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Whose shift? Demographic variation in willingness to adopt plant-rich diets and its mitigation consequences

Hongyi Cai
Leiden University https://orcid.org/0000-0003-3767-0465
Tom Lees
GlobeScan
Aniko Lakezi
GlobeScan
Caroline Holme
GlobeScan
Oliver Taherzadeh
o.a.taherzadeh@cml.leidenuniv.nl
Leiden University

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Abstract

Background:

Dietary transitions towards plant-rich diets are critical to reducing the environmental burden of the food system and improving public health, yet consumer adoption remains slow and uneven globally. Global dietary transition models typically assume uniform and universal uptake of alternative diets, overlooking how willingness to change varies across countries and population groups. Modelling dietary transitions that reflect stated consumer willingness can reveal how much of the expected mitigation is achievable, for whom, and what residual gap needs to be bridged by policy action

Methods:

We coupled consumer adoption willingness data from a representative survey of 30,218 respondents across 31 countries with the MATILDA dietary impact model to compare dietary greenhouse gas emissions (GHGE) under willingness-adjusted and population-wide adoption of the EAT-Lancet 2.0 reference diet. Random forest regression identified demographic and attitudinal predictors of adoption willingness.

Keywords:

Dietary transition; Consumer willingness; EAT-Lancet diet; Demographic inequality; Mitigation gap

Findings:

Across the 23 countries in which adoption of the EAT-Lancet 2.0 guideline lowers dietary greenhouse gas emissions (GHGE), willingness-adjusted adoption delivers 185.3 Mt CO_2-eq per year against 306.6 Mt under full adoption, leaving 121.3 Mt, or 39.6% of the achievable reduction, unrealised. The gap is positive in every one of these countries, equivalent to 2.4% to 24.3% of national dietary GHGE, and is widest in Peru (1.79 kg CO_2-eq/person/day), Argentina (1.28), South Africa (1.20) and Brazil (1.07). It is also demographically structured: the per-capita gap is three times larger for men than for women (0.50 against 0.17 kg CO_2-eq/person/day), a difference that holds in all 23 countries, although the unrealised share of the full-adoption reduction is similar (40%

for men, 38 for women). The unrealised share is higher among adults with low education than with high education (41% against 38%). Predicted willingness falls from 63% among consumers who gave an answer when asked what the diet means to 50% among those who did not know.

Conclusion:

Willingness-adjusted adoption realises only 60% of the reduction expected under full adoption, and willingness is structured by demographic characteristics and by consumers' understanding of the EAT-Lancet guideline. Policy should first identify demographic groups (men, younger consumers and urban residents) where the adoption gap is largest, and direct incentives and information towards them.

Introduction

Dietary transitions towards plant-rich foods can simultaneously reduce food system environmental impacts and ameliorate dietary malnutrition (1). Most dietary transition models assume uniform, optimistic adoption of alternative diets, overlooking real-world variation in consumer willingness (2). Global adoption of the EAT-Lancet reference diet could reduce diet-related greenhouse gas emissions (GHGE) by 15% (relative to 2020), and prevent approximately 15 million premature deaths per year (3). However, dietary transition modelling typically assumes uniform dietary changes across population subgroups towards dietary guidelines (4). In reality, consumer willingness to adopt pro-environmental diets varies substantially across countries and demographic subgroups (5). A global consumer survey across 33 markets found that willingness to adopt the EAT-Lancet diet ranges from 94% in Indonesia to 43% in the UK, with adoption intentions consistently highest across Africa, Southeast Asia, and Latin America (6).

Willingness to shift towards sustainable diets is neither uniform nor universal. It varies markedly between countries, shaped by income, cultural food norms, and the relative price and availability of animal-source foods, and within countries it differs across subgroups defined by age, gender, income, and education (7). If intrinsic motivations of consumers were factored into dietary transition models, the mitigation potential of dietary shifts would be expected to be uneven across geographies and sociodemographic groups. Such insights have not been formally incorporated into global dietary scenario modelling. This omission is concerning given the observation that consumer subgroups with the largest dietary footprints may be among the least willing to change (8). At present, we lack a systematic understanding of which countries and population subgroups offer the greatest realisable environmental gains from dietary transition (9). Consumer studies are typically confined to single countries or regions and rely on heterogeneous survey instruments, precluding the globally comparable, demographically resolved willingness estimates needed for cross-country environmental analysis (10). Moreover, whilst surveys identify barriers to adoption (such

as price, food availability, and knowledge) and enablers (such as environmental concern), the relative importance of these factors and how they vary across demographic subgroups remain unquantified, limiting the design of targeted interventions (11). Without this evidence, global modelling of dietary shift cannot estimate the mitigation potential that diets would deliver under realistic adoption.

We address these gaps by coupling adoption willingness data of 30,000+ consumers from 31 countries, resolved by gender, age, educational attainment, and area of residence (urban versus rural), with the MATILDA (Micro–Macro Assessment Tool to Identify Low-impact Dietary Actions) dietary impact model (12). This enables quantification of emissions reduction potential across demographic subgroups and countries based on realistic adoption patterns, identification of population segments with highest environmental payoff, and examination of how consumers' understanding of the diet relates to adoption willingness. This analysis offers three contributions to assessment of sustainable dietary transitions. First, it represents a global assessment of dietary transition scenarios grounded in empirical consumer willingness data to more accurately capture the expected mitigation potential of realistic dietary shifts. Second, it identifies the population subgroups that hold the largest unrealised mitigation. Third, it examines how consumers' understanding of the diet relates to adoption willingness, indicating where information provision could help.

