Halting the Rise in Obesity in the United States

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Introduction

The United States is suffering from an alarming epidemic of obesity that keeps getting worse every year. In the mid-1980s, the obesity rate in the US was slightly below 10%, however since that time, the obesity rate has steadily increased by about 1 percentage point a year until it rose above 40% in the most recent data available in 2017-2018, the highest among OECD countries.(1) Since obesity can be linked to a variety of other health problems like heart disease, strokes, and type 2 diabetes, this has created a severe public health crisis that requires immediate action.

The key question then becomes what is the cause of this dramatic rise in obesity in the US. One primary culprit is the sugar sweetened beverage (ie soda) which has gotten a lot of research attention in the public health literature. This elevated focus on sugar sweetened beverages is quite justified, but the public health literature makes a key mistake in not distinguishing beverages sweetened by sugar (also known as sucrose) and beverages sweetened by high fructose corn syrup (HFCS), a point I deal with in great detail in a separate working paper (Sly 2018) that provides the basis for this policy memo.(2) The general consensus within the scientific community is that there is no meaningful difference between the two sweeteners since sucrose is simply a 50/50 mix of glucose and fructose, while high fructose corn syrup is quite similar, containing 55% fructose, 42% glucose, and 3% saccharides. This of course misses the fact that in sucrose, the glucose and fructose molecules are bonded together, while in HFCS they are freely floating, and that the fructose level is somewhat higher in HFCS as the name would suggest.

Once you correct for a few key mistakes within the literature, the evidence becomes quite clear that the obesity epidemic in the US was likely caused by the introduction of HFCS into soda in the mid-1980s, and the key solution to ending the growth of obesity in the US is to ban HFCS from being used in food in any form. This does not however leave beverages sweetened with sucrose completely off the hook since obesity is a problem in many different countries around the world and only a handful of countries use HFCS in their soda. This indicates that not only would the US benefit from a ban on HFCS in food, but that the US should reduce our consumption of sugar overall as well. One way to do this is to implement a tax on sugar sweetened beverages, even if they are sweetened with sucrose, which would likely decrease the consumption of those beverages, but this policy is fraught with a variety of potential pitfalls that need to be avoided. The first part of this policy memo summarizes the link between HFCS consumption and obesity, and the second part of this policy memo examines how a tax on sugar sweetened beverages might be implemented successfully.

Establishing the Link Between HFCS and Obesity

There are four main sources of evidence that establish the link between HFCS consumption in soda and an overall rise in obesity. The first source of evidence comes from timing data within the US, where the CDC has been doing phone surveys to calculate state level obesity rates since the late 1970s. The problem is that the phone surveys did not cover all of the states in the country until the early 1990s, so this data from the 1980s generally gets overlooked because it is incomplete. If you assume that choosing which states get surveyed in the early years was essentially a random process overall, then this data can still be used to get a general sense for the overall obesity rate in the country and the trends that occurred over that time period, since the sample of states with data would not be biased one way or the other. This ends up being quite important since obesity rates were generally quite low and approximately flat up until about 1985, and then grew about 1 percentage point a year after that point, indicating something important happened around 1985 that caused the trajectory of obesity in the country to dramatically and abruptly change. One very interesting observation is that both Coke and Pepsi started using HFCS in soda in November of 1984, just before the obesity started rising in the US. This coincidence in timing is suggestive of the fact that adding HFCS to soda may have been the cause of rising obesity in the US, but more evidence would be needed in order to prove a causal relationship.

The second source of evidence that helps establish the link between HFCS and obesity come from comparing obesity rates across countries. In this case, there is a bit of a natural experiment because some countries around the world use sucrose to sweeten their soda and some countries use HFCS to sweeten their soda, and we can see what happens to obesity between these two sets of countries. Using Google, I identified a diverse set of five countries (US, Mexico, New Zealand, Hungary, and Argentina) that use HFCS in their soda, and four of them are members of the OECD. When you look at obesity rates across the OECD, you can see that the four that use HFCS in their soda are also the ones with the four highest obesity rates among those countries, and that if the fifth country, Argentina, were an OECD country, then the five highest obesity rates in that group would all be countries that use HFCS in soda. This international evidence basically confirms the hypothesis suggested by the timing data in the US, though ideally there would be evidence from the strongest type of research design, the randomized controlled trial, as well.

The third source of evidence that helps establish the link between HFCS and obesity comes from a randomized controlled trial conducted using rats. In a study done by Princeton, half of the rats were allowed to consume water sweetened with HFCS and half of the rats were allowed to consume water sweetened with sugar, and the rats in both groups were allowed to consume as much sweetened water as they wanted. Over time, this study showed that the rats who were given water sweetened with HFCS became significantly more obese than those given water sweetened with sucrose, indicating that in rats at least, HFCS has a greater impact on obesity than sucrose does. Even though randomized controlled trials are the strongest source of evidence, ideally there would be randomized controlled trials done in humans rather than rats, since clearly rats and humans are different in many important ways.

