

Prevention in Focus Webinar Series

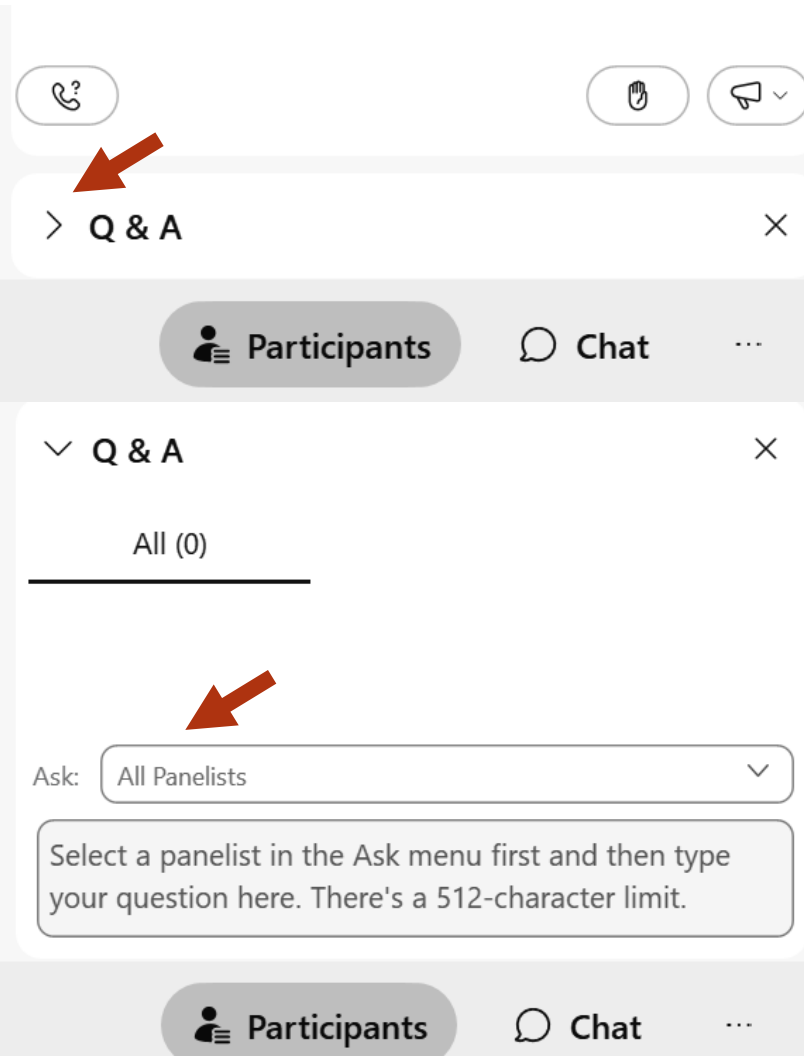
Cost Effective Interventions That Can Prevent Obesity and Chronic Disease, and Improve Health Equity



Steve Gortmaker, Ph.D.
Harvard T.H. Chan School of Public Health

Introduction by Xinzhi Zhang, Ph.D., M.D.
National Heart Lung and Blood Institute

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Upcoming Q&A Session

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All Panelists

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Childhood Obesity Intervention
Cost-Effectiveness Study

Cost Effective Interventions That Can Prevent Obesity, Chronic Disease and Improve Health Equity

Steven Gortmaker, PhD



NIH/ODP Prevention in
Focus Webinar

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HARVARD T.H. CHAN
SCHOOL OF PUBLIC HEALTH

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Current CHOICES Team

Co-Investigators

Angie Cradock

Steven Gortmaker

David Hemenway

Erica Kenney

Howard Koh

Rebekka Lee

Michael Long

Stephen Resch

Zachary Ward

David Williams

Staff, Post-docs, Students

Shilpi Agarwal

Jessica Barrett

Amy Bolton

James Daly

Molly Garrone

Matt Lee

Diana Lopez

Stephanie McCulloch

Aviva Musicus

Roxanne Dupuis

Justin Morgan

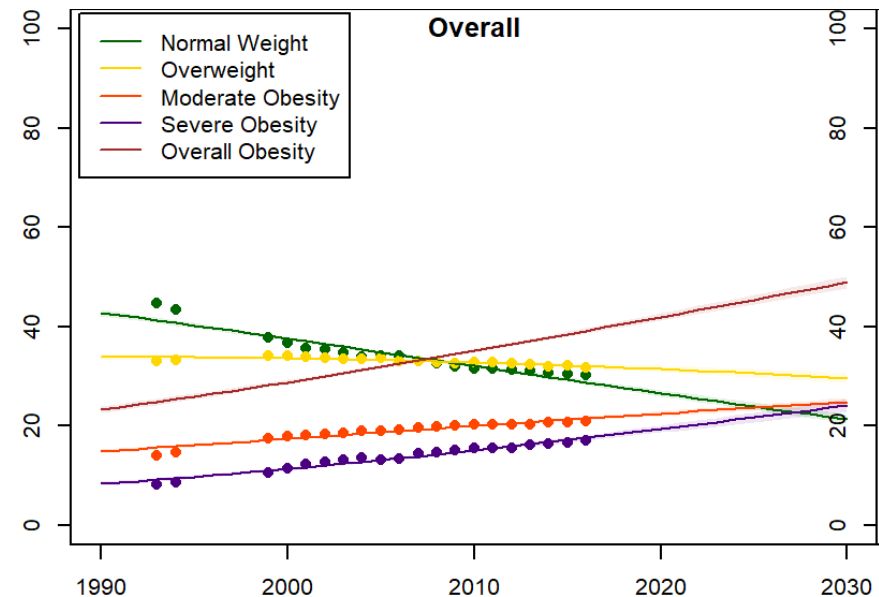
Lorena Pacheco

Mary Kathryn Poole

Jenny Reiner

The Challenge: Obesity & Severe Obesity Rates Continue to Increase

- Research shows that **more and more people have developed obesity in the United States**
 - About half of the adult U.S. population will have obesity and about a quarter will have severe obesity by 2030¹
- Obesity rates are at **historically high levels** ages 2-19²
- Racial/ethnic, geographic, gender and income **disparities are growing**¹



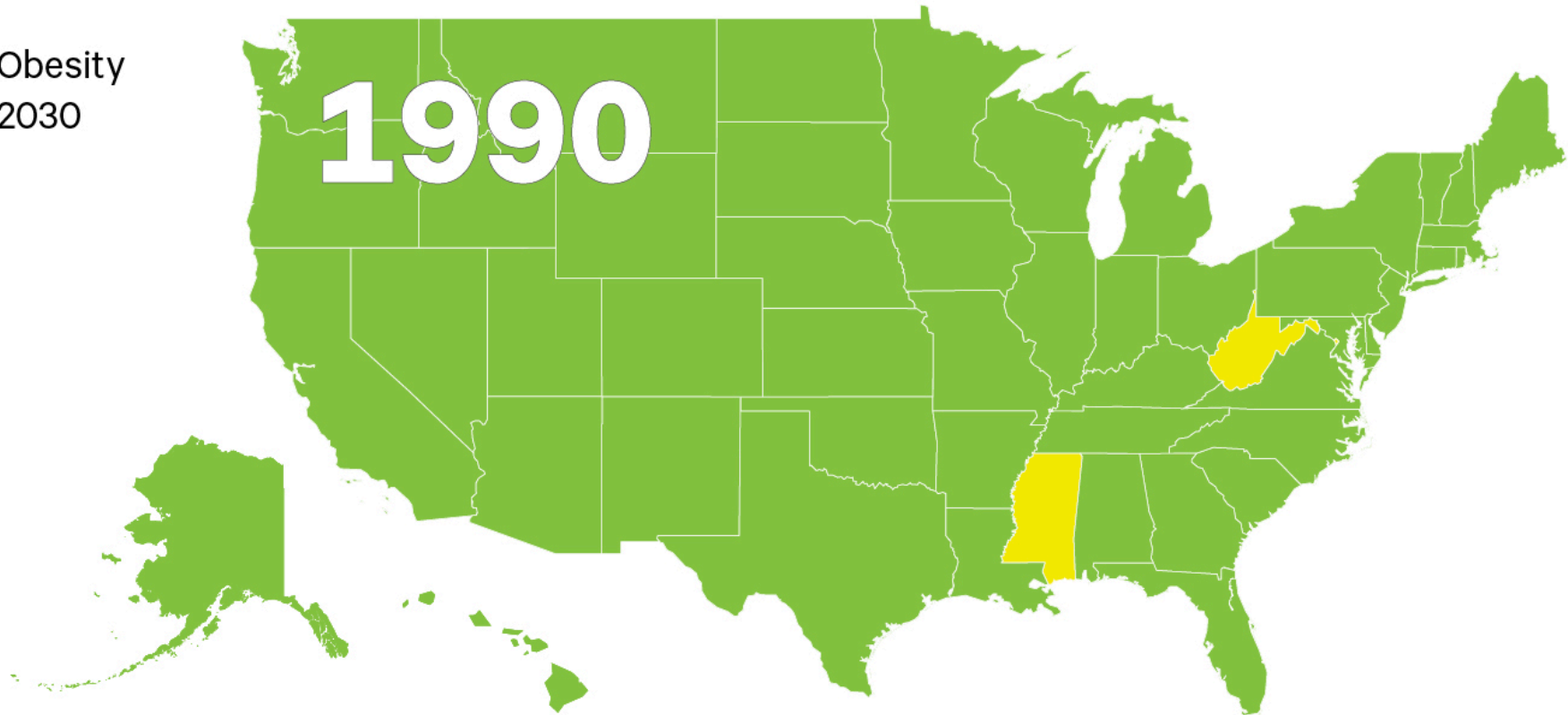
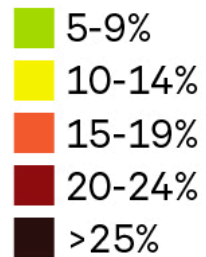
¹Ward ZJ, Bleich SN, Cradock AL, Barrett JL, Giles CM, Flax C, Long MW, Gortmaker SL. N Engl J Med. 2019 Dec 19;381(25):2440-2450.

²Hu K, Staiano AE. JAMA Pediatr. 2022 Oct 1;176(10):1037-1039.

The Future of Severe Obesity in the U.S.