Methods

MATILDA dietary impact model

Dietary environmental impacts were estimated using MATILDA, a harmonised model integrating three global datasets to assess food consumption impacts across demographic subgroups (12). MATILDA couples: (1) the Global Dietary Database (GDD), which harmonises dietary intake data from 185 countries stratified by age (six groups), gender, education (low: 0–6 years; medium: 6–12 years; high: 12+ years), and area of residence (urban/rural) (13); (2) Global Synthetic Population Dataset (GLOPOP-S), providing country-, age-, and gender-specific population structure (14); and (3) Food and Agriculture Biomass Input–Output (FABIO) database, a global input-output environmental footprinting model capturing domestic and international food supply chains across 187 regions (15).

To estimate population-level impacts, food group intakes were matched to their corresponding FABIO environmental coefficients and combined with GLOPOP-S population structure. For each country and demographic subgroup, per-capita daily intakes of each food group were multiplied by the relevant GHGE, water, and land coefficients to derive per-capita environmental footprints, which were then weighted by subgroup population shares to obtain national and aggregate totals. This procedure

preserves heterogeneity in both dietary composition and supply-chain emission intensity across subgroups, enabling impacts to be decomposed by demographic characteristics and food group.

Because GDD dietary intakes are standardised to 2,000 kilocalories per person per day, we rescaled food group intakes using country-, age-, and gender-specific total energy intake estimates calculated by Springmann (16), so that intakes reflect actual population energy consumption patterns. We focused on three environmental indicators connected to FABIO: greenhouse gas emissions (GHGE, expressed as kg CO_2-equivalents per capita per day), water footprint (litres per capita per day), and land footprint (square metres per capita per day). These environmental indicators are country-specific, accounting for international trade and the actual sourcing of each food item along global supply chains.

Consumer adoption willingness data

Consumer willingness data were derived from the 2025 GlobeScan Radar/Healthy & Sustainable Living study, a representative online survey conducted in July and August 2025 across 33 markets (n = 31,960; approximately 1,000 respondents per market in each of Argentina, Australia, Brazil, Canada, China, France, Germany, India, Italy, Indonesia, Japan, Mexico, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Thailand, Turkey, the United Kingdom, Vietnam, Colombia, the Netherlands, Peru, Portugal, Egypt, Morocco, and Poland, with 500 in Hong Kong, Kenya, Nigeria, and Singapore, and 1,500 in the United States). Samples were weighted to national population census data. Respondents who gave identical answers across questions (flatliners) or completed the survey implausibly quickly (speeders) were excluded according to predefined quality standards, which differ by market; the sample sizes reported here are after these exclusions. Respondents were asked to select the one statement that best described what a “planetary health diet” meant to them from eight options: “eating mostly plant-rich food”, “eating fewer animal-sourced foods”, “eating less processed food”, “eating local and seasonal food”, “eating in a way that benefits the planet”, “all of the above”, “none of these”, or “I do not know”. Following this, respondents were asked "How likely are you to adopt the Planetary Health Diet?", with four ordered response options: "Not at all likely", "Somewhat unlikely", "Somewhat likely", and "I will try to adopt this diet". Respondents also provided demographic information (age, gender, education, area of residence) (Supplementary table 1).

We translated each response into a weight w between 0 (no change from baseline) and 1 (full adoption of the EAT-Lancet diet), so that respondent i closed a share w of the gap between baseline and EAT-Lancet intake. We applied this weight uniformly across food groups. Because the survey does not elicit the intended magnitude of change, the mapping from response category to w is an assumption, and we tested two specifications. The first approach (hereafter "robust specification") assigned equal intervals across categories: "Not at all likely" (w = 0), "Somewhat unlikely" (0.33),

"Somewhat likely" (0.67), and "I will try to adopt this diet" (1.0). This linear mapping assumes each step between response categories corresponds to an equal change in the magnitude of dietary transition. The second (hereafter "sensitive specification") compressed the middle categories toward the extremes: 0, 0.25, 0.75, and 1.0, respectively, giving less weight to ambivalent middle responses. In both specifications, the top category is treated as full adoption, which is an upper bound on stated intent. We retained both specifications because no empirical evidence favours one over the other.

Subgroup-level MATILDA environmental footprints (baseline dietary GHGE, water footprint, and land footprint) were merged into the GlobeScan dataset using exact matching by country, age group, gender, education level, and area of residence. Because the survey distinguishes only low and high education, we mapped the MATILDA and GLOPOP-S low (0 to 6 years) to the survey's low-education category, and the high group (more than 12 years) to its high-education category. Hong Kong and Singapore were excluded due to MATILDA data availability constraints, leaving 31 markets included in the analysis. The final merged dataset comprised 30,218 respondents across 31 countries.

Willingness-based dietary transition scenarios

For each respondent, we constructed adjusted dietary intakes under two EAT-Lancet reference diets (version 1.0 and 2.0, hereafter EAT-1 and EAT-2), scaled by the willingness weight w defined above. Adjusted intake of food group f for respondent i was calculated as:

$$x_{if}^{adj} = x_{if}^{base} + w_i \times \left(x_f^{EAT} - x_{if}^{base}\right)$$

where x_f^{EAT} is the target intake of food group f under the respective EAT-Lancet reference diet (the reference intake), and x_{if}^{base} is the baseline intake of respondent i. w ranged from 0 ("Not at all likely") to 1 ("I will try to adopt this diet"), with intermediate values reflecting partial adoption under the robust and sensitive specifications. This approach assumes that willingness responses capture the magnitude of dietary shift that individuals are prepared to undertake, not merely whether they will adopt. We repeated the calculation under both specifications to test sensitivity to the scaling assumption.

