



Oral Health in America: *A Forthcoming Surgeon General's Report*

Tim Ricks, DMD, MPH

Rear Admiral, U.S. Public Health Service

Assistant Surgeon General

Chief Dental Officer



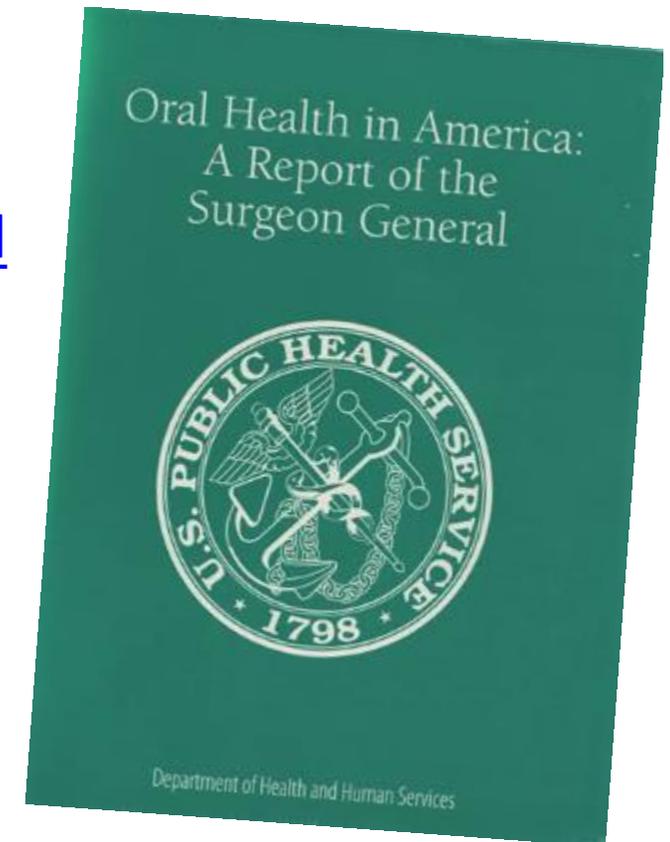
Disclaimer

*The views presented today are not the official views of the
Office of the Surgeon General.*



Oral Health in America: A Report of the Surgeon General

- First-ever report commissioned by the Surgeon General on oral health
- Available at:
<https://www.surgeongeneral.gov/library/reports/index.html>
- Major Message: Oral Health means much more than healthy teeth, and is integral to the general health and well-being of all Americans.



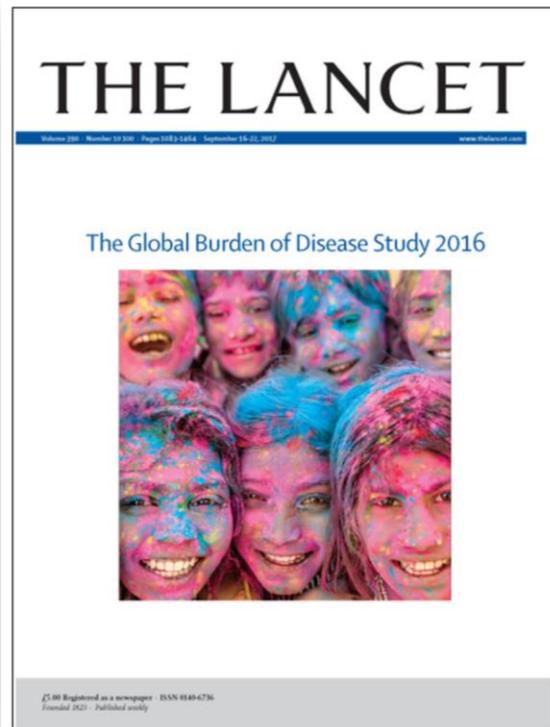


Framework for Action

- Change perceptions regarding oral health and disease so that oral health becomes an accepted component of general health.
- Accelerate the building of the science and evidence base and apply science effectively to improve oral health.
- Build an effective health infrastructure that meets the oral health needs of all Americans and integrates oral health effectively into overall health.
- Remove known barriers between people and oral health services.
- Use public-private partnerships to improve the oral health of those who still suffer disproportionately from oral diseases.



Haven't We Solved It By Now?



Global Burden of Disease

- Four oral health diseases ranked in the top 30 out of 328 conditions:
 - Untreated Dental Caries (tooth decay) in *permanent* teeth — 1st
 - Severe Periodontitis — 11th
 - Untreated Dental Caries (tooth decay) in *primary* teeth — 17th
 - Severe/Complete Tooth Loss — 29th



Surgeon General's Priorities

- Opioids and Addiction
- Tobacco
- Community Health and Economic Prosperity
- Health and National Security
- Emerging Public Health Threats
- **Oral Health**



JEROME M. ADAMS, M.D., M.P.H.
Vice Admiral, U.S. Public Health Service
Surgeon General



Surgeon General's Statement on Oral Health

<https://youtu.be/snOxqakR2zk>



The Path Forward

**Why do we need a
Surgeon General's Report on oral health now?**



Oral Health in America: Advances and Challenges

Developing the 2020 Surgeon General's Report

Bruce A. Dye, DDS, MPH

Project Co-Director and Scientific Editor

April 17, 2019

National Oral Health Conference

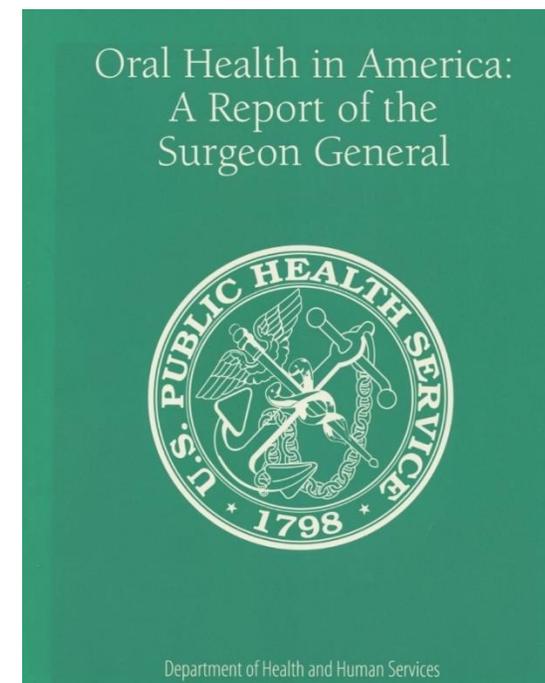


National Institute of Dental
and Craniofacial Research

Oral Health in America

The 2000 Report had 4 overarching themes:

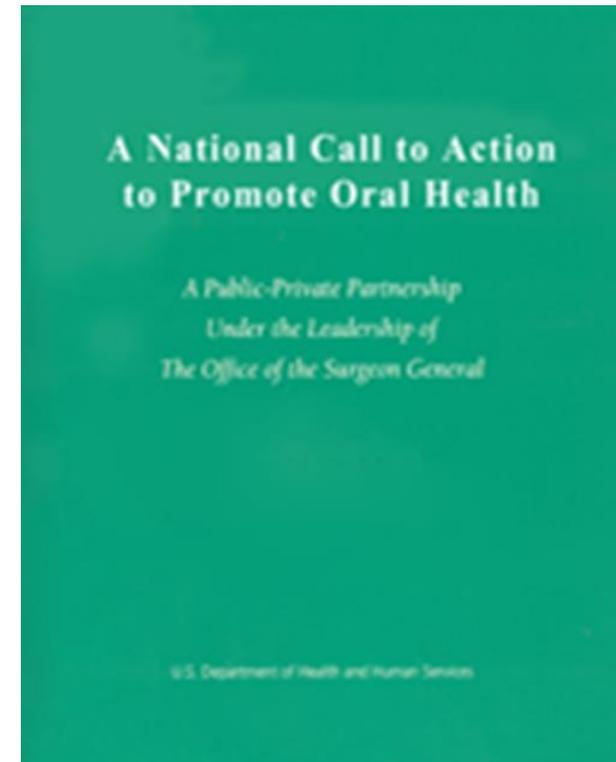
- ***Oral health*** means much more than healthy teeth
- ***Oral health*** is integral to general health
- Safe and effective disease measures exist that everyone can adopt to improve ***oral health*** and prevent disease
- General health risk factors, such as tobacco use and poor dietary practices, also affect ***oral and craniofacial health***



Oral Health in America

The National Call to Action (2003)

- Goals were:
 - To promote oral health
 - To improve quality of life
 - To eliminate oral health disparities



Oral Health in America

Five key action areas highlighted by the Surgeon General in the Call to Action:

- **Change perceptions of oral health**
 - Improving health literacy is the key
- **Replicate Effective Programs and Proven Efforts**
 - Innovative programs by States to expand Medicaid coverage
- **Build the science base**
 - Research will transform our knowledge of the prevention, diagnosis and treatment of oral disease
- **Increase Oral Health Workforce Diversity, Capacity, and Flexibility**
 - Diverse dental profession and culturally-competent messages important part of efforts to eliminate disparities
- **Increase collaborations**

Oral Health in America

Why is it time for a new Surgeon General's Report on Oral Health?



Oral Health in America

The world we live in has changed greatly in the past 20 years

– Digitization of everything

- Communication
- Information management – data
- Technology

– Delivery of services

- Consolidation – convenience and economic efficiencies
- Accountable care organizations

– Demographic changes

- 45 million more of us
- We are more diverse, more urban, and older

Oral Health in America

Sociodemographic factors are significant risk indicators for poor oral health

– Sex

- Men have oropharyngeal cancer 3 times more often than women

– Race/ethnicity

- Significant untreated dental caries disparities exist by race/ethnicity among children and working adults

– Poverty

- Being poor increases the likelihood of increased tooth loss

– Age

- Periodontitis in older adults (65+) is twice that of younger adults (30–44 years)

Oral Health in America

Substantial oral health disparities were identified in the first report for many disadvantaged socioeconomic groups

– *“...there are profound and consequential disparities in the oral health of our citizens.”*

Although oral health for many Americans has improved since 2000, oral health disparities persist

– Ongoing health disparities perpetuate oral health inequities

Oral Health in America

When we think of the possible impact of some of the major changes over the past 2 decades

- **Digitization of everything**

- There is great potential for newer technologies to exacerbate health disparities

