intake

Country Stories That Inspire: Motivating GDQS Data to Action

October 2024

Recommended Citation

Intake – Center for Dietary Assessment. 2024. Country Stories That Inspire: Motivating GDQS Data to Action. Washington, DC: *Intake* – Center for Dietary Assessment at FHI 360.

Funding Statement

Funding for the publication was provided to FHI 360 by the Gates Foundation, through INV-035699 – Women's Nutrition: An Integrated Policy & Advocacy Agenda.

About Intake

Intake is a Center for Dietary Assessment at FHI 360, established in 2016 with funding from the Gates Foundation. *Intake* aims to strengthen policies and programs to improve nutritional status in low- and middle-income countries (LMICs) by increasing the availability, quality, comparability, and use of dietary data. *Intake* provides flexible, on-demand technical assistance to governments for collecting, analyzing, and using dietary intake data for evidence-based decision-making in LMICs; develops tools and technologies to facilitate dietary data collection and analysis; and carries out research to advance dietary assessment methods and develop validated metrics of diet quality.

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Contents

Acknowledgments

This book on Global Diet Quality Score (GDQS) data use would not have been possible without the contribution of many individuals.

Marieke Vossenaar and Winnie Bell led the writing for the Foreword and Part I of the book. Megan Deitchler provided oversight, guidance, and carried out a detailed review of the entire document. Nadieh Bremer created the GDQS data art collection that is presented on the cover and throughout various pages of the book. Heather Finegan supported the layout.

This book would not exist without Part II – the compilation of country stories of GDQS data use. We therefore extend our deep gratitude to the authors of each country story. This includes:

For the **Ethiopia Country Story** — Meron Girma, Dawit Alemayehu, Alemayehu Hussein, Nahom Tefera, Aregash Samuel, Tsedey Mogus, Endale Amare, Arnaud Laillou, Ramadhani Noor, Stanley Chitekwe, and Masresha Tessema

For the **Niger Country Story** — Ali Adamou Issa and Issiak Balarabé Mahamane

For the **Nigeria Country Story** — Tolu Emma Eyinla and Busie Maziya-Dixon

For the **Viet Nam Country Story** — Tuan Thi Mai Phuong, Tran Thanh Do, Ha Huy Tue, Vu Van Tan, Tran Thanh Duong, and Son Duy Nguyen

For the **Zambia Country Story** — Raider Habulembe Mugode, Chisela Kaliwile, Kalumba Chishipula, and Muntanga Mapani

We also acknowledge that the data used for the GDQS country stories were large-scale quantitative 24-hour dietary recall surveys, which involved the work of many, many people in each country, as well as the time of numerous respondents. We thank every person and institution who helped to make each of those surveys a success.

In Ethiopia, the authors would like to acknowledge the enumerators, supervisors, and regional coordinators for their commitment and hard work during data collection for the survey. Special thanks also go to the Regional Health Offices, Public Health Institutes, and the Ethiopian Statistical Services. Finally, special thanks go to all the study participants, without whom the survey would not have been possible. The survey was financially supported by UNICEF, the Power of Nutrition, the World Bank, GAIN, Nutrition International, the National Information Platform for Nutrition, the End Fund, Rotary, and the Eleanor Crook Foundation.

In Niger, the authors would like to acknowledge the contributions made by their colleagues, especially: Mohamed Ag Bendech, Almoustapha Théodore Yatta, Ibrahim Tawayé, Moctar Habou Kalla, and Guillaume Poirel from the National Information Platform for Nutrition hosted by the National Institute of Statistics in Niger; Mahamadou Aboubacar from the Ministry of Health; Gervais Ntandou-Bouzitou from FAO Niger; Agnès Duband from the European Union Delegation Niger; and Aichatou Alirou Mahamadou and Fatimata Jikatt Abdoulaye from the 3N Initiative. Special thanks go to the technical expertise provided by the European Union, *Intake* – Center for Dietary Assessment at FHI 360, FAO, and the National Institute of Statistics. Funding was obtained from the European Union through their Delegation in Niger (DUE), FAO through FIRST, and the Niger Government through the National Institute of Statistics (INS).

In Nigeria, the authors would like to acknowledge the Federal Government of Nigeria, represented by the Federal Ministries of Budget and Economic Planning, Health and Social Welfare, and Agriculture and Food Security; members of the Technical Advisory Committee; members of the Steering Committee; members of the Implementation Working Group, the Lead Implementing Agency (International Institute of Tropical Agriculture); and development partners, namely the Gates Foundation; United Nations Children's Fund (UNICEF), the Foreign, Commonwealth & Development Office (FCDO); Nutrition International; World Bank; and the U.S. Agency for International Development (USAID).

In Viet Nam, the authors would like to express their gratitude to the Leaders of the Ministry of Health and its departments, the Board of Directors of the National Institute of Nutrition, and Professor Le Danh Tuyen for encouragement and support in conducting the National Survey. The authors also thank all the staff from the National Institute of Nutrition and the provincial teams for meticulously completing their fieldwork.

In Zambia, the authors would like to express gratitude to organisations and individuals that supported the conduct of the survey: The government through the Ministry of Health (MoH), the Zambia Statistical Agency (ZamStats), and the University of Zambia (UNZA). The authors also extend their appreciation to their development partners: UNICEF, SIDA, and the World Bank for financial support. UNICEF also offered technical assistance through consultants in the pre-survey, data gathering, and report writing processes. Special thanks go to *Intake* – Center for Dietary Assessment at FHI 360, for technical support in pre-survey activities, data collection, entry and analysis, and report writing of the dietary component of the survey. The authors also acknowledge the Provincial and District Health Officers in the provinces and districts for permitting the research teams to gather data in their areas and for providing logistical support.

Foreword

Imagine a world in which healthy diets for all people are the norm and not the exception. What we eat has the potential to positively impact individual well-being, planetary health, and economic growth in the long run. Healthy diets have the potential to save one in five lives each year (GBD 2017 Diet Collaborators, 2019), reduce greenhouse gas emissions (Crippa et al., 2021), and provide lasting benefits to education outcomes and lifetime earnings (Ramakrishnan, 2020). However, too often, the benefits of healthy diets are unrealized as our current food system is not designed to deliver sustainable and nutritious foods at affordable prices, resulting in suboptimal diets and the attendant outcomes of poor health, consequential harm to the environment, and gross economic losses over time.

Diet quality can be broadly defined as consuming foods that are diverse, healthy, and balanced, resulting in a diet that ensures proper growth and provides energy and nutrients for a healthy and active life (International Atomic Energy Agency, 2023). While it is widely accepted that healthy diets are a public health goal, only recently has diet quality been operationalized in a way that allows for standardized, comparable measurement globally. Historically, diet quality metrics have either required complex data collection processes and food composition data for analysis and/or were not validated for global use. The GDQS was developed to fill this gap, providing the first simple, globally standardized, and validated food-based measure of diet quality that is predictive of both nutrient adequacy and risk of diet-related non-communicable diseases (NCDs) (Miller et al., 2020[1], Bromage et al., 2021a).

The initial validation of the GDQS — which occurred across a diverse set of secondary data from 14 low-, middle-, and high-income countries for both men and non-pregnant, non-lactating women ages 15 years and older — showed that the metric is predictive of both nutrient adequacy and risk factors associated with NCDs (Bromage et al., 2021a, Bromage et al., 2021b, Bromage et al., 2021c, Castellanos-Gutiérrez et al., 2021, He et al., 2021, Matsuaki et al., 2021, Angulo et al., 2021, Fung et al., 2021a, Fung et al., 2021b). More recently, the metric has been validated in Brazil among individuals 10 years and older to show associations with nutrient adequacy (data on NCD-risk outcomes were not evaluated) (Norde et al., 2024), in Thailand among men and women 40-60 years using data collected with the GDQS app to show associations with nutrient adequacy and risk factors associated with NCDs (Bromage et al., 2023), and in Viet Nam to show associations with nutrient adequacy and depression among young adolescent girls (Nguyen et al., 2023). The GDQS was also recently validated for use among children ages 2-14 years (Ali et al., in submission; Arsenault et al., in press; Batis et al., in press; Olvera-Mayorga et al., in submission; Kehoe et al., in submission).

While decisions about what to eat — and preferences for specific foods — occur at the individual and family level, these decisions take place within a broader food environment and food system, which largely dictates the availability, accessibility, and affordability of foods.

Context-appropriate policies and programs need to be designed to address structural issues and to ensure that healthy diets are accessible for all. To guide those policies, substantive, action-oriented data are needed. Data on the GDQS can provide a useful entry point for guiding the design of such policies and provide a feasible entry point for almost all countries, given how easy data are to collect with the GDQS app (Moursi et al., 2021; Asrat et al., in submission). Such data are relevant to a wide range of sectors — from nutrition to health, to agriculture, to social protection, and to trade and finance, among others.

This book provides an evidence-based demonstration of the type of insights that GDQS analyses can bring to policy and programmatic design. The book comprises two parts.

Part I — Measuring Diet Quality with the GDQS — introduces readers to the GDQS.

Part II — Country Stories — is the heart of this book. These stories showcase the use of GDQS data to help inform potential policy and programmatic actions for improved diet quality in five countries: Ethiopia, Niger, Nigeria, Viet Nam, and Zambia.

Each country showcased in this book recently invested in conducting a national or large-scale quantitative 24-hour dietary recall survey. These were the data used to tabulate the GDQS for each country story. The work to collect the quantitative 24-hour dietary data, process and clean the data, analyze the GDQS data, and write the GDQS country stories was led by the following institutions in each country:

Ethiopia – Ethiopian Public Health Institute

Niger – Institut National de la Statistique

Nigeria – International Institute of Tropical Agriculture

[1] The GDQS was released in 2021 after Miller et al. (2020) were unable to identify a single diet quality metric that addressed the double burden of malnutrition.

Viet Nam – National Institute of Nutrition

Zambia – National Food and Nutrition Commission

These institutions successfully championed the need for dietary data in their respective countries, having advocated for and conducted what was in many cases their country's first national or large-scale quantitative 24-hour dietary recall survey. These same institutions are now actively working to ensure effective use of the data collected, as evidenced by the country stories in Part II of this book.

In the country stories, each set of authors has proposed a unique, context appropriate architecture for arriving at improved diet quality in their country by using the GDQS as an analysis tool.

In Ethiopia, the analysis investigates diet quality among adult women. Results show that almost one-third of women are at high risk of poor diet quality outcomes, due to low consumption of healthy foods, with differences identified in consumption patterns between urban and rural residence and by wealth. The authors emphasize the need to address the drivers of poor diet quality and existing disparities in diet quality by scaling up production, supply chain, and education interventions with a lens toward food systems transformation.

In Niger, the focus is on adolescent girls and adult women. The results of the GDQS analysis highlight the importance of advancing policies designed to improve the availability, accessibility, affordability, and ultimately consumption of healthy and diverse foods across the country with an emphasis on regions that are especially vulnerable.

In Nigeria, women's diet quality is explored by socioeconomic status. The data show that women in higher wealth quintiles consume higher amounts of unhealthy foods. Policy-related actions such as taxes for unhealthy foods (e.g., sugar-sweetened beverages) and the development of food-based dietary guidelines for consumer education are highlighted as potential next steps for the country to consider.

In Viet Nam, stratified GDQS analyses are carried out to assess how diets differ between men and women, and between adolescents and adults. The results guide the authors to recommend a multi-pronged policy approach to address diet quality, one that targets adolescents and adults of both sexes and strives to limit consumption of unhealthy foods while also increasing consumption of healthy foods.

In Zambia, the dietary patterns of women living in urban and rural areas are compared. Here, women in urban areas are found to have the poorest diet quality. The authors find the difference in diet quality to be driven by urban women's higher consumption of foods from unhealthy food groups and lower consumption of foods from healthy food groups as compared to their rural counterparts. The authors underscore the need for comprehensive and innovative nutrition education campaigns in Zambia, particularly in urban areas.

Collectively these stories reflect a shared vision to work towards achieving diet quality for all. The stories provide a testament to the importance of not just measuring diet quality but also of the need to effectively leverage diet quality data to guide meaningful, evidence-based action for improving population health and well-being.

The stories provide continued motivation for us at *Intake* as we work toward our aspiration to help foster a world where diet quality for all is not just something to be imagined but a global reality collectively achieved.

We hope you find as much inspiration in these GDQS stories of data use as we do. We offer them as reminders of what is possible when there is a commitment to dietary data collection, analysis, and use.

It always seems impossible until it is done.

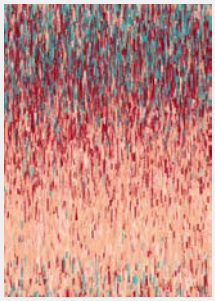
—NELSON MANDELA

About the GDQS Data Art Collection

Throughout this book, we have included an art collection that uses secondary GDQS data from individuals around the world as its foundation and inspiration.[2] We commissioned the collection of data art to symbolically visualize the richness, depth, and detail provided by GDQS data. The art collection was created from the analysis and random selection of a sub-set of one day of GDQS data from among more than 80,000 individuals 15 years and older across a total of 23 countries in six world regions: East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, North America, South Asia, and Sub-Saharan Africa.

The GDQS art collection includes six unique pieces: one foundational piece of art (Art Piece #1) that includes data for all GDQS food groups for the individuals represented in the art piece, plus five complementary pieces of art (Art Piece #2, #3, #4, #5, and #6), each of which presents individuals' data for a unique sub-set of GDQS food groups. The sub-set of GDQS food groups represented in each of the five accompanying art pieces were grouped into a unifying higher-level food group category or theme, as follows:

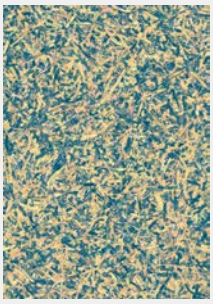
Art Piece #1: Foundational Art Piece – includes all GDQS Food Groups. Learn more about this piece on page vi.



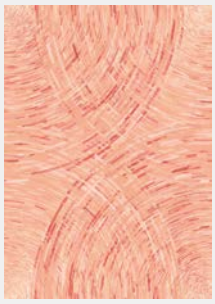
Art Piece #2: Animal Source Foods – includes the following GDQS Food Groups: Fish and shellfish; Poultry and game meat; Red meat; Processed meat; Eggs; Low-fat dairy; High-fat dairy.

Art Piece #3: Vegetables, Roots & Tubers – includes the following GDQS Food Groups: Deep orange tubers; White roots and tubers; Dark green leafy vegetables; Deep orange vegetables; Cruciferous vegetables; Other vegetables.

Art Piece #4: Sweets, Snacks, & Processed Foods – includes the following GDQS Food Groups: Refined grains and baked goods; Juice; Sugar-sweetened beverages; Sweets and ice cream; Purchased deep-fried foods.



Art Piece #5: Whole Foods – includes the following GDQS Food Groups: Whole grains; Legumes; Nuts and seeds; Liquid oils.



Art Piece #6: Fruit – includes the following GDQS Food Groups: Deep orange fruits; Citrus fruits; Other fruits.

In addition, throughout this book, we have used GDQS data from the foundational art piece (Art Piece #1) to provide a border design for each page of the book. No two pages in the book include a border with the exact same design, as the design for the border on each page of the book was created by using GDQS data for a random sub-set of respondents included in the foundational art piece.

We invite you to enjoy the art collection presented throughout this book and to be inspired by the diversity, richness, and possibility that lies within GDQS data.

[2] Please note: the copyright for all art pieces included in the GDQS data art collection is owned by FHI 360.

About Art Piece #1: Foundational Art Piece

This artwork is the collection's cornerstone, weaving together data from all 25 food groups included in the GDQS metric to create a composite visual that captures the diversity of dietary patterns across individuals around the world. It uses the results from a random subset of tens of thousands of individuals 15 years and older from 23 countries who participated in food consumption surveys, from which the quantitative 24-hour dietary recall data collected was used to tabulate the GDQS. These data were then used to create data art to meaningfully showcase the richness, depth, and detail that GDQS data provide on food consumption patterns.

This piece translates the GDQS data into a symphony of color and form. Each GDQS food group has its own unique visual representation; for example, wavy white lines for food items consumed in the "Whole grains" food group contrast with bold red circles for food items consumed in the "Red meat" food group.

Each person's GDQS data are visualized along a ring. If an individual consumed one item from the "Red meat" food group, a small (arc)section of that individual's ring is marked with red circles. The more items eaten from a specific GDQS food group, the greater the length of the (arc)section. For example, if four items were consumed from the "Whole grains" food group, a white wavy line four times longer than the red circle section would be drawn on the ring for that individual. This method was used to place visual markers on the ring for all GDQS food groups consumed by the individual. The same approach was repeated for every individual whose GDQS data are represented in the art piece.

The resulting circular form evokes the familiar image of a plate as seen from above. The art piece reminds us that meals are more than just the sum of their ingredients. They are intricate, unique compositions, informed by culture, context, access, and availability, with implications over the long-term for the nutrition and health of the individual.

For those seeking a deeper dive into the data presented in this art piece, a key is provided to describe how each stroke in the artwork represents a data value in the GDQS data.

Whole grains | *White wavy lines*

Refined grains and baked goods | *Red-orange thick strokes*

Deep orange tubers | *Red-orange circles*

White roots and tubers | *White thick strokes*

Legumes | *Dark blue thick strokes*

Nuts and seeds | *Peach hatched lines*

Fish and shellfish | *Blue circles*

Poultry and game meat | *Red-orange leaves/feathers*

Red meat | *Red circles*

Processed meat | *Dark red circles*

Eggs | *Yellow leaves/feathers*

Low-fat dairy | *White hatched lines*

Deep orange fruits | *Red-orange wavy lines*

Citrus fruits | *Yellow circles*

Other fruits | *Peach wavy lines*

Dark green leafy vegetables | *Black-blue thick strokes*

Deep orange vegetables | *Red hatched lines*

Cruciferous vegetables | *Blue leaves/feathers*

Other vegetables | *Turquoise thick strokes*

Liquid oils | *Yellow thick strokes*

Juice | *Light peach wavy lines*

Sugar-sweetened beverages | *White circles*

Sweets and ice cream | *Red thick strokes*

Purchased deep-fried foods | *Deep red hatched lines*

High-fat dairy | *Peach thick strokes*

Part I.
Measuring Diet Quality with the GDQS

Understanding what people eat is a non-negotiable in protecting the health of people worldwide. The measurement of diet quality matters more than ever because what we eat is intrinsically linked to so many of our national and global systems – health, food, environment, and the economy, to mention just a few. With the GDQS metric validated for use globally, we now have an answer for not only reporting a measure of diet quality for a population, but for reporting a comparable measure across populations and for understanding the components of diet quality that are present or lacking within a given population.

About the GDQS

The GDQS is a food-based metric comprised of 25 food groups: 16 healthy food groups, seven unhealthy food groups, and two food groups (red meat, high-fat dairy)[3] that are unhealthy when consumed in excess (**Table 1** on the next page).

For each GDQS food group, ranges of quantity of consumption are defined using food group-specific gram cutoffs (i.e., grams per day). Ranges of consumption are defined as low (which includes no consumption), medium, and high. For high-fat dairy, a range of very high consumption is also included.

The GDQS metric is tabulated based on the quantity of consumption reported by the respondent for each food group during a 24-hour reference period.

For the **16 healthy food groups**, more points are given for higher consumption.

- **Low consumption** = 0 points
- **Medium consumption** = 0.25 to 2 points (depending on the food group)
- **High consumption** = 0.5 to 4 points (depending on the food group)

For the **7 unhealthy food groups**, more points are given for lower consumption.

- **Low consumption** = 2 points
- **Medium consumption** = 1 point
- **High consumption** = 0 points

For the **2 food groups that are unhealthy when consumed in excess**, more points are given for moderate consumption.

- **Low consumption** = 0 points (red meat and high-fat dairy)
- **Medium consumption** = 1 point (red meat and high-fat dairy)
- **High consumption** = 0 points (red meat); 2 points (high-fat dairy)
- **Very high consumption** = 0 points (high-fat dairy only)

The scoring of each food group is based on whether the epidemiological evidence suggests that its consumption conveys benefits or risks to overall health (Bromage et al., 2021). Naming these food group categories "healthy," "unhealthy," and "unhealthy when consumed in excess" provides a simple (albeit imperfect) method for communicating how the foods in each group contribute to an overall healthy diet, as reflected in the epidemiologic literature and operationalized by the GDQS. For all food groups, a higher score is desired and reflects healthier food consumption patterns.

