

Manuscript Number: PM-17-145R2

Title: Trends in beverage prices following the introduction of a tax on
sugar-sweetened beverages in Barbados

Article Type: Supplement: CDC-NCD Health Economics

Keywords: Nutrition policy; obesity; primary prevention; economics; diet;
diabetes mellitus

Corresponding Author: Ms. Miriam Alvarado, MPH

Corresponding Author's Institution: University of Cambridge

First Author: Miriam Alvarado, MPH

Order of Authors: Miriam Alvarado, MPH; Deliana Kostova, PhD; Marc
Suhrccke, PhD; Ian Hambleton, PhD; Trevor Hassell, MD; Alafia Samuels,
MBBS; Jean Adams, PhD; Nigel Unwin, DM

Abstract: A 10% excise tax on sugar sweetened beverages (SSBs) was implemented in Barbados in September 2015. A national evaluation has been established to assess the impact of the tax. We present a descriptive analysis of initial price changes following implementation of the SSB tax using price data provided by a major supermarket chain in Barbados over the period 2014-2016. We summarize trends in price change before and after the tax using year-on-year mean price per liter change between SSBs and non-SSBs. We find that prior to the tax, year-on-year price growth of SSBs and non-SSBs was very similar (approximately 1%). During the quarter in which the tax was implemented, the trends diverged, with SSB prices growing by almost 3% while prices of non-SSBs decreased slightly. The growth of SSB prices outpaced non-SSBs prices in each quarter thereafter, reaching 5.9% growth compared to <1% for non-SSBs. Future analyses will assess the trends in prices of SSBs and non-SSBs over a longer period and will integrate price data from additional sources to assess heterogeneity of post-tax price changes. A continued examination of the impact of the SSB tax in Barbados will expand the evidence base available to policymakers worldwide in considering SSB taxes as a lever for reducing the consumption of added sugars at the population level.

Chronic Disease Research Centre
University of the West Indies, Cavehill Campus
Cavehill, Barbados

The Editor
Preventive Medicine Editorial Office
Department of Oncology, McGill University
546 Pine Avenue West, Montreal, QC, Canada H2W1S6

July 6, 2017

Dear Editor:

Please find our re-submission of a letter to the editor titled "Trends in beverage prices following the introduction of a tax on sugar-sweetened beverages in Barbados" for your consideration as part of the supplement guest-edited by Frank J Chaloupka and Deliana Kostova, titled "Perspectives on noncommunicable disease risk factor prevention."

Thank you for clarifying the additional word limits for this submission. The revised abstract is 215 words and the manuscript is 913 words, with one figure and 11 references.

Based on reviewer feedback, we made several clarifications and additions to address reviewer comments. As we mentioned previously, this letter represents the first evaluation of a sugar-sweetened beverage (SSB) tax policy in the Caribbean, and focuses on the initial price changes in beverages following implementation of the tax. We believe that although it is short, it communicates the potential implications of the price data in an improved and clearer manner.

We do not have any conflicts of interest to report, nor has this work been published previously. All authors have actively participated in the design and writing of the paper, and have approved the paper in its current form. Institutional review was not required for the work presented here, as this paper did not involve data collection from human subjects or make use of any data traceable to individual human subjects. Please let me know if there is any additional information that I can provide.

Thank you again for considering this submission.

Sincerely,
Miriam Alvarado
PhD Candidate
University of Cambridge

REVIEWERS' COMMENTS FOLLOW:

Reviewer #2: The authors converted the manuscript into a letter. In my opinion, this letter seems a reasonable option given the importance to show, at least from unadjusted numbers, how prices changed after the tax was implemented. I have some comments/ clarifications and recommendations.

Thank you for reviewing this a second time, and we are glad you agree that this represents a reasonable option/format.

The graph shows annual changes in prices compared with the same quarter to at least adjust for seasonality. Are prices deflated?

We have not deflated prices in this descriptive summary, although we will in future analyses. We have clarified this in the text: "For this descriptive analysis, unadjusted prices were used. As inflation would likely lead to similar proportional price changes among SSBs and non-SSBs, using unadjusted prices still allows a comparison of price change trends following the implementation of the tax."

What is the grey bar in the graph?

The grey bar was intended to represent the period between announcement of the tax and implementation, during the third quarter when the tax was implemented. However, we agree that the grey bar is a bit confusing and have replaced it with two lines to indicate when the tax was announced and subsequently implemented. We have included the following text: "The two vertical lines in the Figure correspond to June 2015, when the tax was first announced and to September 2015, when the tax was first implemented. It is possible that manufacturers or retailers may have increased prices following the announcement of the tax, in anticipation of the actual implementation date."

A one sentence explaining the negative change in non-SSB prices would be ideal. Could this be a strategy from the industry?