Nearly a quarter of Americans will have severe obesity by 2030

U.S. Severe Obesity
rates, 1990-2030

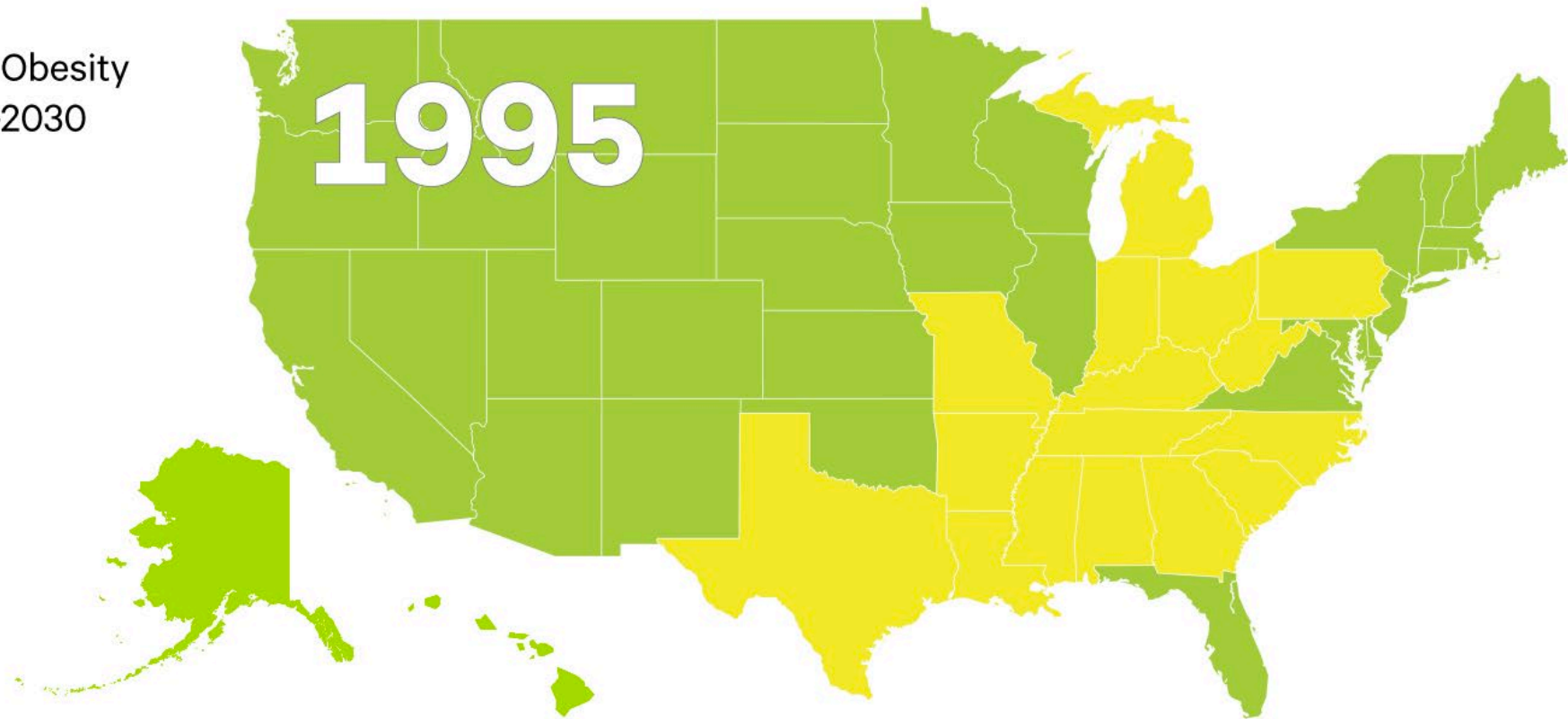
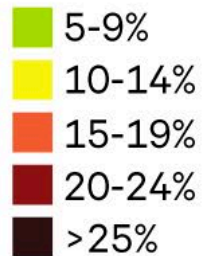


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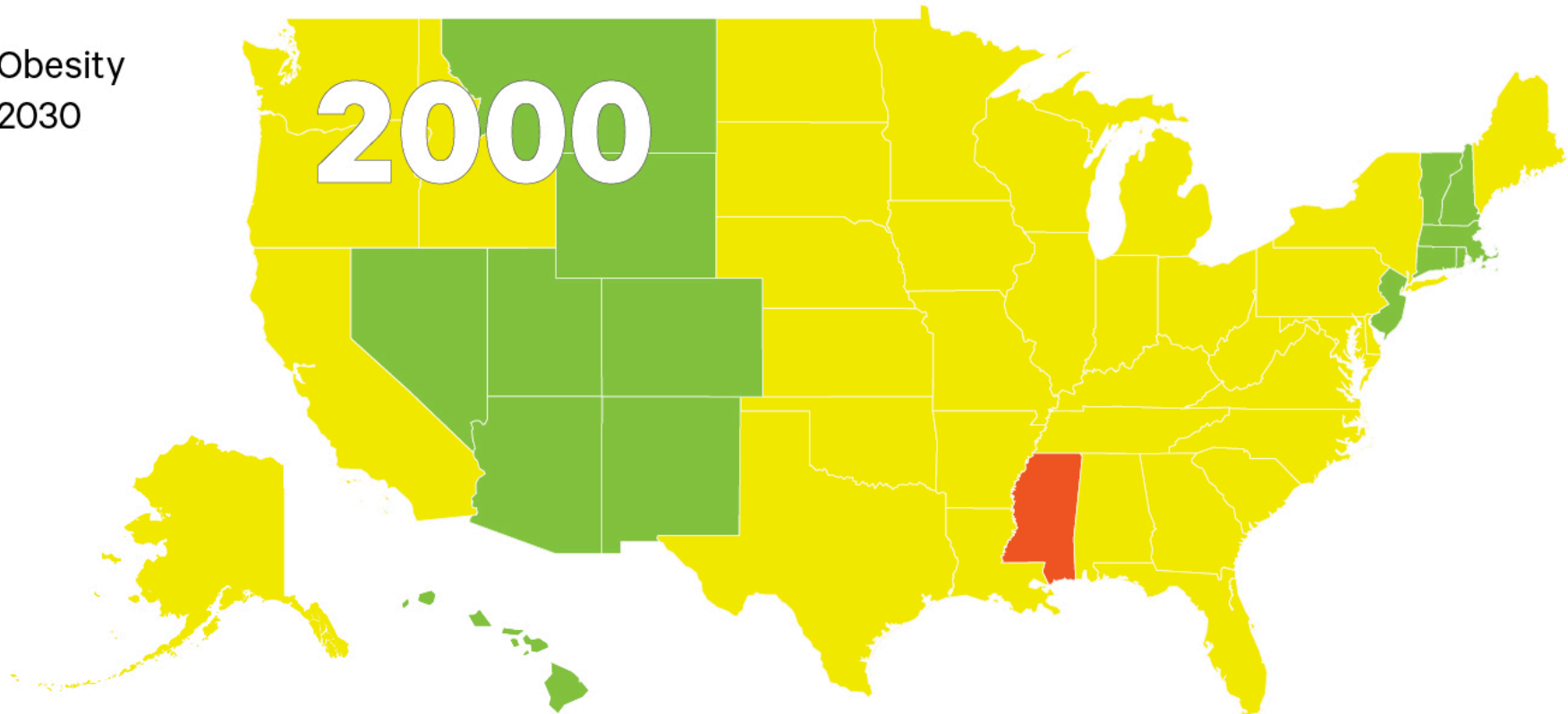
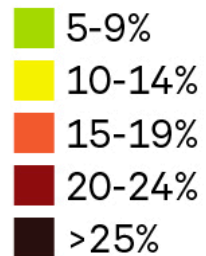


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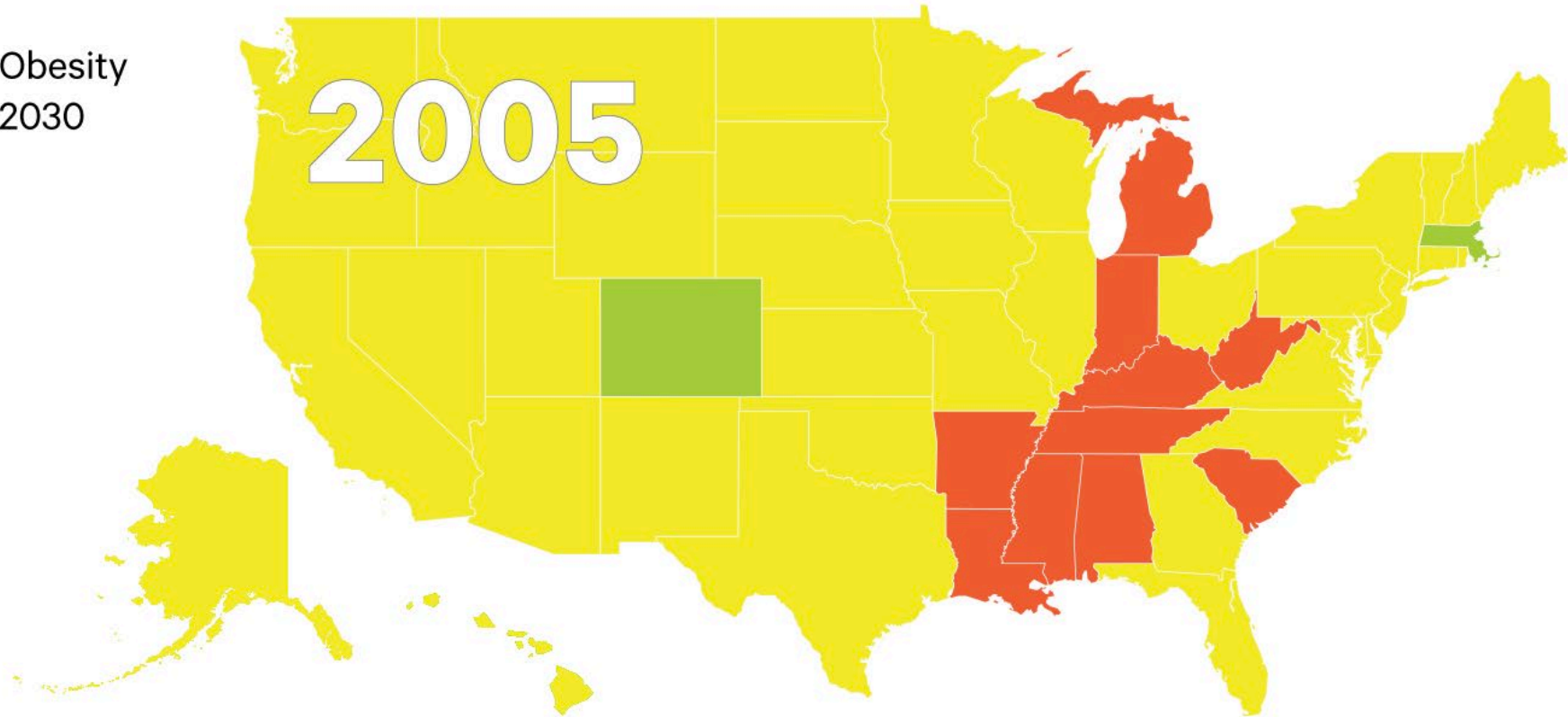
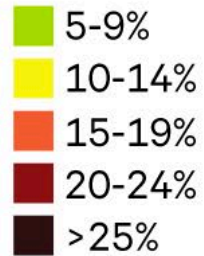