The fourth source of evidence that helps establish the link between HFCS and obesity comes from a randomized controlled trial in humans. In this study, the sample was first divided into three groups,

where one group was given a small amount of sweetener, another group was given a moderate amount of sweetener, and a third group was given a large amount of sweetener. Each of these three groups were divided into two, where half of each group were given milk sweetened with HFCS and half of each group were given milk sweetened with sucrose. These groups were followed for 10 weeks, and allowed to consume whatever food they wanted over that time, and then weighed at both the beginning and the end of the study to see how this affected their weight. As it turns out, there was no difference between the HFCS and sucrose groups when given the small amount of sweetener, but those consuming HFCS in the moderate group gained about 6-7 pounds more weight than the sucrose group, and among the groups given a lot of sweetener, the HFCS group gained about 11-12 pounds more than the sucrose group. Since the study only lasted 10 weeks, this represents a meaningful and important change in weight over that time period, but the problem is that the sample size was so small (there were only 40 participants given a small amount of sweetener, only 40 given a moderate amount of sweetener, and 40 given a large amount of sweetener, divided into groups of 20 for HFCS and sucrose) that the differences in weight gain were not statistically significant. The authors then made a significant mistake by concluding that there was no difference between the groups given HFCS and sucrose, even though there was a substantial difference, it was just that the sample size was too small. This study, even though the published conclusions stated there was no meaningful difference between HFCS and sucrose actually gives us the strongest evidence that consuming more HFCS can be linked to higher levels of obesity as a result.

Taken together, this collection of evidence makes a convincing case establishing a link between HFCS and the obesity epidemic in the US. The obvious solution to this problem then is to ban HFCS from being used in any food consumed in the US. This would not require any specific law passed by the federal government, but instead only needs a ruling by the Food and Drug Administration that declares that HFCS is no longer “Generally Regarded as Safe”, an official designation that allows an additive to be used in the food supply without any restrictions. In order to get to this point, the scientific consensus that there is no difference between HFCS and sucrose would need to be overturned, and to reach that point as quickly as possible, new research should be done immediately, so that the evidence provided here can be confirmed in an even more convincing fashion. In all likelihood, an immediate ban on HFCS in food will bring the rise in obesity to a halt, and dramatically reduce the number of people gaining weight and becoming obese each year, but might not cause people who have already become obese to lose weight and return to a healthier weight level overall. Even though this policy change might not be able to achieve all the public health gains we might have hoped, ending the rise in obesity would be an absolutely critical achievement in public health that will bring substantial benefits to society for decades into the future.

Enacting a Soda Tax that Works Over the Long Term

Another highly debated policy intervention designed to reduce the rise in obesity over time is to impose a tax on sugar sweetened beverages, regardless of how they are sweetened. Since there have been links established between sugar sweetened beverages in general and increases in obesity in the literature, reducing the consumption of these beverages is an obvious strategy to reduce obesity over the long term, and raising the cost of buying those drinks by imposing a tax on them is an obvious way to make

progress on that intermediate goal. Unfortunately, even though a tax on sugar sweetened beverages does hold some promise in making important gains in public health over the long term, imposing a soda tax is likely going to be fraught with pitfalls over the short term. In order to enact a tax that is successful in achieving these public health goals, this policy memo provides four observations that provide valuable insights into how a soda tax might be made to work over the long term.

The first important point to recognize when deciding how to implement a tax on sugar sweetened beverages is that over the very long term there are important gains in public health to be reached. The first part of this policy memo presented a substantial body of evidence that links obesity to the consumption of HFCS in soda, but in the broader international context, only 5 countries use HFCS in soda, but obesity is a problem in many places across the world, and there is evidence that consuming more soda regardless of whether it uses HFCS or sucrose contributes to significant long term health problems. When looking at specific company data on how much Coke gets consumed in a variety of OECD countries around the world (which presumably could serve as a proxy for how much soda is consumed more generally), there is a strong correlation both between Coke consumption and obesity and Coke consumption and life expectancy. Consuming an extra can per day of Coke raises the obesity rate in a country by about 10 to 15 percentage points, and the US consumes the most amount of Coke among OECD countries in the available data and has a life expectancy about 4 to 7 years lower than countries that consume the lowest amount of Coke per year. This evidence is purely observational and only establishes a correlation between Coke consumption and these indicators of public health, but it does suggest the possibility that if a country consumes less soda over many years or decades that this might lead to a lower obesity rate and longer life expectancy.

