FRUITS AND VEGETABLES: GLOBAL VALUE CHAINS EXPLAINED

BRIEFING NOTE SERIES

Briefing Note 4

Closing the consumption gap

Policy solutions to boost fruit and vegetable intake levels

Fruits and vegetables are essential for human health and well-being. People who eat plenty of fresh fruits and vegetables live longer, healthier lives, and significantly reduce the financial burden on national healthcare systems. Yet average intake levels for fruits and vegetables remain far below official recommendations in both high-and low-income countries. In this briefing note, we will provide an overview of current consumption gaps for fruits and vegetables in a number of major economies around the world. We will show how insufficient intake levels affect public health, and how poor nutrition may soon overwhelm healthcare systems. Finally, we will present a number of tools that policymakers can use to encourage consumers to eat more fruits and vegetables. By making fresh produce more available and affordable, and promoting lifelong healthy eating habits, governments can reduce pressure on public health systems and boost the productivity of the national workforce.

THE IMPORTANCE OF PLANT-RICH DIETS

Fresh fruits and vegetables are a crucial part of healthy, balanced diets, offering essential vitamins, minerals, and fiber, while also being low in calories and fat, and naturally cholesterol-free. A diet rich in vegetables and fruits can lower blood pressure, reduce the risk of heart disease and stroke, prevent some types of cancer, and lower the risk of eye and digestive problems. A higher intake of fruit and vegetables is not only associated with less weight gain and lower obesity rates, but also with lower rates of depression and anxiety across the lifespan.

Thousands of studies, spanning decades, underpin the overwhelming consensus that fruits and vegetables are essential for human health and well-being. For example:

- The more fruit and vegetables people eat, the less likely they are to die at any age. A study into the eating habits of the English population found that eating seven or more portions of fruit and vegetables a day reduces the risk of death at any point in time by 42 percent compared to eating less than one portion, and is linked to a 25 percent reduced risk of dying from cancer and a 31 percent reduced risk of dying from heart disease.[i] Meanwhile, a study in Spain established that individuals who consume five or more portions of fruits and vegetables per day lower their all-cause mortality by 30 percent, cardiovascular mortality by 35 percent, and cancer mortality by 16 percent, compared to those who consume less than one portion of fruits and vegetables per day.[ii]

- Strong evidence from World Cancer Research Fund shows that eating plenty of fiber can lower the risk of bowel cancer.[iii]

- The European Prospective Investigation into Cancer and Nutrition, a prospective cohort that includes over half a million participants from ten European countries, found that a high intake of both fruits and vegetables is associated with reduced risks of cancers in the upper gastrointestinal tract and colorectum.[iv]

- A study involving more than 45 000 over-50s living in 26 European countries found that older people who regularly consumed fruits and vegetables reduce their hospitalization risk, recording fewer hospitalizations and shorter hospital stays.[v]

- Dietary components such as fruits and vegetables may prevent and manage mental disorders by increasing beneficial gut microbiota and reducing harmful ones.[vi]

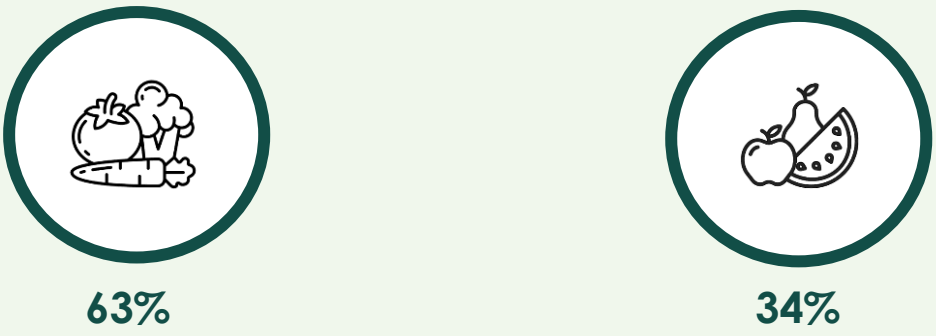
- Multiple studies demonstrate that higher fruit and vegetable intake is linked to better mental health outcomes, including fewer depressive symptoms and improved well-being. A meta-analysis of 61 studies conducted worldwide found that a high total intake of fruits and vegetables (and especially some of their specific subgroups including berries, citrus, and green leafy vegetables) may promote higher levels of optimism and self-efficacy, lower psychological distress, and protect against depressive symptoms.[vii]

The World Health Organization recommends that adults consume at least 400 g of fruits and vegetables every day to lower the risk of serious health problems. Meanwhile, the new *Nordic Nutrition Recommendations*, issued by the Nordic Council of Ministers in 2023, contain scientific recommendations on a diet that is good not only for our health, but also for the environment. In the new edition, the recommendation is to favor a predominantly plant-based diet rich in fruits and vegetables, and cut down on red meat. The Council recommends eating between 500 g and 800 g or more of a variety of fruits and vegetables per day to lower the risk of chronic illnesses like cardiovascular disease and type II diabetes, and reduce environmental impacts. The Global Burden of Disease Study sets optimal intake ranges of 340–350 g/day for fruit and 306–372 g/day for vegetables to achieve the lowest risk of adverse health outcomes.[viii]

Despite these clear messages, intake levels for fruits and vegetables remain far below official recommendations in both high-and low-income countries.

The global average intake of fruits and vegetables in 2021 is estimated at 144 g/day and 213 g/day, respectively, accounting for only 34 percent and 63 percent of the optimal levels, respectively, based on the midpoint of the optimal ranges. Intake levels are suboptimal in all geographical regions, with the exception of vegetable intake in East Asia and Central Asia.[ix]

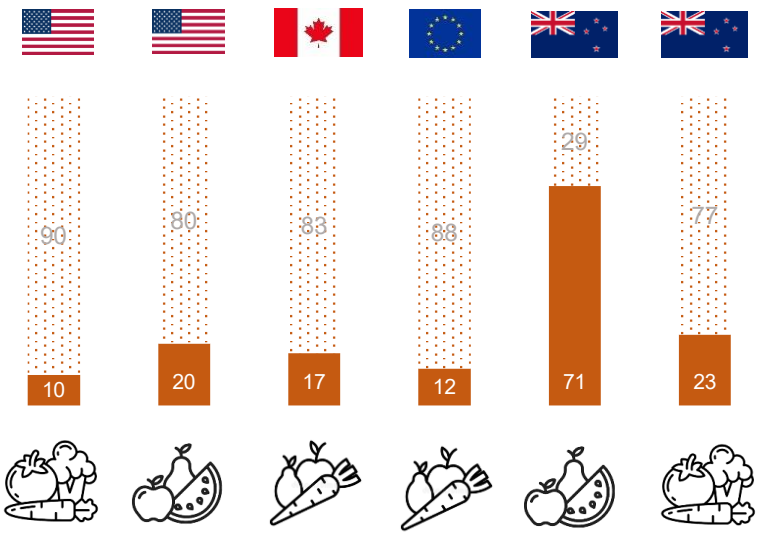
Share of the global population consuming recommended levels of vegetables and fruit



Source: Global Burden of Disease Study 2021.[ix]

