

# Ultra-processed food consumption and mental wellbeing outcomes

Rapid Report // October 2, 2023

## **From Our Founder & Chief Scientist**

There has been increasing attention on ultra-processed food as the cause of various of diseases, particularly in countries such as the United States and United Kingdom, where the majority of calories consumed today come from ultra-processed food. While much of the focus has been on obesity, diabetes, and more recently, heart disease, the mind too is not exempt from its effects. Studies showing a link between ultra-processed food consumption and depression are growing. This includes a recent study that demonstrates an improvement of depression symptoms, even with just three weeks of diet change in those who regularly consume a diet of ultra-processed food placing ultra-processed food consumption as a core cause. But just how far reaching are the effects of ultra-processed food on mental health? Here we look at the self-reported frequency of ultra-processed food consumption and its relationship to the full breadth of mental health symptoms, and aggregate mental wellbeing, in a global sample of almost 300,000 people.

The results are profound. Over half of those who eat ultra-processed food daily are distressed or struggling with their mental health, compared to just 18% of those who rarely or never consume ultra-processed food, an almost 3-fold increase. These effects persist across all age groups and cannot be explained as indirect effects of exercise frequency or income, suggesting that up to a third of the mental health burden might be relieved by a shift away from ultra-processed food consumption. Specifically, ultra-processed food consumption increases the symptoms associated with depression as well as causes widespread challenges with the control of thoughts and emotions, suggesting a disruption of physiological regulation and control in the brain. Altogether this means that ultra-processed food may be one of the key culprits of the growing mental health burden, particularly among young people who are the biggest consumers of it.

By highlighting the magnitude and importance of the effects of ultra-processed food consumption on mental health we hope that it will invite greater interest in this area from researchers, clinicians and regulators as a key lever to tackle the global mental health crisis.

**Tara Thiagarajan, PhD.**

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# Executive Summary

## Research Question

This report examines the relationship between people's consumption of ultra-processed food and their mental wellbeing. The findings are based on data from 292,786 respondents across 70 countries, obtained between January and August 2023 as part of the Global Mind Project. Data were collected using an assessment called the Mental Health Quotient, or MHQ, which assesses 47 aspects of mental feeling and function that are aggregated into a composite mental wellbeing score as well as dimensional scores. The assessment also collects data on demographic, lifestyle and life experience factors including the frequency of ultra-processed food consumption, exercise, and income.

## Key findings

1. Mental wellbeing decreases sharply with more frequent ultra-processed food consumption. Those who consume ultra-processed food several times a day are three times more likely to have serious mental health struggles compared to those who rarely or never do.
2. While younger adults consume ultra-processed food more frequently, ultra-processed food consumption has a similar impact on all age groups.
3. The decline in mental wellbeing with increased frequency of ultra-processed food consumption cannot be attributed to indirect effects of exercise frequency or income.
4. Higher frequency of ultra-processed food consumption impacts all dimensions of mental function from *Adaptability & resilience* to *Cognition*.
5. Depression symptoms and problems with cognitive and emotional control dominate with higher frequency of ultra-processed food consumption.
6. Among 26 countries compared, respondents in the Philippines, United States and United Kingdom reported the highest consumption of ultra-processed food, while those in Egypt, Morocco and Venezuela reported the lowest.

## **Conclusion**

The steep decrease in mental wellbeing with more frequent ultra-processed food consumption independent of either exercise frequency or income, suggests a causal relationship. Furthermore, the breadth and nature of symptoms suggests that ultra-processed food may mediate a widespread physiological dysregulation of mental processes. Ultra-processed food may be a substantial driver of the growing mental health burden, particularly in young adults aged 18-24 who are twice as likely to consume ultra-processed food daily compared to adults 45 and older. A societal move towards less ultra-processed diets can therefore play a substantial role in mitigating the mental health burden.

# Introduction

Since the 1950s, the consumption of ultra-processed food has steadily increased. Today, it's estimated that in countries such as the United Kingdom and United States, approximately 60% of all food intake comes from ultra-processed food<sup>1,2</sup>. As the prevalence of ultra-processed food in the diet has increased, so too has concern over the implications for our physical and mental health. This report from the Global Mind Project, which aims to track and understand our evolving mental wellbeing, explores the relationship between self-reported frequency of ultra-processed food consumption and mental wellbeing. Data is taken from a sample of nearly 300,000 people across 70 countries obtained between January and August 2023.

Although definitions of ultra-processed food are complex and based on different categories of processing, one every-day definition is that it is food that contains substances that are never or rarely used in kitchens<sup>3</sup>, and common culprits include junk, pre-packaged and pre-prepared foods. Much of the research carried out to date has established links between ultra-processed food consumption and physical health conditions such as obesity, diabetes and, more recently, heart disease<sup>4-6</sup>, the rates of which have also been steadily increasing over the past few decades. For example, since the 1970s, levels of obesity have tripled with 1.9 billion adults overweight and 650 million of these classified as obese<sup>7</sup>. Similarly, the prevalence of type 2 diabetes has doubled since 1980, now affecting over 420 million people<sup>8</sup>. However, there is increasing evidence that it's not just our physical health that's impacted by eating ultra-processed foods, but our mental health as well.