Intakes of non-targeted food groups (coffee, tea, refined grains, and other starchy vegetables) remained unchanged. The EAT-Lancet 2.0 allowances for beef, pork and lamb (15 g/day) and poultry (30 g/day) were applied to unprocessed red meat and to the total processed meat group, which includes poultry in our GDD mapping, respectively. Country-specific environmental impact factors (per gramme of food) were applied to the adjusted and baseline intakes to calculate dietary GHGE, water footprint, and land footprint for each respondent. The change in environmental impact for respondent i was the difference between adjusted and baseline dietary impacts:

$$\Delta E_i^k = \sum_f e_{c(i),f}^k \times \left(x_{if}^{adj} - x_{if}^{base}\right)$$

where E denotes GHGE, water footprint, or land footprint, k denotes the environmental indicator (GHGE, water footprint, or land footprint) and $e_{c(i),f}^k$ is the country-specific impact factor of food group f for the country c of respondent i.

We aggregated individual-level changes to demographic subgroups (defined by country, age group, gender, education level, and area of residence) using survey weights from GlobeScan, and scaled subgroup estimates to population size using population weights from GLOPOP-S. The weighted mean change for subgroup *g* was:

$$\overline{\Delta E}_g^k = \frac{\sum_{i \in g} s_i \ \Delta E_i^k}{\sum_{i \in g} s_i}$$

$$\Delta E_{g,total}^k = \overline{\Delta E}_g^k \times N_g$$

Where s_i is the survey weight of respondent i and N_g is the adult population size of subgroup g from GLOPOP-S. We derived national per-capita and total reductions by aggregating across all subgroups within each country. National per-capita changes are population-weighted means of the subgroup changes, and the full-adoption scenario sets w = 1 for every respondent. We define reducing countries as those in which the national per-capita change under full adoption is below zero. For each country or demographic group, the willingness gap is the difference between the willingness-adjusted and the full-adoption change, so that a positive value denotes reduction left unrealised; we report it in three forms: in kg CO_2-eq per person per day; as a percentage of the full-adoption reduction; and in percentage points of national baseline dietary GHGE. Annual totals in Mt CO_2-eq were obtained by multiplying per-capita daily changes (kg CO_2-eq per person per day) by subgroup population.

Differences in per-capita GHGE change across demographic groups were tested with Kruskal-Wallis tests (omnibus) and Mann-Whitney U tests (pairwise), because the distributions were skewed (Supplementary Table 2).

Identification of predictors of adoption willingness

To identify the predictors of adoption willingness, we fitted a random forest regression using the ranger package in R, with permutation-based variable importance. The dependent variable was each respondent's adoption weight w (0, 0.33, 0.67 or 1.0), which is the share of the gap between the baseline and EAT-Lancet diets that the respondent would close. Predictors were demographic characteristics (gender, age group, education, area of residence, country) and the respondent's interpretation of what the planetary health diet most means to them (single choice: plant-rich food, fewer animal-sourced foods, less processed food, local and seasonal food, benefits the planet,

all of the above, none of these, I do not know), entered as binary indicators. The forest comprised 1,000 trees, with four predictors sampled at each split (mtry = 4 of 13) and a minimum terminal node size of 10. GlobeScan survey weights were used as case weights, so that bootstrap samples were drawn in proportion to the weights. The model was fitted to 30,218 respondents with complete data. Out-of-bag (OOB) R^2 was 0.115 (0.118 when weighted by survey weights), indicating that the predictors explain 11.5% of the variance in individual-level willingness. Variable importance was quantified by permutation importance on OOB samples. Partial dependence plots showed the marginal effect of each predictor on predicted willingness, averaging over the observed distribution of all other predictors. Predicted willingness lies between 0 and 1 and is reported as a percentage, so that for example 63% denotes an expected closure of 63% of the dietary gap, not a 63% probability of adoption.

Results

Willingness-adjusted dietary transitions to the EAT-Lancet 2.0 dietary guideline reconfigured expected dietary GHGE outcomes unevenly across countries, but on balance led to a net increase in emissions compared with the baseline diet. Twenty-three of the 31 countries reduce their dietary footprint and eight increase it, for a net rise of 146.9 Mt CO_2-eq per year (+332.2 Mt in the eight increasing countries, −185.3 Mt in the 23 reducing countries). Under willingness-adjusted adoption, the largest proportional cuts occur in South Africa (41.7%), Peru (33.0%) and Argentina (30.0%); the largest rises occur in India (89.7%), Nigeria (40.0%) and Indonesia (32.8%). The rises in India and Nigeria are driven mainly by animal-sourced foods (86% and 69% of the increase), as baseline intakes sit below EAT-Lancet recommendations, whereas Indonesia's rise is mainly plant-sourced. Across the 23 reducing countries, the willingness-adjusted reduction falls short of the full-adoption reduction by 2.4 (China) to 24.3 (Argentina) percentage points of national dietary GHGE: Argentina from 54.4% to 30.0%, Sweden from 46.2% to 24.0%, and the Netherlands from 35.5% to 14.6%; in seven of the eight increasing countries the rise contracts, from 122.6% to 89.7% in India; in Viet Nam it widens slightly (0.2% to 0.8%). In absolute terms (Figure 1b), India's footprint rises from 261.9 Mt today to 582.9 Mt under full adoption and to 496.9 Mt after willingness adjustment. Among the reducing countries, Brazil's emissions fall by 71.4 Mt under full adoption but by only 41.3 Mt after adjustment, followed by China (36.1 Mt versus 26.2 Mt). Sensitivity analysis produced directionally consistent results across willingness assumptions (Supplementary Figure 1). In absolute terms, the willingness gap leaves 121.3 Mt CO_2-eq per year (39.6% of the achievable reduction) unrealised across the 23 reducing countries, equivalent to 2.4% to 24.3% of national dietary GHGE.