We agree that it would be helpful to explain the dip in non-SSB prices. It may be an industry response, but it is not clear to what extent this was a strategic response, and by whom, and to what extent it may be explained as a standard fluctuation in prices. We have added the following to address this "It is possible that the slight dip in non-SSB prices may have been part of an industry response to the introduction of the SSB tax, or may reflect other unknown factors. Bottled water and other diet beverages are produced/imported by some of the same manufacturers and distributors that supply SSBs. Future analyses will assess the trends in prices of SSBs and non-SSBs over a longer period and by manufacturer/distributor to further explore these diverging trends."

Is bottled water included in the non-SSB category and if so, is it produced by the beverage industry? A brief description of the beverages included in the non-SSB category is recommended.

We agree that it would be helpful to clarify the SSB and non-SSB categories. We have included the following text "We classified sodas, sugar-sweetened juices, and sugar-sweetened sports and energy drinks as SSBs, and no-added-sugar juices, sugar-free (diet) sodas/energy drinks/sports drinks, and bottled waters as non-SSBs."

Bottled water is included in the non-SSB category, and it is produced by some of the same bottling/manufacturing companies that produce high-selling SSBs. Some bottled water is also imported. We have added "Bottled water and other diet beverages are produced/imported by some of the same manufacturers and distributors that supply SSBs"

I also recommend that the authors emphasize in the letter that this is an unadjusted/descriptive analysis; that the data comes from a chain of supermarkets that may not be representative of all stores in the country and that further studies should assess the heterogeneity of the pass-through prices.

Thank you for highlighting this, and yes, we agree that it is important to highlight that these are unadjusted data and represent a preliminary, solely descriptive analysis. We have included the following “This is a preliminary descriptive analysis using readily available price data following the Barbados SSB tax.... In addition, these price data represent prices in one major retail chain, and may not be representative of price changes across all stores. Future work will aim to integrate price data from additional sources to assess heterogeneity of post-tax price changes.”

EDITORIAL OFFICE'S ADDITIONAL REVISION INSTRUCTIONS:

You may use up to 2000 words for your revised manuscript (main text) (and a maximum of 250 words for the abstract), including the additional text required to address the points raised in the critiques. We ask you to include word counts for the abstract and for the main text on the cover page. Please take into account also the editorial instructions in the body of this email.

Thank you for clarifying these word limits. We have added an abstract of 215 words, and summarized the word count for the abstract and main text (913 words) in our revised cover page.

Highlights

A 10% excise tax was introduced on sugar-sweetened beverages (SSBs) in Barbados

SSBs and non-SSBs showed similar year-on-year price growth trends prior to the tax

Post-tax, the growth in SSB prices reached 5.9% while staying below 1.0% for non-SSBs

Trends in beverage prices following the introduction of a tax on sugar-sweetened beverages in Barbados

Authors: Miriam Alvarado, MPH^{1,5}, Deliana Kostova, PhD², Marc Suhrcke, PhD³, Ian Hambleton, PhD¹, Trevor Hassell, MD⁴, T Alafia Samuels, MBBS¹, Jean Adams, PhD⁵, Nigel Unwin, DM^{1,5} on behalf of the Barbados SSB Tax Evaluation Group

Keywords: Nutrition policy, obesity, primary prevention, economics, diet, diabetes mellitus

Author affiliations:

¹George Alleyne Chronic Disease Research Centre, University of the West Indies, Barbados

²Division of Global Health Protection, Center for Global Health, US Centers for Disease Control and Prevention, Atlanta, USA

³Centre for Health Economics, University of York, UK

⁴Healthy Caribbean Coalition, and National NCD Commission, Barbados

⁵Centre for Diet & Activity Research, MRC Epidemiology Unit, University of Cambridge, UK

Correspondence to: Dr. Alafia Samuels, Director, George Alleyne Chronic Disease Research Centre

Ph: +1-246-426-6416

Email: alafia.samuels@cavehill.uwi.edu

Mailing Address:

Avalon, Jemmott's Lane,

Bridgetown,

St. Michael,

BB11115

Barbados, West Indies

Abstract

A 10% excise tax on sugar sweetened beverages (SSBs) was implemented in Barbados in September 2015. A national evaluation has been established to assess the impact of the tax. We present a descriptive analysis of initial price changes following implementation of the SSB tax using price data provided by a major supermarket chain in Barbados over the period 2014-2016. We summarize trends in price change before and after the tax using year-on-year mean price per liter change between SSBs and non-SSBs. We find that prior to the tax, year-on-year price growth of SSBs and non-SSBs was very similar (approximately 1%). During the quarter in which the tax was implemented, the trends diverged, with SSB prices growing by almost 3% while prices of non-SSBs decreased slightly. The growth of SSB prices outpaced non-SSBs prices in each quarter thereafter, reaching 5.9% growth compared to <1% for non-SSBs. Future analyses will assess the trends in prices of SSBs and non-SSBs over a longer period and will integrate price data from additional sources to assess heterogeneity of post-tax price changes. A continued examination of the impact of the SSB tax in Barbados will expand the evidence base available to policymakers worldwide in considering SSB taxes as a lever for reducing the consumption of added sugars at the population level.