Multiple studies from all corners of the globe have shown a link between ultra-processed food consumption and the occurrence of depression<sup>9-16</sup>. In parallel, evidence also shows that rates of depression have been on the rise, especially amongst younger generations<sup>17</sup>, who are also the highest consumers of ultra-processed food<sup>18</sup>. Significantly, studies show that even 3-weeks of diet change is enough to generate improvements in symptoms of depression<sup>19</sup>, suggesting that diet may be a key causal factor in depression. Overall, the present evidence paints a worrying picture of the long-term implications of our dietary shift towards ultra-processed foods on our mood and mental capabilities that needs to be understood better and urgently addressed.

This rapid report describes the magnitude and breadth of the harmful effects of ultra-processed food consumption on people's mental wellbeing around the world. We demonstrate that these effects are independent of exercise frequency and income, suggesting a causal relationship that is not mitigated by exercise and socioeconomic status. This corroborates and extends previous findings suggesting that a significant fraction of the global burden of depression and the broader mental health crisis in youth may arise from the food environment.

## **About the Global Mind Project**

The Global Mind Project is the largest and most comprehensive study of mental wellbeing in the world. Spanning 140 countries in 12 languages, it currently collects 1000-2000 new data responses each day and, since 2020, has collected responses from over 1.2 million people around the globe. The project uses an assessment called the MHQ which collects data across 47 aspects of mental wellbeing, together with information on demographics, lifestyle, and life experience, including ultra-processed food consumption (see methods for more information on the assessment). It therefore provides a unique opportunity to study the impact of ultra-processed food consumption on mental health and wellbeing, as well as real-time trends of ultra-processed food consumption around the world. The data from this ongoing study is openly available to academic and nonprofit research organizations.

# Key Findings

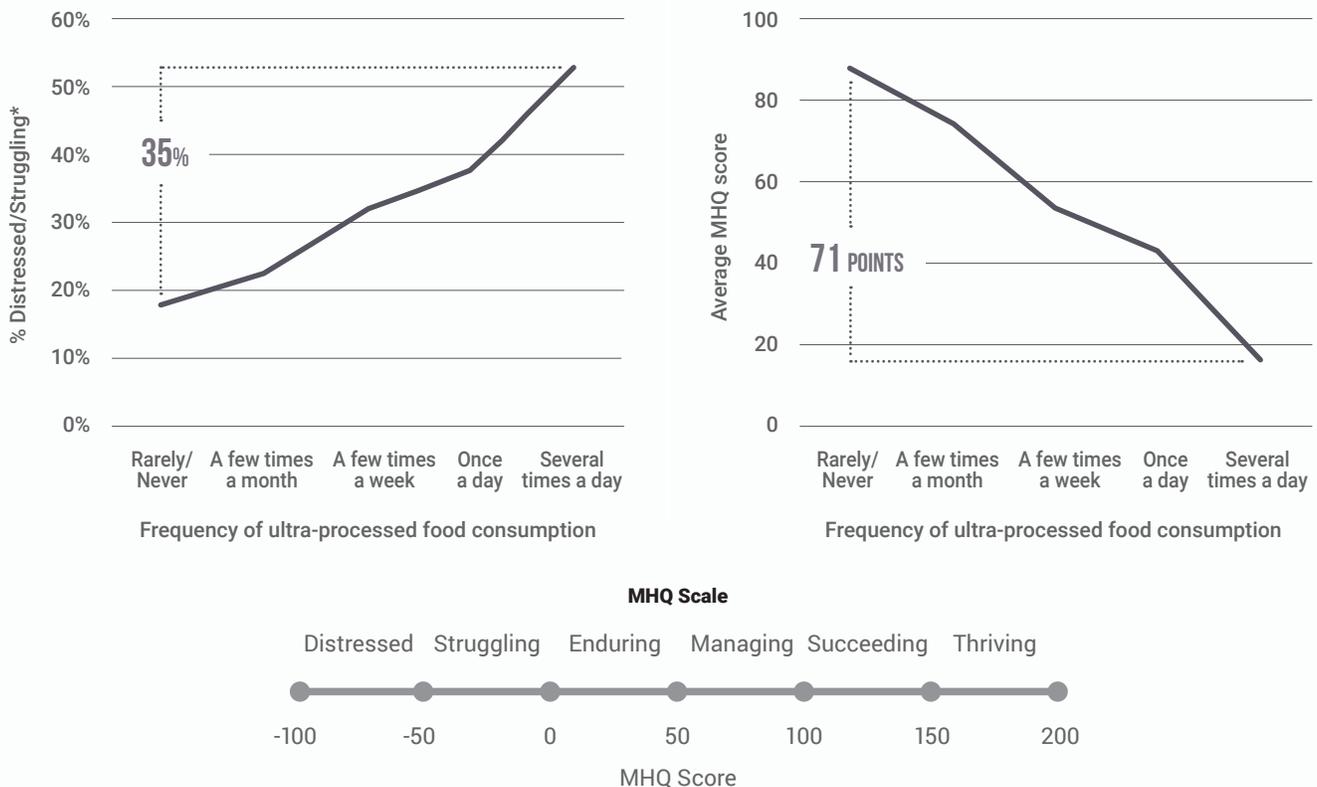
## 1 Mental wellbeing decreases sharply with higher frequency of ultra-processed food consumption.