- **Delivery of services**

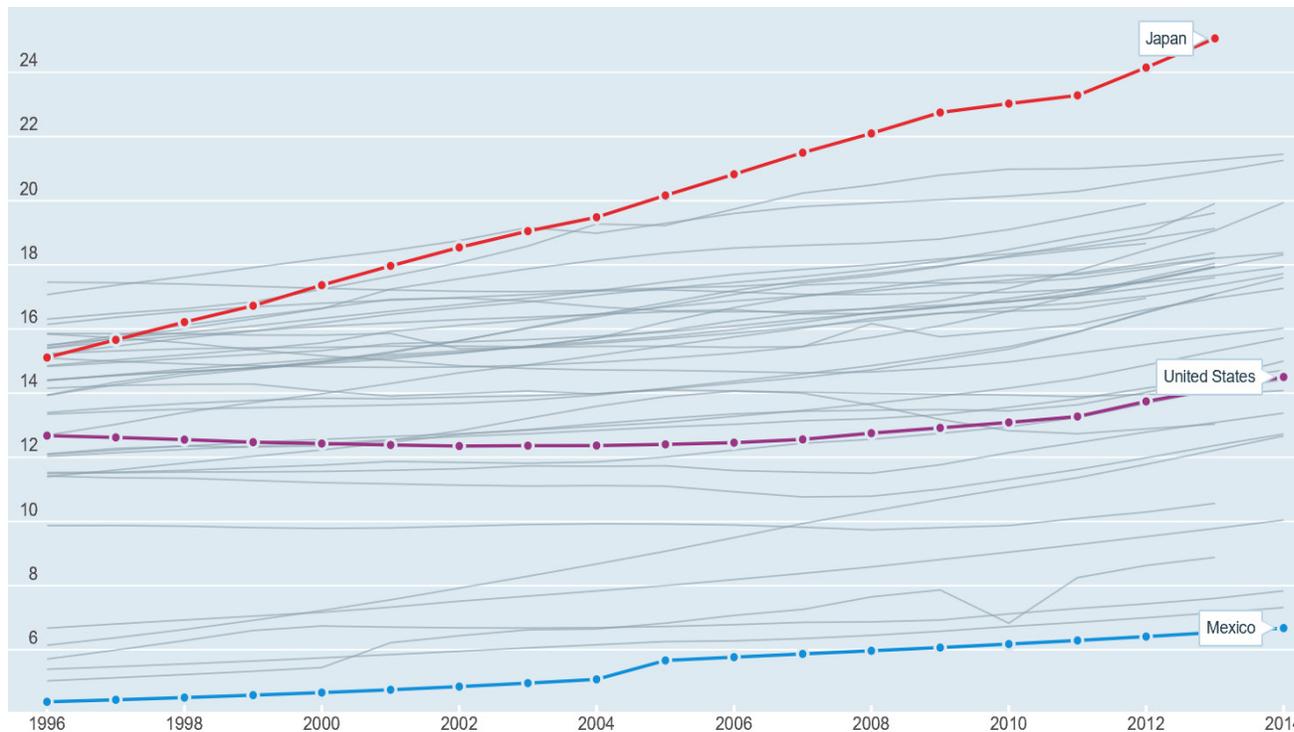
- Consolidation and economic forces can negatively affect access to dental care

- **Demographic changes**

- Sociodemographic risk indicators suggest more people are at risk of poor oral health

Oral Health in America

Aging of America is very important

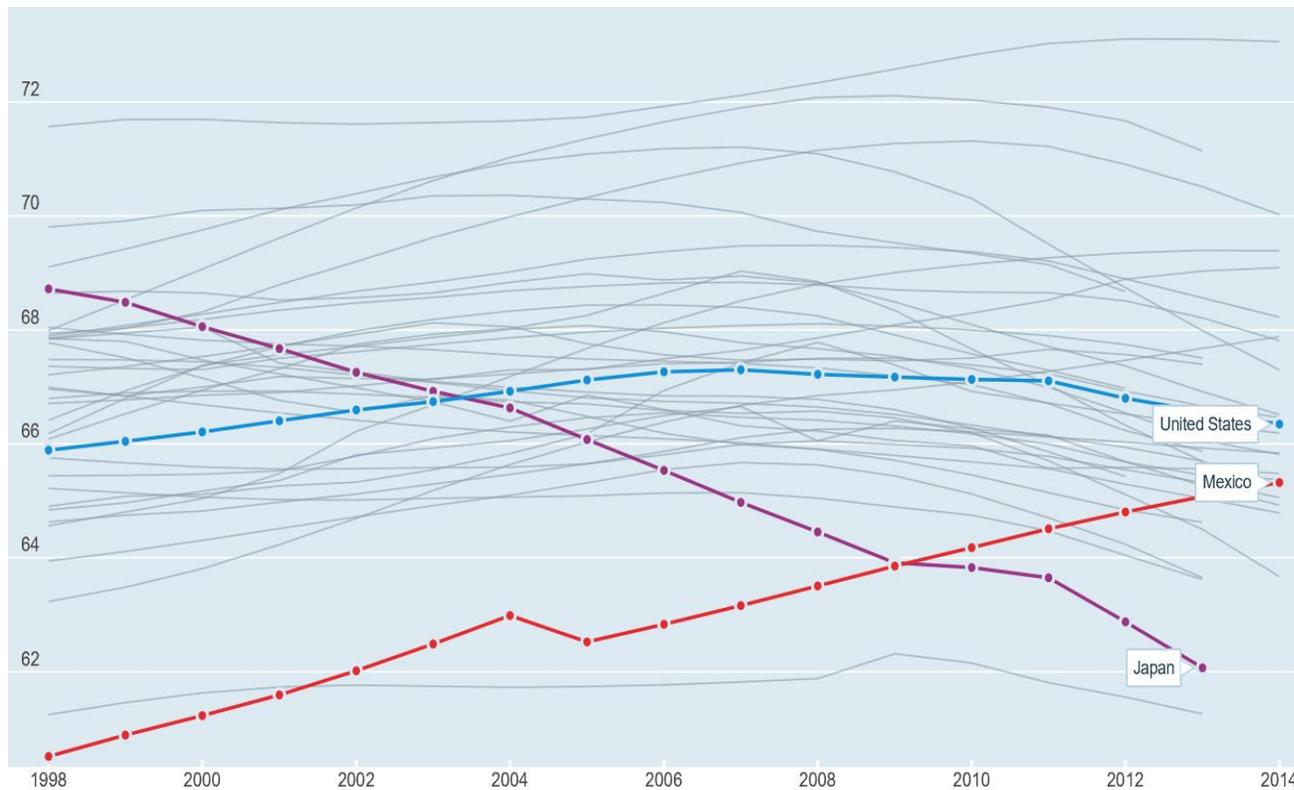


Percent of the elderly population 1996–2014 among 35 OECD countries

Organization for Economic Cooperation and Development (2019). Elderly population (indicator). doi: 10.1787/8d805ea1-en (Accessed on April 4, 2019.)

Oral Health in America

Aging of America is very important



**Percent of the
working-age
population
1996–2014 among
35 OECD countries**

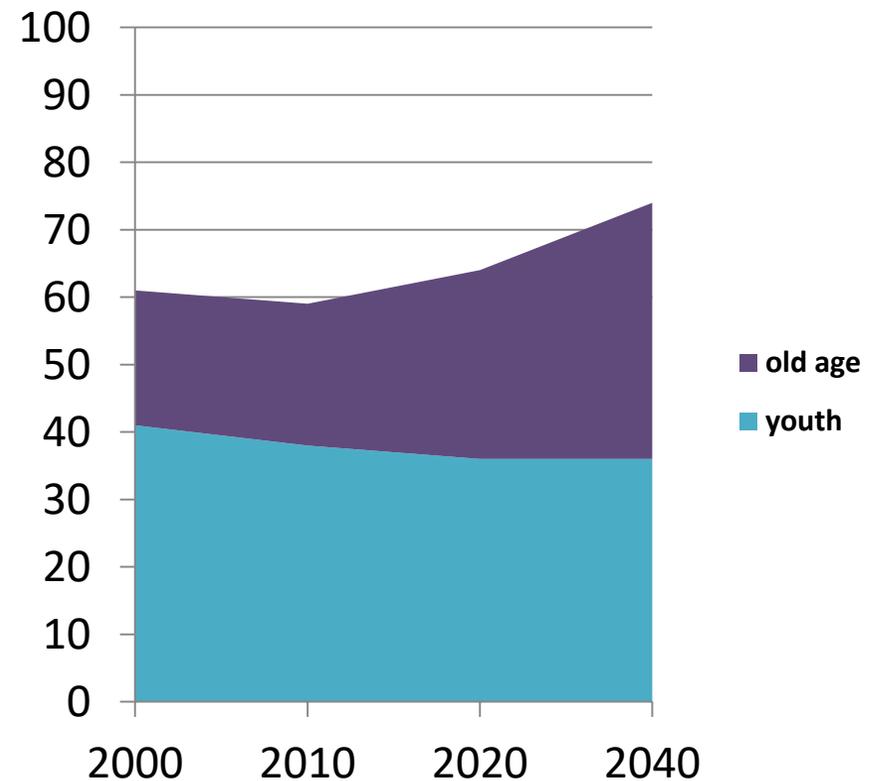
OECD (2019). Working age population (indicator). doi: 10.1787/d339918b-en (Accessed on April 4, 2019.)

Oral Health in America

Aging of America is very important

Changing Dependency Ratio is a concern

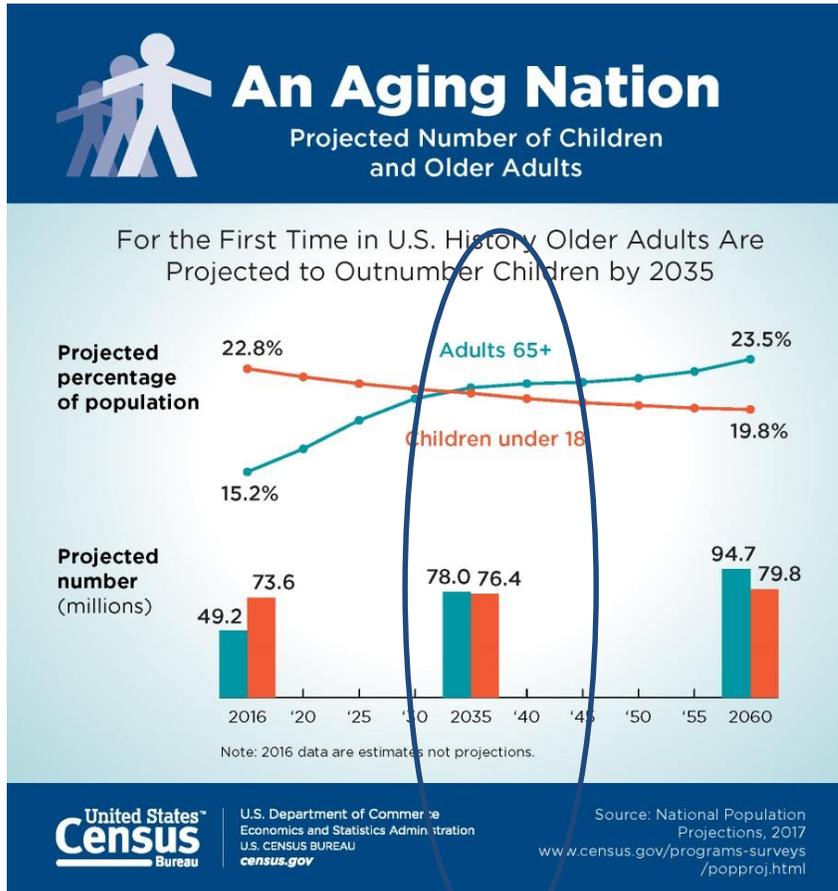
- **In 2000:**
 - 20 older adults: 100 working adults
- **Today:**
 - 28 older adults: 100 working adults
- **In 2040:**
 - *Older adults increase to 38:100*



Source: Dependency ratio: the number of youths (<18 years) and older adults (≥65 years) for every 100 working-age adults (18-64 years). US Census Bureau, Current Population Reports, March 2018.