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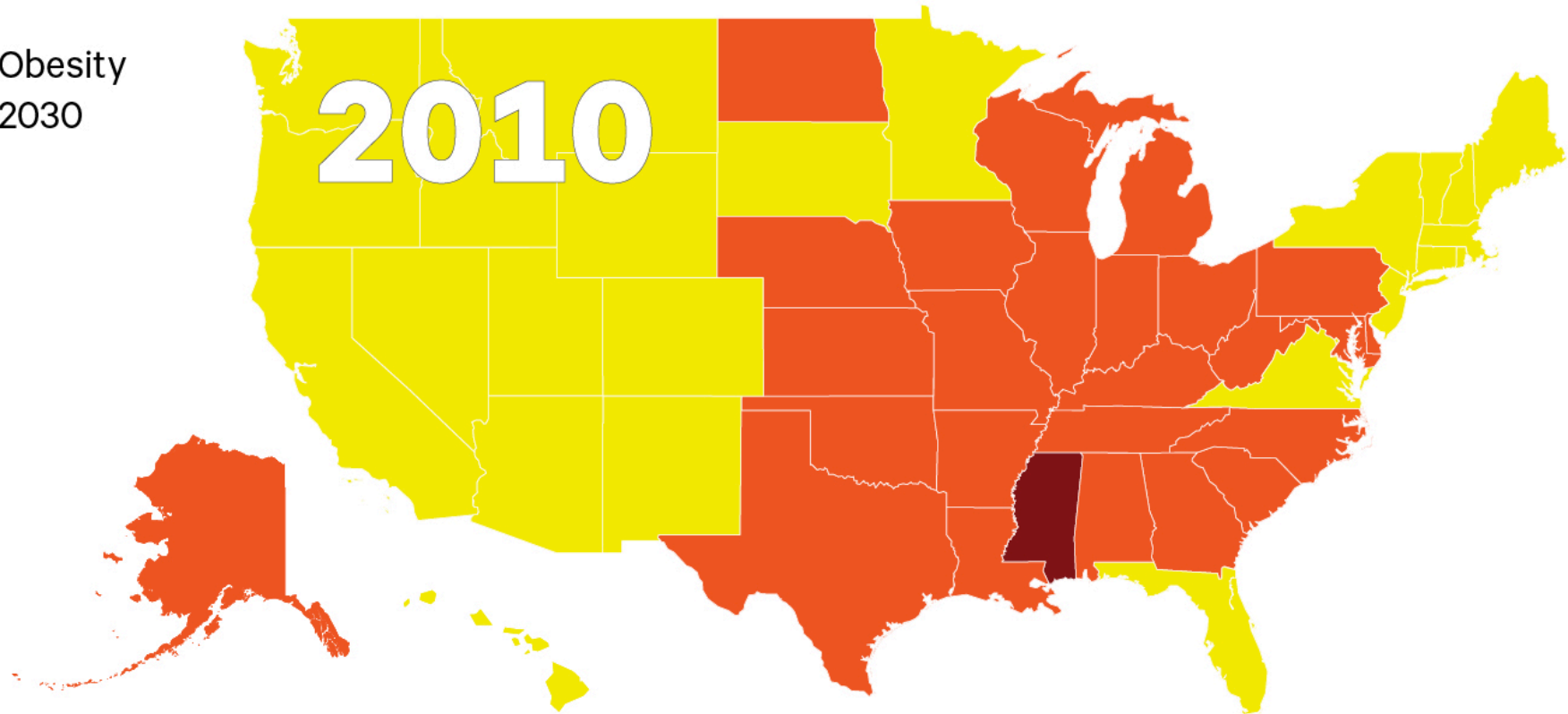
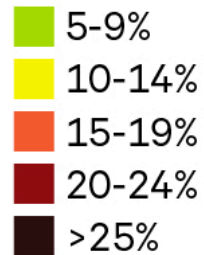


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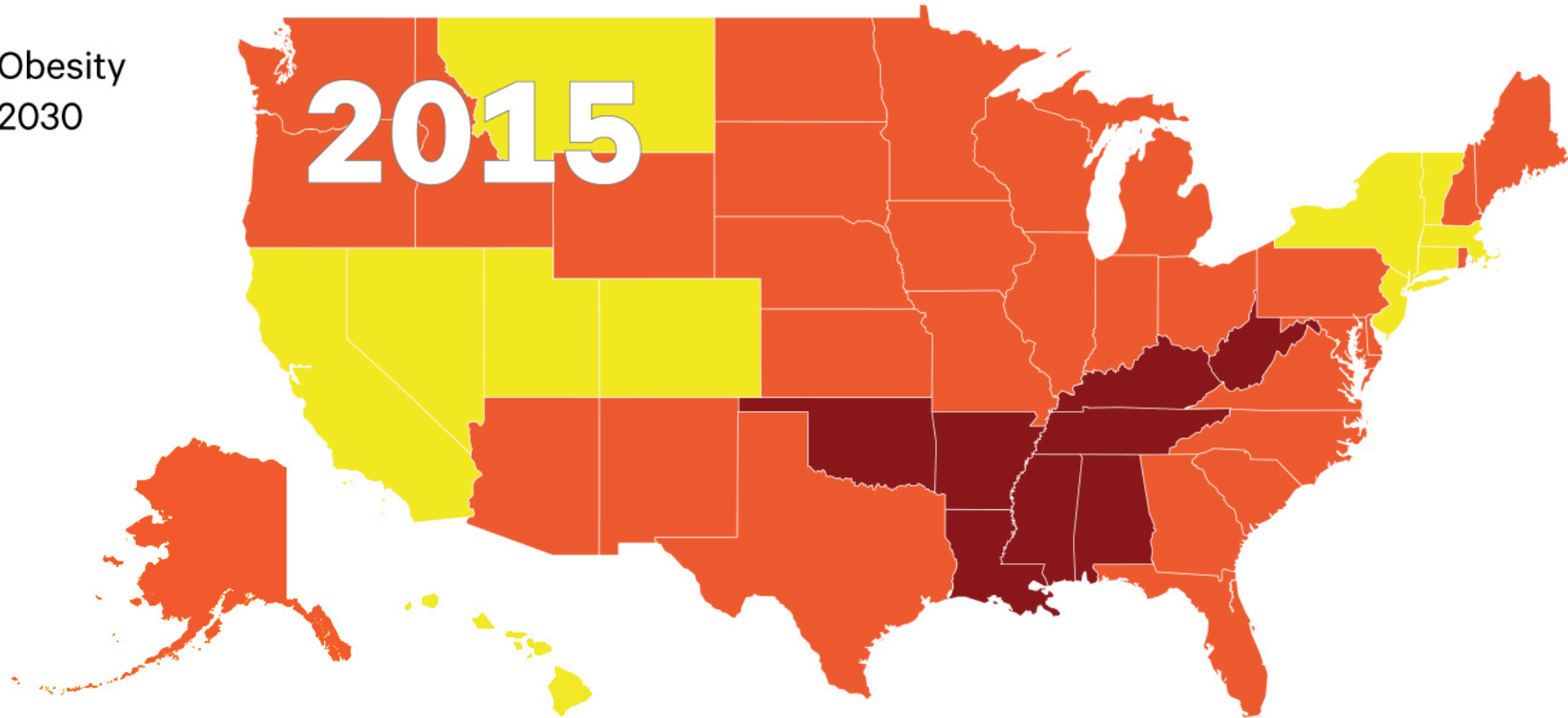
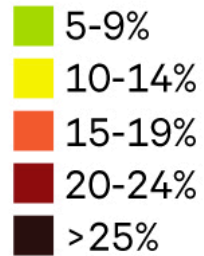


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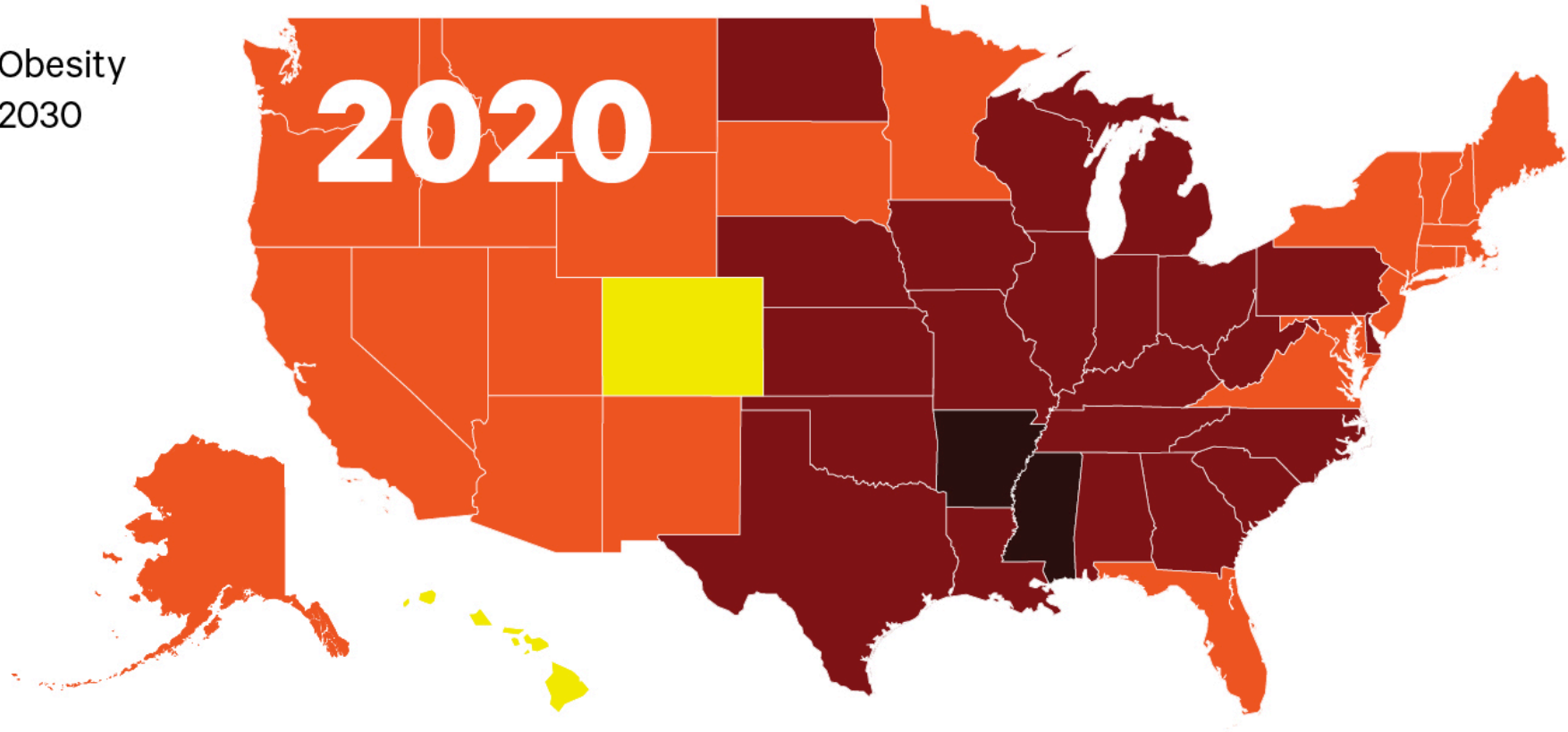
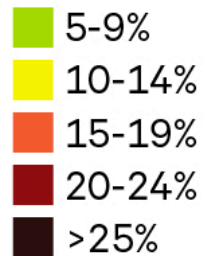