Across all respondents, 53% of those who consumed ultra-processed food several times a day were distressed or struggling with their mental wellbeing (i.e. had MHQ scores in a negative range) compared to only 18% of those who rarely or never consumed ultra-processed food. This approximately 3-fold difference in mental health problems corresponds to 35% of the population, and was similar across both biological males and females. Correspondingly, their overall mental wellbeing, as measured by aggregate MHQ scores, decreased with increasing frequency of ultra-processed food consumption from an average MHQ of 88 points for those who rarely or never consumed ultra-processed food, to 17 for those who indicated they consumed ultra-processed food several times a day, a 71 point drop that is equivalent to 23% of the scale. Overall, this suggests that ultra-processed food may be a major factor in growing rates of mental health problems around the world.

***53% of those who consumed ultra-processed food several times a day were distressed or struggling with their mental health (i.e. had MHQ scores in a negative range) compared to only 18% of those who rarely or never consumed ultra-processed food, a ~3-fold increase.***

**Figure 1: Change in mental wellbeing with increasing ultra-processed food consumption**

% of respondents distressed or struggling (defined as MHQ scores <0) increases with each higher frequency of ultra-processed food consumption (left) while mental wellbeing as defined by average MHQ score correspondingly decreases (right)



\* Negative scores reflect 5+ clinical level symptoms and significant impact to ability to function. >100 indicates functionally succeeding/thriving.

## 2

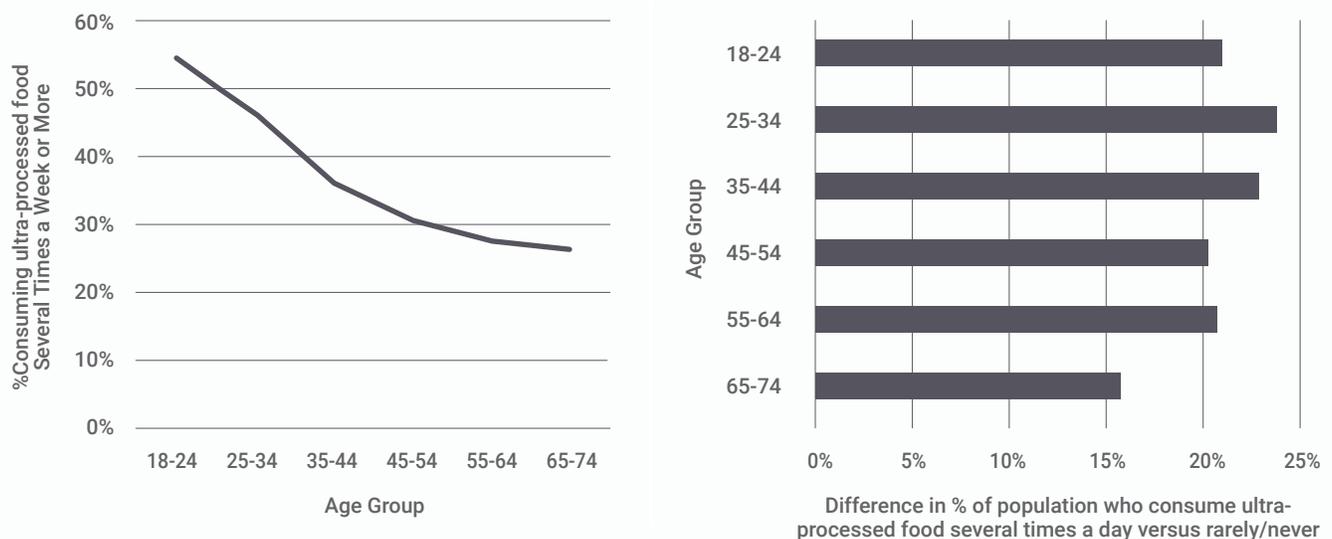
### While younger adults consume ultra-processed food more frequently, its consumption has a similar impact on all ages.

Younger age groups, who typically also have lower mental wellbeing<sup>20</sup>, are known to consume ultra-processed food more frequently<sup>18,21,22</sup>. Here we show a similar pattern, where 54% of respondents aged 18-24 reported they consumed ultra-processed food several times a week or more in contrast to only 26% of respondents aged 65-74. This raises the possibility that the overall decrease in mental wellbeing shown above is an age effect rather than a consequence of ultra-processed food consumption per se. However, the data shows that the effects cannot be fully attributed to age differences as the percentage of people distressed or struggling is 20-23% higher across all age groups 18 to 65, among those who consumed ultra-processed food several times a day compared to those who rarely or never do so. Thus at least 2/3rds of the global effect cannot be attributed to unrelated challenges in younger adults who are overrepresented in the high frequency ultra-processed group.