The overall GDQS is the sum of points across all 25 GDQS food groups, with the possible score ranging from 0 to 49. However, a score of 49 is never expected to be attained since the GDQS is not a prescriptive dietary pattern but instead a method for assessing, scoring, and categorizing different dietary patterns in terms of healthiness.

GDQS Data Requirements

Different sources of dietary data can be used to tabulate the GDQS. Guidance on how to tabulate the GDQS using quantitative 24-hour dietary recall data, food frequency data, and data collected with the GDQS app is available (*Intake* – Center for Dietary Assessment, 2021). The choice of data source for tabulating the GDQS depends on the availability of existing dietary data and the resources available for collecting primary data.

When secondary data sources are used to tabulate the GDQS, quantitative 24-hour dietary recall data are an ideal source because this type of dietary data provides detailed information about all foods and beverages consumed by the respondent, including an estimate of the amount consumed. Data collected using a quantitative food frequency instrument can also be used, but the instrument must comprehensively list the foods commonly consumed by the target population and allow for the quantity of consumption of each food to be derived for a 24-hour reference period.

For primary data collection, the GDQS app provides a streamlined, relatively low-resource method for collecting GDQS data (Moursi et al., 2021, Asrat et al., in submission). The GDQS app was validated in Thailand with positive results (Bromage et al., 2023) and, to date, has been used in the following countries, with multiple surveys or studies conducted in several of these countries: Bangladesh, Cameroon, the Democratic Republic of Congo, Ethiopia, India, Lebanon, Myanmar, Nepal, Nigeria, the Philippines, Tanzania, Thailand, and the United States.

With the GDQS app, an open recall for a 24-hour reference period is used to collect a listing of all foods, beverages, and mixed dishes consumed (this is the same as the quick pass of a multiple pass quantitative 24-hour dietary recall interview). The app includes a global food database of 7,000+ items

[3] Red meat and high-fat dairy are important sources of high-quality protein and micronutrients such as iron and calcium but, in the context of diet-related NCDs, are unhealthy when consumed in excessive amounts. As such, moderate consumption is recommended.

Table 1. GDQS Scoring and Food Groups for Adolescents and Adults 10 Years and Older[4]

Sub-metric	Scoring Classification	Food Group	Categories of Consumed Amounts (g/day)				Points Assigned			
			Low	Medium	High	Very high	Low	Medium	High	Very high
GDQS+	**Healthy**	Citrus fruits	<24	24-69	>69		0	1	2	
		Deep orange fruits	<25	25-123	>123		0	1	2	
		Other fruits	<27	27-107	>107		0	1	2	
		Dark green leafy vegetables	<13	13-37	>37		0	2	4	
		Cruciferous vegetables	<13	13-36	>36		0	0.25	0.5	
		Deep orange vegetables	<9	9-45	>45		0	0.25	0.5	
		Other vegetables	<23	23-114	>114		0	0.25	0.5	
		Legumes	<9	9-42	>42		0	2	4	
		Deep orange tubers	<12	12-63	>63		0	0.25	0.5	
		Nuts and seeds	<7	7-13	>13		0	2	4	
		Whole grains	<8	8-13	>13		0	1	2	
		Liquid oils	<2	2-7.5	>7.5		0	1	2	
		Fish and shellfish	<14	14-71	>71		0	1	2	
		Poultry and game meat	<16	16-44	>44		0	1	2	
		Low-fat dairy	<33	33–132	>132		0	1	2	
		Eggs	<6	6–32	>32		0	1	2	

Sub-metric	Scoring Classification	Food Group	Categories of Consumed Amounts (g/day)				Points Assigned			
			Low	Medium	High	Very high	Low	Medium	High	Very high
GDQS-	**Unhealthy in excessive amounts**	High-fat dairy (in milk equivalents)	<35	35–142	>142–734	>734	0	1	2	0
		Red meat	<9	9–46	>46		0	1	0	
	Unhealthy	Processed meat	<9	9–30	>30		2	1	0	
		Refined grains and baked goods	<7	7–33	>33		2	1	0	
		Sweets and ice cream	<13	13–37	>37		2	1	0	
		Sugar-sweetened beverages	<57	57–180	>180		2	1	0	
		Juice	<36	36–144	>144		2	1	0	
		White roots and tubers	<27	27–107	>107		2	1	0	
		Purchased deep-fried foods	<9	9–45	>45		2	1	0	

[4] Adapted from *Intake* – Center for Dietary Assessment 2022. Global Diet Quality Score Toolkit. Washington, DC: *Intake* – Center for Dietary Assessment/FHI Solutions. Available at GDQS Toolkit - Now Available in Multiple Languages | intake

that are categorized into their corresponding GDQS food group. The database is integrated into the app, allowing for automated, standardized classification of foods, beverages, and ingredients reported as consumed into the correct GDQS food group. Estimates of consumption at the food group level are captured using a set of ten 3D cubes of varying, specified sizes.

When the GDQS app is used to collect data, no data entry or processing after data collection is needed. The app automatically generates the following results for each respondent: the GDQS metric, the categorical range of intake (low, medium, high, or very high) for each GDQS food group, and a listing of the foods, beverages, and ingredients consumed per GDQS food group.

By simplifying data collection and providing rich detailed data, the GDQS app fills a gap in dietary data collection methodologies, allowing countries to regularly monitor diet quality and have actionable information on diets available at scale.

How to Use GDQS Data in Action-Oriented Analyses

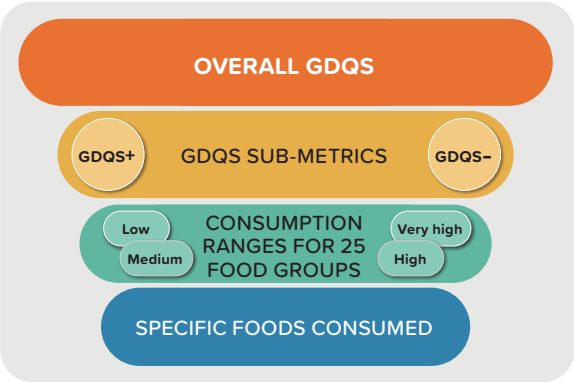
The GDQS metric provides a solution for deriving a comparable measure of diet quality across countries, across geographic areas within a country, and across different demographic groups. In the context of changing dietary patterns and the double burden of malnutrition, the GDQS metric provides crucial information for assessing and understanding the healthiness of diets.

At the aggregate level, the overall GDQS can be reported as a population's mean diet quality score. Population-based cutoffs can also be applied to the GDQS:

Score	Risk of poor diet quality outcomes
GDQS < 15	High
GDQS ≥15 and <23	Moderate
GDQS ≥ 23	Low

Applying these population-based cutoffs to GDQS data provides useful information about the distribution of diet quality among the population, as well as insights into how the distribution of risk for poor diet quality outcomes compares across different countries, geographic areas, and demographic groups.

Figure 1. GDQS Data Analysis Levels[5]



To provide more detailed information about food consumption patterns among the population, the GDQS can be disaggregated into its component parts. There are three levels of disaggregation possible (**Figure 1**).

At the first level of disaggregation, GDQS data can be used to derive a GDQS positive sub-metric and a GDQS negative sub-metric. The GDQS positive provides a measure for healthy food group consumption and the GDQS negative provides a measure of unhealthy food consumption. Tabulation of the GDQS positive and GDQS negative provides insight into what is driving the overall GDQS result — healthy consumption patterns, unhealthy consumption patterns, or both. For the GDQS positive and the GDQS negative, a higher score is desired and reflects healthier food consumption patterns.

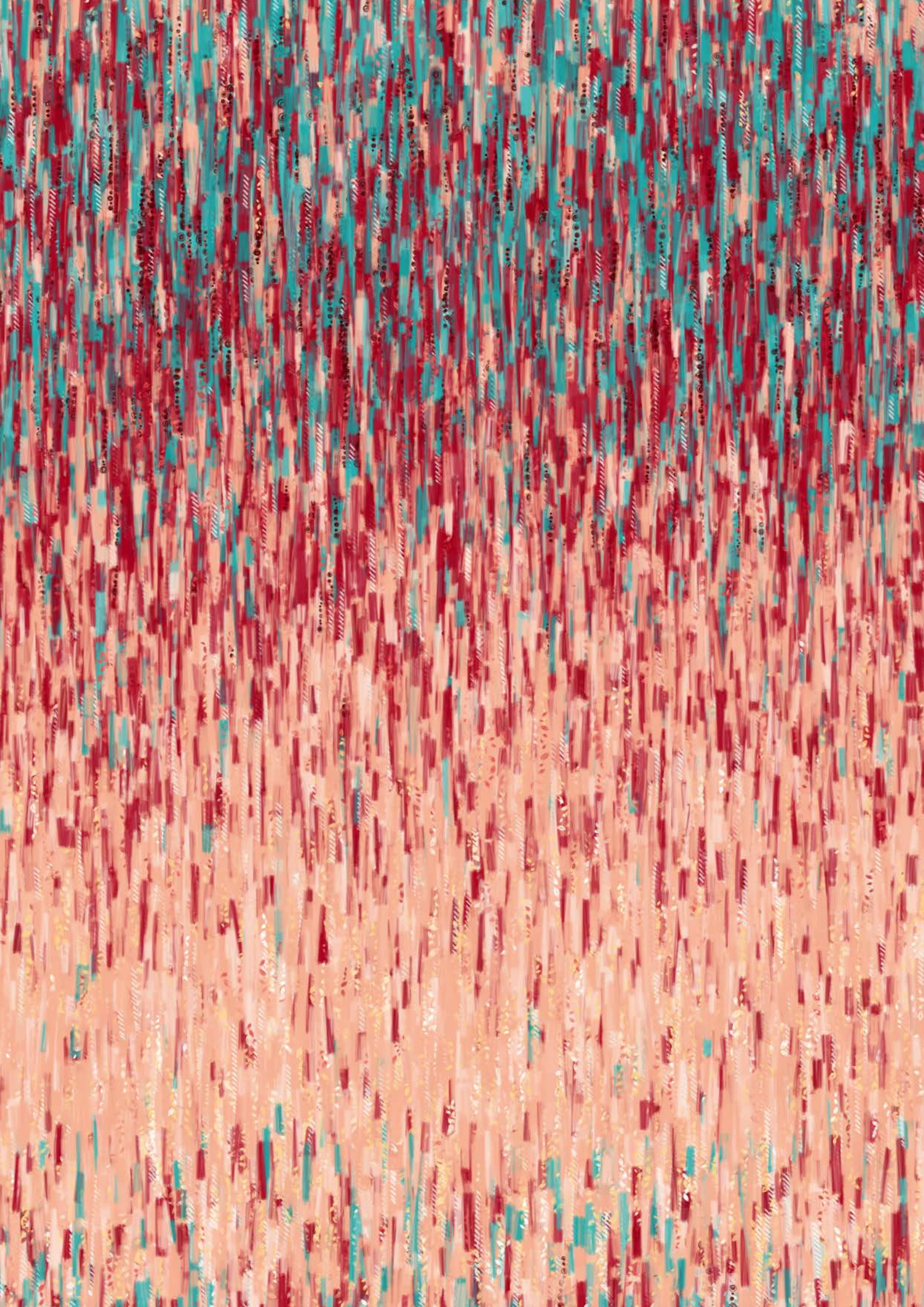
Further disaggregation of GDQS data provides more action-oriented insight into context-specific needs. For example, GDQS data can be analyzed to provide results at the food group level to assess the percentage consuming low, medium, and high (or very high) amounts of healthy and unhealthy food groups. These data can be used to identify which healthy food groups are not consumed in sufficient quantities for promoting good health and which unhealthy food groups are consumed in excess, thereby presenting risks for poor health.

Additionally, GDQS data always provide information about the specific food or beverage items reported as consumed by the population. These data – the percentage reporting consumption of specific foods and beverages during the reference 24-hour period – hold important insights for understanding specific food consumption practices and the set of policies and/or messages that are both needed and might resonate most with the target population.

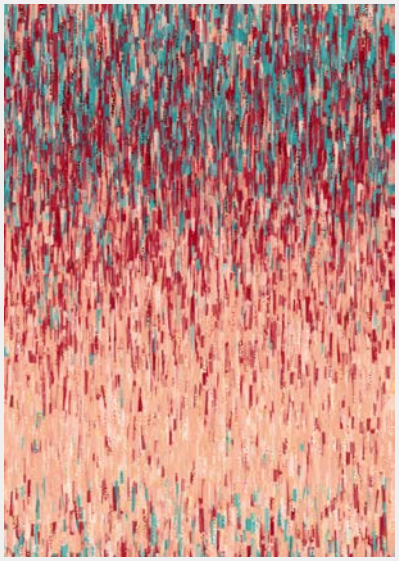
[5] For a further illustration of these different levels of disaggregation, refer to the *Intake* website, where interactive data visualizations that summarize GDQS data from 23 different countries can be found.

Part II.
Country Stories

The country stories presented in this section are a clear demonstration of how to use the GDQS metric to derive action-oriented insights for policies and programs. Each story starts at the aggregate level, providing results for overall diet quality for the country, and across geographic areas or demographic groups. Each story then advances to present the results for more detailed analyses, conducted at different levels of GDQS metric disaggregation. In the process, each country's story reveals how the drivers of – and barriers to – diet quality are similar or different across various geographic areas and demographic groups, and how the data can be used to provide targeted information for effective programmatic and policy design. Together the stories illustrate the power of the GDQS, showing how this metric can bring data-driven insights to help transform evidence into action for improved diet quality.



About Art Piece #2: Animal Source Foods



This artwork delves into the world of animal-source foods. Its elongated, undulating form echoes the graceful lines of muscle fibers.

The piece utilizes the same core data visualization method as the foundational piece. However, here, each person's GDQS data are drawn along a sinuous line traversing the canvas from top to bottom.

The following seven GDQS food groups are represented in this piece:

Fish and shellfish | *Blue thick strokes (portrayed as circles in the main piece)*

Poultry and game meat | *Red-orange leaves/feathers*

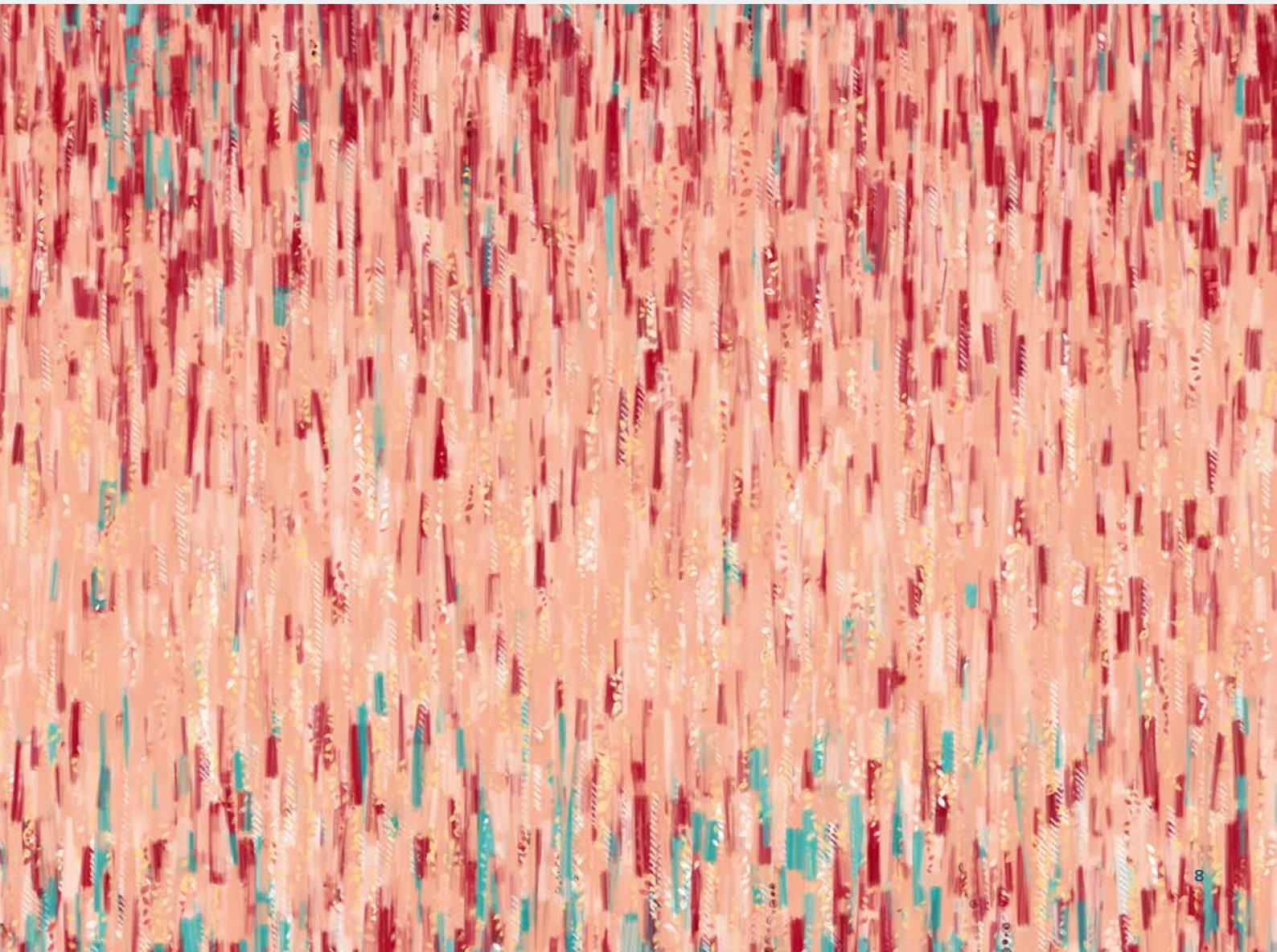
Red meat | *Red circles*

Processed meat | *Dark red thick strokes (portrayed as circles in the main piece)*

Eggs | *Yellow to white leaves/feathers*

Low-fat dairy | *White hatched lines*

High-fat dairy | *Peach thick strokes*



Ethiopian Women Have Low Consumption of Healthy Food Groups: An Analysis Using the GDQS

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Introduction

Sub-optimal diets are the leading cause of mortality globally, with one in five deaths attributed to poor diets, emphasizing the urgent need to improve diet quality. Low intake of healthy foods such as whole grains, fruits, nuts, and seeds are major dietary risk factors contributing to mortality, surpassing the effect of high intakes of fats and sugars (GBD 2017 Diet Collaborators, 2019).

In Ethiopia, dietary risks contribute to one in ten deaths (Melaku et al., 2018). Micronutrient deficiencies persist alongside chronic energy deficiency, reflecting long-term inadequate dietary intake (Ethiopian Public Health Institute, 2016). In 2011, the prevalence of inadequate intake of vitamin A, zinc, and iron among women of reproductive age was 82%, 50%, and 13%, respectively (Ethiopian Public Health Institute, 2013). The latest national survey, conducted in 2023, shows that only 7% of women consumed the minimally recommended five or more food groups, out of the 10 included in the Minimum Dietary Diversity for Women indicator (Ethiopian Public Health Institute, 2023).

Ethiopia has been implementing a National Nutrition Program since 2013 and endorsed its first-ever Food and Nutrition Policy in 2018 (Federal Democratic Republic of Ethiopia, 2018). To operationalize this policy, the National Food and Nutrition Strategy was initiated in 2023 (Federal Democratic Republic of Ethiopia, 2021a). Ethiopia has also committed to transforming its food system, identifying 22 game-changing solutions for its 10-year food system transformation plan (Federal Democratic Republic of Ethiopia, 2021b). Effective implementation of these strategies requires scalable priority interventions. However, the lack of timely and comprehensive information on the nutritional status of the population, including women's diets, hampers these efforts.

The Ethiopian Food and Nutrition Strategy Baseline Survey, conducted from July 2021 to October 2022 across 10 regions and 2 city administrations, aimed to fill this evidence gap. The survey is a population-based cross-sectional study that aimed to assess the anthropometric status, dietary intakes, and micronutrient status of various population groups in Ethiopia and evaluated the coverage of nutrition-sensitive and nutrition-specific interventions to support the implementation of the recent National Food and Nutrition Strategy. The survey employed a two-stage stratified cluster sampling procedure to select participants. The sample size was estimated to ensure adequate precision for generating national and regional estimates for key indicators, including the prevalence of inadequate intake of selected nutrients. Further details about sample size calculation, sampling procedures, and recruitment can be found elsewhere (Woldeyohannes et al., 2023).

