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Distribution of Volume Sold of Calorically and Noncalorically Sweetened Beverages: Evidence from Two U.S. Cities

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The link between sugar-sweetened beverage (SSB) consumption and adverse health outcomes, such as type 2 diabetes and obesity, is well established.[3] However, evidence on potential health risks associated with the intake of noncalorically sweetened beverages (NSBs) is mixed. Noncaloric sweeteners include natural substitutes that are found in plants (e.g., stevia, monk fruit extract, allulose, and sugar alcohols) and artificial sweeteners (e.g., aspartame, sucralose, and saccharin). While there is direct or indirect evidence suggesting the potential for negative health effects from artificial sweeteners including cardiovascular disease, changes to the microbiome, and carcinogenicity,[4-7] the evidence remains inconsistent and at least one review suggests artificial sweeteners are safe for human consumption.[8] While the literature on natural substitutes has more consistently found these to be safe for human consumption, not as much research has been conducted on these sweeteners as some have only been recently approved by the Food and Drug Administration.[9-12]

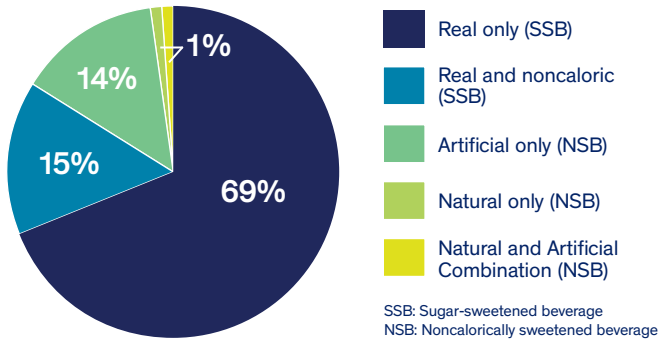
As a policy response to the health risks associated with SSBs, calls for SSB taxes have come from the Institute of Medicine and the World Health Organization.[13,14] However, based on the mixed evidence regarding health effects for NSBs, it is unclear whether taxes should also be applied to NSBs. Of the eight local sweetened beverage taxes implemented in the United States (with one since repealed), only two have included NSBs.[15] In jurisdictions that tax SSBs only, we would expect substitution to untaxed beverages, including those that are sweetened by noncaloric sweeteners.

It is valuable to understand the extent to which beverages with noncaloric sweeteners are purchased and to what extent they are sweetened with natural substitutes or artificial sweeteners in order to inform policymakers on the extent of baseline demand for these products. The purpose of this brief is to describe the volume sold of SSBs and NSBs by sweetener status, based on retail scanner data for Oakland and Sacramento, California, from June 26, 2016 through June 24, 2017.

Key Findings

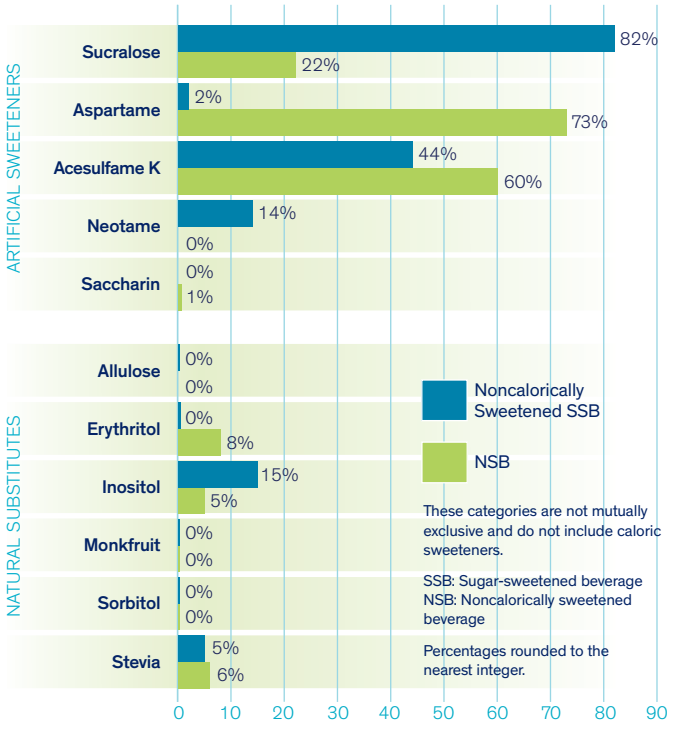
- **NSBs represent roughly 16% of total volume sold of sweetened beverages, mostly in the form of NSBs sweetened only with artificial sweeteners (14% of total volume).**
- **Aspartame is the most common noncaloric sweetener used in NSBs (73% of volume sold) and sucralose is the most common noncaloric sweetener used in combination with caloric sweeteners in SSBs (82% of volume sold).**
- **Acesulfame K is used frequently in both noncalorically sweetened SSBs (44% of volume sold) and NSBs (60% of volume sold) and in NSBs is usually found in combination with other noncaloric sweeteners.**
- **Most (73%) of the volume sold of NSBs that contain artificial sweeteners comes from soda.**
- **Energy drinks have the greatest percentage (73%) containing natural sugar substitutes out of all NSB types.**

