**Supplementary Material**

**Public Health Nutrition**

**Opportunities for diet quality improvement: the potential role of staple grain foods**

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# **Supplementary Table 1**. Food items included in the substitution models.

|  |  |  |
| --- | --- | --- |
| **Models** | **Food item consumed** | **Food item included as replacement** |
| **Model 1** | grains, rice, white, regular cooking, cooked in unsalted water | grains, rice, brown, cooked in unsalted water |
| grains, rice, white, regular cooking, cooked in salted water | grains, rice, brown, cooked in salted water |
| **Model 2** | French bread | whole wheat French bread |
| white bread, regular, commercial | wheat bread, whole wheat, regular, commercial |
| **Model 3** | grains, rice, white, regular cooking, cooked in unsalted water | grains, rice, brown, cooked in unsalted water |
| grains, rice, white, regular cooking, cooked in salted water | grains, rice, brown, cooked in salted water |
| French bread | whole whole-wheat French bread |
| white bread, regular, commercial | wheat bread, whole wheat, regular, commercial |

# **Supplementary Table 2**. Nutritional values of white rice and white bread *versus* brown rice and whole-wheat bread.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Energy and nutrients** | **Rice** | | **Bread** | | | |
| **White rice** | **Brown rice** | **French bread** | **Whole wheat French bread** | **White bread** | **Whole wheat bread** |
| Energy (kcal/serving)† | 153.55 | 130.70 | 138.32 | 113.35 | 128.07 | 112.00 |
| Carbohydrate (g/serving) | 35.21 | 28.70 | 28.22 | 22.59 | 24.53 | 20.65 |
| Available carbohydrate (g/serving) | 33.71 | 25.14 | 27.02 | 20.24 | 23.18 | 17.29 |
| Dietary fiber (g/serving) | 1.50 | 3.56 | 1.20 | 2.35 | 1.35 | 3.35 |
| Total sugar (g/serving) | 0.04 | 0.44 | 1.28 | 1.28 | 2.54 | 5.04 |
| Added sugars (g/serving) | 0.00 | 0.00 | 0.00 | 0.00 | 2.06 | 2.51 |
| Protein (g/serving) | 3.36 | 3.23 | 4.90 | 4.90 | 4.58 | 5.25 |
| Total fat (g/serving) | 0.25 | 1.13 | 0.92 | 0.90 | 1.59 | 1.68 |
| Saturated fatty acids (g/serving) | 0.19 | 0.33 | 0.34 | 0.30 | 0.25 | 0.37 |
| Polyunsaturated fatty acids (g/serving) | 0.06 | 0.38 | 0.39 | 0.20 | 0.37 | 0.39 |
| Monounsaturated fatty acids (g/serving) | 0.06 | 0.50 | 0.31 | 0.10 | 0.30 | 0.40 |
| Vitamin B1 (mg/serving) | 0.23 | 0.10 | 0.23 | 0.04 | 0.04 | 0.04 |
| Vitamin B2 (mg/serving) | 0.02 | 0.02 | 0.34 | 0.02 | 0.02 | 0.02 |
| Vitamin B3 (mg/serving) | 1.64 | 1.20 | 1.23 | 2.36 | 2.39 | 2.36 |
| Vitamin B6 (mg/serving) | 0.10 | 0.10 | 0.30 | 0.08 | 0.08 | 0.08 |
| Folate (DFE µg/serving) | 2.64 | 5.00 | 74.8 | 46.1 | 66.00 | 46.10 |
| Vitamin E (mg/serving) | 0.04 | 0.24 | 0.13 | 1.00 | 0.08 | 0.97 |
| Sodium (mg/serving)‡ | 2.50 | 1.25 | 323.84 | 303.00 | 430.00 | 200.00 |
| Calcium (mg/serving) | 6.46 | 6.25 | 8.00 | 53.50 | 78.00 | 53.50 |
| Potassium (mg/serving) | 21.75 | 36.38 | 71.10 | 81.50 | 81.50 | 81.50 |
| Iron (mg/serving) | 0.41 | 0.38 | 2.10 | 1.22 | 2.10 | 1.22 |
| Selenium (µg/serving) | 2.13 | 1.01 | 3.65 | 2.75 | 2.75 | 2.75 |
| Magnesium (mg/serving) | 2.50 | 73.75 | 12.73 | 30.00 | 12.50 | 30.00 |
| Zinc (mg/serving) | 0.61 | 0.85 | 0.38 | 0.90 | 0.65 | 0.90 |

DFE, dietary folate equivalents

†50 g serving was adopted as standard serving size for bread and 125g serving for rice (1)

‡236.3 mg of sodium for salted white rice and 235 mg for salted brown rice.

# **Supplementary Table 3**. Sociodemographic characteristics and rice or bread consumption according to subsample assignment. Health Survey of São Paulo, 2015

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Characteristics** | **25%** | | **50%** | | **75%** | | **100%** | |
| **%** | **95% CI** | **%** | **95% CI** | **%** | **95% CI** | **%** | **95% CI** |
| Age group, years |  |  |  |  |  |  |  |  |
| 12-19 | 21.92 | 18.35-25.96 | 22.51 | 19.75-25.52 | 23.54 | 21.01-26.27 | 23.18 | 20.87-25.66 |
| 20-59 | 53.42 | 48.07-58.68 | 54.36 | 50.71-57.96 | 53.76 | 50.72-56.78 | 54.15 | 51.45-56.82 |
| ≥ 60 | 24.66 | 19.75-30.34 | 23.14 | 19.48-27.25 | 22.70 | 19.57-26.15 | 22.68 | 19.90-25.71 |
| Sex |  |  |  |  |  |  |  |  |
| Male | 47.63 | 42.31-52.99 | 47.32 | 43.41-51.27 | 48.73 | 45.53-51.95 | 50.02 | 47.17-52.86 |
| Female | 52.37 | 47.01-57.69 | 52.68 | 48.73-56.59 | 51.27 | 48.05-54.47 | 49.98 | 47.14-52.83 |
| Education level |  |  |  |  |  |  |  |  |
| < High school graduate | 50.86 | 45.22-56.47 | 48.26 | 43.97-52.58 | 49.10 | 45.16-53.06 | 50.82 | 46.97-54.67 |
| High school graduate / equivalent | 27.21 | 22.67-32.27 | 23.65 | 20.66-26.93 | 23.08 | 20.50-25.88 | 22.42 | 20.10-24.93 |
| College or some college | 21.94 | 17.29-27.42 | 28.08 | 23.63-33.01 | 27.81 | 23.83-32.18 | 26.75 | 23.06-30.80 |
| Family income *per capita* |  |  |  |  |  |  |  |  |
| ≤ 1 minimum wage † | 42.21 | 35.85-48.85 | 42.44 | 36.86-48.21 | 40.94 | 35.95-46.12 | 42.59 | 37.75-47.59 |
| > 1 and ≤ 3 minimum wages | 31.99 | 26.31-38.25 | 33.89 | 29.19-38.92 | 35.20 | 30.85-39.82 | 32.90 | 28.96-37.10 |
| > 3 minimum wages | 9.77 | 6.21-15.05 | 9.31 | 6.44-13.29 | 9.21 | 6.50-12.89 | 9.58 | 7.00-12.99 |
| Do not know | 16.03 | 10.42-23.85 | 14.37 | 9.91-20.36 | 14.64 | 10.34-20.33 | 14.92 | 10.6-20.59 |
| Ethnicity |  |  |  |  |  |  |  |  |
| White and yellow | 51.95 | 46.21-57.64 | 51.09 | 46.16-56.00 | 51.78 | 47.49-56.04 | 51.08 | 47.35-54.80 |
| Black, brown, and indigenous | 48.05 | 42.36-53.79 | 48.91 | 44.00-53.84 | 48.22 | 43.96-52.51 | 48.92 | 45.20-52.65 |
| White rice consumers | 80.29 | 75.66-84.22 | 79.54 | 76.08-82.61 | 80.76 | 77.69-83.5 | 80.82 | 78.09-83.29 |
| Brown rice consumers | 2.05 | 1.08-3.86 | 3.33 | 2.09-5.26 | 3.37 | 2.28-4.94 | 3.32 | 2.40-4.59 |
| White bread consumers | 63.71 | 57.94-69.11 | 63.86 | 59.81-67.72 | 63.07 | 59.75-66.27 | 62.82 | 59.88-65.66 |
| Whole-wheat bread consumers | 7.05 | 4.41-11.08 | 5.32 | 3.53-7.93 | 4.42 | 3.08-6.31 | 4.57 | 3.38-6.16 |
| White rice or white bread consumers | 91.63 | 87.67-94.41 | 90.76 | 88.10-92.87 | 91.77 | 89.59-93.53 | 91.59 | 89.65-93.19 |
| Brown rice or whole-wheat bread consumers | 8.55 | 5.73-12.57 | 7.97 | 5.81-10.86 | 7.3 | 5.49-9.65 | 7.47 | 5.92-9.38 |