Dietary intakes of women of reproductive age and children aged 6–59 months were assessed using a one-day quantitative multiple-pass 24-hour recall, with a second non-consecutive day repeat 24-hour recall carried out on a randomly selected subsample of women and children to account for day-to-day variability in dietary intakes within individuals.

This analysis uses dietary data collected from the 2021/2022 national survey to tabulate the Global Diet Quality Score (GDQS) and generate estimates of diet quality among women, for whom data are currently scarce. The GDQS is a novel metric that considers both the quantity and quality of consumption and is validated as a population-based diet quality assessment tool for women (Bromage et al., 2021). For details on how the quantitative 24-hour dietary recall data were processed to tabulate the GDQS, refer to the Annex.

A sample of 7,050 women of reproductive age (15–49 years) from 10 of the 12 regions where data collection was completed by August 2022 was available for this analysis. Sampling weights were applied when calculating all GDQS estimates to account for the probability of selection for each respondent. All statistical tests applied sampling weights and accounted for the stratified cluster design used for the survey. Data management and statistical analysis were conducted using Stata Version 16.1.

Differences in overall GDQS, GDQS positive, and GDQS negative scores across residence and wealth quintiles were tested using a t-test and one-way analysis of variance. Prior to performing the t-test, we checked for assumptions of normality and homogeneity of variances. To examine the association between the categorical GDQS score with residence and wealth; and the level of consumption of GDQS food groups with residence and wealth, we employed the chi-square test of independence. This test allowed us to determine whether there were statistically significant associations between the categorical variables.

Results

Overall Diet Quality

The mean (SD) GDQS for women of reproductive age was 16.6 (2.8) out of a maximum possible score of 49, although a score of 49 is not expected. Interestingly, women living in urban areas had slightly higher mean GDQS (16.9) than their rural counterparts (16.4) ($p<0.001$). The mean GDQS also varied according to wealth quintile, ranging from 16.6 in the lowest to 17.3 in the highest wealth quintile ($p<0.001$).

Almost one-third of women (29.1%) faced a high risk of poor diet quality outcomes (i.e., GDQS <15), both in terms of risk of nutrient inadequacy and risk of non-communicable disease (NCD) (**Figure 1**). Most women (70.2%) faced a moderate risk of poor diet quality outcomes (GDQS ≥15 and <23), while only 0.7% had a low risk of poor outcomes (GDQS ≥ 23). More rural women had a high risk of poor diet outcomes compared to their urban counterparts (30.6% vs. 25.7%) ($p=0.005$). The risk of poor diet quality outcomes did not consistently decrease or increase with increasing wealth.

These findings underscored the need to delve deeper and to further disaggregate the overall GDQS metric into GDQS positive and GDQS negative sub-metrics to understand how the consumption of different food groups contributed to the overall GDQS score.

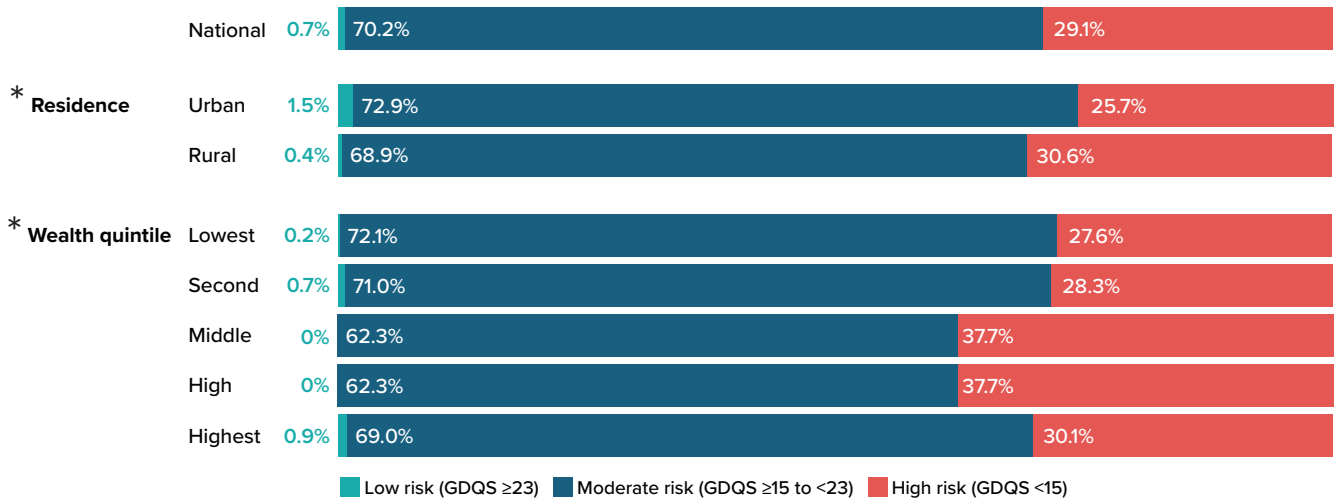
GDQS Positive and GDQS Negative Sub-Metrics

The GDQS positive consists of 16 healthy food groups, whereas the GDQS negative consists of seven unhealthy food groups and two food groups considered unhealthy when consumed in excess. A high GDQS positive score indicates a high consumption of healthy food groups, while a high GDQS negative score indicates a low consumption of unhealthy food groups.

Our analysis revealed that the mean GDQS positive score was 4.1 out of a possible 32 points, indicating an unacceptably low intake of healthy foods among Ethiopian women (**Figure 2**). Conversely, the mean GDQS negative score was 12.5 out of 17 points, indicating a relatively low consumption of unhealthy foods. These sub-metrics help us pinpoint the problem of low intakes of nutrient-rich foods.

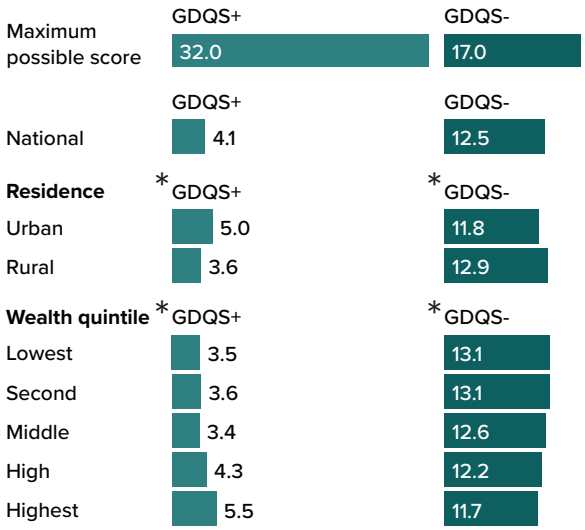
Notably, urban women had a higher mean GDQS positive score than rural women (5.0 vs. 3.6, $p<0.001$), and the mean GDQS positive score consistently increased with increasing wealth. In contrast, rural women had a higher mean GDQS negative score compared to urban women (12.9 vs. 11.8, $p<0.001$), and the mean GDQS negative score consistently decreased with increasing wealth.

Figure 1. Percentage of Women at Low, Moderate, and High Risk of Poor Diet Quality Outcomes, by Residence and by Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

Figure 2. Mean GDQS Positive and GDQS Negative Score Among Women of Reproductive Age, by Residence and Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

Food Group Level Results

By tabulating the GDQS positive and negative sub-metrics, we gained insights revealing that the consumption of healthy food groups among women was extremely low. We then conducted a detailed food group analysis to identify which specific healthy food groups are consumed by women. Consumption at the food group level was categorized as low (which includes no consumption), medium, or high based on the amount of consumption of respective foods in the past 24 hours. We present here ranges of consumption for the 16 food groups considered healthy and of key concern to this population.

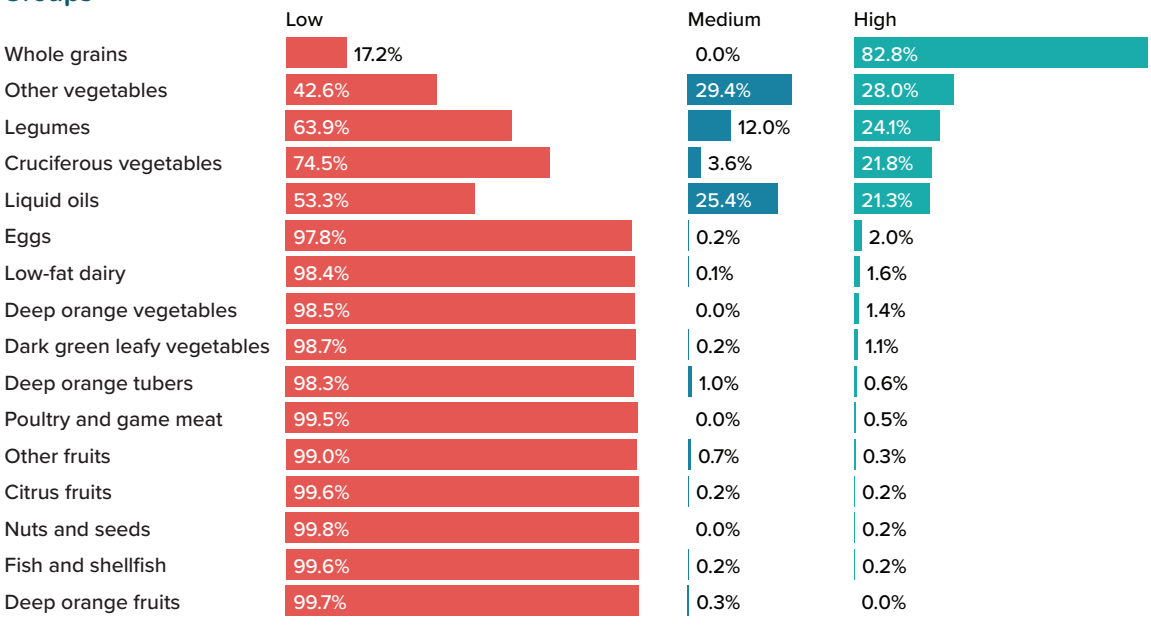
Our findings reveal that for 11 of the 16 healthy food groups, almost all women (97.8% or more) had a low range of consumption (**Figure 3**). The five healthy food groups that predominantly make up the diets of these women were whole grains, other vegetables, legumes, cruciferous vegetables, and liquid oils. Whole grains were the most consumed healthy food group, with 82.8% of women having a high intake.

Differences between residential area and wealth quintile in the consumption ranges for the six most consumed healthy GDQS food groups were explored (**Figure 4**). Urban women had higher consumption of five of these six food groups (p<0.001), namely: whole grains, other vegetables, legumes, liquid oils, and eggs. Rural women, however, had higher consumption of cruciferous vegetables (p=0.01). Differences were also observed by wealth quintile for the following five food groups: whole grains, other vegetables, legumes, liquid oils, and eggs (p<0.001).

Although only 2.0% of all women had a high consumption of eggs, there were clear differences between residential areas (4.7% in urban areas vs. 0.8% in rural areas) (p<0.001) and between wealth quintiles (0.1% for the lowest wealth quintile vs. 6.2% in the highest) (p<0.001).

The GDQS also provides information on two food groups, high-fat dairy and red meat, which are

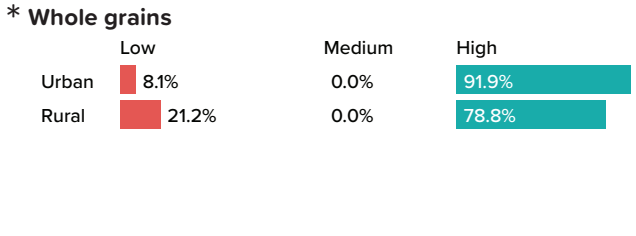
Figure 3. Percentage of Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups

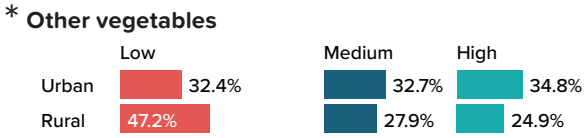


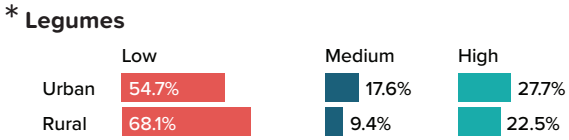
Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

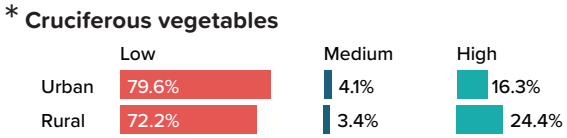
Figure 4. Percentage of Women Consuming Low, Medium, and High Amounts of the Six Most Consumed Healthy GDQS Food Groups by Residence and Wealth Quintile

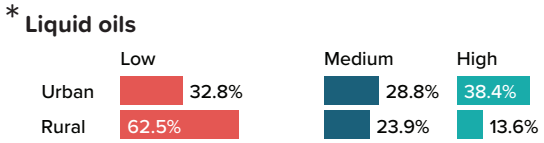
CONSUMPTION RANGES BY RESIDENCE



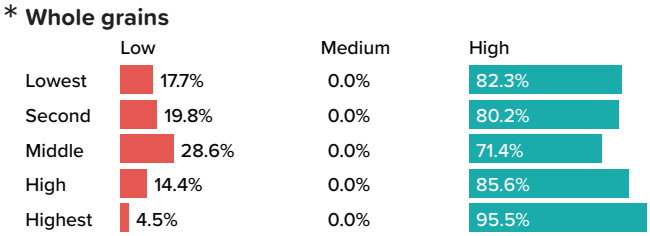


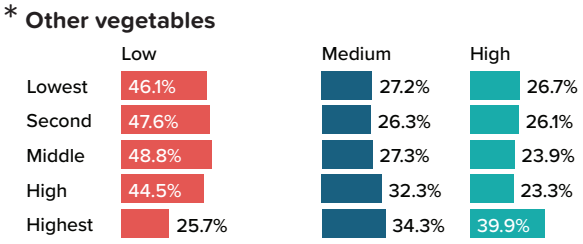


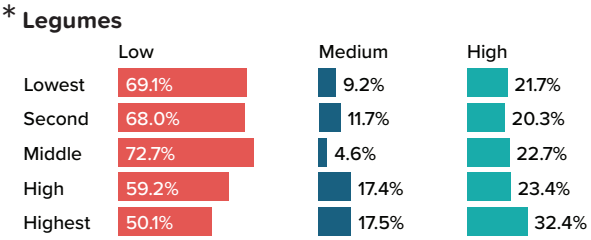


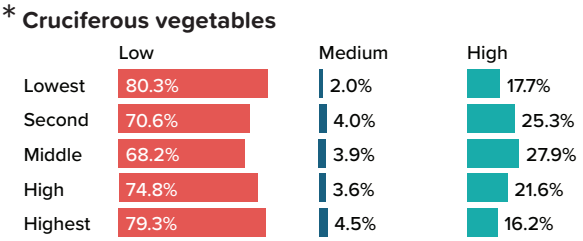


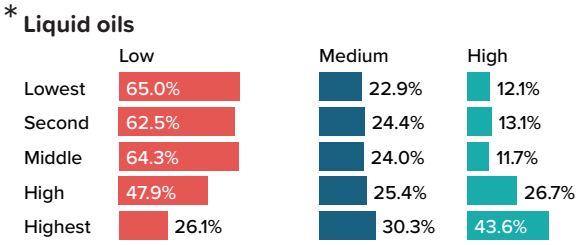
CONSUMPTION RANGES BY WEALTH QUINTILE

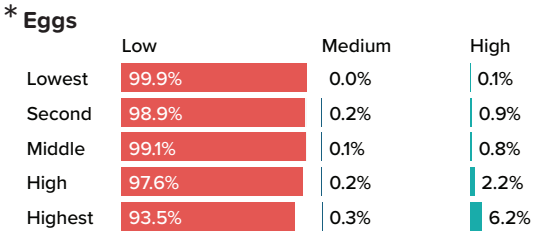












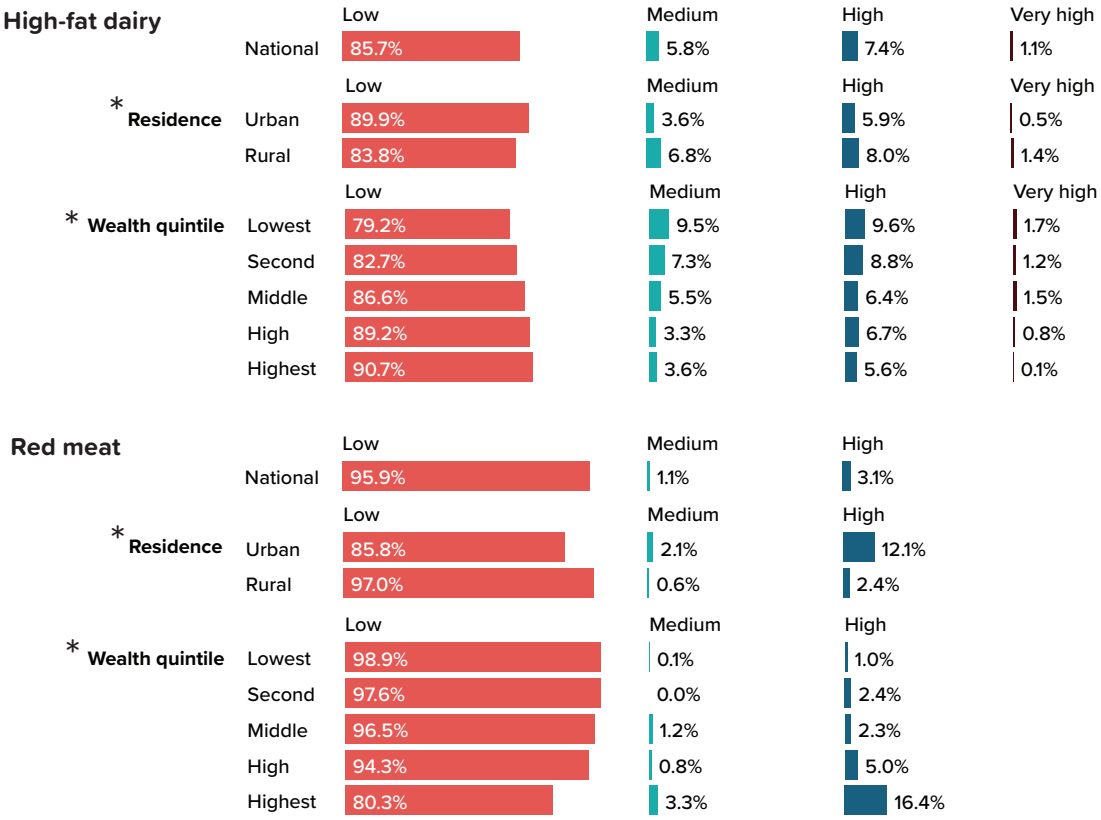
Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

considered healthy when consumed in moderation but unhealthy when consumed in excess. These food groups can provide important sources of nutrients such as animal protein, iron, and calcium.

Our analysis revealed that 13.2% of women had a moderate consumption of high-fat dairy (medium or high range) and 1.1% of women had a moderate (medium range) consumption of red meat (**Figure 5**). Urban women consumed more red meat than rural women, with 12.1% versus 2.4% reporting high intake ($p<0.001$). Urban women consumed less high-fat dairy than rural women, with 89.9% versus 83.8% reporting low intake ($p<0.001$). There was a trend of decreasing high-fat dairy consumption with rising wealth ($p<0.001$). However, less than one-fifth (19.1%) of women in the lowest wealth quintile had medium or high consumption. Additionally, there was a clear trend of increasing red meat consumption with rising wealth: only 1.0% of women in the lowest wealth quintile had high intake, compared to 16.4% of women in the highest wealth quintile ($p<0.001$).