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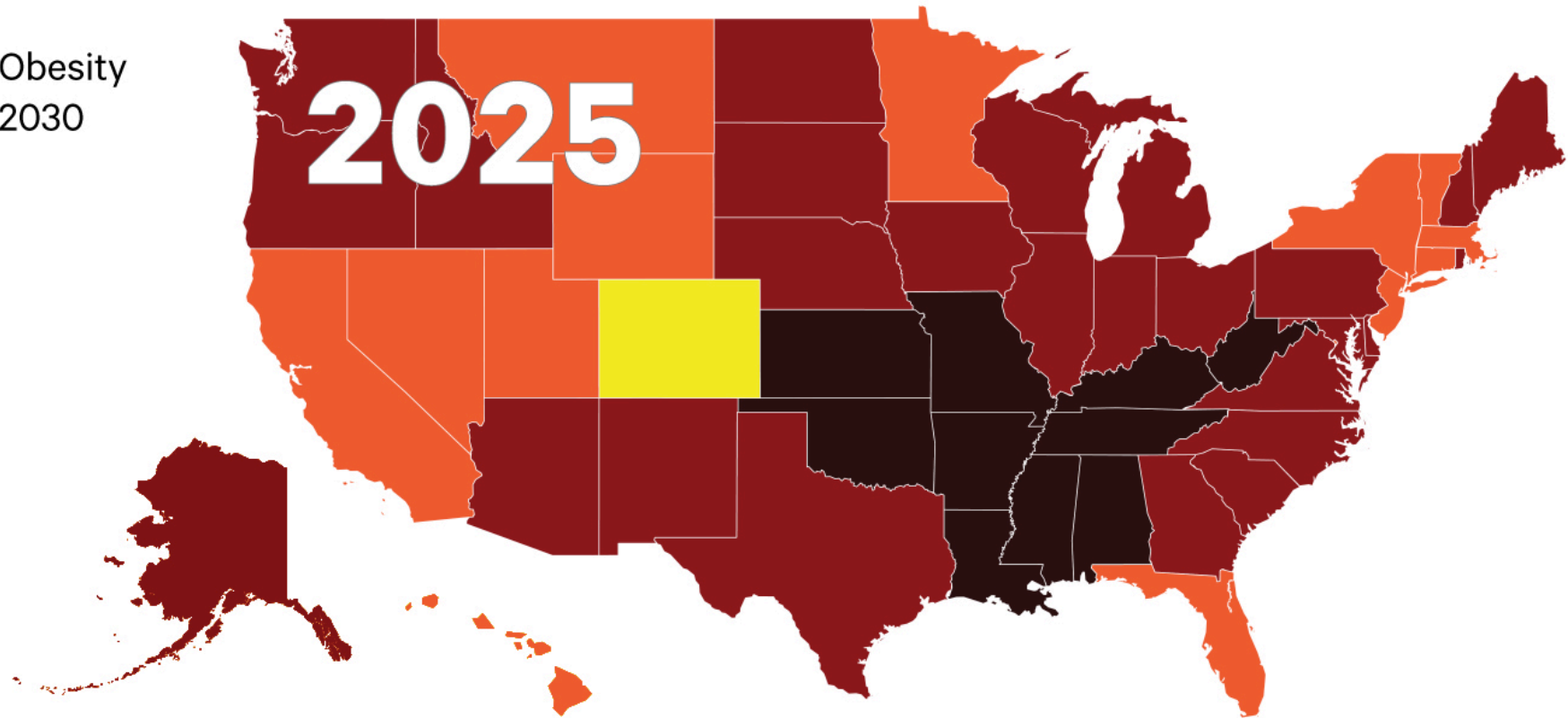
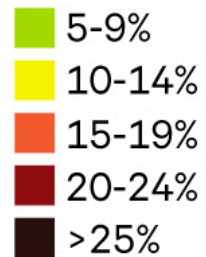


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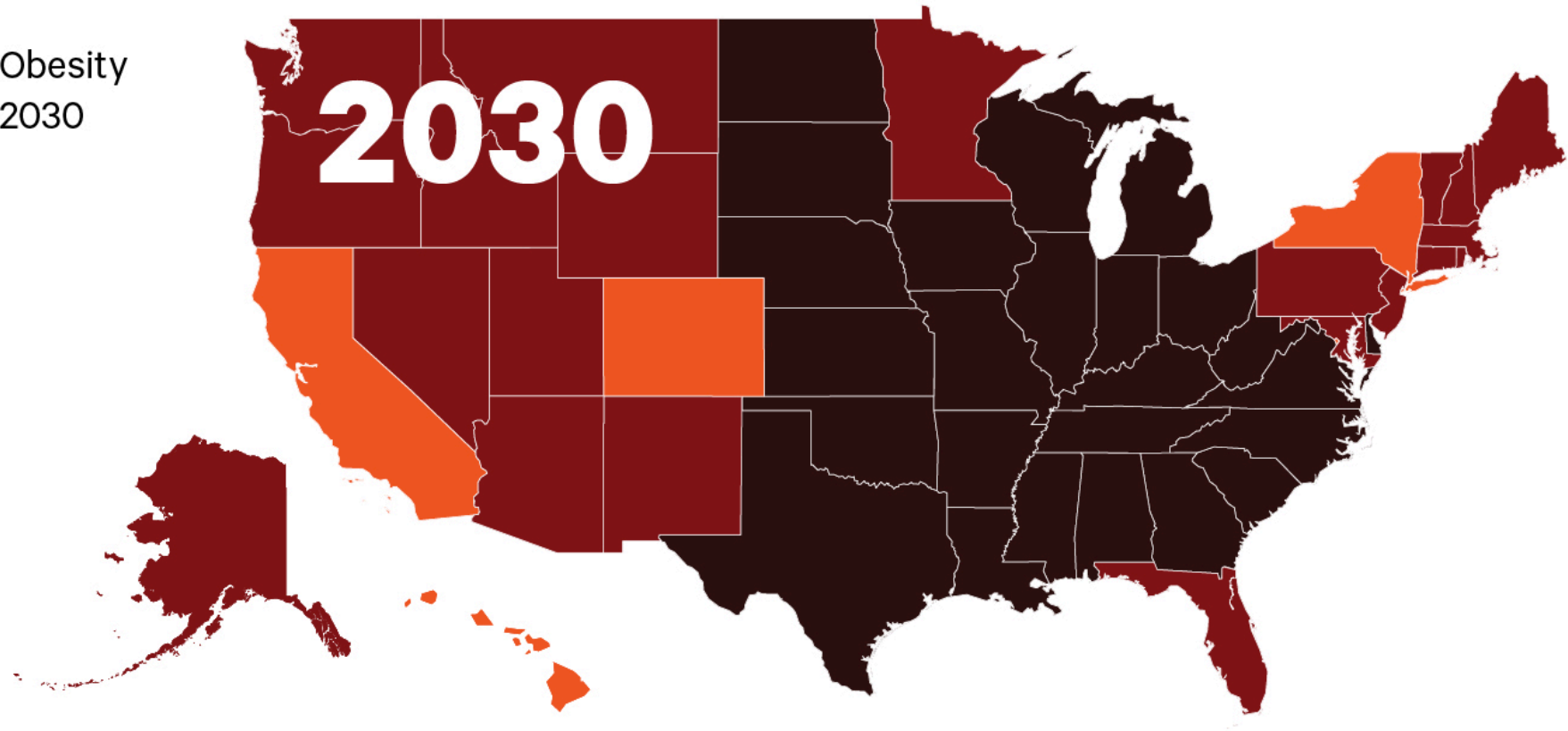
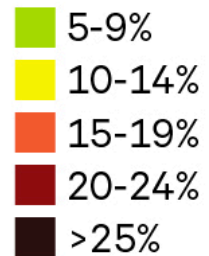


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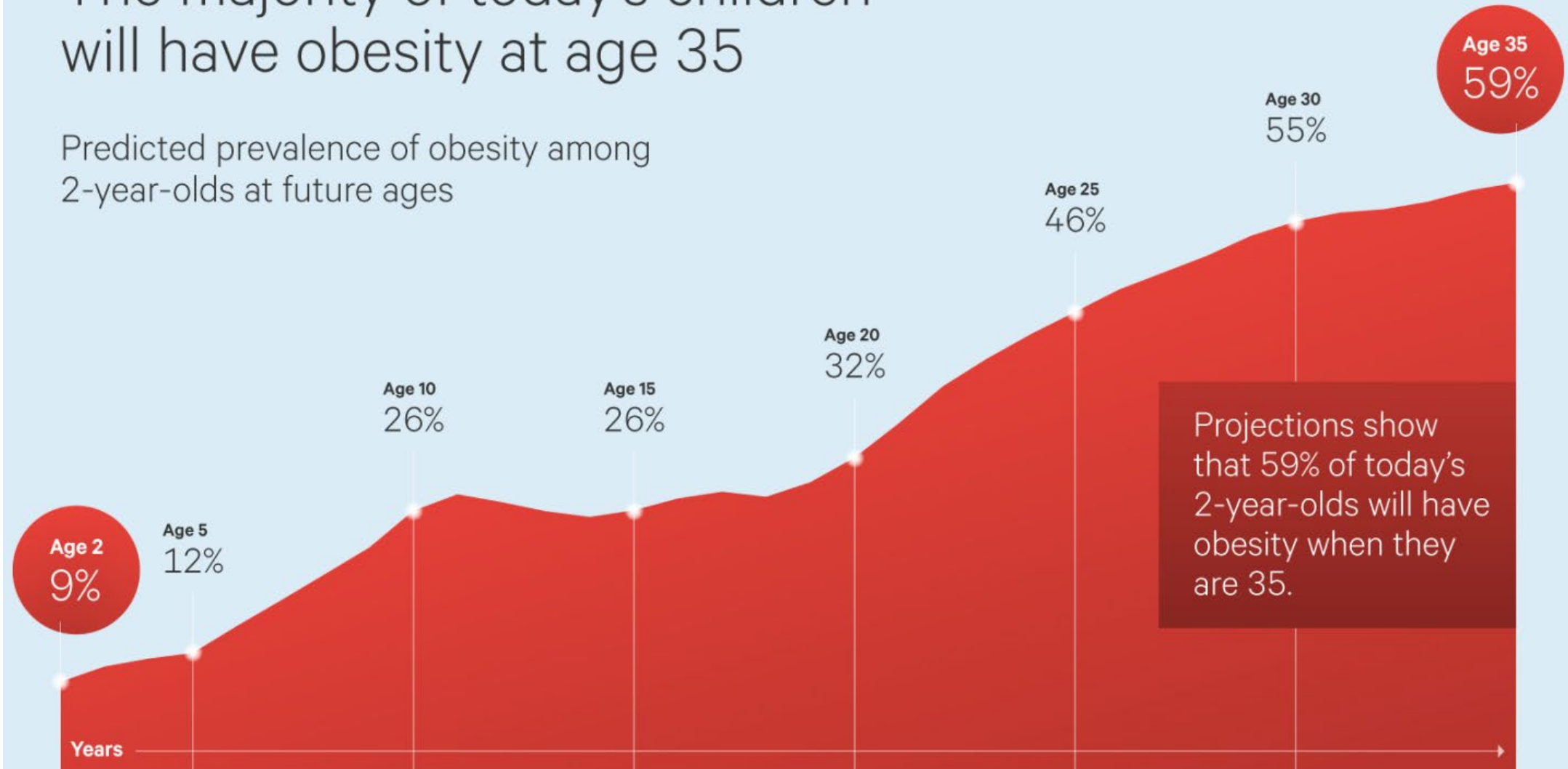
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The majority of today's children will have obesity at age 35

Predicted prevalence of obesity among 2-year-olds at future ages



Ward ZJ, Long MW, Resch SC, Giles CM, Cradock AL, Gortmaker SL. Simulation of Growth Trajectories of Childhood Obesity into Adulthood. N Engl J Med. 2017 Nov 30;377(22):2145-2153.

