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## DIABETES

### Incidence trends of type 1 and type 2 diabetes among youths, 2002-2012

Mayer-Davis EJ, Lawrence JM, Dabelea D, et al. *NEJM*. 2017; 376:1419-29

**Key Question:** What is the incidence rate of type 1 and type 2 diabetes in youth in America?

**Key finding:** Incidence of type 2 diabetes increased by nearly 5% each year from 2002-2012. Incidence increased in all racial/ethnic groups except for white youth, and increased most among Native American and Black youth.

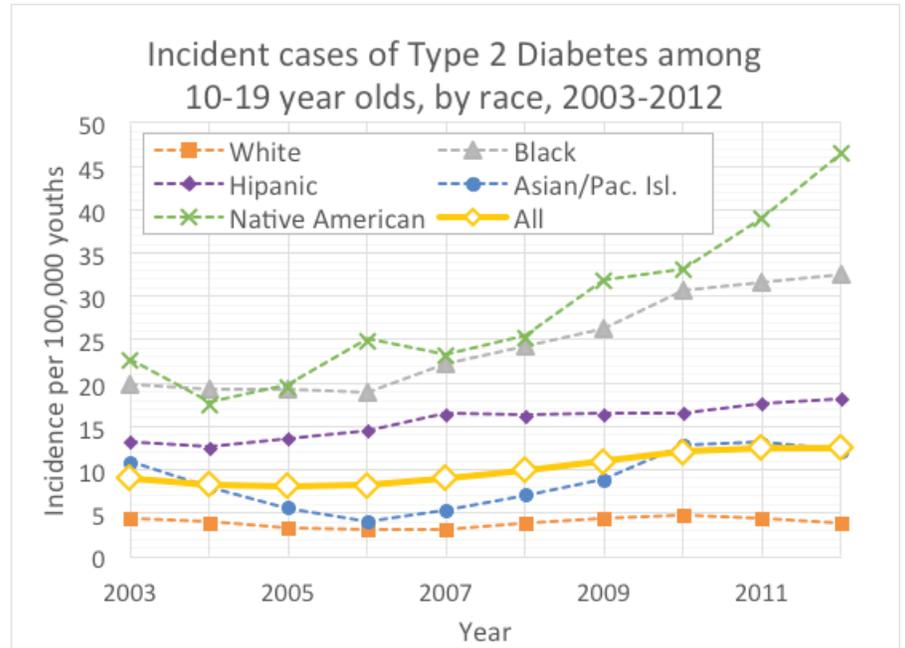
**Implications:** This study demonstrates the urgent need to focus diabetes prevention efforts on minority youths.

**M**ayer-Davis and colleagues examined trends in incident cases of type 1 and type 2 diabetes in youth using data from the SEARCH for Diabetes in Youth study from 2002-2012. As expected, incidence of both type 1 and type 2 diabetes increased steadily over the study period, by 1.8 percent and 4.8 percent per year, respectively. More surprising were the stark racial and ethnic disparities in incidence trends of type 2 diabetes.

Annual incidence of type 2 diabetes increased significantly for all racial and ethnic groups except for white youths, who also had the lowest absolute incidence throughout the study period. The incidence

rate increased the most among Native American and Black youth at 8.9 percent and 6.3 percent per year, respectively, compared to 0.6 percent per year for white youth.

Developing diabetes as a child increases risk of complications and death from diabetes later in life. Disparities in diabetes incidence in youth will likely exacerbate racial health inequities in the future. Furthermore, [another recent report](#) found that black youth are more than twice as likely to die from acute complications of diabetes than white youth. ■



**Limitations:** Incident cases were drawn from 5 clinical centers in distinct regions in the US and incidence rates were generalized to the US population. Rigorous methods were applied to ensure generalizability, but there is always a risk of bias with generalizing to a larger population. Statistical power was limited for demographic subgroups with low incidence of diabetes. For example, the incidence trend for type 2 diabetes among white youth was not statistically significant due to a small sample size.

## Fresh fruit consumption in relation to incident diabetes and diabetic vascular complications: A 7-year prospective study of 0.5 million Chinese adults [🔗](#)

Du H, Liming L, Bennett D, et al. *PLoS Med.* 2017; 14(4):e1002279

**Key Question:** What effect does fresh fruit consumption have on the prevention of diabetes and its complications?

**Key Finding:** Fresh fruit consumption significantly reduced the risk of developing diabetes and reduced risk of dying or developing complications from diabetes.

