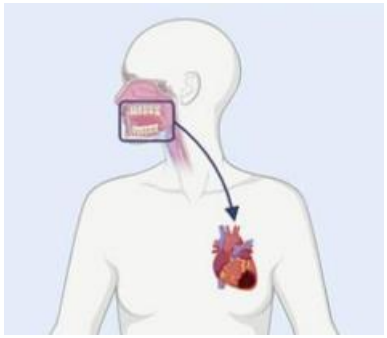


6×6	Oral diseases and conditions	Sugars
5×5	Mental disorders and conditions	Air pollution
4×4	Cardiovascular diseases	Tobacco
	Diabetes	Alcohol
	Cancers	Unhealthy diet
	Chronic respiratory diseases	Physical inactivity

Political declaration of the fourth high-level meeting of the General Assembly on the prevention and control of noncommunicable diseases and the promotion of mental health and well-being, UN 2025
Image credit: Dove Dental. Why is sugar bad for your teeth? https://dovedental.com.au/why-is-sugar-bad-for-your-teeth/

Benzian H, Daar A, Naidoo S. Redefining the non-communicable disease framework to a 6 × 6 approach: incorporating oral diseases and sugars. *Lancet Public Health*. 2023;8(11):e899-e904. doi:10.1016/S2468-2667(23)00205-0

Sugar's relationship with NCDs



(Yang et al, 2014)

HEART, VASCULAR DISEASES

(Limpijankit et al., 2022)

(Nygaard et al., 2026)

(Pitts et al, 2021; Chi & Scott, 2019)

TOOTH DECAY (DENTAL CARIES)

(Bakhoda et al., 2024)

(Boyajan & Bilal, 2025)

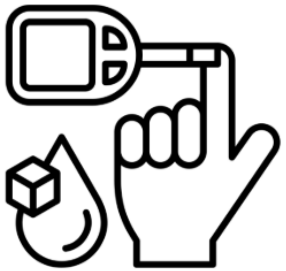
WEIGHT LOSS

(Sheiham, 2006)

SUGAR

Consumption of free sugars is a major risk factor for overweight, obesity and dental caries (WHO)

(Powell-Wiley et al, 2021)



DIABETES (Veit et al, 2022)

(Klein et al, 2022)

OBESITY (Te Morega et al, 2014)

Oral health is essential to general health and well-being **across the lifespan.**

During pregnancy, women may be more prone to gum disease and cavities.

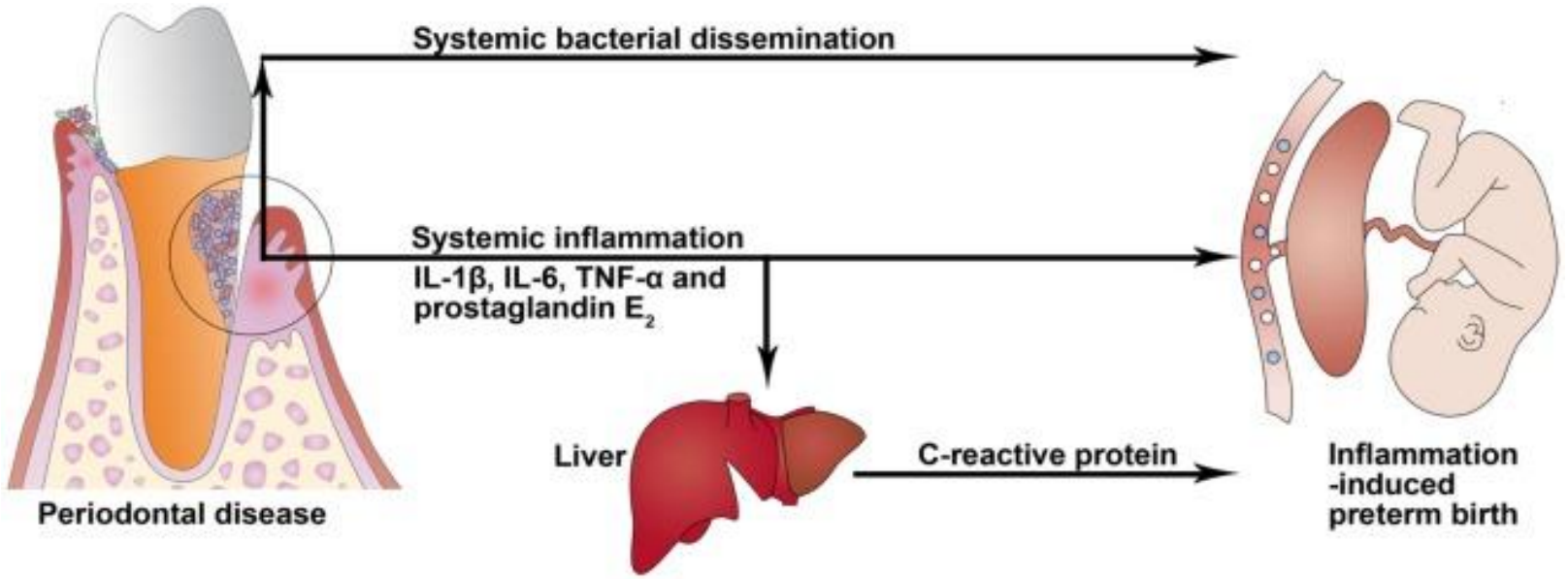
A mother's oral health status is a strong predictor of her child's oral health status.

If mothers have high levels of untreated cavities or tooth loss, their children are 3X more likely to have cavities.

www.cdc.gov/oralhealth

CS315153A

Oral health during pregnancy



Adverse Pregnancy Outcomes (APO)

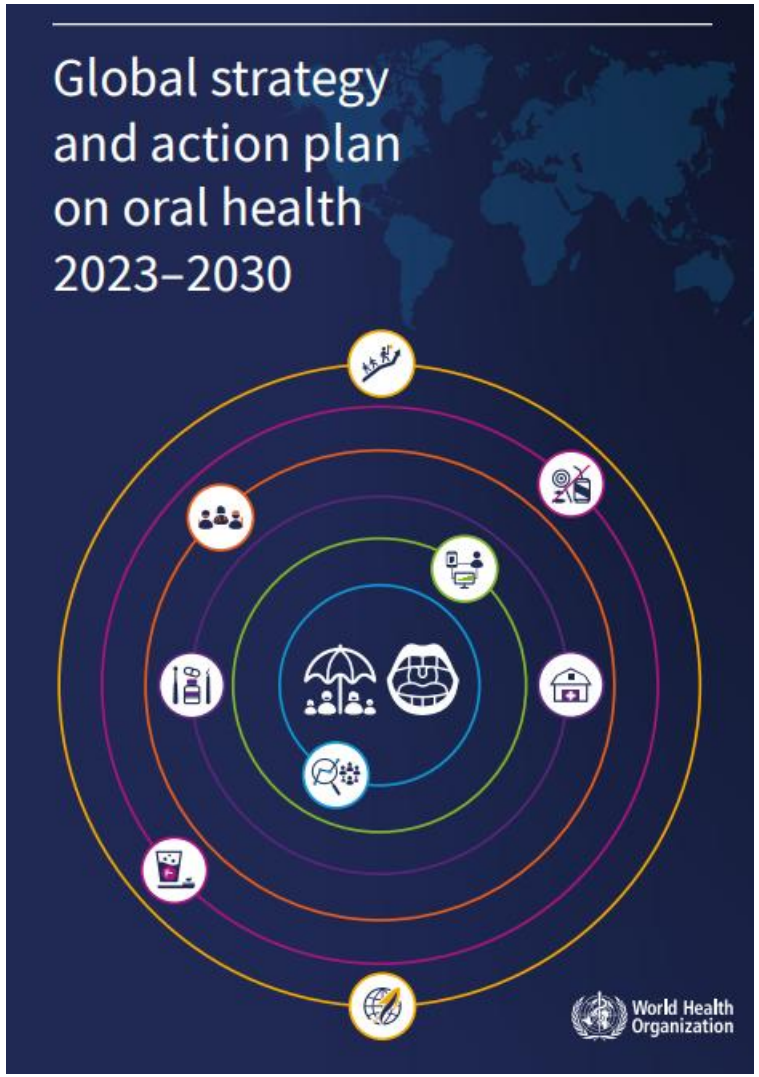
- ✓ Decrease in placenta size (Offenbacher et al, 2005)
- ✓ Fetal growth restriction
- ✓ Premature rupture of membrane
- ✓ Premature myometrial contraction

Periodontal pathogens → circulation → Infection in the feto-placenta unit (FPU) → APO
→ Inflammation in FPU/injury (animal models) → APO
→ Metastatic/Systematic inflammation → APO

(Bobetsis et al., 2020; Gauthier et al., 2011; Han et al., 2006; Han et al., 2009; Han et al., 2010)

Image Source: Ren H, Du M. Role of Maternal Periodontitis in Preterm Birth. Front Immunol. 2017;8:139.