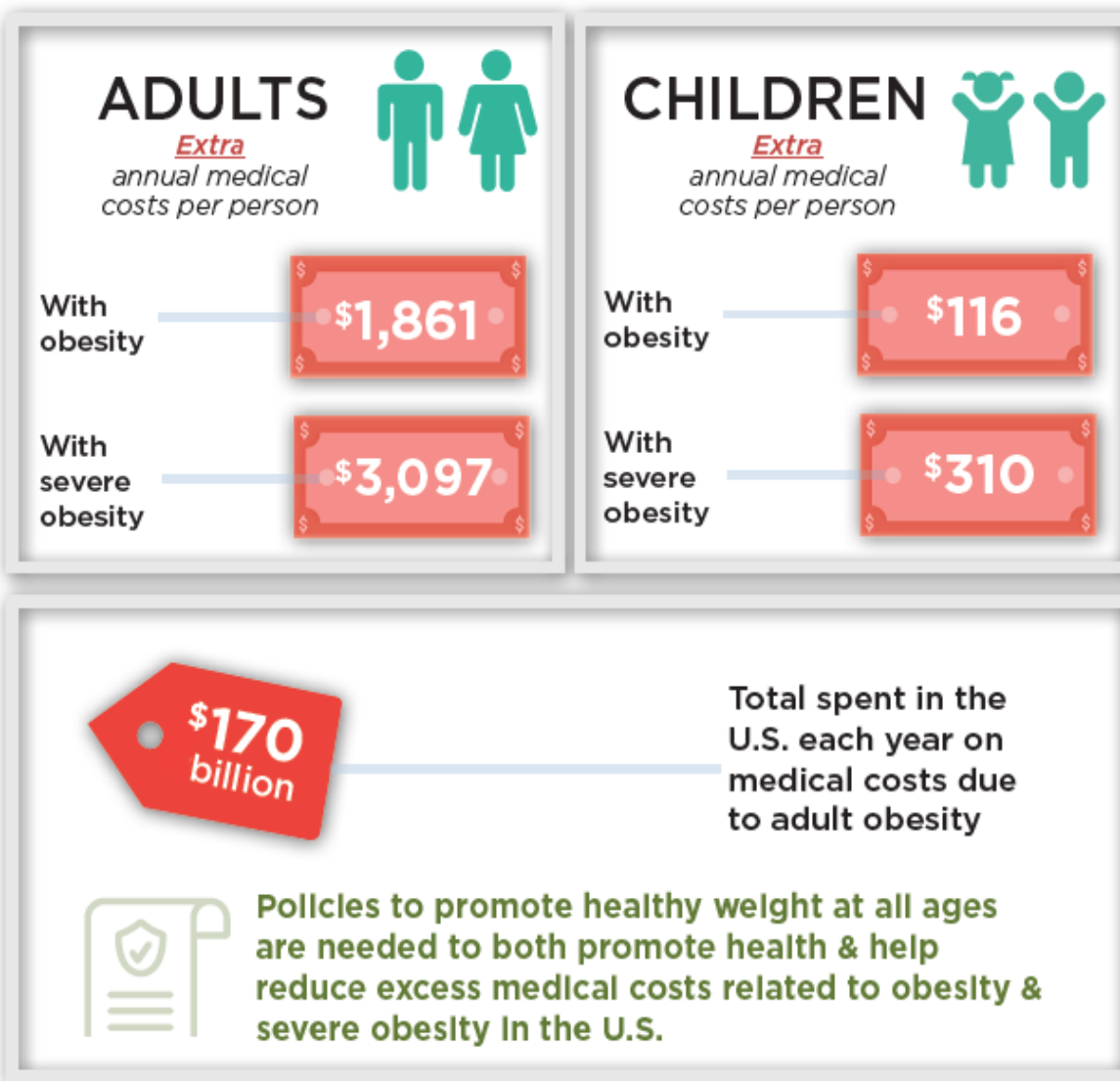
These Increases & Disparities Impact Population Mortality

- We estimate that excess weight was responsible for **1,300 excess deaths per day** (nearly 500,000 per year) in 2016
- There was a **loss in life expectancy of nearly 2-4 years** - higher than excess mortality due to smoking
- Weight-related life expectancy loss was **highest for non-Hispanic Black females**, with large disparities across states¹

¹Ward ZJ, Willett WC, Hu FB, Pacheco LS, Long MW, Gortmaker SL. Excess mortality associated with elevated body weight in the USA by state and demographic subgroup: A modelling study. EClinicalMedicine. 2022 Apr 28;48:101429



Obesity & severe obesity[†] lead to higher annual medical costs^{*}



[†]Obesity for adults is defined as a body mass index (BMI) ≥ 30 . Obesity for children is defined as a BMI $\geq 95^{\text{th}}$ percentile. Severe obesity for adults is defined as a BMI ≥ 35 . Severe obesity for children is defined as a BMI $\geq 120\%$ of 95th percentile.
^{*}These annual medical costs are paid by both individuals and insurance providers. Costs are reported in \$US 2019.

Ward ZJ, Bleich SN, Long MW, Gortmaker SL. Association of body mass index with health care expenditures in the United States by age and sex. PLOS One. 2021 Mar;16(3): e0247307. doi:10.1371/journal.pone.0247307.

Current Increases & Disparities in Obesity & Chronic Disease are Driven by Many Forces

- Social and economic determinants of health^{1,2,3}
- Structural racism^{1,2}
- Commercial determinants of health^{1,2,3}
- All these forces are long term influences on the neighborhoods we live in, household income and wealth, racial segregation, concentrated poverty, physical activity levels and foods and beverages we consume.

¹Kumanyika SK. Am J Public Health. 2019 Oct;109(10):1350-1357.

²Bleich SN, Ard JD. Cell Metab. 2021 Feb 2;33(2):234-241.

³Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, Gortmaker SL. Lancet. 2011 Aug 27;378(9793):804-14.

Changing These Trends & Disparities Requires ***Interventions***

- To change these increases and disparities, we need interventions: **policies and programs that can cost-effectively make a difference**
- I'll discuss several such interventions today – all with **good evidence for effectiveness**, some already implemented and some that could be widely implemented
- We estimate that these are interventions that cost-effectively improve overall population health and improve health equity
- These interventions will not eliminate these trends and disparities – but they can make important differences in the lives of both children and adults, prevent excess weight gain and future chronic disease, improve quality of life, and improve health equity.

We Need Good Evidence for Effectiveness

- ✓ Each of the strategies I will discuss today is backed by good evidence for effectiveness – generally from randomized trials and natural or quasi-experimental studies.
- ✓ The major questions we want answered today are the following:



Are these strategies cost-effective (do they provide good value for money)?



Do they improve health equity while they improve population health?¹

¹Gortmaker SL, Bleich SN, Kenney EL, Barrett JL, Ward ZJ, Long MW, Cradock AL. Cost-Effective Strategies to Prevent Obesity and Improve Health Equity. Harvard T. H. Chan School of Public Health, 2021.

Two Paths to Health Equity-Producing Strategies

*I'll highlight two promising paths
to cost-effective strategies that also improve health equity:¹*

Intervention strategies where households at economic disadvantage are the focus for implementation:

– For example, low-income children are at higher obesity risk, and the effective WIC intervention I'll discuss is targeted to this population.

Intervention strategies with evidence for stronger impact among economically disadvantaged populations.

– Examples include implementation of the Healthy Hunger Free Kids Act and sugar sweetened beverage (SSB) excise taxes

¹Gortmaker SL, Bleich SN, Kenney EL, Barrett JL, Ward ZJ, Long MW, Cradock AL. Cost-Effective Strategies to Prevent Obesity and Improve Health Equity. Harvard T. H. Chan School of Public Health, 2021.

Definitions of Key Terms

Health equity: attainment of the highest level of health for all people¹

Health inequities: differences that are modifiable, associated with social disadvantage, and considered ethically unfair

Health disparities: differences in health outcomes and their determinants between, as defined by social, demographic, environmental, and geographic attributes

¹ Centers for Disease Control and Prevention – Division of Community Health. A Practitioner's Guide for Advancing Health Equity: Community Strategies for Preventing Chronic Disease. Atlanta, GA: US Department of Health and Human Services; 2013.

Cost-Effectiveness & Health Equity Metrics in CHOICES

Definitions of Key Metrics & Modeled Outputs:

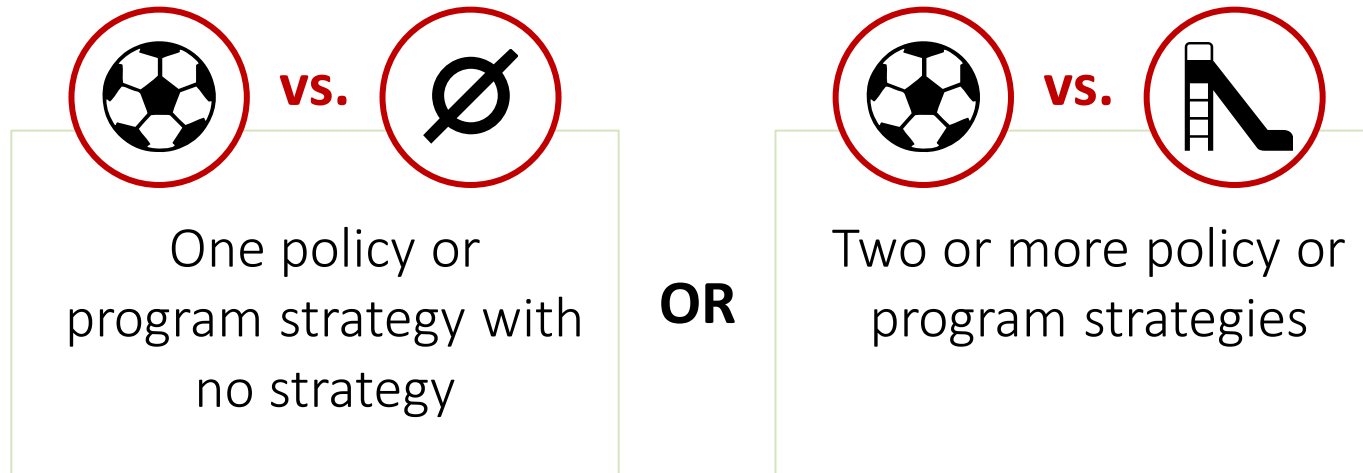
- Cost-Effectiveness Metrics
- Costs
- Reach of Intervention
- Population Impact
- Impact on Disparities and Health Equity
- Reference Groups
- Uncertainty intervals and confidence intervals