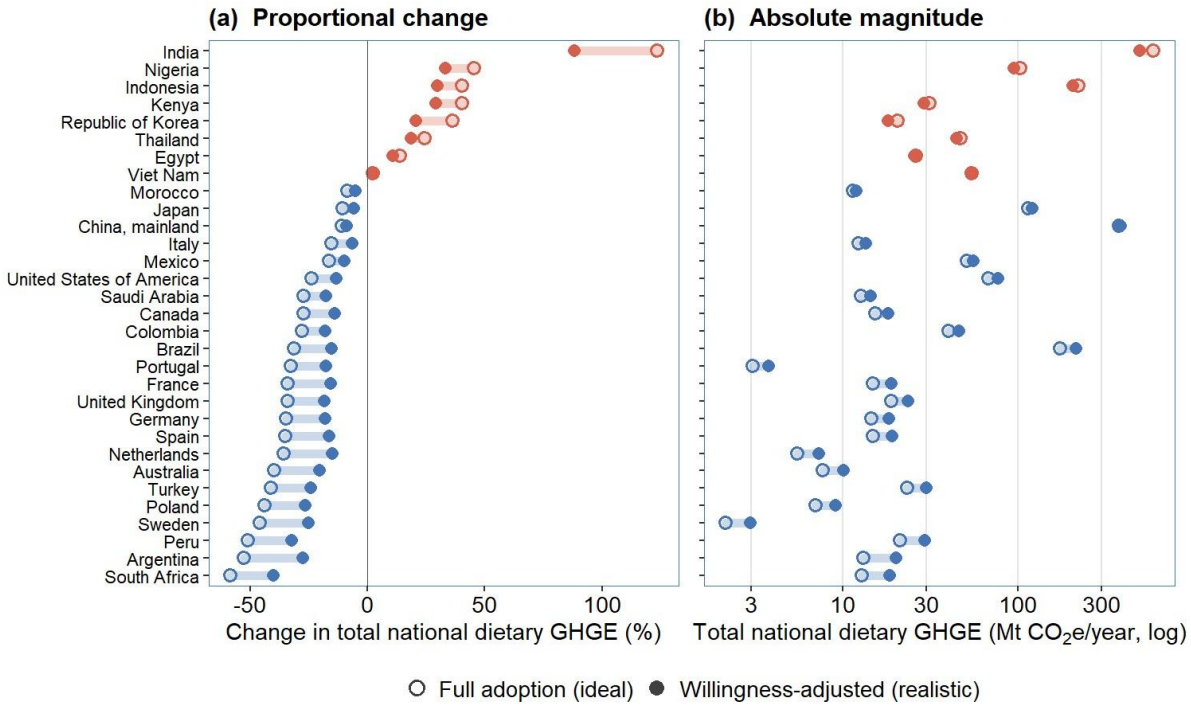


Figure 1. National dietary GHGE under full adoption of the EAT-Lancet 2.0 diet and under willingness-adjusted adoption (robust specification).

(a) Proportional change in total national dietary GHGE under full (universal) adoption of the EAT-Lancet 2.0 reference diet (open circles) compared with a willingness-adjusted transition (filled circles; robust specification). Shaded bands indicate the willingness gap between the two scenarios; blue denotes countries where full adoption reduces dietary GHGE and red denotes countries where it increases them. (b) Corresponding absolute national dietary GHGE (Mt CO_2-eq/year, log scale) under full adoption (open circles) and willingness-adjusted adoption (filled circles; robust specification), with shaded bands again indicating the willingness gap. Full adoption fixes the 12 EAT-Lancet target food groups at their recommended intake and keeps coffee, tea, refined grains and other starchy vegetables at current intake. Results under the sensitive specification are shown in Supplementary Figure 1. Results for the EAT-Lancet diet 1.0 are shown in Supplementary Figure 2.

Red meat (unprocessed) drove the willingness-adjusted GHGE reductions. Its contribution was negative in 30 of 31 countries, and it was the largest single reducing food group in all 23 countries with a net reduction, accounting for a median of 72% (range 38% to 98%) of the gross reduction (Figure 2). Peru showed the largest net reduction (3.50 kg CO_2-eq/person/day), with red meat alone contributing 4.38 kg CO_2-eq/person/day, partially offset by increases in whole grains, legumes, vegetables and nuts (net 0.87 kg CO_2-eq/person/day across all other food groups). Peru's baseline red meat consumption (127.3 g/day) was 8.5 times the EAT-Lancet 2.0 allowance of 15 g/day. India was the exception, with a net increase of 1.24 kg CO_2-eq/person/day. Its baseline intakes of processed meat and poultry (1.0 g/day) and red meat (5.0 g/day) lie well below their

allowances of 30 and 15 g/day, so movement towards them accounted for 0.54 and 0.41 kg CO_2-eq/person/day respectively, and animal-sourced foods contributed 86% of the total increase. Animal-sourced foods also dominated the increases in Egypt (65%), Kenya (67%) and Nigeria (69%), whereas Indonesia's increase was mainly plant-sourced (animal-sourced foods 29%).