Women as change agents



Action 29. Review and scale up mid-stream promotion and prevention measures:… Facilitate social mobilization and engage and empower **a diverse range of actors, including women as change agents in families and communities.**

Action 32. Fortify and improve downstream promotion and prevention measures: **Tailor interventions to address oral health along the life course…pregnant women, parents…**, with special consideration for poor, vulnerable and/or marginalized members of the society

Mothers and caretakers

bring a very unique

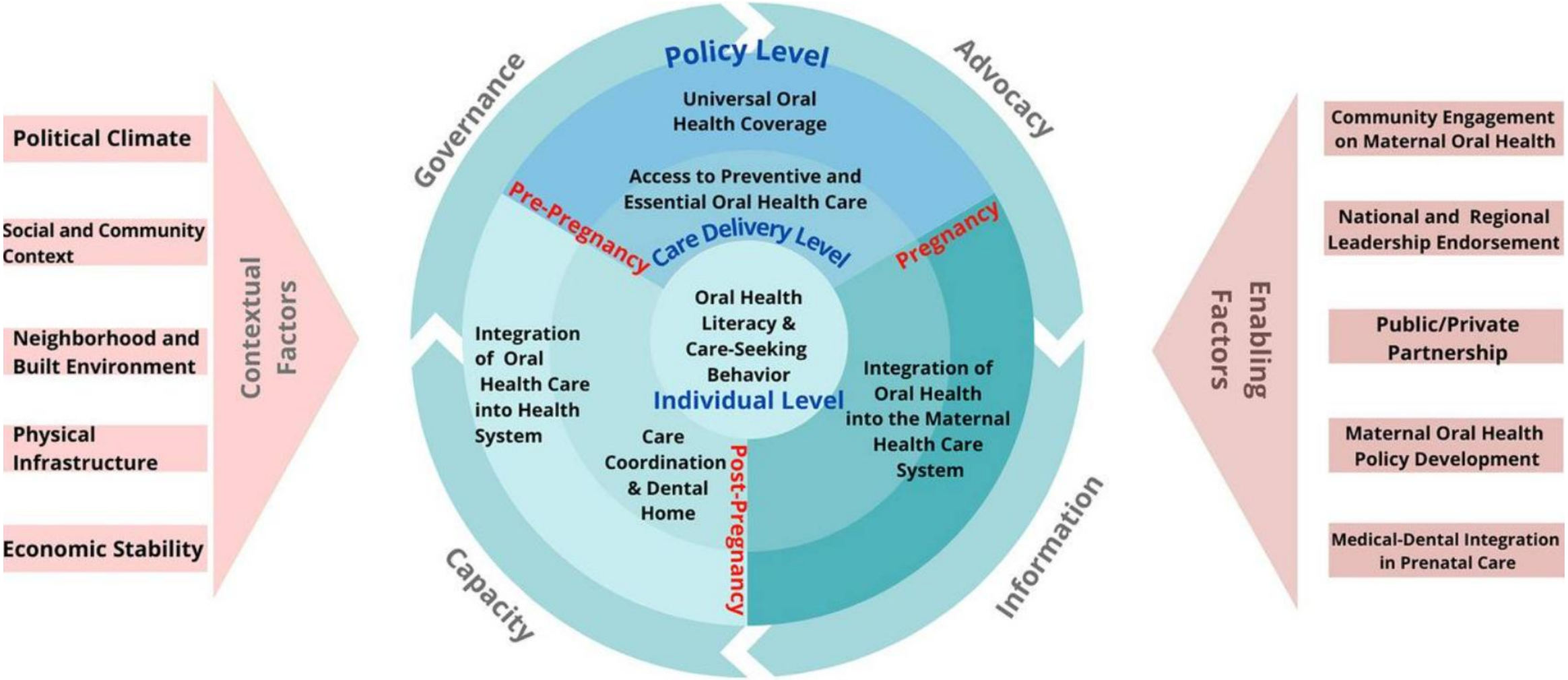
“HEALTH CAPITAL” and “HEALTH CONTEXT”

