

Nudging populations towards healthier eating behaviours


An innovative case study on salt reduction in China

Unlocking the power of food environment change, policy support, data science and communication: the emergence of a synergistic force

SALT LEVEL FOR YOUR DISH

REGULAR
SALT

REDUCED
SALT



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CONTENTS

Preface	v
Acknowledgements.....	vi
1. Nutrition: a bedrock for achieving the Sustainable Development Goals	1
2. The digitalization of the food environment in China	4
3. Nudging: an innovative approach to improve healthy diets.....	5
4. Key findings	7
5. Expanding nudge-based intervention in a real-world setting: subtle changes to promote a healthier China	14
6. Strengthening nutrition actions to drive better health for all	17
References	21

PREFACE

This document aims to recap the key findings and insights gained from an innovative salt reduction study, which could serve as a demonstration for future intervention projects involving a multisectoral partnership on healthy diet promotion.



SALT REDUCTION

ACKNOWLEDGEMENTS

The Innovative Salt Reduction Study was initiated by the World Health Organization Representative Office for China (WHO China) and implemented by research teams from the National Institute for Nutrition and Health of the Chinese Center for Disease Control and Prevention (NINH, China CDC) and Tsinghua University. We would like to acknowledge the technical contributions of the following individuals from the above agencies: Gangqiang Ding, Ailing Liu and Chao Song from NINH, China CDC; Wenyue Li, Ying Long and Yue Ma from Tsinghua University; and Zhongdan Chen, Ying Cui, Gauden Galea, Beisi Li and Paige Snider from WHO China.

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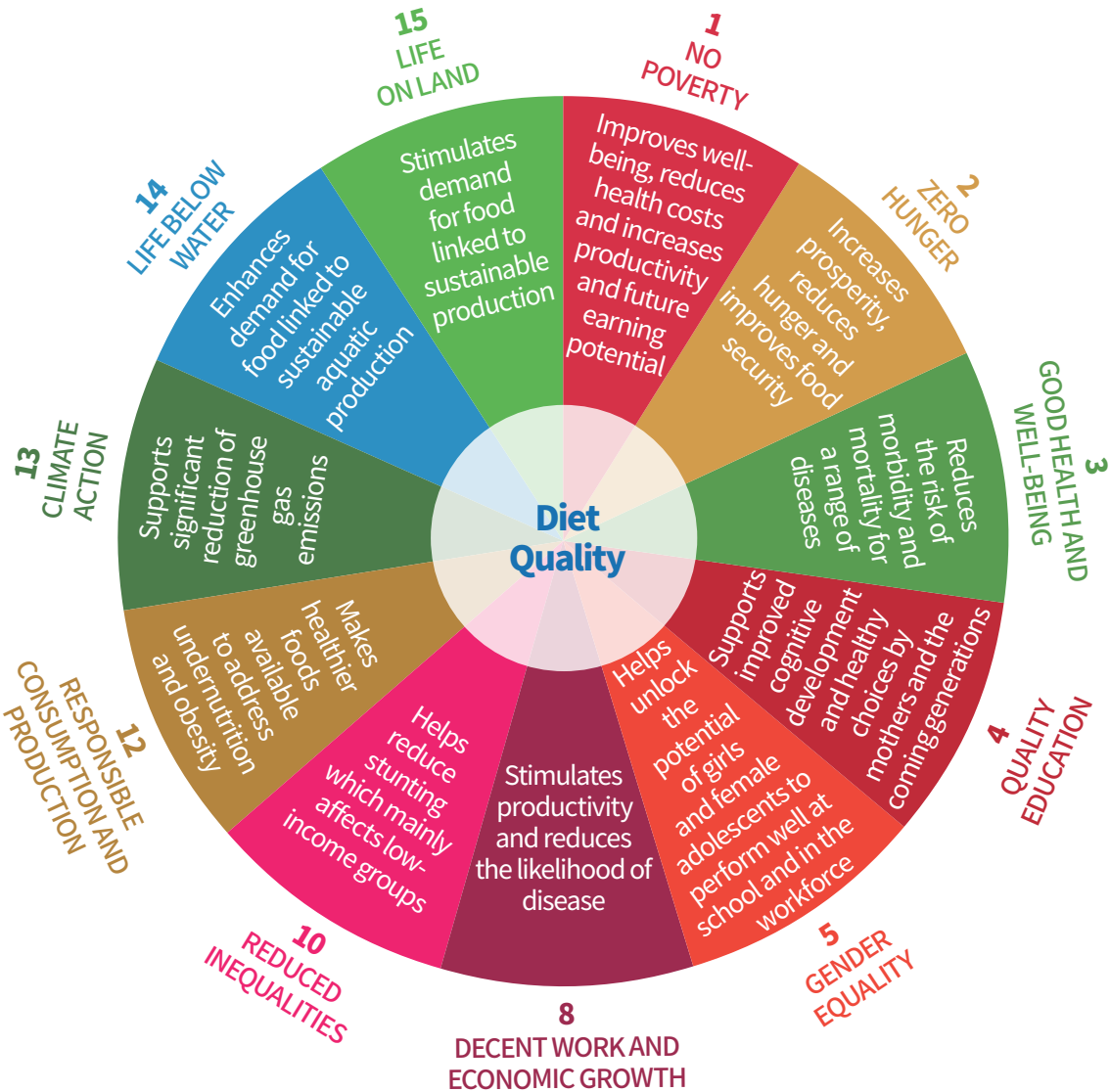
The Study was funded by Resolve to Save Lives through a grant to WHO China. We recognize their contribution and support to the Study.

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1. Nutrition: a bedrock for achieving the Sustainable Development Goals

The challenges to ending all forms of malnutrition keep growing, exacerbated by the coronavirus disease (COVID-19) pandemic. The most recent evidence suggests that across the world, more than 3.1 billion people could not afford a healthy diet in 2021, up 134 million from 2019 (1). Effective and sustained actions are needed to address this global nutrition crisis.