Oral Health in America

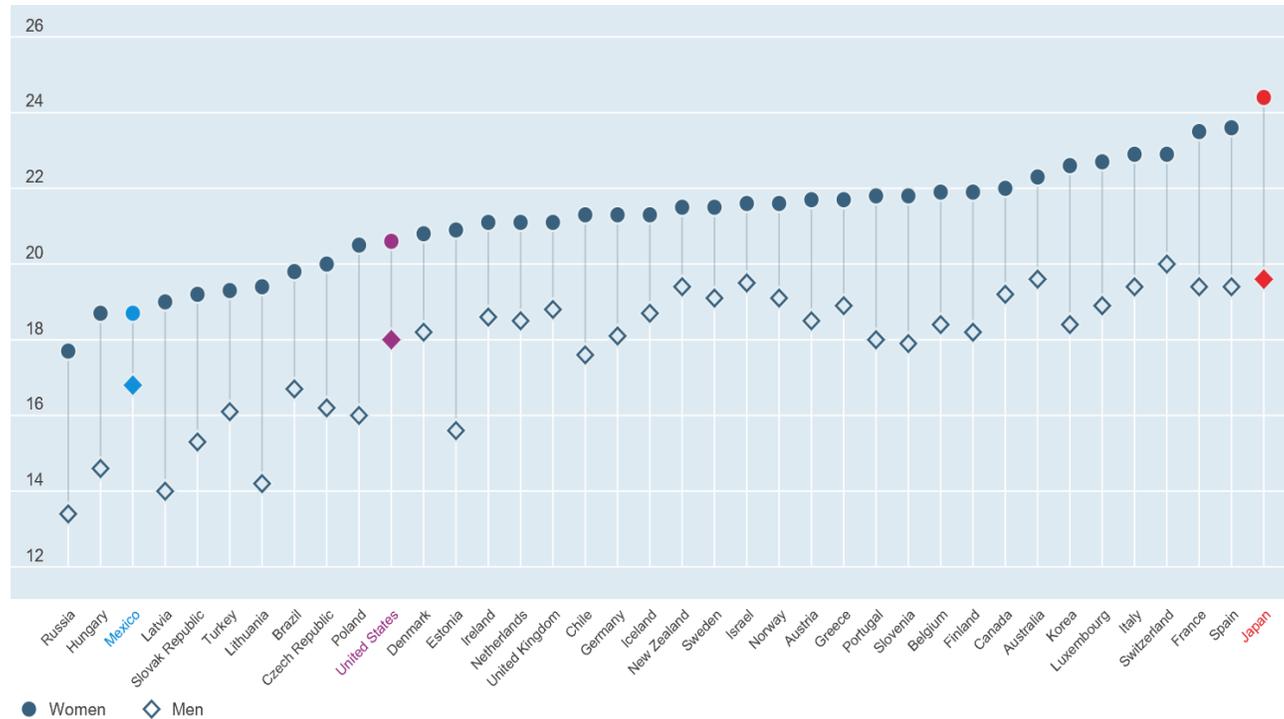
Aging of America is very important



By 2035, there may be more older adults than youth in the US

Oral Health in America

Aging of America is very important



Life expectancy at age 65 Women/Men, in Years, 2017 (or latest available) among 35 OECD countries

Sex differential in older age profoundly affects prevalence of some chronic diseases

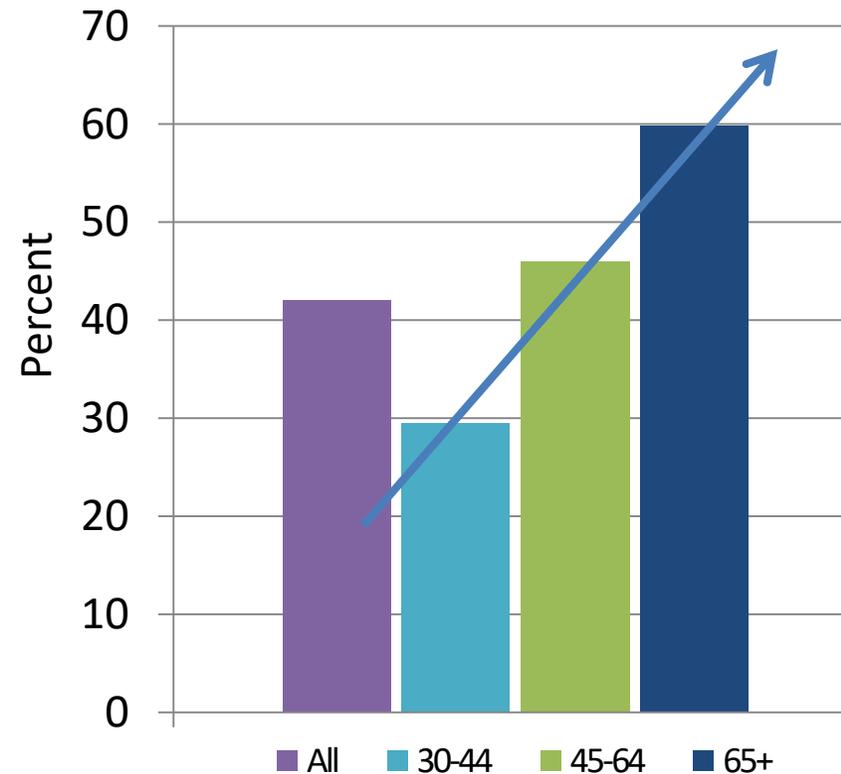
OECD (2019). Life expectancy at 65 (indicator). doi: 10.1787/0e9a3f00-en (Accessed on April 4, 2019.)

Oral Health in America

Age is also a very important determinant for periodontitis

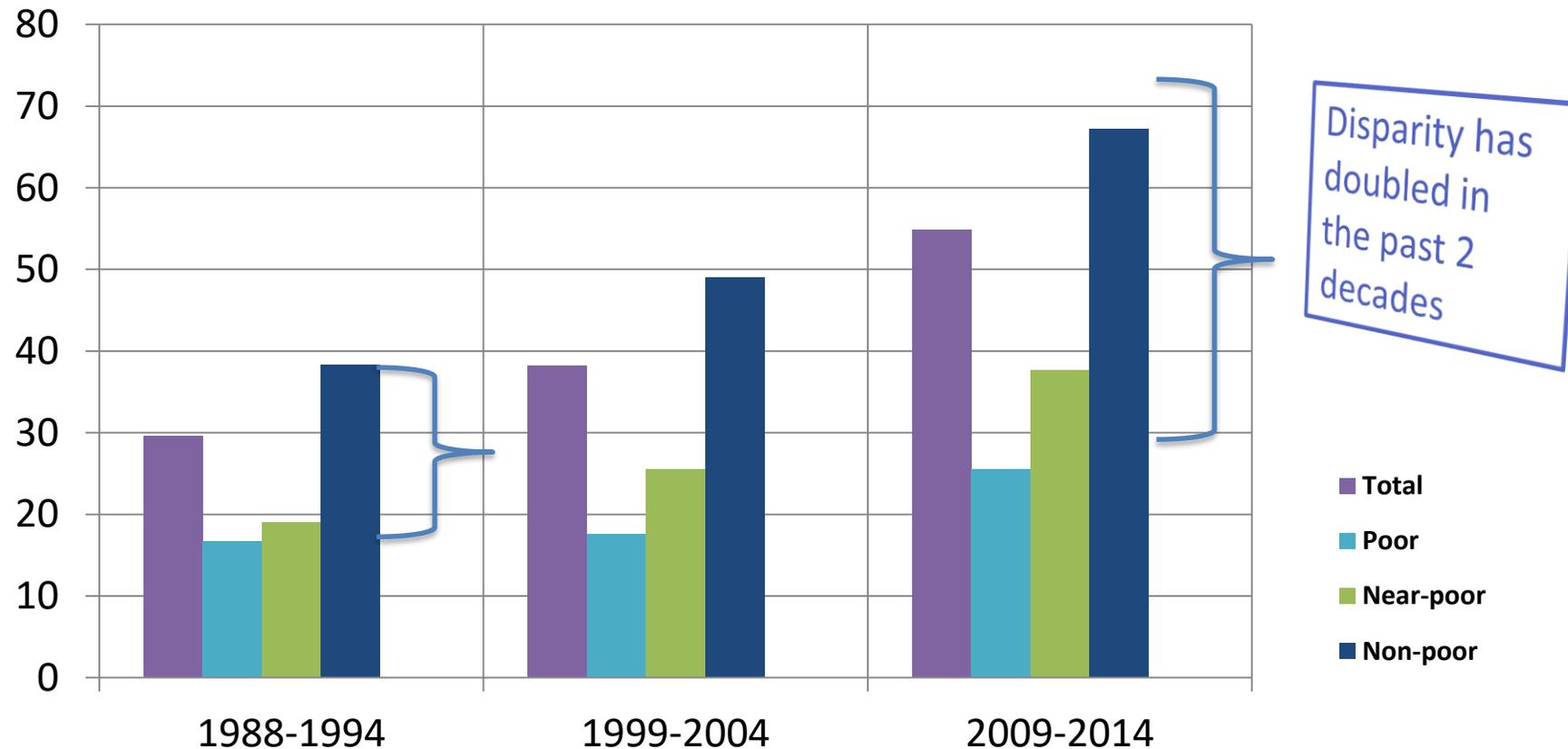
In 2009–2014, prevalence of total periodontitis among adults aged 30 years and older in the United States = **42%**

29.5% (aged 30–44 years)
46.0% (aged 45–64 years)
59.8% (aged 65 years and older)



Oral Health in America

Changes in functional dentition (≥ 21 teeth) among adults aged 65 years and older in the United States



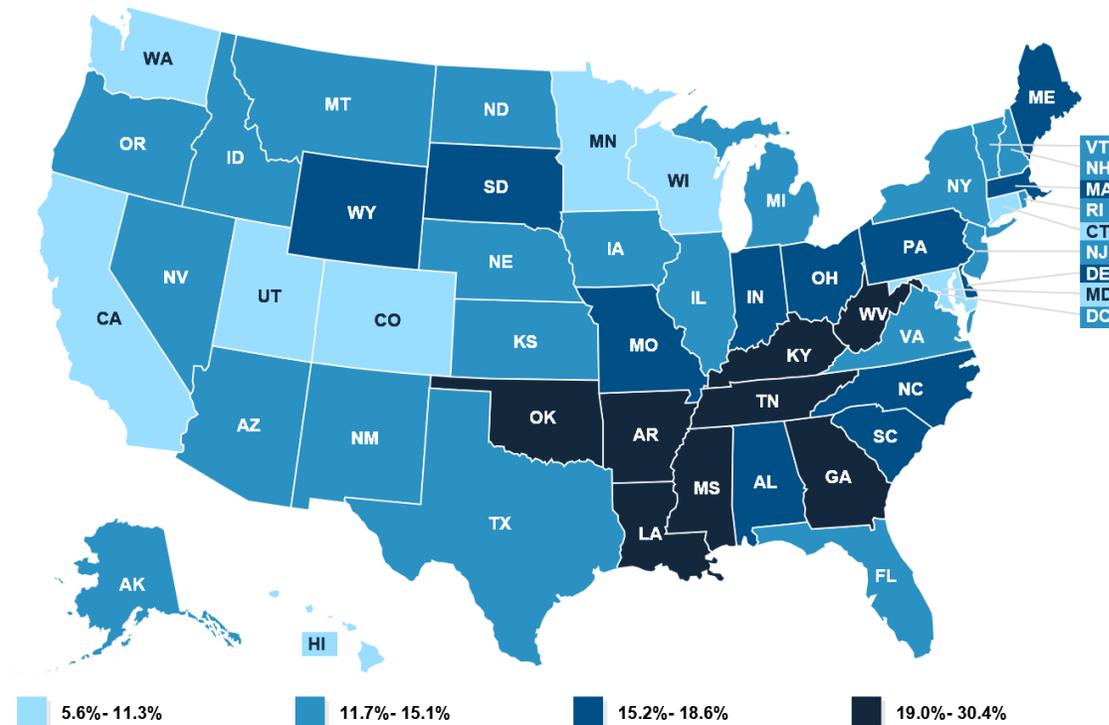
Source: Dye BA, Tan S, Smith V, et al. Trends in Oral Health Status—United States, 1988-1994 and 1999-2004. Vital and Health Statistics. Series 11, Number 248 (April 2007).
Dye BA, Lopez Mitnik G, Weatherspoon DJ. Tooth loss among older adults according to poverty status in the United States from 1999 through 2004 and 2009 through 2014. JADA 2018;150(1):9-23.