1
2
3
4
5
6 Caribbean populations suffer from the highest burden of non-communicable diseases (NCDs) in the
7 Americas (*Health in the Americas 2012 Edition: Regional Outlook*, 2012). Barbados, an island in the
8 Eastern Caribbean, faces a serious problem with overweight, obesity and related diseases. In 2012, the
9 adult rates of overweight and obesity were 74.2% and 43.4%, respectively, for women, and 66.2% and
10 23.4%, respectively, for men (Howitt et al., 2015).
11
12
13

14
15 In June 2015, the Government of Barbados announced the introduction of a 10% ad valorem tax on sugar-
16 sweetened beverages (SSBs). The tax is applied to sodas, sugar-sweetened juices, and sugar-sweetened
17 sports and energy drinks, but not 100% juices, sugar-free (diet) sodas, or sugar-free flavored waters
18 (Healthy Caribbean Coalition, 2016). The tax was implemented in September 2015, making Barbados the
19 first country in the Caribbean with this measure (Healthy Caribbean Coalition, 2016).
20
21
22

23
24 There is considerable evidence linking increased consumption of SSBs with weight gain in adults and
25 children, and increased incidence of type 2 diabetes independent of adiposity (Imamura et al., 2015;
26 Malik et al., 2013). Reduced consumption of beverages with added sugar can have population-level health
27 benefits (Brownell et al., 2009; Mytton et al., 2014; World Health Organization, 2016). A tax on SSBs
28 can lead to an increase in the prices of SSBs relative to other beverages, creating an incentive for reducing
29 the demand for SSBs. Prices of SSBs have been shown to increase relative to prices of non-SSBs
30 following implementation of SSB taxes in Mexico and Berkeley, California (Cawley and Frisvold, 2017;
31 Colchero et al., 2015; Grogger, 2015). An ongoing evaluation of the effect of the 2015 SSB tax on
32 beverage prices and sales in Barbados is presently being conducted at the University of West Indies, on
33 behalf of the Barbados SSB Tax Evaluation Steering Committee. This letter highlights the motivation for
34 further analytic assessment of SSB tax effects in Barbados by comparing the pace of growth in SSB and
35 non-SSB prices leading up to and immediately following the tax implementation.
36
37
38
39
40
41
42
43

44
45 We used retail sales data on 224 unique beverages from a large supermarket chain in Barbados from the
46 last quarter of 2013 through the first quarter of 2016. Prices per liter were calculated by dividing total
47 beverage sales in Barbados dollars by sales volume. We classified sodas, sugar-sweetened juices, and
48 sugar-sweetened sports and energy drinks as SSBs, and no-added-sugar juices, sugar-free (diet)
49 sodas/energy drinks/sports drinks, and bottled waters as non-SSBs. We then calculated average quarterly
50 prices and estimated the year-over-year percentage change in quarterly prices for each category. Prices in
51 each quarter were assessed relative to the same quarter of the previous year to account for within-year
52 seasonality. The resulting price growth estimates were compared across categories (Figure). In the three
53 quarters prior to the introduction of the tax, SSBs and non-SSBs experienced very similar year-over-year
54 price growth of approximately 1% for both beverage categories, and had parallel patterns of fluctuation.
55
56
57
58
59
60
61
62
63
64
65

1
2
3
4 During the third quarter of 2015, at the end of which the SSB tax took effect, the trends diverged. At that
5 time, the growth in SSB prices approached 3% while the growth in non-SSB prices decreased; thereafter,
6 the change in SSB prices outpaced that of non-SSBs. In the two quarters after the tax took effect, the
7 growth in average SSB prices compared to the previous year reached 5.9% while staying mostly flat,
8 between 0 and 1%, for non-SSBs. The two vertical lines in the Figure correspond to June 2015, when the
9 tax was first announced and to September 2015, when the tax was first implemented. It is possible that
10 manufacturers or retailers may have increased prices following the announcement of the tax, in
11 anticipation of the actual implementation date.
12
13
14
15
16
17

18 This is a preliminary descriptive analysis using readily available price data following the Barbados SSB
19 tax. For this descriptive analysis, unadjusted prices were used. As inflation would likely lead to similar
20 proportional price changes among SSBs and non-SSBs, using unadjusted prices still allows a comparison
21 of price change trends following the implementation of the tax. Additional data are being collected to
22 extend the post-tax observation period to 18 months, expanding the analysis of the tax effect on beverage
23 prices and sales volume while accounting for variations in product size and type and adjusting for
24 inflation.
25
26
27
28
29
30

31 It is possible that the slight dip in non-SSB prices may have been part of an industry response to the
32 introduction of the SSB tax, or may reflect other unknown factors. Bottled water and other diet
33 beverages are produced/imported by some of the same manufacturers and distributors that supply SSBs.
34 Future analyses will assess the trends in prices of SSBs and non-SSBs over a longer period and by
35 manufacturer/distributor to further explore these diverging trends. In addition, these price data represent
36 prices in one major retail chain, and may not be representative of price changes across all stores. Future
37 work will aim to integrate price data from additional sources to assess heterogeneity of post-tax price
38 changes.
39
40
41
42
43
44
45
46