† Minimum wage was BRL 788.00 (equivalent to USD 253.00) in 2015

# **Supplementary Table 4**.Estimated mean energy and nutrient intake after partially replacing (1 eating occasion) white rice for brown rice and white bread for whole-wheat bread (models 1, 2 and 3) among São Paulo population aged over 12 years based on the 2015 Health Survey of São Paulo.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy and nutrients† | Observed | | Model 1: Rice | | | | Model 2: Bread | | | | Model 3: Rice + Bread | | | |
| Partial replacement‡ | | Absolute change§ | | Partial replacement | | Absolute change | | Partial replacement | | Absolute change | |
| Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| More healthful grains (g/d) | 10.1 | 1.0 | 128.8\*\*\* | 4.0 | 118.7 | 3.9 | 48.0\*\*\* | 1.4 | 37.9 | 1.1 | 166.7\*\*\* | 4.5 | 156.6 | 4.5 |
| Energy (kcal/d) | 1891.4 | 33.8 | 1869.8 | 33.5 | -21.6 | 0.7 | 1873.0 | 33.6 | -18.4 | 0.6 | 1851.4 | 33.3 | -40.0 | 1.1 |
| Carbohydrate (g/d) | 241.2 | 4.4 | 235.0 | 4.3 | -6.2 | 0.2 | 237.0 | 4.3 | -4.2 | 0.1 | 230.9 | 4.2 | -10.3 | 0.3 |
| Available carbohydrate (g/d) | 224.7 | 4.1 | 216.6 | 4.0 | -8.1 | 0.3 | 219.6 | 4.1 | -5.1 | 0.1 | 211.5\*\*\* | 3.9 | -13.2 | 0.4 |
| Dietary fiber (g/d) | 16.5 | 0.3 | 18.4\*\*\* | 0.4 | 1.9 | 0.1 | 17.4\*\*\* | 0.4 | 0.9 | 0.0 | 19.3\*\*\* | 0.4 | 2.9 | 0.1 |
| Total sugar (g/d) | 84.2 | 2.1 | 84.6 | 2.1 | 0.4 | 0.0 | 84.3 | 2.1 | 0.2 | 0.0 | 84.7 | 2.1 | 0.6 | 0.0 |
| Added sugars (g/d) | 51.3 | 1.7 | 51.3 | 1.7 | 0.0 | 0.0 | 51.3 | 1.7 | 0.0 | 0.0 | 51.3 | 1.7 | 0.0 | 0.0 |
| Protein (g/d) | 79.1 | 1.7 | 79.0 | 1.7 | -0.1 | 0.0 | 79.1 | 1.7 | 0.0 | 0.0 | 79.0 | 1.7 | -0.1 | 0.0 |
| Total fat (g/d) | 68.1 | 1.3 | 68.9 | 1.4 | 0.8 | 0.0 | 68.1 | 1.3 | 0.0 | 0.0 | 68.9 | 1.4 | 0.8 | 0.0 |
| Saturated fatty acids (g/d) | 22.4 | 0.5 | 22.5 | 0.5 | 0.1 | 0.0 | 22.3 | 0.5 | 0.0 | 0.0 | 22.5 | 0.5 | 0.1 | 0.0 |
| Polyunsaturated fatty acids (g/d) | 14.9 | 0.3 | 15.2 | 0.3 | 0.3 | 0.0 | 14.7 | 0.3 | -0.1 | 0.0 | 15.0 | 0.3 | 0.2 | 0.0 |
| Monounsaturated fatty acids (g/d) | 22.5 | 0.5 | 22.9 | 0.5 | 0.4 | 0.0 | 22.3 | 0.5 | -0.1 | 0.0 | 22.8 | 0.5 | 0.3 | 0.0 |
| Vitamin B1 (mg/d) | 1.7 | 0.0 | 1.6\*\*\* | 0.0 | -0.1 | 0.0 | 1.6\*\*\* | 0.0 | -0.1 | 0.0 | 1.5\*\*\* | 0.0 | -0.3 | 0.0 |
| Vitamin B2 (mg/d) | 1.5 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 1.3\*\*\* | 0.0 | -0.2 | 0.0 | 1.3\*\*\* | 0.0 | -0.2 | 0.0 |
| Vitamin B3 (mg/d) | 31.4 | 0.8 | 31.0 | 0.8 | -0.4 | 0.0 | 32.2 | 0.8 | 0.8 | 0.0 | 31.8 | 0.8 | 0.4 | 0.0 |
| Vitamin B6 (mg/d) | 1.5 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 1.4\*\*\* | 0.0 | -0.2 | 0.0 | 1.4\*\*\* | 0.0 | -0.2 | 0.0 |
| Folate (DFE µg/d) | 375.3 | 7.7 | 377.5 | 7.7 | 2.2 | 0.1 | 354.0\*\*\* | 7.6 | -21.2 | 0.6 | 356.3\*\*\* | 7.6 | -19.0 | 0.6 |
| Vitamin E (mg/d) | 7.5 | 0.2 | 7.7 | 0.2 | 0.2 | 0.0 | 8.1\*\*\* | 0.2 | 0.7 | 0.0 | 8.3\*\*\* | 0.2 | 0.9 | 0.0 |
| Sodium (mg/d) | 2843.0 | 84.3 | 2841.8 | 84.3 | -1.2 | 0.0 | 2812.5 | 84.0 | -30.5 | 2.0 | 2811.3 | 84.0 | -31.7 | 2.0 |
| Calcium (mg/d) | 671.0 | 49.6 | 670.8 | 49.6 | -0.2 | 0.0 | 700.7 | 49.6 | 29.8 | 1.2 | 700.5 | 49.6 | 29.6 | 1.2 |
| Potassium (mg/d) | 2183.4 | 38.9 | 2197.2 | 39.1 | 13.8 | 0.5 | 2190.5 | 39.0 | 7.2 | 0.2 | 2204.4 | 39.1 | 21.0 | 0.6 |
| Iron (mg/d) | 10.5 | 0.2 | 10.5 | 0.2 | 0.0 | 0.0 | 9.8\*\*\* | 0.2 | -0.7 | 0.0 | 9.8\*\*\* | 0.2 | -0.7 | 0.0 |
| Selenium (µg/d) | 68.5 | 1.8 | 67.4 | 1.8 | -1.1 | 0.0 | 67.9 | 1.8 | -0.6 | 0.0 | 66.8 | 1.8 | -1.7 | 0.0 |
| Magnesium (mg/d) | 250.5 | 16.1 | 317.9\*\*\* | 16.6 | 67.3 | 2.2 | 263.7\*\*\* | 16.2 | 13.2 | 0.4 | 331.0\*\*\* | 16.7 | 80.5 | 2.4 |
| Zinc (mg/d) | 10.7 | 0.3 | 10.9 | 0.3 | 0.2 | 0.0 | 11.0 | 0.3 | 0.4 | 0.0 | 11.3\*\*\* | 0.3 | 0.6 | 0.0 |