Improving nutrition is key to global development and is closely tied to several Sustainable Development Goals (SDGs) (2). Nutrition sits at the core



Nutrition ties to several SDGs (2)

The prevalence of hypertension among Chinese adults is **27.5%**, but among hypertension patients, only **11%** have their hypertension controlled (4).

of SDG2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture) and contributes to SDG3 (Ensure healthy lives and promote well-being for all at all ages) – ensuring healthy diets and optimal nutrition decreases the risk of noncommunicable diseases (NCDs) (3).

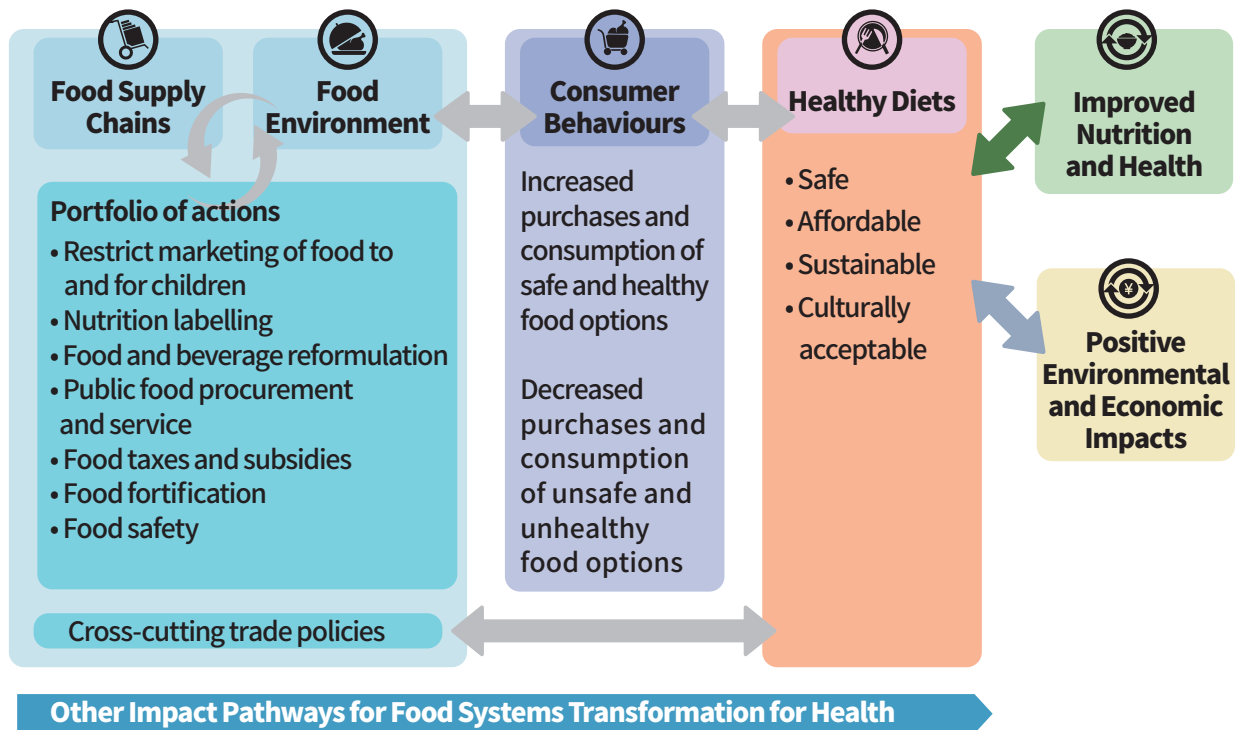
China faces severe threats from NCDs. They contribute to **88.5%** of all deaths in China, and an estimated **84.9%** of China's disease burden (disability-adjusted life years, DALYs) is due to NCDs (4,5). Hypertension, as a major NCD, has had a high prevalence in the past years – **27.5%** of Chinese adults live with hypertension, but only **11.0%** of patients have their hypertensive condition controlled (4).

Salt is the primary dietary source of sodium. Too much salt intake is associated with an increased risk of hypertension, a risk factor for NCDs such as cardiovascular diseases, stroke and kidney diseases (6).

As one of the World Health Organization (WHO) Member States, China has agreed to the voluntary global targets of a **30%** relative reduction in mean population intake of salt/sodium by 2025 as a priority intervention to reduce the incidence of NCDs and a **25%** relative reduction in the prevalence of raised blood pressure relative to the prevalence in 2010 (7). The Healthy China Action Plan (2019–2030) initiated by the Chinese Government has also established goals for hypertension prevention and control, setting a promotion target to reduce average salt intake to under 5 grams per day by 2030 (8).

It takes innovative and strategic approaches to educate, nudge and transform dietary habits that require generational change. Today, people in China still consume 9.3 grams of salt on average from home cooking alone (4), around twice the 5 grams of salt per day recommended by WHO (9) and *The Chinese Dietary Guidelines* (10).

To deliver healthy diets including reduced-salt food options to people, a portfolio of multisectoral actions is needed to transform food systems (11). In addition, the nutritional quality of foods, as well as the availability, accessibility and affordability of healthier food options, should be enhanced through food system transformation.



A portfolio of actions for food supply chains and the food environment to deliver healthy diets (11)

2. The digitalization of the food environment in China

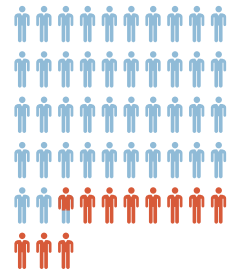
China's food environment is rapidly changing. With the digitalization trend, online meal delivery services have proliferated in China and have become a leading source of prepared meals. Between 2020 and 2022, online meal delivery users increased by 102 million to 521 million, accounting for **48.8%** of China's internet users (12).

Studies also show that meals prepared away from home are often less healthy and contain more salt (13–15). Meanwhile, food ordering platforms typically provide little or no nutritional information to guide consumers towards healthier food decisions.

To establish a better understanding of consumers' knowledge, attitude and perception of salt reduction and willingness to make changes in dietary habits, the WHO Representative Office for China (WHO China) conducted a series of focus group discussions and an online questionnaire covering urban and rural areas from 2018 to 2019 (16). Most participants reported an awareness of the health benefits of lowered salt intake and an intention to reduce salt consumption. However, they pointed out that eating prepared foods made it more difficult to cut salt intake because of the lack of options and not being confident to make their dietary requests to the kitchen.