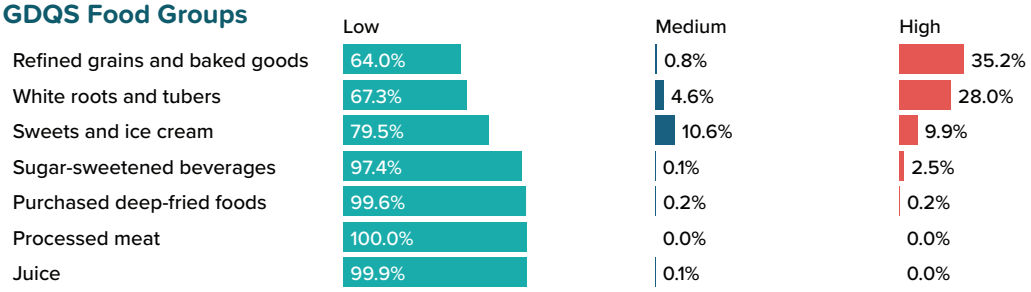
Although the primary risk in these women was inadequate intake of healthy foods, exploring the consumption of unhealthy foods provides additional insights into their diets. Among the seven unhealthy GDQS food groups, the refined grains and baked goods food group was the most consumed, with 35.2% of women having high consumption (**Figure 6**). Nearly

Figure 5. Percentage of Women Consuming Low, Medium, High, and Very High Amounts of GDQS Food Groups That Are Unhealthy When Consumed in Excess by Residence and Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

Figure 6. Percentage of Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

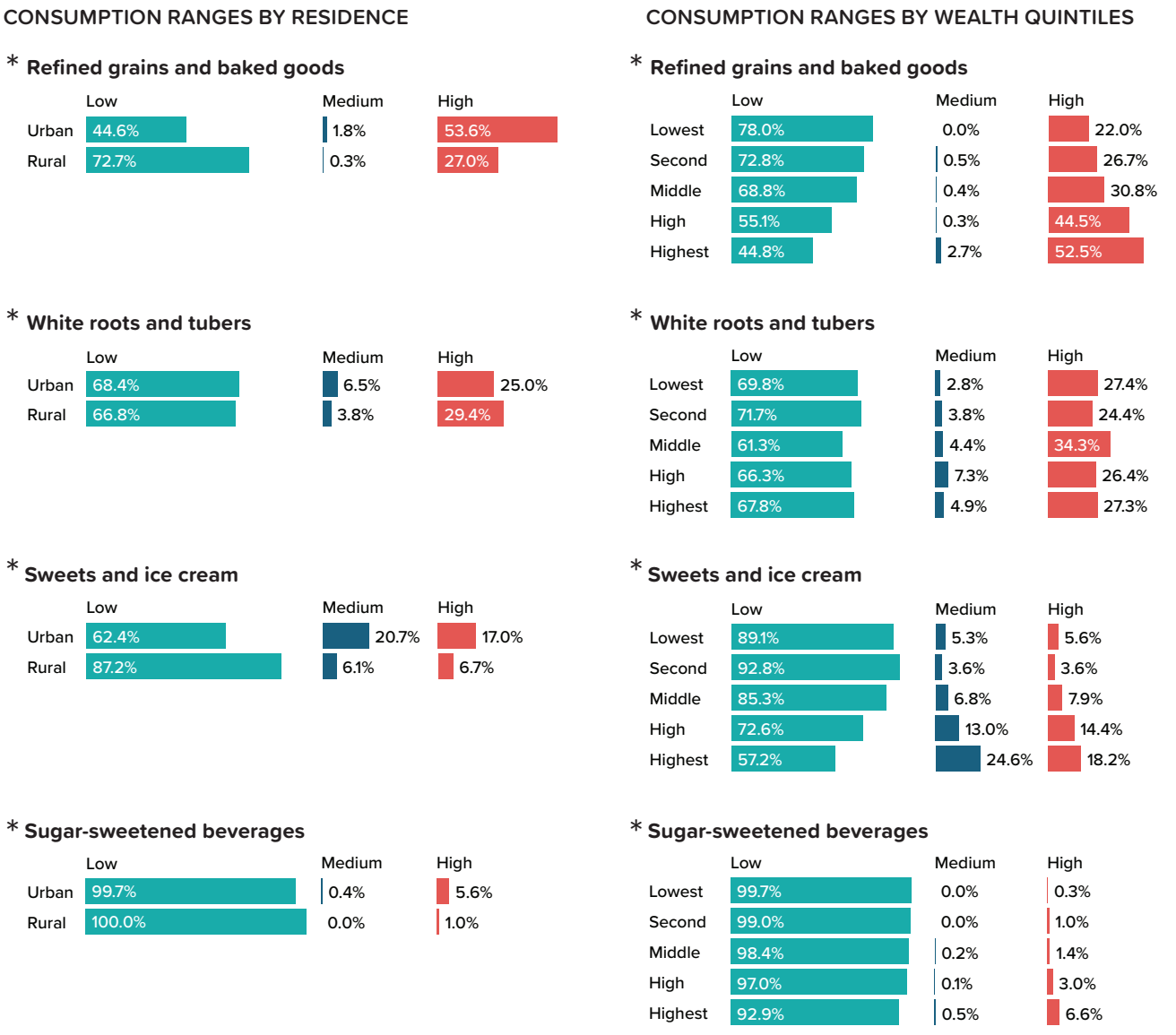
one in three women (28.0%) had a high consumption of foods in the white roots and tubers food group. Regarding the sweets and ice cream food group we found that 9.9% of women had a high intake, with an additional 10.6% falling into the medium intake category. In contrast, only a small percentage (2.5%) of women reported high consumption of sugar-sweetened beverages.

More urban women consumed refined grains and baked goods compared to rural women (53.6% vs. 27.0%, p<0.001), with intake increasing with wealth (52.5% in the highest wealth quintile) (p<0.001) (**Figure 7**). Conversely, rural women consumed more white roots and tubers (p=0.024). Sweets and ice cream consumption was higher in urban areas (17.0%) than in rural areas (6.7%) (p<0.001) and increased with wealth (18.2% in the highest quintile vs. 5.6% in the lowest) (p<0.001). Sugar-sweetened beverages followed the same pattern, with higher consumption in urban areas (5.6%) compared with rural areas (1.0%) (p<0.001) and increasing consumption with wealth (6.6% in the highest quintile vs. 0.3% in the lowest) (p<0.001).

Food Level Results

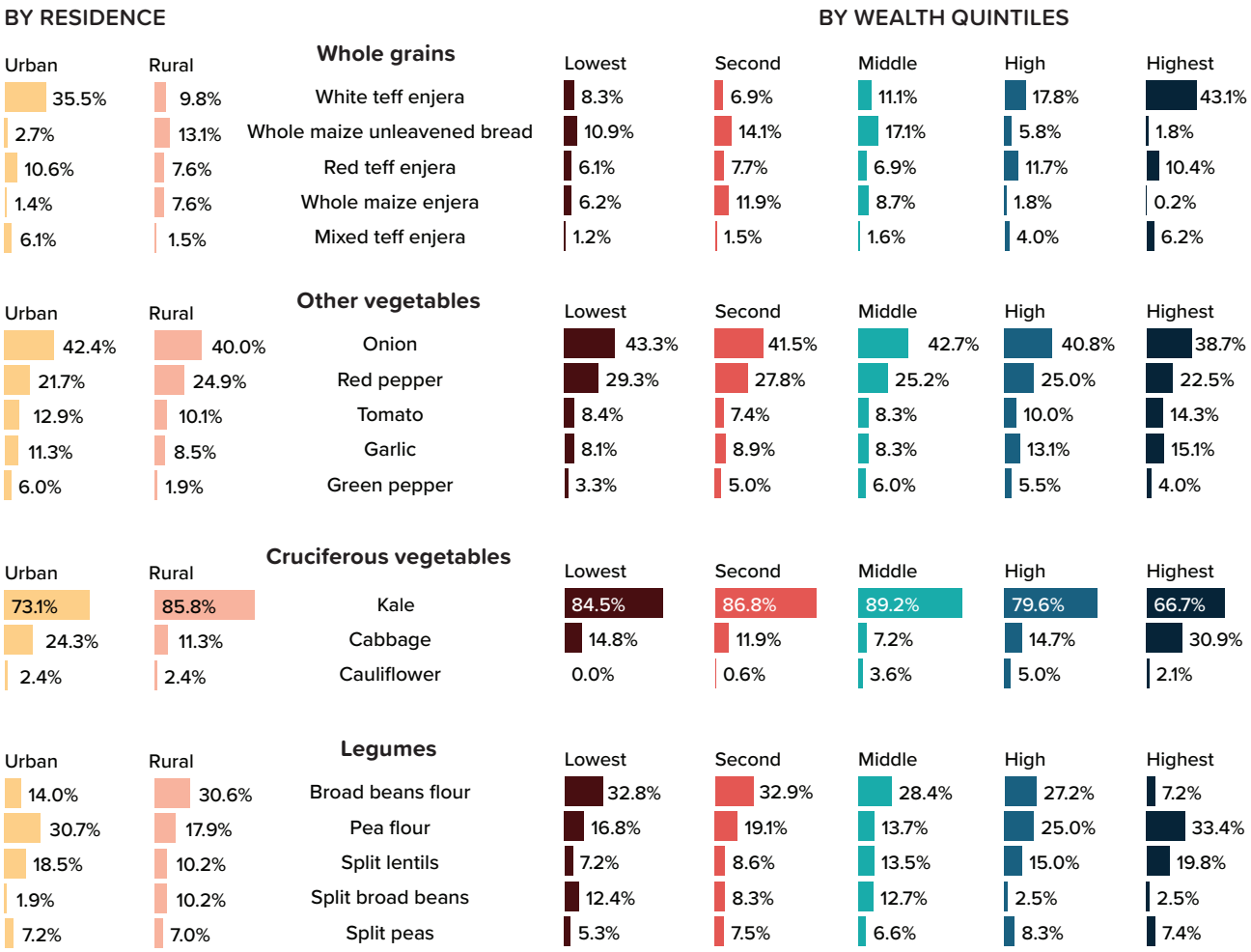
To gain a comprehensive understanding of women's dietary habits, we identified the specific foods consumed within the four most consumed healthy GDQS food groups. **Figure 8** displays the five most commonly consumed foods within each food group and highlights urban-rural differences and trends across wealth quintiles.

Figure 7. Percentage of Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups, by Residence and Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

Figure 8. Percentage of Women Who Consumed Foods of Selected Healthy Food Groups, by Residence and Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

As anticipated, whole grain injera and whole grain bread were the most commonly consumed whole grains. Teff-based foods (such as injera) were more consumed by urban women, whereas whole maize-based breads were more consumed by rural women. Similar patterns were observed by wealth, with more women consuming teff-based foods as wealth increased.

In the other vegetables food group, onions were the most frequently consumed item among all women.

Kale was notably the most consumed cruciferous vegetable (83.0%) among all women, with a higher consumption rate among rural women (85.8%) compared to urban women (73.1%), and this trend declined with increasing wealth.

Among legumes, broad bean flour was consumed by more rural women (30.6%) than urban women (14.0%), and the highest consumption was seen among those in lower wealth quintiles. In contrast, peas and lentils were more commonly consumed by urban women, and consumption increased with wealth.

Conclusion

Our analysis reveals a concerning picture of poor dietary quality among women in Ethiopia, with nearly one-third of women (29.1%) at high risk of poor diet quality outcomes. The main contributing factor to this risk is the very low consumption of healthy food groups. For 11 of the 16 healthy food groups included in the GDQS positive sub-metric, over 97.8% of women had a low intake. The most consumed healthy GDQS food groups were whole grains, other vegetables, legumes, cruciferous vegetables, and liquid oils. Urban women had a higher intake of healthy foods compared to rural women, and this intake increased with increasing wealth. The consumption of unhealthy food groups was low. However, urban women had a higher intake of unhealthy foods, and intake increased with increasing wealth. These findings highlight the urgent need to improve diet quality among Ethiopian women. Targeted interventions are necessary to enhance healthy food consumption and address disparities, especially for rural women and those in lower wealth quintiles with limited access to nutritious foods.

Between 2000 and 2011, the amount of food consumed, and consequently caloric intake, has increased in Ethiopia. There has also been a modest rise in the consumption of nutrient-dense foods such as fruits, vegetables, and animal-source foods (Hassen, Dereje, Minten, & Hirvonen, 2016). However, as our findings show, cereals and starches remain the main staples of the diet. Whole grains and white roots and tubers are the most widely consumed food groups among Ethiopian women. The push for increased productivity as an agricultural strategy has led to a rise in cereal production and, to a lesser extent, pulse production over the past two decades (Minten, Dereje, Bachewe, & Tamru, 2018). Ethiopia is producing enough cereals to meet demand. However, despite sustained growth in agricultural productivity, the production of fruits, vegetables, nuts and seeds, and animal-source foods remains well below demand (Minten et al., 2018). This shortfall is reflected in the very low intake of these healthy food groups by Ethiopian women in our analysis.

Although Ethiopia has invested in road networks over the past two decades, improving market connectivity, the price of healthy foods has been increasing (Minten et al., 2018). Between 2007 and 2016, prices rose significantly for vitamin A-rich dark green leafy vegetables (80% increase), other fruits and vegetables (40% increase), legumes and nuts (30% increase), and dairy, eggs, and meats (30% increase). In contrast, prices of grains, roots, and tubers remained stable (Bachewe, Hirvonen, Minten, & Yimer, 2017). Both shortfalls in agricultural productivity and the increasing unaffordability of healthy foods have profound implications for diet quality in Ethiopia as shown in our findings.

In addition to these challenges, Ethiopia has faced recent structural shocks such as conflict, internal displacement, and natural disasters like swarms of desert locusts, which are likely to have significant impacts on diet quality. Available information on dietary quality among women indicates that before these shocks, in 2015, 20% of women consumed the recommended Minimum Dietary Diversity for Women of five food groups or more out of ten defined food groups (Ethiopian Public Health Institute, 2015). However, an assessment conducted in 2023 showed that only 7% of women were able to meet these minimum dietary diversity recommendations (Ethiopian Public Health Institute, 2023). Our results from this analysis further confirm these findings, with a majority of women having low consumption of healthy food groups.

Despite these challenges, in 2021 Ethiopia set an ambitious goal to transform its food system, aiming to ensure the consumption of sustainable healthy diets. Below we apply a food systems framework to recommend interventions that consider the results from the analyses presented here. These recommendations aim to improve diet quality and should be implemented within the context of the Food System Transformation Roadmap (Federal Democratic Republic of Ethiopia, 2021b).

Increase production of healthy foods: To enhance diet quality, Ethiopia must boost agricultural productivity by focusing on increasing the production of fruits, vegetables, nuts, seeds, and animal-source foods. Strategies such as crop diversification, improved livestock productivity, and provision of enhanced agricultural supplies can be employed to achieve this goal. These interventions will enhance the availability of healthy foods, thereby improving overall diet quality in the country.

Strengthen food supply chains: Improving food supply chains in Ethiopia is essential to enhance the availability and affordability of healthy foods. This involves improving food transport, distribution, processing, and packaging systems. Strengthening these aspects of the food supply chain will help reduce food loss and waste, ensuring that nutritious foods reach consumers at affordable prices.

Implement nutrition education interventions to enhance nutrition literacy and promote healthy food consumption: Ethiopia launched Food-Based Dietary Guidelines in 2022. Implementing nutrition education interventions based on these guidelines is crucial for creating demand and increasing the consumption of healthy foods. Social behavior change communication strategies should leverage these guidelines as a benchmark to design interventions.

Targeted intervention to address disparities in consumption of healthy foods: To address disparities in healthy food consumption among rural and low-socioeconomic status women, targeted interventions are crucial. Strengthening existing social protection programs, such as the Ethiopia Productive Safety Net Program (PSNP) and initiatives like the Seqota Declaration (which targets areas with high rates of undernutrition), is essential. These efforts should specifically focus on increasing access to and consumption of healthy foods.

Integrating the above identified game-changing solutions from the Ethiopian Food Systems Transformation Roadmap is crucial for effectively improving the gaps in diet quality shown in the GDQS results presented here and for addressing the existing disparities in healthy food consumption by residence and wealth.

About Art Piece #3: Vegetables, Roots, & Tubers

Inspired by the iconic, leafy head of lettuce, this artwork celebrates the diverse world of vegetables, roots, and tubers. Most of the GDQS food groups of focus in this artwork are components of the GDQS positive metric, except for the “White roots and tubers” food group, which is a component of the GDQS negative metric.

Like the foundational piece, this art piece translates dietary data for tens of thousands of individuals - as reflected by the GDQS - into visual form. However, in this piece, each person’s GDQS data are depicted along a wavy “ring” encircling the artwork’s center instead of a perfect circle.

The data showcased here include the following six GDQS food groups:

Deep orange tubers | *Red-orange circles*

White roots and tubers | *White thick strokes*

Dark green leafy vegetables | *Black-blue thick strokes*

Deep orange vegetables | *Red hatched lines*

Cruciferous vegetables | *Blue leaves/feathers*

Other vegetables | *Turquoise thick strokes*

Diet Quality of Adolescent Girls and Adult Women in Niger

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Introduction

With a surface area of 1,267,000 km^2 and a population estimated at 26 million in 2023, most of Niger's population (80%) lives in rural areas and depends on agriculture (Ministère du Plan, Institut National de la Statistique (INS), 2020). Rain-fed agriculture, although subject to climate, is the most dominant form of food-producing farming. Millet and sorghum are the main food crops, along with cash crops such as cowpeas, groundnuts, pigeon peas, sesame, sorrel, and tiger nuts. Household food is essentially made up of self-produced agricultural products, except for a few products such as rice, maize, and oil, which, although produced locally, are imported on a massive scale.

According to the Institut National de la Statistique of Niger, some 10 million Nigeriens – 41% of the population – live in extreme poverty (INS, 2023). This situation impacts nutritional status and is reflected in nutrition indicators. There is a high prevalence of hunger in Niger (30.2% in 2019) (von Grebmer et al., 2019) and anemia among women of childbearing age (46.1% in 2022) (INS, 2022). Malnutrition also is high in Niger, especially among children under 5 years. The prevalence of global acute malnutrition in children under 5 years is 12.2%, slightly above the 10% World Health Organization critical threshold. Many Nigeriens suffer from a poor diet with little diversity (INS/Haut-Commissariat à l'Initiative 3N (HC3N), 2023).

Quantitative and qualitative data on the population's food consumption are needed to understand the food and nutritional situation dynamics. This information enables us not only to estimate macro- and micronutrient intakes and understand the eating habits and behaviors of individuals and households but also to recommend behaviors to adopt for a healthy, balanced diet essential to the health and well-being of the population. Until recently, quantitative data on individual and household food consumption in Niger were virtually non-existent. The scarcity of data on food consumption prompted Niger and its food and nutritional security partners to conduct a food consumption survey in 2019 using the quantitative 24-hour dietary recall approach.

The 2019 survey was conducted in five regions affected by malnutrition and included children ages 24-59 months, adolescent girls ages 10-18 years, and adult women ages 19-49 years (Ministère du Plan, INS, Plateforme Nationale d'information pour la Nutrition (PNIN), 2021a, 2021b, 2023; Ministère de L'Economie et des Finances, INS, PNIN, 2024). This survey provides Niger with quantitative information on nutritional intakes and their adequacy in relation to nutrient requirements.

Considering persisting undernutrition in Niger, and the likelihood that the non-communicable disease (NCD) burden will increase over time, multiple coexisting burdens of malnutrition will continue to pose a major threat to the future of public health in the country. The coexistence of multiple burdens calls for an approach that can measure and track diet quality in terms of both dietary nutrient adequacy and NCD risk. Below, an analysis of diet quality is presented using the recently developed Global Diet Quality Score (GDQS) metric, which is a proxy method for measuring diet quality. This analysis will enhance our understanding of the eating habits and behaviors of adolescent girls and adult women in Niger.

Methods

Quantitative 24-hour dietary recall data collected during the 2019 national food consumption survey in the regions of Dosso, Maradi, Tahoua, Tillaberi, and Zinder of Niger were used to examine diet quality using the GDQS approach. The analysis included two of the three target groups sampled for the national survey, namely, adolescent girls ages 10-18 years (n=1,106) and adult women ages 19-49 years (n=1,052), irrespective of their physiological status.

The analysis of diet quality was conducted in several steps. First, daily quantities of food and ingredients consumed by each individual were estimated using the first 24-hour dietary recall only (the repeat interview data was not used). These

foods and ingredients were then classified into the 25 GDQS food groups; these included 16 food groups considered to be healthy, seven food groups considered to be unhealthy, and two that are considered unhealthy when consumed in excess. The next step was to compute the total amount of each food group consumed by each individual for each food group. Points were then awarded for each food group according to ranges of consumption (low, medium, high, or very high). For further details on how the quantitative 24-hour dietary recall data were processed to tabulate the GDQS, refer to the Annex.

Survey design parameters were specified, and sampling weights were applied to the statistical analyses. Statistical tests (Wald) were performed to explore differences in key variables between adolescent girls and adult women and among the five regions within each target group.