It is estimated that 90 percent of the US population does not meet national intake recommendations for vegetables, and that 80 percent does not meet the recommendations for fruits.[x] Meanwhile, the proportion of the Canadian population whose fruit and vegetable consumption was below recommended levels increased from 83 percent in 2015 to 90 percent in 2021.[xi] In Europe, it is estimated that 88 percent of the population fails to consume the recommended five portions daily, with a third of the population failing to consume even one portion of fruit or vegetables daily (numbers for 2019).[xii] EU citizens consumed an average of 351 grams of fruit and vegetables per person per day in 2023, well below recommended intake levels.[xiii] Sixty percent of New Zealanders fail to consume their recommended five or more portions of fruit and vegetables per day. Twenty-nine percent consumes less than the recommended two servings of fruit per day, while 77 percent consume less than the recommended five or more servings of vegetables per day.[xiv]

Share of the population of selected countries consuming the recommended levels of fruit and vegetables



Source: USDA, 2023; [x] CPMA,2023;[xi] Eurostat, 2022;[xii] European Commission, n.d.;[xiii] IQNielsen, 2024;[xiv]

What is especially worrying is that global diets have seen little to no improvement over the past decades. According to the *Global Nutrition Report*, global fruit intake levels were 58 percent below recommended levels in 2010 and 60 percent in 2018, while vegetable intake levels were 43 percent below recommended levels in 2010 and 40 percent in 2018. Intakes of whole grains, and of fruit and vegetables, both critical components of healthy diets, increased by a mere 2 percent globally between 2010 and 2018. Meanwhile, intake levels of most foods associated with negative health impacts increased more noticeably, such as red meat and processed meat (up 3 percent) and sugary drinks (up 4 percent).[xv]

In some developed nations, consumption is actually on the decline. Estimates by the United States Department of Agriculture show that average fruit intake levels in the country fell by 14 percent from 2003 to 2021.[xvi] Similarly, average intake levels for vegetables decreased by 14 percent from 2004 until 2022.[xvii] Freshfel Europe's Consumption Monitor shows that average fruit and vegetable consumption in the European Union decreased to 350 g per day in 2022, a 5 percent decline from 2021 and almost 3 percent below the average of the previous five years.

Today's diets are associated with a large and increasing health burden.

It is estimated that globally, 26 percent of all avoidable deaths (deaths that are either preventable or treatable for those aged under 75 years) are attributable to poor diet—more than any other risk factor, including tobacco use and high blood pressure.[xix] Avoidable mortality is primarily driven by preventable conditions like cardiovascular disease, cancers, and diabetes. A poor diet, and specifically one lacking fruits and vegetables, is a major contributing risk factor for these premature deaths. Out of a worldwide total of 12 million diet-related avoidable deaths in 2018, an estimated 4.5 million were attributable to inadequate fruit and vegetable consumption (2.8 million deaths were due to low intake of fruits, and 1.7 million were due to low intake of vegetables). This marks a noticeable increase from 2010, when 3.9 million deaths were due to low fruit and vegetable intake. Although the share of premature deaths attributed to various dietary risks differ by region, insufficient intake of fruits and vegetables stands out as a leading cause of premature mortality across *all* regions.[xx]

It is estimated that cardiovascular diseases account for 84 percent and 80 percent of mortality due to suboptimal fruit and vegetable intakes, respectively.[xxi] Insufficient intake of fruit and vegetables is estimated to cause around 14 percent of deaths from gastro-intestinal cancer worldwide, 11 percent of those due to ischemic heart disease and 9 percent of those caused by stroke.[xxii] In addition, low fruit consumption is one of the three main dietary risk factors contributing to the burden of diabetes.[xxiii]

26% (12 million)
of all avoidable deaths are attributable to **poor diet**

10% (4.5 million)
of all avoidable deaths are attributed to **insufficient intake of fruit and vegetables**

USD 11 trillion
costs to human health attributable to **unhealthy diets**

Source: Development Initiatives, 2021[xix]; World Economic Forum, 2022[xxiv]

The crisis of diet-related disease has grown to an unprecedented scale, making it one of the leading global threats to healthcare capacity. Without a significant global shift towards better nutrition, people suffering from diseases caused or accelerated by poor nutrition will soon overwhelm healthcare systems. According to a recent publication by the World Economic Forum, unhealthy diets cause USD 11 trillion in costs to human health globally, every year. These astronomical costs stem from the ongoing management of lifelong chronic illnesses due to poor diets, rather than providing preventative care.[xxiv]

Promoting fruit and vegetable-rich diets can significantly ease the burden on healthcare systems by lowering the costs of managing chronic diseases and reducing hospitalization rates. It also boosts national productivity and strengthens the workforce by reducing workplace absenteeism, improving mental focus, and extending the working lifespan of citizens.

Consuming a diet high in fruits and vegetables is associated with a decreased risk for chronic conditions such as diabetes, hypertension, heart disease, and cancer. By adopting such a plant-rich diet, an individual can save thousands of dollars on health care over the course of a lifetime. It has been estimated that in the United States of America, a person with three to four chronic diseases will spend 25 000 USD annually on health care expenses, while individuals without any chronic diseases will spend 6 000 USD annually.[xxv]

These individual savings are reflected at the national level. In Canada, research has shown that over three quarters of the population do not meet the recommended daily servings of fruits and vegetables, leading to an annual economic burden attributable to inadequate fresh produce consumption of CAD 4.39 billion. If Canadians improved their diets by eating just 1 percent more fruits and vegetables annually, the cumulative reduction of the economic burden between 2013 and 2036 could reach CAD 8.4 billion.[xxvi] Meanwhile, an Australian study established that by lifting vegetable consumption by just one serving per person per day by 2030, there is potential to save 1.4 billion AUD in healthcare costs due to a reduction in the dietary-linked disease burden over time.[xxvii]

Promoting plant-rich diets not only reduces the burden on stretched healthcare systems; it also boosts workforce productivity. Employees who consume a healthy, plant-rich diet are less likely to call in sick for work due to illness or chronic disease. They are also more productive, as the nutrients and vitamins in fruits and vegetables support cognitive function, memory, and concentration,[xxviii] and the complex carbohydrates and fiber in produce ensure steady energy levels, avoiding blood sugar spikes and crashes.[xxix] In addition, a higher intake of fruits and vegetables is associated with improved mental health and well-being, thereby impacting workers' ability to realize their potential, work productively, and cope with daily life and work tasks. The vitamins in fruits and vegetables help regulate cortisol, lowering workplace anxiety and stress-induced burnout. And the consumption of fruits and vegetables stimulates the production of neurotransmitters like serotonin, boosting job satisfaction, work engagement, and teamwork.[xxx] Finally, a healthy workforce remains economically active for a much longer period, lessening financial strain on national health systems and ensuring generational knowledge transfer.[xxxi]

Transformation to healthy diets by 2050 will require substantial dietary shifts. Global consumption of fruits, vegetables, nuts and legumes will have to double, and consumption of foods such as red meat and sugar will have to be reduced by more than 50 percent.