FIGURE 1 **Distribution of Sweetened Beverage Volume Sold by Presence of Caloric and Noncaloric Sweeteners**



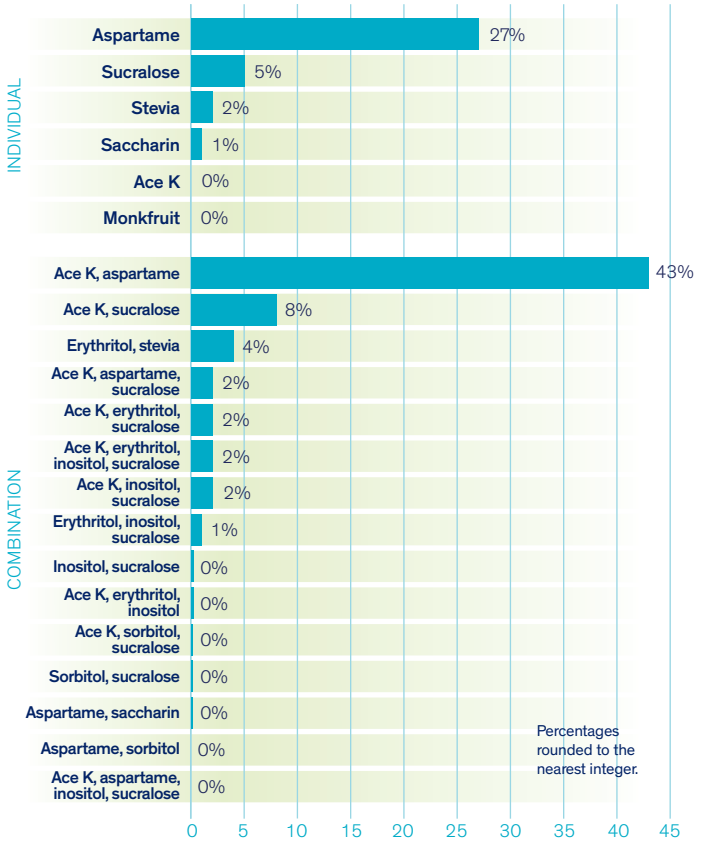
- NSBs represent roughly 16% of total volume of sweetened beverages sold. In particular, artificially sweetened only NSBs represent 14% of total volume sold of sweetened beverages.
- NSBs sweetened with natural substitutes only or a combination of natural substitutes and artificial sweeteners each make up roughly just 1% of total volume sold of all sweetened beverage sales.

FIGURE 2 **Percentage of Volume Sold of Noncalorically Sweetened SSBs and NSBs by Noncaloric Sweetener Type**



- Aspartame is the most common noncaloric sweetener, found in 73% of NSB volume sold.
- Sucralose is the most common noncaloric sweetener used in combination with caloric sweeteners in SSBs with 82% of noncalorically sweetened SSB volume sold containing sucralose.
- Acesulfame K is used frequently in both noncalorically sweetened SSBs (44% of volume sold) and NSBs (60% of volume sold).

FIGURE 3 **Percentage of Volume Sold of Noncalorically Sweetened Beverages by Sweetener Type (Individual or Combination)**



- Acesulfame K (Ace K) is often used in combination with other sweeteners rather than on its own in NSBs. The most popular combination is acesulfame K combined with aspartame (43% of volume sold).
- Among all NSBs, 27% are sweetened with aspartame exclusively.