Results

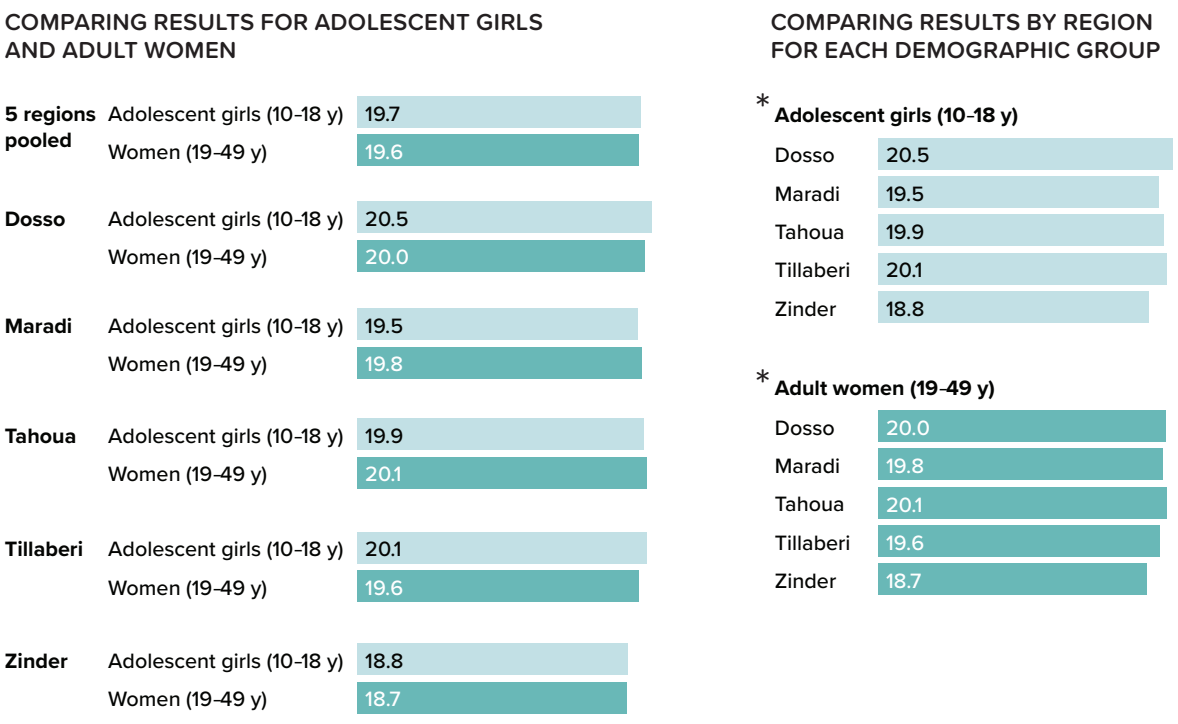
Overall Diet Quality

The GDQS score ranges from 0 to 49, with a higher score reflecting a healthier and more desirable food consumption pattern. The mean GDQS score was just below 20 for both adolescent girls and adult women, with no significant difference between the two groups (p=0.627) (**Figure 1, left panel**). There were no significant differences in mean GDQS between adolescent girls and adult women in any of the five regions (p>0.05).

Regional differences in mean GDQS were observed for both adolescent girls (p=0.036) and adult women (p=0.009) (**Figure 1, right panel**). Poor diet quality remains a major concern for adolescent girls and adult women, especially in the Zinder region.

Around two-thirds of adolescent girls and adult women were at moderate risk of poor diet quality

Figure 1. Mean GDQS Among Adolescent Girls and Adult Women, by Region



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

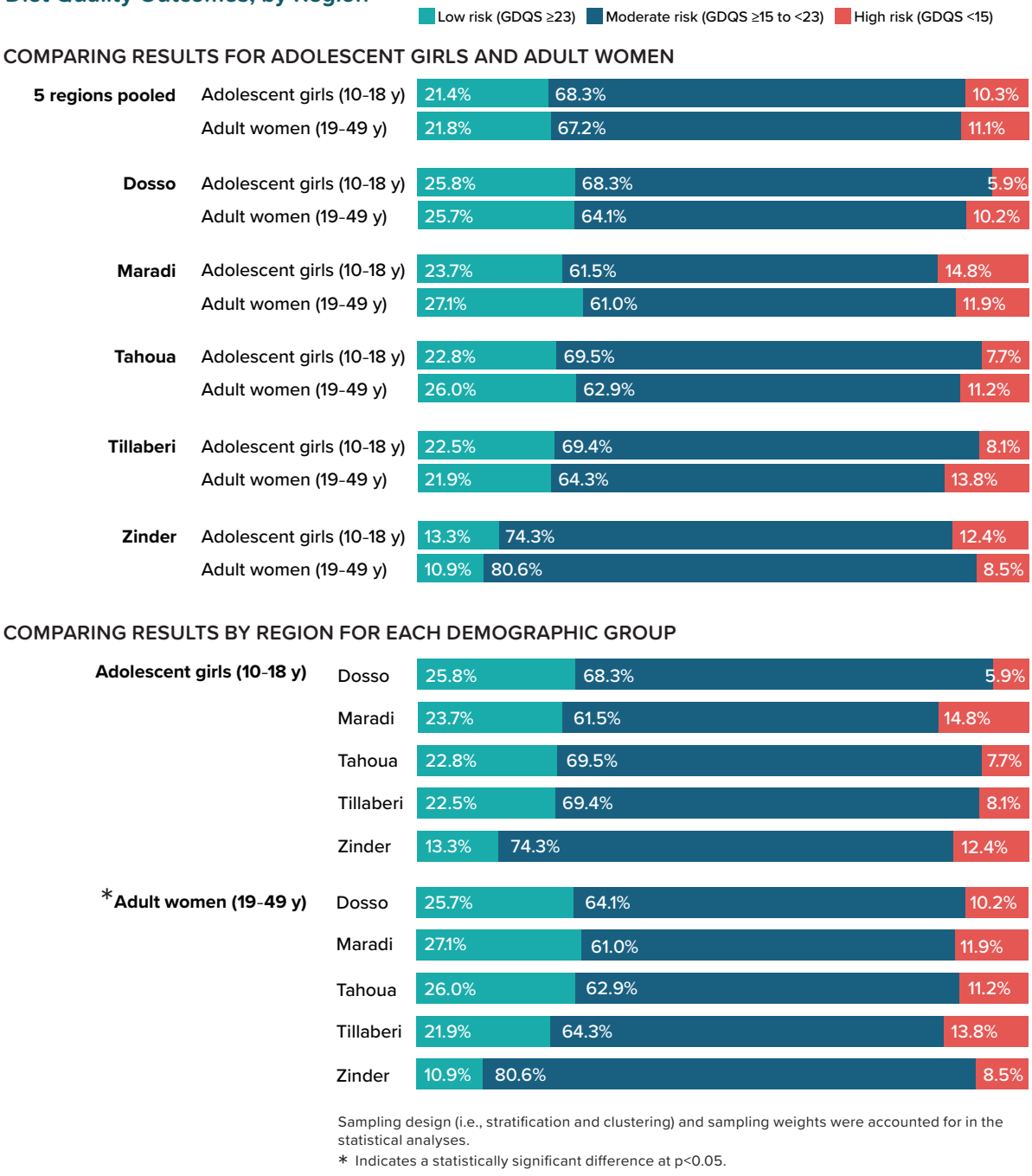
outcomes, both in terms of nutritional inadequacy and/or NCD risk (**Figure 2, upper panel**). About one out of 10 adolescent girls and adult women were at high risk of poor diet quality outcomes. No significant difference in the risk of poor diet quality outcomes was observed between adolescent girls and adult women in any of the five regions ($p>0.05$) or for the pooled sample across five regions ($p=0.809$).

There were no significant regional differences in the risk of poor diet quality outcomes among adolescents ($p=0.075$) (**Figure 2, lower panel**). However, there were regional differences among adult women; fewer women in Zinder were at low risk of poor diet outcomes when compared to the other regions.

GDQS Positive and GDQS Negative Sub-Metrics

Although no differences in mean GDQS or risk of poor diet quality outcomes were found between adolescent girls and adult women, some regional differences were observed within each demographic group. Further exploration into the GDQS positive and GDQS negative sub-metrics was deemed useful.

Figure 2. Percentage of Adolescent Girls and Adult Women at Low, Moderate, and High Risk of Poor Diet Quality Outcomes, by Region



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

Examination of the scores derived from the consumption of healthy food groups showed that the mean GDQS positive was around 10 for adolescent girls and adult women (**Figure 3, left panel**), with no significant difference between the two demographic groups (p=0.571).

However, there were differences in the GDQS positive between regions for both adolescent girls (p=0.001) and adult women (p<0.001) (**Figure 3, right panel**). Among both adolescent girls and adult women, the GDQS positive was the highest in Dosso and lowest in Zinder (p<0.001).

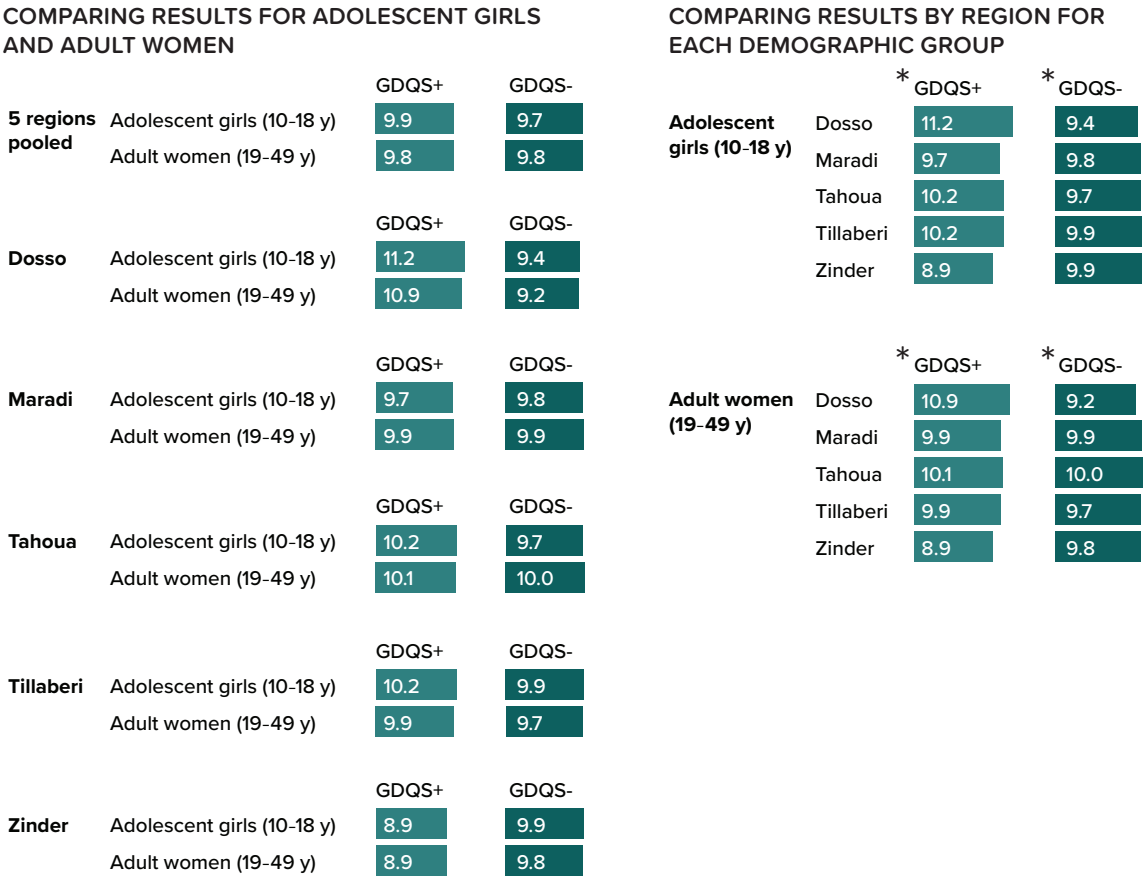
Similar patterns were observed for the scores derived from the consumption of unhealthy food groups and food groups that are unhealthy when consumed in excess. The mean GDQS negative was just below 10 for both adolescent and adult women, with no significant difference between the two groups (p=0.795) (**Figure 3, left panel**).

However, differences were observed between regions in the mean GDQS negative for both adolescent girls (p=0.023) and adult women (p=0.003) (**Figure 3, right panel**). Among both adolescent girls and adult women, the GDQS negative was the lowest in Dosso (p<0.001).

Food Group Level Results

Consumption for each GDQS food group is defined as low, medium, and high (and very high for high-fat dairy) based on a food group-specific cutoff defined by daily gram intakes. GDQS positive and GDQS negative points are awarded according to the level of consumption.

Figure 3. Mean GDQS Positive and GDQS Negative Among Adolescent Girls and Adult Women, by Region



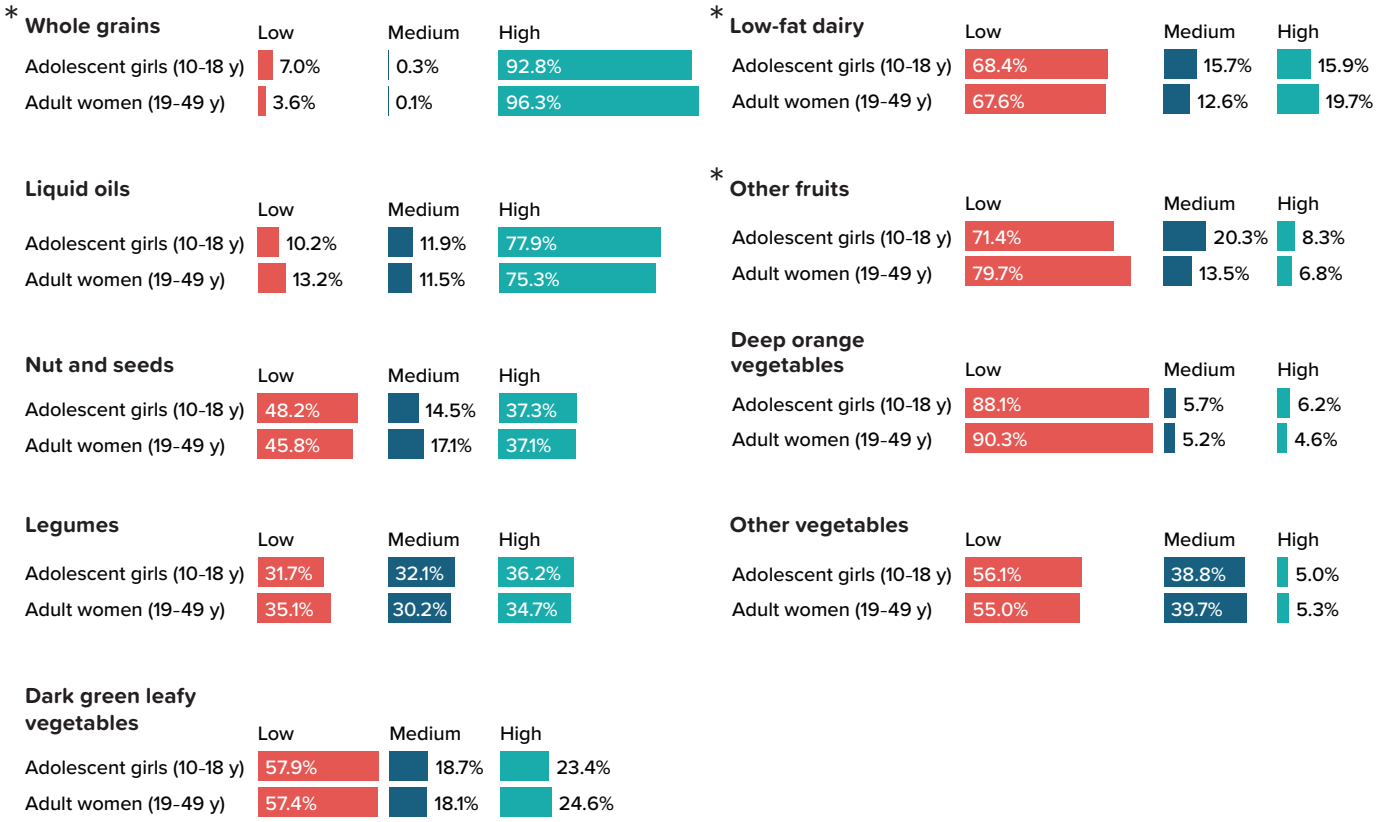
Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

The most consumed healthy food groups among both adolescent girls and adult women were whole grains and liquid oils (**Figure 4**). Consumption of micronutrient-rich foods such as eggs, fish, poultry, vegetables, and fruit was very low for both target groups and across regions (data not shown).

Although the GDQS positive score was similar for adolescent girls and adult women, some differences in consumption patterns were observed. Adult women consumed more whole grains and low-fat dairy products, while adolescent girls consumed more other fruits.

When exploring regional differences in the consumption of healthy food groups, significant differences were observed (**Figure 5**). High consumption of dark green leafy vegetables among adolescent girls was 39.2% in Dosso vs. 6.8% in Zinder. Differences were also observed for high consumption of legumes (46.1% in Dosso vs. 36.8% in Zinder) and nuts and seeds (39.4% in Dosso vs. 30.0% in Zinder). Similar trends were observed among adult women for these same food groups. For example, high consumption of dark green leafy vegetables among adult women was 42.8% in Dosso vs. 7.0% in Zinder.

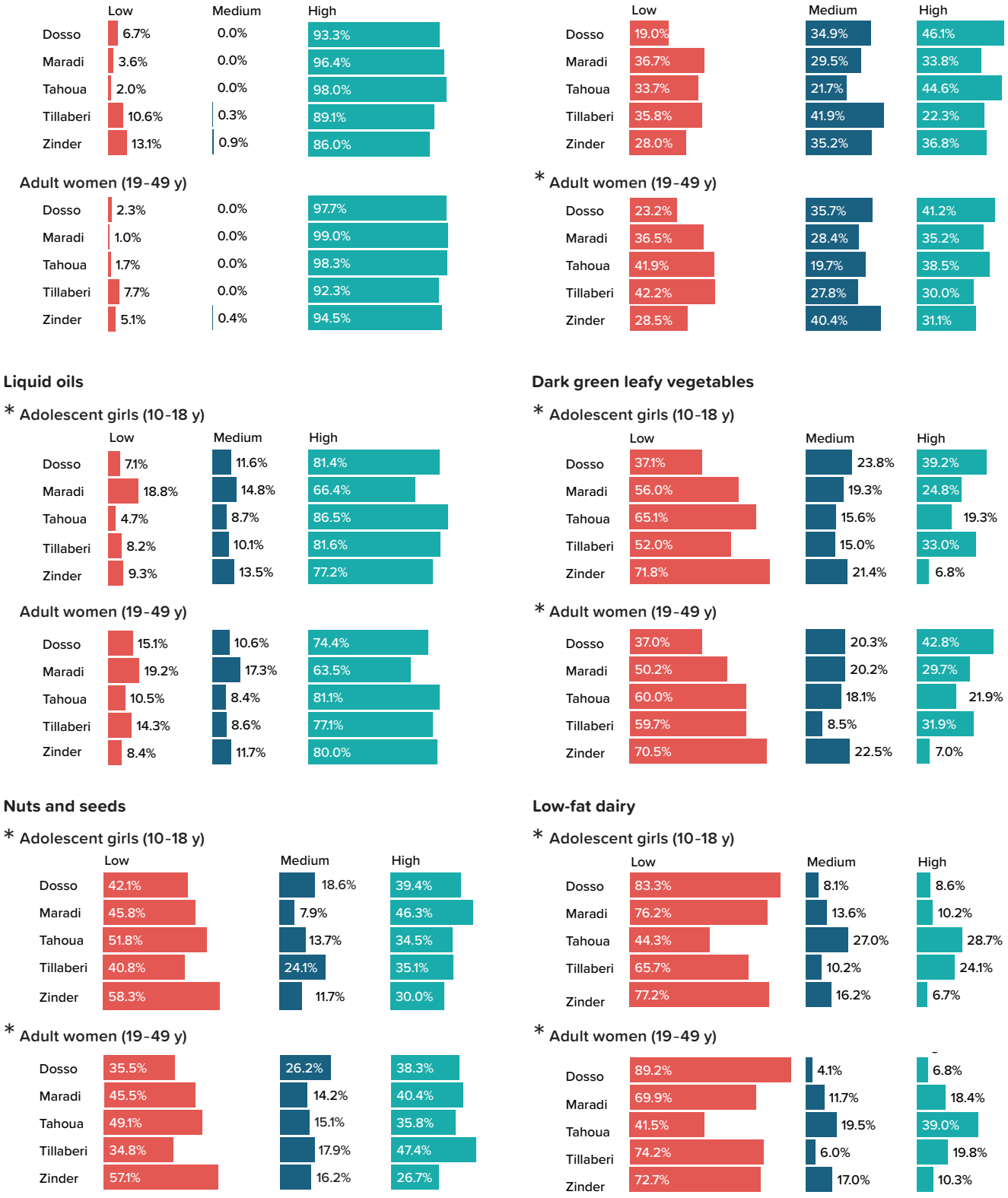
Figure 4. Percentage of Adolescent Girls and Adult Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups



Only food groups with high consumption for at least 5% of either adolescent girls or adult women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

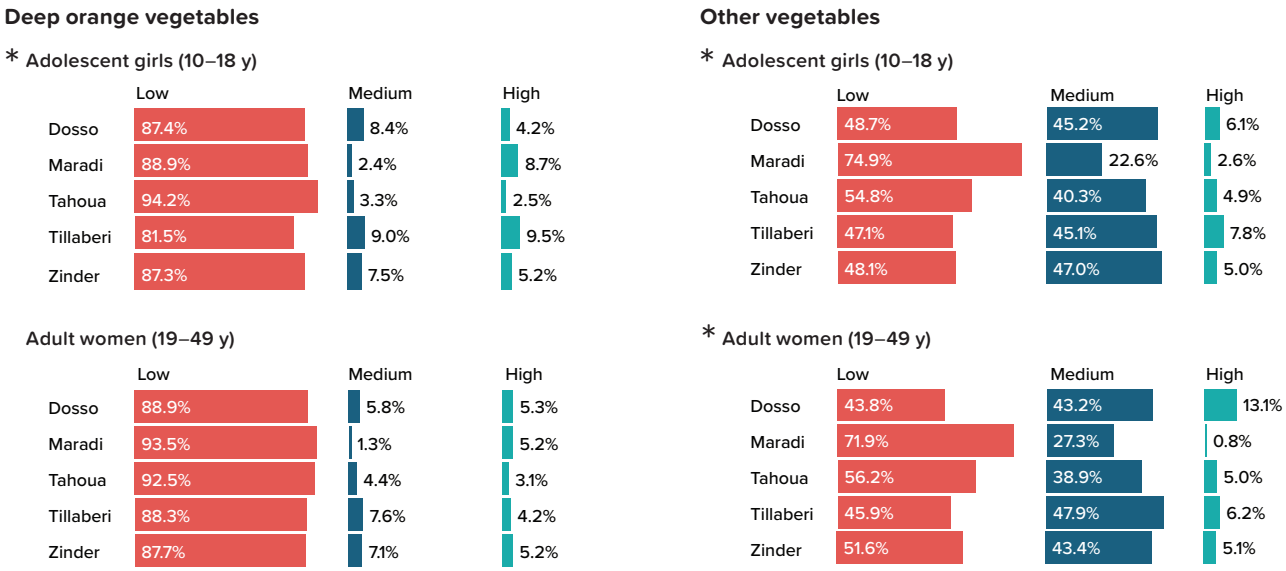
Figure 5. Percentage of Adolescent Girls and Adult Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups, by Region



Only food groups with a significant difference between regions for either adolescent girls or adult women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

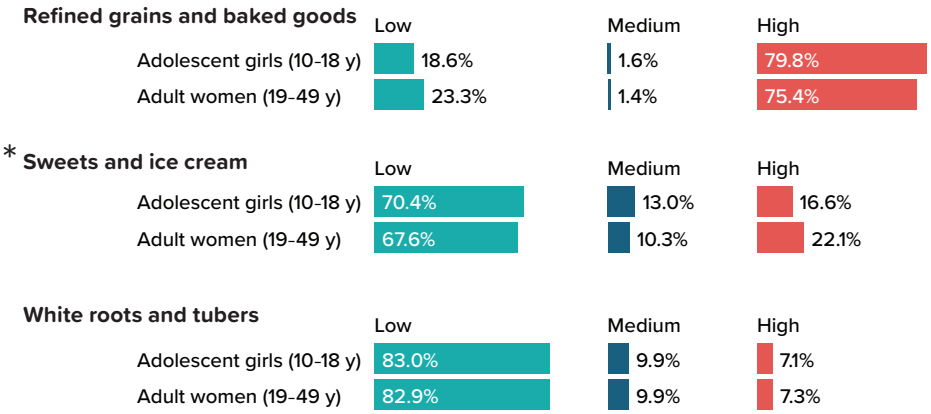
Figure 5. *continued*



Only food groups with a significant difference between regions for either adolescent girls or adult women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at p<0.05.

Figure 6. Percentage of Adolescent Girls and Adult Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups



Only food groups with high consumption for at least 5% of either adolescent girls or adult women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

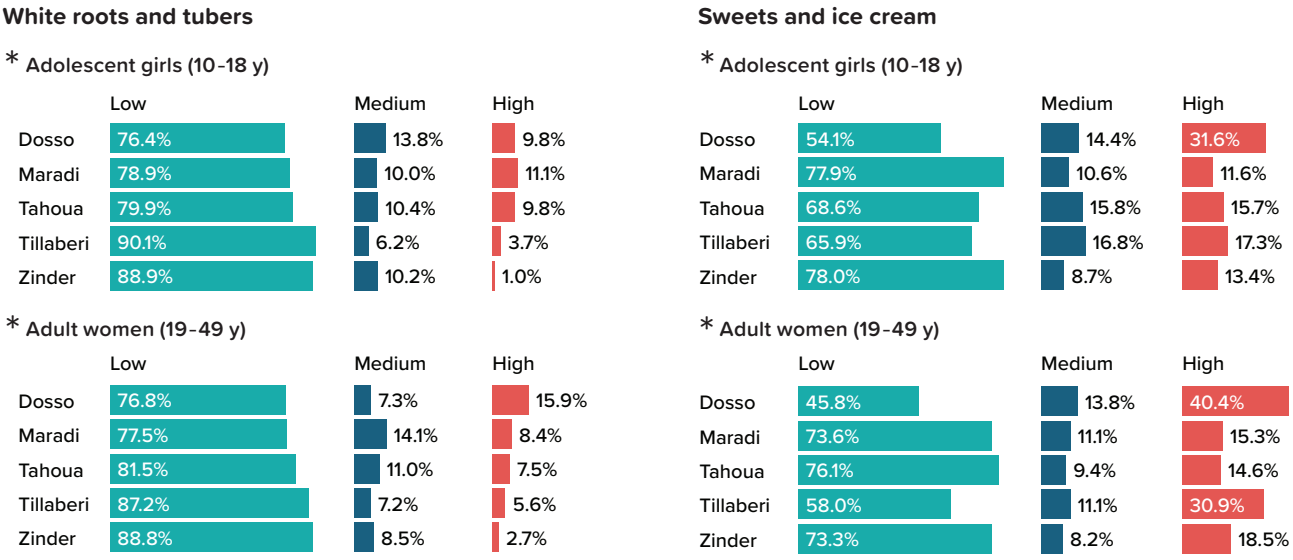
* Indicates a statistically significant difference at p<0.05.

Refined grains and baked goods were the most consumed unhealthy food group for both adolescent girls and adult women; almost 80% of respondents had high consumption (**Figure 6**). Consumption of sweets and ice cream was high for about one-fifth of respondents, with a higher percentage of high consumers among adult women than adolescent girls (p=0.008). A positive finding for diet quality for both adolescent girls and adult women is the extremely low consumption of unhealthy food groups such as processed meat, sugar-sweetened beverages, and juice (less than 1% of girls and women had high consumption).

Regional differences in the mean GDQS negative for each target group were linked to the consumption of two food groups, namely white roots and tubers and sweets and ice cream (**Figure 7**). Consumption of these food groups was especially high in Dosso, where the GDQS negative was the lowest.

The negative GDQS sub-metric also includes two food groups for which moderate consumption is recommended. For medium consumption of red meat, 1 point is added to the negative GDQS. For medium or high consumption of high-fat dairy products, 1 or 2 points, respectively, are added to the negative GDQS. Across regions, a high percentage of adolescent girls and adult women had low consumption of red meat and high-fat dairy products (**Figure 8**). There were significant differences in red meat consumption between adolescent girls and adult women (p=0.011), with a higher percentage of adult women consuming a medium or high range of intake of red meat than observed among adolescent girls.

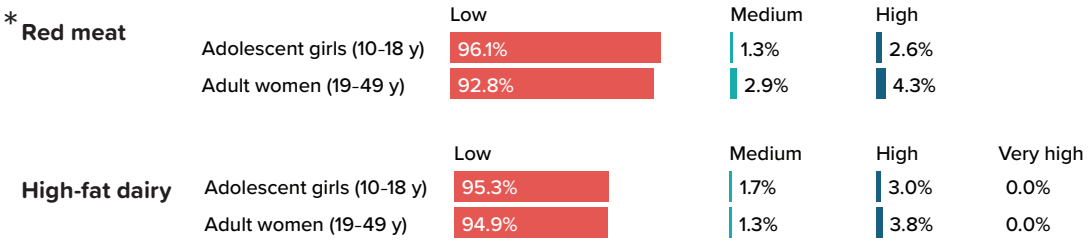
Figure 7. Percentage of Adolescent Girls and Adult Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups, by Region



Only food groups with a significant difference between regions for either adolescent girls or adult women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at p<0.05.

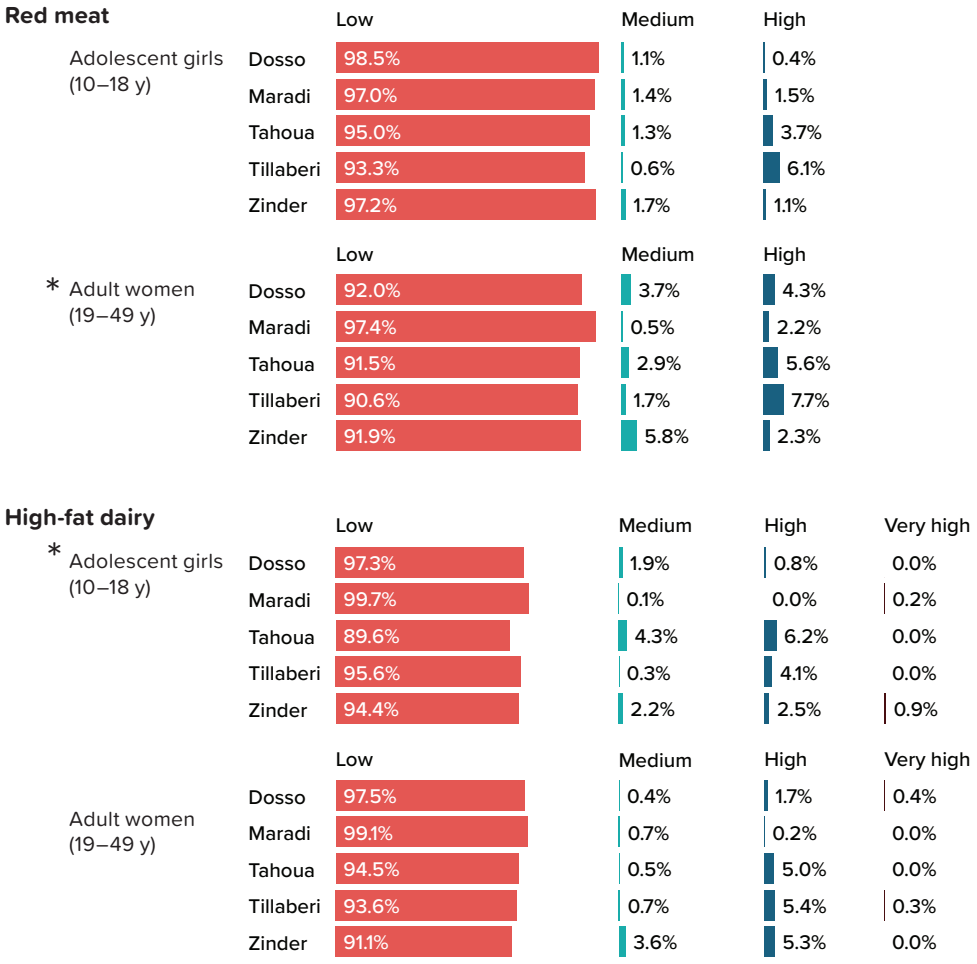
Figure 8. Percentage of Adolescent Girls and Adult Women Consuming Low, Medium, and High Amounts of GDQS Food Groups That Are Unhealthy when Consumed in Excess



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at p<0.05.

Figure 9. Percentage of Adolescent Girls and Adult Women Consuming Low, Medium, and High Amounts of GDQS Food Groups That Are Unhealthy When Consumed in Excess, by Region



Only food groups with a significant difference between regions are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

Significant differences were also observed between regions in the consumption of red meat for adult women ($p=0.041$) and high-fat dairy for adolescent girls ($p=0.012$) (**Figure 9**). Red meat consumption was medium for 5.8% of adult women in Zinder vs. 0.5% in Maradi. High-fat dairy consumption was medium or high for 10.5% of adolescent girls in Tahoua vs. less than 5.0% in all other regions.

Food Level Results

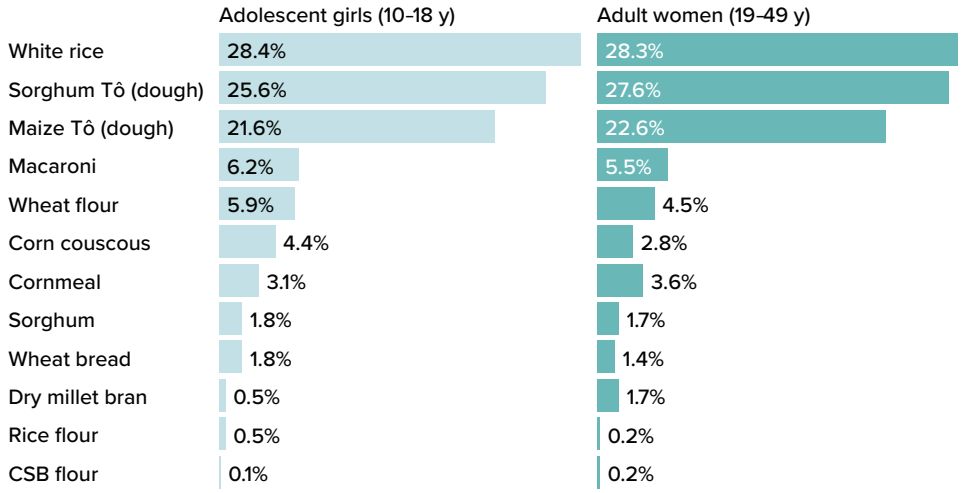
The observed difference in ranges of consumption of some food groups for adolescent girls and adult women merits exploration into the foods consumed.

Whole grains and liquid oils were the most consumed healthy food groups by adolescent girls and adult women. The high consumption of whole grains can be explained by the very high consumption of whole millet among both adolescent girls and adult women (consumed by about 94% of both target groups). As for liquid oils, palm oil was the most widely consumed among both adolescent girls and adult women (consumed by more than 90% of both target groups).

Although ranges of consumption of dark green leafy vegetables were similar for adolescent girls and adult women, differences in the types of leaves consumed were observed. Adult women had a higher consumption of baobab leaves (consumed by 39.7% of women vs. 36.0% of adolescents), whereas adolescent girls had a higher consumption of false sesame (*Ceratotheca sesamoides*) leaves (consumed by 26.0% of adolescents vs. 21.9% of women).

A closer look at refined grains and baked goods reveals that white rice, sorghum dough, and maize dough were the foods consumed among the highest

Figure 10. Percentage of Adolescent Girls and Adult Women Who Consumed Refined Grains and Baked Goods (Any Amount)



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

proportion of women within both target groups (**Figure 10**). The high consumption of sweets and ice cream can be explained by the high consumption of sugar, especially among adult women (consumed by 93.4% of women vs. 85.6% of adolescents, $p<0.001$). Although consumption of commercial sweets, cookies, and chocolates was low, adolescent girls had a higher consumption than adult women ($p<0.001$).

Conclusion

The GDQS analysis revealed that the diets of adolescent girls and adult women are very similar across the five regions included in the 2019 national survey. The diet is monotonous, consisting essentially of staple foods such as cereals, dark green leafy vegetables, and to a lesser extent, cowpeas. The diet quality of girls and women in Maradi and Zinder was particularly poor. Consumption of micronutrient-rich foods such as fruits, vegetables, animal products, eggs, and nuts was extremely low in all five regions. Some exceptions included the consumption of low-fat dairy in Tahoua and Tillaberi. Consumption of some unhealthy food groups was high, particularly in Dosso.

The strong similarity in the GDQS results for adolescent girls and adult women in the five regions implies that their eating habits and behaviors are similar. Therefore, similar strategies and messages could be considered for improving diet quality among both groups.

To improve the quality of the diet, adolescent girls and women should be encouraged to consume micronutrient-rich foods. For food groups that are healthy when consumed in moderation, such as red meat and high-fat dairy, consumption that avoids excessive levels that could harm health in the long term should be encouraged. A study on the determinants of dietary diversity among women of childbearing age suggests the improvement of purchasing power through access to regular and decent cash incomes among women of childbearing age provides a pathway for increasing dietary diversity (INS/HC3N, 2023).

Political decision-makers and other stakeholders must take long-term action to accelerate the implementation of Niger's national roadmap on Transforming Local Food Systems for Healthy Diets (HC3N/Nations Unie (NU), 2021). They must also put into practice on the ground the commitments made in the summary note of the consultations on sustainable food systems (INS, 2021). Within this framework, we need to stimulate the consumption of healthy foods through nutrition education targeting both adolescent girls and adult women and create awareness to increase demand for healthy diets adapted to the specificities of administrative regions. This is to be achieved by developing and promoting dedicated tools, such as seasonal food availability maps, national dietary recommendations, and food-based dietary guidelines. The use of these tools will rely on tailored and targeted messages informed by evidence-based data such as the GDQS analyses to reach both adolescent girls and adult women across regions in Niger.

About Art Piece #4: Sweets, Snacks & Processed Foods

This artwork evokes the sugary allure of a classic, round lollipop, both in shape and color, and reflects a set of the GDQS food groups that can be broadly classified as sweets, snacks, and processed foods. These foods all fall under the GDQS negative umbrella (meaning low consumption is desired).

This art piece utilizes the same data visualization process as the main piece to translate GDQS data into a visual story. However, here, an individual's GDQS data are presented along a spiral path that winds its way from the center outwards.

The piece presents data for the following five GDQS food groups:

Refined grains and baked goods | *Red-orange thick strokes*

Juice | *Light peach thick strokes (portrayed as wavy lines in the main piece)*

Sugar-sweetened beverages | *White circles*

Sweets and ice cream | *Red thick strokes*

Purchased deep-fried foods | *Deep red hatched lines*

A Paradox of Healthy and Unhealthy Food Consumption Among Nigerian Women Living in Wealthier Households

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[1]University of Ibadan, Ibadan, Nigeria [2]International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria

Introduction

Nigeria continues to face the co-existence of chronic undernutrition, micronutrient deficiency, overnutrition, and associated diet-related non-communicable diseases (NCDs) (Gustafson, 2021). Until recently, the lack of current data on food consumption from a representative sample was a major constraint to understanding nutrient and dietary gaps in Nigeria.

The 2021 National Food Consumption and Micronutrient Survey (NFCMS) is the third nationally representative survey of its kind conducted in Nigeria (Federal Government of Nigeria [FGoN] and International Institute of Tropical Agriculture [IITA], 2023), following those implemented in 1968 and 2001. The dietary component of the NFCMS was designed to assess the type and amounts of foods consumed and the nutrient adequacy of the diet. The sample size for the dietary component was 11,219 respondents and included children 6-59 months (n=5,022), non-pregnant women of reproductive ages 15-49 years (n=5,241), and pregnant women (n=999). The INDDEX24 Mobile App was used for data collection with tablets between March and July 2021. All respondents completed a single 24-hour dietary recall interview, and a sub-sample of about 25% completed a repeat 24-hour dietary recall interview two to three days later.

Dietary data collected for the 2023 NFCMS was used to tabulate the Global Diet Quality Score (GDQS). The GDQS is a food-based metric of diet quality for assessing risk factors for nutrient inadequacy and NCDs that has been validated against nutrient adequacy and NCD risk-related health outcomes among women and men. Respondents are assigned points for each GDQS food group consumed according to the GDQS pre-defined ranges of consumption for each food group for a 24-hour reference period. Consumption data to tabulate the GDQS were derived from the first 24-hour dietary recall interview. Data collected from the repeat interview were not used. Survey design parameters were specified and sampling weights (adjusted for non-response) were applied in the statistical analyses. For further details on how the quantitative 24-hour dietary recall data were processed to tabulate the GDQS, refer to the Annex.