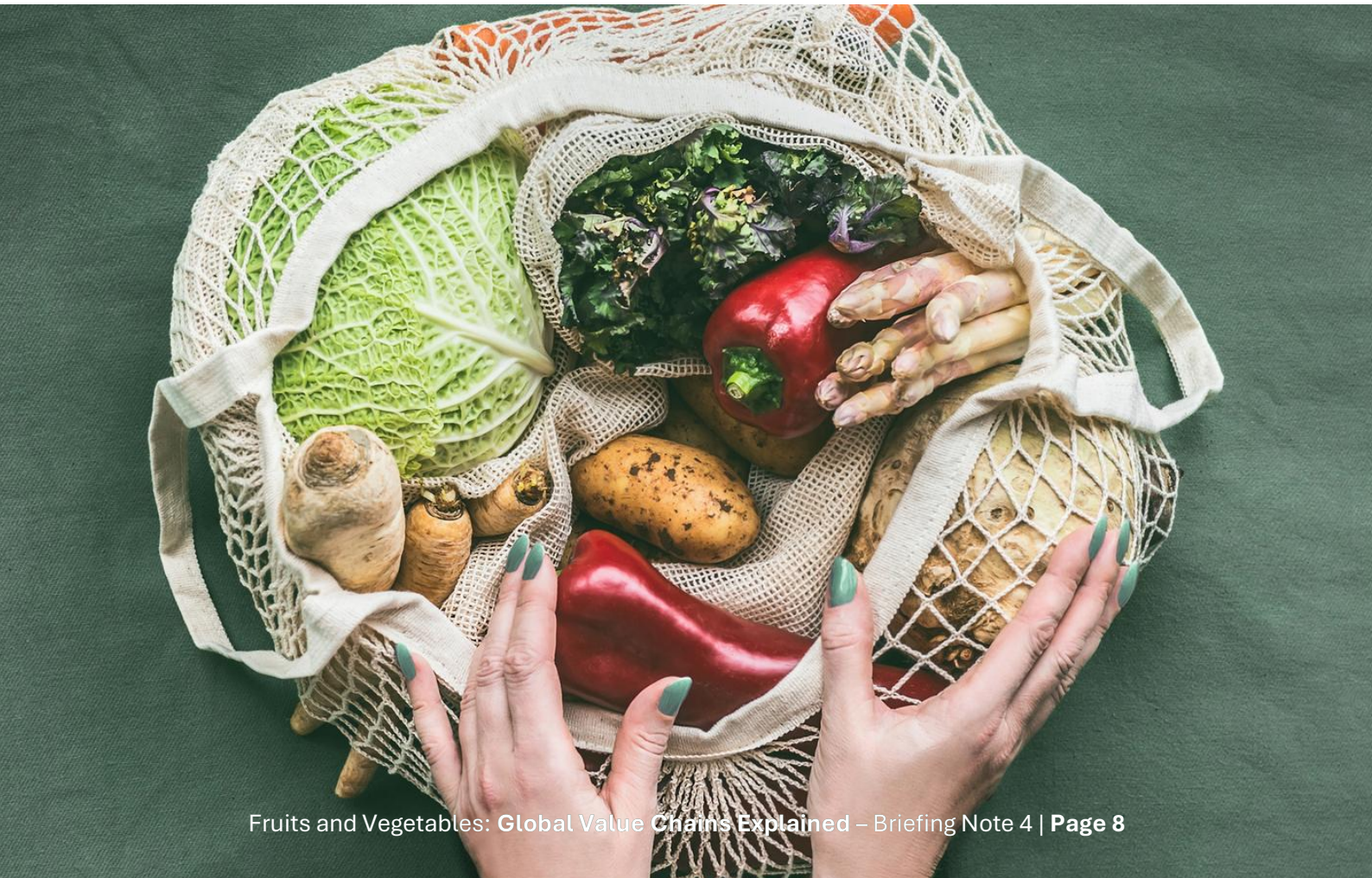
EAT Lancet Report, 2025[xxxii]

A landmark study of nearly 20 000 American workers conducted in 2012 found that employees with unhealthy diets were 66 percent more likely to report a loss in productivity than those who regularly ate whole grains, fruits, and vegetables.[xxxiii]

66%

1/2

The findings of recent studies into the affordability of fruits and vegetables run counter to the general belief that a healthy diet must be expensive. Researchers from The Miriam Hospital and the Rhode Island Community Food Bank found that individuals who followed simple, plant-rich recipes (incorporating olive oil, whole grain pasta, brown rice, and fruits and vegetables) decreased their total food spending by more than half, purchased healthier food items and improved their food security—in addition to decreasing their body mass index.[xxxiv] Meanwhile, a study by the US Department of Agriculture found that the average price per serving of healthy fruits and vegetables was less than that of unhealthy options for both snacks and side dishes, concluding that it is possible, even for low-income families, to meet the government's nutritional recommendations.[xxxv,xxxvi]



POLICY RECOMMENDATIONS

Governments can support national health goals by making fresh produce more affordable and accessible for consumers, using subsidies and voucher programs to lower costs. In addition, they can increase the desirability of fruits and vegetables through various initiatives, including public campaigns to educate on health benefits, and school meal programs to improve accessibility and encourage children to adopt healthy eating habits. Such investments pay off in the form of the acquisition of lifelong healthy eating habits, reducing pressure on public health systems and boosting the productivity of the national workforce.

1 Make fruits and vegetables more affordable through **subsidy and taxation tools**, and through **produce prescription programs**.

2 Shape **school food environments** to promote healthier diets by **providing fresh fruits and vegetables to students**, **setting and enforcing nutrition standards for school food**, and developing and implementing **nutritional education campaigns in schools**.

3 Formulate and implement policy measures that **improve the accessibility and desirability of fruits and vegetables in various food environments**, including in retail outlets, the workplace, and public settings.

4 Incorporate **precise recommendations regarding fruit and vegetable intake** in national dietary guidelines.

5 Develop and roll out effective **educational and information campaigns** highlighting the importance of fruits and vegetables as part of a healthy diet.

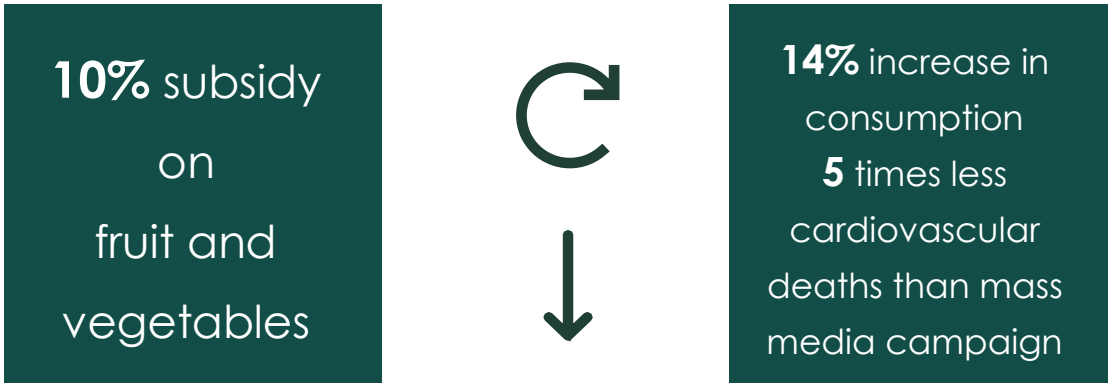
1 Making fruits and vegetables more affordable: subsidy and tax measures

Governments can improve the affordability of a healthy diet rich in fruit and vegetables through a range of economic tools, including targeted subsidies and taxes. Such measures have been found to be highly effective at increasing fruit and vegetable consumption, thereby improving dietary quality and lowering healthcare costs.

There is ample evidence that fruit and vegetable consumption would increase if governments subsidized it.[xxxvii] According to the World Health Organization, targeted subsidies on fruit and vegetables are one of the policy options with the "greatest potential to induce positive changes in consumption".