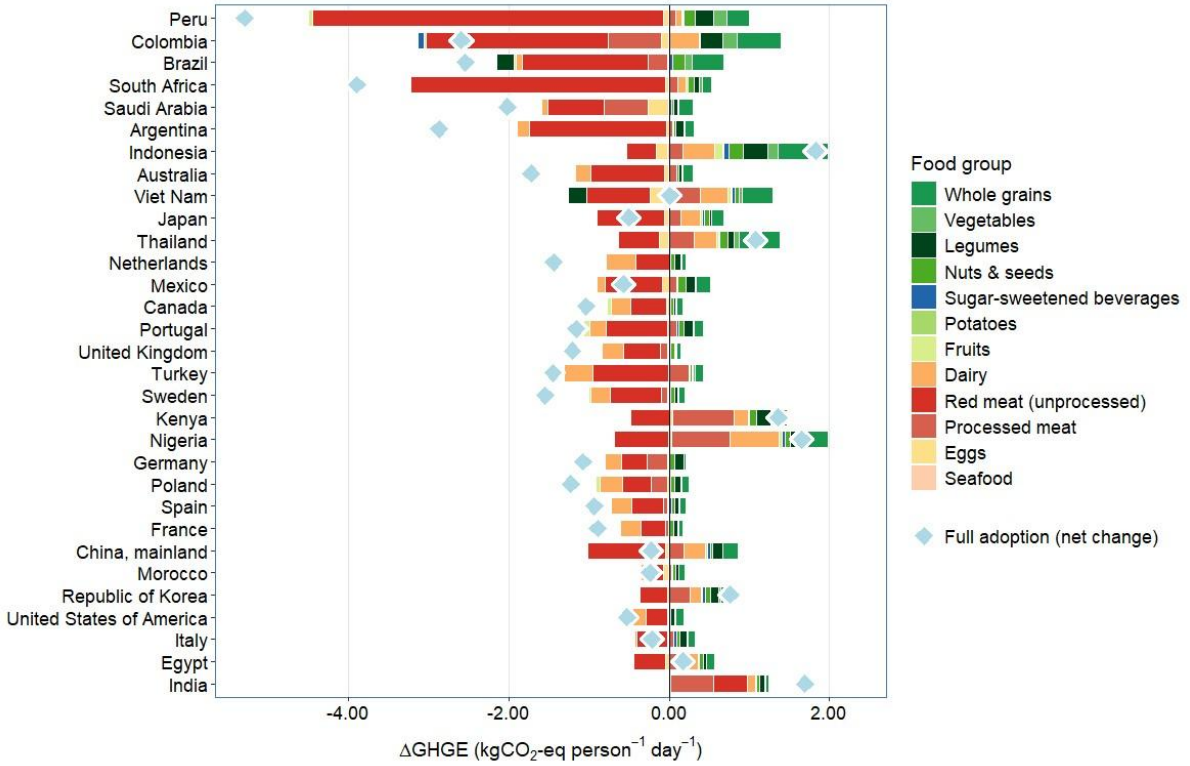


Figure 2. Food-group contributions to willingness-adjusted GHGE change under EAT-Lancet 2.0 diet adoption

Per-capita changes in dietary GHGE attributed to each food group under willingness-adjusted adoption of the EAT-Lancet 2.0 reference diet. Stacked bars show willingness-adjusted contributions of each food group (population-weighted); diamonds show the net change under full adoption; countries ordered by baseline GHGE.

Having summarised the willingness-adjusted results, we now turn to the mitigation gap, defined as the difference between the reduction achieved under full adoption, and under willingness-adjusted adoption (Figure 3). The gap is widest in Peru, where willingness-adjusted adoption delivers 1.79 kg CO_2-eq/person/day less reduction than full adoption (33.8% of the full-adoption reduction), followed by Argentina (1.28; 44.7%), South Africa (1.20; 30.9%) and Brazil (1.07; 42.1%). In relative terms the shortfall is largest in the Netherlands (58.9%) and Japan (56.9%). Across the 23 reducing countries the per-capita gap reaches 0.50 kg CO_2-eq/person/day for men (40.3% of their full-adoption reduction) against 0.17 for women (37.6%), a three-fold difference that holds in all 23 countries. It is 0.73 for consumers aged 15 to 24 (39.5%) against 0.13 among those aged 55 to 64 (42.0%), a 5.7-fold difference that also holds in all 23 countries. The urban gap exceeds the rural

gap on average (0.37 against 0.20; 39.0% against 43.1%), although this holds in only 16 of the 23 countries. The gap between men and women is most pronounced in Australia, where it widens from 0.30 for women to 1.41 for men, followed by Argentina (0.80 to 1.78) and Brazil (0.61 to 1.57). When scaled to total population (Supplementary Figure 3), willingness-adjusted adoption across the 23 reducing countries delivers 185.3 Mt CO_2-eq/year of realised mitigation, 60.4% of the 306.6 Mt achievable under full adoption; the remaining 121.3 Mt (39.6%) is not realised. In absolute terms the shortfall concentrates where emissions are largest: men account for 88.1 Mt against 33.2 Mt for women, and urban residents for 102.0 Mt against 19.4 Mt for rural residents. In relative terms the unrealised share is similar for men (40%) and women (38%), but it is higher among rural (43%) than urban residents (39%) and among adults with low education (41%) than with high education (38%).