**Implications:** This large prospective cohort study provides robust evidence that fresh fruit consumption may prevent incidence of diabetes and its complications despite its high sugar content. It also supports the idea that intrinsic sugars found naturally in foods like fruit do not need to be avoided by people with diabetes.

**F**resh fruit is high in sugar, which is thought to contribute to chronic diseases like heart disease and diabetes. However, many believe that the intrinsic sugars found in fruit are not as damaging to health as added sugars found in other food products like sugary

drinks. Hu and colleagues sought to examine the relationship between fruit consumption and diabetes through a large cohort in China.

This prospective cohort study followed over 500,000 participants age 35-74 years from ten diverse regions in China for seven years. The study looked at the association of fruit consumption with the development of diabetes for those without diabetes at baseline, or with hospitalizations and death due to complications of diabetes for those with diabetes at baseline.

After adjustments, fresh fruit consumption was inversely associated with risk of developing diabetes or suffering complications from diabetes (those with the highest fruit consumption had the lowest risk). Daily consumption of fresh fruit was associated with a 12 percent lower risk of developing diabetes. Consuming fruit more than three days a week decreased risk of developing diabetes-related complications by 13-28 percent, and reduced risk of dying from diabetes by 17 percent. ■

**Limitations:** The dietary intake questionnaire was not validated for accuracy. The questionnaire only asked about intake of fresh fruit and did not include canned, frozen, or dried fruit, or fruit juice, nor did it ask about types of fruit consumed. Meat, dairy, and vegetables consumption were adjusted for in statistical analysis, but other dietary factors, including total energy intake, were not adjusted for. As with all observational studies, it is not possible to determine causality, and the association could be caused by other confounding factors. Finally, this study looked at a Chinese population and may not be generalizable to other populations.

## OBESITY

### Health effects of overweight and obesity in 195 countries over 25 years.

Global Disease Burden 2015 Obesity Collaborators. *NEJM*. 2017 (in press)

**Key Question:** *What is the global prevalence and disease burden of obesity?*

**Key Finding:** *Since 1980, obesity prevalence has continually increased in most countries and has doubled in more than 70 countries. Overweight and obesity contributed to 4 million deaths in 2015.*

**Implications:** *Obesity is a global epidemic. This study highlights the need to implement multicomponent strategies to prevent obesity and reduce its disease burden in every country.*

**T**he Global Burden of Disease Obesity Collaborators group systematically reviewed data from 195 countries to estimate prevalence of overweight and obesity in adults and children from 1980 to 2015, and quantified the burden of disease related to obesity.

In 2015, 107.7 million children (5 percent) and 603.7 million adults (12 percent) were obese. The highest prevalence of adult obesity was in Egypt (35.3 percent) and highest prevalence of childhood obesity was in the United States (12.7 percent\*). While childhood obesity was

generally less prevalent than adult obesity, childhood obesity increased at a greater rate from 1980 to 2015 than adult obesity.

Overweight and obesity contributed to 4 million, or 7.1 percent, of deaths around the world from any cause in 2015. 41 percent of BMI-related deaths were due to cardiovascular disease followed by diabetes (15 percent) and cancer and chronic kidney disease (<10 percent each). ■

**Limitations:** Data quality and collection methods can vary by country. The researchers pooled data from multiple sources, but it is not clear if more reliable data sources were prioritized over others. Data for some countries were sparse and some estimates had to be drawn from regional data. Disease burden estimates were based on observational studies, which may not account for all possible confounding factors.

\*Note: The National Health and Nutrition Examination Survey (NHANES), which is considered the gold standard in the US, estimated childhood obesity at 17 percent in 2015 (Ogden et al, 2016). Estimates in this study were determined by pooling multiple data sources. The lower estimate in this study may have resulted from including self-reported data sources, which typically underestimate overweight and obesity.

## POLICY

### The effect of prices on nutrition: Comparing the impact of product- and nutrient-specific taxes.

Harding M & Lovenheim M. *J Health Econ.* 2017; 53:53-71

**Key Question:** What is the potential impact of product- and nutrient-based taxes on overall nutrient content of groceries?