Evidence shows that subsidies for fresh fruits and vegetables that reduce prices are highly effective at driving up fresh produce intake levels:

- A study in high-income countries and South Africa found that subsidies that resulted in a 10 percent decrease in the price of fruits and vegetables were associated with a 14 percent increase in fresh produce consumption.[xxxviii]
- A study by the US National Institutes of Health published in 2017 argued that a 10 percent produce subsidy would prevent or delay over five times more cardiovascular deaths than a mass media campaign to promote healthy eating, or a 10 percent soda tax.[xxxix]
- In England, a 10 percent universal subsidy on fruit and vegetables was found to increase per capita consumption by 0.25 portions, thereby preventing or postponing 2 595 deaths—more than three times more than a nation-wide social media campaign promoting fruit and vegetables.[xl]
- Research in the United States has estimated that an incentive program offering 30 percent off the cost of fruit and vegetables over a lifetime would increase consumption by 0.4 servings a day while preventing approximately 1.93 million cardiovascular diseases and saving USD 39.7 billion in healthcare costs.[xli]
- Researchers at the University of Warwick recently argued for a subsidy for fruit and vegetables of 25 percent to increase consumption and make diets healthier. The annual costs of this subsidy are estimated at less than one tenth of the costs of obesity to wider society.



One of the most tax-efficient ways to subsidize fruits and vegetables is to lower the value added tax (VAT). Recently, an Environmental Change Institute/Oxford Martin School-led team of researchers reported that setting VAT rates based on health and environmental considerations can help people choose healthier and more sustainable diets by making them more affordable. The researchers, who collected data from the United Kingdom and the European Union, found that levying full VAT rates on meat and dairy, and zero-rating fruits and vegetables would improve dietary health, environmental impacts, and government revenues. Zero-rating fruits and vegetables would increase intake by about a portion per week on average, reducing cases of diet-related diseases such as heart disease, stroke, cancer, and diabetes. This would result in 170 000 less deaths in total across the United Kingdom and the European Union, or 330 per million people per year. The study also found that the new diets were similarly affordable to consumers, who are expected to replace some higher priced meat and dairy with lower-priced fruits and vegetables. At the same time, the shift in tax base would generate additional revenues (of USD 45 billion in total, or 0.2% of GDP) that governments could use elsewhere.

Recent studies have demonstrated that fiscal policies that combine taxation and subsidy measures have the largest health and economic impacts. For example, policies combining subsidies on fruit and vegetables and taxation of “unhealthy” foods high in fat, sugar, and salt have been shown to have

greater effects on dietary health than subsidies that reduce prices alone. A recent study in Chile found that increased taxes on sweet and salty foods and on sugar-sweetened beverages, combined with excluding fruits and vegetables from value added tax, increased household purchases of fresh produce by over 5 kilograms per month.[xlii] Fiscal policies combining taxation and subsidy measures have also been found to have a larger impact on national health care spending than policies focusing on a single strategy. A recent study in Canada examined three taxation and subsidy scenarios: a CAD 0.75/100 g tax on sugar-sweetened beverages; a CAD 0.75/100 g tax on free sugar in all foods; and a 20 percent subsidy on fruits and vegetables. It found that combining the second and third scenarios would lead to the largest health and economic benefits, saving CAD 150 million and 442 million in health care costs, respectively, over a lifetime.

Produce prescription programs are a novel "food is medicine" approach whereby healthcare providers "prescribe" free or heavily subsidized fresh fruits and vegetables to patients with diet-related chronic health conditions. These programs treat healthy food as a medical intervention to lower blood pressure, improve body mass index, and reduce overall healthcare costs—fundamentally shifting the focus from simply treating diseases with pharmaceuticals to addressing the root causes of ill-health. Evidence reveals consistent positive outcomes of produce prescription programs, in terms of increased produce consumption, improved cardiometabolic markers, better weight management, and increased food security.[xliii] For example, an evaluation of a US program providing USD 1 coupons for physician-written produce prescriptions found significant increases in fruit and vegetables consumption among participating patients, as well as reductions in body mass index.[xliv]

"Alternative" healthcare approaches promoting healthy eating are estimated to be as or more cost-effective than many currently covered medical interventions, such as drug treatments. According to a study by the Friedman School of Nutrition Science and Policy at Tufts University, implementing monthly produce prescription programs for people with diabetes could reduce healthcare spending in the United States of America by USD 40 billion (in addition to a reduction of USD 4.8 billion in costs of lost productivity)—on par with other "best buys" in health care, like blood pressure, cholesterol, and cancer screening and control.

2 School-based interventions to increase fruit and vegetable intake

Because children spend a significant portion of their day at school, the school environment sets the standard for dietary habits. A healthy school food environment allows and encourages the entire school community, including children, their families, and school staff, to make healthy food choices and establish healthy habits that will last a lifetime.

Governments can shape school food environments to promote healthier diets in various ways, including providing fresh fruits and vegetables to students, setting and enforcing nutrition standards for school food, and developing and implementing nutritional education campaigns in schools. Research has found consistent evidence in support of multi-component interventions in schools, combining initiatives related to both diet and physical activity, specialized educational curricula, and the provision of fruits and vegetables to schoolchildren.[xlv]

Improving the accessibility of fruits and vegetables in schools has a noticeable positive impact on children's overall wellbeing, concentration levels, and academic outcomes. The micronutrients and polyphenols in fruits and vegetables help support brain function and focus, providing a steady natural energy boost.[xlvi] In addition, gut microbiota health—heavily influenced by the dietary fiber provided by fruits and vegetables—plays an important role in a child's mood regulation and learning capability.

Governments should set clear nutritional guidelines for healthy school meals, setting specific nutritional standards and limiting unhealthy options (such as those high in sugar, fat, and sodium) to improve the nutritional quality and adequacy of school meals.