Oral Health in America

Percentage of adults aged 65 years and older with no remaining natural teeth (2016)

Although edentulism continues to decline (**11%**) similar to tooth retention, disparities remain among lower income adults

This can also disproportionately affect some adults more than others based on *where* they live



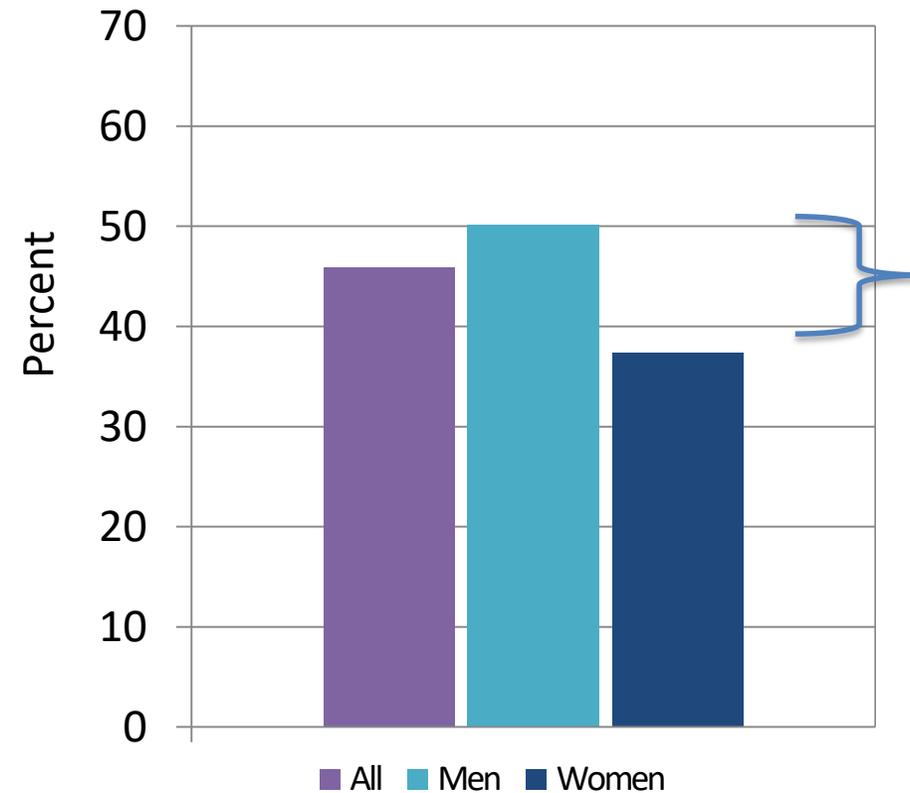
Source: Kaiser Family Foundation analysis of the Center for Disease Control and Prevention (CDC)'s Behavioral Risk Factor Surveillance System (BRFSS) 2016 Survey Results. Accessed April 10, 2019.

Oral Health in America

Important Oral Health disparities exist by sex

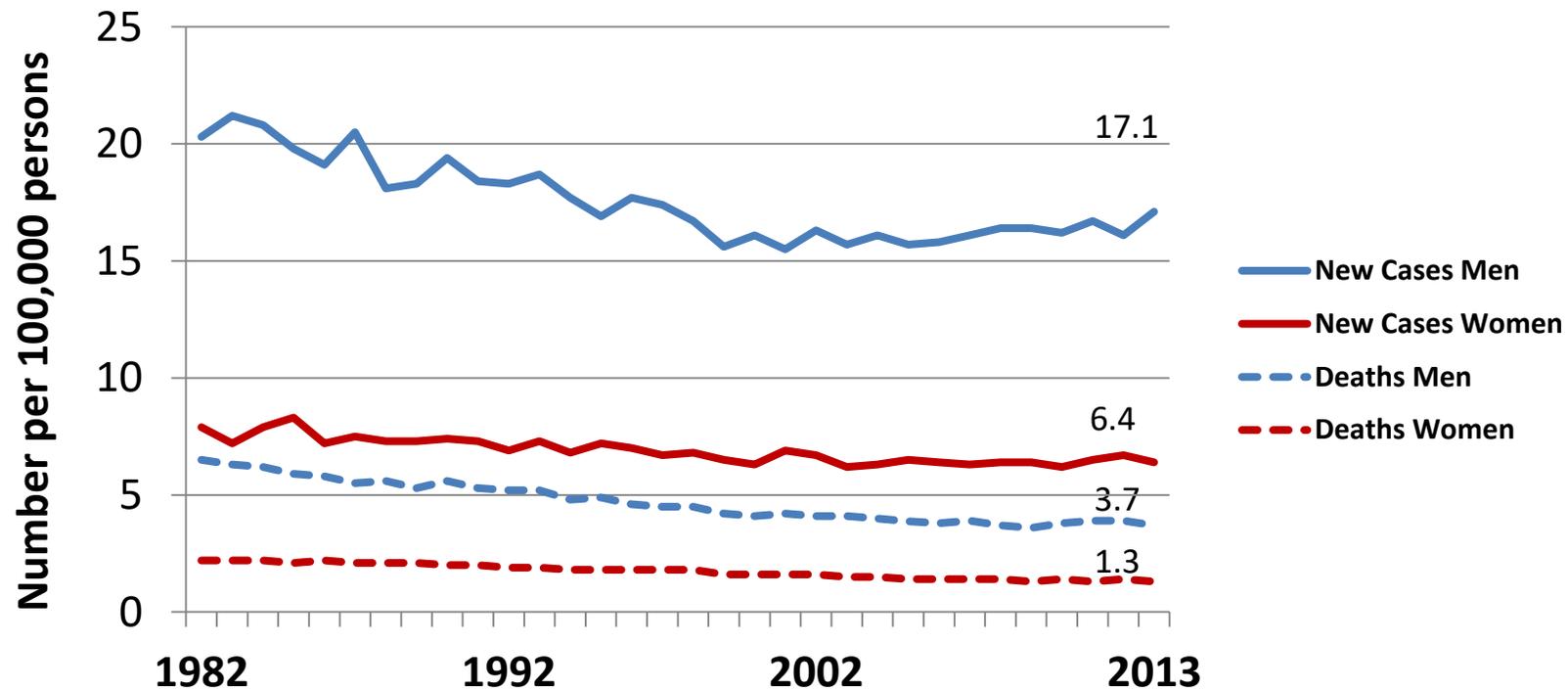
Prevalence of total periodontitis = 42% for adults aged 30 years and older by sex in the United States, 2009–2014

- 50% (men)
- 35% (women)



Oral Health in America

Number of new cases and deaths from oropharyngeal cancer per 100,000 persons in the United States



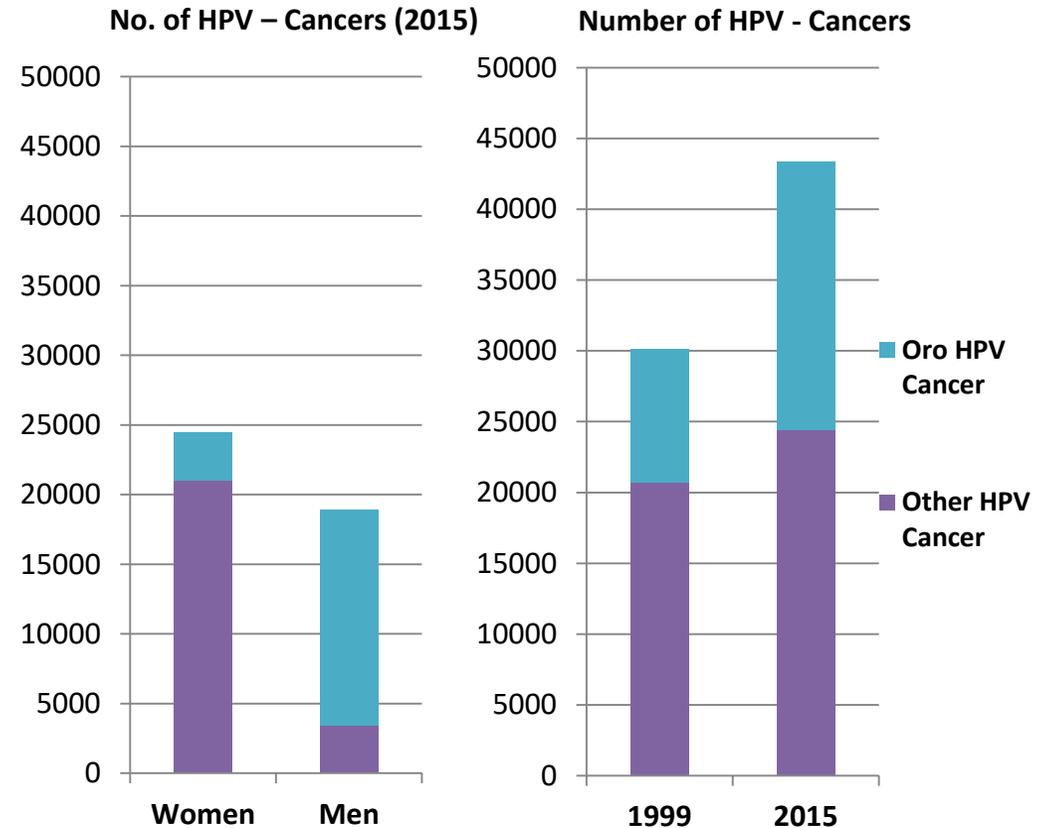
Source: SEER 9. Rates are age adjusted. http://seer.cancer.gov/csr/1975_2013/