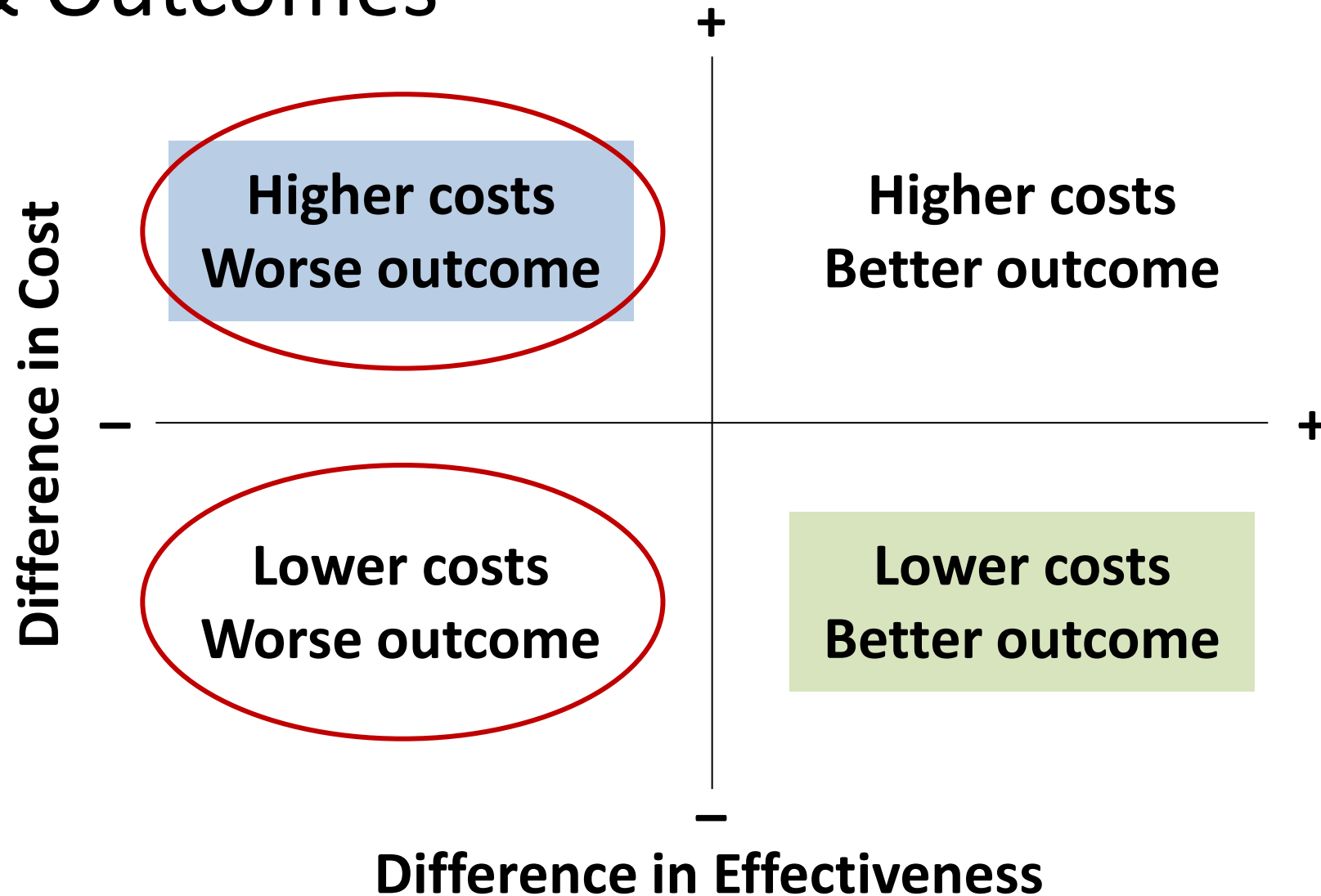
See our handout
describing
definitions &
metrics→



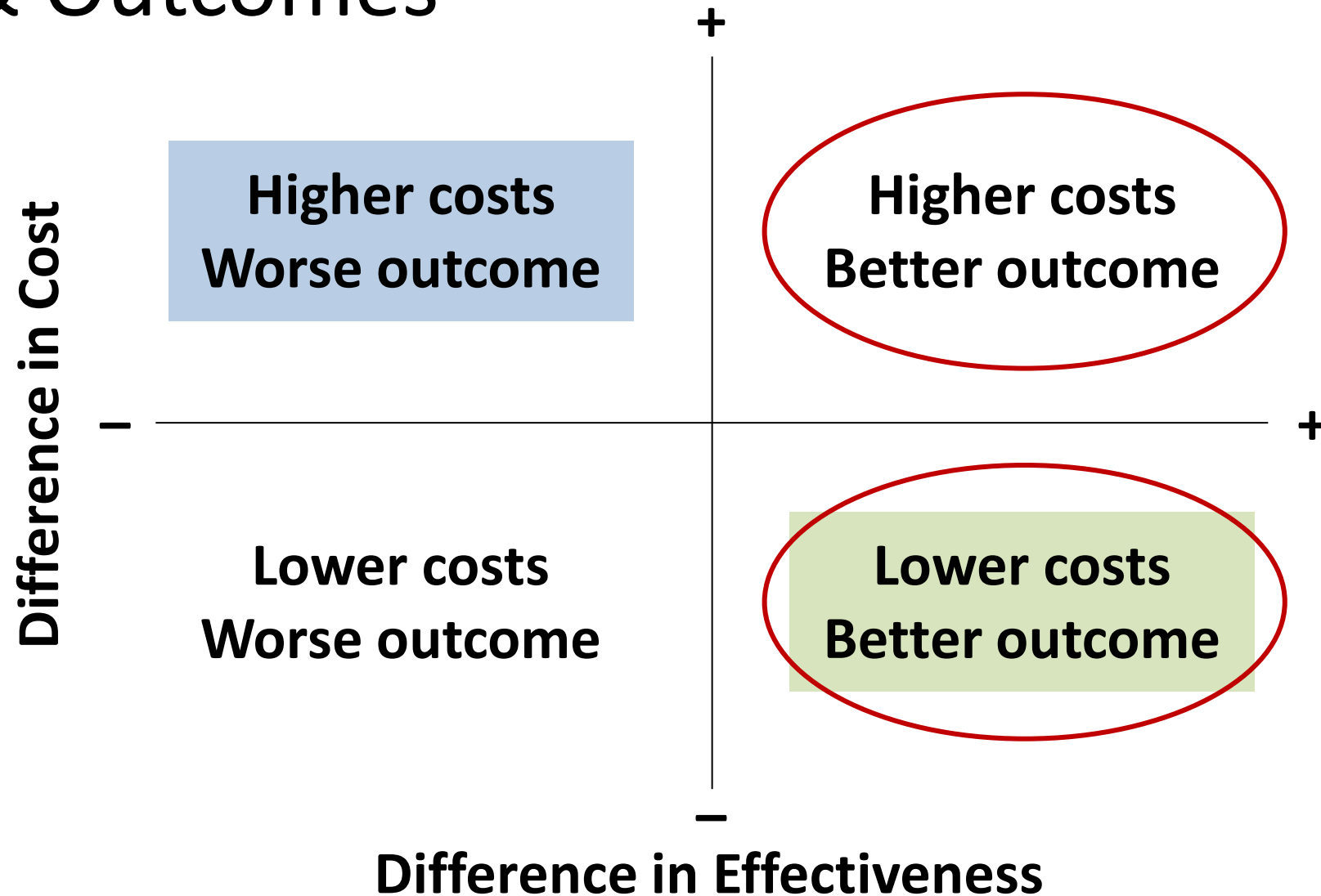
Cost-Effectiveness Analysis



Costs & Outcomes



Costs & Outcomes



More Informed Decision-Making

- A cost-effectiveness framework provides an opportunity to compare strategies & health outcomes for better decision-making:



Evidence for impact on health



Population reach



Implementation resources, activities, & costs



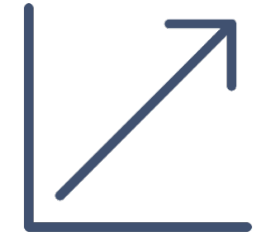
Potential impact on health disparities & equity

How the CHOICES Model Works



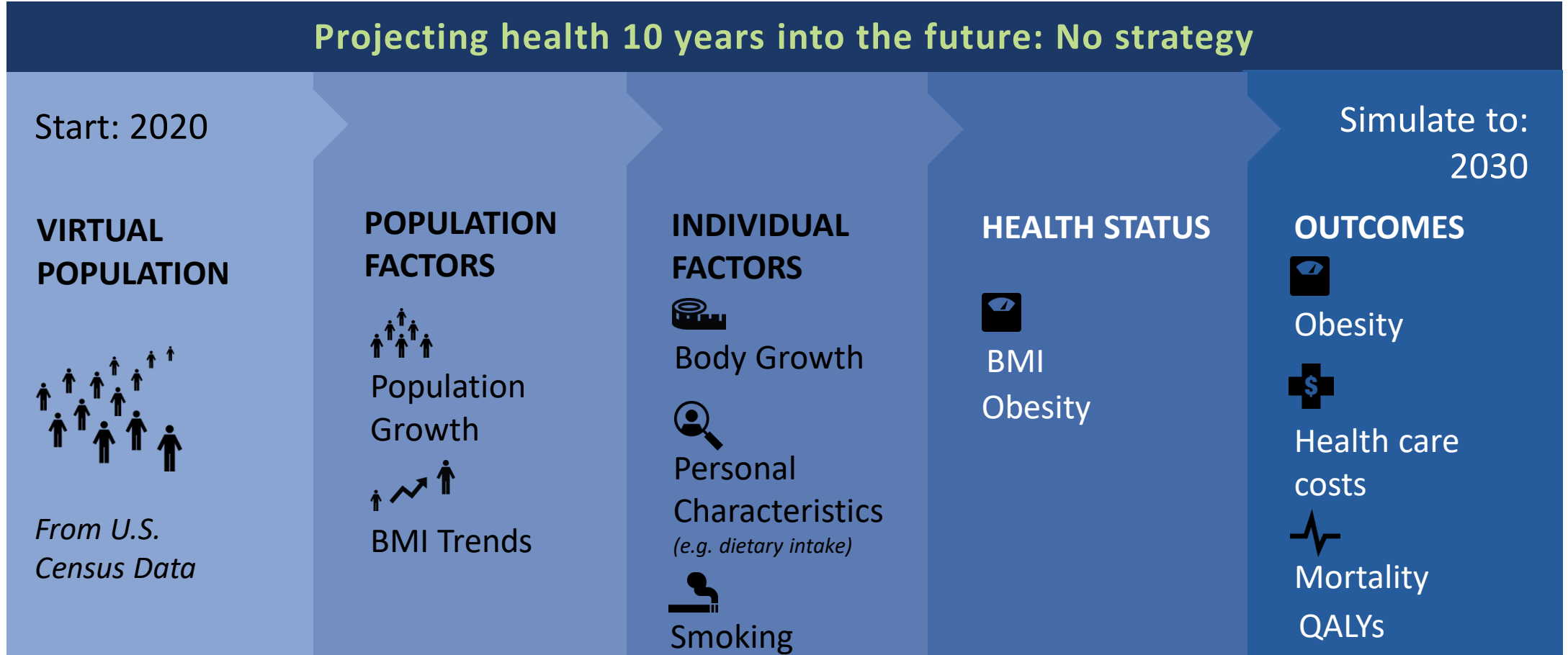
Project impact on the population

The CHOICES microsimulation model projects the future course of the obesity epidemic by evaluating how an identified strategy will impact obesity, healthcare costs & mortality outcomes over 10 years

