**Supplementary File**

*Supplementary Material 1: Standardised protocol for Euromonitor countries*

The ingredients were needed to verify if the respondents had submitted toothpaste products containing the desirable levels of fluoride (1000–1500 ppm). The price, reported in 2019 domestic levels, was relevant for detecting the cheapest top-three selling FT in the case of Euromonitor countries, and the subsequent computation of FTAR in all countries, i.e., both Euromonitor and non-Euromonitor countries. The package size was required, so that we could compute the price/g of the cheapest (top-three selling) FT and use it in the nominator of the FTAR for each country. Finally, if a country belonged to the Euromonitor database of the top-three selling brands, the full product names were essential for cross-matching the names of the sampled FT products with the top-three selling brands according to the Euromonitor database.

The standardised protocol for Euromonitor countries is available on Page 2. The images in the protocol were removed because FT brands, neither endorsed by the WHO nor financially related to our study, were visible. These images were attached solely for demonstration purposes.

**Affordability of toothpaste in [Insert Country]**

The World Health Organisation (WHO) Oral Health Programme is working on a new “Global Oral Health Report”. As part of this report, we are intending to address the benefit of fluoride toothpaste in preventing tooth decay. However, there is little information available on the affordability of fluoridated toothpaste in different socioeconomic contexts around the world. To this end we are inviting you to help us gather publicly available information about certain toothpastes *for adults* in [Insert Country], simply by using your smartphone.

Based on the data received from Euromonitor, a global market analysis database*,* the top 3 selling brands in your country are the following:

1. **Brand 1**
2. **Brand 2**
3. **Brand 3**

In addition to these 3 brands, we are also looking at:

1. **The cheapest available toothpaste *for adults* overall** (note that this toothpaste can be one of the top 3 selling brands mentioned above)

We need to know the price, package size, and the ingredients of each of the above toothpaste brands *for adults*.

HOW TO PROCEED TO GET THIS INFORMATION?

1. Bring your smartphone.
2. Go to a regular point of purchase where local families would usually buy their supplies.
3. Take (as many as necessary) pictures of each the above toothpaste brands for *adults* that will include the following components:

* **Brand** (inc. full product name). In case there are multiple products of the 3 top selling brands,

select the cheapest product[[1]](#footnote-1). [Image 1]

* **Package Size** (preferable range 75ml-100ml /75g-100g) 1 [Image 2]
* **Ingredients**1  [Image 3]
* **Price** (e.g. price label on the product or on the shelf). The prices should be *regular* prices (NO special offers, vouchers, promotions, discounts etc.) 1

[Image 4]

In addition, **please note that**:

* In case you observe the expiry date or/and the manufacturing date on the package of any of the above toothpaste brands, take also pictures of these elements.

4) Send the pictures (in medium size) to the following email-addresses: [gkekasa@who.int](mailto:gkekasa@who.int) and [varenneb@who.int](mailto:varenneb@who.int)[[2]](#footnote-2)

5) You’re done! *Thank you very much for your participation!*

*Supplementary Material 2: Sample protocol for non-Euromonitor countries*

**Affordability of toothpaste in [Insert Country]**

The World Health Organisation (WHO) Oral Health Programme is working on a new “Global Oral Health Report”. As part of this report, we are intending to address the benefit of fluoride toothpaste in preventing tooth decay. However, there is little information available on the affordability of fluoridated toothpaste in different socioeconomic contexts around the world. To this end we are inviting you to help us gather publicly available information about certain toothpastes *for adults* in [Insert Country], simply by using your smartphone.

We would like to know the price, package size, and the ingredients of:

* **The cheapest available toothpaste *for adults***

HOW TO PROCEED TO GET THIS INFORMATION?

1) Bring your smartphone.

2) Go to a regular point of purchase where local families would usually buy their supplies.

3) Take (as many as necessary) pictures of each the above toothpaste brands for *adults* that will include the following components:

* **Brand** (inc. full product name). In case there are multiple products of the 3 top selling brands,

select the cheapest product[[3]](#footnote-3). [Image 1]

* **Package Size** (preferable range 75ml-100ml /75g-100g) 1 [Image 2]
* **Ingredients**1  [Image 3]
* **Price** (e.g. price label on the product or on the shelf). The prices should be *regular* prices (NO special offers, vouchers, promotions, discounts etc.) 1

[Image 4]

In addition, **please note that**:

* In case you observe the expiry date or/and the manufacturing date on the package of any of the above toothpaste brands, take also pictures of these elements.