47 In summary, we have shown a divergence in the growth trends of SSB prices relative to non-SSB prices
48 following the introduction of the tax. This evidence is foundational to the forthcoming evaluation of the
49 tax as a factor in raising SSB prices in Barbados. Presently, the number of countries that have
50 implemented SSB taxes is limited. An examination of the impact of SSB taxes in Barbados will expand
51 the evidence base available to policymakers worldwide in considering SSB taxes as a lever for reducing
52 the consumption of added sugars at the population level.
53
54
55
56
57
58
59
60
61
62
63
64
65

Acknowledgements

The full Barbados SSB Tax Evaluation Group is: Trevor Hassell (Chairperson of the group, National NCD Commission of Barbados and Healthy Caribbean Coalition); Miriam Alvarado (CEDAR, University of Cambridge); Kenneth George (Ministry of Health), Ian Hambleton (UWI); Maisha Hutton (Healthy Caribbean Coalition); Winston Moore (UWI); Madhuvanti Murphy (UWI); Alafia Samuels (UWI); Godfrey Xuereb (PAHO); Nigel Unwin (UWI; CEDAR, University of Cambridge), Cyril Gill (Ministry of Finance).

The group is supported by a Technical Advisory Committee: Jean Adams (CEDAR, University of Cambridge); Deliana Kostova (US Center for Disease Control and Prevention); Charmaine Metivier (UWI); Marc Suhrcke (University of York); Anne Marie Thow (University of Sydney); James Woodcock (CEDAR, University of Cambridge).

Financial support for the analyses presented in this paper was from the US Center for Disease Control and Prevention (TEPHINET). The full evaluation is receiving support from the Canadian International Development Research Centre (grant no. 107604-001), the Pan American Health Organization. MA is funded through a Gates Cambridge PhD Scholarship. JA is funded by the Centre for Diet and Activity Research (CEDAR), a UKCRC Public Health Research Centre of Excellence. Funding from the British Heart Foundation, Cancer Research UK, Economic and Social Research Council, Medical Research Council, the National Institute for Health Research, and the Wellcome Trust, under the auspices of the UK Clinical Research Collaboration, is gratefully acknowledged.

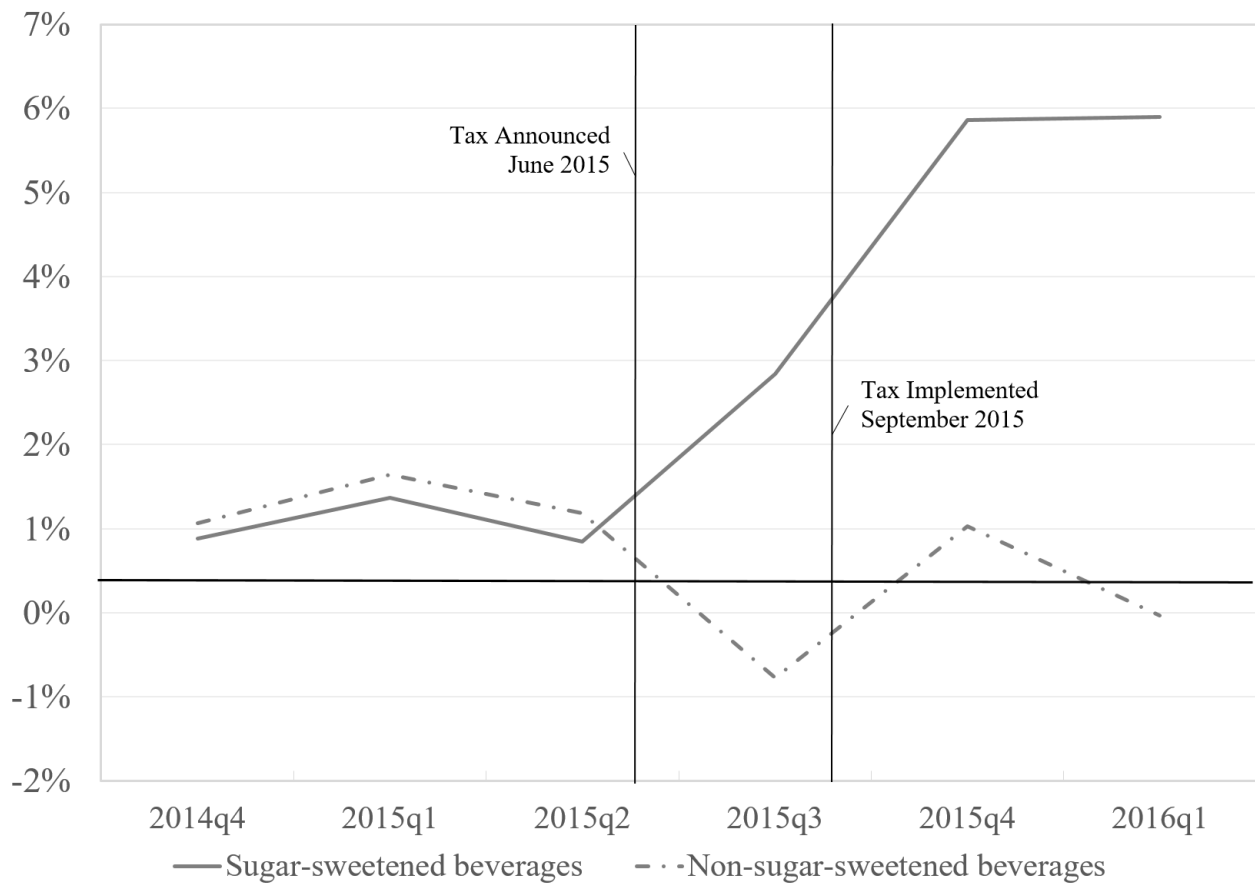
Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention.