Methods

This study used Nielsen retail scanner data for Oakland and Sacramento, CA, from June 26, 2016 through June 24, 2017. The Nielsen dataset included weekly data on units sold by universal product code (UPC) for all non-alcoholic beverages purchased from stores in Nielsen's sample, which included supermarkets, grocery stores, convenience stores (including some non-chain locations), drug stores, mass merchandise stores, and dollar stores. This study examined volume sold of SSBs and NSBs, corresponding to a total of 4,590 UPCs. Store brands, for which it was not possible to look up the full set of sweetener information, were excluded (480 UPCs representing 5.85% of total volume sold), as were beverages that were missing sweetener type information (2 UPCs representing 0.003% of the remaining volume sold), leaving an analytical sample of 4,108 UPCs.

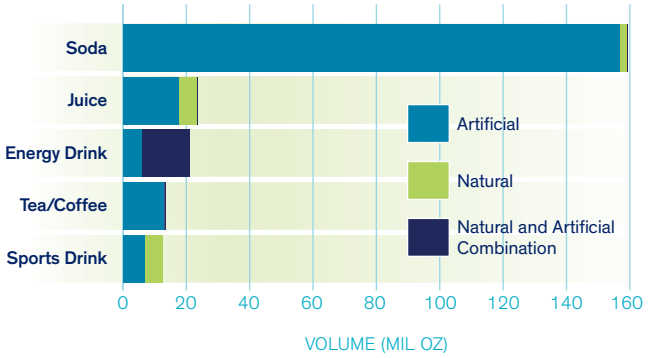
For each UPC, the overall beverage sweetener classification (SSB or NSB), the full set of sweeteners used, and the beverage type (soda, energy drink, sports drink, juice drink, or tea/coffee) were determined. Nutrition information was initially determined based on beverage characteristics provided in the Nielsen data and information from the manufacturer's website. When this was unavailable, the U.S. Department of Agriculture Food Composition Databases, Open Food Facts, and Label Insight were used.[16-18] If not available in these sources, labels were examined from multiple grocery store websites.

Individual sweeteners were classified as: caloric sweeteners; artificial sweeteners, which included aspartame, sucralose, acesulfame K, neotame, and saccharin; and, natural substitutes, which included stevia, monk fruit extract, allulose, and sugar alcohols. Beverages were classified by the combination of individual sweeteners they contained.

While 100% juice was not considered a sweetener, juice concentrate that was not fully reconstituted was considered a caloric sweetener. This was determined by comparing the grams of sugar of beverages containing juice concentrate to the grams of sugar in 100% juice. Trace amounts of caloric sweeteners in beverages with zero calories were not considered in the analyses.

For this brief, total volume sold over the study period was computed by beverage sweetener classification, sweeteners included, and beverage type.

FIGURE 4 **Volume Sold of Noncalorically Sweetened Beverages by Beverage Type and Sweeteners Included**



- Most volume sold of NSBs that contain artificial sweeteners comes from soda (73%).
- Energy drinks have the greatest percentage (73%) containing natural sugar substitutes out of all NSB types.

Definitions

Caloric Sweeteners: Sweeteners that contain sugars (sucrose, glucose, fructose, etc). Sugars add four calories per gram.[1]

Noncaloric Sweeteners: Sweeteners that contribute zero calories or sugar alcohols.[2] Noncaloric sweeteners are divided into artificial sweeteners and natural substitutes.

Artificial Sweeteners: A type of noncaloric sweetener that cannot be found in any quantity in plants. These include aspartame, sucralose, acesulfame K, neotame, and saccharin.

Natural Substitutes: A type of noncaloric sweetener that can be found in plants. This category includes both high-intensity sweeteners that are at least 200 times sweeter than table sugar—stevia and monk fruit extract—as well as low-intensity sweeteners with a similar sweetness to table sugar—allulose and sugar alcohols (erythritol, sorbitol, and inositol).

Sugar-Sweetened Beverage (SSB): A beverage that contains caloric sweeteners, and which may also contain noncaloric sweeteners.

Noncalorically Sweetened Beverage (NSB): A beverage that contains noncaloric sweeteners and no caloric sweeteners.

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