DFE, dietary folate equivalents. N/A, not applicable due to the large number of zero in the observed intake of more healthful grain foods

† Values represent total daily energy and nutrients consumed by São Paulo residents (n=1741)

‡ Difference between values estimated from the respective substitution in the entire population in one eating occasion from observed intake.

§ Observed vs. partial replacement

Asterisks indicate statistical significance comparing whether modeled changes are 5% change or more from observed diets. \*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value< 0.001 in survey weighted t-tests\*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value < 0.001 in survey weighted t-tests

# **Supplementary Table 5**. Estimated mean energy and nutrient intake after replacing white rice for brown rice and white bread for whole-wheat bread (models 1, 2 and 3) among males aged over 12 years living in São Paulo based on the 2015 Health Survey of São Paulo.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy and nutrients† | Observed | | Model 1: Rice | | | | Model 2: Bread | | | | Model 3: Rice + Bread | | | |
| 100% change ‡ | | Absolute change§ | | 100% change | | Absolute change | | 100% change | | Absolute change | |
| Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| More healthful grains (g/d) | 8.5 | 1.2 | 233.2\*\*\* | 9.1 | 224.7 | 9.1 | 66.8\*\*\* | 2.4 | 58.3 | 2.1 | 291.4\*\*\* | 9.6 | 282.9 | 9.6 |
| Energy (kcal/d) | 2156.1 | 46.3 | 2115.1 | 45.8 | -41.1 | 1.7 | 2127.9 | 45.9 | -28.3 | 1.0 | 2086.8 | 45.4 | -69.3 | 2.1 |
| Carbohydrate (g/d) | 274.7 | 6.0 | 263.0 | 5.8 | -11.7 | 0.5 | 268.3 | 5.9 | -6.4 | 0.2 | 256.6\*\*\* | 5.7 | -18.1 | 0.6 |
| Available carbohydrate (g/d) | 255.7 | 5.7 | 240.3\*\*\* | 5.5 | -15.4 | 0.6 | 247.9 | 5.6 | -7.8 | 0.3 | 232.5\*\*\* | 5.4 | -23.2 | 0.7 |
| Dietary fiber (g/d) | 19.0 | 0.5 | 22.7\*\*\* | 0.6 | 3.7 | 0.1 | 20.4\*\*\* | 0.5 | 1.4 | 0.1 | 24.1\*\*\* | 0.6 | 5.1 | 0.2 |
| Total sugar (g/d) | 90.6 | 3.0 | 91.4 | 3.0 | 0.7 | 0.0 | 90.9 | 3.0 | 0.2 | 0.0 | 91.6 | 3.0 | 1.0 | 0.1 |
| Added sugars (g/d) | 56.7 | 2.4 | 56.7 | 2.4 | 0.0 | 0.0 | 56.7 | 2.4 | 0.0 | 0.0 | 56.7 | 2.4 | 0.0 | 0.0 |
| Protein (g/d) | 91.0 | 2.3 | 90.8 | 2.3 | -0.2 | 0.0 | 91.1 | 2.3 | 0.1 | 0.0 | 90.8 | 2.3 | -0.2 | 0.0 |
| Total fat (g/d) | 76.7 | 2.0 | 78.3 | 2.0 | 1.6 | 0.1 | 76.7 | 2.0 | 0.0 | 0.0 | 78.2 | 2.0 | 1.6 | 0.1 |
| Saturated fatty acids (g/d) | 25.1 | 0.7 | 25.3 | 0.7 | 0.3 | 0.0 | 25.1 | 0.7 | 0.0 | 0.0 | 25.3 | 0.7 | 0.2 | 0.0 |
| Polyunsaturated fatty acids (g/d) | 16.9 | 0.5 | 17.4 | 0.5 | 0.6 | 0.0 | 16.7 | 0.5 | -0.2 | 0.0 | 17.2 | 0.5 | 0.4 | 0.0 |
| Monounsaturated fatty acids (g/d) | 25.4 | 0.7 | 26.2 | 0.7 | 0.8 | 0.0 | 25.2 | 0.7 | -0.2 | 0.0 | 26.0 | 0.7 | 0.6 | 0.0 |
| Vitamin B1 (mg/d) | 2.0 | 0.1 | 1.7\*\*\* | 0.0 | -0.2 | 0.0 | 1.8\*\*\* | 0.0 | -0.2 | 0.0 | 1.5\*\*\* | 0.0 | -0.4 | 0.0 |
| Vitamin B2 (mg/d) | 1.7 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 | 1.4\*\*\* | 0.0 | -0.3 | 0.0 | 1.4\*\*\* | 0.0 | -0.3 | 0.0 |
| Vitamin B3 (mg/d) | 35.7 | 1.1 | 35.0 | 1.1 | -0.8 | 0.0 | 37.0 | 1.1 | 1.2 | 0.0 | 36.2 | 1.1 | 0.4 | 0.1 |
| Vitamin B6 (mg/d) | 1.8 | 0.1 | 1.8 | 0.1 | 0.0 | 0.0 | 1.6\*\*\* | 0.0 | -0.2 | 0.0 | 1.6\*\*\* | 0.0 | -0.2 | 0.0 |
| Folate (DFE µg/d) | 414.5 | 10.5 | 418.7 | 10.5 | 4.2 | 0.2 | 381.8\*\*\* | 10.1 | -32.6 | 1.2 | 386.1\*\*\* | 10.2 | -28.4 | 1.2 |
| Vitamin E (mg/d) | 8.4 | 0.2 | 8.8 | 0.2 | 0.4 | 0.0 | 9.4\*\*\* | 0.2 | 1.0 | 0.0 | 9.8\*\*\* | 0.2 | 1.4 | 0.0 |
| Sodium (mg/d) | 3329.5 | 145.9 | 3327.2 | 145.9 | -2.3 | 0.1 | 3285.6 | 145.3 | -43.8 | 3.6 | 3283.3 | 145.3 | -46.2 | 3.6 |
| Calcium (mg/d) | 756.5 | 96.4 | 756.1 | 96.4 | -0.4 | 0.0 | 803.0\*\*\* | 96.7 | 46.5 | 2.0 | 802.6\*\*\* | 96.7 | 46.2 | 2.0 |
| Potassium (mg/d) | 2419.3 | 53.1 | 2445.6 | 53.4 | 26.3 | 1.1 | 2430.4 | 53.2 | 11.2 | 0.4 | 2456.7 | 53.5 | 37.5 | 1.2 |
| Iron (mg/d) | 12.1 | 0.3 | 12.0 | 0.3 | -0.1 | 0.0 | 11.1\*\*\* | 0.2 | -1.0 | 0.0 | 11.0\*\*\* | 0.2 | -1.1 | 0.0 |
| Selenium (µg/d) | 76.2 | 2.5 | 74.2 | 2.5 | -2.0 | 0.1 | 75.2 | 2.5 | -1.0 | 0.0 | 73.2 | 2.5 | -3.0 | 0.1 |
| Magnesium (mg/d) | 294.3 | 31.3 | 422.4\*\*\* | 32.4 | 128.1 | 5.2 | 314.5\*\* | 31.4 | 20.1 | 0.7 | 442.5\*\*\* | 32.5 | 148.2 | 5.3 |
| Zinc (mg/d) | 12.5 | 0.5 | 12.9 | 0.5 | 0.4 | 0.0 | 13.0 | 0.5 | 0.6 | 0.0 | 13.5\*\*\* | 0.5 | 1.0 | 0.0 |