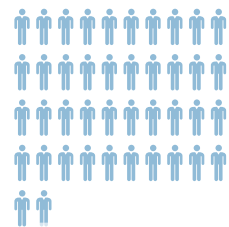
Hence, the cause-effect chain of proliferating food delivery services, high-level salt intake and hypertension forge a valuable case to observe and intervene in the context of the changing food environment in China for researchers, policy-makers, business owners and the public.

2022 521 million



+ 102 million

2020 419 million



Online meal delivery users in China increased by 102 million to 521 million between 2020 and 2022 (12).

3. Nudging: an innovative approach to improve healthy diets

To respond to the challenges brought about by the changing food environment, WHO China designed an Innovative Salt Reduction Study together with the National Institute for Nutrition and Health of the Chinese Center for Disease Control and Prevention (NINH, China CDC) and Tsinghua University. The Study lasted from 2020 to 2022.

The Study investigated the influence of nudge-based intervention on consumers' choices when ordering meals via ELEME, a major Chinese meal delivery app (MDA). It aimed to create an enabling environment to nudge consumers towards reduced-salt options when ordering meals on MDAs.

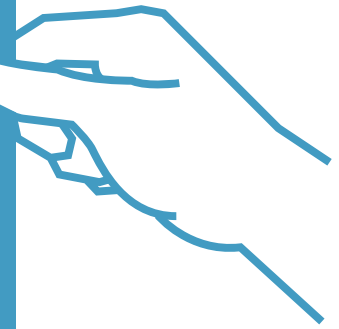
Nudging, as an innovative approach, is receiving increasing attention in the field of nutrition where there are opportunities to influence food choices (17).

Nudges are small, subtle changes to the physical and social environment that alter the prevailing choice architecture and the context in which consumers make decisions (17).

Nudges are often implemented with low cost (17), without removing the options that already exist and without providing substantial economic incentives (18). An integral element of nudging is an understanding of the choice architecture and the context within which people make decisions and how it influences their decisions (18).

Any aspect of the choice architecture that adjusts choice behaviour can be classified as a nudge (19). Food choice architecture, specifically, relates to various elements of how food options are framed; it can include aspects such as the relative availability and presentation of different food options, and the subsequent influence of these factors on the selections people make (19).

Research has shown that people's decisions about food choices can be influenced through nudges. A good system of choice architecture can help promote healthier food options and facilitate healthier diets (18).



The nudge-based intervention in this Study included changes to the food choice architecture, which was a salt submenu linked to the individual dishes sold on the MDA. A conventional educational health message was also introduced as part of the intervention to test the salt reduction effect as compared with the salt submenu and its control counterpart.

Such an intervention approach is different from existing salt reduction campaigns. Current salt reduction efforts by public health agencies in China mainly focus on home cooking and public education (20,21). No existing studies have explored consumer demand for salt reduction for meals ordered on MDAs in China against the backdrop of rapid digitalization.

The Study was the first real-world study to explore how changes in food choice architecture could nudge consumers toward reduced-salt options. To validate the salt reduction effect of the applied nudge-based intervention, the Study also explored consumer demand for salt reduction and tested whether consumers' requests for less salt would result in lower salt content in delivered meals.

The Study shows that a collaborative, low-cost, nudge-based intervention by the government, academia and the private sector can effectively contribute to further salt reduction efforts at the


population level, which is critical, given the rapid acceleration and reliance on meals delivered by MDAs in China.



4. Key findings

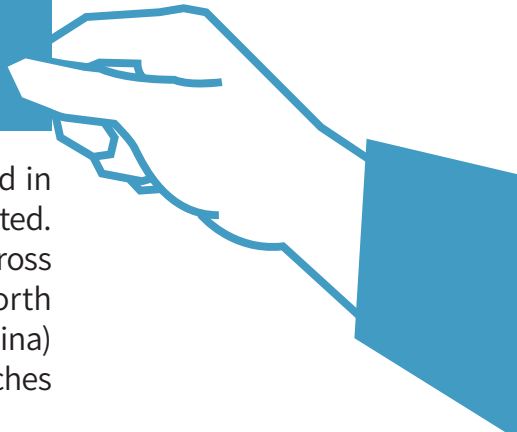
Is there a consumer demand for reduced-salt meals ordered on MDAs?

In 2019, WHO China used the Communication for Health (C4H) approach (22) to understand the social and behavioural drivers at play in salt intake through quantitative and qualitative information gathering. The data collected suggest that:



Despite public awareness that high salt consumption is unhealthy, many people still found it difficult to reduce salt when eating out because of the lack of options and because they were reluctant to ask for a dish to be modified.

This finding was further verified through the analysis of consumer requests for reduced-salt dishes on the MDA ELEME for the six-month period prior to the study intervention.



On MDAs, consumers can add messages before placing their meal orders to indicate taste preferences. However, orders can be placed without scrolling down the page, which makes the comment box, usually appearing at the bottom of the page, a “hidden” setting and easily overlooked by consumers.

From July to December 2020, consumer messages contained in 3 630 798 orders from 718 restaurants on the MDA were collected. The recruited restaurants were mainly located in four cities across different geographical regions in China, including Beijing (north China), Taizhou (south-east China), Shenyang (north-east China) and Chengdu (south-west China). A restaurant chain with branches