*The percentage distressed/struggling with their mental health among those who consume ultra-processed food several times a day compared to those who rarely or never do was consistently higher by 20-23% of the population for most age groups.*

**Figure 2: Age and ultra-processed food consumption**

Consumption of ultra-processed food across different age groups (left) and the relationship between mental wellbeing and ultra-processed food consumption across these different age groups (right)



### 3 The decline in mental wellbeing with increased frequency of ultra-processed food consumption cannot be attributed to differences in exercise or income.

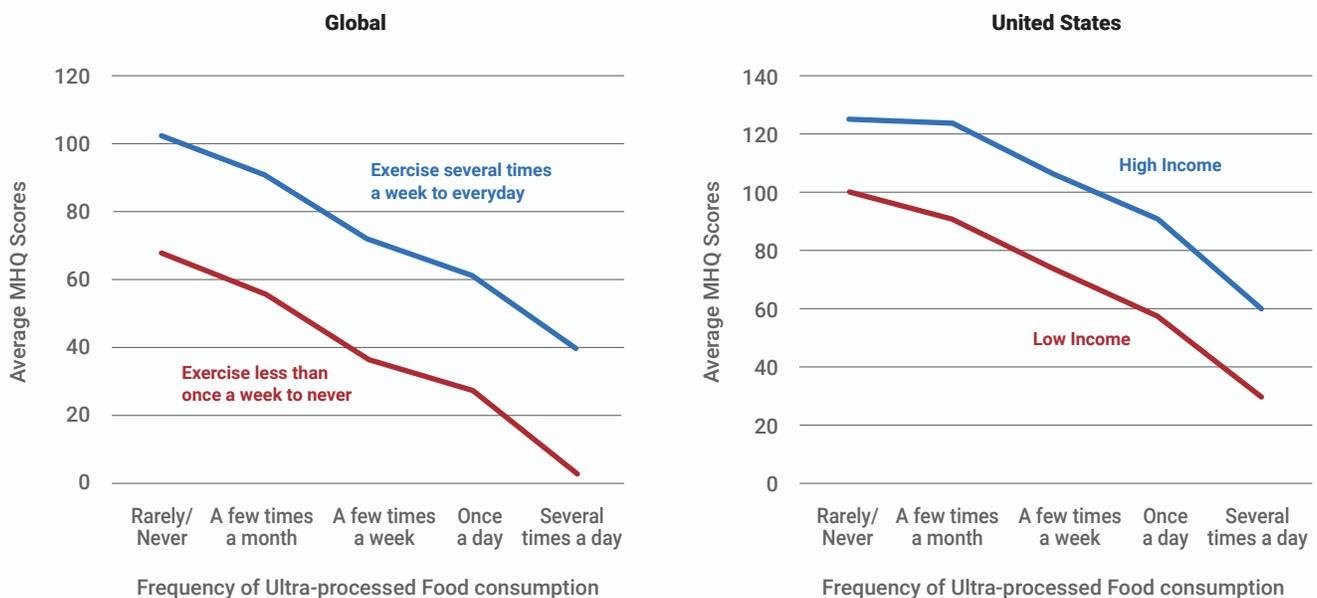
The association between ultra-processed food consumption and depressive symptoms is more significant among inactive people, which may be mediated by obesity<sup>23</sup>. This could suggest that the effects of ultra-processed food consumption are indirect, arising from differences in activity levels. However, the magnitude of the decline in mental wellbeing with increasing frequency of ultra-processed food consumption was the same for people who exercised daily and those who did not exercise at all. In addition, those who exercised daily had higher mental wellbeing at all frequencies of ultra-processed food consumption, in line with what we've previously reported<sup>24</sup>. This suggests that exercise and diet appear to have additive effects on mental wellbeing.

Similarly, in the United States, consumption of ultra-processed food is typically higher among those with lower income<sup>25</sup>, a factor associated with greater stress and mental health challenges. However, the decrease in mental wellbeing with increasing frequency of ultra-processed food consumption was the same for those with annual household income less than \$40,000 and more than \$100,000, although those with higher income had better mental wellbeing at every frequency of ultra-processed food consumption. This strengthens the evidence for a causal interpretation of the relationship between ultra-processed food consumption and mental wellbeing.

*Ruling out indirect effects of exercise and income strengthens the evidence for a causal interpretation of the relationship between ultra-processed food consumption and mental wellbeing.*

**Figure 3: Impact of ultra-processed food consumption for different levels of exercise and income**

*Relationship between MHQ scores and frequency of ultra-processed food consumption for individuals who (i) exercise several times a week (blue line) or less than once a week to never (red line) for the global sample (left) and (ii) for those who are low income (<\$40,000 annually; red line) versus high income (>\$100,000 annually; blue line) for respondents in the United States (right)*