We present here the GDQS data for non-pregnant women ages 15-49 years (including lactating women) and explore dietary patterns across wealth quintiles.[6] This is of interest to Nigeria — a country with great diversity in wealth across the population — to understand how far the transition toward a Western diet has progressed and how patterns of healthy and unhealthy food consumption may be the same or differ across wealth quintiles.

Results

Overall Diet Quality

The GDQS is expressed as a mean at the group level. The cutoffs for risk of poor diet quality outcomes are GDQS < 15 (high risk), GDQS ≥15 and <23 (moderate risk), and GDQS ≥ 23 (low risk).

The overall mean GDQS for non-pregnant women was 18.7 out of a maximum score of 49, placing more than two-thirds (72.2%) at moderate risk of poor diet quality outcomes in terms of both nutrient inadequacy and diet-related NCDs, and a further 15.0% at high risk (**Figure 1**).

When looking at the results by wealth quintile, the data show the percentage of women at high risk of poor diet quality outcomes decreases as wealth quintile increases ($p<0.005$).

GDQS Positive and GDQS Negative Sub-Metrics

For a better understanding of the trends in the overall GDQS, we examined the GDQS positive and GDQS negative sub-metrics. These sub-metrics provide more targeted information about the relative contribution of healthy and unhealthy food group

[6] Wealth quintiles were derived using the asset approach, whereby all household possessions were recorded to form a wealth index score.

consumption to overall diet quality. The GDQS positive relates to 16 healthy food groups, whereas the GDQS negative relates to seven unhealthy food groups and two food groups that are unhealthy when consumed in excess (red meat and high-fat dairy). A higher GDQS positive indicates a higher consumption of healthy food groups, whereas a higher GDQS negative indicates a lower consumption of unhealthy food groups.

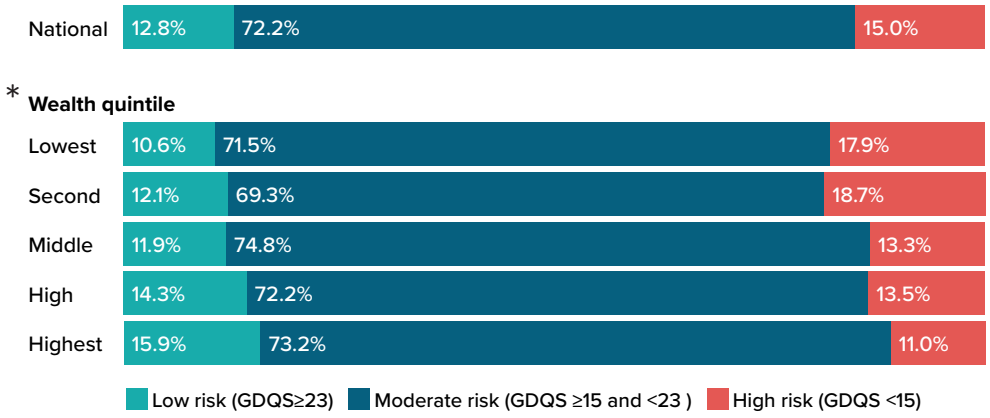
Non-pregnant women had a mean GDQS positive of 7.7 out of a maximum score of 32, which indicates that they did not consume adequate portions and diversity of healthy food groups (**Figure 2, left column**), regardless of wealth quintile (p=0.892). These findings are consistent with the observed poor nutrient adequacy of the diets of non-pregnant women for several key micronutrients such as calcium, folate, and riboflavin as reported in the 2021 NFCMS (FGoN and IITA, 2023).

Non-pregnant women had a mean GDQS negative of 11.1 out of a maximum score of 17, which indicates that they had a medium or high consumption of some, but not all, unhealthy food groups (**Figure 2, right column**). The mean GDQS negative decreased with wealth quintile (p<0.001), showing that women living in households in the highest wealth quintile consumed greater amounts of unhealthy foods.

Food Group Level Results

Although the mean GDQS positive score was similar across wealth quintiles, there were some differences

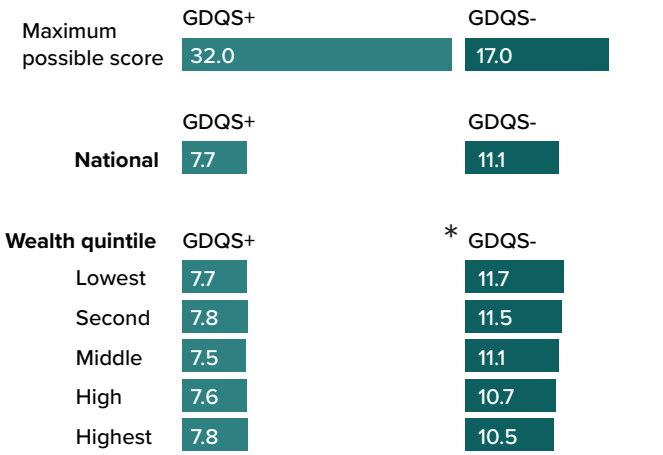
Figure 1. Percentage of Non-Pregnant Women at Low, Moderate, and High Risk of Poor Diet Quality Outcomes, by Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

* Indicates a statistically significant difference at p<0.05.

Figure 2. Mean GDQS Positive and GDQS Negative Among Non-Pregnant Women, by Wealth Quintile

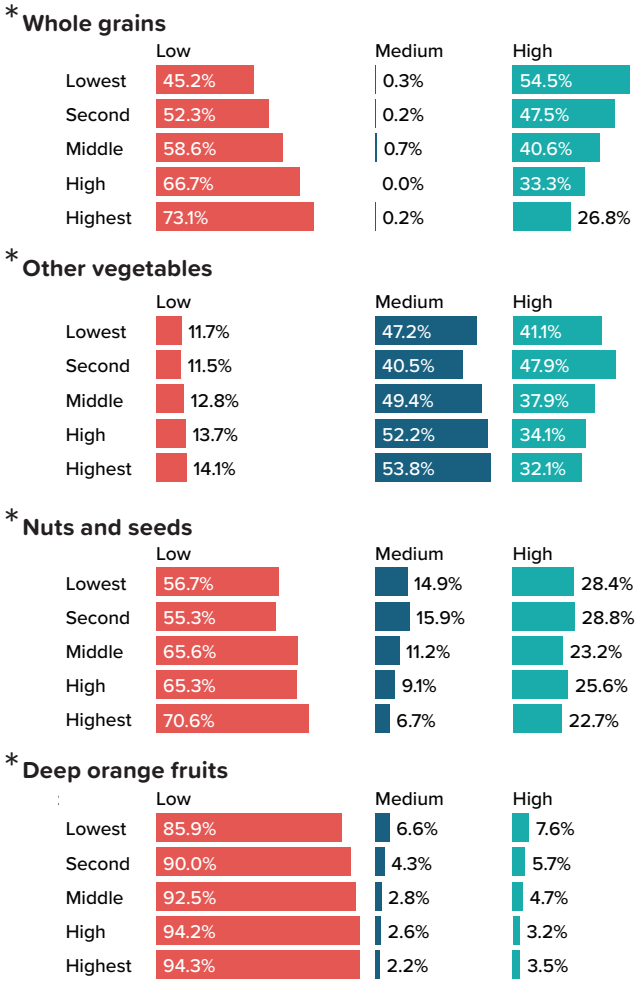


Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

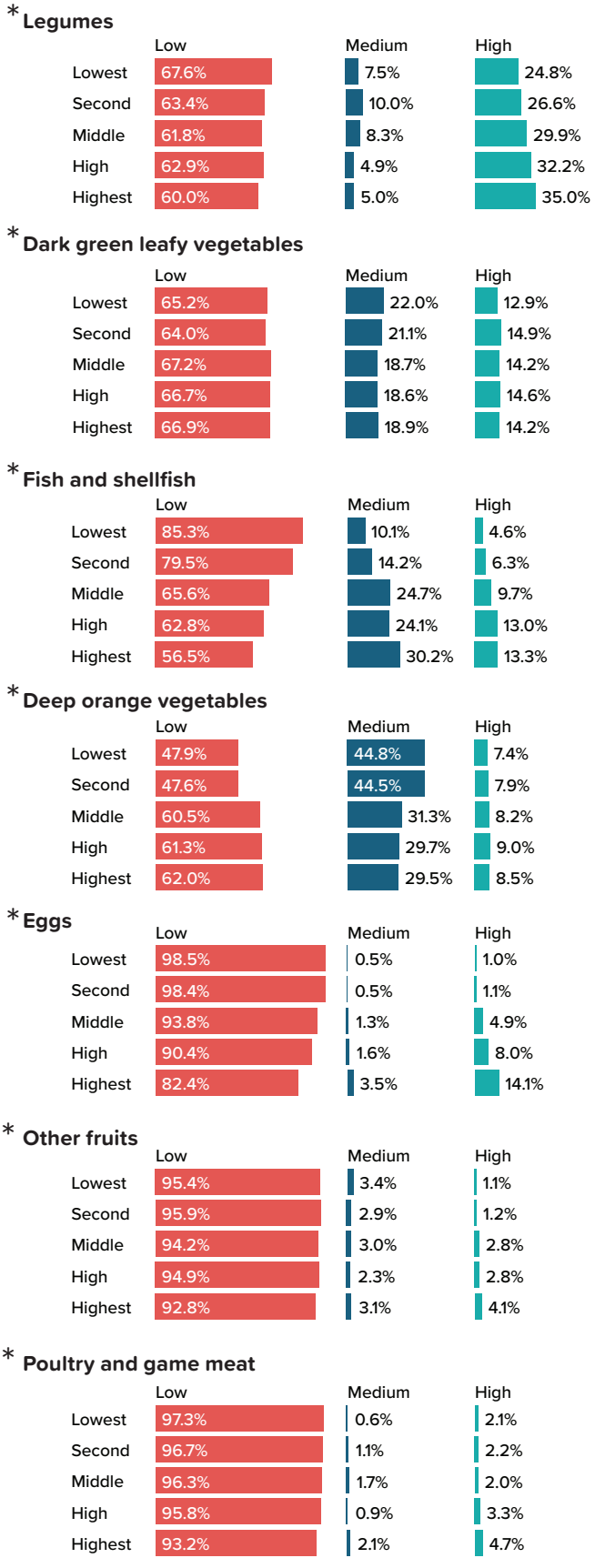
* Indicates a statistically significant difference at p<0.05.

Figure 3. Percentage of Non-Pregnant Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups, by Wealth Quintile

FOOD GROUPS FOR WHICH CONSUMPTION DECREASED WITH INCREASED WEALTH



FOOD GROUPS FOR WHICH CONSUMPTION INCREASED WITH INCREASED WEALTH



Only food groups with a significant trend by wealth quintile are presented. Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

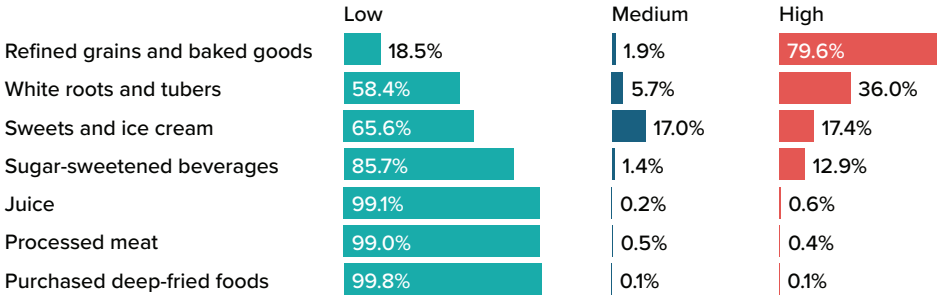
observed in healthy food group consumption (**Figure 3**). A lower consumption with increasing wealth was observed for whole grains, other vegetables, nuts and seeds, and deep orange fruits ($p<0.001$). For legumes, a higher consumption with increasing wealth was observed ($p<0.001$), and although consumption was generally low, this trend was also observed for several other healthy food groups such as dark green leafy vegetables, fish and shellfish, and eggs ($p<0.001$). A possible reason for the lower consumption of whole grains with increasing wealth could be access to unrefined grains. For foods that tend to be more expensive than grains, such as animal-source foods like fish and eggs, affordability may be the reason consumption increased with the level of wealth.

Among the food groups considered unhealthy, the data show a distinct pattern of high intake of refined grains and baked goods, and to a lesser extent, high consumption of white roots and tubers, sweets and ice cream, and sugar-sweetened beverages (**Figure 4**).

The GDQS negative sub-metric also includes two food groups for which moderate consumption is recommended. Although three-quarters (75.2%) of women had a low range of consumption for red meat, 14.8% had a medium range of consumption (for which 1 point is assigned to the GDQS negative sub-metric). Although 92.0% of women had a low range of consumption for high-fat dairy, 8.0% had a medium or high range (for which 1 point or 2 points, respectively, are assigned to the GDQS negative sub-metric) (**Figure 5**).

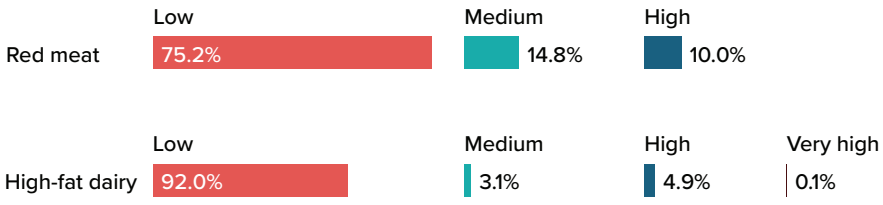
The exploration of levels of consumption across wealth quintiles shows that women's consumption of unhealthy food groups increased as wealth increased

Figure 4. Percentage of Non-Pregnant Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups



Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

Figure 5. Percentage of Non-Pregnant Women Consuming Low, Medium, and High Amounts of GDQS Food Groups That Are Unhealthy When Consumed in Excess

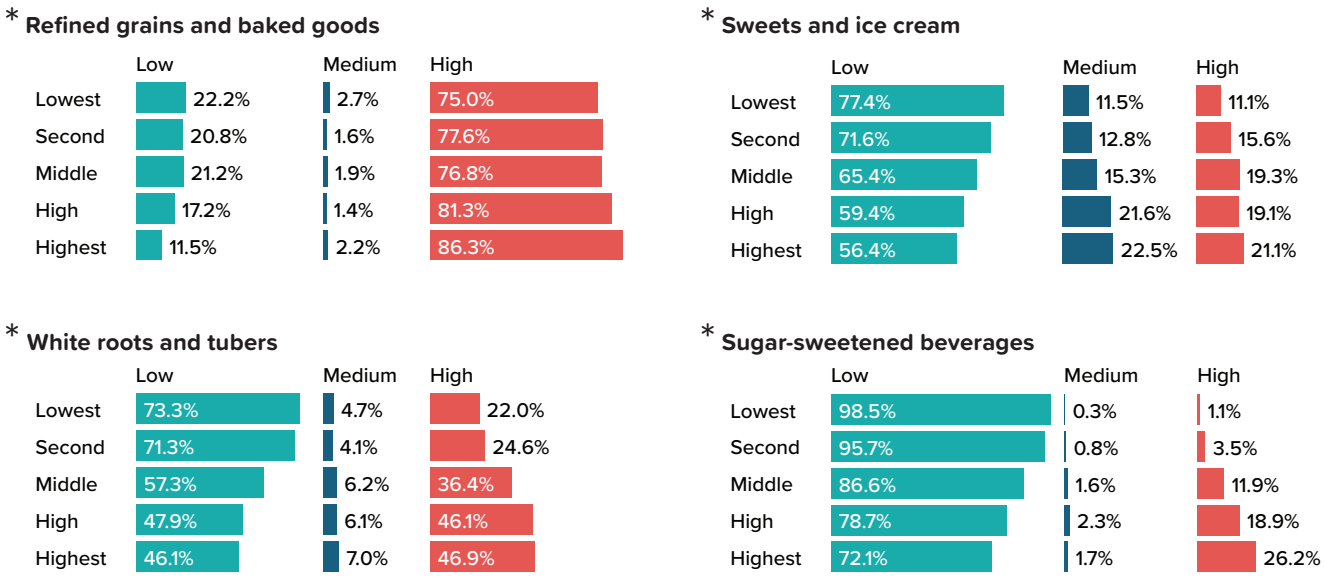


Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

(**Figure 6**). The most notable food groups with the highest consumption among wealthier households were refined grains and baked goods ($p<0.001$), white roots and tubers ($p<0.001$), sweets and ice cream ($p<0.001$), and sugar-sweetened beverages ($p<0.001$). These patterns suggest that women from wealthier households tended to make more obesogenic food choices than women in lower wealth quintiles.

Consumption of red meat also showed a clear gradient across wealth, with consumption increasing as wealth quintile increased (**Figure 7**). The proportion of women with a medium range of consumption, which contributes 1 point toward the GDQS negative sub-metric, was 5.0% for the lowest wealth quintile vs. 25.1% for the highest wealth quintile.

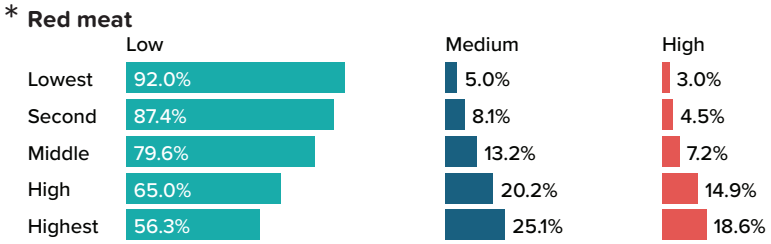
Figure 6. Percentage of Non-Pregnant Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups, by Wealth Quintile



Only food groups with a significant trend by wealth quintile are presented. Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

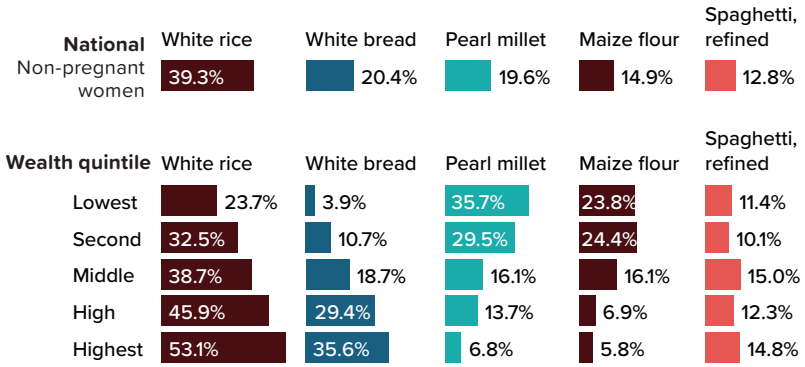
Figure 7. Percentage of Non-Pregnant Women Consuming Low, Medium, and High Amounts of Red Meat, by Wealth Quintile



Only food groups with a significant trend by wealth quintile are presented. Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

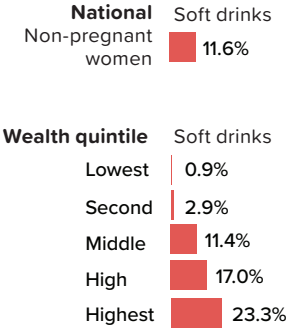
* Indicates a statistically significant difference at $p<0.05$.

Figure 8. Percentage of Non-Pregnant Women Who Consumed Specific Foods in the Refined Grains and Baked Goods Food Group (Any Amount), by Wealth Quintile



The five most commonly consumed food items by respondents within the refined grains and baked goods are presented here. Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses.

Figure 9. Percentage of Non-Pregnant Women Who Consumed Soft Drinks (Any Amount), by Wealth Quintile



Sampling design (i.e., stratification and clustering) and sampling weights (adjusted for non-response) were accounted for in the statistical analyses).