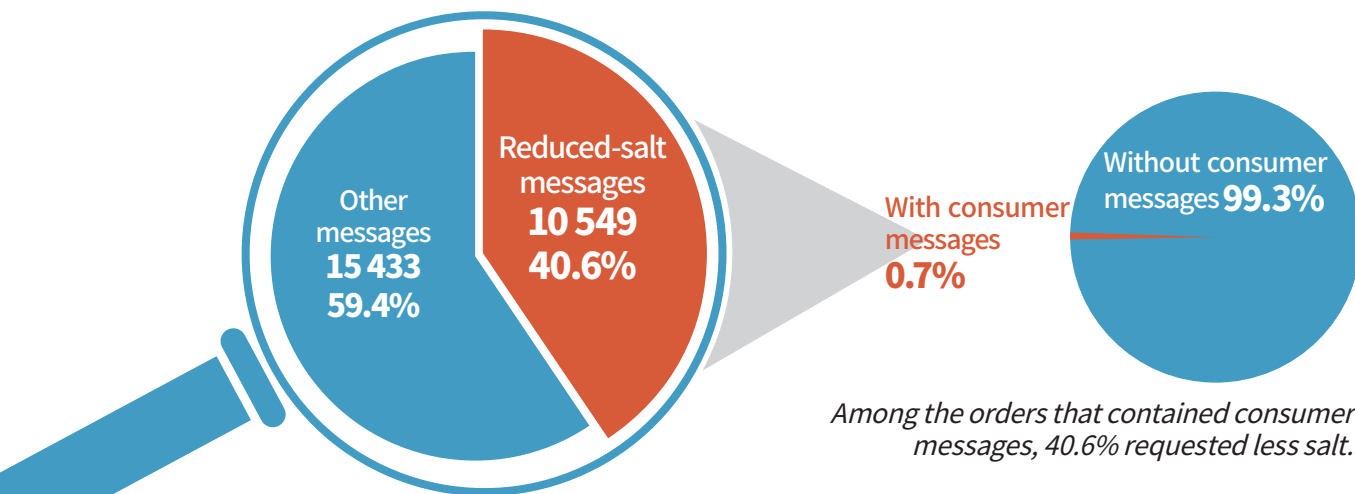
In the Western Pacific Region, WHO is adopting the Communication for Health (C4H) approach. C4H leverages the power of communication as a tool for health, such as using insights from social and behavioural sciences to inspire and empower people to make healthy choices for themselves and their families (23).

Consumer messages in **3 630 798** orders from **718** restaurants across **4** cities and **1** restaurant chain with branches in tier-one and tier-two cities were analysed.

in tier-one and tier-two cities* was also part of the 718 restaurants. The geographic distribution represented people’s diverse dietary habits, including salt intake.

Only 0.7% of the orders contained consumer messages. This could be due to the inconvenience of leaving a message – consumers need to scroll to the final order placement page to find the “Notes” caption, click on it, and then be directed to a field (referred to as the comment box), in which they enter their message.

However, when consumers overcame this “extra effort” constraint, a sizeable minority (40.6%) requested less salt.



Populations with special health and nutritional needs, such as pregnant women, elderly people, children and sick people, showed a higher demand for reduced-salt meals, according to the analysed messages.

Examples of consumer messages

“Please make the soup with less oil and less salt. It is for a pregnant woman.”

“It is for children. Not spicy and less salt, thank you! Please do make sure the food is not spicy.”

“I am your regular customer. Please make the order with less oil and less salt. It is for an elderly person who had their gall bladder removed, so they cannot eat greasy food. Thank you.”

“Please do not add chilli and make it less salty. There are sick people in the house. Thank you.”

**Note: the city-tier system is a common hierarchical classification of Chinese cities, with the first-tier cities normally representing the most developed areas with the largest population size, highest income level and highest administrative hierarchy (for example, Beijing and Shanghai).*



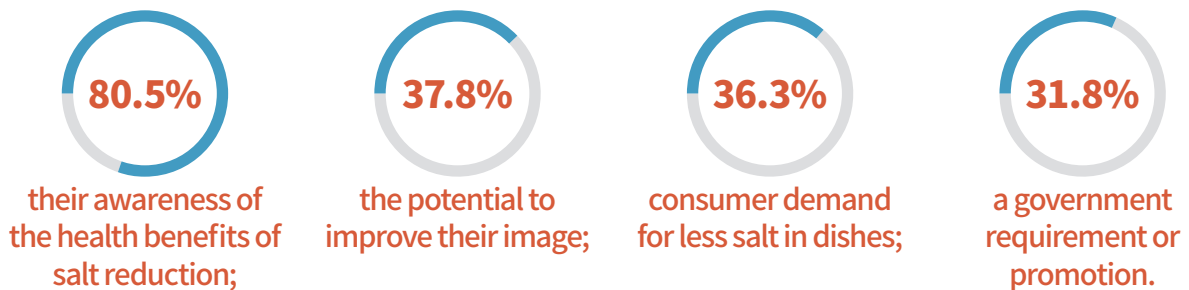
Do restaurants have a willingness to comply with reduced-salt requests from consumers?

We distributed a survey questionnaire through the MDA to the restaurant managers upon their signing up for the Study. The survey questions covered general restaurant information; knowledge, attitude and practices related to salt reduction; and the potential impact of salt reduction practices on their businesses.

We collected **421 questionnaires**.



Restaurants' willingness to offer reduced-salt dishes was primarily linked to:



Over half of the restaurant managers held a positive attitude about the long-term impact of salt reduction on their restaurant.



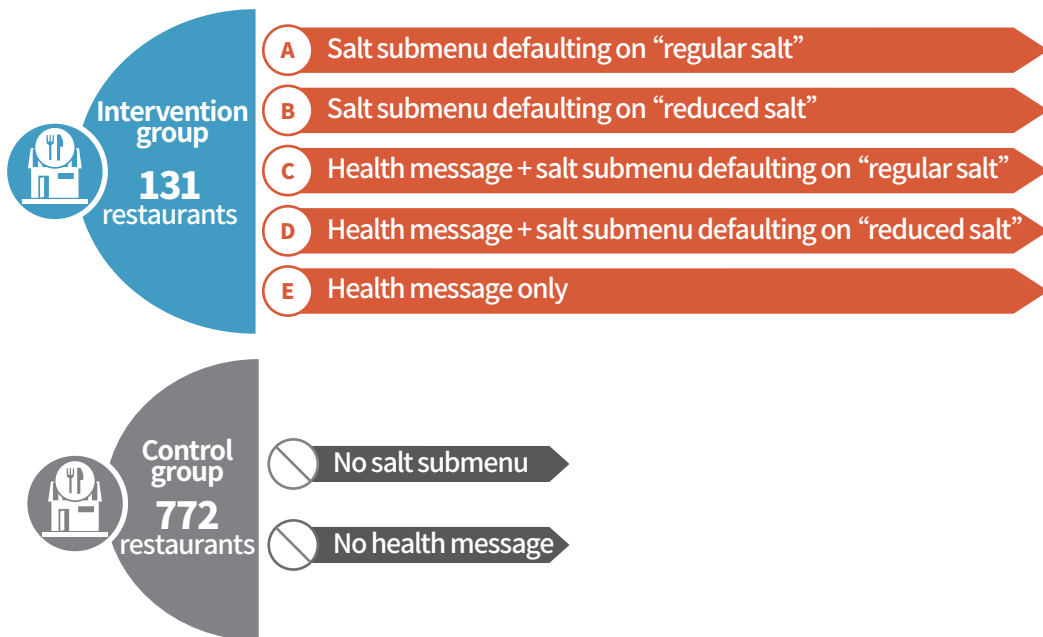
How would the nudge-based intervention impact consumers' behaviour on MDAs?