to young children to make

healthier choices throughout life span

– Health trajectory

Maternal Oral Heath Framework



Barillas & Lee, 2022

About us: Panel Introduction

POLICY & PROGRAM 1

Katy Battani

Deputy Director, US National Maternal and Child Oral Health Resource Center

POLICY & PROGRAM 2

Jayanth Kumar

Former New York and California State Dental Director

SOUTH KOREA CASE

Hawon Baik

Student, Public Health
George Washington University

KENYA CASE

Sanghyeon Baek

Master program student
Seoul National University

WORKSHOP CASE 1

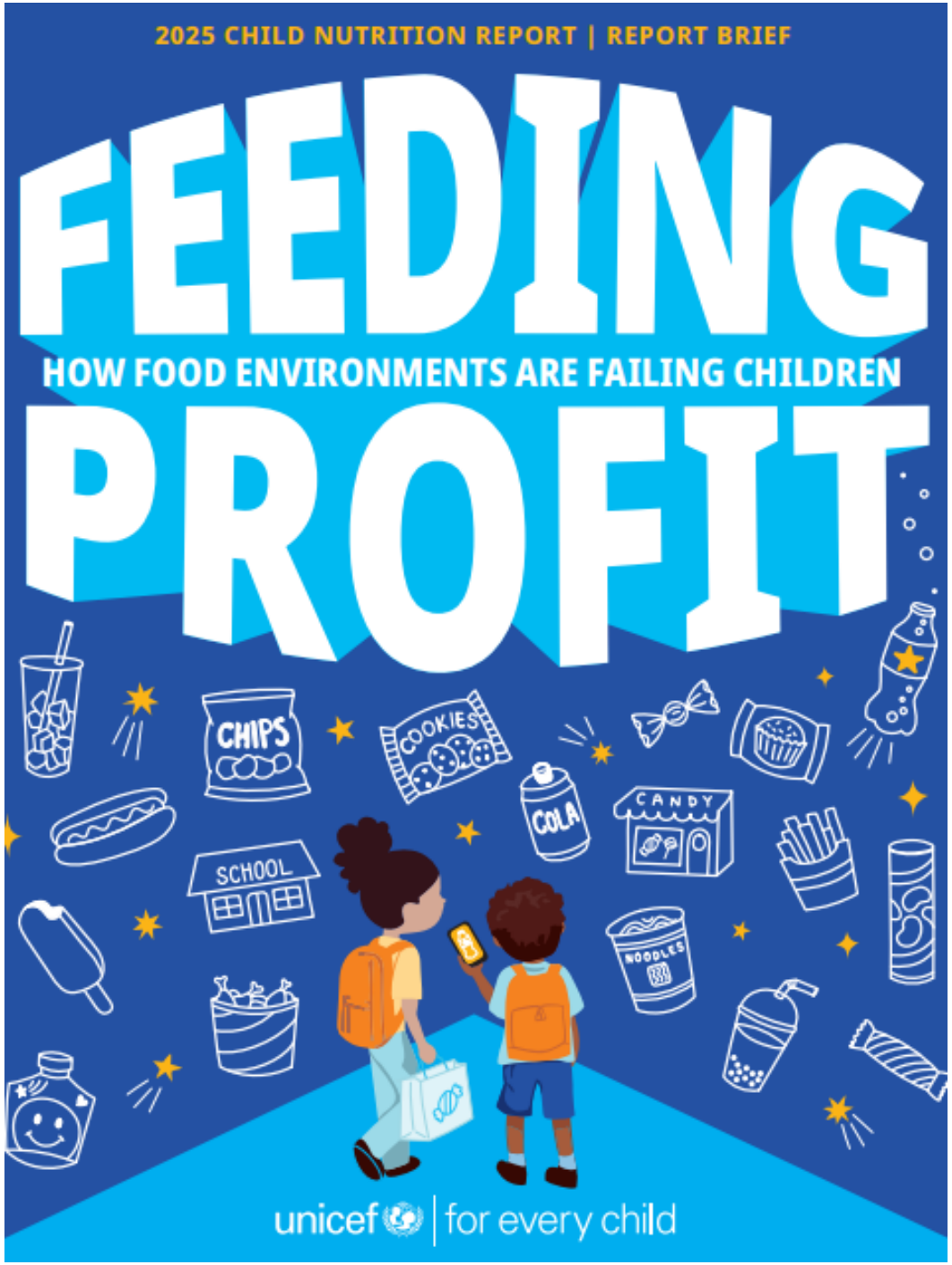
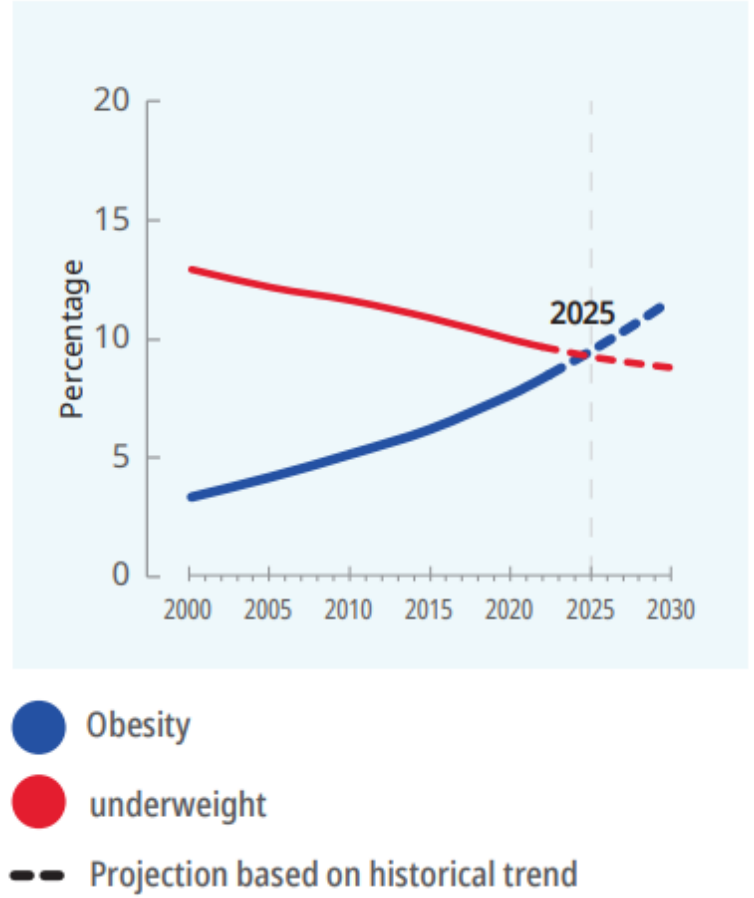


FIGURE 2: **Trends in the percentage of children and adolescents aged 5–19 years with (a) obesity, (b) underweight, and projections to 2030, globally**

Source: UNICEF analysis of data from NCD-RisC for children and adolescents 5–19 years.



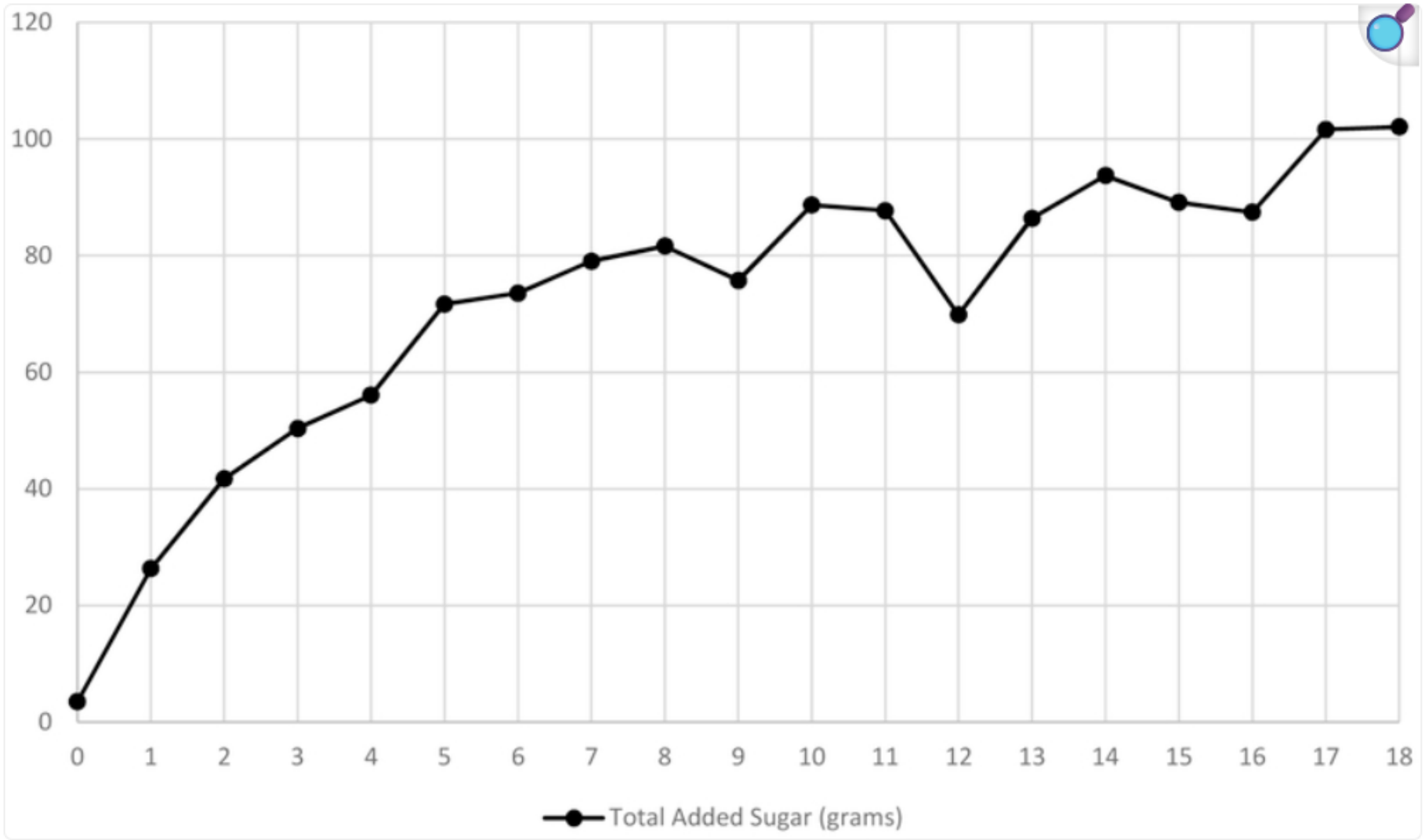
1 in 5 children and adolescents aged 5-19 globally (391 million) are overweight.