The second important point to recognize when deciding how to implement a tax on sugar sweetened beverages is that imposing a tax can reduce consumption of these beverages quite quickly. The city of Berkeley implemented a one cent per ounce tax on sugar sweetened beverages in 2015 and saw a 10% reduction in sales of these drinks based on checkout scanner data at two big retail chains, but over the longer term, consumption of those drinks among low and moderate income families declined by 52% three years later based on a survey given to individuals. Philadelphia enacted a 1.5 cent per ounce tax on sugar sweetened beverages and saw a 51% drop in sales for these products at major food retailers in the city, but about a quarter of that was offset from higher sales in the surrounding suburbs. A survey of individuals in Philadelphia before and after the tax was imposed showed a decline in soda consumption of about 31%.(3)

The third important point to recognize is that even if we can demonstrate lower soda consumption leads to long term health benefits over time and a soda tax would reduce soda consumption overall, then this might not actually create significant public health benefits ***over the short term***. This observation is going to be especially relevant if politicians impose a tax on sugar sweetened beverages without banning HFCS first, where soda consumption peaked around 1999 in the US and decreased by as much as 20% through 2014 but obesity still consistently rose to higher and higher levels over that time period. In theory, banning HFCS would end the consistent rise in obesity that seems to occur every year, and then imposing a tax on sugar sweetened beverages would drive down soda consumption even further. Over the short term though, even if there might be fewer people becoming obese each year, it might have

little or no impact on reducing the weight of those already obese, leaving obesity rates at alarmingly high levels for years after a sugar sweetened beverage tax gets enacted. Since the related health conditions like heart disease, strokes, and type 2 diabetes often take years to develop, there might be little change in broad indicators of public health in the years immediately following a new soda tax, and the negative trends might even continue for a while longer due to the delayed onset from the increase in obesity that was occurring prior to the imposition of the soda tax. That means there is a danger to creating a rationale for imposing a tax on sugar sweetened tax that links it to immediate improvements in public health, since those benefits will take many years and perhaps even decades to finally be realized.

The fourth important point to make is that you have to be careful how you use the revenue from the soda tax. Oftentimes, cities and their residents want to dedicate the revenue from the soda tax to a specific set of purposes, and some of the most common ones are to give money to non-profits to encourage healthy eating and to parks to offer more opportunities for exercise and recreation. Even though these priorities are well meaning, unfortunately they are also unproven in achieving additional public health benefits beyond the reduction in soda consumption resulting from the tax. The existence of a direct, immediate, financial cost due to the new soda tax combined with the nebulous, intangible, long term benefits of the programs receiving the designated tax revenue creates a political economy problem that might cause the tax to be ended soon after it was created, especially since the public health benefits of reducing soda consumption might take many years or decades to show up. Instead, city politicians might be better served by copying Philadelphia's example that designated the revenue to be used primarily on pre-K programs. This is a strategy with a well documented and proven track record of providing important long term benefits for society, and creates a specific constituency of young kids and parents that directly benefit from the program. Removing the soda tax would then create a specific documented harm that provides a political counterweight to the desire to get rid of the immediate financial penalties from the soda tax. Only by creating some political obstacles to removing the new soda tax will the policy be in place long enough to realize the very long term public health benefits from reducing soda consumption.

Conclusion

Clearly, the rising obesity epidemic in the US is a serious problem that requires immediate action. Enacting a complete ban on using HFCS in food should be the highest priority, since in theory this should be able to halt the constant year to year rise in obesity rates. Once that is taken care of then it might make sense for states or cities to start charging a tax on sugar sweetened beverages. This might drive down soda consumption even further, and if these taxes can remain in place for extended periods of time, eventually society will likely see some important gains to public health. In order to get to that point, however, the choices surrounding how the tax revenue gets used need to be made carefully in order to ensure that the political economy problems created by the tax can be counteracted. Using the revenue for pre-K initiatives is one viable solution that Philadelphia has adopted, but using the revenue for a merit based college aid program, as I discuss in another policy memo (Sly 2020), might be another possible alternative that creates a proven tangible benefit for a well identified constituency. The obesity crisis has been unfolding for over three decades now, and this problem is likely going to take

generations to repair, but by taking some of these immediate steps, perhaps we can keep the problem from getting worse and set the stage for future long term progress.

End Notes

#1 – The obesity rate in 1985 was slightly below 10% as indicated by the phone survey conducted by the CDC at the state level, which did exclude some states at that time, as I reported in more detail in another working paper on the topic (Sly 2018). The most recent data on obesity came from a national survey on health and nutrition that was also conducted by the CDC, which showed that the obesity rate in adults over the age of 20 reached 42.4% in 2017-2018. The comparison over time might not be exactly comparable since it uses two different data sources, but the overall trend should be generally accurate.

#2 – The evidence presented in this paper generally comes from my working paper on the subject (Sly 2018) and if you want specific references and citations to the underlying sources of data and research, they can be found in that more detailed working paper. If the statistics do not come from that working paper, such as the more recent evidence on the impact of soda taxes on soda consumption, then they will be specifically cited in this policy memo.

#3 – The data on the 52% sales drop as reported by individuals in Berkeley came from a study done by Matthew Lee and a number of authors (Lee et al 2019). The data on the decline in sales at checkout scanners for two major retail chains in Berkeley, as well as the data on the consumption declines in Philadelphia were reported in an article by Greg Miller (2019).

References

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