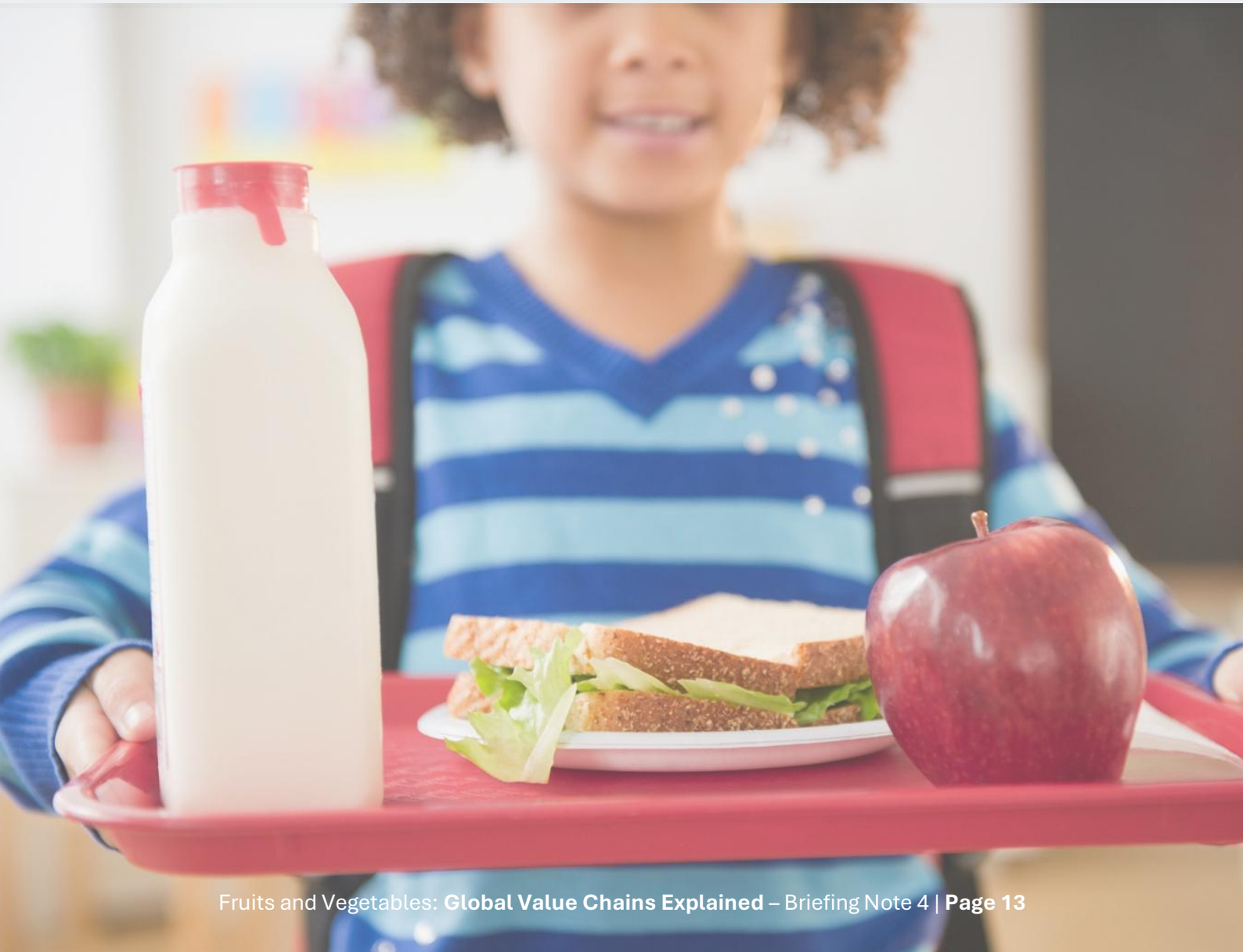
Schools should be an important part of awareness campaigns. Nutritional messages should encourage children to adopt healthy eating habits early in life. Teachers should also act as role models. Studies have demonstrated that teachers' positive health behavior is associated with higher fruit and vegetables intake and nutrition knowledge in children.[xlvii]

School-based food interventions have been found to result in significant increases in the intake of fresh produce servings among schoolchildren:

- A systematic review of 91 school food interventions in North America, Europe, and New Zealand found that the direct provisioning of fruits and vegetables in schools resulted in an overall increase in children's produce intake of 0.28 servings/day, while school meal standards focusing on the nutritional quality of school lunches, increased fruit intake by 0.76 servings/day.[xlviii]
- It is estimated that in the United States of America, every dollar spent on healthy school meals generates nearly two dollars in human health and economic benefits.[xlix]
- In its European Food and Nutrition Action Plan 2015–2020, the World Health Organization recommends the extension of existing school fruit schemes to more schools and encourages an increase in the amount or frequency of vegetables and fruits provided.[l]
- In the United States of America, the Brighter Bites school programs significantly increase children's fruit and vegetable intake by combining weekly produce distributions with nutrition education and recipe tastings. Evaluations show that this model drastically boosts healthy snacking at home, decreases added sugar consumption, and creates lasting, multi-year improvements in family eating habits.[li]

The impacts of school-based interventions to boost fruit and vegetable intake extend beyond the school grounds. Children are an important link between school, home, and community. Evidence has shown that school-based programs not only help children eat more fruits and vegetables when on campus but also promote the adoption of healthy eating habits at home, improving diets for the entire family.[lii]

In New Zealand, the *Fruit in Schools* program is funded by Te Whatu Ora or Health New Zealand and implemented by United Fresh NZ. The program provides daily fresh fruit and vegetables to children in 565 schools in low socio-economic areas across the country. A 2023 evaluation of the initiative found that it is highly effective at supporting a healthy school environment and healthy behaviors. Fruit in Schools not only allows schools feed hungry children with healthy food; it is also considered as the most effective tool to help schools promote healthy eating. The 5+ A Day resources that are made available to support the Fruit in Schools program are the most commonly used instruments to teach about healthy eating and nutrition in the schools covered by the program, and are widely regarded as extremely valuable. An important benefit of Fruit of Schools is that it supports families with the high cost of living and relieves stress as parents are confident that children get fruit every day at school. Overall, Fruit in Schools is widely regarded by principals as a vital initiative that has a positive impact on engagement, learning, and physical wellbeing. Principals' fear that without the program, children would go hungry or default to unhealthy, highly processed food, is very real. Nearly all principals interviewed in the framework of the evaluation indicated that without the program, many of the children would eat little or no fruit. Interestingly, Fruit in Schools has positive impacts for children at home too, with children consuming more fruit at home because of the program—and encouraging family members to eat more fresh produce as well.[I]



3 Improving the accessibility and desirability of fruits and vegetables in other food environments

In addition to schools, governments should formulate and implement policy measures that improve the accessibility and desirability of fruits and vegetables in various food environments, including in retail outlets, the workplace, and public settings.

Government interventions can directly influence decisions made by retailers about location, product selection, prices, and in-shop promotions, all of which significantly affect the accessibility, desirability, and affordability of fruits and vegetables, particularly in low-income areas. Evidence from a range of countries shows that in-store marketing (e.g. posters near produce or at checkout) and strategic product placement (e.g. in kiosks or high-traffic areas) can substantially increase sales, as can the combination of nutritional messaging with price reductions.[liii]

Workplaces are other sites that may be used to change awareness and encourage the adoption of healthy eating habits. Workplace programs to boost fruit intake rely on increasing daily access, convenience, and visibility. Such actions are growing in number and scope around the world as employers realize that they contribute to increased productivity and reduced absenteeism. There is a growing body of evidence supporting the efficacy of these workplace approaches, and especially fruit and vegetable interventions, in promoting healthy diets. For example, research shows that simply making at least one piece of fruit freely available per employee per day increases total consumption while decreasing the intake of added sugars.[liv] Interventions focusing on more than one level of influence, including individual workers, their social networks, and the food environment, have been shown to lead to the largest increase of fruit and vegetable intake amongst workers.[lv] Governments can contribute to public health goals by encouraging employers, through tax breaks, grants, or other financial incentives, to provide fruits and vegetables in the workplace.

Through its wide reach, healthy public food procurement and provision has enormous potential to shape eating habits and shift demand towards healthier diets (World Health Organization, 2022).[lvi]

Public settings such as government offices, hospitals, nursing homes, and canteens or kiosks in other public buildings, can play a key role in ensuring people are provided with nutritious, safe and healthy food. By setting nutrition-based criteria for foods that are served or sold in such settings and for food purchased with government funds, governments can effectively drive fruit and vegetable consumption for vulnerable populations and employees alike. The full potential of healthy public food procurement and provision is not yet being realized. Although a significant number of countries are implementing food procurement policies for schools, there is little action in other settings. Public procurement across the board should be redirected towards the delivery of healthy, plant-rich diets.[lvii]

4 National dietary guidelines

Many countries have developed public dietary guidelines to establish a scientific basis for public food and nutrition, health, and agricultural policies, and nutrition education programs aimed at fostering healthy eating habits and lifestyles. They provide advice on foods, food groups and dietary patterns to provide the required nutrients to the general public to promote overall health and prevent chronic diseases.[lviii]

While many countries follow the World Health Organization's recommendation of consuming 400 grams of fruits and vegetables per day, national dietary guidelines show great variations based on culture, resources available, specific dietary and public health challenges, and more. One thing that is consistent in every country is the inclusion of daily intake of fruits and vegetables.