Oral Health in America

Oropharyngeal cancer is now the most common HPV-associated cancer

Oral oncogenic HPV prevalence is 6.6% for men and 1.5% for women

Men have 3½ times more oropharyngeal cancer than women



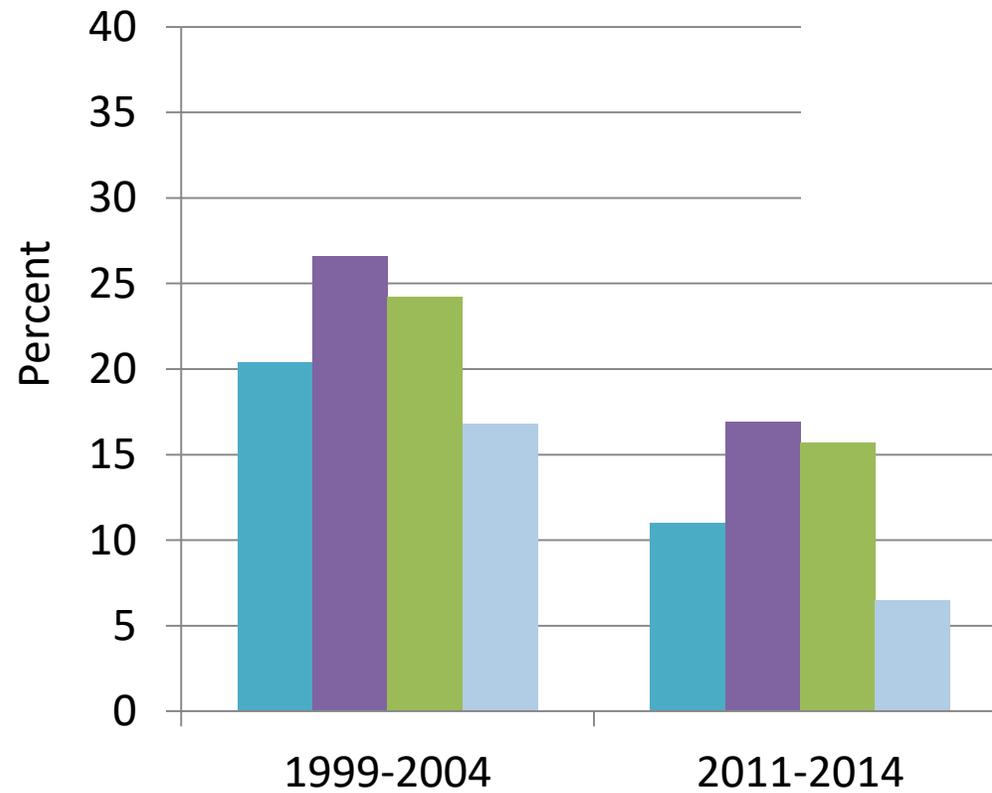
Notes: Chaturvedi et al. NHANES 2009-2012 findings: association of sexual behaviors with higher prevalence of oral oncogenic human papillomavirus infections in U.S. men. *Cancer Res* 2015; 75: 2468-2477. Van Dyne EA, Henley SJ, Saraiya M, Thomas CC, Markowitz LE, Benard VB. Trends in Human Papillomavirus–Associated Cancers — United States, 1999–2015. *MMWR Morb Mortal Wkly Rep* 2018;67:918–924.

Oral Health in America

Important Oral Health disparities exist by race/ethnicity

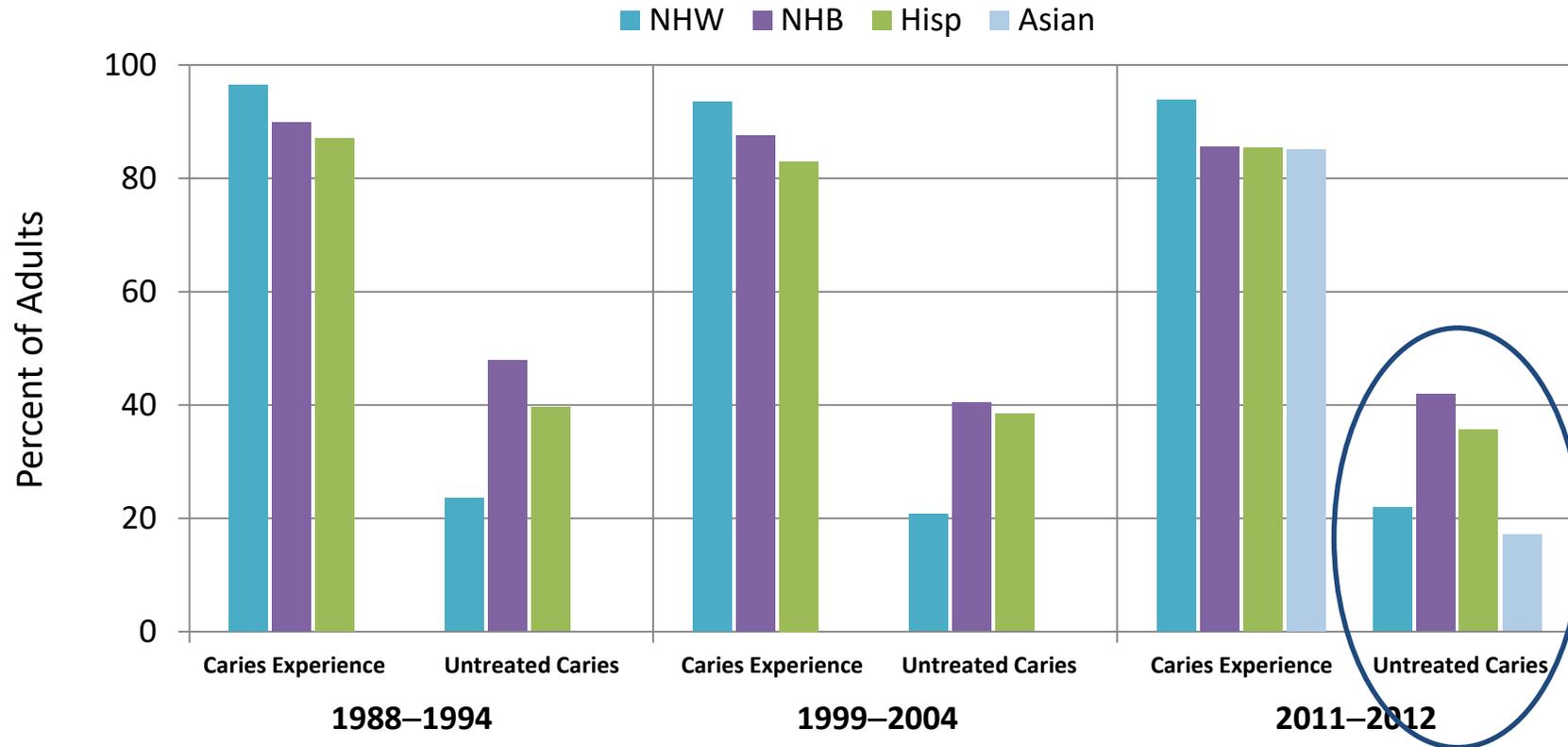
Prevalence of untreated caries in primary teeth for preschool children aged 2–5 years by race/ethnicity in the US

Although there are big improvements in untreated caries in preschool children overall, disparities remain



Oral Health in America

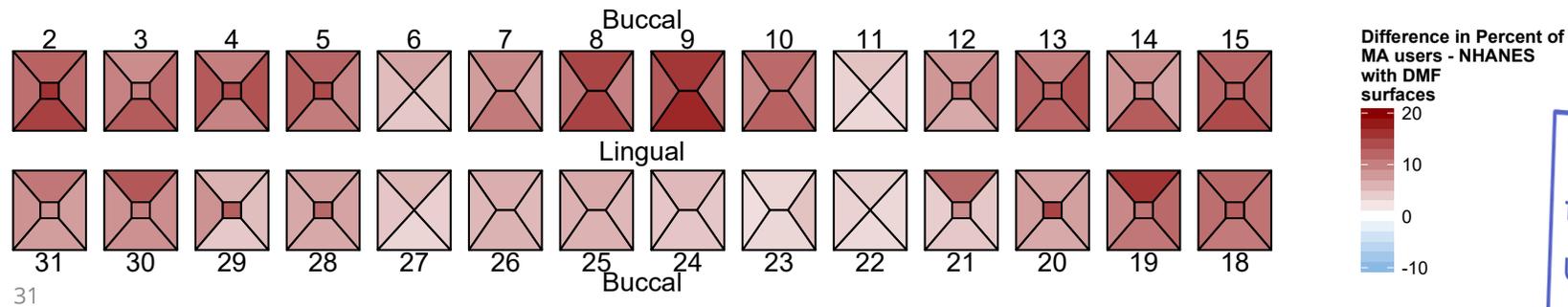
Prevalence of dental caries in permanent teeth for adults aged 20–64 years by race/ethnicity in the United States



Source: National Health and Nutrition Examination Survey, 1988-1994, 1999-2004, and 2011-2012. Caries Experience (DMFT>0). Untreated Caries (DT>0). Non-Hispanic White (NHW); Non-Hispanic Black (NHB); Hispanic (Hisp) in 2011-2012 or Mexican American in 1988-1994 and 1999-2004; Non-Hispanic Asian (Asian).

Oral Health in America

Important differences in dental caries prevalence exist between methamphetamine users and the US population

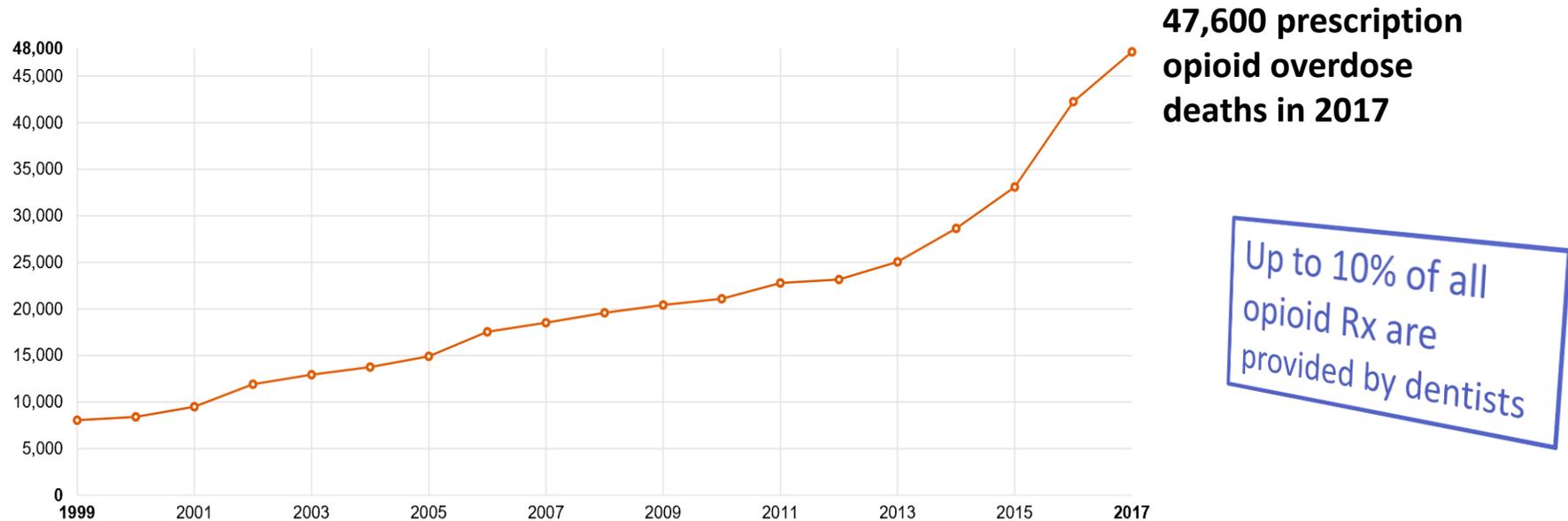


Darker the "red" the worse for MA users compared to US population

Methamphetamine (MA) users were twice as likely to have 2 more decayed, missing, or filled teeth than NHANES participants.