**Key Finding:** A 20 percent tax on sugar had the greatest impact on overall nutrition: total calories dropped 18 percent and grams of sugar dropped 16 percent, along with substantial reductions in fat and salt. This effect was greater than taxes focused on specific products like soda, sugary drinks or snacks and candy.

**Implications:** This study provides comprehensive data on own-price elasticity (the effect of price change on purchase of a product) of a variety of products as well as cross-price elasticities (the effect of price change of one product on purchase of a substitute product) between product groups. The modeling analysis sheds light on changes in overall nutrition of household purchases in response to price changes in specific products or nutrients.

**M**any modeling studies have examined the effect of sugary drink taxes on sugary drink purchase and consumption, but less is known about the impact of taxes on overall grocery purchases and dietary patterns. Harding and Lovenheim aimed to identify the impact of specific product taxes (i.e. sugary drinks) or nutrient taxes (i.e. sugar, salt, or fat) on the overall nutritional content of groceries.

The first step in the analyses was determining own-price and cross-price elasticities for different food groups and product. The researchers used data from the Nielson Homescan Panel which included 123 million transactions between 2002-2007. All food and beverage products were partitioned according to food type and then by nutritional content to make 33 mutually-exclusive product-nutrient categories. Price elasticity was estimated for each category and between categories.

Using the price elasticity estimates, the researchers were then able to estimate the impact of a specific product or nutrient tax on purchase of all food categories and overall nutrition content and cost of groceries per household per month. Product-specific taxes included 1) soda, 2) sugar-sweetened beverages (SSB), 3) packaged meals, and 4) snacks and candy, and nutrient-specific taxes were for salt, sugar, and fat. All taxes assumed a 20% increase in price.

Overall, nutrient-based taxes had a greater impact on nutrition because they applied to more products and offered less options for substitution of taxed products. The sugar tax had the greatest impact, reducing total calories by 18 percent and grams of sugar by 16 percent, along with substantial reductions in fat (-12 percent) and salt (-10%). A fat tax had a slightly greater reduction in total calories, but also caused a drop in fruit and vegetable purchases and increased purchase of soda. This indicates that a sugar tax may generally promote a better diet than a fat tax. All taxes increased monthly grocery expenditures by about \$20 (except for salt and packaged meal taxes which were much lower) ■

**Limitations:** Like all modelling studies, the results of this analysis rely on many assumptions that cannot be tested. Cross-price elasticities are particularly hard to predict, but this study likely provides the most robust estimates given the vast and detailed data source.

## Expected population weight and diabetes impact of the 1-peso-per-liter tax to sweetened beverages in Mexico.

Barrientos-Gutierrez T, Zepeda-Tello R, Rodrigues ER, et al. *PLoS One*. 2017;12(5):e0176336

Several modelling studies have projected the potential health impact of sugary drink taxes based on predicted reductions in sugary drink consumption. For the first time, Barrientos-Gutierrez and colleagues were able to use actual observed reductions in sugary drink consumption to project the impact on weight and diabetes that the tax will have in Mexico.

Based on the 6.1 percent reduction in sugary drink consumption observed by [Colchero and colleagues](#) in the first year of the Mexican tax, Barrientos-Gutierrez and colleagues project that obesity prevalence will decrease by 2.5 percent overall and 7 percent among the heaviest consumers of sugary drinks over ten years, and BMI will decrease most in

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low income households. They also project that 86 to 134 thousand cases of diabetes will be prevented by 2030. These estimates are likely underestimations since sugary drink consumption decreased even more (10 percent) in the second year of the tax.

A previous study by [Sanchez-Romero](#) and colleagues estimated the health impact in Mexico of a 10 percent reduction in sugary drink consumption, and projected about twice as much of a reduction in diabetes than the current study. This difference is likely due to important differences in the model assumptions. The current study is based on incidence of diagnosed diabetes using a model based on the Mexican population, whereas the Sanchez-Romero study modelled incidence of total diabetes (including undiagnosed cases) using a model based on the US population.

## **SUGARY DRINK TRENDS**

### Global trends in the affordability of sugar-sweetened beverages, 1990-2016.

Blecher E, Liber AC, Drope JM, et al. *Prev Chronic Disease*. 2017; 14(37)

**Key Question:** How has the affordability of sugary drinks changed around the world?

**Key Finding:** Sugary drinks have gotten more affordable since 1990, especially in low- and middle-income countries.

**Implications:** Higher affordability of sugary drinks encourages more consumption. Sugary drink taxes can reverse the affordability trend by raising prices, especially in low- and middle-income countries, which could curb rising consumption.