Conflict of Interest

The authors declare there is no conflict of interest.

Figure: Year-over-year percent change in the average quarterly price per liter of sugar-sweetened and non-sugar-sweetened beverages, Barbados, 2014-2016¹



¹ The first line corresponds to June 2015 when the tax was first announced, and the second line corresponds to September 2015, when the tax was first implemented

References

- Brownell, K.D., Farley, T., Willett, W.C., Popkin, B.M., Chaloupka, F.J., Thompson, J.W., Ludwig, D.S., 2009. The Public Health and Economic Benefits of Taxing Sugar-Sweetened Beverages. *N. Engl. J. Med.* 361, 1599–1605. doi:10.1056/NEJMp0905723
- Cawley, J., Frisvold, D.E., 2017. The Pass-Through of Taxes on Sugar-Sweetened Beverages to Retail Prices: The Case of Berkeley, California. *J. Policy Anal. Manage.* 36, 303–326. doi:10.1002/pam.21960
- Colchero, M.A., Salgado, J.C., Unar-Munguía, M., Molina, M., Ng, S., Rivera-Dommarco, J.A., 2015. Changes in Prices After an Excise Tax to Sweetened Sugar Beverages Was Implemented in Mexico: Evidence from Urban Areas. *PLOS ONE* 10, e0144408. doi:10.1371/journal.pone.0144408
- Grogger, J., 2015. Soda taxes and the prices of sodas and other drinks: evidence from Mexico. National Bureau of Economic Research.
- Health in the Americas 2012 Edition: Regional Outlook, 2012. . Pan American Health Organization, Washington DC.
- Healthy Caribbean Coalition, 2016. The implementation of taxation on sugar sweetened beverages by the Government of Barbados: A civil society perspective. Healthy Caribbean Coalition.
- Howitt, C., Hambleton, I.R., Rose, A.M.C., Hennis, A., Samuels, T.A., George, K.S., Unwin, N., 2015. Social distribution of diabetes, hypertension and related risk factors in Barbados: a cross-sectional study. *BMJ Open* 5, e008869. doi:10.1136/bmjopen-2015-008869
- Imamura, F., O'Connor, L., Ye, Z., Mursu, J., Hayashino, Y., Bhupathiraju, S.N., Forouhi, N.G., 2015. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction.
- Malik, V.S., Pan, A., Willett, W.C., Hu, F.B., 2013. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. *Am. J. Clin. Nutr.* 98, 1084–1102. doi:10.3945/ajcn.113.058362
- Mytton, O.T., Eyles, H., Ogilvie, D., 2014. Evaluating the Health Impacts of Food and Beverage Taxes. *Curr. Obes. Rep.* 3, 432–439. doi:10.1007/s13679-014-0123-x
- World Health Organization, 2016. Fiscal policies for diet and prevention of noncommunicable diseases.

Trends in beverage prices following the introduction of a tax on sugar-sweetened beverages in Barbados

Authors: Miriam Alvarado, MPH^{1,5}, Deliana Kostova, PhD², Marc Suhrcke, PhD³, Ian Hambleton, PhD¹, Trevor Hassell, MD⁴, T Alafia Samuels, MBBS¹, Jean Adams, PhD⁵, Nigel Unwin, DM^{1,5} on behalf of the Barbados SSB Tax Evaluation Group

Keywords: Nutrition policy, obesity, primary prevention, economics, diet, diabetes mellitus

Author affiliations:

¹George Alleyne Chronic Disease Research Centre, University of the West Indies, Barbados

²Division of Global Health Protection, Center for Global Health, US Centers for Disease Control and Prevention, Atlanta, USA

³Centre for Health Economics, University of York, UK

⁴Healthy Caribbean Coalition, and National NCD Commission, Barbados

⁵Centre for Diet & Activity Research, MRC Epidemiology Unit, University of Cambridge, UK