Oral Health in America

Prescription opioid overdose deaths and death rate per 100,000 population (age-adjusted) in the US



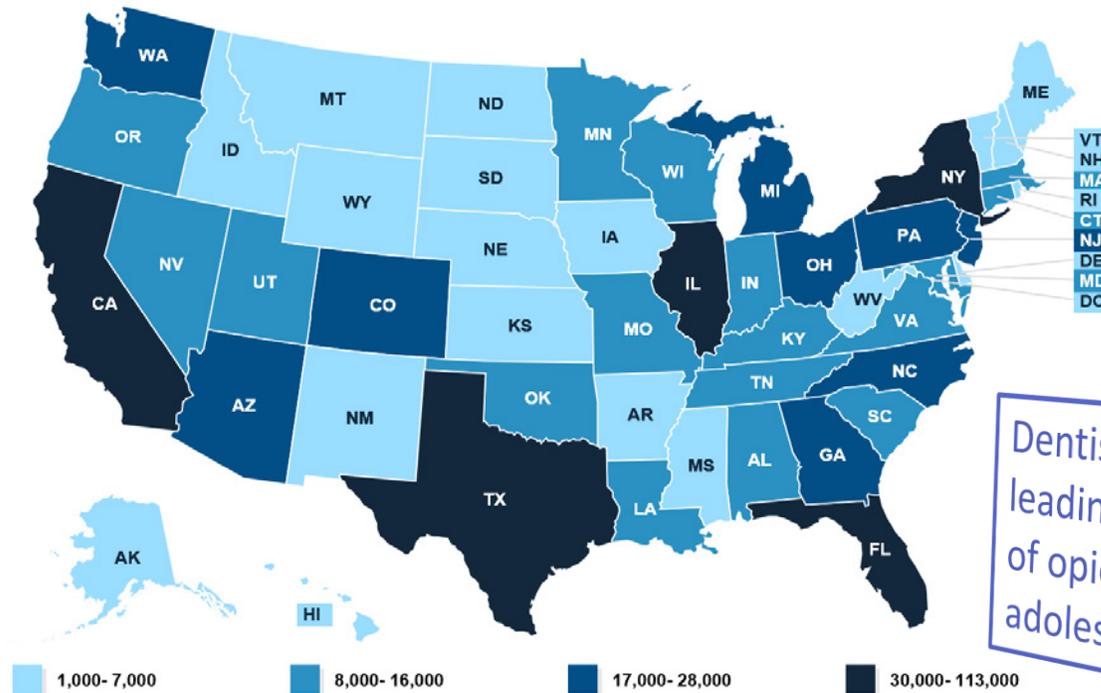
Kaiser Family Foundation analysis of Centers for Disease Control and Prevention (CDC), National Center for Health Statistics. Multiple Cause of Death 1999-2017 on CDC WONDER Online Database, released 2018. Data are from the Multiple Cause of Death Files, 1999-2017, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at <http://wonder.cdc.gov/mcd-icd10.html> on January 10, 2019.

Oral Health in America

Substance abuse and mental illness co-occur

Teenagers reporting mental illness in the past year (765,000)

Upwards of 60% of adolescents in community-based Substance Abuse Disorder treatment programs also meet diagnostic criteria for another mental illness



Dentists are the leading prescriber of opioids to adolescents

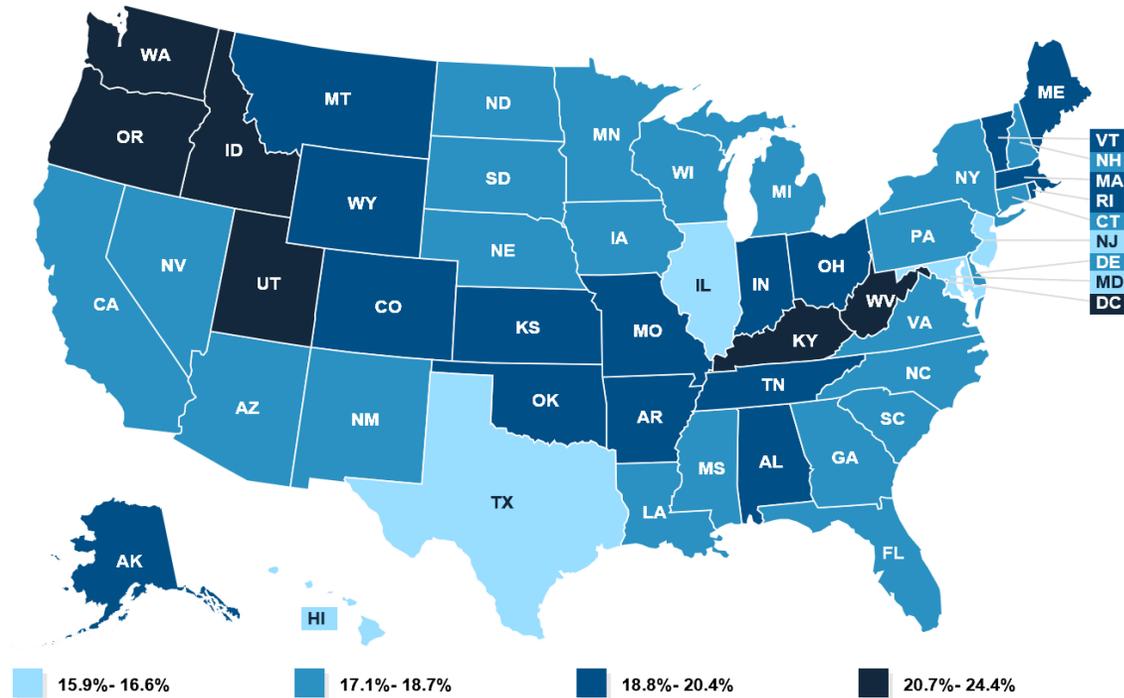
Source: Kaiser Family Foundation. Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2016 and 2017. (Accessed April 10, 2019.)

Oral Health in America

Substance abuse and mental illness co-occur

Adults reporting mental illness in the past year (18.2% or 45.6 million)

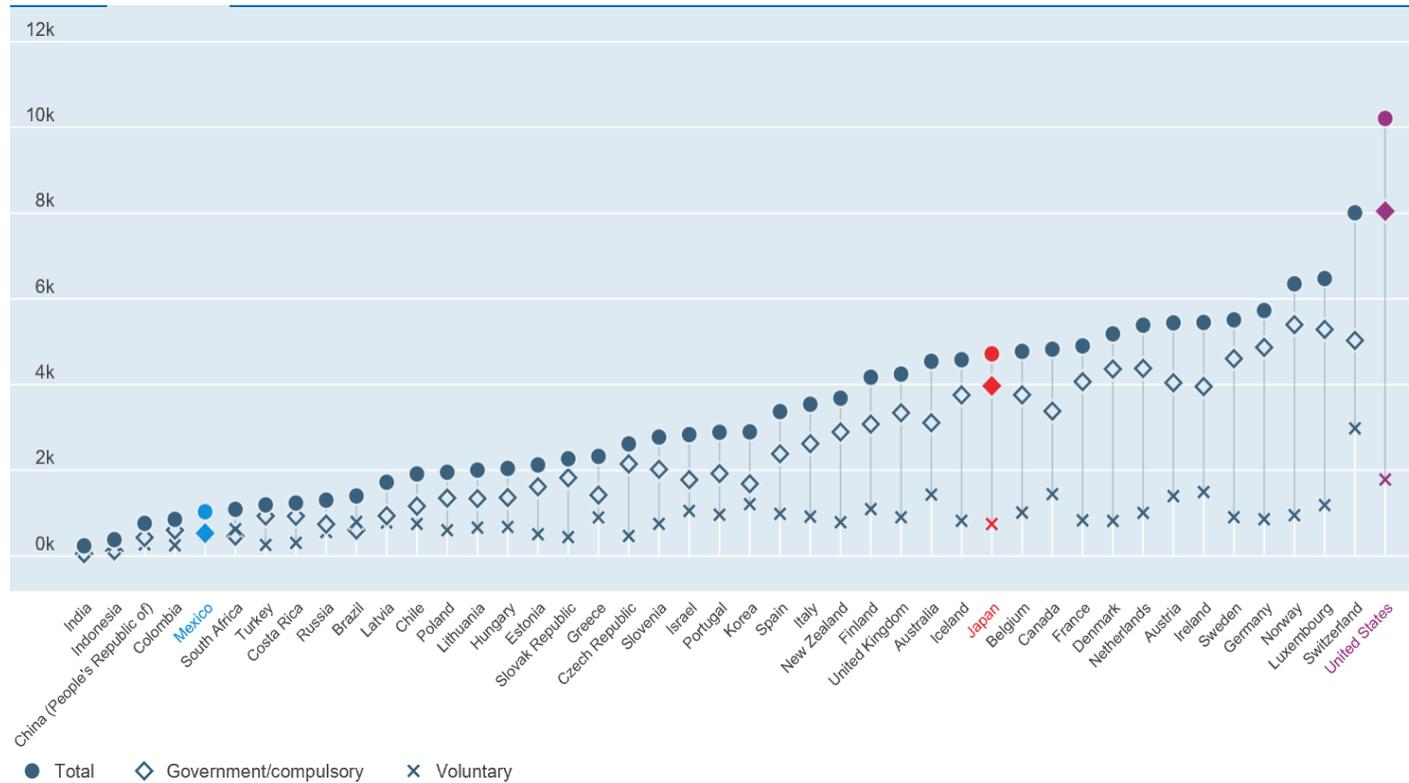
24% in Idaho
5.4 million in California



Source: Kaiser Family Foundation. Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2016 and 2017. (Accessed April 10, 2019.)

Oral Health in America

Health care expenditures are a concern



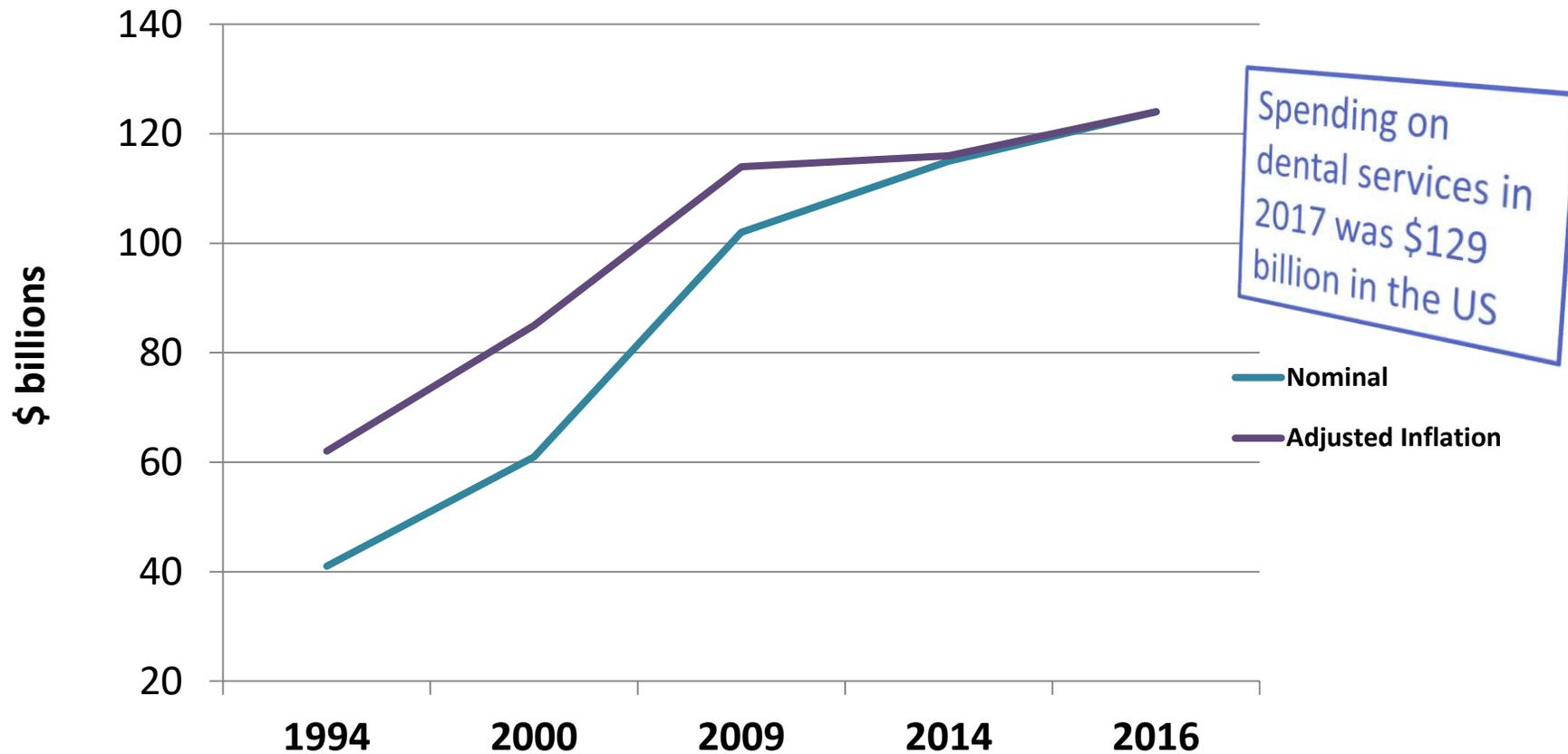
Health spending, US dollars/capita, 2017 (or latest available)