Note: Income is only captured for select countries

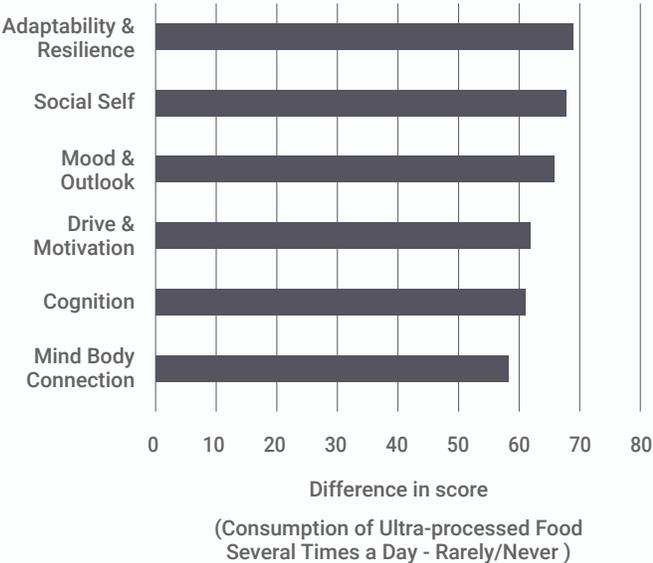
## 4 Ultra-processed food consumption has a significant impact on all dimensions of mental wellbeing.

In addition to the aggregate score for overall mental wellbeing, the MHQ also computes subscores across 6 different dimensions: Mood & Outlook, Social Self, Adaptability & Resilience, Drive & Motivation, Cognition and Mind-Body Connection. Scores for all 6 dimensions decreased significantly with increasing frequency of ultra-processed food consumption. The effects were greatest for the dimension of Adaptability & Resilience (69 point difference on the 300 point scale between consuming ultra-processed food multiple times a day vs rarely/never) followed by Social Self, Mood & Outlook, Drive & Motivation, Cognition and Mind-Body connection (58 point difference). Thus, altogether, ultra-processed food consumption appears to have a broad effect on mental wellbeing spanning multiple facets of mental feeling and functioning.

*Ultra-processed food consumption has a broad effect on people’s mental wellbeing spanning multiple dimensions of mental feeling and functioning.*

**Figure 4: Multi-dimensional impact of frequent ultra-processed food consumption**

*Difference in dimensional sub scores between those who consume ultra-processed food several times a day and those who rarely/never consume ultra-processed food*



**Adaptability & Resilience:** Your ability to shift your behaviour and outlook in response to changing circumstances and cope with the challenges and setbacks that you encounter.

**Social Self:** How you interact with, relate to and see yourself with respect to others.

**Mood and Outlook:** Your ability to manage and regulate your emotions effectively and to have a constructive or optimistic outlook for the future.

**Drive and Motivation:** Your ability to work towards achieving your desired goals and to initiate, persevere and complete activities in your daily life.

**Cognition:** Your ability to perform basic cognitive functions, make sense of complex sets of events and situations and display a longer-term perspective in your thoughts and behavior.

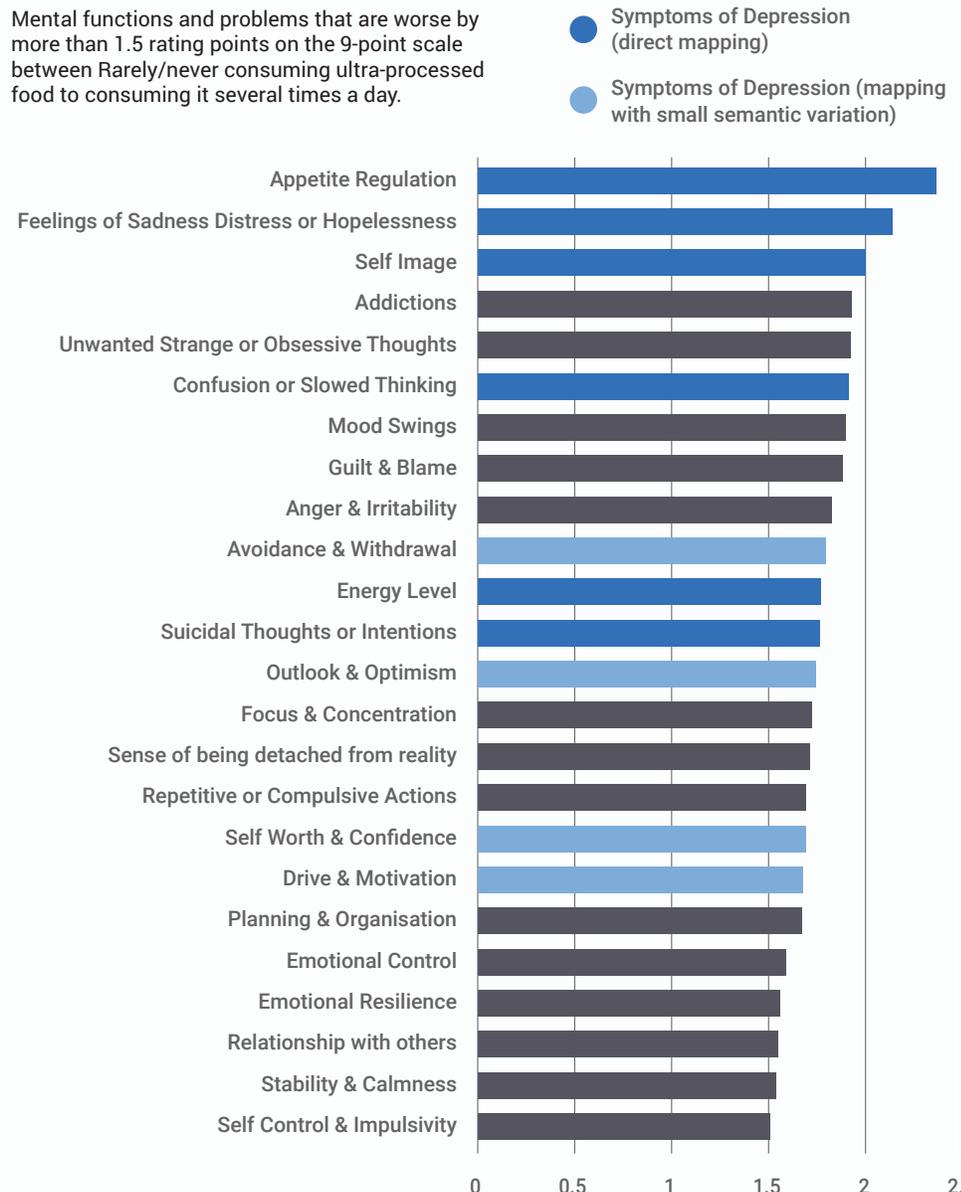
**Mind-Body Connection:** The regulation of the balance between your mind and body.