DFE, dietary folate equivalents. N/A, not applicable due to the large number of zero in the observed intake of more healthful grain foods

† Values represent total daily energy and nutrients consumed by São Paulo residents (n=1741)

‡ Difference between values estimated from the respective substitution in the entire population in one eating occasion from observed intake.

§ Observed vs. partial replacement

Asterisks indicate statistical significance comparing whether modeled changes are 5% change or more from observed diets. \*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value< 0.001 in survey weighted t-tests\*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value < 0.001 in survey weighted t-tests

# **Supplementary Table 6**. Estimated mean energy and nutrient intake after replacing white rice for brown rice and white bread for whole-wheat bread (models 1, 2 and 3) among females aged over 12 years living in São Paulo based on the 2015 Health Survey of São Paulo.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy and nutrients† | Observed | | Model 1: Rice | | | | Model 2: Bread | | | | Model 3: Rice + Bread | | | |
| 100% change ‡ | | Absolute change§ | | 100% change | | Absolute change | | 100% change | | Absolute change | |
| Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| More healthful grains (g/d) | 11.7 | 1.3 | 129.9\*\*\* | 5.2 | 118.2 | 5.1 | 51.0\*\*\* | 2.1 | 39.3 | 1.8 | 169.2\*\*\* | 6.1 | 157.5 | 6.1 |
| Energy (kcal/d) | 1626.4 | 32.6 | 1604.8 | 32.3 | -21.6 | 0.9 | 1607.8 | 32.4 | -18.6 | 0.9 | 1586.2 | 32.1 | -40.2 | 1.6 |
| Carbohydrate (g/d) | 207.7 | 4.0 | 201.5 | 3.9 | -6.2 | 0.3 | 203.4 | 3.9 | -4.2 | 0.2 | 197.3\*\*\* | 3.8 | -10.4 | 0.4 |
| Available carbohydrate (g/d) | 193.7 | 3.8 | 185.6 | 3.7 | -8.1 | 0.4 | 188.5 | 3.7 | -5.2 | 0.2 | 180.4\*\*\* | 3.6 | -13.3 | 0.5 |
| Dietary fiber (g/d) | 13.9 | 0.3 | 15.9\*\*\* | 0.4 | 1.9 | 0.1 | 15.0\*\*\* | 0.3 | 1.0 | 0.0 | 16.9\*\*\* | 0.4 | 3.0 | 0.1 |
| Total sugar (g/d) | 77.7 | 2.3 | 78.1 | 2.3 | 0.4 | 0.0 | 78.0 | 2.2 | 0.3 | 0.0 | 78.4 | 2.2 | 0.7 | 0.0 |
| Added sugars (g/d) | 45.9 | 1.9 | 45.9 | 1.9 | 0.0 | 0.0 | 45.9 | 1.9 | 0.1 | 0.0 | 45.9 | 1.9 | 0.1 | 0.0 |
| Protein (g/d) | 67.2 | 1.8 | 67.1 | 1.8 | -0.1 | 0.0 | 67.3 | 1.8 | 0.1 | 0.0 | 67.1 | 1.8 | 0.0 | 0.0 |
| Total fat (g/d) | 59.6 | 1.5 | 60.4 | 1.5 | 0.8 | 0.0 | 59.6 | 1.5 | 0.0 | 0.0 | 60.4 | 1.5 | 0.8 | 0.0 |
| Saturated fatty acids (g/d) | 19.6 | 0.5 | 19.8 | 0.5 | 0.1 | 0.0 | 19.6 | 0.5 | 0.0 | 0.0 | 19.7 | 0.5 | 0.1 | 0.0 |
| Polyunsaturated fatty acids (g/d) | 12.9 | 0.4 | 13.2 | 0.4 | 0.3 | 0.0 | 12.8 | 0.4 | 0.1 | 0.0 | 13.1 | 0.4 | 0.2 | 0.0 |
| Monounsaturated fatty acids (g/d) | 19.5 | 0.5 | 19.9 | 0.5 | 0.4 | 0.0 | 19.4 | 0.5 | 0.1 | 0.0 | 19.8 | 0.5 | 0.3 | 0.0 |
| Vitamin B1 (mg/d) | 1.5 | 0.0 | 1.4\*\*\* | 0.0 | -0.1 | 0.0 | 1.4\*\*\* | 0.0 | -0.1 | 0.0 | 1.2\*\*\* | 0.0 | -0.2 | 0.0 |
| Vitamin B2 (mg/d) | 1.4 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 1.2\*\*\* | 0.0 | -0.2 | 0.0 | 1.2\*\*\* | 0.0 | -0.2 | 0.0 |
| Vitamin B3 (mg/d) | 27.1 | 0.9 | 26.7 | 0.9 | -0.4 | 0.0 | 27.9 | 0.9 | 0.8 | 0.0 | 27.4 | 0.9 | 0.3 | 0.0 |
| Vitamin B6 (mg/d) | 1.3 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 1.1\*\*\* | 0.0 | -0.1 | 0.0 | 1.1\*\*\* | 0.0 | -0.1 | 0.0 |
| Folate (DFE µg/d) | 336.0 | 8.2 | 338.3 | 8.3 | 2.2 | 0.0 | 314.4\*\*\* | 8.0 | -21.6 | 1.0 | 316.7\*\*\* | 8.1 | -19.4 | 1.0 |
| Vitamin E (mg/d) | 6.6 | 0.2 | 6.7 | 0.2 | 0.2 | 0.0 | 7.2\*\*\* | 0.2 | 0.7 | 0.0 | 7.4\*\*\* | 0.2 | 0.9 | 0.0 |
| Sodium (mg/d) | 2356.2 | 53.7 | 2354.9 | 53.7 | -1.2 | 0.1 | 2315.4 | 53.3 | -40.8 | 3.7 | 2314.2 | 53.3 | -42.0 | 3.7 |
| Calcium (mg/d) | 585.4 | 18.7 | 585.2 | 18.7 | -0.2 | 0.0 | 613.2 | 18.2 | 27.7 | 1.9 | 613.0 | 18.2 | 27.5 | 1.9 |
| Potassium (mg/d) | 1947.3 | 43.9 | 1961.1 | 44.0 | 13.8 | 0.6 | 1954.3 | 44.0 | 7.0 | 0.4 | 1968.1 | 44.1 | 20.8 | 0.8 |
| Iron (mg/d) | 8.9 | 0.2 | 8.9 | 0.2 | 0.0 | 0.0 | 8.2 | 0.2 | -0.7 | 0.0 | 8.2\*\*\* | 0.2 | -0.7 | 0.0 |
| Selenium (µg/d) | 60.8 | 1.9 | 59.7 | 1.9 | 1.1 | 0.0 | 60.2 | 1.9 | -0.6 | 0.0 | 59.1 | 1.9 | -1.7 | 0.1 |
| Magnesium (mg/d) | 206.7 | 4.3 | 274.1\*\*\* | 5.8 | 67.4 | 2.9 | 220.3\*\*\* | 4.4 | 13.6 | 0.6 | 287.7\*\*\* | 6.0 | 81.0 | 3.2 |
| Zinc (mg/d) | 8.8 | 0.2 | 9.1 | 0.2 | 0.2 | 0.0 | 9.2 | 0.2 | 0.4 | 0.0 | 9.5\*\*\* | 0.3 | 0.6 | 0.0 |