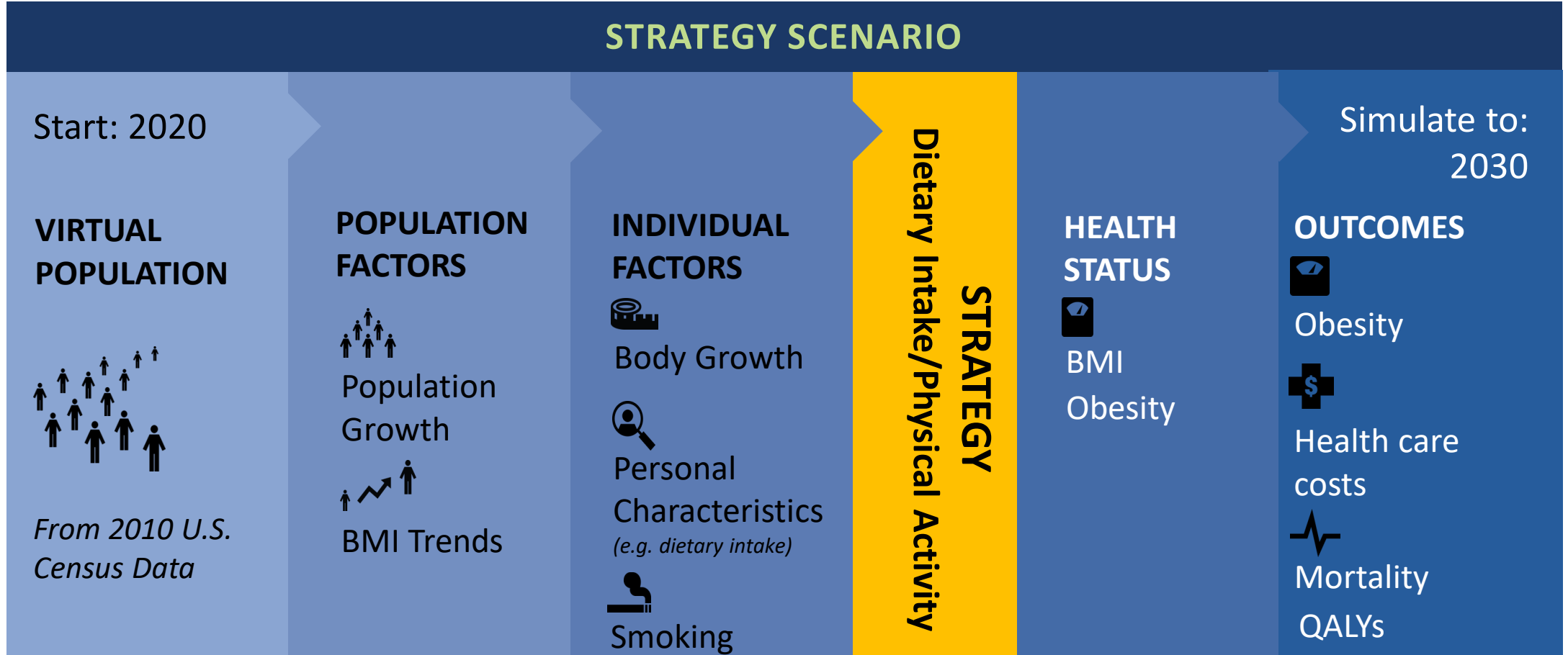


How the CHOICES Model Works

Example 2020-2030



How the CHOICES Model Works

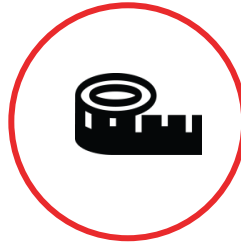


CHOICES Model Inputs



Reach

Who will benefit?



Effect

What is effect of the policy/program on health?



Cost

Implementation costs of program/policy and health care cost savings

Focus on cost-effectiveness implementation of strategies to improve nutrition & physical activity environments

Four Examples of Applying the CHOICES Model to Intervention Strategies

- Some strategies are already implemented nationally
- Some have been implemented locally, and we project the impact of statewide implementation
- Some are not yet implemented, yet are based on good evidence for effectiveness
- For all of these strategies, the impact is generally to prevent excess weight gain – to slow the increase in obesity

1) Improvements to the WIC Food Package

- Implemented in 2009, we have good evidence that this intervention improved foods that households purchased and consumed – including fewer total calories, less juice, more whole grains, and more fruits/vegetables)¹⁻⁵
- We have good evidence for effectiveness at reducing obesity rates, across all US states, based on an interrupted time series analysis of data before and after the food package change⁶

¹ Andreyeva et al.

² Schwartz et al.

³ Odoms-Young et al.

⁴ Tester et al.

⁵ Ng et al.

⁶ Daepp MIG, Gortmaker SL, Wang YC, Long MW, Kenney EL. Pediatrics. 2019

CHOICES Results: WIC Food Package Change

- **Cost-effectiveness:**

- Reach over 10 years (2010-2020) 14 million
- Low cost (\$18 per child)
- Estimated to prevent 63,000 cases of child obesity in 2020
- \$10,600 per Quality Adjusted Life Year (QALY) far below commonly accepted thresholds

- **Health equity impact**

- The intervention led to a closing of the gap in obesity prevalence between children from households in poverty and not in poverty^{*}

*Erica Kenney, Matthew Lee, Jessica Barrett, Zachary Ward, Michael Long, Angie Craddock, ScD, Steven Gortmaker. Cost-effectiveness and health equity impacts of improved nutrition standards in WIC, and the potential for maximizing WIC's benefits for population health. Abstract at APHA, Boston, MA, Nov 7, 2022.

2) Implementation of SSB Excise Taxes

- Local evaluations in multiple cities (e.g., Berkeley, Oakland, Philadelphia, Seattle) indicate effectiveness of SSB excise taxes at reducing purchases of SSB (e.g.,¹⁻³). There is strong evidence linking intake of these drinks to excess weight gain, type 2 diabetes, heart disease, tooth decay and mortality.⁴⁻⁸
- Disparities in sugary drink consumption are driven by many forces, including targeted advertising.⁹⁻¹⁰
- We have worked with partners in multiple states to project the cost-effectiveness and health equity impact of these interventions. I'll use results from California to illustrate expected impact.

¹Silver LD et al 2017; ²Roberto CA et al. 2019; ³Powell LM et al 2020; ⁴Hu FB. 2013; ⁵Malik VS et al 2013; ⁶Malik VS et al 2010; ⁷Malik VS et al 2019; ⁸Bernabe E et al 2016; ⁹Bleich SN et al, 2018; ¹⁰Harris et al 2019.

CHOICES Results: California SSB \$0.02 Excise Tax¹

Cost effectiveness:

- Reach over 10 years 42.2 million
- Decrease in SSB spending first year per household: \$142
- Prevent 198,000 cases of obesity in 2030, prevent cases of diabetes and tooth decay
- Save \$1.8 billion in health care costs over 10 years and reduce Medical expenditures
- Tax is projected to be cost saving: to save more in future health care costs than it costs to implement

Health equity impact

- Project non-Latino Black/African American and Latino residents will experience greater health benefits than the average resident; an updated model projects even greater health equity impact.²

Also: Tax Revenue

Tax revenue (not included in CEA) is projected at \$1.3-1.8 billion/year. This can be used for a range of benefits to economically disadvantaged populations.³

¹Gouck J, Whetstone L, Walter C, Pugliese J, Kurtz C, Seavey-Hultquist J, Barrett J, McCulloch S, Garrone M, Cradock A, Gortmaker, S. California: A Sugary Drink Excise Tax. California Department of Public Health, Sacramento, CA, the County of Santa Clara Public Health Department, San Jose, CA, and the CHOICES Learning Collaborative Partnership at the Harvard T.H. Chan School of Public Health, Boston, MA; March 2021.

²Matthew Lee, Jessica Barrett, Erica Kenney, Jessie Gouck, Stephanie McCulloch, Angie Cradock, Michael Long, Zachary Ward, Benjamin Rohrer, Steven Gortmaker. Impacts of a state-wide sugar-sweetened beverage excise tax in California: Projected benefits for population obesity and health. Abstract at APHA, Boston, MA, Nov 7, 2022.

³Krieger J, Bleich SN, Scarmo S, Ng SW. Sugar-Sweetened Beverage Reduction Policies: Progress and Promise. Annu Rev Public Health. 2021 Apr 1;42:439-461.

3) Impact of the Healthy Hunger Free Kids Act: Improved School Meals, Snacks, & Beverages

- The HHFKA began in the 2012-13 school year
 - There is good evidence for improved diet quality following implementation¹
 - There is good evidence for the impact of the HHFKA on obesity prevalence nationally among ages 10-17 using an interrupted time series design with repeated measures before and after implementation²

¹Kinderknecht K, Harris C, Jones-Smith J. JAMA. 2020 Jul 28;324(4):359-368.

²Kenney EL, Barrett JL, Bleich SN, Ward ZJ, Cradock AL, Gortmaker SL. Impact of the Healthy, Hunger-Free Kids Act on Obesity Trends. Health Aff (Millwood). 2020 Jul;39(7):1122-1129.

CHOICES Results: HHFKA Implementation*

Cost effectiveness:

- Reach over 8 years 2012-2020: 73.7 million
- Implementation cost: \$25 per person per year
- Prevented an estimated 248,000 cases of obesity in 2020 alone
- Net cost per QALY gained: \$162,000, in the range of common thresholds for cost-effectiveness

Health equity Impact

- Cases of obesity prevented were mainly among youth with household poverty income (228,000), so the HHFKA led to substantial improvement in health equity.

*Jessica Barrett, Erica Kenney, Zachary Ward, Angie Cradock, Steven Gortmaker. Obesity prevented and improvement in health equity for children in poverty due to the Healthy, Hunger-Free Kids Act of 2010 school nutrition standards. Abstract at APHA, Boston, MA, Nov 7, 2022.

4) Projected Impact of Excluding Sugar-Sweetened Beverage (SSB) Purchases from SNAP

- As noted above, SSBs are the leading source of added sugar in US diet, and linked to excess weight gain, type 2 diabetes, heart disease, tooth decay and mortality.
 - SNAP benefits are used to buy more than \$4 billion/yr of SSBs¹
 - Excluding SSB purchases from SNAP would in essence raise the price, and there is good evidence this will lead to less purchasing and consumption.²
 - We evaluated the likely cost-effectiveness, health impact and health equity impact of making this policy change nationally.³

¹Garaski et al, 2010; ²Cuffey et al 2015.

³Aviva Musicus, Michael Long, Benjamin Rohrer, Jessica Barrett, Zachary Ward, Angie Cradock, Sara Bleich, Steven Gortmaker. Improving health equity by excluding sugar-sweetened beverage purchases from SNAP. Abstract at APHA, Boston, MA, Nov 8, 2022.