To explore the effectiveness of changing the choice architecture and introducing health educational messages on MDAs to alter consumers' behaviour, the intervention was conducted through three treatments:



- Setting up a salt submenu for “reduced salt” and “regular salt” options
- Setting up a salt submenu defaulting on either “reduced salt” or “regular salt” options
- Adding an educational health message – “Healthy adults eat no more than 5 grams of salt per day” – on the top of the ordering page

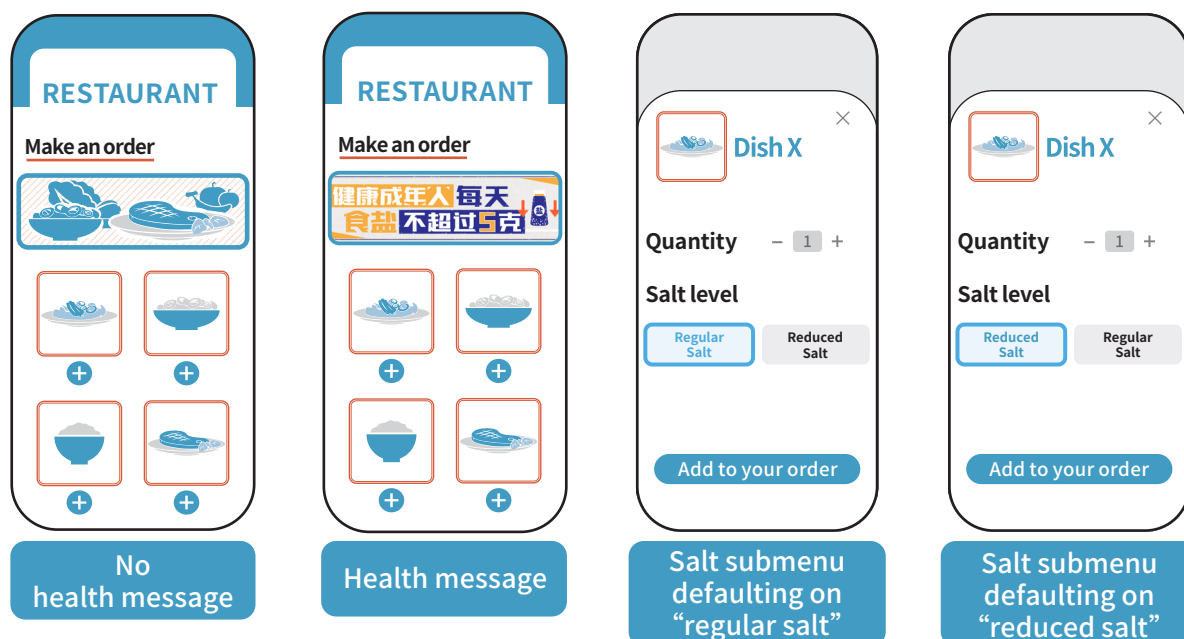
Participating restaurants were assigned to different combinations of the three treatments to create five intervention groups. They were encouraged to set up their MDA interface as per their assigned intervention group.



Notes:

- Consumers placing orders with restaurants in the intervention group without a salt submenu (Group E) could only request reduced-salt dishes by leaving a message in the comment box before placing the order.
- Data collection period: July–August 2021.

By taking the differentiated taste preferences of consumers into consideration, and their potential impact on the choice of reduced-salt dishes, data collected from restaurants located in cities across different geographic regions of the country were analysed, including Beijing, Taizhou, Shenyang and Chengdu, as well as from a restaurant chain with branches across tier-one and tier-two cities in China.



Intervention on the MDA ELEME interface

The results were as follows:

- ① The inclusion of a salt submenu with explicit options over “reduced salt” and “regular salt” significantly boosted the selection of reduced-salt dishes among consumers.
- ② *The positive effect of a salt submenu defaulting “reduced salt” was larger than if the default was “regular salt”.*
- ③ The introduction of a health message on its own was not enough to influence consumers to choose reduced-salt dishes.
- ④ With an adjustment for restaurant location (city), cuisine category (Chinese cuisine, fast food and others) and intervention category, the effect of the salt submenu was weaker but still significant.



Thus, changing the choice architecture on MDAs by creating a salt submenu and setting the default on “reduced salt” can nudge consumers towards reduced-salt food options.



Would consumers' choice of reduced-salt options result in lower salt content in their delivered meals?

The sodium content in dishes randomly ordered on the MDA was measured by a qualified testing company using the method documented in the Food Safety National Standard (24).

In total, the Study sampled 576 dishes from 179 restaurants.

51.6% 
dishes

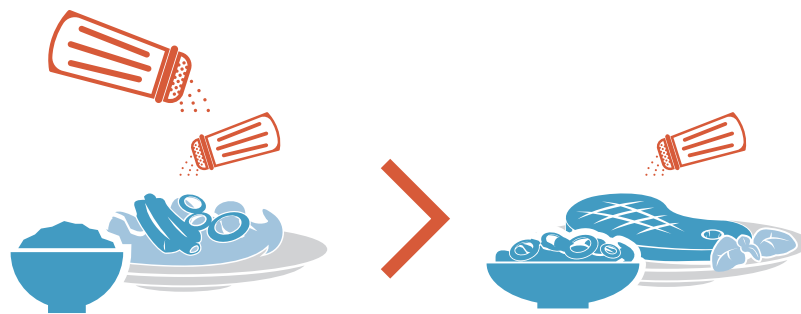
were ordered with regular salt (297);

48.8% 
orders

were placed for the same dish with a request for “reduced salt”, to match with their regular salt counterpart accordingly (279).