DFE, dietary folate equivalents. N/A, not applicable due to the large number of zero in the observed intake of more healthful grain foods

† Values represent total daily energy and nutrients consumed by São Paulo residents (n=1741)

‡ Difference between values estimated from the respective substitution in the entire population in one eating occasion from observed intake.

§ Observed vs. partial replacement

Asterisks indicate statistical significance comparing whether modeled changes are 5% change or more from observed diets. \*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value< 0.001 in survey weighted t-tests\*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value < 0.001 in survey weighted t-tests

# **Supplementary Table 7**. Estimated mean energy and nutrient intake after replacing white rice for brown rice and white bread for whole-wheat bread (models 1, 2 and 3) among adolescents (12 to 19 years old) living in São Paulo based on the 2015 Health Survey of São Paulo.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy and nutrients† | Observed | | Model 1: Rice | | | | Model 2: Bread | | | | Model 3: Rice + Bread | | | |
| 100% change ‡ | | Absolute change§ | | 100% change | | Absolute change | | 100% change | | Absolute change | |
| Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| More healthful grains (g/d) | 9.2 | 2.3 | 192.4\*\*\* | 9.3 | 183.2 | 9.3 | 63.6\*\*\* | 3.8 | 54.4 | 2.8 | 246.8\*\*\* | 10.2 | 237.6 | 10.1 |
| Energy (kcal/d) | 2117.3 | 53.9 | 2083.9 | 53.1 | -33.5 | 1.7 | 2091.0 | 53.5 | -26.3 | 1.3 | 2057.5 | 52.8 | -59.8 | 2.3 |
| Carbohydrate (g/d) | 273.0 | 6.4 | 263.5 | 6.3 | -9.5 | 0.5 | 267.1 | 6.3 | -6.0 | 0.3 | 257.5\*\*\* | 6.2 | -15.5 | 0.6 |
| Available carbohydrate (g/d) | 256.3 | 6.0 | 243.8 | 5.9 | -12.6 | 0.6 | 249.0 | 6.0 | -7.3 | 0.4 | 236.5\*\*\* | 5.8 | -19.9 | 0.8 |
| Dietary fiber (g/d) | 16.7 | 0.5 | 19.7\*\*\* | 0.6 | 3.0 | 0.2 | 18.1\*\*\* | 0.5 | 1.3 | 0.1 | 21.1\*\*\* | 0.6 | 4.4 | 0.2 |
| Total sugar (g/d) | 103.2 | 3.5 | 103.7 | 3.5 | 0.6 | 0.0 | 103.4 | 3.5 | 0.3 | 0.1 | 104.0 | 3.5 | 0.8 | 0.1 |
| Added sugars (g/d) | 72.3 | 2.9 | 72.3 | 2.9 | 0.0 | 0.0 | 72.3 | 2.9 | 0.0 | 0.0 | 72.3 | 2.9 | 0.0 | 0.0 |
| Protein (g/d) | 83.8 | 3.3 | 83.6 | 3.3 | -0.2 | 0.0 | 83.8 | 3.3 | 0.1 | 0.0 | 83.6 | 3.3 | -0.1 | 0.0 |
| Total fat (g/d) | 78.9 | 2.5 | 80.2 | 2.5 | 1.3 | 0.1 | 78.9 | 2.5 | 0.0 | 0.0 | 80.1 | 2.5 | 1.3 | 0.1 |
| Saturated fatty acids (g/d) | 25.5 | 0.9 | 25.7 | 0.9 | 0.2 | 0.0 | 25.5 | 0.9 | 0.0 | 0.0 | 25.7 | 0.9 | 0.2 | 0.0 |
| Polyunsaturated fatty acids (g/d) | 17.6 | 0.6 | 18.1 | 0.6 | 0.5 | 0.0 | 17.4 | 0.6 | -0.2 | 0.0 | 17.9 | 0.6 | 0.3 | 0.0 |
| Monounsaturated fatty acids (g/d) | 25.8 | 0.9 | 26.4 | 0.9 | 0.6 | 0.0 | 25.6 | 0.9 | -0.2 | 0.0 | 26.2 | 0.9 | 0.4 | 0.0 |
| Vitamin B1 (mg/d) | 1.8 | 0.1 | 1.6\*\*\* | 0.1 | -0.2 | 0.0 | 1.6\*\*\* | 0.1 | -0.2 | 0.0 | 1.5\*\*\* | 0.1 | -0.4 | 0.0 |
| Vitamin B2 (mg/d) | 1.7 | 0.1 | 1.7 | 0.1 | 0.0 | 0.0 | 1.4\*\*\* | 0.1 | -0.3 | 0.0 | 1.4\*\*\* | 0.1 | -0.3 | 0.0 |
| Vitamin B3 (mg/d) | 29.2 | 1.3 | 28.6 | 1.3 | -0.6 | 0.0 | 30.4 | 1.3 | 1.1 | 0.1 | 29.7 | 1.3 | 0.5 | 0.1 |
| Vitamin B6 (mg/d) | 1.7 | 0.1 | 1.7 | 0.1 | 0.0 | 0.0 | 1.5\*\*\* | 0.1 | -0.2 | 0.0 | 1.5\*\*\* | 0.1 | -0.2 | 0.0 |
| Folate (DFE µg/d) | 411.9 | 14.0 | 415.4 | 14.0 | 3.5 | 0.2 | 381.5\*\*\* | 13.9 | -30.4 | 1.5 | 385.0\*\*\* | 13.9 | -26.9 | 1.5 |
| Vitamin E (mg/d) | 8.4 | 0.3 | 8.7 | 0.3 | 0.3 | 0.0 | 9.3 | 0.3 | 0.9 | 0.0 | 9.6\*\*\* | 0.3 | 1.2 | 0.1 |
| Sodium (mg/d) | 3058.2 | 88.9 | 3056.3 | 88.9 | -1.9 | 0.1 | 3014.0 | 88.1 | -44.2 | 5.2 | 3012.1 | 88.0 | -46.1 | 5.2 |
| Calcium (mg/d) | 642.2 | 24.3 | 641.9 | 24.3 | -0.3 | 0.0 | 684.7\*\*\* | 24.3 | 42.5 | 2.5 | 684.4\*\*\* | 24.3 | 42.2 | 2.5 |
| Potassium (mg/d) | 2076.0 | 66.1 | 2097.5 | 66.6 | 21.4 | 1.1 | 2086.3 | 66.2 | 10.3 | 0.6 | 2107.8 | 66.7 | 31.7 | 1.3 |
| Iron (mg/d) | 12.0 | 0.3 | 12.0 | 0.3 | 0.0 | 0.0 | 11.1\*\*\* | 0.3 | -1.0 | 0.0 | 11.0\*\*\* | 0.3 | -1.0 | 0.0 |
| Selenium (µg/d) | 70.7 | 2.4 | 69.1 | 2.3 | -1.6 | 0.1 | 69.8 | 2.4 | -0.9 | 0.0 | 68.2 | 2.3 | -2.5 | 0.1 |
| Magnesium (mg/d) | 235.7 | 6.7 | 340.2\*\*\* | 10.2 | 104.4 | 5.3 | 254.6\*\*\* | 6.9 | 18.9 | 1.0 | 359.0\*\*\* | 10.4 | 123.2 | 5.5 |
| Zinc (mg/d) | 11.8 | 0.5 | 12.1 | 0.5 | 0.3 | 0.0 | 12.3 | 0.5 | 0.5 | 0.0 | 12.7\*\*\* | 0.5 | 0.9 | 0.0 |

DFE, dietary folate equivalents. N/A, not applicable due to the large number of zero in the observed intake of more healthful grain foods

† Values represent total daily energy and nutrients consumed by São Paulo residents (n=1741)

‡ Difference between values estimated from the respective substitution in the entire population in one eating occasion from observed intake.

§ Observed vs. partial replacement

Asterisks indicate statistical significance comparing whether modeled changes are 5% change or more from observed diets. \*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value< 0.001 in survey weighted t-tests\*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value < 0.001 in survey weighted t-tests