4) Send the pictures (in medium size) to the following email-addresses: [gkekasa@who.int](mailto:gkekasa@who.int) and [varenneb@who.int](mailto:varenneb@who.int)[[4]](#footnote-4)§

5)You’re done! *Thank you very much for your participation*

*Supplementary material 3: FTAR Analysis by WHO Region*

The EURO Region, whose 83% of its members included in the sample were high-income countries and 17% of its members included in the sample were upper middle-income countries, experienced no unaffordable expenditures on 182.5g of the cheapest (top-three selling) FT. The lowest-paid unskilled government worker needed only 0.25 (95% CI 0.19 to 0.31) working days to purchase 182.5g of the cheapest (top-three selling) FT, on average (*Table 2.1*). Bulgaria had the highest reported FTAR (=0.7650), but still below the affordability threshold of FTAR=1. As a result, no country in the sample belonging to the EURO Region experienced unaffordable expenditures on FT.

The PAHO Region, whose 40% of its members included in the sample were high-income countries and 60% of its members included in the sample were upper middle-income countries, did not experience unaffordable expenditures on the cheapest (top-three selling) FT, on average (*Table 2.1)*. The lowest-paid unskilled government worker needed only 0.58 (95% CI 0.29 to 0.86) working days to purchase 182.5g of the cheapest (top-three selling) FT, on average. However, there were variations among the included countries, with Brazil facing unaffordable expenditures on purchasing FT (FTAR=1.3673). 10% of the included countries from the PAHO Region experienced unaffordable expenditures on FT.

The WPRO Region, whose 42% of its members included in the sample were high-income countries, 25% of its members included in the sample were upper middle-income countries, and 33% of its members included in the sample were lower middle-income countries did not experience unaffordable expenditures on FT on average (*Table 2.1*). The lowest-paid unskilled government worker needed only 0.51 (95% CI 0.21 to 0.81) working days to purchase 182.5g of the cheapest (top-three selling) FT, on average. However, there were variations among the included countries, with New Zealand having the lowest reported FTAR in the sample of all countries in the study (=0.0279) but with Laos and Philippines experiencing unaffordable expenditures on 182.5g of the cheapest (top-three selling) FT (FTAR=1.4869 and FTAR=1.1778, respectively). 17% of the included countries from the WPRO Region experienced unaffordable expenditures on the cheapest (top-three selling) FT.

However, the SEARO Region, which none of its members included in the sample were high-income countries, 20% of its members included in the sample were upper-middle- income countries, and 80% of its members included in the sample were lower middle-income countries, may be subject to unaffordable expenditures on FT (*Table 2.1*). The lowest-paid unskilled government worker needed 1.28 (95% CI 0.43 to 2.14) days of work to purchase 182.5g of the cheapest (top-three selling) FT, on average. Furthermore, there was substantial variation among the included countries, with Indonesia having a low FTAR figure (=0.5074), but with Bangladesh and Nepal experiencing significant unaffordable expenditures on FT (FTAR=2.7546 and FTAR=1.7960, respectively). The variation among the included countries of the SEARO Region was reflected through the wide FTAR 95% confidence intervals. 40% of the included countries from the SEARO Region experienced unaffordable expenditures on the cheapest (top-three selling) FT.

The AFRO Region, the only region associated with low-income countries in the sample and a significant proportion of lower middle-income countries (50%), was subject to unaffordable expenditures on FT (*Table 2.1*). An average lowest-paid unskilled government worker needed 4.08 (95% CI 2.54 to 5.62) days of work to purchase 182.5g of the cheapest (top-three selling) FT, on average. Benin had the highest reported FTAR across the sample of all included countries in the study (=11.8159). Purchasing FT was affordable in only three of 18 included countries from the AFRO region, i.e. Mauritius (FTAR=0.3249), the Central African Republic (FTAR=0.7821) and Senegal (FTAR=0.9108). 83% of the included countries from the AFRO Region experienced unaffordable expenditures on the cheapest (top-three selling) FT.