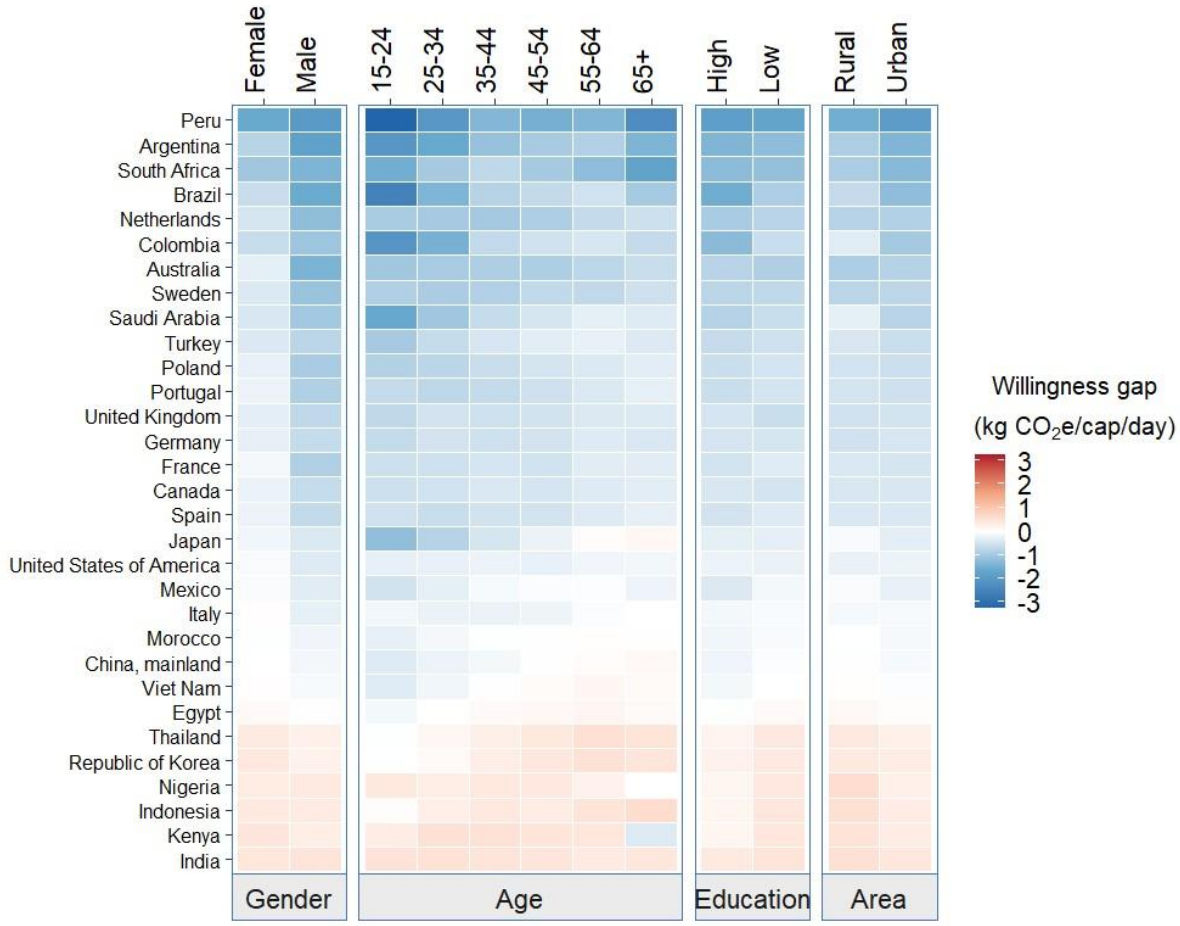


Figure 3. The willingness gap in per-capita dietary GHGE across countries and demographic groups.

Each cell shows the willingness gap defined as the full-adoption change minus the willingness-adjusted change in per-capita dietary GHGE (kg CO_2-eq per capita per day); the text reports these values as positive magnitudes. Blue (negative values) marks reduction left unrealised, where willingness delivers less reduction than full adoption; red (positive values) marks an emissions increase averted, where unwillingness withholds part of the rise that full adoption would bring.

Beyond sociodemographic characteristics, what consumers think the diet means is also associated with their willingness to adopt it (Figure 4). A random forest model predicts each group's willingness as the share of the gap to the EAT-Lancet diet that respondents would close, expressed here as a percentage. Respondents who said that a planetary health diet means "all of the above" (plant-rich food, fewer animal-sourced foods, less processed food, local and seasonal food, and eating in a way that benefits the planet) reach 67%, against 60% for those giving other answers, a difference of 7 percentage points. Respondents who did not know what the diet means sit at 50%, against 63% for those who gave an answer, a difference of 13 percentage points. Those who answered "none of these" record the lowest willingness, 44%, against 62% for the rest, a difference of 18 percentage points. Across demographic characteristics, predicted willingness ranges from 59% to 63% (Supplementary Figure 4): higher among women (63%) than men (60%), among the more educated (62%) than the less educated (61%) and in urban (62%) than rural areas (59%), with a slight rise across age from 60% (15 to 24) to 62% (65 and over).