USA: \$10,739/capita

Dental services accounts for 4% of total health expenditures in the US

Oral Health in America

Total dental expenditures in the United States

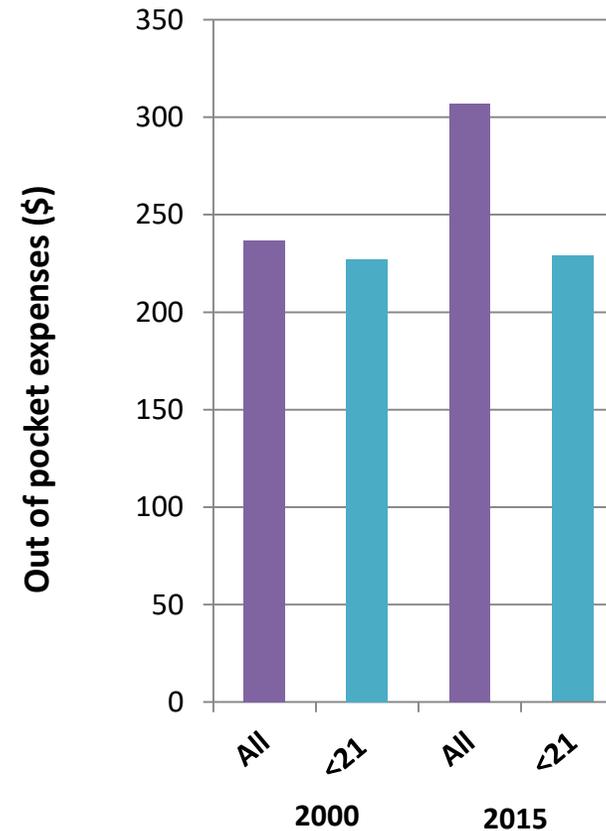


Oral Health in America

Personal dental expenses have increased

Out of pocket dental expenses have increased ~\$70 overall

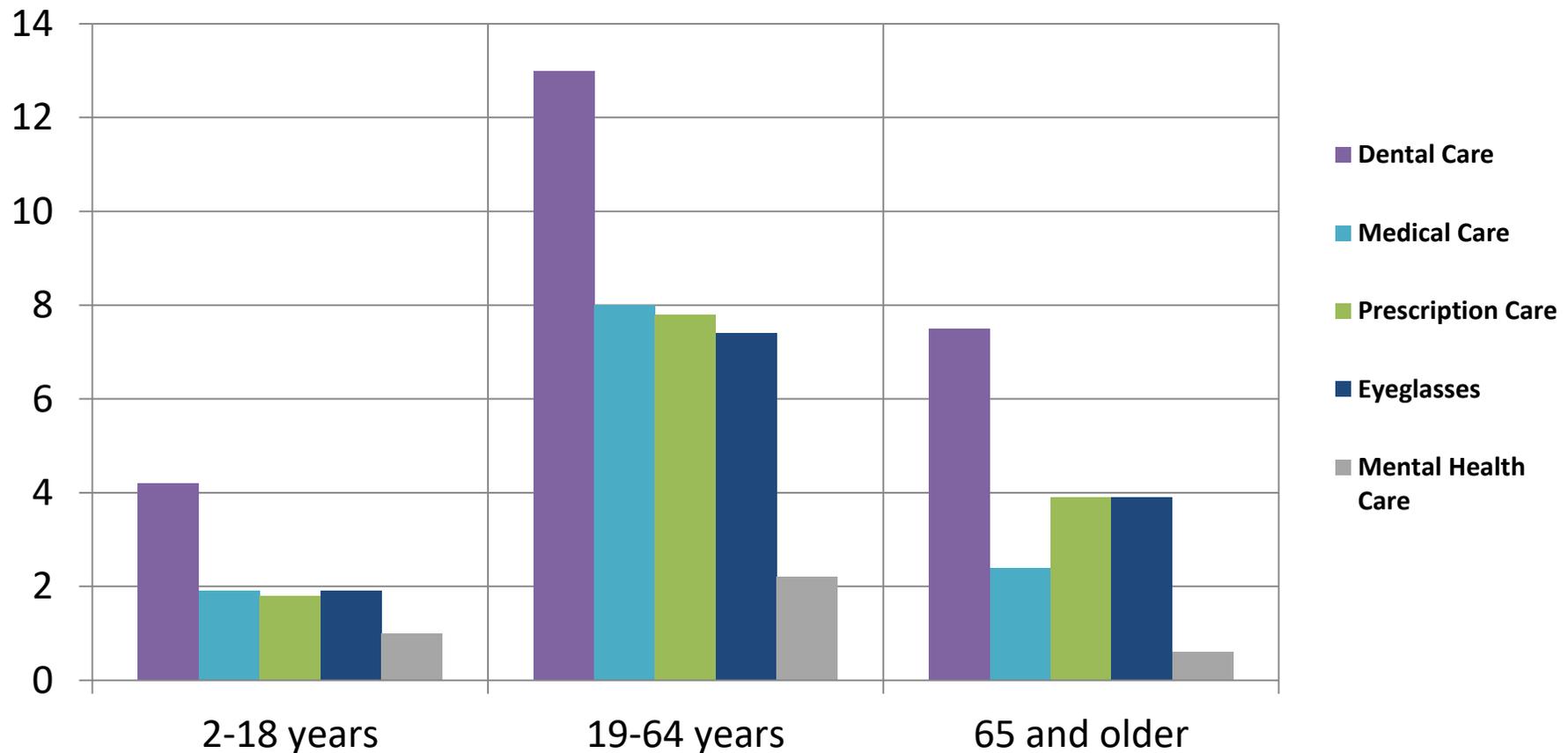
But have remained unchanged for those under 21 years



Source: Manski RJ and Rohde F. Dental Services: Use, Expenses, Source of Payment, Coverage and Procedure Type, 1996–2015: Research Findings No. 38. November 2017. Agency for Healthcare Research and Quality, Rockville, MD.

Oral Health in America

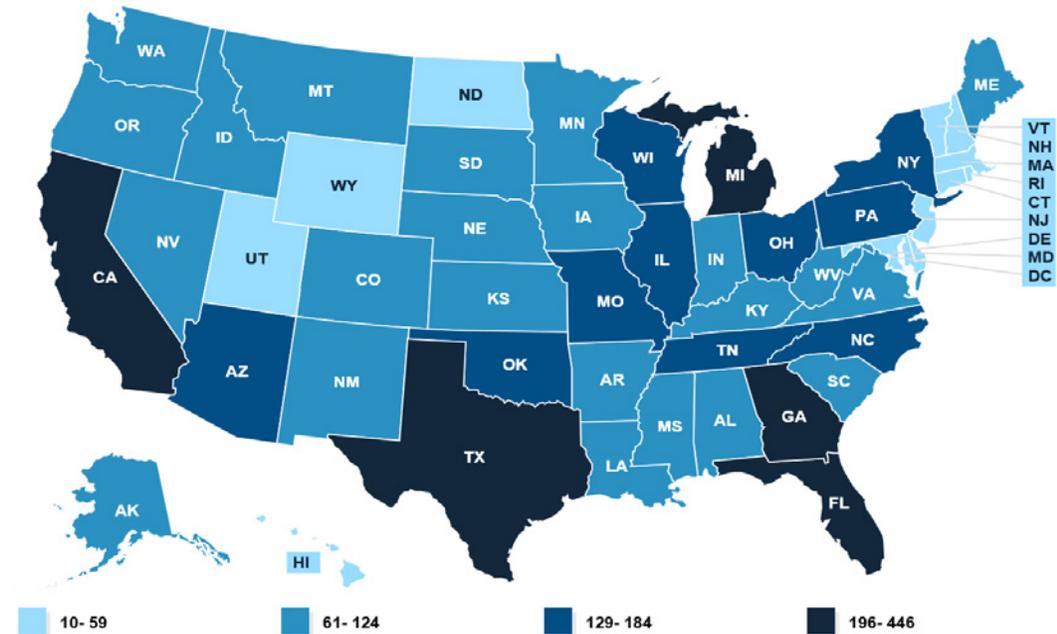
Percent of people who did not get selected health care services they needed in the past 12 months because of cost



Oral Health in America

Cost is not the only barrier affecting access to dental care — Dental Health Professional Shortage Areas

5,833 Dental HPSAs affecting 58 million

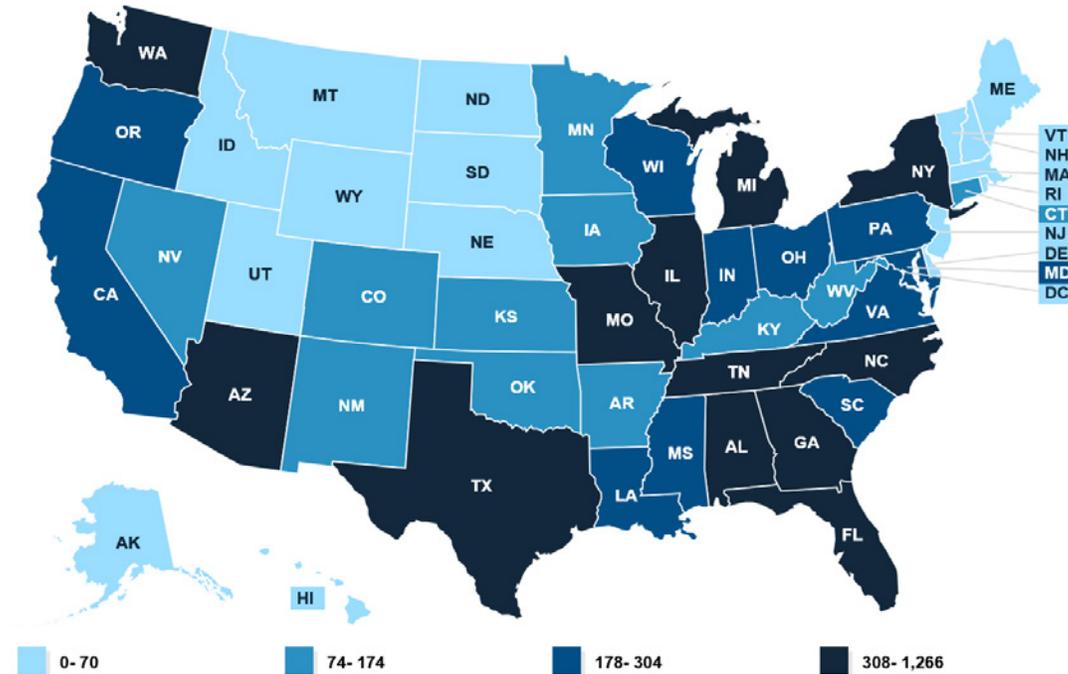


Source: Kaiser Family Foundation. Bureau of Health Workforce, Health Resources and Services Administration (HRSA), U.S. Department of Health & Human Services, Designated Health Professional Shortage Areas Statistics: Designated HPSA Quarterly Summary, as of December 31, 2018. (Accessed April 10, 2019.)