The findings with respect to the EMRO Region are uncertain, as data from only 3 countries (of 22 in the Region) were compiled and analysed (*Table 2.1*). From the available sample, an average lowest-paid unskilled government worker needed 1.22 (95% CI 0.35 to 2.10) days of work to purchase the annual recommended amount of the cheapest (top-three selling) FT (i.e., 182.5 g). In addition, there was a variation with respect to the FTARs of the included countries from the EMRO Region, with the 95% FTAR confidence intervals being wide. Purchasing FT was affordable in only one of three included countries from the EMRO Region, i.e., Lebanon (FTAR=0.5217). 67% of the included countries from the EMRO Region experienced unaffordable expenditures on the cheapest (top-three selling) FT.

Whereas FT affordability across WHO Regions was heterogeneous, no significant variations in the price per gram of the cheapest (top-three selling) FT between the WHO Regions existed. The two-sample t-tests, which considered all possible pairs of WHO Regions, concluded that there was insufficient evidence to reject the hypothesis that the mean price per gram of the cheapest (top-three selling) FT was the same in a given pair of two WHO Regions (*Supplementary Material 4)*. The only exception was the comparison of the mean price/g of the cheapest (top-three selling) FT between any WHO Region and the EMRO Region. However, this finding is inconclusive because of the limited sample size of the included countries from the EMRO Region.

*Table 1.1: Descriptive Statistics by WHO Regions, in FTARs*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **FTAR by WHO Region** | **EURO** | **AFRO** | **PAHO** | **WPRO** | **EMRO** | **SEARO** |
| **Mean (95% Confidence Interval)** | 0.25 (95% CI 0.19 to 0.31) | 4.08 (95% CI 2.54 to 5.62) | 0.58 (95% CI 0.29 to 0.86) | 0.51 (95% CI 0.21 to 0.81) | 1.22 (95% CI 0.35-2.10) | 1.28 (95% CI 0.43 to 2.14) |
| **Standard Deviation** | 0.1680 | 3.3061 | 0.4531 | 0.4870 | 0.7744 | 0.9717 |
| **Maximum** | 0.7650 | 11.8159 | 1.3673 | 1.4869 | 2.0536 | 2.7546 |
| **Minimum** | 0.0752 | 0.3249 | 0.0899 | 0.0279 | 0.5217 | 0.5074 |
| **Median** | 0.17895 | 3.2502 | 0.5986 | 0.3682 | 1.0906 | 0.7694 |
| **Number of countries (=n)** | 30 | 18 | 10 | 12\* | 3 | 5 |
| **Number of WHO Member states (=n)** | 30 | 18 | 10 | 11 | 3 | 5 |
| **Percentage of included countries experiencing**  **unaffordable expenditure on FT** | 0% | 83.33% | 10% | 16.66% | 66.67% | 40% |

\* Including Hong Kong, China SAR (Special Administrative Region of People’s Republic of China)

*Supplementary material 4: Differences in mean price/g of the cheapest (top-three selling) FTs among World Bank Income Groups and WHO Regions*

To check the hypothesis that the difference in the mean price/g of the cheapest (top-three selling) FTs among World Bank Income Groups or WHO Regions was significant, two-sided hypothesis testing of the difference of mean price/g of the cheapest (top-three selling) FTs was applied to all possible pairs of Income Groups or WHO Regions, respectively. The null hypothesis of no significant difference in the mean prices/g of the cheapest (top-three selling) FTs between a given Income Group or WHO region (indexed by 1) and another Income Group or WHO region (indexed by 2),

H0: p1il-p2il=0

was tested against the two-sided alternative hypothesis that the difference in the mean prices/g of the cheapest (top-three selling) FTs was significant between a given pair of Income Group or WHO region,

H1: p1il-p2il#0

, where p1il is the mean price/g of the cheapest (top-three selling) FTs in Income Group or WHO Region, indexed by 1, and p2il is the proportion of the mean price/g of the cheapest (top-three selling) FTs in the other Income Group or WHO Region, indexed by 2, for a given i=0, 1,.., 6 combination of Income Groups or l= 0, 1,…, 15 combination of WHO Regions. For each combination of i or l, the test-statistic (til) under the null hypothesis follows a t-distribution with

v= n1 + n2 – 2 degrees of freedom:

til= ~tv

, where n1 is the number of observations of Income Group 1 or WHO Region 1, n2 is the number of observations of Income Group 2 or WHO Region 2, sil= is the pooled standard deviation of a given combination of i or l, s12 is the variance of prices of the cheapest (top-three selling) FT associated with Income Group 1 or WHO Region 1 in a given combination of i or l, and s22 is the variance of prices of the cheapest (top-three selling) FT associated with Income Group 2 or WHO Region 2 in a given combination of i or l.