A significant difference ($p < 0.05$) in the median sodium content was found between the regular salt and reduced-salt versions of dishes. No significant difference was observed in the median sodium content of the reduced-salt dishes ordered by the subgroup of the intervention group, the subgroup of restaurants (with or without the salt submenu setup) or the subgroup of the dish category (meat dish, vegetable dish or snack/staple) ($p > 0.05$).

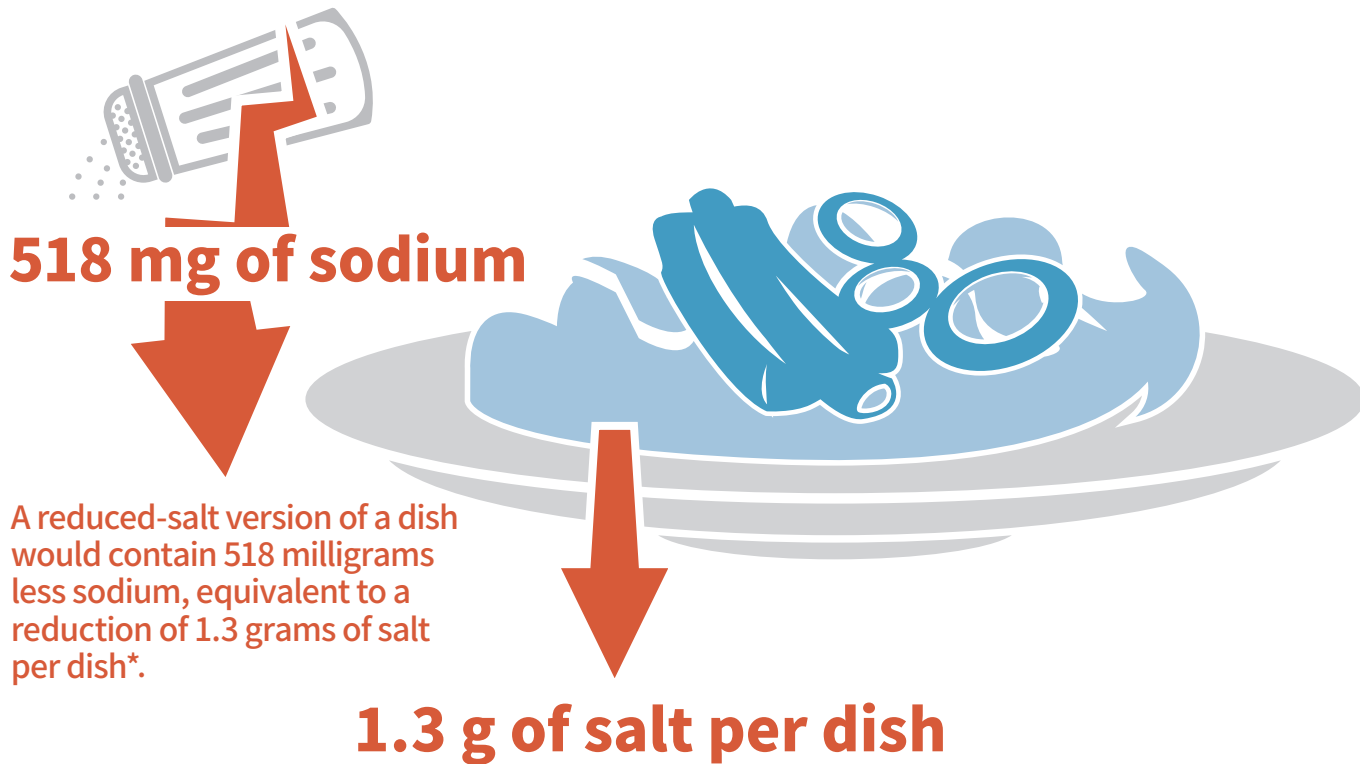
When comparing results across restaurant categories, the sodium content of dish samples ordered from Chinese cuisine restaurants was generally higher than those ordered from restaurants specializing in other types of cuisine ($p < 0.05$), regardless of whether the dishes were ordered as “regular salt” or “reduced salt”.



**Chinese cuisine
restaurants**

**Other types
of cuisine**

The results also revealed an average sodium reduction of 90 mg/100 g in reduced-salt dishes. A 2019 study conducted in China reported that the average serving size of a dish was 575.6 grams (25). This suggests:



**Note: 1 g of salt contains approximately 400 mg of sodium. Given a sodium reduction level of 90 mg/100 g per dish and an average dish size of 575.6 g, a reduced-salt dish would contain 518 mg less sodium: $90 \text{ mg} \times (575.6 \text{ g} \div 100 \text{ g}) \approx 518 \text{ mg}$. This is equivalent to 1.3 g of salt: $1 \text{ g} \times (518 \text{ mg} \div 400 \text{ mg}) \approx 1.3 \text{ g}$.*

To conclude, restaurants not only expressed a strong willingness to comply with reduced-salt requests from consumers, but also did so by reducing the amount of salt in the served dishes.

5. Expanding nudge-based intervention in a real-world setting: subtle changes to promote a healthier China

By subtly changing how the elements of the choice architecture on MDAs were presented, the nudge-based intervention removed the barriers to expressing taste or food preferences for less salt and made reduced-salt options easier and more accessible choices for consumers.

If academia tested nudge-based interventions with sufficient data collection and analysis, the government could be provided with evidence-based policy recommendations.

If the government introduced a policy to require all MDAs to offer a reduced-salt option in addition to educational campaigns targeting consumers, more than 500 million Chinese consumers (12) would be offered reduced-salt dish options and a healthier food environment would be enabled without further cost.

If restaurants and MDAs recognized consumer demands for reduced-salt dishes and offered reduced-salt dish options on their menu, they would be able to improve their image and contribute to their consumers' health, which would benefit their business in the long term.