Policymakers should incorporate precise recommendations regarding fruit and vegetable intake in these guidelines, including for children. Furthermore, adequate financing is needed to design, implement, and monitor regulations, policies, and programs based on the content of public dietary guidelines. Additional technical guidance often needs to be provided to facilitate their thorough implementation and monitoring.[lix]

5 Educational and information campaigns

While almost all countries make dietary recommendations that include fruit and vegetables, most consumers eat far less fruit and vegetables than the recommended amounts. One of the factors that explain why people do not eat enough fruits and vegetables is a lack of awareness of their value for health and nutrition. Thus, there is an urgent need for effective educational and information campaigns highlighting the importance of fruits and vegetables as part of a healthy diet, thus making fresh produce more desirable.

Currently, national campaigns typically promote the consumption of a certain number of fruits and vegetables a day, such as "5 a day" or "6 a day". Evidence has demonstrated that such interventions can be effective in boosting consumption, with evaluations in the United Kingdom, Australia, the United States of America, and Chile all showing that awareness campaigns increase people's average daily number of servings of fruit and vegetables. For example, the "Five-A-Day" campaign in England is estimated to have increased consumption of fruit and vegetables by approximately 7 percent over the first three years of its implementation.[lx] Consumer research has found that the most effective of these messages appeal to mothers' emotional need to be "responsible". Furthermore, studies have concluded that sustained, focused media and educational campaigns using multiple channels focused on increasing the consumption of fruits and vegetables are likely to be more effective.[lxi]

STRENGTHENING FRESH PRODUCE SUPPLY CHAINS TO IMPROVE AFFORDABILITY AND ACCESS

An efficient and resilient fresh produce supply chain is one of the most powerful, yet often overlooked, tools for increasing fruit and vegetable consumption. Unlike most food products, fresh fruits and vegetables are highly perishable and sensitive to delays, infrastructure constraints, transportation disruptions, and regulatory inefficiencies. Every unnecessary cost added between farm and consumer ultimately affects product availability and affordability.

Global fresh produce value chains play an essential role in ensuring year-round access to a diverse and affordable supply of fruits and vegetables. Through trade and integrated supply networks, consumers can access fresh produce regardless of local growing seasons, weather disruptions, or regional production limitations. Efficient supply chains therefore contribute directly to food security, nutritional security, and dietary diversity.

Investments that improve supply chain performance can help reduce food loss and waste, stabilize prices, increase product availability, and expand consumer access to fresh produce, particularly in underserved communities. Governments can support these outcomes by:

- investing and or enabling growth in transportation, warehousing, and cold chain infrastructure to reduce spoilage and improve distribution efficiency;
- modernizing inspection and border clearance procedures to reduce delays for perishable products;
- encouraging the adoption of digital tools that improve inventory management, traceability, and supply chain visibility;
- supporting regulatory harmonization that facilitates the movement of fresh produce across jurisdictions while maintaining food safety standards;
- promoting public-private collaboration to identify bottlenecks and improve supply chain resilience; and
- ensuring policies affecting labour, transportation, energy, and trade consider their impact on fresh produce affordability and accessibility.

Even modest improvements in supply chain efficiency can have significant impacts on consumer prices and product availability. Lower costs throughout the supply chain help make fruits and vegetables more affordable for consumers while reducing food loss, strengthening grower returns, improving retailer performance, and increasing overall consumption.

Efficient supply chains = more affordable produce

Improving transportation, logistics, cold chain capacity, and regulatory efficiency can:

- reduce food loss and waste;
- improve year-round availability;
- lower consumer prices;
- increase access in rural and remote communities;
- strengthen food security and nutritional outcomes; and
- support increased fruit and vegetable consumption.

Insufficient intake levels of fruits and vegetables are directly linked to the global epidemic of chronic diseases. By making fresh produce more available and affordable, and promoting lifelong healthy eating habits, governments can reduce pressure on public health systems and boost the productivity of the workforce.

Any single initiative aimed at boosting fresh produce intake—through tax breaks or subsidies, by providing consumers with fruits and vegetables in public settings or in the workplace, educating the public about their health benefits, or improving supply chain efficiency—is insufficient on its own to achieve a lasting change in fresh produce consumption. It is important to include each instrument in a comprehensive set of policies and programs to improve health, nutrition, and food environments.

The Global Coalition of Fresh Produce calls for continued action, collaboration, and knowledge sharing between the global fresh fruit and vegetable industry, policymakers, and other stakeholders to identify gaps in current efforts, develop strategies for improvement, and leverage our products' beneficial attributes for society and the environment. To join us on our journey, visit our website at www.producecoalition.net or contact us at info@producecoalition.net.

[i] **University College London.** 2014. New evidence linking fruit and vegetable consumption with lower mortality. *ScienceDaily*, 1 April. https://www.sciencedaily.com/releases/2014/03/140331194030.htm

[ii] **Martínez-Castañeiras, P., Ortiz, C., Fernandez de Larrea-Baz, N. *et al.*** 2025. Intake of fruit, vegetables and pulses, and all-cause, cardiovascular and cancer mortality: Results from a population-based prospective study. *Public Health*, 239: 169–178. https://doi.org/10.1016/j.puhe.2024.12.014

[iii] **World Cancer Research Fund.** 2026. Bowel cancer. In: *Preventing cancer*. [Online]. London. https://www.wcrf.org/preventing-cancer/cancer-types/bowel-cancer/

[iv] **Bradbury, K.E., Appleby, P.N. & Key, T.J.** 2014. Fruit, vegetable, and fiber intake in relation to cancer risk: findings from the European Prospective Investigation into Cancer and Nutrition (EPIC). *The American Journal of Clinical Nutrition*, 100(1): 394S–398S. https://doi.org/10.3945/ajc.n.113.071357

[v] **Palmer, N.** 2025. Fruit and veg keep older people out of hospital, and could save governments billions. In: *News*. [Online]. London, Brunel, University of London. https://www.brunel.ac.uk/news-and-events/news/articles/Fruit-and-veg-keep-older-people-out-of-hospital-and-could-save-governments-billions#:~:text=Dr%20Tabaghdehi%20strongly%20believes%20that,Discover%20Social%20Science%20and%20Health

[vi] **Xiong, R.G., Li, J., Cheng, J. *et al*.** 2023. The Role of Gut Microbiota in Anxiety, Depression, and Other Mental Disorders as Well as the Protective Effects of Dietary Components. *Nutrients*, 15(14): 3258. https://pubmed.ncbi.nlm.nih.gov/37513676/

[vii] **Głąbska, D., Guzek, D., Groele, B. *et al*.** 2020. Fruit and vegetable intake and mental health in adults: A systematic review. *Nutrients,* 12(1): 115. https://pubmed.ncbi.nlm.nih.gov/31906271/

[viii] **Xu, X., Yan, P., Chen, W. *et al.*** 2025. The global burden of disease attributable to suboptimal fruit and vegetable intake, 1990–2021: a systematic analysis of the global burden of disease study. *BMC Med*icine, 23:456. https://doi.org/10.1186/s12916-025-04275-9