If the absolute value of til is greater than the critical t-value (tva) at a=0.05 significance level for and v= n1 + n2 – 2 degrees of freedom for a given combination of i or l, i.e. | til |> tva, the null hypothesis of no significant difference in average prices between a given pair of Income Groups or WHO Regions is rejected at the 2.5% significance level. Instead, if | til | < tva, there is no sufficient evidence to reject the null hypothesis of no difference in average prices between a given pair of Income Groups or WHO Regions at the 2.5% level.

*Table 2.1: Results from two-sample-t-tests of the difference in mean prices/g of the cheapest (top-three selling) FTs between all pairs of World Bank Income Groups and WHO Regions*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Combination of World Bank Income Groups or WHO Regions (qualitative) | Combination of World Bank Income Groups or WHO Regions (in terms of i, l) | Sample difference in the average price/g of the cheapest (top-three selling) FTs  (p1il-p2il) | Pooled standard deviation  (sil) | Degrees of freedom  (v) | Absolute t statistic  (| til |) | Critical t-value (tva) | Conclusion |
| EURO Region against AFRO Region | i=1,l=0 | -0.006 | 0.0106 | 46 | 1.9206 | 2.013 | No difference in average prices |
| EURO Region against WPRO Region | i=2,l=0 | 0.001 | 0.0071 | 40 | 0.4426 | 2.021 | No difference in average prices |
| EURO Region against SEARO Region | i=3,l=0 | -0.004 | 0.0071 | 33 | 1.1694 | 2.035 | No difference in average prices |
| EURO Region against PAHO Region | i=4,l=0 | -0.001 | 0.0068 | 38 | 0.2895 | 2.024 | No difference in average prices |
| EURO Region against EMRO Region | i=5,l=0 | -0.035 | 0.0085 | 31 | 6.7948 | 2.040 | Difference in average prices |
| AFRO Region against WPRO Region | i=6,l=0 | 0.007 | 0.0128 | 28 | 1.5008 | 2.048 | No difference in average prices |
| AFRO Region against SEARO Region | i=7,l=0 | 0.002 | 0.0142 | 21 | 0.2898 | 2.080 | No difference in average prices |
| AFRO Region against PAHO Region | i=8,l=0 | 0.005 | 0.0129 | 26 | 1.0521 | 2.056 | No difference in average prices |
| AFRO Region against EMRO Region | i=9,l=0 | -0.029 | 0.0160 | 19 | 2.9071 | 2.093 | Difference in average prices |
| WPRO Region against SEARO Region | i=10,l=0 | -0.005 | 0.0083 | 15 | 1.1436 | 2.131 | No difference in average prices |
| WPRO Region against PAHO Region | i=11,l=0 | -0.002 | 0.0076 | 20 | 0.5517 | 2.086 | No difference in average prices |
| WPRO Region against EMRO Region | i=12,l=0 | -0.036 | 0.0112 | 13 | 4.9961 | 2.160 | Difference in average prices |
| SEARO Region against PAHO Region | i=13,l=0 | 0.003 | 0.0079 | 13 | 0.7599 | 2.160 | No difference in average prices |
| SEARO Region against EMRO Region | i=14,l=0 | -0.031 | 0.0147 | 6 | 2.8939 | 2.447 | Difference in average prices |
| PAHO Region against EMRO Region | i=15,l=0 | -0.034 | 0.0113 | 11 | 4.6254 | 2.201 | Difference in average prices |
| High-income countries against upper middle-income countries | i=0,l=1 | -0.006 | 0.0100 | 51 | 1.9460 | 2.008 | No difference in average prices |
| High-income countries against lower middle-income countries | i=0,l=2 | -0.011 | 0.0110 | 50 | 3.3449 | 2.009 | Difference in average prices |
| High-income countries against low-income countries | i=0,l=3 | -0.001 | 0.0074 | 39 | 0.2119 | 2.023 | No difference in prices |
| Upper middle-income countries against lower middle-income countries | i=0,l=4 | -0.005 | 0.0149 | 35 | 1.0528 | 2.030 | No difference in prices |
| Upper middle-income countries against low-income countries | i=0,l=5 | 0.005 | 0.0127 | 24 | 0.8789 | 2.064 | No difference in prices |
| Lower middle-income countries against low-income countries | i=0,l=6 | 0.010 | 0.0145 | 23 | 1.5647 | 2.069 | No difference in prices |

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