Oral Health in America

Cost is not the only barrier affecting access to dental care — Dental Health Professional Shortage Areas

10,635 dental practitioners
needed to remove HPSA
designation



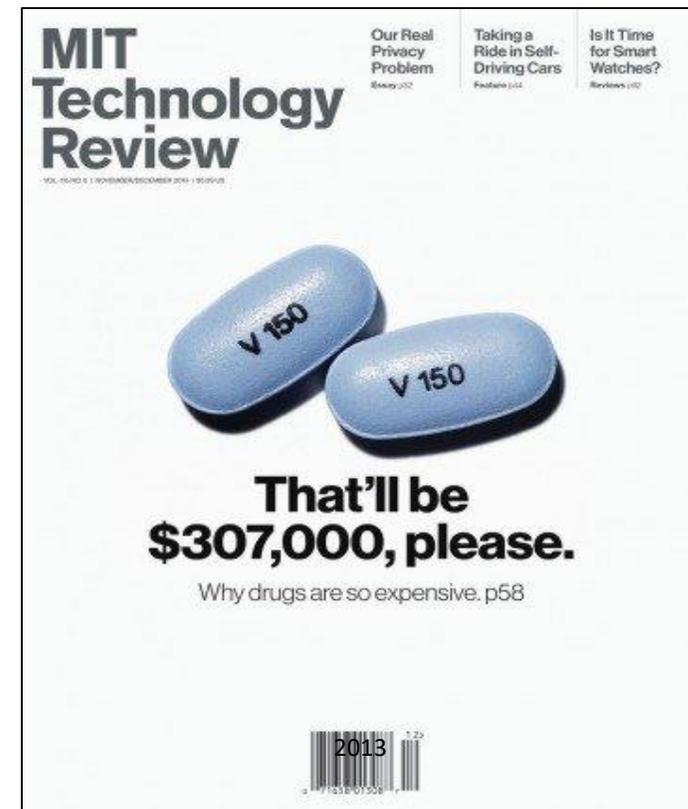
Source: Kaiser Family Foundation. Bureau of Health Workforce, Health Resources and Services Administration (HRSA), U.S. Department of Health & Human Services, Designated Health Professional Shortage Areas Statistics: Designated HPSA Quarterly Summary, as of December 31, 2018. (Accessed April 10, 2019.)

Oral Health in America

The costly paradox of health care technology

In every industry but one – technology makes things better and cheaper

Innovation increases the cost of health care



Oral Health in America

The paradox of too much data and not enough information

“Biomedical sciences juxtaposes the term ‘precision’ to medicine and public health with companion words like big data, data science, and deep learning.”

Barriers remain for *precision* medicine/ public health interventions to effect change that benefits individuals and population groups

Prosperi et al. BMC Medical Informatics and Decision Making (2018) 18:139
<https://doi.org/10.1186/s12911-018-0719-2>

BMC Medical Informatics and
Decision Making

DEBATE

Open Access

Big data hurdles in precision medicine and precision public health



Mattia Prosperi^{1*}, Jae S. Min¹, Jiang Bian² and François Modave³

Abstract

Background: Nowadays, trendy research in biomedical sciences juxtaposes the term ‘precision’ to medicine and public health with companion words like big data, data science, and deep learning. Technological advancements permit the collection and merging of large heterogeneous datasets from different sources, from genome sequences to social media posts or from electronic health records to wearables. Additionally, complex algorithms supported by high-performance computing allow one to transform these large datasets into knowledge. Despite such progress, many barriers still exist against achieving precision medicine and precision public health interventions for the benefit of the individual and the population.

Main body: The present work focuses on analyzing both the technical and societal hurdles related to the development of prediction models of health risks, diagnoses and outcomes from integrated biomedical databases. Methodological challenges that need to be addressed include improving semantics of study designs; medical record data are inherently biased, and even the most advanced deep learning’s denoising autoencoders cannot overcome the bias if not handled a priori by design. Societal challenges to face include evaluation of ethically actionable risk factors at the individual and population level; for instance, usage of gender, race, or ethnicity as risk modifiers, not as biological variables, could be replaced by modifiable environmental proxies such as lifestyle and dietary habits, household income, or access to educational resources.

Conclusions: Data science for precision medicine and public health warrants an informatics-oriented formalization of the study design and interoperability throughout all levels of the knowledge inference process, from the research semantics, to model development, and ultimately to implementation.

Background

The United States White House initiative on precision medicine stated that its mission is “to enable a new era of medicine through research, technology, and policies that empower patients, researchers, and providers to work together toward development of individualized care” [1]. Our ability to store data now largely surpasses our ability to effectively and efficiently learn from them and to develop actionable knowledge that leads to improvements in health outcomes. Precision medicine sprouts from big data and is the manifest evidence of such a dramatic change in scientific thinking. However, from its inception, precision medicine has been beleaguered with technical and sociopolitical challenges [2].

What is precision medicine?

The National Institutes of Health (NIH) defines precision medicine as the “approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person” [3]. The emphasis is placed on tailored prevention, diagnosis and treatment for each individual based on genetics, epigenetics, and other lifestyle considerations. The terms ‘personalized’, ‘stratified’ and ‘individualized’ medicine have been often used interchangeably, but superseded lately by ‘precision’ [4]. Precision has been preferred “to emphasize the new aspects of this field, which is being driven by new diagnostics and therapeutics” [5]. Nonetheless, the debate on terms and definitions is still open [6].

A classic example of precision medicine is the customization of disease treatment for a single individual. In the old paradigm of one-size-fits-all medicine, an effective treatment is the treatment known to benefit

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Oral Health in America

What does this all mean for a new Surgeon General's Report on Oral Health?

Oral Health in America

Contemporary issues to consider in the 2020 Report

- *Oral health* has improved for many but not for all
- Changes across the lifespan substantially influence *oral health*
- More needs to be known about the effect of addiction and substance use disorders on *oral health* and the role of dental providers

Oral Health in America

Contemporary issues to consider in the 2020 Report

- Changes in the delivery of *oral health* services, including integration with primary health care, are accelerating
- Ongoing technological and scientific advances have the potential to transform *oral health*, but concerns persist they will not equally benefit all
- *Oral health* impacts overall well-being, the economy, and national security

Oral Health in America

What is the status of the 2020 report today?



Oral Health in America Advances and Challenges

Developing the 2020 Surgeon General's Report

Judith Albino, PhD

Project Co-Director and Scientific Editor

April 17, 2019

National Oral Health Conference



National Institute of Dental
and Craniofacial Research

The Surgeon General's Charge

“The report will describe and evaluate oral health and the interaction between oral health and general health throughout the lifespan, considering advances in science, healthcare integration, and social influences to articulate promising new directions for improving oral health and oral health equity across communities.”

2020 Surgeon General's Report

Assess Knowledge



Write



Edit



Review and Revise



What Topics will be Included?

- Effect of oral health on the community, overall well-being, the economy, and military readiness
 - **Section Editor:** Robert Weyant
 - **Associate Editors:** Carlos Quiñonez, Scott Tomar, and Marko Vujicic



What Topics will be Included?

- Oral Health in children and adolescents
 - **Section Editor:** Paul Casamassimo
 - **Associate Editors:** Jessica Lee, Belinda Borrelli, Margherita Fontana, and Norman Tinanoff



What Topics will be Included?

- Oral Health in working adults and older adults
 - **Section Editor:** Jocelyne Feine
 - **Associate Editors:** Linda Niessen, Judith Jones, Eliza Chavez, and Susan Reisine



What Topics will be Included?

- Oral health integration, workforce, practice
 - **Section Editor:** Kathy Atchison
 - **Associate Editors:** Nadeem Karimbux, Jeff Fellows, and Jeff Chaffin



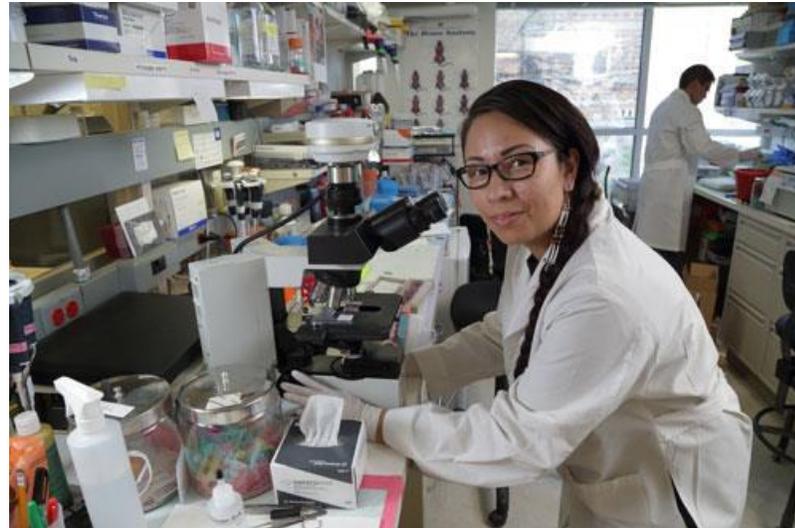
What Topics will be Included?

- Substance use disorders, the opioid epidemic, high-risk behaviors, and mental health
 - **Section Editor:** Christian Stohler
 - **Associate Editors:** Israel Agaku, Linda Fried, and Jon-Kar Zubieta



What Topics will be Included?

- Emerging technologies and promising science to transform oral health
 - **Section Editor:** Laurie McCauley
 - **Associate Editors:** Wenyan Shi, William Giannobile, and Michelle Robinson



How are we Gathering Input?

- SG Listening Session (November 2018) elicited input from more than 150 health professionals, researchers, educators, and other experts
- Overview Webinar (January 2019) to invite public input
 - More than 1700 Views
 - 168 Comments, including 40 descriptions of programs and 57 individuals volunteering to contribute to the SGR
- Asked the Association of State and Territorial Dental Directors (March 2019) to share exemplary private-public partnerships for improving oral health (18 responses)

Using the Input to Shape Content

- Six Section Editors and 20 Associates outline and expand topics and content
- 250+ researchers and health professionals review science and practice and write text
- More than 50 experts critically read and revise
- Federal clearance procedures ensure that standards of the Surgeon General and the US Department of Health and Human Services are met

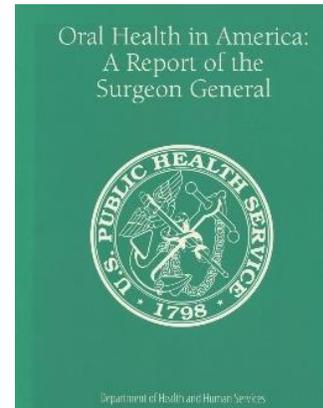
Expectations

Available in Fall 2020, the Surgeon General's Report will provide:

- Information that will impact population health, the economy, national security, health professions education, and public policy
- Guidance for research, education, practice, and individual health
- Promising approaches to achieving oral health equity for our country's diverse communities
- A road map to optimal oral health for all

Questions

E-mail to: NIDCR-SGROH@nidcr.nih.gov



Free – *Ask for one today*

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