

Availability, affordability, and consumption of fruits and vegetables in 18 countries across income levels: findings from the Prospective Urban Rural Epidemiology (PURE) study



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Summary

Background Several international guidelines recommend the consumption of two servings of fruits and three servings of vegetables per day, but their intake is thought to be low worldwide. We aimed to determine the extent to which such low intake is related to availability and affordability.

Methods We assessed fruit and vegetable consumption using data from country-specific, validated semi-quantitative food frequency questionnaires in the Prospective Urban Rural Epidemiology (PURE) study, which enrolled participants from communities in 18 countries between Jan 1, 2003, and Dec 31, 2013. We documented household income data from participants in these communities; we also recorded the diversity and non-sale prices of fruits and vegetables from grocery stores and market places between Jan 1, 2009, and Dec 31, 2013. We determined the cost of fruits and vegetables relative to income per household member. Linear random effects models, adjusting for the clustering of households within communities, were used to assess mean fruit and vegetable intake by their relative cost.

Findings Of 143 305 participants who reported plausible energy intake in the food frequency questionnaire, mean fruit and vegetable intake was 3.76 servings (95% CI 3.66–3.86) per day. Mean daily consumption was 2.14 servings (1.93–2.36) in low-income countries (LICs), 3.17 servings (2.99–3.35) in lower-middle-income countries (LMICs), 4.31 servings (4.09–4.53) in upper-middle-income countries (UMICs), and 5.42 servings (5.13–5.71) in high-income countries (HICs). In 130 402 participants who had household income data available, the cost of two servings of fruits and three servings of vegetables per day per individual accounted for 51.97% (95% CI 46.06–57.88) of household income in LICs, 18.10% (14.53–21.68) in LMICs, 15.87% (11.51–20.23) in UMICs, and 1.85% (–3.90 to 7.59) in HICs ($p_{trend}=0.0001$). In all regions, a higher percentage of income to meet the guidelines was required in rural areas than in urban areas ($p<0.0001$ for each pairwise comparison). Fruit and vegetable consumption among individuals decreased as the relative cost increased ($p_{trend}=0.00040$).

Interpretation The consumption of fruit and vegetables is low worldwide, particularly in LICs, and this is associated with low affordability. Policies worldwide should enhance the availability and affordability of fruits and vegetables.

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Introduction

Most nutritional guidelines recommend the consumption of at least two servings of fruits and three servings of vegetables per day.^{1,2} However, a large proportion of individuals do not meet these targets.^{3,4} An improved understanding of the factors that affect fruit and vegetable consumption is essential to improving the diet quality of populations.

Food cost has been shown to affect dietary intake in developed countries,^{5,7} but similar data for low-income countries (LICs) and middle-income countries (MICs) are sparse. High food cost might particularly affect

affordability among households spending a considerable proportion of their income on food.^{8,9} Increases in the cost of food have been shown to result in food-based coping strategies such as reductions in the quantity, quality, and diversity of food selections, and consumption of increased quantities of cheap, energy-dense foods.^{10–12}

Determining the affordability of essential foods such as fruits and vegetables in countries with different levels of economic development is important. In this study, we aimed to document the availability cost of fruits and vegetables in community grocery stores and market places, and the affordability of meeting dietary guidelines

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