## 5 Depression symptoms and problems with cognitive and emotional control dominate with higher frequency of ultra-processed food consumption.

47 mental feelings and functions are evaluated in the MHQ on a 9-point life-impact rating scale. All 47 had significantly worse ratings with each higher frequency of ultra-processed food consumption. Among these *Appetite Regulation* followed by *Feelings of Sadness, distress or hopelessness* and *Self-image*, all three of which are symptoms of depression, had the greatest magnitude of change. In total, 24 of the 47 feelings and functions demonstrated a 1.5 point difference between daily and rare ultra-processed food consumption. These included all symptoms associated with depression as well as numerous symptoms that indicate impaired regulation and control of emotions and thoughts such as problems with *Anger & irritability*, *Emotional control*, and control of *Unwanted, strange or obsessive thoughts*. Therefore, while ultra-processed food consumption has been shown to drive dysregulation of physiological functions, it appears to also drive a broad dysregulation of mental function.

**24 of the 47 mental elements were rated on average at least 1.5 points worse with ultra-processed food consumption including all symptoms associated with depression as well as numerous symptoms that indicate impaired regulation and control of emotions and thoughts**

**Figure 5: Ultra-processed food consumption substantially impacts symptoms of depression as well as cognitive and emotional control**



Difference in ratings between respondents who consume ultra-processed food several times a day and those who rarely or never consume ultra-processed food. All differences show a worse rating of each element.

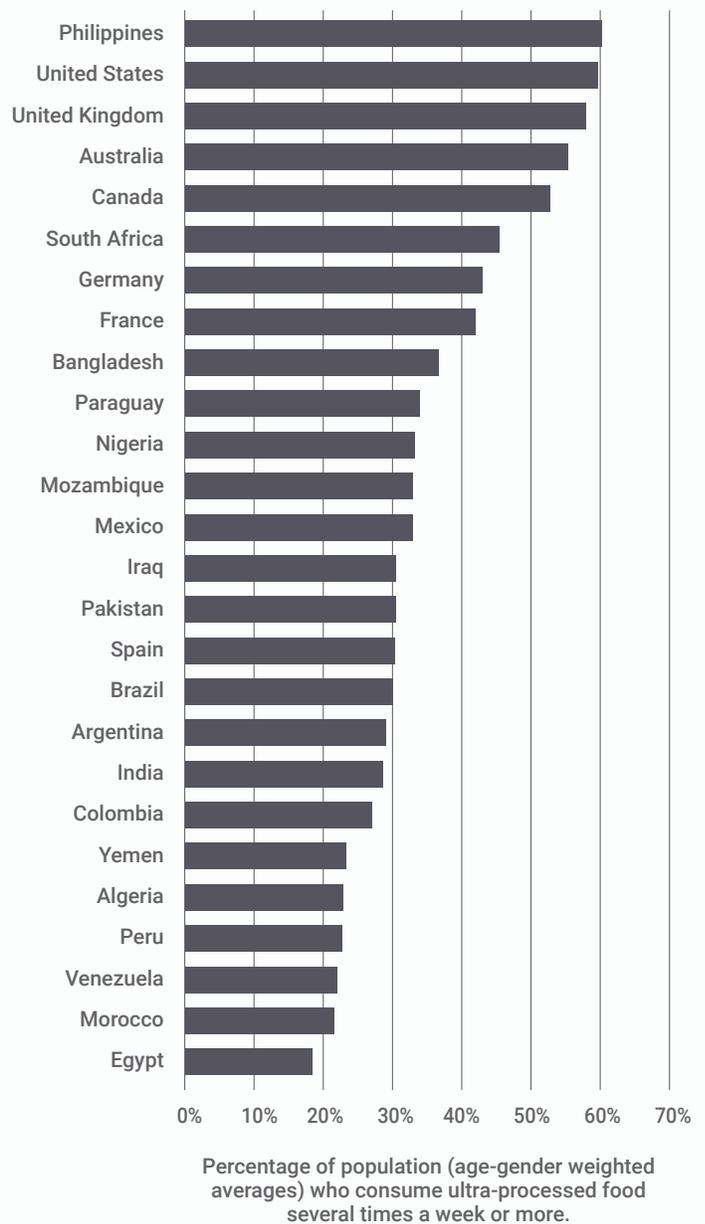
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## The United States and United Kingdom lead the world in the highest ultra-processed food consumption.