**S**ugary drink consumption is increasing around the world as global brands like Coke and Pepsi are being marketed and sold in more corners of the globe. But are sugary drinks becoming more affordable as well? Blecher and colleagues sought to answer this question by looking at changes in prices and personal income to determine the relative affordability of sugary drinks over time.

The study looked at data from 82 countries total (40 high income countries [HICs] and 42 low- and middle-income countries [LMICs]) between 1990 and 2016. Personal income was measured as per capita Gross Domestic Product (GDP) and the price of Coke was used as a proxy for all sugary drinks. The researchers calculated affordability as the “relative-income price,” or the percentage of per capita GDP needed to purchase 100 liters of Coke.

In 2016, the price of one liter of Coke ranged from \$0.38 in Ukraine to \$2.74 in Papua New Guinea (the average price was \$0.73). The relative-income price of 100 liters of Coke was generally higher for LMICs than HICs, but affordability has increased more rapidly since 1990 in LMICs than in HICs (9 vs. 2 percent per year). Sugary drinks became less affordable

in only 3 countries. Increasing affordability in LMICs was driven largely by increasing income, and to a lesser extent by decreasing prices of sugary drinks. ■

**Limitations:** This study only looked at the affordability of Coke as a proxy for all sugary drinks, and did not compare changes in affordability to other food and beverage products. Since economic growth was the main driver of affordability in LMICs, it could be assumed that all consumer goods became more affordable over the study period. To reconcile this weakness, the authors analyzed affordability of bottled water in an appendix. They found that the affordability of water increased at about the same rate per year as Coke, but the price of bottled water was, on average, more than double the price of Coke. This suggests that Coke is still relatively more affordable than bottled water, but even more comparisons would strengthen the conclusions of this study.

## Consumption of carbonated soft drinks among young adolescents aged 12-15 years in 53 low- and middle-income countries. [🔗](#)

Yang L, Bovet P, Liu Y, et al. *AJPH*. 2017;107(7)

**Key question:** How much regular soda are young people consuming in low- and middle-income countries?

**Key finding:** On average, adolescents consumed soda 1.4 times per day, and 54 percent consumed soda at least once per day. Consumption was highest in Central and South America.

**Implications:** Young people all over the world are consuming too much soda, even in low- and middle-income countries. This may be contributing to the global rapid rise in childhood obesity.

**W**hile Blecher and colleagues examined affordability of soda, Yang and colleagues looked at consumption of soda among adolescents (12-15 year-olds) in low- and middle-income countries (LMICs). The researchers used data from the Global School-based Health Survey between 2009 and 2013. The analysis included a total of 137,449 students from 53 countries (median sample size was 1,809). The survey asked students how many times per day they drank a carbonated soft drink during the past 30 days (not including diet soda).

Fifty-four percent of all adolescents reported consuming soda at least once per day. In most countries (36 out of 53), more than half of adolescents consume soda at least once per day, and in 12 out of 53 countries (mostly in Central and South America), more than a quarter of adolescents consume soda at least three times per day. For comparison, 20 percent of American high school students drink soda at least once per day, and 7 percent drink soda at least 3 times per day ([Youth Risk Behavior Surveillance, 2015](#)).

Average consumption frequency was 1.4 times per day, and frequency varied substantially by country and region. Central and South America had the highest average consumption frequencies (1.7 times per day), and Southeast Asia had the lowest (0.9 times per day) ■

**Limitations:** This study was unable to measure trends in soda consumption, but will hopefully serve as a baseline for ongoing monitoring. The survey did not include questions about sugary drinks other than soda, and only asked about consumption frequency, not volume. The data is based on a self-reported questionnaire, which may be prone to bias. The survey is only administered to students during school hours, so does not capture consumption among adolescents who do not attend school.