CHOICES Results: Excluding SSBs Purchases from SNAP*

Cost effectiveness:

- Reach over 10 years 67.3 million
- 362,000 cases of obesity prevented in 2030 alone
- 7,390 deaths averted
- Save \$3.6 billion in health care costs over 10 years
- Gain 152,000 QALYs
- This policy is projected to be cost saving: to save more in future health care costs than it costs to implement.

Health equity impact

- Project much greater prevention of obesity among individuals in households at 130% or less of the federal poverty level compared to higher income households – thus improving health equity.
- Project greater prevention of obesity among Black and Hispanic households compare to White non-Hispanic – thus also improving health equity

*Aviva Musicus, Michael Long, Benjamin Rohrer, Jessica Barrett, Zachary Ward, Angie Cradock, Sara Bleich, Steven Gortmaker.
Improving health equity by excluding sugar-sweetened beverage purchases from SNAP. Abstract at APHA, Boston, MA, Nov 8, 2022.

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Our examples highlight two promising paths to cost-effective strategies that also improve health equity:¹

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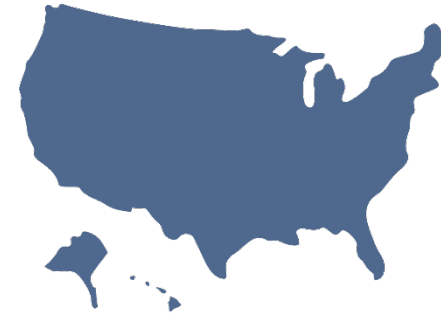
- Examples include implementation of the Healthy Hunger Free Kids Act and sugar sweetened beverage (SSB) excise taxes*

¹Gortmaker SL, Bleich SN, Kenney EL, Barrett JL, Ward ZJ, Long MW, Cradock AL. Cost-Effective Strategies to Prevent Obesity and Improve Health Equity. Harvard T. H. Chan School of Public Health, 2021.

Learning Collaborative Partnerships



We have worked with many partners to apply the CHOICES framework to identify “best value for money” strategies for states and cities



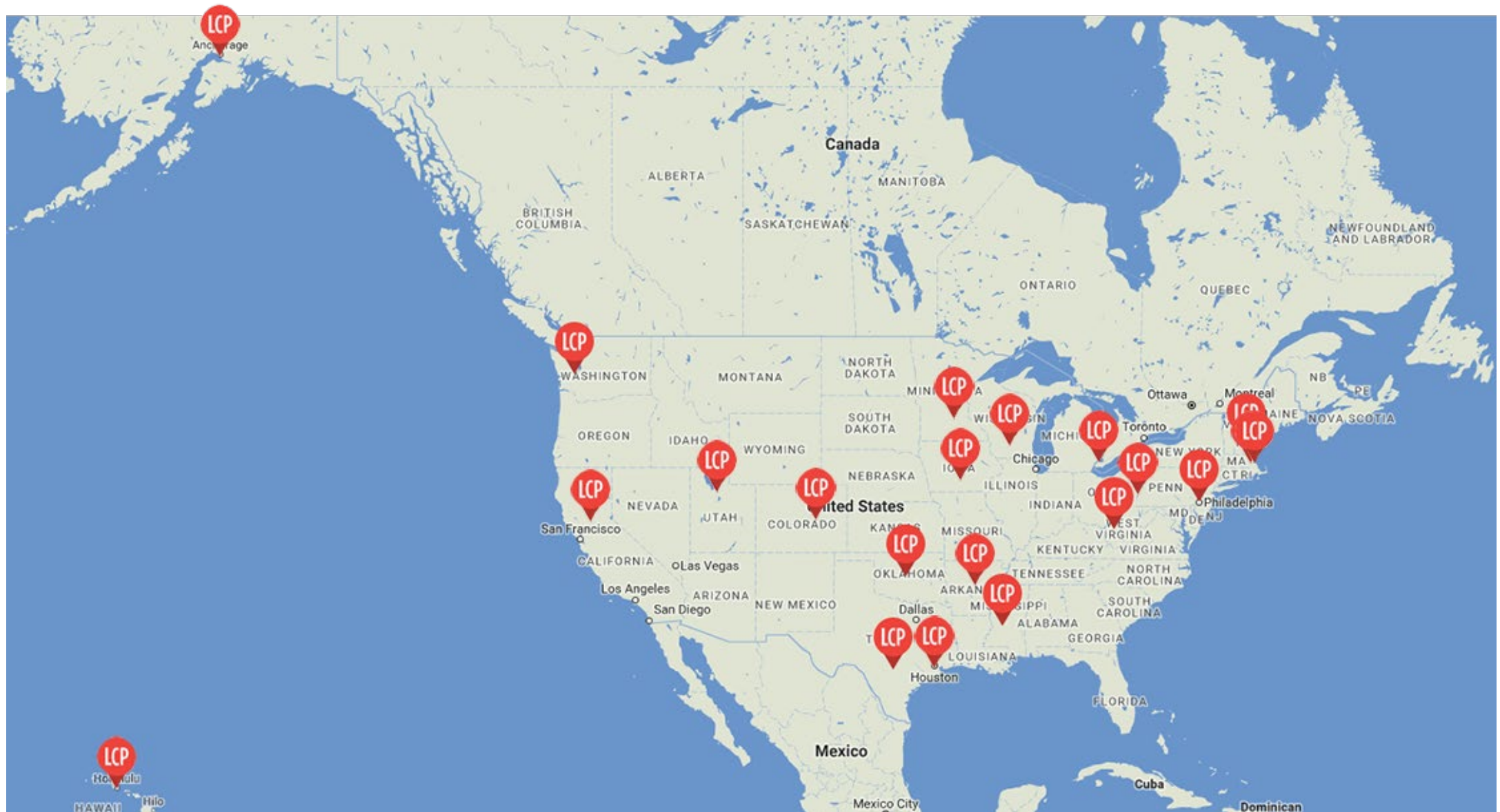
This has provided evidence of some best value for money to strategies to prevent obesity and improve health equity throughout the US

Key CHOICES Partners

- Connect health agencies and other partner organizations to work with CHOICES team
- Advise on framework and logistics for the learning collaborative partnership
- Advise on communications and policy



Learning Collaborative Partnerships Throughout the US



Strategies Developed & Modeled with Partners

- **SSB excise taxes:** Washington, West Virginia, Denver, Salt Lake City, New Hampshire, New York City and New York State, Alaska, California, Minnesota
- **Improved nutrition and physical activity in early care and education settings:** West Virginia, Philadelphia, Oklahoma, Washington, New Hampshire, Mississippi, Detroit, Arkansas
- **Water access at school:** California
- **STAR clinical intervention:** Denver, Iowa
- **Healthy Beverages in Out of School settings:** San Antonio, Wisconsin, Allegheny County PA
- **WIC screen time intervention:** Oklahoma, Arkansas
- **Healthy Incentives in SNAP:** Harris County Texas
- **Active Recess:** Washington, Salt Lake
- **Active PE:** Hawaii, Allegheny County PA, Iowa
- **More Movement & Reduced Screen Time in Early Care:** Boston
- **Safe Routes to Schools:** Minnesota, Houston, Wisconsin

Summary

- We need effective interventions to prevent excess weight gain and to slow rising rates of child and adult obesity.
- We highlight a number of effective interventions that can prevent future obesity, improve health equity, and save more in health care costs than they cost to implement: these are cost-saving strategies.
 - A sugar sweetened beverage excise tax, and excluding sugar sweetened beverage purchases from SNAP are examples.
 - The SNAP strategy focuses on improving diet quality among SNAP recipients. SSB excise taxes have the greatest impact among individuals consuming the most SSBs, and those with higher BMI, and the overall impact is progressive.

Summary (cont'd)

- Only some interventions will be cost-saving: often we need to invest in programs and policies for children.
 - For example, the WIC food package change costs \$18 per child, and the cost/QALY is estimated as \$10,600 – well under commonly used thresholds. This intervention has also substantially improved health equity.
 - There is good evidence implementation of the HHFKA has improved children's diets, prevented many cases of obesity and improved health equity, and the cost/QALY is near commonly accepted thresholds indicating good value for money spent
- All the strategies reviewed can help slow population weight gain and obesity rates: many such strategies are needed

On our website you'll find many examples of interventions and cost effectiveness analyses in published research studies and with partners in 21 state, county and city health departments across the US – check out our Community of Practice

Join the CHOICES
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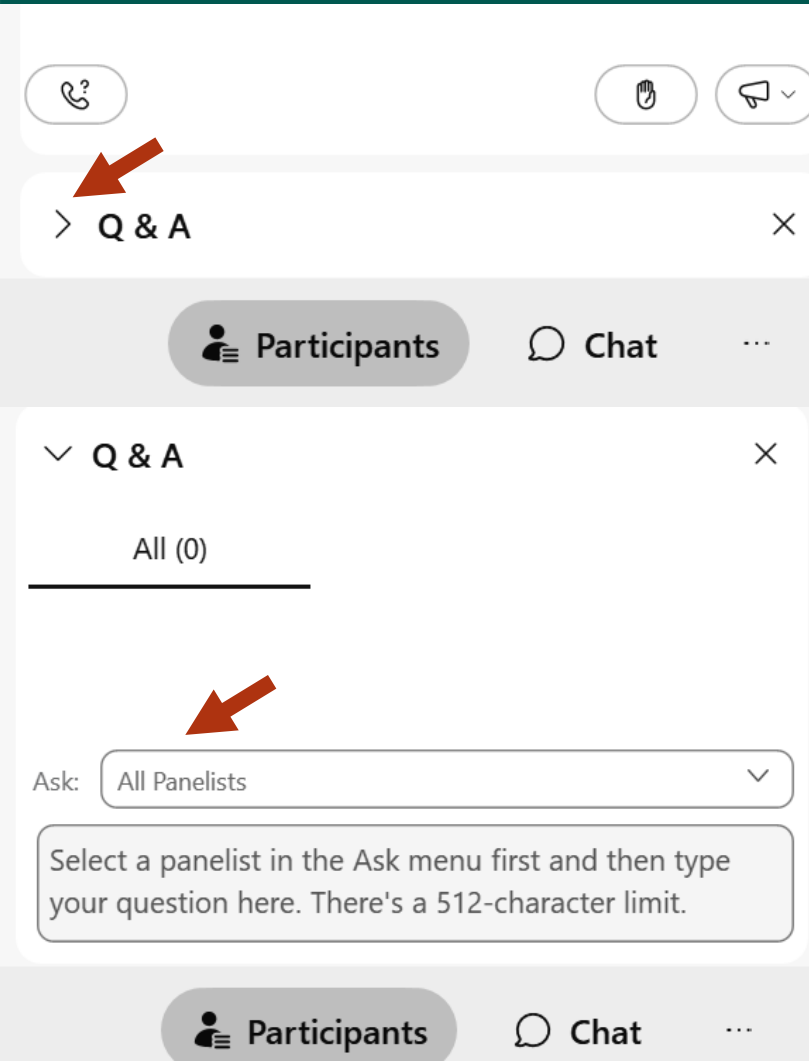
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