Data from over 190 countries, children aged 5-19, Since 2000

- Underweight: 13%→ 9.2%
- Obesity: 3%→ 9.4%

This pattern in all regions of the world, except sub-Saharan Africa and South Asia (Cook Islands: 37%, Chile: 27%, US/UAE: 21%)

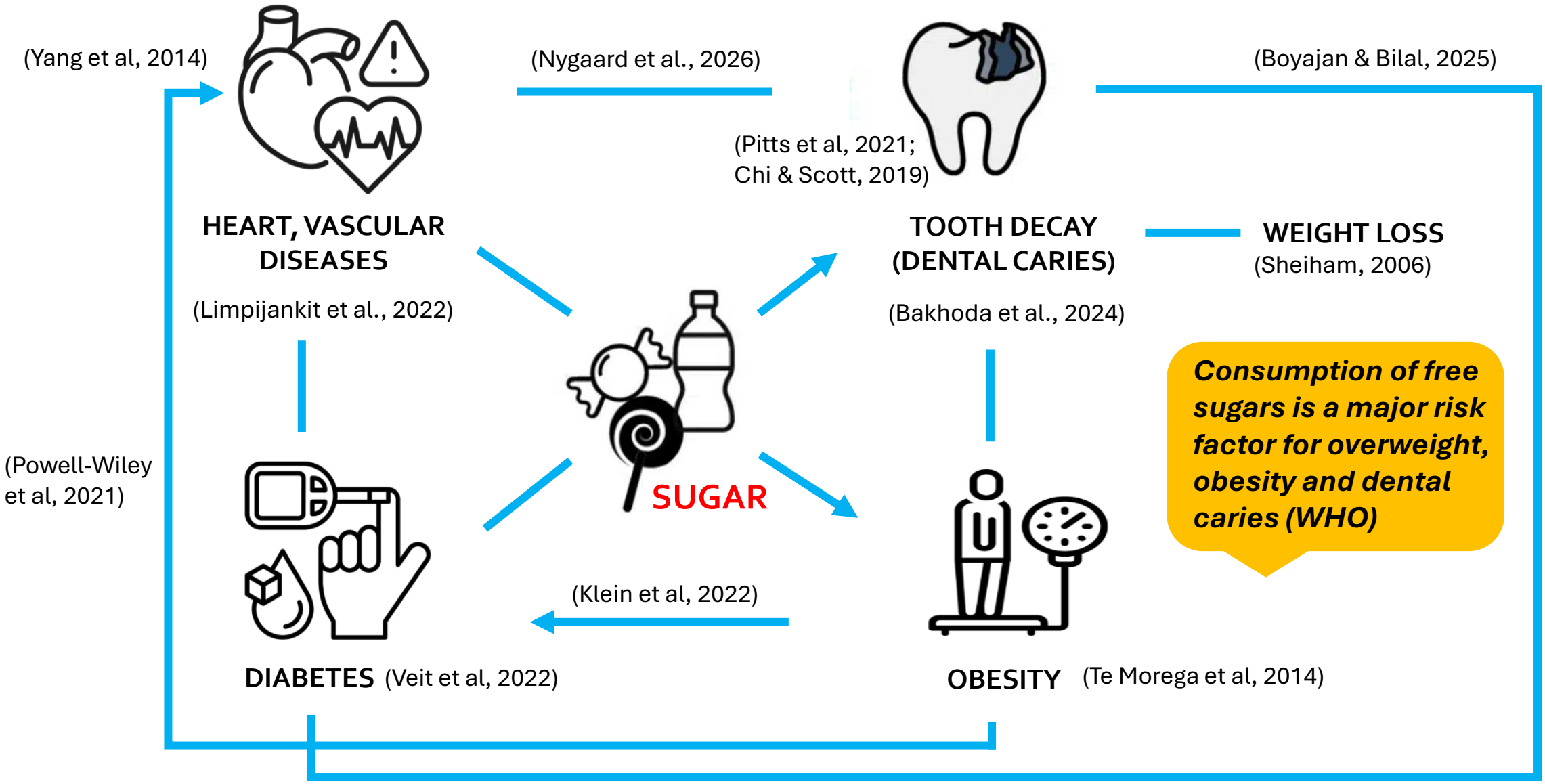
Figure 2.



Mean Daily Added Sugar Intake by Age Group for U.S. Children Ages 18 Years and Younger (N=3,441).

Chi DL, Scott JM. Added Sugar and Dental Caries in Children: A Scientific Update and Future Steps. *Dent Clin North Am*. 2019;63(1):17-33. doi:10.1016/j.cden.2018.08.003

Sugar's relationship with NCDs



Interventions for children (0-12 yo) for reduced sugar intake at

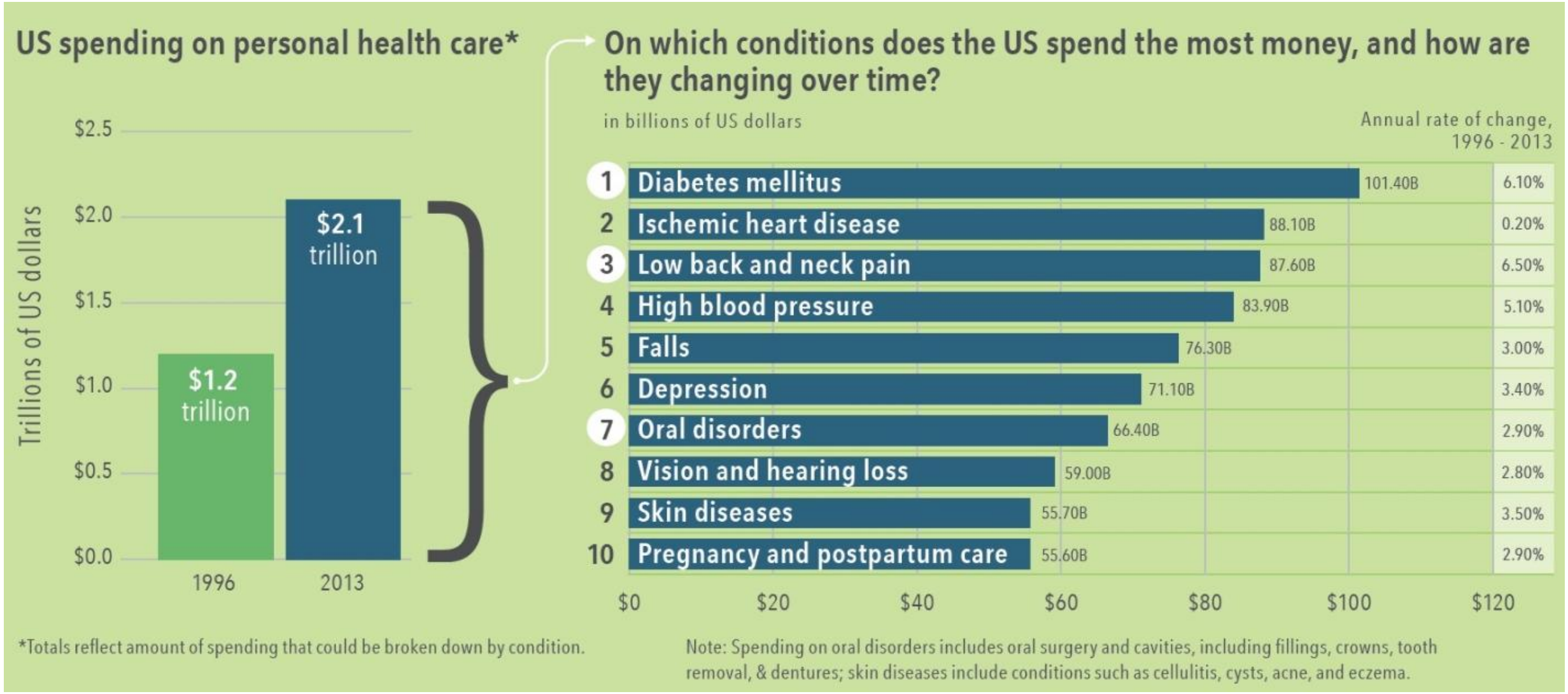
- Policy level
- Practice/Program level
- People/Culture change/Advocacy level (caregivers and children)

WORKSHOP CASE 2

Fig. 1 Ranking of most prevalent conditions per WB country income level

	Global	World Bank low income	World Bank lower-middle income	World Bank upper-middle income	World Bank high income
Oral diseases	1	1	1	1	1
Neurological disorders	2	5	2	3	2
Digestive diseases	3	7	4	2	6
Respiratory infections & TB	4	4	3	4	9
Skin diseases	5	3	5	6	5
Sense organ diseases	6	9	8	5	7
Musculoskeletal disorders	7	11	9	7	3
NTDs & malaria	8	2	7	12	19
HIV/AIDS & STIs	9	8	10	8	10
Nutritional deficiencies	10	6	6	13	15
Unintentional injury	11	13	13	9	4
Diabetes & CKD	12	14	12	10	8
Mental disorders	13	10	11	11	11
Cardiovascular diseases	14	16	14	14	13

WHO Global strategy and action plan on oral health 2023-2030



Dieleman JL, Baral R, Birger M, Bui AL, Bulchis A, Chapin A, et al. US Spending on Personal Health Care and Public Health, 1996-2013. Jama. 2016;316(24):2627-46.
Institute of Medicine Committee on Quality of Health Care in A. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington (DC): National Academies Press (US) Copyright 2001 by the National Academy of Sciences. All rights reserved.; 2001.