# **Supplementary Table 8**. Estimated mean energy and nutrient intake after replacing white rice for brown rice and white bread for whole-wheat bread (models 1, 2 and 3) among adults (20 to 59 years old) living in São Paulo based on the 2015 Health Survey of São Paulo.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy and nutrients† | Observed | | Model 1: Rice | | | | Model 2: Bread | | | | Model 3: Rice + Bread | | | |
| 100% change ‡ | | Absolute change§ | | 100% change | | Absolute change | | 100% change | | Absolute change | |
| Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| More healthful grains (g/d) | 9.3 | 1.3 | 186.8\*\*\* | 9.2 | 177.6 | 9.1 | 58.4\*\*\* | 2.6 | 49.1 | 2.2 | 236.0\*\*\* | 9.9 | 226.7 | 9.8 |
| Energy (kcal/d) | 1945.8 | 46.8 | 1913.4 | 46.1 | -32.5 | 1.7 | 1922.2 | 46.5 | -23.7 | 1.1 | 1889.7 | 45.8 | -56.1 | 2.2 |
| Carbohydrate (g/d) | 246.6 | 6.1 | 237.3 | 5.9 | -9.3 | 0.5 | 241.2 | 6.0 | -5.4 | 0.2 | 232.0\*\*\* | 5.8 | -14.6 | 0.6 |
| Available carbohydrate (g/d) | 229.8 | 5.8 | 217.6 | 5.5 | -12.2 | 0.6 | 223.2 | 5.7 | -6.6 | 0.3 | 211.1\*\*\* | 5.4 | -18.8 | 0.8 |
| Dietary fiber (g/d) | 16.8 | 0.5 | 19.7\*\*\* | 0.6 | 2.9 | 0.1 | 18.0\*\*\* | 0.5 | 1.2 | 0.1 | 20.9\*\*\* | 0.6 | 4.1 | 0.2 |
| Total sugar (g/d) | 84.3 | 2.9 | 84.9 | 2.9 | 0.6 | 0.0 | 84.6 | 3.0 | 0.2 | 0.0 | 85.2 | 3.0 | 0.8 | 0.1 |
| Added sugars (g/d) | 51.7 | 2.3 | 51.7 | 2.3 | 0.0 | 0.0 | 51.8 | 2.3 | 0.0 | 0.0 | 51.8 | 2.3 | 0.0 | 0.0 |
| Protein (g/d) | 81.4 | 2.2 | 81.2 | 2.2 | -0.2 | 0.0 | 81.4 | 2.2 | 0.1 | 0.0 | 81.3 | 2.2 | -0.1 | 0.0 |
| Total fat (g/d) | 69.6 | 1.8 | 70.9 | 1.9 | 1.3 | 0.1 | 69.6 | 1.8 | 0.0 | 0.0 | 70.9 | 1.9 | 1.2 | 0.1 |
| Saturated fatty acids (g/d) | 22.9 | 0.7 | 23.1 | 0.7 | 0.2 | 0.0 | 22.9 | 0.7 | 0.0 | 0.0 | 23.1 | 0.7 | 0.1 | 0.0 |
| Polyunsaturated fatty acids (g/d) | 15.2 | 0.4 | 15.6 | 0.4 | 0.5 | 0.0 | 15.0 | 0.4 | -0.2 | 0.0 | 15.4 | 0.4 | 0.3 | 0.0 |
| Monounsaturated fatty acids (g/d) | 23.0 | 0.6 | 23.7 | 0.6 | 0.6 | 0.0 | 22.9 | 0.6 | -0.2 | 0.0 | 23.5 | 0.6 | 0.4 | 0.0 |
| Vitamin B1 (mg/d) | 1.8 | 0.1 | 1.6\*\*\* | 0.0 | -0.2 | 0.0 | 1.6\*\*\* | 0.0 | -0.2 | 0.0 | 1.4\*\*\* | 0.0 | -0.3 | 0.0 |
| Vitamin B2 (mg/d) | 1.6 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 1.3\*\*\* | 0.0 | -0.3 | 0.0 | 1.3\*\*\* | 0.0 | -0.3 | 0.0 |
| Vitamin B3 (mg/d) | 33.3 | 1.2 | 32.7 | 1.2 | 0.6 | 0.0 | 34.3 | 1.2 | 1.0 | 0.1 | 33.7 | 1.2 | 0.4 | 0.1 |
| Vitamin B6 (mg/d) | 1.6 | 0.1 | 1.6 | 0.1 | 0.0 | 0.0 | 1.4\*\*\* | 0.0 | -0.2 | 0.0 | 1.4\*\*\* | 0.0 | -0.2 | 0.0 |
| Folate (DFE µg/d) | 378.2 | 10.1 | 381.5 | 10.1 | 3.4 | 0.2 | 350.8\*\*\* | 9.8 | -27.4 | 1.3 | 354.2\*\*\* | 9.8 | -24.0 | 1.2 |
| Vitamin E (mg/d) | 7.6 | 0.2 | 7.9 | 0.2 | 0.3 | 0.0 | 8.4 | 0.2 | 0.9 | 0.0 | 8.7\*\*\* | 0.2 | 1.1 | 0.0 |
| Sodium (mg/d) | 2961.7 | 139.6 | 2959.9 | 139.6 | -1.8 | 0.1 | 2920.7 | 138.4 | -41.0 | 3.8 | 2918.9 | 138.4 | -42.8 | 3.8 |
| Calcium (mg/d) | 721.7 | 89.8 | 721.4 | 89.8 | -0.3 | 0.0 | 759.6\*\*\* | 90.0 | 37.9 | 2.1 | 759.3\*\*\* | 90.0 | 37.6 | 2.1 |
| Potassium (mg/d) | 2252.1 | 53.1 | 2272.9 | 53.5 | 20.8 | 1.1 | 2261.3 | 53.2 | 9.2 | 0.5 | 2282.1 | 53.6 | 30.0 | 1.2 |
| Iron (mg/d) | 10.6 | 0.3 | 10.6 | 0.3 | 0.0 | 0.0 | 9.8\*\*\* | 0.2 | -0.9 | 0.0 | 9.7\*\*\* | 0.2 | -0.9 | 0.0 |
| Selenium (µg/d) | 71.2 | 2.4 | 69.6 | 2.3 | -1.6 | 0.1 | 70.4 | 2.4 | -0.8 | 0.0 | 68.8 | 2.3 | -2.4 | 0.1 |
| Magnesium (mg/d) | 270.2 | 29.4 | 371.4\*\*\* | 30.5 | 101.2 | 5.2 | 287.2\*\*\* | 29.6 | 17.0 | 0.8 | 388.4\*\*\* | 30.7 | 118.2 | 5.4 |
| Zinc (mg/d) | 10.9 | 0.4 | 11.2 | 0.4 | 0.3 | 0.0 | 11.4 | 0.4 | 0.5 | 0.0 | 11.7\*\*\* | 0.4 | 0.8 | 0.0 |

DFE, dietary folate equivalents. N/A, not applicable due to the large number of zero in the observed intake of more healthful grain foods

† Values represent total daily energy and nutrients consumed by São Paulo residents (n=1741)

‡ Difference between values estimated from the respective substitution in the entire population in one eating occasion from observed intake.

§ Observed vs. partial replacement

Asterisks indicate statistical significance comparing whether modeled changes are 5% change or more from observed diets. \*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value< 0.001 in survey weighted t-tests\*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value < 0.001 in survey weighted t-tests