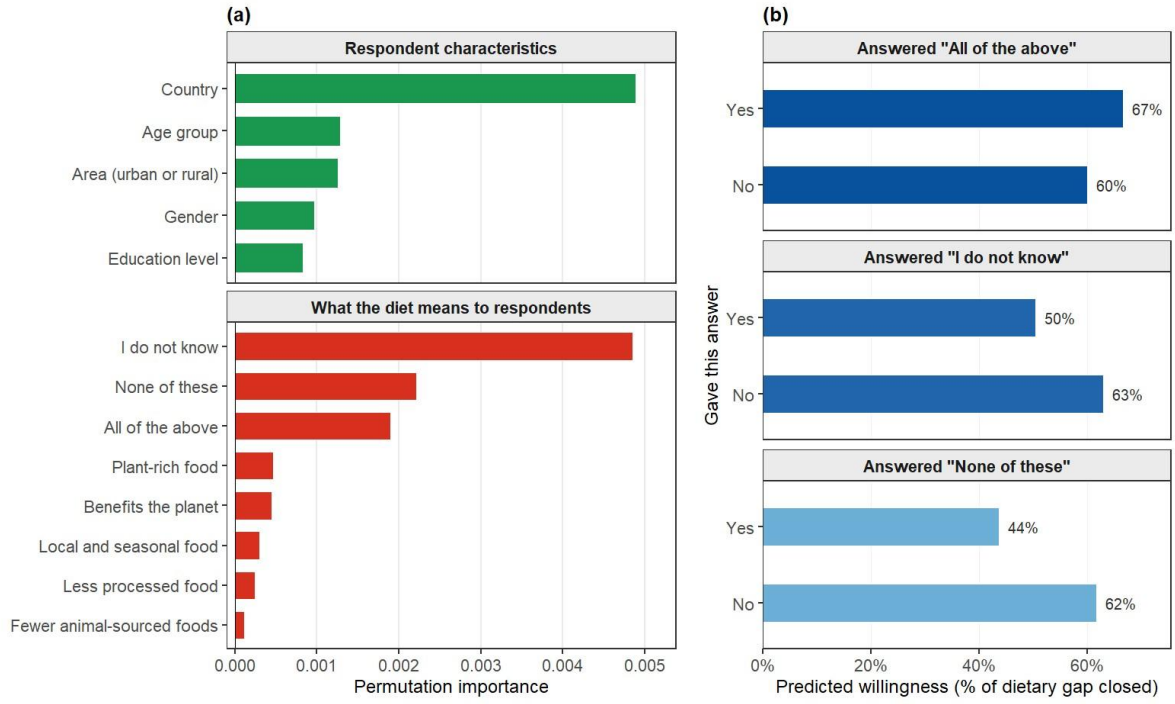


Figure 4. Predictors of consumer willingness to adopt EAT-Lancet 2.0 diet

Random forest analysis of willingness to adopt the diet, trained on respondent characteristics (country, area, age, gender, education) and respondents' answer to the single-choice question "What does a planetary health diet most mean to you?". (a) Permutation importance of each predictor, grouped into respondent characteristics and the eight answer options. (b) Predicted willingness for respondents who gave each of three summary answers ("All of the above", "I do not

know", "None of these", Yes) versus those who did not (No); predicted willingness expressed as the percentage of the dietary gap closed.

Discussion

Grounding dietary transition scenarios in measured adoption willingness rather than assumed uniform adoption reveals a willingness gap of 121.3 Mt CO_2-eq per year across the 23 countries in which the EAT-Lancet 2.0 guideline lowers GHGE: willingness delivers 185.3 Mt against 306.6 Mt under full adoption, leaving 39.6% of the achievable reduction unrealised. The shortfall appears in every one of these countries, equal to 2.4% to 24.3% of national dietary GHGE, and is widest in Peru, Argentina, South Africa and Brazil (1.79, 1.28, 1.20 and 1.07 kg CO_2-eq/person/day). It is also demographically patterned: 40.3% of men's full-adoption reduction is left unrealised against 37.6% for women, and 41.2% for adults with low education against 37.9% for those with high education, while men and urban residents account for most of the absolute shortfall (73% and 84%) because of their larger baseline footprints. Among the factors we measured, consumers' understanding of the diet is, alongside country, the strongest predictor of willingness: predicted willingness falls to 50% among those who do not know what the diet entails and to 44% among those answering "none of these", against 63% and 62% respectively among the remainder. Our analysis therefore identifies men, younger consumers and urban residents as the groups that warrant additional attention, and points to consumers' understanding of the diet's sustainability rationale as one route to accelerating the transition.

The willingness gap is demographically patterned. Predicted willingness varies only modestly across groups, from 60% among men to 63% among women, and the share of the full-adoption reduction that is not realised is similar for men (40%) and women (38%) when scaled by population. In absolute terms, however, men account for 88.1 Mt of unrealised mitigation against 33.2 Mt for women, and urban residents for 102.0 Mt against 19.4 Mt for rural residents. A modest difference in willingness therefore translates into a large mitigation gap because men and urban residents carry the larger baseline dietary GHGE. The patterning of adoption willingness we identify aligns with established evidence that men consume more meat (17) and express lower willingness to reduce animal-source foods (18), whilst meat consumption reduction is more prevalent among women (19). By contrast, younger consumers in our sample were slightly less willing than older ones (60% against 62%). The pattern also reflects greater dietary heterogeneity in urban areas compared to rural settings (20). Policy interventions targeting men, younger consumers and urban residents, where the willingness-emissions mismatch is greatest (21), would unlock the largest unrealised mitigation potential.

Consumer understanding of the diet is also a key predictor of willingness to shift towards a sustainable diet. In our sample, predicted adoption willingness was 63% among

consumers who gave an answer when asked what the diet means, falling to 50% among those who said they did not know and to 44% among those who answered “none of these”, against 62% for all other respondents (Figure 4). This is consistent with earlier research reporting that public understanding of the link between food and climate is limited, and that this limitation constrains willingness to reduce animal-source foods: focus-group work in Scotland found widespread scepticism that dietary change is relevant to climate mitigation (22), whilst a systematic review reports that consumers consistently underestimate the environmental burden of meat relative to other food-system interventions such as packaging or food waste (23). Our results show that unawareness of the recommended dietary guideline's meaning produces a substantial decline in predicted adoption willingness. Information interventions should therefore prioritise conveying the rationale for the dietary guideline (24).