Original Investigation

February 14, 2025

Tracking US Health Care Spending by Health Condition and County

Joseph L. Dieleman, PhD[1]; Meera Beauchamp, BS[1]; Sawyer W. Crosby, BA[1]; et al

» Author Affiliations

JAMA. 2025;333(12):1051-1061. doi:10.1001/jama.2024.26790

Table 3. Estimated Health Care Spending for the 50 Most Expensive Health Conditions in 2019[a]

Health condition	Total 2019 spending, US$ billions (95% CI)	Annual growth rate (2010-2019), % (95% CI)		%			
				Age, y		Type of care	
		Unadjusted	Inflation adjusted, age- and sex-standardized spending per capita	<20	>65	Inpatient	Er de
Diabetes type 2	143.9 (140-147.2)	6 (5.6-6.3)	1.9 (1.5 to 2.2)	0.1	57.5	8.7	1.
Other musculoskeletal disorders	108.55 (106.4-110.3)	5.6 (5.3-6)	2.4 (2.1 to 2.7)	8.6	34.2	10.0	1.
Oral disorders	93.03 (92.7-93.3)	3.7 (3.7-3.7)	1.1 (1.1 to 1.1)	20.0	16.9	0.8	0.
Ischemic heart disease	80.66 (79-82.4)	2.3 (2.1-2.7)	-1.8 (-2.1 to -1.5)	0.1	65.9	44.5	3.
Urinary diseases	72.19 (71-73.3)	3.4 (3.3-3.6)	-0.1 (-0.3 to 0.1)	6.0	51.7	21.0	5.
Skin and subcutaneous diseases	69.93 (68.5-71.1)	3.6 (3.4-3.9)	0.6 (0.4 to 0.8)	13.0	34.0	19.5	2.
Heart failure	58.57 (57.5-59.7)	5.5 (5-6)	1.3 (0.8 to 1.8)	0.4	77.0	49.0	1.
Acute kidney failure	55.44 (54.6-56.3)	6.9 (6.6-7.2)	2.9 (2.6 to 3.2)	0.8	55.5	25.6	1.
Low back pain	52.89 (51.3-54.5)	3.4 (2.9-3.9)	-0.1 (-0.6 to 0.4)	1.5	45.9	20.2	2.
Endocrine, metabolic, blood, and immune disorders	51.37 (50.6-52.1)	5.7 (5.3-6.1)	2.5 (2.2 to 2.9)	15.6	39.0	14.7	1.
Gynecological diseases	51.17 (48.5-54.2)	2.1 (1.2-3)	-0.2 (-1.1 to 0.7)	4.0	6.5	3.8	1.
Septicemia	50.98 (48.9-53.3)	7.7 (7.1-8.4)	3.8 (3.3 to 4.5)	4.1	52.0	95.1	0.

WHO Essential Dental Medicine 2021

A new section for dental preparations has been included during the 2021 review of the World Health Organization's (WHO) Model List of Essential Medicines (EML) and Model List of Essential Medicines for Children (EMLc).

This new section includes fluoride (previously under the section for vitamins and minerals as "sodium fluoride") given its indication for dental caries and an initial selection of fluoride-containing and fluoride-releasing products: silver diamine fluoride and glass-ionomer cement. This development will be key in increasing access to these products and help to reduce the burden of dental caries – the most prevalent disease globally.

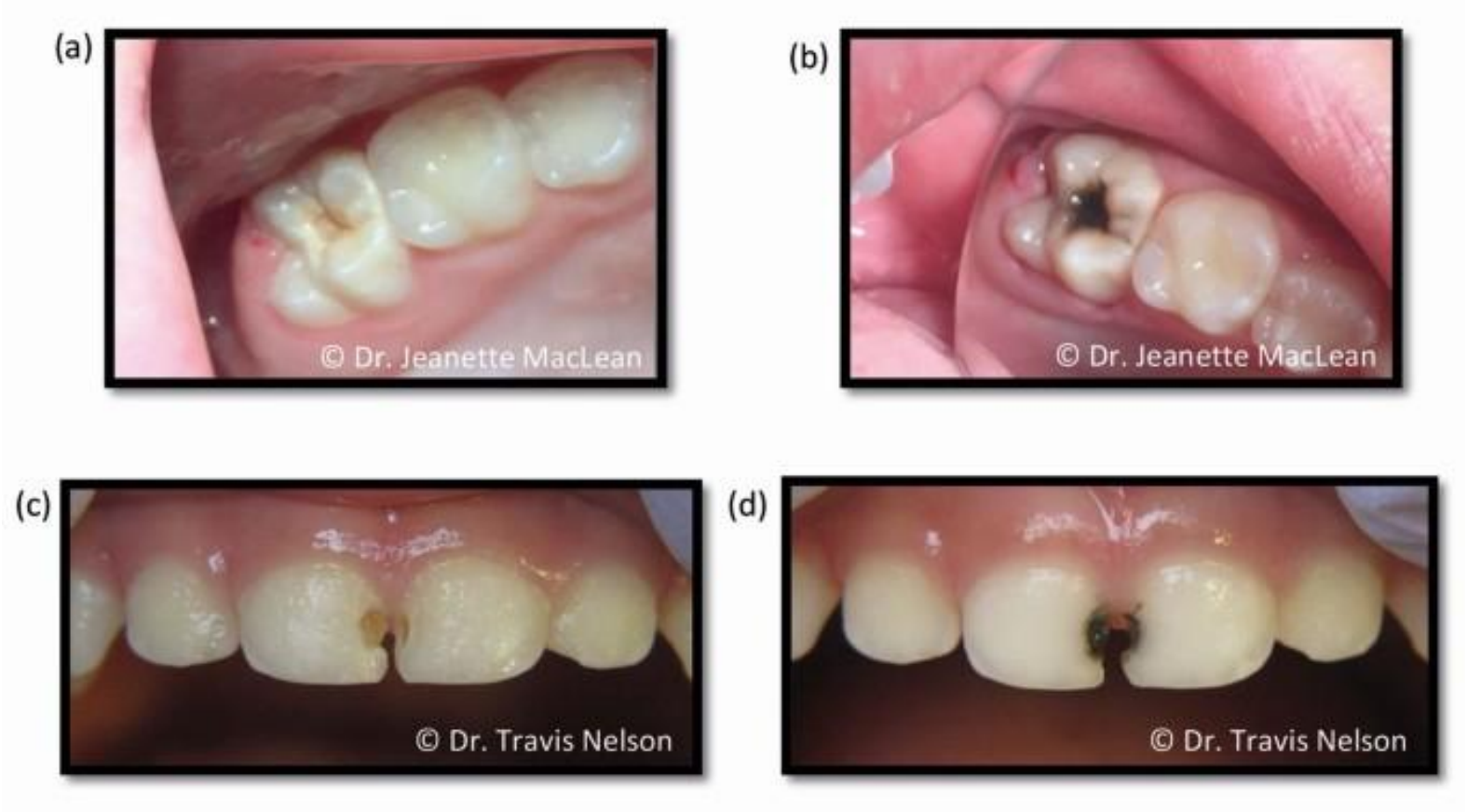
Excerpt from FDI: https://www.fdiworlddental.org/who-list-essential-medicines-includes-new-section-dental-preparations

How to treat caries….