The prevalence of ultra-processed food consumption is known to vary across countries, with particularly high rates in the United States and United Kingdom<sup>1,2</sup>. In this data too, out of the 26 countries with >2000 respondents, the United States and United Kingdom ranked amongst the highest in ultra-processed food consumption, together with other countries in the core Anglosphere and the Philippines, where over 50% of respondents indicated they consumed ultra-processed food several times a week or more (computed as the population weighted average of respondents by age-gender groups). We note that the Philippines has lower levels of ultra-processed food consumption than the United States and United Kingdom at all age groups but skews younger in its population and therefore tops the list in the aggregate (see associated data tables). Conversely, Egypt, Morocco and Venezuela ranked the lowest in ultra-processed food consumption with 23% or less. We also note that several countries, such as the Philippines, have a lower Internet penetration and thus respondents do not reflect the offline population who may have lower consumption of ultra-processed food.

*The Philippines, United States and United Kingdom ranked the highest in ultra-processed food consumption out of 26 countries while Egypt, Morocco, and Venezuela ranked the lowest.*

**Figure 6: Ranking of countries by prevalence of frequent ultra-processed food consumption**



# Insights and Interpretations

This rapid report describes a strong link between mental wellbeing and the frequency of ultra-processed food consumption that is independent of age, exercise, and income. The findings also corroborate the link between depression and ultra-processed food consumption that has been shown in country specific samples in the literature<sup>9-16</sup>, and extends our understanding of symptomatic effects beyond depression to show a broad impact on emotional and cognitive regulation.

## ***A causal relationship***

While these findings are correlational in nature, the demonstration that this relationship is independent of both exercise frequency and income strengthen a causal explanation. Furthermore, when taken together with previous studies that show a decrease in depression symptoms with as little as three weeks of diet change<sup>19</sup>, there is a strong case for a causal interpretation. Altogether, in countries where over half the population consumes ultra-processed food almost daily this may drive up to a third or more of the mental health challenges.

## ***Distinct symptoms relative to early smartphone use***

We note that the feelings and functions most substantially impacted by ultra-processed food consumption are distinct from those most significantly impacted by younger age of smartphone ownership, that we have reported on [previously](#). In the case of smartphones, owning a smartphone at a young age was most strongly associated with *Suicidal thoughts*, *Self-image*, *Feelings of detachment from reality* and *Aggression towards others* in adulthood, and more so in females than males. In contrast, depression symptoms such as *Feelings of Sadness*, *distress and hopelessness* as well as *Appetite regulation* that are most strongly impacted by ultra-processed food consumption in males and females alike, were not strongly and significantly changed with early smartphone ownership. Thus, the dominant symptoms and gender patterns are distinct between the two, although frequent ultra-processed food consumption may well amplify the symptoms driven by smartphones such as *Self-Image* which is significantly changed in both cases.

## ***Understanding mechanisms by which ultra-processed food impacts mental health***

The breadth and nature of symptoms suggests that ultra-processed food may mediate a widespread physiological dysregulation or metabolic disruption of mental processes (e.g. to the microbiome or thyroid or directly to neuronal or other brain processes). However, little is known about what aspects of ultra-processed food affect the brain and how they do so. For example, the effects may arise out of

reduced nutritional quality and resulting deficiencies as well as physiological disruptions caused by various food additives and chemicals or even by the phthalates and bisphenols used as plasticizers in food packaging. This study therefore calls for more urgent attention to understanding the specific aspects of the ultra-processed food environment that impact mental health and wellbeing. Such understanding is essential in order to enable appropriate regulation of food manufacturing and marketing practices and better guidance on healthy dietary choices. We urge researchers and funding agencies to bring their attention to this important challenge.

In the meantime, this data indicates that people should take stock of how much ultra-processed food they currently consume, and take action to reduce their ultra-processed food consumption, shifting their diet towards fresh grains, meats and vegetables where possible. We also urge clinicians and public health professional to make diet a central factor in their preventative strategies for managing mental health.

# Methodology

## The Global Mind Project

The Global Mind Project acquires data from adults age 18+ from the literate Internet-enabled world through a comprehensive online self-report assessment called the MHQ. Participants are recruited through broad targeting of populations in each age-gender group across 70+ countries in 12 languages through advertising on Facebook and Google. Individuals take the MHQ for the purpose of obtaining their mental wellbeing scores along with a detailed report offering self-help guidance.