[ix] **Xu, X., Yan, P., Chen, W. *et al.*** 2025. The global burden of disease attributable to suboptimal fruit and vegetable intake, 1990–2021: a systematic analysis of the global burden of disease study. *BMC Med*icine, 23:456. https://doi.org/10.1186/s12916-025-04275-9

[x] **Stewart, H., Hyman, J. & Young, S.** 2024. *Satisfying Fruit and Vegetable Recommendations Possible for Under $3 a Day, Data Analysis Shows*. Amber Waves. Washington D.C., United States Department of Agriculture, Economic Research Service. https://www.ers.usda.gov/amber-waves/2024/september/satisfying-fruit-and-vegetable-recommendations-possible-for-under-3-a-day-data-analysis-shows

[xi] **Canadian Produce Marketing Association.** 2022. *The Economic Burden Attributable to Low Fruit and Vegetable Consumption in Canada*. Ottawa. https://cpma.ca/media/3y2nspdc/cpma_kruger_economic-burden.pdf

[xii] **Eurostat.** 2022. How much fruit and vegetables do you eat daily? In: *News.* [Online]. Brussels. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220104-1

[xiii] **European Commission.** N.d. Taste the season: Eat more fruit and vegetables. In: *Farming*. [Online]. Brussels. https://agriculture.ec.europa.eu/farming/crops/fruit-and-vegetables/taste-season-eat-more-fruit-and-vegetables_en

[xiv] **NielsenIQ.** 2024. *5+ A Day awareness and consumption report: December 2023*. Auckland, 5+ A Day Charitable Trust.

[xv] **Springmann, M., Mozaffarian, D., Rosenzweig, C. *et al*.** 2021. What we eat matters: Health and environmental impacts of diets worldwide. In: *Reports.* [Online]. Bristol, United Kingdom, Global Nutrition Report. https://globalnutritionreport.org/reports/2021-global-nutrition-report/health-and-environmental-impacts-of-diets-worldwide/

[xvi] **Young, S.** 2025. *Fruit juice intake dropped, driving decline in total U.S. fruit consumption*. Charts of Note. Washington D.C., United States Department of Agriculture, Economic Research Service. https://ers.usda.gov/data-products/charts-of-note/111091

[xvii] **Kantor, L. & Blazejczyk.** 2024. *U.S. vegetable availability decreased in 2022 compared with 2021*. Washington D.C., United States Department of Agriculture, Economic Research Service. https://www.ers.usda.gov/data-products/chart-gallery/105364

[xviii] **World Economic Forum.** 2023. Why nutritious food could be the answer to some of the world's greatest health problems. In: *Forum in Focus.* [Online]. Geneva. https://www.weforum.org/stories/2023/01/nurition-health-food-davos23/

[xix] **Development Initiatives.** 2021. *Global Nutrition Report: The state of global nutrition.* Bristol, United Kingdom. https://www.un.org/nutrition/sites/www.un.org.nutrition/files/global_nutrition_report_2021.pdf

[xx] **Springmann, M., Mozaffarian, D., Rosenzweig, C. *et al*.** 2021. What we eat matters: Health and environmental impacts of diets worldwide. In: *Reports.* [Online]. Bristol, United Kingdom, Global Nutrition Report. https://globalnutritionreport.org/reports/2021-global-nutrition-report/health-and-environmental-impacts-of-diets-worldwide/

[xxi] **Xu, X., Yan, P., Chen, W. *et al.*** 2025. The global burden of disease attributable to suboptimal fruit and vegetable intake, 1990–2021: a systematic analysis of the global burden of disease study. *BMC Med*icine, 23:456. https://doi.org/10.1186/s12916-025-04275-9

[xxii] **FAO.** 2020. *Fruit and vegetables–your dietary essentials. The International Year of Fruits and Vegetables, 2021. Background paper*. Rome. https://doi.org/10.4060/cb2395en

[xxiii] **Hong, T., Sun, F., Wang, Q. *et al*.** 2024. Global burden of diabetes mellitus from 1990 to 2019 attributable to dietary factors: An analysis of the Global Burden of Disease Study 2019. *Diabetes, Obesity & Metabolism*, 26(1): 85–96. https://pubmed.ncbi.nlm.nih.gov/37743825/

[xxiv] **World Economic Forum.** 2022. *Achieving Societal Resilience: The Nutrition Opportunity*. Geneva. https://www3.weforum.org/docs/WEF_Achieving_Societal_Resilience_The_Nutrition_Opportunity_2022.pdf

[xxv] **Utah State University.** 2020. Does healthy eating cost more? In: *Nutrition.* [Online]. Logan, USA. https://extension.usu.edu/nutrition/research/does-healthy-eating-cost-more

[xxvi] **Kruger, H., Koot, J. & Andres, E.** 2017. The economic benefits of fruit and vegetable consumption in Canada. *Canadian Journal of Public Health*, 108(2): e152–e161. https://doi.org/10.17269/cjph.108.5721

[xxvii] **AUSVEG.** 2025. Increasing vegetable consumption by 2030: the Plus One Serve initiative. In: *Knowledge Hub.* [Online]. Glen Iris, Australia. https://ausveg.com.au/knowledge-hub/increasing-vegetable-consumption-by-2030-the-plus-one-serve-initiative/