Correspondence to: Dr. Alafia Samuels, Director, George Alleyne Chronic Disease Research Centre

Ph: +1-246-426-6416

Email: alafia.samuels@cavehill.uwi.edu

Mailing Address:

Avalon, Jemmott's Lane,

Bridgetown,

St. Michael,

BB11115

Barbados, West Indies

Abstract

A 10% excise tax on sugar sweetened beverages (SSBs) was implemented in Barbados in September 2015. A national evaluation has been established to assess the impact of the tax. We present a descriptive analysis of initial price changes following implementation of the SSB tax using price data provided by a major supermarket chain in Barbados over the period 2014-2016. We summarize trends in price change before and after the tax using year-on-year mean price per liter change between SSBs and non-SSBs. We find that prior to the tax, year-on-year price growth of SSBs and non-SSBs was very similar (approximately 1%). During the quarter in which the tax was implemented, the trends diverged, with SSB prices growing by almost 3% while prices of non-SSBs decreased slightly. The growth of SSB prices outpaced non-SSBs prices in each quarter thereafter, reaching 5.9% growth compared to <1% for non-SSBs. Future analyses will assess the trends in prices of SSBs and non-SSBs over a longer period and will integrate price data from additional sources to assess heterogeneity of post-tax price changes. A continued examination of the impact of the SSB tax in Barbados will expand the evidence base available to policymakers worldwide in considering SSB taxes as a lever for reducing the consumption of added sugars at the population level.

Caribbean populations suffer from the highest burden of non-communicable diseases (NCDs) in the Americas (*Health in the Americas 2012 Edition: Regional Outlook*, 2012). Barbados, an island in the Eastern Caribbean, faces a serious problem with overweight, obesity and related diseases. In 2012, the adult rates of overweight and obesity were 74.2% and 43.4%, respectively, for women, and 66.2% and 23.4%, respectively, for men (Howitt et al., 2015).

In June 2015, the Government of Barbados announced the introduction of a 10% ad valorem tax on sugar-sweetened beverages (SSBs). The tax is applied to sodas, sugar-sweetened juices, and sugar-sweetened sports and energy drinks, but not 100% juices, sugar-free (diet) sodas, or sugar-free flavored waters (Healthy Caribbean Coalition, 2016). The tax was implemented in September 2015, making Barbados the first country in the Caribbean with this measure (Healthy Caribbean Coalition, 2016).

There is considerable evidence linking increased consumption of SSBs with weight gain in adults and children, and increased incidence of type 2 diabetes independent of adiposity (Imamura et al., 2015; Malik et al., 2013). Reduced consumption of beverages with added sugar can have population-level health benefits (Brownell et al., 2009; Mytton et al., 2014; World Health Organization, 2016). A tax on SSBs can lead to an increase in the prices of SSBs relative to other beverages, creating an incentive for reducing the demand for SSBs. Prices of SSBs have been shown to increase relative to prices of non-SSBs following implementation of SSB taxes in Mexico and Berkeley, California (Cawley and Frisvold, 2017; Colchero et al., 2015; Grogger, 2015). An ongoing evaluation of the effect of the 2015 SSB tax on beverage prices and sales in Barbados is presently being conducted at the University of West Indies, on behalf of the Barbados SSB Tax Evaluation Steering Committee. This letter highlights the motivation for further analytic assessment of SSB tax effects in Barbados by comparing the pace of growth in SSB and non-SSB prices leading up to and immediately following the tax implementation.

We used retail sales data on 224 unique beverages from a large supermarket chain in Barbados from the last quarter of 2013 through the first quarter of 2016. Prices per liter were calculated by dividing total beverage sales in Barbados dollars by sales volume. We classified sodas, sugar-sweetened juices, and sugar-sweetened sports and energy drinks as SSBs, and no-added-sugar juices, sugar-free (diet) sodas/energy drinks/sports drinks, and bottled waters as non-SSBs. We then calculated average quarterly prices and estimated the year-over-year percentage change in quarterly prices for each category. Prices in each quarter were assessed relative to the same quarter of the previous year to account for within-year seasonality. The resulting price growth estimates were compared across categories (Figure). In the three quarters prior to the introduction of the tax, SSBs and non-SSBs experienced very similar year-over-year price growth of approximately 1% for both beverage categories, and had parallel patterns of fluctuation.