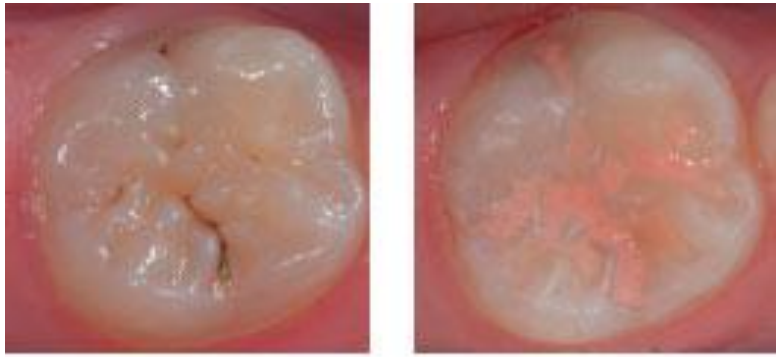
- Traditional way
- Drill and fill
- Extraction

When there is no electricity, lack of water…

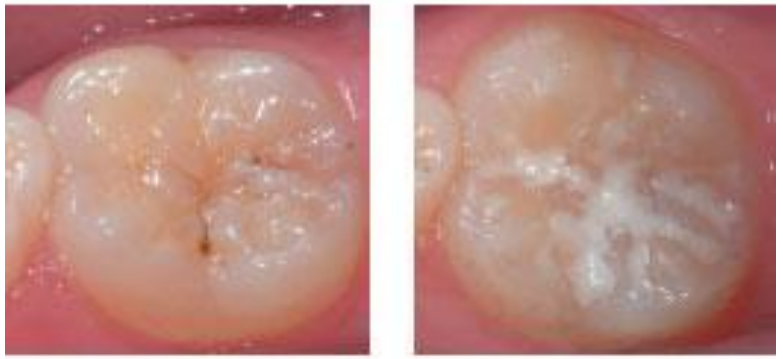
Silver Diamine Fluoride



Glass Ionomer restoration and sealants



Pink shade shown



White shade shown. Photos courtesy of Dr Geoff Knight.

30. DENTAL MEDICINES AND PREPARATIONS	
fluoride	**Gel:** containing 2500 to 12 500 ppm fluoride (any type). **Mouthrinse:** containing 230 to 900 ppm fluoride (any type). **Toothpaste, cream or gel:** containing 1000 to 1500 ppm fluoride (any type). **Varnish:** containing 22 500 ppm fluoride (any type).
glass ionomer cement	**Single-use capsules:** 0.4 g powder + 0.09 mL liquid. **Multi-use bottle:** powder + liquid. Powder (fluoro-alumino-silicate glass) contains: 25-50% silicate, 20-40% aluminium oxide, 1-20% fluoride, 15-40% metal oxide, 0-15% phosphate, remainder are polyacrylic acid powder and metals in minimal quantities. Liquid (aqueous) contains: 7-25% polybasic carboxylic acid, 45-60% polyacrylic acid.
resin-based composite (low-viscosity)*	**Single-use applicator or multi-use bottle** *of any type for use as dental sealant
resin-based composite (high-viscosity)*	**Single-use capsule or multi-use syringe** *of any type for use as dental filling material
silver diamine fluoride	**Solution:** 38% w/v.

https://environmentalmedicine.eu/who-resin-based-composites-become-essential-medicine/

2026 WHO Global Curriculum Guide for Community Health Workers

S4. Provide basic support for disease management, including self-management.	• Counsel on daily oral hygiene, including toothbrushing with fluoride toothpaste. • Provide general advice on oral disease and common NCD risk factors, such as tobacco use (as well as use of areca nut or betel quid), alcohol consumption and unhealthy diet (including high intake of free sugars). • Apply fluoride varnish or silver diamine fluoride application (twice a year). • Provide oral analgesics for pain relief. • Refer individuals for urgent and immediate oral health care in cases of excessive bleeding, severe pain, swelling, damage or unusual lesions in or around the mouth.

How to create incentives for

- Dental Caries Prevention
- Low sugar intake
- Focusing on health > incentivizing more treatment (drill-fill-bill)

Policy Level

Program Level

People/Advocacy Level

+ How to measure the success (indicators)

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Extra slides

WFPHA World Federation of Public Health Associations

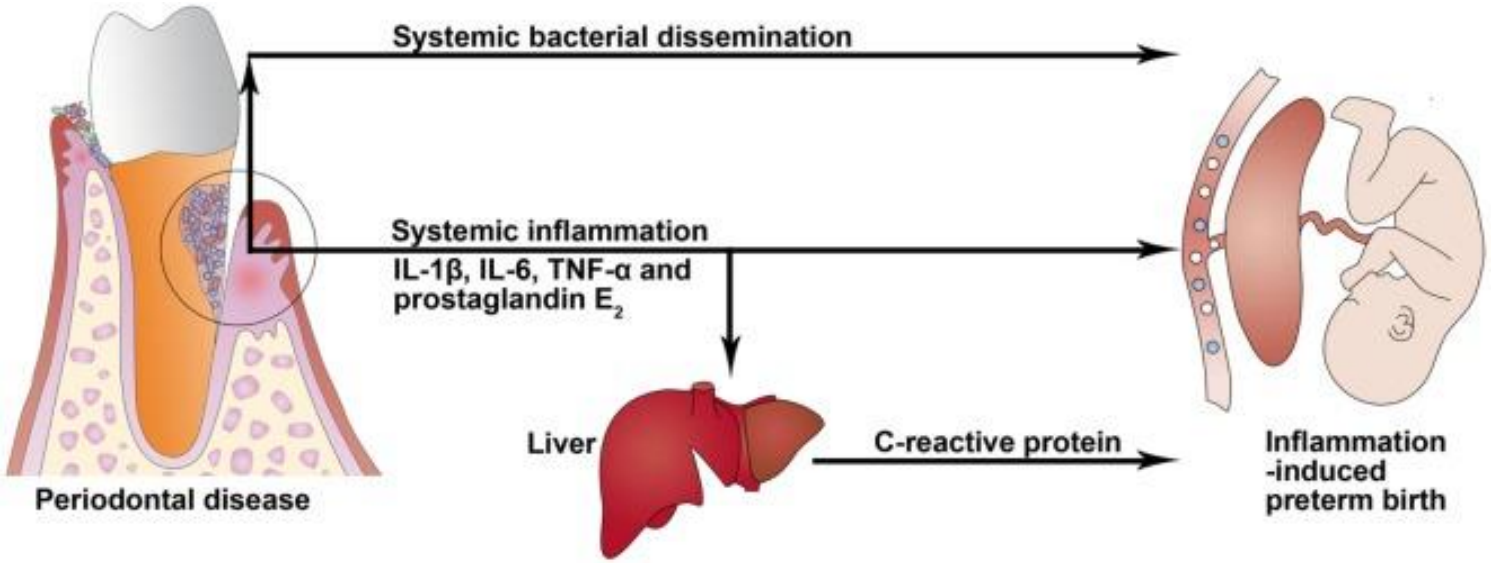
c/o Institute of Global Health • University of Geneva, Campus Biotech - G6 • Chemin des Mines 9, 1202 Geneva • Switzerland • www.wfpha.org