If consumers tried their best to make their demand for salt reduction heard by restaurants, MDAs and policy-makers, then food supply businesses would be willing to respond accordingly and policy-makers would be more confident in their policy being implemented.

The Study found that **1.4%** of the meal orders made through the intervention groups were reduced-salt orders, the proportion of which was **0.6%** in the control group. That is, with the salt reduction intervention, an extra **0.8%** of orders contained reduced-salt dishes (reduced-salt orders).

If each party made a small effort and applied the intervention across all the Chinese MDAs:

The number of reduced-salt orders could reach*:

779 000 orders per day

23.7 million orders per month

284.5 million orders per year

If the intervention impact alone was taken into consideration, the number of extra reduced-salt orders could reach*:

445 000 orders per day

13.5 million orders per month

162.6 million orders per year

**In 2021, a total of 20.3 billion orders were placed on Chinese MDAs, averaging 55.7 million daily (26). Therefore, if the intervention was applied across all the MDAs in China, at least 1.4% of the meal orders would contain reduced-salt dishes. If the intervention impact alone was taken into consideration, an extra 0.8% of the meal orders would contain reduced-salt dishes.*

According to the sodium content test, a reduced-salt version of a dish would contain 518 mg less sodium or 1.3 g less salt on average, as compared with their regular salt counterpart.

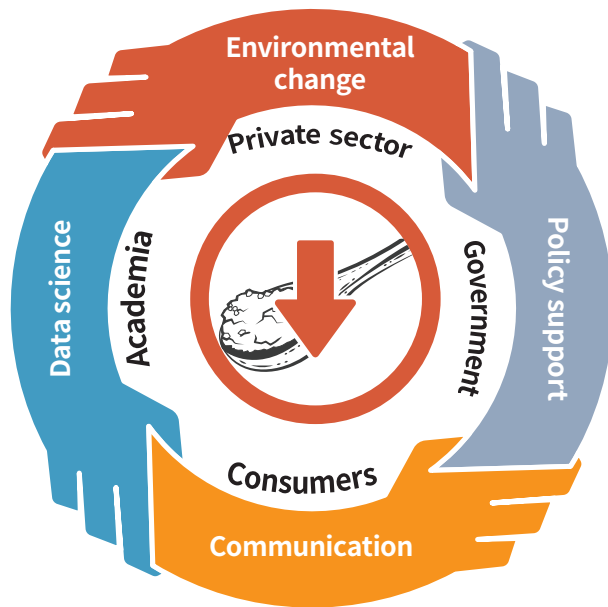
Assuming every reduced-salt order would contain one reduced-salt dish at the minimum, that amounts to almost **150 tons** of sodium, equivalent to about **368 tons** of salt being removed from Chinese MDA orders annually.

A separate study found that reducing the Chinese population's daily salt intake by 1 g could prevent almost 9 million cardiovascular events by 2030 (27). Thus, applying the nudge-based intervention across all MDAs in China could greatly contribute to public health goals and help prevent cardiovascular diseases in China.



Reducing the Chinese population's salt intake by **1 g per day** could prevent almost **9 million** cardiovascular events by 2030 (27), contributing to a healthier China.

It is worth noting that the sodium content contained in dishes ordered from Chinese cuisine restaurants was significantly higher than that from other types of restaurants, indicating a more notable impact if efforts were made to target and prioritize Chinese cuisine restaurants for salt reduction interventions.



Multisectoral efforts and an integrated approach are needed to enable the food environment change necessary to achieve the national goal of salt reduction.

Together, through the integration of environmental change, policy support, data science and communication, a synergistic effect can be created to ensure the digital ordering environment conducive to achieving the goals set in the Healthy China Action Plan (2019–2030).

6. Strengthening nutrition actions to drive better health for all

Based on the sound social and behavioural sciences, the innovative nudging approach, including what was applied by the Study for salt reduction, has the potential to be scaled up across the entire food system to address unhealthy diets in general, such as high intakes of saturated- or trans-fat and sugar and low intakes of fresh vegetables and fruits. Addressing these issues could improve the overall health and nutritional status of Chinese people.

In addition to the nudge-based intervention applied in this Study, there are many other opportunities to deliberately adjust the choice architecture and introduce nudges to promote or demote the selection of certain food options, enabling a healthy eating environment (17). Note that the interventions should be tailored, tested and assessed based on the situational context to maximize their effectiveness in implementation.

Nudge-based interventions can aim to improve children's dietary practices in school

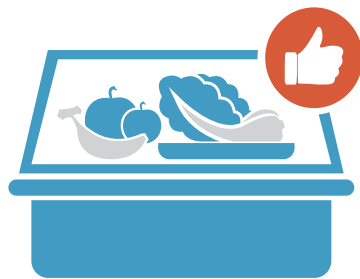
Historically, school-based approaches to promoting healthy dietary practices have emphasized nutrition education (which is incumbent on rational and thoughtful food selection) and the regulation of school foods and beverages (which restricts what is offered in school settings). Nudges, on the other hand, can operate within a person's automatic decision-making processes, reducing the cognitive load or physical effort involved in choosing healthy food options.

Whenever healthier options are made available, nudges may shift school children's food choices towards those that contribute to healthy diets; hence, they offer an important opportunity for action, alongside measures such as nutrition standards for school foods (28) and policies related to the provision and procurement of foods for healthy diets (29).



Example 1

To increase children’s choice of healthy foods in school canteens, the nudges can include placing fruits on a stand near the cash register, presenting daily vegetable specials in grab-and-go pots, and using emoticon stickers (smiley faces) with meal sets containing less salt, fat and sugar and written prompts for the target foods, such as “Today’s SPECIAL - Make a fresh choice” for vegetable dishes and “GOOD for YOU” for fresh fruits (17).