## **SUGARY DRINKS AND HEALTH**

### **Sugar- and artificially-sweetened beverages and the risks of incident stroke and dementia: A prospective cohort study.**

Pase MP, Himali JJ, Beiser AS, et al. *Stroke*. 2017;48(5):1139-46

**Key Question:** Does consumption of sugar- and artificially-sweetened beverages increase risk of stroke or dementia?

**Key Finding:** Consumption of artificially sweetened beverages, but not sugar sweetened beverages, was associated with a two- and three-fold increase in risk of stroke and dementia, respectively.

**Implications:** This study adds to a growing body of evidence on artificial sweeteners, and is one of the first to examine their relationship with stroke and dementia. However, results should be interpreted cautiously due to several important study limitations.

**T**his study by Pase and colleagues captured many headlines due to its surprising and novel findings on sweetened beverages and brain health. Many studies have established a connection between sugary drinks and cardiometabolic disease but few have looked at the associated risk of stroke and dementia.

This study followed 2888 participants >45 years old for incident stroke, and 1484 participants >60 years old for incident dementia from the Framingham Heart Study Offspring cohort. Beverage intake was assessed by food frequency questionnaires from three examination cycles from 1991 to 2001. Sugar sweetened beverage (SSB) intake was classified as <1 per day (reference), 1-2 per day, or >2 per day, and artificially sweetened beverage (ASB) intake was classified as 0 per week (reference), ≤6 per week, or ≥1 per day.

Participants were surveyed for incident stroke or dementia starting in 2001 and were followed for a maximum of 10 years. Compared to no ASB consumption, consumption of one or more ASBs a day was associated with a nearly two-fold increased risk of all-cause stroke and a nearly three-fold increased risk of Alzheimer's disease. SSB consumption was not associated with stroke or dementia. ■

**Limitations:** There are several important points to consider when interpreting these results. First, while the relative risk is quite substantial, the absolute number of study participants that developed stroke or dementia was extremely low (<1 percent). Second, as an observational

study, these results represent only an association and do not prove that ASBs are a cause of stroke and dementia.

The association could be due to reverse causation – people with risk factors for dementia choose to drink diet beverages. The authors found that ASB consumption was associated with prevalent diabetes and hypertension, which were associated with dementia and stroke, respectively. When diabetes and hypertension were controlled for in the analysis, the association between ASB and stroke and dementia was no longer statistically significant. This could be the result of reverse causation or mediation (ASB consumption causes diabetes or hypertension, which causes dementia or stroke).

For a more thorough analysis of this study and its limitations, you can read the accompanying editorial, “[Sugar-Sweetened and Artificially Sweetened Beverages in Relation to Stroke and Dementia: Are Soft Drinks Hard on the Brain?](#)”

## Sugary beverage intake and preclinical Alzheimer’s disease in the community. [🔗](#)

Pase MP, Himali JJ, Jacques PF, et al. *Alzheimer’s & Dementia*. 2017 (*in press*)

Another study by Pase and colleagues found that sugar sweetened beverages were associated with markers of preclinical Alzheimer’s Disease. This study also used subjects from the Framingham Heart Study, but looked at MRI scans and neuropsychological tests for early signs of brain aging, rather than new diagnoses of dementia.

In this instance, the researchers found that SSBs were associated with a lower total brain volume and poorer performance on memory tests, signs that are consistent with preclinical Alzheimer’s disease. ASB consumption was also associated with lower total brain volume, but no other markers.

Together, these studies seem to suggest that sugary drink consumption is associated with early brain aging, but not dementia, and artificially sweetened drinks may be associated with both. As observational studies, neither can prove causation, and both could be confounded by reverse causation or mediation. Other differences in study design could explain the differential result on sugary drinks and brain health.

First, this study looked at a younger sample of subjects (>30 years old vs. >60 years old for the dementia analysis in the previous study). It is possible that associations between

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sugary drinks and brain health are stronger in younger people. It is also possible that heavy consumers of sugary drinks were at higher risk of dying from other conditions before developing dementia. Results of the previous study may also have been biased by low statistical power – sugary drink consumption was low among study participants, and relatively few developed incident stroke or dementia, resulting in a small sample size for statistical analysis.

Research Watch reviews the evidence on the health effects of sugar and the effectiveness of policy and other interventions to curb consumption to inform sugar reduction activities across the US.

*This publication was prepared by Jaclyn Konich.*

Healthy Food America acts on scientific evidence to drive change in food policy and industry practice, giving people greater control over their health and reducing diet-related illnesses, such as obesity, diabetes, and heart disease.