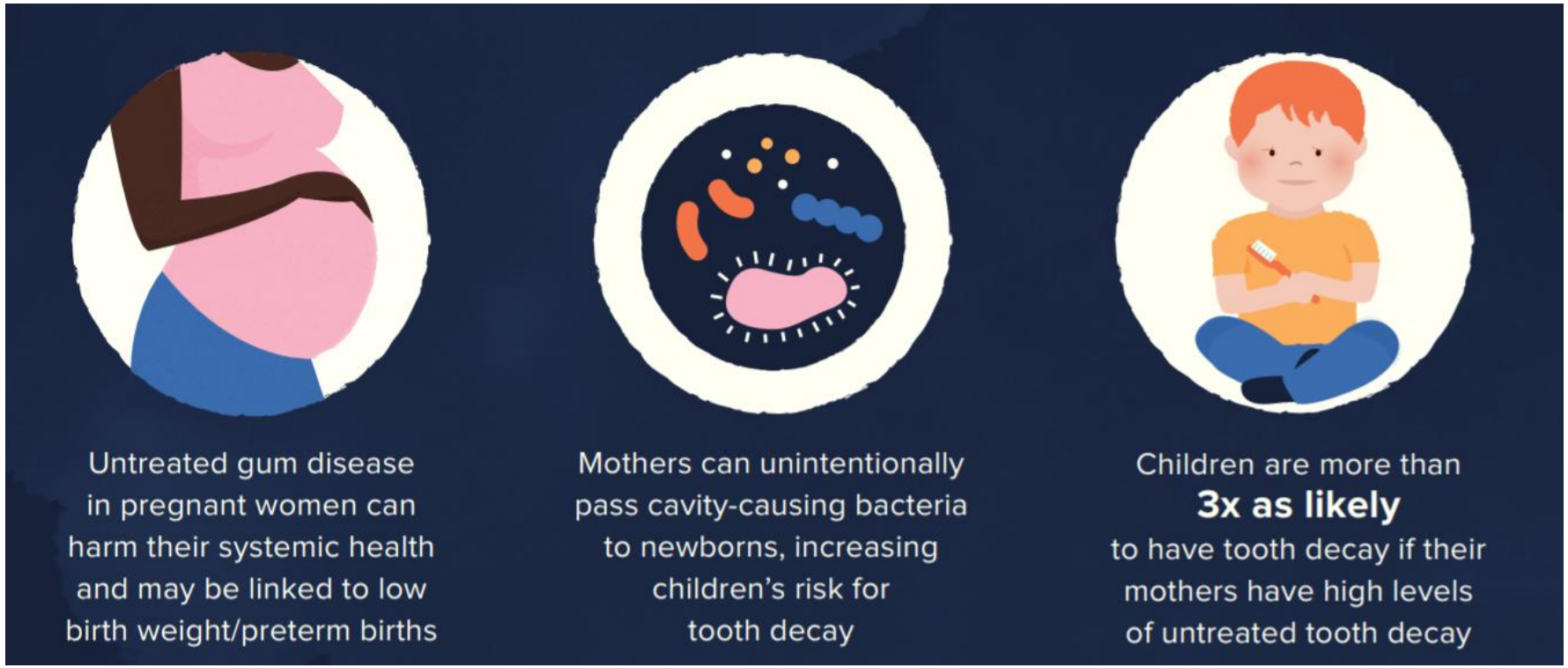
Policy Statement
Oral health is an integral part of maternal and child health

March 2023

Good oral health of mothers is essential for their overall health and their young children (1, 2). A mother's oral health, oral health knowledge, oral health literacy, attitudes, behaviors, and socioeconomic status influence children's health as important determinants of childhood caries. Thus, the life course approach focusing on cross-generational intervention is critical (3-10). Previous research has demonstrated that untreated dental caries in mothers can lead to a higher risk for dental caries in young children (3, 11-15). There is also a potential association between periodontal (gum) diseases during pregnancy and adverse birth outcomes (9, 13, 16-25). Future research needs to define this association as current results are mixed (26-30).

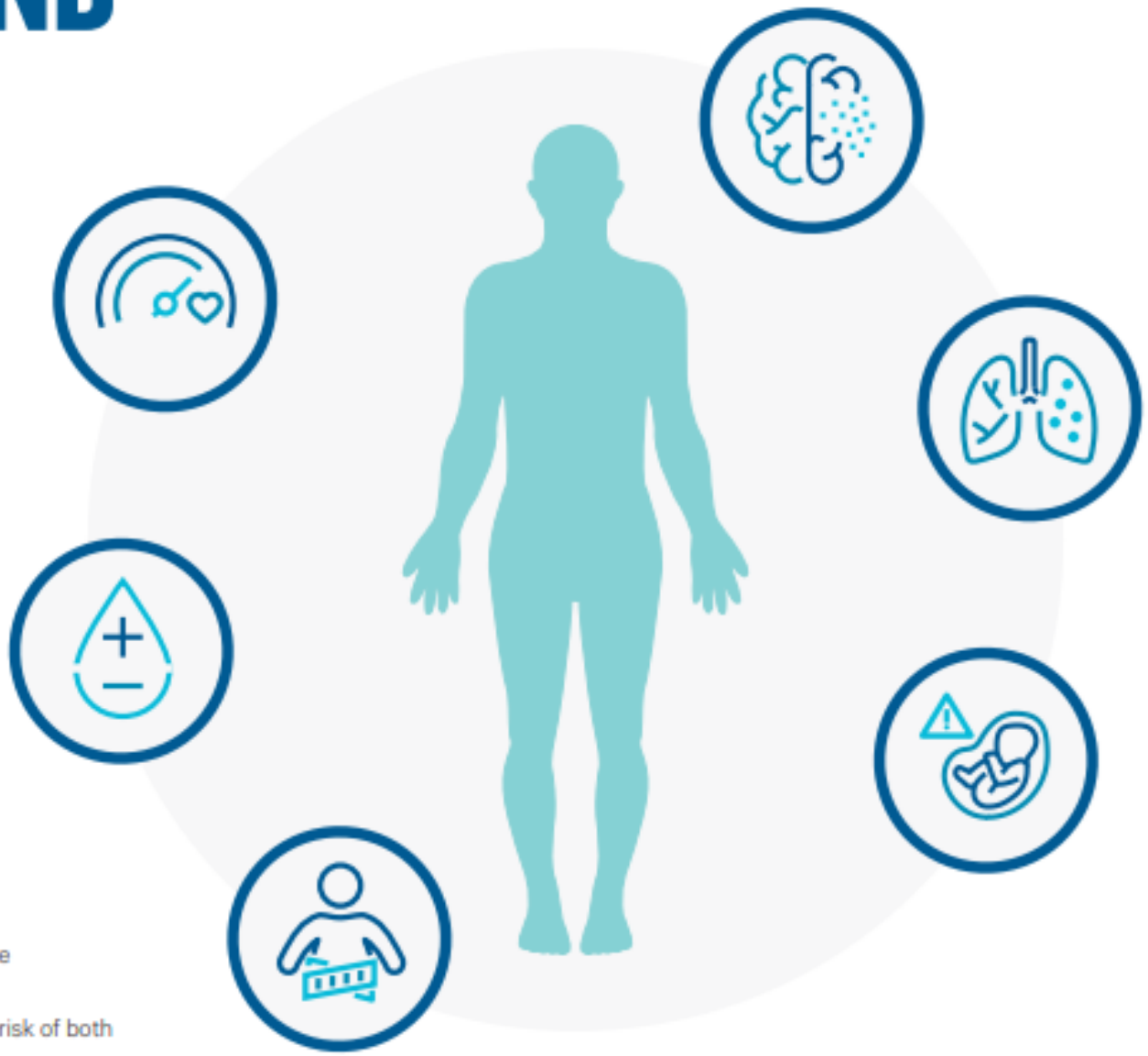
In addition to those biological links, what matters the most is to **create a system of health care and health promotion for mothers and children to achieve oral health and oral health equity**. When


Systemic bacterial dissemination
Systemic inflammation
IL-1β, IL-6, TNF-α and prostaglandin E_2
Liver
C-reactive protein
Periodontal disease
Inflammation -induced preterm birth


Untreated gum disease in pregnant women can harm their systemic health and may be linked to low birth weight/preterm births
Mothers can unintentionally pass cavity-causing bacteria to newborns, increasing children's risk for tooth decay
Children are more than **3x as likely** to have tooth decay if their mothers have high levels of untreated tooth decay

IMPACTS BEYOND THE MOUTH

Growing evidence connects a healthy mouth with a healthy body. Here are some examples showing why oral health is about much more than a smile:



High Blood Pressure

- Putting off dental care during early adulthood is linked to an increased risk of having high blood pressure.[1]
- Patients with gum disease are less likely to keep their blood pressure under control with medication than are those with good oral health.[2]