Presently, 1000-2,000 people complete the assessment each day and are added to a dynamic database. The MHQ is freely available online, is anonymous, and takes ~15 minutes to complete. In addition to the scored questions on mental feeling and function, respondents answer various demographic, lifestyle, and life experience questions.

The Global Mind Project is a public interest project that has ethics approval from the Health Media Lab Institutional Review Board (HML IRB), an independent IRB that provides assurance for the protection of human subjects in international social and behavioral research (OHRP Institutional Review Board #00001211, Federal Wide Assurance #00001102, IORG #0000850).

**The Global Mind Project database is freely available to researchers in nonprofit and government organizations for non-commercial purpose. [Access can be requested here.](#)**

## The MHQ

The MHQ is a unique comprehensive assessment of mental wellbeing comprised of 47 elements of mental feeling and function including both positive assets, as well as problems that span the symptoms of ten major disorders<sup>26</sup>.

Within the MHQ, respondents rate each of these 47 items using a 9-point life impact scale reflecting the impact on one's ability to function. For items on a spectrum from positive to negative (spectrum items such as self-image) 1 on the 9-point scale refers to *Is a real challenge and impacts my ability to function*, 9 refers to *It is a real asset to my life and my performance* and 5 refers to *Sometimes I wish it was better, but it's ok*. For items with varying degrees of problem severity (problem items such as suicidal thoughts): the 1 rating on the 9-point scale refers to *Never causes me any problems*, the 9 rating refers to *Has a constant and severe impact on my ability to function*, and the 5 rating refers to *Sometimes causes me difficulties*

*or distress but I can manage.* Respondents rate these elements based on their current perception of themselves.

The MHQ score is an aggregate score of mental wellbeing calculated from these 47 elements, and positions individuals on the spectrum from Distressed to Thriving, spanning a possible range of scores from -100 to +200. Negative scores indicate a mental wellbeing status that has significant negative impact on the ability to function (i.e. a status of distressed or struggling). It also provides sub-scores across 6 broad functional dimensions.

## **Data used in this report**

Data used in this report included all responses obtained by the Global Mind Project between January 1st and August 15th, 2023 (see associated tables for N values by age, gender and country) after the application of certain exclusion criteria described below. This resulted in a sample size of 292,783.

Data fields used in this report included 1) ratings to all 47 mental health questions 2) computed dimension scores and aggregate MHQ score and 3) responses to the following questions on frequency of ultra-processed food consumption and exercise as well as income.

***How frequently do you consume ultra-processed food*** e.g. McDonalds, Dominos, microwave meals, ultra-processed canned food, deli meats/cold cuts, noodles in a cup, packaged crisps/chips, sweets/candies, sodas/fizzy drinks.

- Several times a day
- Once a day
- A few times a week
- A few times a month
- Rarely/Never

***How regularly do you engage in physical activity (30 minutes or more)***

- Every day
- Few days a week
- Once a week
- Less than once a week
- Rarely/Never

*What is your household income? (the sum of income from all sources received by all members of the household who operate as a financial unit in a year).* [United States respondents only]

- Under \$20,000
- \$20,001-\$40,000
- \$40,001-\$60,000
- \$60,001-\$80,000
- \$80,001-\$100,000
- \$100,001-\$250,000
- More than \$250,000
- Prefer not to say

### **Data Exclusion Criteria**

Respondents who stated that they did not find the MHQ easy to understand were excluded. This exclusion criterion was applied by removing respondents who answered No to the final question in the MHQ which asks them “Did you find this assessment easy to understand?”. Also excluded were those assessments completed in under 7 minutes (the minimum time needed to read and respond to the MHQ), and those where response ratings had a standard deviation of less than 0.2, indicating that the same rating value was selected across all 47 rating items.

### **Data analysis and statistics**

Average MHQ scores, average dimensional scores, and average ratings for each of the 47 problems and mental functions assessed were computed for all respondents in each ultra-processed food response category altogether and for each age-gender group separately and overall averages were constructed as weighted averages of age-gender prevalence. These mean values as well as standard deviations, N values and *P*-values for all comparisons are shown in the associated data tables.

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**Sapien Labs is a 501(c) (3) not for profit organization founded in 2016 with a mission to understand and enable the human mind.**

The Global Mind Project seeks to understand the root causes behind recent trends of declining mental health and deliver preventative solutions. Here are some of the ways that you can support the project:



### **Researcher Hub**

Data from the **Global Mind Project** is freely available to researchers through our **Researcher Hub** and we invite broad participation in this investigation.



### **Take the MHQ**

What is your Mental Wellbeing Score? Take the **MHQ** to add your anonymous mental wellbeing profile to the database.



### **Collaborate**

We are currently seeking researchers to collaborate with us on this unique initiative. To express your interest in collaborating, email us at **[info@sapienlabs](mailto:info@sapienlabs)**.



### **Support**

Support our work to bring greater understanding of the root causes of the mental health crisis and enable preventative strategies. **[Donate now](#)**