Fresh fruits and vegetables



Meal sets containing less salt, fat and sugar

Nudges can empower healthier food choices at the grocery store

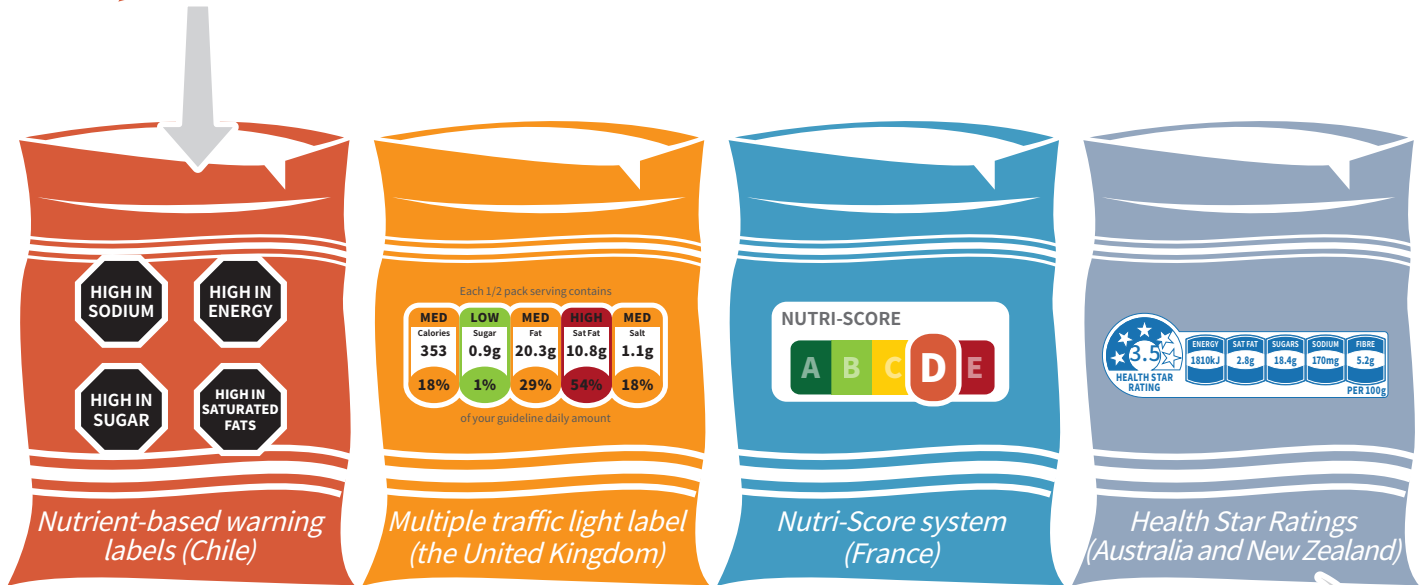
Clear and accurate front-of-pack labelling (FOPL) can help inform consumers to make healthier food purchases, while encouraging food producers to improve the nutritional composition of food products.

Example 2

The government can lead the local evidence-based development process to identify an interpretive FOPL system that quickly captures consumers’ attention and helps them understand at a glance if a food has high or low levels of nutrients, for example, sodium/salt, fat and sugar, which are related to NCDs (30).

Nutrition Information		
Typical values	Per 100g / 100ml	NRV%
Energy	kJ	%
Protein	g	%
Fat	g	%
Carbs	g	%
Sodium	mg	%

Carbs: carbohydrates
NRV: nutrient reference value

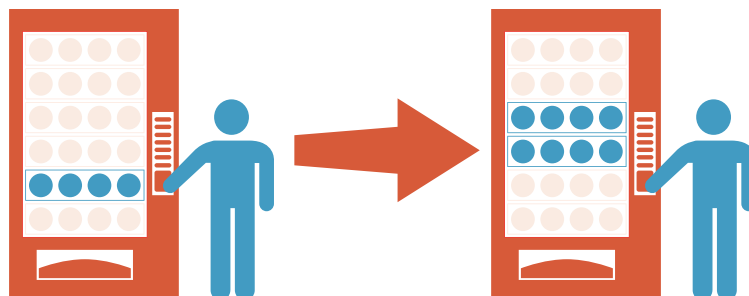


Examples of front-of-pack labelling systems

Front-of-pack labelling presents simple, often graphic information on the nutrient content or nutritional quality of products to complement the more detailed nutrient declarations (for example, nutrition information panel) usually provided on the back of food packages (30).

Example 3

Supermarkets can place water, sugar-free drinks and pre-packaged foods with less salt, sugar and fat on their shelves at eye level, and make more of them available on the shelves, to increase the likelihood of consumers choosing healthier food options (17).



In addition to the nudge-based approaches mentioned above, a portfolio of actions is needed to transform the entire food system and deliver better nutrition for all. Below are several other action areas that WHO recommends the government consider as a comprehensive package (11). The implementation of the actions can be stepwise to ensure higher practicality.



Introduce public food procurement and service policies for healthy diets

Healthy food procurement and service policies involve governments setting criteria for foods served or sold in public settings and/or purchased with government funds that enable healthy diets. As millions of meals and snacks are served or sold every day in government-involved settings, there is an enormous opportunity to promote healthy diets through these policies.



Introduce restriction regulations to protect children from harmful food marketing

Marketing can shape children's food preferences and promote unhealthy dietary patterns that can contribute to later obesity or diet-related NCDs. Exposure to marketing for foods high in fats, sugars and salt/sodium increases the likelihood that children and adolescents request, buy and consume those foods. Regulations on the marketing of foods and beverages to and for children of all ages should be adopted in order to protect children from the harmful impacts of marketing, including digital marketing.



Introduce food and drink reformulation policies

Food reformulation is the process of altering the processing or composition of a food or beverage product, to improve its nutritional profile or to reduce its content of ingredients or nutrients of concern, for example, sodium/salt, fat and sugar. Food and drink reformulation policies can contribute to shifting towards healthier and sustainable consumption patterns because consumers do not need to change what they buy or make a conscious effort to seek healthier options.



Introduce fiscal policies to promote healthy food options

Changes in price often influence consumer demand for many foods and beverages. Hence, fiscal policies can help shift consumer behaviour towards healthy diets. For example, levying taxes on unhealthy food options would increase their price and discourage their purchase and consumption, while subsidies can be used to reduce the price of healthy options to encourage their consumption. This will increase the affordability of healthier food options and reduce the availability of unhealthy foods to promote healthy diets at the population level.

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