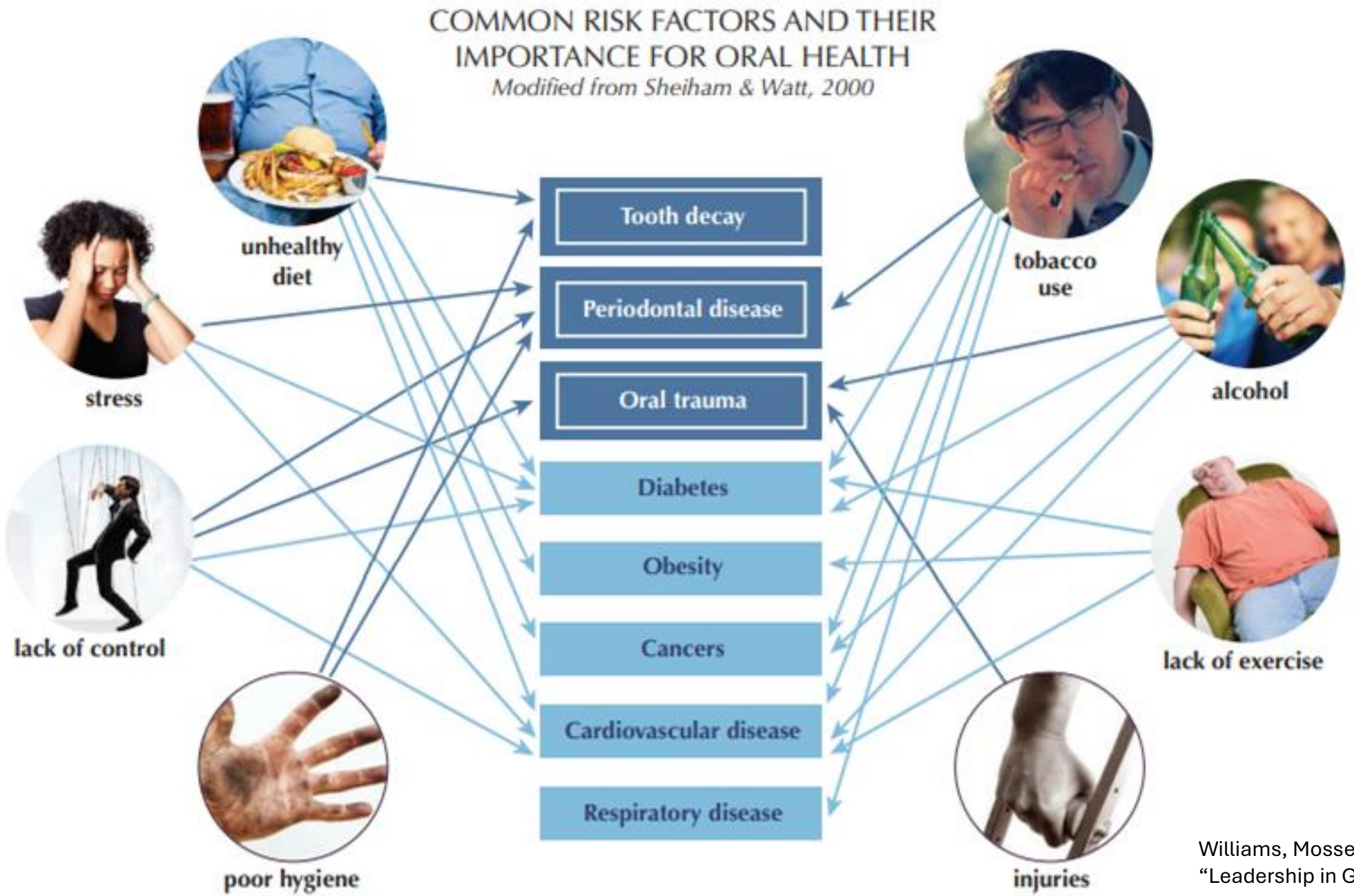
Diabetes

- Untreated gum disease makes it harder for people with diabetes to manage their blood glucose levels.[3]
- Diabetes raises the risk of developing gum disease by 86%.[4]

Obesity

- Brushing teeth no more than once per day was linked with the development of obesity.[5]
- Frequent consumption of sugar-sweetened drinks raises the risk of both obesity[6] and tooth decay among children[7] and adults.[8]

DentaQuest, “Critical Connections: Five Facts About Oral Health’s Influence on the Body (Aug 12, 2020)



Williams, Mossey, Mathur (2019)
"Leadership in Global Oral Health

Oral diseases and CVD

- The results published in *The International Journal of Cardiology* showed boys with the greatest number of cavities, affecting 13-16 teeth, had a 32% higher incidence of atherosclerotic cardiovascular disease later in life compared with those with cavities in 0-4 teeth.
- In girls the association was even stronger, with a 45% increase in risk linked to high numbers of dental caries (cavities and instances of tooth decay) compared with those with fewer caries. Similarly, kids with the most severe gingivitis had an increased long-term risk for cardiovascular disease — by 21% in boys and 31% in girls.

Nygaard N, D'Aiuto F, Eriksen AK, et al. Childhood oral health is associated with the incidence of atherosclerotic cardiovascular disease in adulthood. *Int J Cardiol*. 2026;448:134151. doi:10.1016/j.ijcard.2025.134151

Is childhood oral health associated with adulthood atherosclerotic cardiovascular disease?

Cohort

Nationwide Danish register data

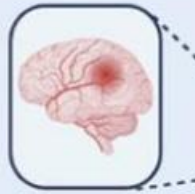
568,677 individuals
23 years of follow-up

Variables

Dental caries

Gingivitis

Myocardial infarction

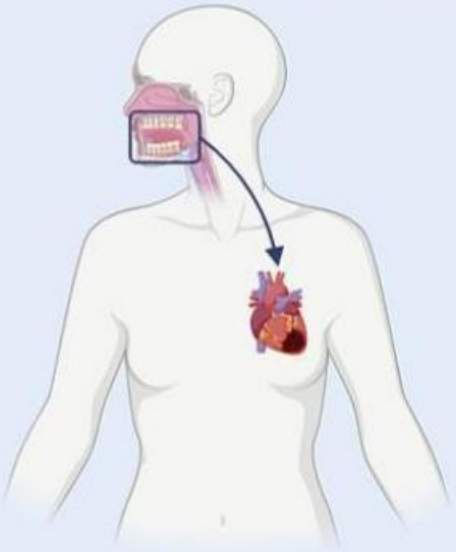


Ischemic stroke

Ischemic heart disease

Associations

Severe dental caries was associated with an up to 46% higher incidence of atherosclerotic cardiovascular disease.



High levels of gingivitis were associated with an up to 33% higher incidence of atherosclerotic cardiovascular disease.

Dental Caries (tooth decay)

- …**oral diseases are a major health and economic burden** in many countries and impact people across their lifetime… that untreated dental caries (tooth decay) in permanent teeth is among the most common health conditions, and that oral diseases … can contribute to other NCDs;

Sugar consumption

- Promote healthy diets and **reduce unhealthy diets, overweight and obesity** through measures such as:

…improving policies and taking measures to reduce industrially produced trans-fatty acids to the lowest level possible **and reduce excessive levels of saturated fats, free sugars and sodium;**

Draft resolution submitted by the President of the General Assembly Political declaration of the fourth high-level meeting of the General Assembly on the prevention and control of noncommunicable diseases and the promotion of mental health and well-being, UN 2025

Dental caries - NCD

...the development of a caries lesion is associated with **a shift in the balance of the resident dental microbiota**, so that normally minor components of the biofilm become more prevalent. The **main driver of such dysbiotic shift is frequent consumption of sugars.**

Table 1.

Differences between dental caries and classical infections and communicable diseases

Infection	Communicable disease	Dental caries
Microbial aetiology is diagnostic of disease	Yes	No
Pathogen is present in health	No	Yes/often
Pathogen satisfies Koch's postulate	Yes	No
Pathogen produces specific virulence factors	Often	No
Disease is transmitted person-to-person	Yes	No

Pitts NB, Twetman S, Fisher J, Marsh PD. Understanding dental caries as a non-communicable disease. *Br Dent J*. 2021;231(12):749-753. doi:10.1038/s41415-021-3775-4