

Supplementary Table 1. Sensitivity analysis for associations between ultra-processed foods intake (serving/d) and outcomes from 2006-2008 to 2018-2023 (n = 2734)

| Outcomes                 | Model 1                    | P-value <sup>†</sup> | Model 2                    | P-value <sup>†</sup> |
|--------------------------|----------------------------|----------------------|----------------------------|----------------------|
| Weight (kg)              | 0.15 (0.04, 0.25)          | 0.01                 | 0.14 (0.03, 0.24)          | 0.01                 |
| BMI (kg/m <sup>2</sup> ) | 0.05 (0.01, 0.09)          | 0.01                 | 0.05 (0.01, 0.09)          | 0.02                 |
| Waist (cm)               | 0.12 (0.01, 0.23)          | 0.03                 | 0.12 (0.01, 0.23)          | 0.04                 |
| BAE index                | 0.07 (0.03, 0.12)          | 0.002                | 0.07 (0.02, 0.11)          | 0.003                |
| BRI                      | 0.02 (-0.001, 0.03)        | 0.05                 | 0.02 (-0.001, 0.03)        | 0.06                 |
| ABSI                     | 0.00005 (-0.00001, 0.0001) | 0.10                 | 0.00005 (-0.00001, 0.0001) | 0.09                 |
| VAI                      | 0.002 (-0.04, 0.04)        | 0.99                 | 0.001 (-0.04, 0.04)        | 0.96                 |
| WHtR                     | 0.0007 (0.0005, 0.001)     | 0.03                 | 0.008 (0.01, 0.002)        | 0.002                |

\*Data presented as beta (95% CI) per 1 serving/day.

<sup>†</sup>P-value was obtained by the linear mixed models with a random intercept at patients. Model 1 was adjusted for age (continuous), sex (male/female), marital status (single/married), physical activity (low, moderate, or high), smoking (yes/no), length of follow-up (years), and baseline values for each outcome (continuous), and total energy intake (continuous). Model 2 was adjusted for Model + baseline metabolic disease (i.e., diabetes, hypertension, and hyperlipidemia).

ABSI: a body shape index; BAE index: body adiposity estimator index; BMI: body mass index; BRI: body roundness index; VAI: visceral adiposity index; WHtR: waist-to-height ratio.

Supplementary Table 2. Associations between ultra-processed foods intake (% of energy) and outcomes

from 2006-2008 to 2018-2023 (n = 2734)

| Outcomes                 | Model 1                     | P-value <sup>†</sup> | Model 2                     | P-value <sup>†</sup> |
|--------------------------|-----------------------------|----------------------|-----------------------------|----------------------|
| Weight (kg)              | 0.07 (0.03, 0.11)           | <0.0001              | 0.06 (0.02, 0.1)            | 0.004                |
| BMI (kg/m <sup>2</sup> ) | 0.02 (0.01, 0.04)           | 0.004                | 0.02 (0.01, 0.04)           | 0.008                |
| Waist (cm)               | 0.07 (0.02, 0.11)           | 0.003                | 0.06 (0.02, 0.11)           | 0.008                |
| BAE index                | 0.03 (0.01, 0.05)           | <0.0001              | 0.03 (0.01, 0.05)           | 0.001                |
| BRI                      | 0.01 (0.001, 0.01)          | 0.02                 | 0.007 (0.001, 0.01)         | 0.03                 |
| ABSI                     | 0.00002 (-0.00001, 0.00004) | 0.14                 | 0.00001 (-0.00001, 0.00004) | 0.19                 |
| VAI                      | 0.004 (-0.02, 0.01)         | 0.58                 | 0.006 (-0.02, 0.009)        | 0.47                 |
| WHtR                     | 0.0004 (0.0001, 0.0007)     | 0.009                | 0.0003 (0.0006, 0.0006)     | 0.02                 |

\*Data presented as beta (95% CI) per 1 serving/day.

<sup>†</sup>P-value was obtained by the linear mixed models with a random intercept at patients. Model 1 were adjusted for age (continuous), sex (male/female), marital status (single/married), physical activity (low, moderate, or high), smoking (yes/no), length of follow-up (years), and baseline values for each outcome (continuous). Model 2 was adjusted for Model 1 + total energy intake (continuous).