Even when consumers exhibit similar dietary transition willingness (Supplementary Figure 5), dietary distance from guidelines and regional production intensity generate divergent environmental reductions across regions. First, dietary distance from guidelines determines the direction of change: countries with consumption substantially exceeding recommended levels (red meat at a median of 4.8 times the allowance across the 23 reducing countries, range 2.3 to 14.1) experience per-capita emissions reductions, whilst countries with consumption below recommendations (for example, processed meat and poultry at 1.0 g/day and red meat at 5.0 g/day in India, against allowances of 30 and 15 g/day) experience per-capita increases. Prior modelling demonstrated that high- and middle-income countries achieve environmental resource reductions and greenhouse gas emissions reductions through plant-rich dietary transitions, whilst in low-income countries, diversification of diets away from staple-crop dominance toward nutritionally adequate patterns leads to moderate increases in overall resource use (25). Second, despite similar magnitude of deviation, the environmental intensity of food production varies markedly by region and commodity, driving differences in absolute reduction values. Unprocessed red meat consumed in Peru carries 59 kg CO_2-eq per kg, 2.3 times that in Australia (26 kg CO_2-eq per kg) in the FABIO-based emission factors. This indicates that achieving dietary adequacy whilst reducing environmental burden requires a comprehensive food systems transformation approach encompassing dietary change, productivity enhancement, and social protection mechanisms (26). This entails demand-side information interventions to improve dietary quality, coupled with supply-side investments in agricultural productivity and food systems infrastructure (27).

Policy recommendations

Policy frameworks should be informed by measured consumer willingness and country context, as tailored dietary transition strategies are more effective than uniform approaches (28).

First, for urban consumers and younger cohorts, municipal authorities already hold the relevant levers over workplace and university catering (29,30); interventions designed specifically for young men have demonstrated reductions in red meat consumption where general campaigns have not (31). Second, given that not knowing what the dietary guideline entails is associated with 13 percentage points lower predicted willingness (50% against 63%), information provision should convey the rationale behind the guideline. An informational intervention designed to raise understanding of the role of meat consumption in climate change reduced students' meat consumption by 5.6 percentage points, with no signs of reversal over three years, at an estimated US$14 per tonne CO_2-eq (32). Such interventions are low-cost and readily deliverable at scale through existing educational and institutional channels (33). In the eight countries where adoption raises GHGE, adoption willingness should continue to be raised whilst the accompanying emissions are addressed through production-side investment and improved resource use efficiency (34). Finally, progress towards food-based dietary guidelines should be monitored by demographic subgroup, allowing incentives to be directed to the groups where the gap is largest: men, younger consumers and urban residents (35).

Limitations

This study has several limitations that warrant acknowledgement. First, the GlobeScan survey measured stated willingness rather than actual dietary behaviour. The conversion of ordinal willingness responses into continuous adoption magnitudes (0–1.0) assumes proportional translation from intention to behaviour, yet the psychological literature documents substantial gaps between stated and revealed preferences, particularly for sustained dietary shifts (36). Our sensitivity analysis demonstrates directional consistency in the relationship between willingness and per-capita outcomes (Supplementary Figure 1), but cannot validate whether stated willingness truly corresponds to dietary transition magnitude in practice. Our estimates of realised mitigation therefore probably overstate what stated motivation delivers. Future work should employ longitudinal dietary surveys tracking the same respondents over 12–24 months following willingness measurement, comparing actual dietary changes to predicted changes based on stated willingness scores (37).

Second, the random forest model for identifying predictors of adoption willingness uses cross-sectional data and cannot establish temporal precedence or causal mechanisms. The relative importance of cognitive, behavioural, and structural factors in driving sustained dietary transitions remains uncertain without longitudinal validation (38). Future research should incorporate panel data or experimental and quasi-experimental designs (e.g. randomised controlled trials of information interventions) (39,40).

Third, subgroup-level MATILDA environmental footprints were merged into the GlobeScan dataset using exact matching on country, age group, gender, education level, and area of residence. This approach assumes that all respondents within a demographic

cell have identical dietary environmental footprints, yet substantial heterogeneity in dietary choice exists within demographic cells. By assigning demographic-group-average environmental footprints to all individual respondents, the analysis introduces measurement error that obscures within-cell variation in dietary choice. Future research should calculate respondent-specific environmental footprints based on the dietary composition reported by each individual respondent, whilst simultaneously collecting data on consumer dietary preferences, rather than using population demographic group averages (41).

Conclusion

Grounding dietary transition scenarios in measured adoption willingness rather than assumed universal uptake shows that willingness to shift towards a sustainable diet is structured by demographic characteristics and by what consumers think the diet means. Across the 23 countries in which adoption of the guideline lowers dietary GHGE, willingness-adjusted transitions deliver 185.3 Mt CO_2-eq per year against 306.6 Mt under full adoption, leaving 39.6% of the achievable reduction unrealised. Within every country the per-capita shortfall is larger among men than women (0.50 against 0.17 kg CO_2-eq/person/day on average), and the unrealised share is higher among adults with low education (41% against 38%). Consumers who do not know what the diet means report lower predicted willingness (50%) than those who gave an answer (63%), although the survey did not ask about price, affordability or availability, so we cannot judge how large a barrier understanding is relative to these. Closing the willingness gap therefore depends on identifying the countries and groups where the gap is largest and directing incentives and information towards them, with progress monitored by subgroup. Dietary transition policy that treats consumers as uniform would leave roughly 40% of the assumed mitigation unrealised in the countries where the guideline lowers emissions.

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