[xxviii] **Vauzour, D.** 2012. Dietary polyphenols as modulators of brain functions: biological actions and molecular mechanisms underpinning their beneficial effects. *Oxidative Medicine and Cellular Longevity*, 914273. https://pmc.ncbi.nlm.nih.gov/articles/PMC3372091/
[xxix] **Harvard T.H. Chan School of Public Health.** 2026. Carbohydrates and Blood Sugar. In: *The Nutrition Source.* [Online]. Boston, USA. https://nutritionsource.hsph.harvard.edu/carbohydrates/carbohydrates-and-blood-sugar/
[xxx] **Friedman, R.** 2014. What You Eat Affects Your Productivity. *Harvard Business Review*, 17 October 2014. https://hbr.org/2014/10/what-you-eat-affects-your-productivity
[xxxi] **Health Action Alliance.** 2024. How To Harness the Power of Longevity at Work. In: *What's New.* [Online]. Los Angeles, USA. https://www.healthaction.org/whatsnew/how-to-harness-the-power-of-longevity-at-work
[xxxii] **Rockström, J., Thilsted, S., Willett, W. *et al*.** 2025. The EAT–Lancet Commission on healthy, sustainable, and just food systems. *The Lancet*, 406: 1625-1700. https://www.thelancet.com/action/showCitFormats?doi=10.1016%2FS0140-6736%2825%2901201-2&pii=S0140-6736%2825%2901201-2
[xxxiii] **HERO & Healthways.** 2012. *Poor employee health habits drive lost productivity according to major new study of nearly 20,000 American workers*. Raleigh, USA. https://hero-health.org/wp-content/uploads/2013/06/Presenteeism_8_6_2012.pdf
[xxxiv] **American Association for the Advancement of Science.** 2013. Miriam study reveals financial benefits of a plant-based, Mediterranean diet. In: *EurekAlert.* [Online]. Washington, DC. https://www.eurekalert.org/news-releases/651826
[xxxv] **United States Department of Agriculture.** 2004. *How much do Americans pay for fruits and vegetables?* Washington, DC. https://www.ers.usda.gov/webdocs/publications/42549/15155_aib790_1_.pdf?v=8482.9
[xxxvi] **Center for Science in the Public Interest.** 2013. *Healthy bargains: fruits and vegetables are nutritious and economical*. Washington, DC. https://www.cspinet.org/sites/default/files/attachment/healthybargains.pdf
[xxxvii] **World Health Organization.** 2016. *Fiscal Policies for Diet and Prevention of Noncommunicable Diseases*. Geneva. https://iris.who.int/server/api/core/bitstreams/2a5166c4-ce4d-4ac2-ac3d-b6d1ffdf4151/content
[xxxviii] **Afshin, A., Peñalvo, J.L., Del Gobbo, L. *et al*.** 2017. The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis. *PLoS One*, 12(3): e0172277. https://doi.org/10.1371/journal.pone.0172277
[xxxix] **Pearson-Stuttard, J., Bandosz, P., Rehm, C.D. *et al.*** 2017. Reducing US cardiovascular disease burden and disparities through national and targeted dietary policies: a modelling study. *PLoS Medicine*, 6 June 2017. https://doi.org/10.1371/journal.pmed.1002311
[xl] **Pinho-Gomes, A., Knight, A., Critchley, J.A. *et al*.** N.d. Addressing low consumption of fruit and vegetables in England: a cost-effectiveness analysis of public policies. *Journal of Epidemiology and Community Health*, 75(3): 282–288. https://pubmed.ncbi.nlm.nih.gov/33070113/
[xli] **Lee, Y., Mozaffarian, D., Sy, S. *et al.*** 2019. Cost-effectiveness of financial incentives for improving diet and health through Medicare and Medicaid: A microsimulation study. *PLoS Medicine, 1*6(3): e1002761. https://pmc.ncbi.nlm.nih.gov/articles/PMC6424388/
[xlii] **Caro, J.C., Valizadeh, P., Correa, A. *et al*.** 2020. Combined fiscal policies to promote healthier diets: Effects on purchases and consumer welfare. *PLoS One*, 15(1): e0226731. https://doi.org/10.1371/journal.pone.0226731
[xliii] **Hager, K., Du, M., Li, Z. *et al.*** 2023. Prescriptions on Diet, Food Security, and Cardiometabolic Health Outcomes: A Multisite Evaluation of 9 Produce Prescription Programs in the United States. *Circulation: Cardiovascular Quality and Outcomes*, 16(9): e009520. https://pmc.ncbi.nlm.nih.gov/articles/PMC10529680/
[xliv] **Wholesome Wave.** 2013. *Wholesome Wave's fruit and vegetable prescription program, New York City. 2013 outcomes.* Bridgeport, USA. https://www.wholesomewave.org/sites/default/files/wp-content/uploads/2014/10/2013-FVRxReport_-Final-1.pdf
[xlv] **Hawkes, C.** 2013. *Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness.* Rome, Food and Agriculture Organization of the United Nations. https://www.fao.org/4/i3235e/i3235e.pdf
[xlvi] **Arshad, M.T., Maqsood, S., Altalhi, R. *et al*.** 2025. Role of Dietary Carbohydrates in Cognitive Function: A Review. *Food Science & Nutrition*, 13(7): e70516. https://pmc.ncbi.nlm.nih.gov/articles/PMC12209867/
[xlvii] **Marconi, S., Vezzoli, M., Locatelli, M. *et al.*** The role of primary school teachers' nutrition training in healthy eating promotion. *Health Education Journal*, 1–19. https://iris.unibs.it/retrieve/d5d0bd0b-4f4b-47aa-ab94-e1d4ef74096c/0017896922109371 4.pdf
[xlviii] **Micha, R., Karageorgou, D., Bakogianni, I. *et al.*** 2018. Effectiveness of school food environment policies on children's dietary behaviors: A systematic review and meta-analysis. *PLoS One*, 29, 13(3): e0194555. https://pubmed.ncbi.nlm.nih.gov/29596440/
[xlix] **The Rockefeller Foundation.** 2021. *True Cost of Food: School Meals Case Study*. New York, USA. https://www.rockefellerfoundation.org/wp-content/uploads/2021/11/True-Cost-of-Food-School-Meals-Case-Study-Full-Report-Final.pdf
[l] **World Health Organization.** 2015. *European Food and Nutrition Action Plan 2015–2020*. Geneva. https://iris.who.int/server/api/core/bitstreams/2a3b47d9-5c59-438b-8796-5f49f32e5783/content
[li] **Marshall, A.N., Markham, C., Ranjit, N. *et al.*** 2020. Long-term impact of a school-based nutrition intervention on home nutrition environment and family fruit and vegetable intake: A two-year follow-up study. *Preventive Medicine Reports*, 20: 101247. https://pmc.ncbi.nlm.nih.gov/articles/PMC7710647/
[lii] **Watts, C.** 2023. *External evaluation of Fruit in Schools. Final report. Prepared for 5+ A Day Charitable Trust*. Quigley and Watts, Wellington. https://5adayeducation.org.nz/assets/site/images/Final-Evaluation-Report-fruit-in-schools-May-2023.pdf
[liii] **Food Foundation.** 2020. *Peas please. Reviewing the evidence: what can retailers do to increase sales of fruit and veg?* London. https://foodfoundation.org.uk/sites/default/files/2021-10/A-review-of-the-evidence_FV-interventions-1.pdf
[liv] **Hutchinson, A., Howlett, G. & Wilson, C.** 2013. Increasing Employees' Fruit Consumption through Access and Peer Support at Work. *Food and Nutrition Sciences*, 04(10):88-95. https://www.researchgate.net/publication/272652501_Increasing_Employees'_Fruit_Consumption_through_Access_and_Peer_Support_at_Work
[lv] **Quintiliani, L., Poulsen, S. & Sorensen, G.** 2010. Healthy Eating Strategies in the Workplace. *International Journal of Workplace Health Management*, 1, 3(3): 182–196. https://pmc.ncbi.nlm.nih.gov/articles/PMC3737584/
[lvi] **World Health Organization.** 2022. Healthy public food procurement and service policies. Their untapped potential to support repurposing of food and agricultural policies to make healthy diets more affordable. In: *News.* [Online]. Geneva.

https://www.who.int/news/item/15-07-2022-the-untapped-potential-of-healthy-public-food-procurement-and-service-policies-to-support-the-repurposing-of-food-and-agricultural-policies-for-delivery-of-affordable-healthy-diets

[lvii] **World Health Organization.** 2022. Healthy public food procurement and service policies. Their untapped potential to support repurposing of food and agricultural policies to make healthy diets more affordable. In: *News.* [Online]. Geneva. https://www.who.int/news/item/15-07-2022-the-untapped-potential-of-healthy-public-food-procurement-and-service-policies-to-support-the-repurposing-of-food-and-agricultural-policies-for-delivery-of-affordable-healthy-diets

[lviii] **FAO.** 2026. Dietary guidelines. In: *Nutrition.* [Online]. Rome. https://www.fao.org/nutrition/nutrition-education/food-dietary-guidelines/en/

[lix] **FAO & Chile, Ministry of Social Development and Family.** 2021. *Promoting fruit and vegetable consumption*. Santiago de Chile. https://doi.org/10.4060/cb7956en

[lx] **Castiglione, C. & Mazzocchi, M.** 2019. Ten years of five-a-day policy in the UK: Nutritional outcomes and environmental effects. *Ecological Economics*, 157(C): 185–194. https://ideas.repec.org/a/eee/ecolec/v157y2019icp185-194.html

[lxi] **Hawkes, C.** 2013. *Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness.* Rome, Food and Agriculture Organization of the United Nations. https://www.fao.org/4/i3235e/i3235e.pdf