# **Supplementary Table 9**. Estimated mean energy and nutrient intake after replacing white rice for brown rice and white bread for whole-wheat bread (models 1, 2 and 3) among older adults (60 or more years) living in São Paulo based on the 2015 Health Survey of São Paulo.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy and nutrients† | Observed | | Model 1: Rice | | | | Model 2: Bread | | | | Model 3: Rice + Bread | | | |
| 100% change ‡ | | Absolute change§ | | 100% change | | Absolute change | | 100% change | | Absolute change | |
| Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| More healthful grains (g/d) | 13.0 | 2.0 | 157.8\*\*\* | 7.6 | 144.8 | 8.1 | 55.3\*\*\* | 2.4 | 42.2 | 2.1 | 200.1\*\*\* | 8.1 | 187.0 | 8.8 |
| Energy (kcal/d) | 1530.3 | 32.7 | 1503.9 | 32.1 | -26.5 | 1.5 | 1510.3 | 32.5 | -20.0 | 1.0 | 1483.8 | 31.9 | -46.5 | 2.0 |
| Carbohydrate (g/d) | 195.7 | 4.9 | 188.2 | 4.7 | -7.5 | 0.4 | 191.2 | 4.9 | -4.5 | 0.2 | 183.6\*\*\* | 4.7 | -12.1 | 0.5 |
| Available carbohydrate (g/d) | 180.3 | 4.7 | 170.4 | 4.4 | -9.9 | 0.6 | 174.7 | 4.6 | -5.6 | 0.3 | 164.7\*\*\* | 4.3 | -15.6 | 0.7 |
| Dietary fiber (g/d) | 15.4 | 0.4 | 17.8\*\*\* | 0.4 | 2.4 | 0.1 | 16.5\*\*\* | 0.4 | 1.1 | 0.1 | 18.9\*\*\* | 0.4 | 3.5 | 0.2 |
| Total sugar (g/d) | 64.4 | 2.4 | 64.8 | 2.4 | 0.5 | 0.0 | 64.7 | 2.4 | 0.3 | 0.1 | 65.1 | 2.4 | 0.8 | 0.1 |
| Added sugars (g/d) | 28.8 | 1.8 | 28.8 | 1.8 | 0.0 | 0.0 | 28.8 | 1.8 | 0.1 | 0.0 | 28.8 | 1.8 | 0.1 | 0.0 |
| Protein (g/d) | 68.9 | 1.8 | 68.7 | 1.8 | -0.2 | 0.0 | 68.9 | 1.8 | 0.1 | 0.0 | 68.8 | 1.8 | -0.1 | 0.0 |
| Total fat (g/d) | 53.6 | 1.2 | 54.6 | 1.2 | 1.0 | 0.1 | 53.6 | 1.2 | 0.0 | 0.0 | 54.6 | 1.2 | 1.0 | 0.1 |
| Saturated fatty acids (g/d) | 17.7 | 0.6 | 17.9 | 0.6 | 0.2 | 0.0 | 17.7 | 0.6 | 0.0 | 0.0 | 17.9 | 0.6 | 0.2 | 0.0 |
| Polyunsaturated fatty acids (g/d) | 11.4 | 0.3 | 11.8 | 0.4 | 0.4 | 0.0 | 11.3 | 0.3 | -0.1 | 0.0 | 11.6 | 0.4 | 0.2 | 0.0 |
| Monounsaturated fatty acids (g/d) | 17.8 | 0.4 | 18.3 | 0.4 | 0.5 | 0.0 | 17.6 | 0.4 | -0.1 | 0.0 | 18.1 | 0.4 | 0.4 | 0.0 |
| Vitamin B1 (mg/d) | 1.5 | 0.1 | 1.4\*\*\* | 0.0 | -0.1 | 0.0 | 1.4\*\*\* | 0.1 | -0.1 | 0.0 | 1.2\*\*\* | 0.0 | -0.3 | 0.0 |
| Vitamin B2 (mg/d) | 1.3 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 1.1\*\*\* | 0.0 | -0.2 | 0.0 | 1.1\*\*\* | 0.0 | -0.2 | 0.0 |
| Vitamin B3 (mg/d) | 29.1 | 1.1 | 28.6 | 1.1 | -0.5 | 0.0 | 29.9 | 1.1 | 0.8 | 0.1 | 29.4 | 1.1 | 0.3 | 0.1 |
| Vitamin B6 (mg/d) | 1.3 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 1.1\*\*\* | 0.0 | -0.2 | 0.0 | 1.1\*\*\* | 0.0 | -0.2 | 0.0 |
| Folate (DFE µg/d) | 330.8 | 11.2 | 333.6 | 11.2 | 2.7 | 0.2 | 307.7\*\*\* | 11.3 | -23.2 | 1.2 | 310.4\*\*\* | 11.3 | -20.4 | 1.2 |
| Vitamin E (mg/d) | 6.3 | 0.2 | 6.5 | 0.2 | 0.2 | 0.0 | 7.0 | 0.2 | 0.7 | 0.0 | 7.2\*\*\* | 0.2 | 1.0 | 0.0 |
| Sodium (mg/d) | 2339.5 | 57.0 | 2338.0 | 57.0 | -1.5 | 0.1 | 2296.0 | 56.3 | -43.5 | 5.5 | 2294.5 | 56.3 | -45.0 | 5.5 |
| Calcium (mg/d) | 579.2 | 21.0 | 579.0 | 21.0 | -0.2 | 0.0 | 609.0\*\*\* | 20.6 | 29.8 | 2.3 | 608.8\*\*\* | 20.6 | 29.6 | 2.3 |
| Potassium (mg/d) | 2128.8 | 53.1 | 2145.8 | 53.3 | 16.9 | 0.9 | 2136.3 | 53.2 | 7.5 | 0.5 | 2153.3 | 53.4 | 24.5 | 1.2 |