ABSI: a body shape index; BAE index: body adiposity estimator index; BMI: body mass index; BRI: body roundness index; VAI: visceral adiposity index; WHtR: waist-to-height ratio.

processed foods (% of energy) from 2006-2008 to 2018-2023 (n = 2734)

| Outcomes                 |         | Tertile 1<br>(< 2.51) | Tertile 2<br>(2.51-4.80) | Tertile 3<br>(> 4.80) | Mean difference<br>(95% CI) <sup>‡</sup> | P-value <sup>†</sup> |
|--------------------------|---------|-----------------------|--------------------------|-----------------------|------------------------------------------|----------------------|
| Weight (kg)              | Model 1 | 0.28±0.05             | 0.32±0.05                | 0.40±0.05             | 0.11 (0.04, 0.19)                        | 0.004                |
|                          | Model 2 | 0.28±0.05             | 0.31±0.05                | 0.38±0.05             | 0.10 (0.03, 0.18)                        | 0.01                 |
| BMI (kg/m <sup>2</sup> ) | Model 1 | 0.10±0.02             | 0.11±0.02                | 0.13±0.02             | 0.04 (0.01, 0.06)                        | 0.01                 |
|                          | Model 2 | 0.10±0.02             | 0.11±0.02                | 0.13±0.02             | 0.03 (0.01, 0.06)                        | 0.02                 |
| Waist (cm)               | Model 1 | 0.57±0.06             | 0.60±0.06                | 0.66±0.06             | 0.09 (0.01, 0.18)                        | 0.03                 |
|                          | Model 2 | 0.56±0.06             | 0.59±0.06                | 0.65±0.06             | 0.08 (-0.002, 0.17)                      | 0.06                 |
| BAE index                | Model 1 | 0.25±0.02             | 0.27±0.02                | 0.30±0.02             | 0.05 (0.02, 0.08)                        | 0.005                |
|                          | Model 2 | 0.25±0.02             | 0.26±0.02                | 0.29±0.02             | 0.05 (0.01, 0.08)                        | 0.01                 |
| BRI                      | Model 1 | 0.08±0.01             | 0.08±0.01                | 0.09±0.01             | 0.01 (-0.002, 0.02)                      | 0.07                 |
|                          | Model 2 | 0.08±0.01             | 0.08±0.01                | 0.09±0.01             | 0.01 (-0.002, 0.02)                      | 0.09                 |
| ABSI                     | Model 1 | 0.0003±0.000          | 0.0003±0.000             | 0.0003±0.000          | 0.000 (0.000, 0.000)                     | 0.50                 |
|                          | Model 2 | 0.0003±0.000          | 0.0003±0.000             | 0.0003±0.000          | 0.000 (0.000, 0.000)                     | 0.54                 |
| VAI                      | Model 1 | 0.002±0.02            | 0.02±0.02                | 0.02±0.02             | 0.02 (-0.05, 0.007)                      | 0.14                 |
|                          | Model 2 | 0.002±0.02            | 0.02±0.02                | 0.02±0.02             | 0.02 (-0.05, 0.005)                      | 0.14                 |
| WHtR                     | Model 1 | 0.004±0.000           | 0.004±0.000              | 0.00±0.000            | 0.000 (-0.00, 0.001)                     | 0.08                 |
|                          | Model 2 | 0.004±0.000           | 0.004±0.000              | 0.00±0.000            | 0.000 (-0.00, 0.001)                     | 0.10                 |

\*Data presented as mean (standard error).

<sup>‡</sup>Mean difference is based on the comparison between the third tertile and the first tertile.

<sup>†</sup>P-value was obtained by the linear mixed models with a random intercept at patients. Model 1 was adjusted for age (continuous), sex (male/female), marital status (single/married), physical activity (low, moderate, or high), smoking (yes/no), and baseline values for each outcome (continuous). Model 2 was adjusted for Model 1 + total energy intake (continuous).

ABSI: a body shape index; BAE index: body adiposity estimator index; BMI: body mass index; BRI: body roundness index; VAI: visceral adiposity index; WHtR: waist-to-height ratio.