1
2
3
4 During the third quarter of 2015, at the end of which the SSB tax took effect, the trends diverged. At that
5 time, the growth in SSB prices approached 3% while the growth in non-SSB prices decreased; thereafter,
6 the change in SSB prices outpaced that of non-SSBs. In the two quarters after the tax took effect, the
7 growth in average SSB prices compared to the previous year reached 5.9% while staying mostly flat,
8 between 0 and 1%, for non-SSBs. The two vertical lines in the Figure correspond to June 2015, when the
9 tax was first announced and to September 2015, when the tax was first implemented. It is possible that
10 manufacturers or retailers may have increased prices following the announcement of the tax, in
11 anticipation of the actual implementation date.
12
13
14
15
16
17

18 This is a preliminary descriptive analysis using readily available price data following the Barbados SSB
19 tax. For this descriptive analysis, unadjusted prices were used. As inflation would likely lead to similar
20 proportional price changes among SSBs and non-SSBs, using unadjusted prices still allows a comparison
21 of price change trends following the implementation of the tax. Additional data are being collected to
22 extend the post-tax observation period to 18 months, expanding the analysis of the tax effect on beverage
23 prices and sales volume while accounting for variations in product size and type and adjusting for
24 inflation.
25
26
27
28
29
30

31 It is possible that the slight dip in non-SSB prices may have been part of an industry response to the
32 introduction of the SSB tax, or may reflect other unknown factors. Bottled water and other diet
33 beverages are produced/imported by some of the same manufacturers and distributors that supply SSBs.
34 Future analyses will assess the trends in prices of SSBs and non-SSBs over a longer period and by
35 manufacturer/distributor to further explore these diverging trends. In addition, these price data represent
36 prices in one major retail chain, and may not be representative of price changes across all stores. Future
37 work will aim to integrate price data from additional sources to assess heterogeneity of post-tax price
38 changes.
39
40
41
42
43
44

45
46 In summary, we have shown a divergence in the growth trends of SSB prices relative to non-SSB prices
47 following the introduction of the tax. This evidence is foundational to the forthcoming evaluation of the
48 tax as a factor in raising SSB prices in Barbados. Presently, the number of countries that have
49 implemented SSB taxes is limited. An examination of the impact of SSB taxes in Barbados will expand
50 the evidence base available to policymakers worldwide in considering SSB taxes as a lever for reducing
51 the consumption of added sugars at the population level.
52
53
54
55
56
57
58
59
60
61
62
63
64
65

Acknowledgements

The full Barbados SSB Tax Evaluation Group is: Trevor Hassell (Chairperson of the group, National NCD Commission of Barbados and Healthy Caribbean Coalition); Miriam Alvarado (CEDAR, University of Cambridge); Kenneth George (Ministry of Health), Ian Hambleton (UWI); Maisha Hutton (Healthy Caribbean Coalition); Winston Moore (UWI); Madhuvanti Murphy (UWI); Alafia Samuels (UWI); Godfrey Xuereb (PAHO); Nigel Unwin (UWI; CEDAR, University of Cambridge), Cyril Gill (Ministry of Finance).

The group is supported by a Technical Advisory Committee: Jean Adams (CEDAR, University of Cambridge); Deliana Kostova (US Center for Disease Control and Prevention); Charmaine Metivier (UWI); Marc Suhrcke (University of York); Anne Marie Thow (University of Sydney); James Woodcock (CEDAR, University of Cambridge).

Financial support for the analyses presented in this paper was from the US Center for Disease Control and Prevention (TEPHINET). The full evaluation is receiving support from the Canadian International Development Research Centre (grant no. 107604-001), the Pan American Health Organization. MA is funded through a Gates Cambridge PhD Scholarship. JA is funded by the Centre for Diet and Activity Research (CEDAR), a UKCRC Public Health Research Centre of Excellence. Funding from the British Heart Foundation, Cancer Research UK, Economic and Social Research Council, Medical Research Council, the National Institute for Health Research, and the Wellcome Trust, under the auspices of the UK Clinical Research Collaboration, is gratefully acknowledged.