| Iron (mg/d) | 8.6 | 0.2 | 8.6 | 0.2 | 0.0 | 0.0 | 7.9\*\*\* | 0.2 | -0.7 | 0.0 | 7.8\*\*\* | 0.2 | -0.8 | 0.0 |
| Selenium (µg/d) | 59.8 | 2.9 | 58.5 | 2.9 | -1.3 | 0.1 | 59.1 | 2.9 | -0.6 | 0.0 | 57.8 | 2.9 | -1.9 | 0.1 |
| Magnesium (mg/d) | 218.7 | 5.1 | 301.2\*\*\* | 7.4 | 82.5 | 4.6 | 233.3\*\*\* | 5.1 | 14.6 | 0.7 | 315.9\*\*\* | 7.5 | 97.2 | 4.8 |
| Zinc (mg/d) | 8.9 | 0.3 | 9.2 | 0.3 | 0.3 | 0.0 | 9.3 | 0.3 | 0.4 | 0.0 | 9.6\*\*\* | 0.3 | 0.7 | 0.0 |

DFE, dietary folate equivalents. N/A, not applicable due to the large number of zero in the observed intake of more healthful grain foods

† Values represent total daily energy and nutrients consumed by São Paulo residents (n=1741)

‡ Difference between values estimated from the respective substitution in the entire population in one eating occasion from observed intake.

§ Observed vs. partial replacement

Asterisks indicate statistical significance comparing whether modeled changes are 5% change or more from observed diets. \*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value< 0.001 in survey weighted t-tests\*p-value < 0.05; \*\*p-value <0.01; \*\*\* p-value < 0.001 in survey weighted t-tests

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(c)

(b)

(a)

# **Supplementary Figure 1.** Estimated survey weighted percent change in population mean intake of nutrients\* per day according to sex based on the 2015 Healthy Survey of São Paulo. (a) white rice replaced for brown rice (model 1), (b) white bread was replaced for whole-wheat bread (model 2), (c) white rice was replaced for brown rice, and white bread was replaced for whole-wheat bread (model 3). White bars represent percent changes estimated for males. Light gray bars percent changes estimated for females. Dashed gray lines represent the cut-off points for strong changes (10% or -10% change). Error bars represent standard error.

\*Only nutrients that changed 5% or more comparing observed and modelled intakes in any of the models were presented.

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(c)

(b)

(a)

# **Supplementary Figure 2.** Estimated survey weighted percent change in population mean intake of nutrients\* per day according to age group based on the 2015 Healthy Survey of São Paulo. (a) white rice replaced for brown rice (model 1), (b) white bread was replaced for whole-wheat bread (model 2), (c) white rice was replaced for brown rice, and white bread was replaced for whole-wheat bread (model 3). White bars represent percent changes estimated for adolescents. Light gray bars percent changes estimated for adults. Dark gray bars represent percent changes estimated for older adults. Dashed gray lines represent the cut-off points for strong changes (10% or -10% change). Error bars represent standard error.

\*Only nutrients that changed 5% or more comparing observed and modelled intakes in any of the models were presented.

**Reference**

1. Pereira JL, Mendes A, Crispim SP *et al.* (2016) Association of Overweight with Food Portion Size among Adults of Sao Paulo - Brazil. *PLoS One* **11**, e0164127. doi:10.1371/journal.pone.0164127.