Supplementary Table 4. Odds ratio (95% CI) for the highest annual increase in outcomes across tertiles of ultra-processed foods (% of energy) from 2006-2008 to 2018-2023 (n = 2734)

| Outcomes                 |         | Tertile 1<br>(< 2.51) | Tertile 2<br>(2.51-4.80) | Tertile 3<br>(> 4.80) | P-trend | Per 1-serving/d   | P-value |
|--------------------------|---------|-----------------------|--------------------------|-----------------------|---------|-------------------|---------|
| Weight (kg)              | Model 1 | 1                     | 1.19 (0.81, 1.74)        | 1.62 (1.12, 2.33)     | 0.005   | 1.04 (1.02, 1.06) | 0.001   |
|                          | Model 2 | 1                     | 1.19 (0.81, 1.74)        | 1.59 (1.10, 2.29)     | 0.008   | 1.03 (1.01, 1.05) | 0.001   |
| BMI (kg/m <sup>2</sup> ) | Model 1 | 1                     | 1.13 (0.78, 1.64)        | 1.58 (1.11, 2.25)     | 0.006   | 1.04 (1.02, 1.06) | <0.0001 |
|                          | Model 2 | 1                     | 1.13 (0.78, 1.64)        | 1.57 (1.10, 2.25)     | 0.007   | 1.04 (1.02, 1.06) | <0.0001 |
| Waist (cm)               | Model 1 | 1                     | 0.93 (0.65, 1.34)        | 1.18 (0.83, 1.67)     | 0.26    | 1.02 (0.99, 1.04) | 0.12    |
|                          | Model 2 | 1                     | 0.93 (0.65, 1.33)        | 1.16 (0.82, 1.65)     | 0.31    | 1.01 (0.99, 1.04) | 0.16    |
| BAE index                | Model 1 | 1                     | 1.19 (0.80, 1.77)        | 1.91 (1.31, 2.78)     | <0.0001 | 1.09 (1.05, 1.14) | <0.0001 |
|                          | Model 2 | 1                     | 1.21 (0.81, 1.80)        | 1.98 (1.31, 2.99)     | <0.0001 | 1.10 (1.05, 1.16) | <0.0001 |
| BRI                      | Model 1 | 1                     | 0.98 (0.70, 1.39)        | 1.24 (0.88, 1.75)     | 0.17    | 1.02 (1.00, 1.04) | 0.06    |
|                          | Model 2 | 1                     | 0.98 (0.69, 1.38)        | 1.23 (0.87, 1.72)     | 0.20    | 1.02 (0.99, 1.04) | 0.08    |
| ABSI                     | Model 1 | 1                     | 0.09 (0.62, 1.30)        | 1.14 (0.80, 1.65)     | 0.40    | 1.08 (0.99, 1.03) | 0.45    |
|                          | Model 2 | 1                     | 0.89 (0.62, 1.29)        | 1.11 (0.77, 1.60)     | 0.52    | 1.01 (0.98, 1.03) | 0.63    |
| VAI                      | Model 1 | 1                     | 0.94 (0.67, 1.31)        | 1.16 (0.83, 1.61)     | 0.32    | 1.01 (0.99, 1.03) | 0.46    |
|                          | Model 2 | 1                     | 0.94 (0.67, 1.31)        | 1.14 (0.82, 1.59)     | 0.37    | 1.08 (1.02, 1.14) | 0.01    |
| WHtR                     | Model 1 | 1                     | 1.03 (0.72, 1.47)        | 1.14 (0.81, 1.62)     | 0.42    | 1.01 (0.99, 1.03) | 0.19    |
|                          | Model 2 | 1                     | 1.03 (0.72, 1.46)        | 1.13 (0.80, 1.61)     | 0.46    | 1.01 (0.99, 1.03) | 0.23    |

The logistic regression models were used. Model 1 was adjusted for age (continuous), sex (male/female), marital status (single/married), physical activity (low, moderate, or high), smoking (yes/no), and baseline values for each outcome (continuous). Model 2 was adjusted for Model 1 + total energy intake (continuous).

The highest annual increase ( $\geq 90^{\text{th}}$  percentile) is  $\geq 1.24$  kg/yr in weight;  $\geq 0.45$  kg/m<sup>2</sup>/yr in body mass index;  $\geq 1.67$  cm/yr in waist;  $\geq 0.72$ /yr in body adiposity estimator index;  $\geq 0.22$  unit/yr in body roundness index;  $\geq 0.001$  unit/yr in a body shape index;  $\geq 0.15$  unit/yr in visceral adiposity index; and  $\geq 0.01$  unit/yr in waist-to-height ratio.