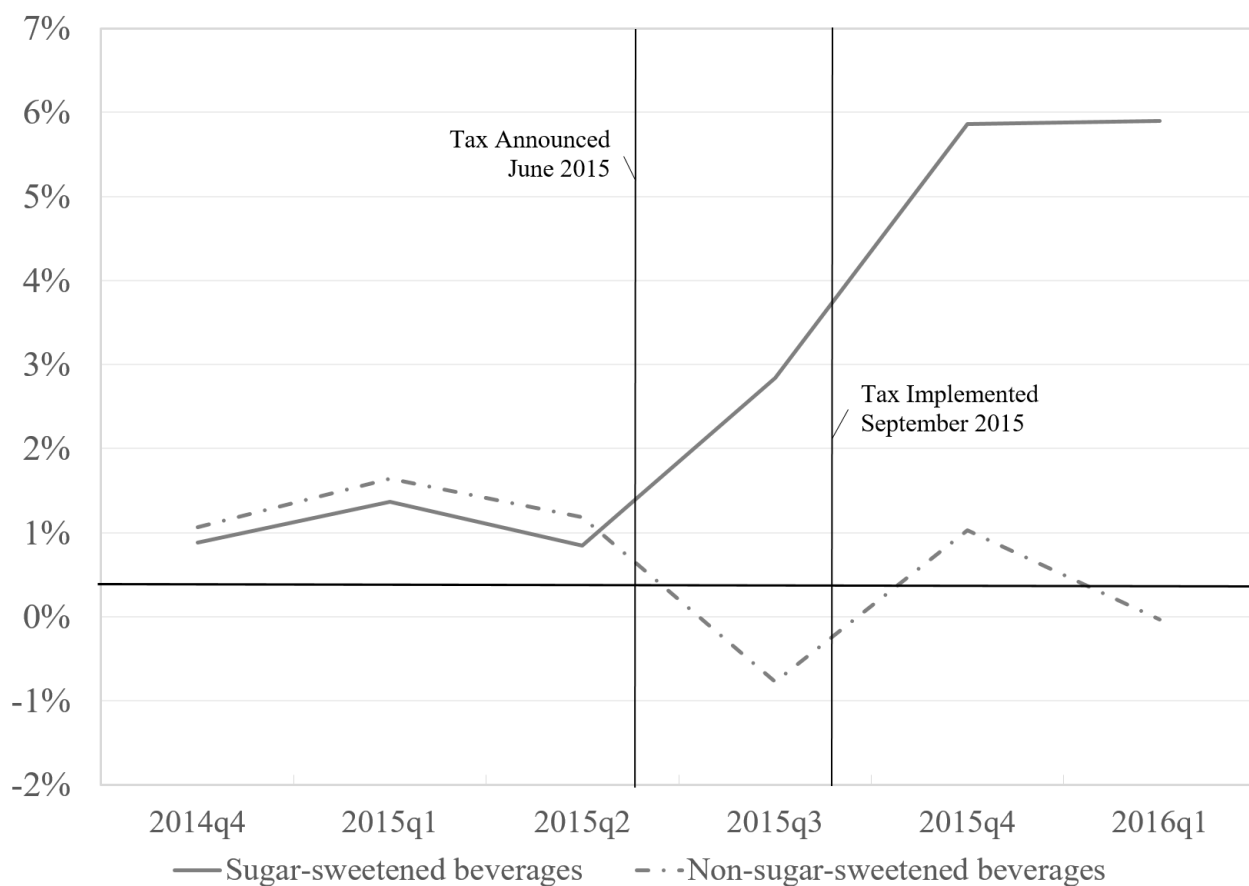
Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention.

Conflict of Interest

The authors declare there is no conflict of interest.

Figure: Year-over-year percent change in the average quarterly price per liter of sugar-sweetened and non-sugar-sweetened beverages, Barbados, 2014-2016¹



¹ The first line corresponds to June 2015 when the tax was first announced, and the second line corresponds to September 2015, when the tax was first implemented

References

- Brownell, K.D., Farley, T., Willett, W.C., Popkin, B.M., Chaloupka, F.J., Thompson, J.W., Ludwig, D.S., 2009. The Public Health and Economic Benefits of Taxing Sugar-Sweetened Beverages. *N. Engl. J. Med.* 361, 1599–1605. doi:10.1056/NEJMp0905723
- Cawley, J., Frisvold, D.E., 2017. The Pass-Through of Taxes on Sugar-Sweetened Beverages to Retail Prices: The Case of Berkeley, California. *J. Policy Anal. Manage.* 36, 303–326. doi:10.1002/pam.21960
- Colchero, M.A., Salgado, J.C., Unar-Munguía, M., Molina, M., Ng, S., Rivera-Dommarco, J.A., 2015. Changes in Prices After an Excise Tax to Sweetened Sugar Beverages Was Implemented in Mexico: Evidence from Urban Areas. *PLOS ONE* 10, e0144408. doi:10.1371/journal.pone.0144408
- Grogger, J., 2015. Soda taxes and the prices of sodas and other drinks: evidence from Mexico. National Bureau of Economic Research.
- Health in the Americas 2012 Edition: Regional Outlook, 2012. . Pan American Health Organization, Washington DC.
- Healthy Caribbean Coalition, 2016. The implementation of taxation on sugar sweetened beverages by the Government of Barbados: A civil society perspective. Healthy Caribbean Coalition.
- Howitt, C., Hambleton, I.R., Rose, A.M.C., Hennis, A., Samuels, T.A., George, K.S., Unwin, N., 2015. Social distribution of diabetes, hypertension and related risk factors in Barbados: a cross-sectional study. *BMJ Open* 5, e008869. doi:10.1136/bmjopen-2015-008869
- Imamura, F., O'Connor, L., Ye, Z., Mursu, J., Hayashino, Y., Bhupathiraju, S.N., Forouhi, N.G., 2015. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction.
- Malik, V.S., Pan, A., Willett, W.C., Hu, F.B., 2013. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. *Am. J. Clin. Nutr.* 98, 1084–1102. doi:10.3945/ajcn.113.058362
- Mytton, O.T., Eyles, H., Ogilvie, D., 2014. Evaluating the Health Impacts of Food and Beverage Taxes. *Curr. Obes. Rep.* 3, 432–439. doi:10.1007/s13679-014-0123-x
- World Health Organization, 2016. Fiscal policies for diet and prevention of noncommunicable diseases.

Figure
[Click here to download Figure: CaptureJuly6.eps](#)