Food Level Results

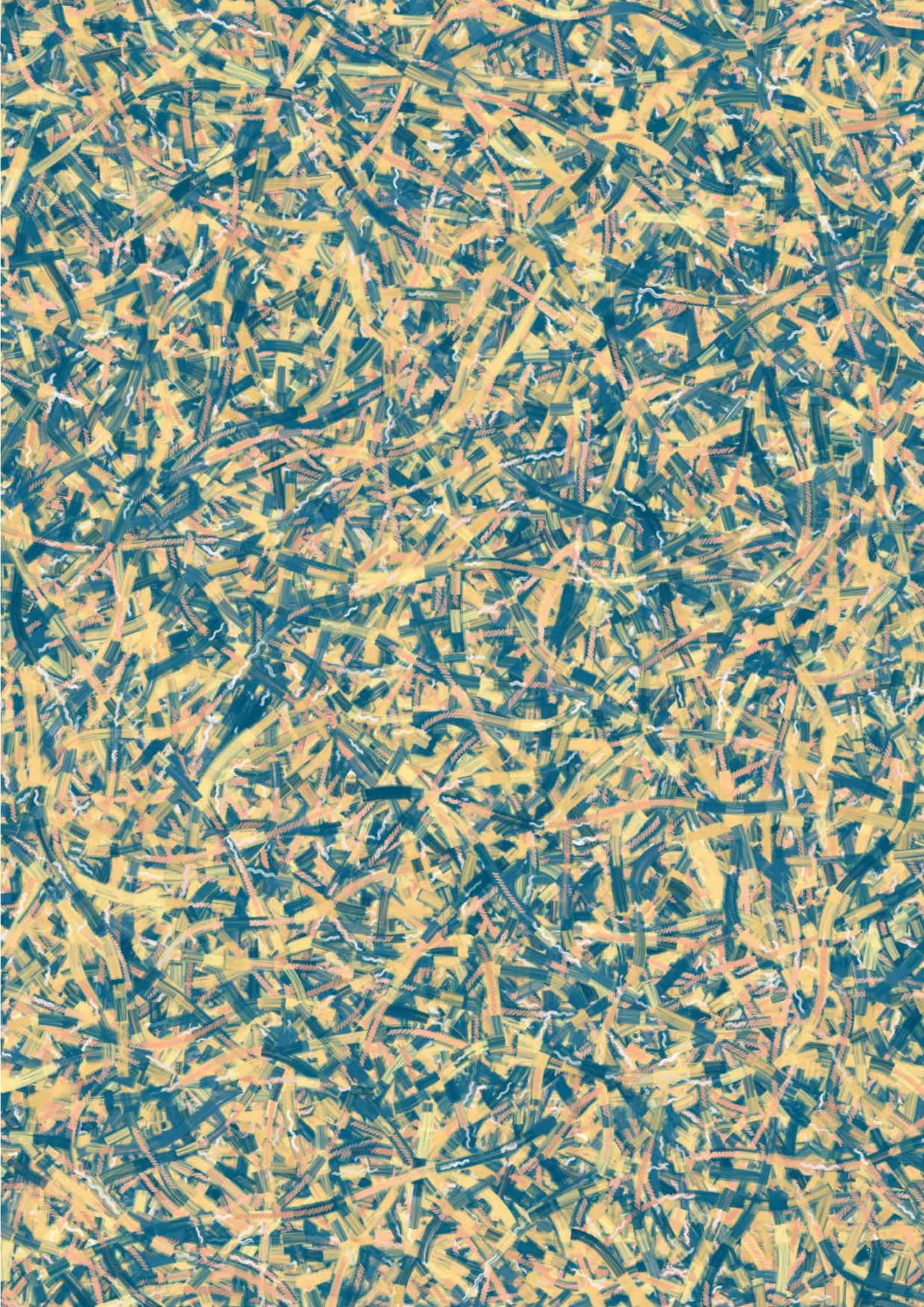
When looking at the consumption of specific foods within these key unhealthy food groups, interesting patterns arise across wealth quintiles. Although consumption of refined grains and baked goods was high across wealth quintiles, the specific foods consumed within this food group varied greatly by wealth quintile (**Figure 8**). White rice and white bread were the most consumed refined grains, with a clear trend toward higher consumption with higher wealth quintile. The opposite trend toward lower consumption with higher wealth quintile was observed for pearl millet and maize flour, whereas no trend could be seen for spaghetti made from refined grains.

Another noteworthy trend was observed for soft drinks in the sugar-sweetened beverages food group. Although consumption was high among more than one-fifth (23.3%) of women in the highest wealth quintile, consumption was almost non-existent in the lowest wealth quintile (0.9%) (**Figure 9**).

Conclusion

The GDQS analyses suggest that women from wealthier households in Nigeria did not take advantage of their relative wealth to obtain and consume higher amounts of healthier foods, with some exceptions, and tended to make more obesogenic food choices than women in lower wealth quintiles. The influence of wealth status on unhealthy food choices may have resulted from increased purchasing power combined with poor nutrition knowledge or a scarcity in the availability of healthier options. These possibilities invite further probing of the key drivers of the low intake of healthy foods and the preference for some unhealthy foods among Nigerian women.

In terms of policy inferences and implications, these results may encourage revisiting Nigeria's tax policies on sugar-sweetened beverages to evaluate effectiveness and propose amendments. A more far-reaching policy intervention opportunity is the development and deployment of Nigerian food-based dietary guidelines. This would ensure messages are targeted to reach women in wealthier households whose dietary patterns indicate they are at greater risk for NCDs, while continuing to focus on women in lower-income households, to prevent the rise in unhealthy/obesogenic dietary patterns as processed, energy-dense foods become more readily accessible over time.



About Art Piece #5: Whole Foods

This artwork brings together data for four GDQS food groups – “Whole grains”, “Legumes”, “Nuts and seeds”, and “Liquid oils” – which we broadly refer to as “Whole Foods” for naming of the art piece.

Employing the same overall approach as described for the collection’s main art piece, here, an individual’s GDQS data are represented along a free-flowing, curved line. The shape and form of the set of free-flowing lines shown is inspired by the image of a bowl of whole grain noodles.

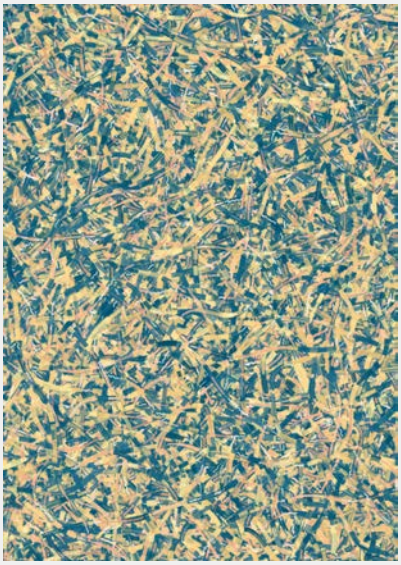
The markers used to visualize data for the four GDQS food groups included in this art piece are:

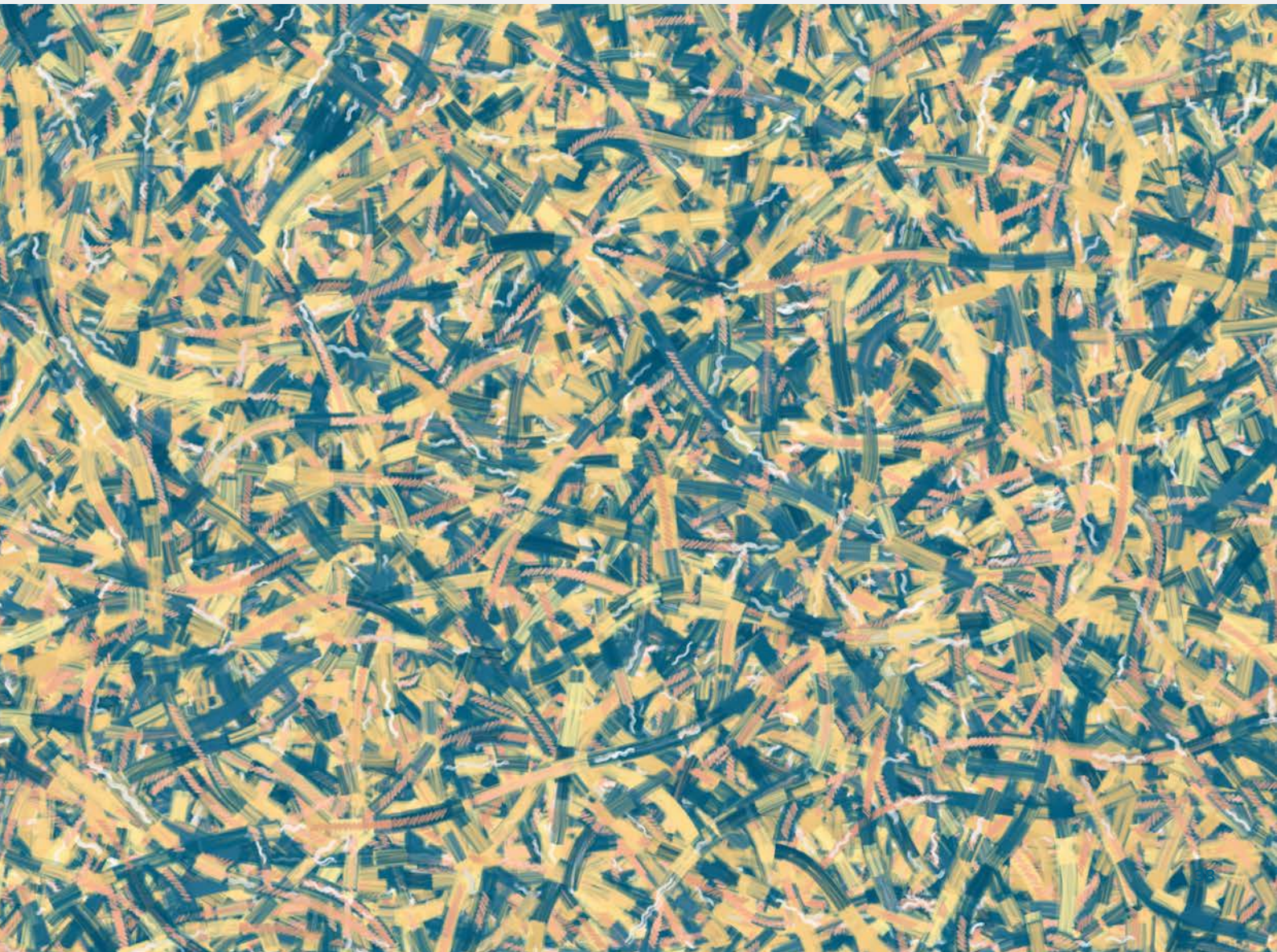
Whole grains | *White wavy lines*

Legumes | *Dark blue thick strokes*

Nuts and seeds | *Peach hatched lines*

Liquid oils | *Yellow thick strokes*





The GDQS Highlights Opportunities to Improve Diet Quality for Adolescents and Adults of Both Sexes in Viet Nam

Tuan Thi Mai Phuong, Tran Thanh Do, Ha Huy Tue, Vu Van Tan, Tran Thanh Duong and Son Duy Nguyen

National Institute of Nutrition (NIN), Hanoi, Viet Nam

Introduction

Viet Nam is undergoing a nutritional transition, with a notable shift toward a more Westernized diet, highlighted by an increase in red meat and processed meat[7] consumption over the past decade. High levels of nutrient inadequacy persist, alongside the emergence of non-communicable diseases (NCDs). In 2018, 80% of mortality in Viet Nam was attributed to NCDs (Institute for Health Metrics and Evaluation, n.d.).

In light of the ongoing shift in dietary trends in Viet Nam, it has become critical for us to explore potential variations in dietary patterns among different demographic groups, specifically between sexes and age groups (adolescents ages 15-19 years and adults ages 20-49 years). It was deemed crucial to analyze data elucidating distinctions in consumption habits and, more importantly, variations in diet quality among these groups. This investigation was considered essential to comprehensively understand the entry points for interventions specific to each target demographic. Additionally, we aimed to conduct a broader assessment to identify individuals within these target groups who were most susceptible to adverse outcomes related to diet quality, such as nutrient inadequacy and the risk of NCDs.

In 2019 the National Institute of Nutrition in Viet Nam conducted the nationally representative General Nutrition Survey (GNS), which included an individual dietary intake module. Dietary information was collected through multiple-pass quantitative 24-hour dietary recalls — with two recalls on non-consecutive days among a sub-sample — for non-pregnant, non-lactating (NPNL) women of reproductive age (15-49 years) (n=2,598), pregnant women (n=431), lactating women (n=821), and adult men ages 15-49 years (n=919). This was the first national survey in Viet Nam with dietary data collected at the individual level and not at the household level. To the best of our knowledge, this was one of the few national surveys in a low- and middle-income country (LMIC) that collected dietary data on men. The survey's main objective was to provide evidence to develop the new National Nutrition Strategy for 2021-2030.

Dietary data collected for the GNS were used to tabulate the Global Diet Quality Score (GDQS). GDQS analysis offers insights into diet quality and risk of nutrient inadequacy and NCD-related outcomes. The results of GDQS can contribute to the identification and design of interventions for specific target groups. NPNL women and men ages 15-49 years were identified as key target groups for the GDQS analysis. The quality of the diet of adolescents ages 15-19 years and adults ages 20-49 years was examined separately for males and females. Only data from the first 24-hour dietary recall interview were used. For details on how the quantitative 24-hour dietary recall data were processed to tabulate the GDQS, refer to the Annex. Survey design parameters were specified, and sampling weights were applied in the statistical analyses.

Results

Overall Diet Quality

The overall GDQS score for boys/men (ages 15–49 years) was 19.2 and was significantly lower, at 18.8, for girls/women (ages 15–49 years) (p=0.021). The mean GDQS score for both males and females was less than half the maximum score of 49. While guidance on the GDQS suggests that the maximum score is not expected to ever be attained, the average score of approximately 19 points for both sexes in Viet Nam is, nevertheless, not an optimal mean score for the GDQS metric.

The use of population-based GDQS cutoffs allows the reporting of the population at low (GDQS ≥23), moderate (GDQS ≥15 and <23), and high (GDQS <15) risk for poor diet quality outcomes. More than two-thirds of boys/men and girls/women were at moderate risk of poor dietary outcomes. The proportion of the population at high risk for poor diet quality outcomes was 11.9% for boys/men and significantly higher, at 14.2%, for girls/women (p=0.015) (**Figure 1**).

[7] Meat is typically processed using traditional methods such as salting and drying.

Comparisons between adolescents and adults by sex showed that the risk of poor outcomes was similar for boys and men (p=0.516) and for girls and women (p=0.262).

The risks of poor diet quality outcomes for girls/women and boys/men (i.e., more than 80% at moderate or high risk) underscore the importance of directing policy and program interventions toward improving the diet quality of both males and females. It is evident that a comprehensive approach to nutrition interventions should not exclusively target girls and women, but also prioritize the dietary needs of boys and men.

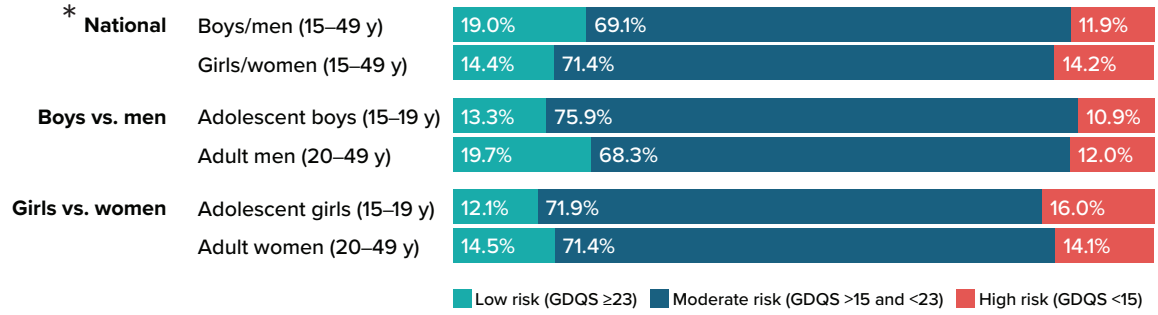
GDQS Positive and GDQS Negative Sub-Metrics

To gain insights into the overall GDQS results for males and females and by age group, we tabulated the GDQS positive and GDQS negative sub-metrics. The GDQS positive sub-metric provides a picture of eating patterns related to the consumption of 16 healthy food groups. The GDQS negative sub-metric, on the other hand, provides a picture of eating patterns related to the consumption of seven unhealthy food groups and two food groups (high-fat dairy and red meat) that are unhealthy when consumed in excessive amounts. Higher scores for the GDQS positive sub-metric indicate higher consumption of healthy food groups. Higher scores for the GDQS negative sub-metric indicate lower consumption of unhealthy food groups.

A higher mean GDQS positive was observed among boys/men in comparison to girls/women (9.2 vs. 8.8 out of a maximum score of 32, p=0.012), indicating that boys/men consumed more healthy foods than girls/women (**Figure 2**). When comparing adolescents to adults by sex, no differences were observed for either males (p=0.074) or females (p=0.289).

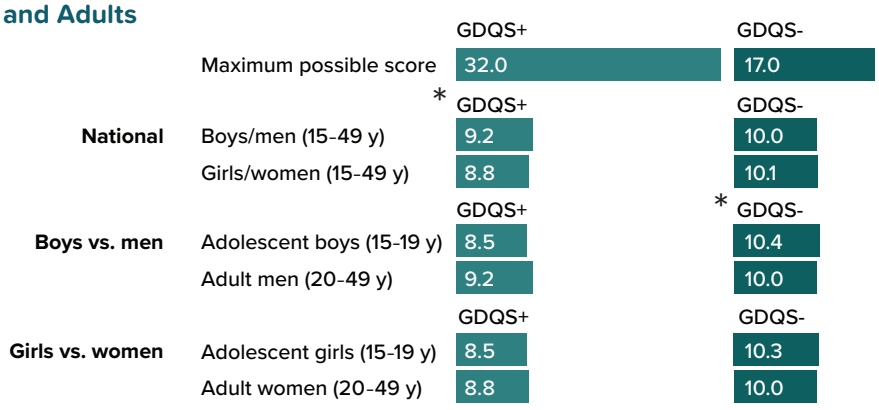
The GDQS negative was around 10 out of a maximum score of 17 for both boys/men and girls/women (p=0.702). The GDQS negative was higher for adolescent boys than for adult men (10.4 vs. 10.0, p=0.038), indicating that adult men consumed more unhealthy foods. No difference in the GDQS negative sub-score was observed between adolescent girls and adult women (p=0.087).

Figure 1. Percentage of Adolescent Boys and Girls and Adult Men and Women at Low, Moderate, and High Risk of Poor Diet Quality Outcomes



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

Figure 2. Mean GDQS Positive and GDQS Negative Among Males and Females, for Adolescents and Adults



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

Figure 3. Percentage of Boys/Men and Girls/Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups

FOOD GROUPS WITH HIGHER CONSUMPTION AMONG MALES THAN FEMALES

* **Liquid oils**

	Low	Medium	High
Boys/men	7.3%	26.4%	66.4%
Girls/women	10.9%	34.7%	54.5%

* **Dark green leafy vegetables**

	Low	Medium	High
Boys/men	40.0%	7.9%	52.0%
Girls/women	42.6%	10.6%	46.9%

* **Fish and shellfish**

	Low	Medium	High
Boys/men	32.1%	18.3%	49.7%
Girls/women	36.0%	22.7%	41.3%

* **Legumes**

	Low	Medium	High
Boys/men	64.3%	6.6%	29.0%
Girls/women	68.1%	9.1%	22.8%

* **Poultry and game meat**

	Low	Medium	High
Boys/men	63.9%	6.7%	29.5%
Girls/women	72.3%	7.1%	20.5%

* **Eggs**

	Low	Medium	High
Boys/men	68.5%	8.2%	23.3%
Girls/women	72.7%	9.7%	17.7%

* **Deep orange tubers**

	Low	Medium	High
Boys/men	79.3%	15.3%	5.4%
Girls/women	87.1%	9.3%	3.6%

FOOD GROUPS WITH LOWER CONSUMPTION AMONG MALES THAN FEMALES

* **Other fruits**

	Low	Medium	High
Boys/men	64.0%	16.8%	19.3%
Girls/women	53.0%	18.0%	29.1%

* **Citrus fruits**

	Low	Medium	High
Boys/men	87.3%	3.2%	9.5%
Girls/women	78.3%	4.5%	17.1%

* **Deep orange fruits**

	Low	Medium	High
Boys/men	95.3%	1.7%	3.0%
Girls/women	91.2%	4.5%	4.3%

Only food groups for which significant differences were observed between boys/men and girls/women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

Food Group Level Results

The GDQS food group level data can provide a deeper understanding of what types of food consumption behaviors are driving the GDQS positive and GDQS negative sub-metrics. We used the GDQS food group level data to further explore the observed differences in the mean GDQS positive between boys/men and girls/women and the observed differences in the mean GDQS negative between adolescent boys and adult men.

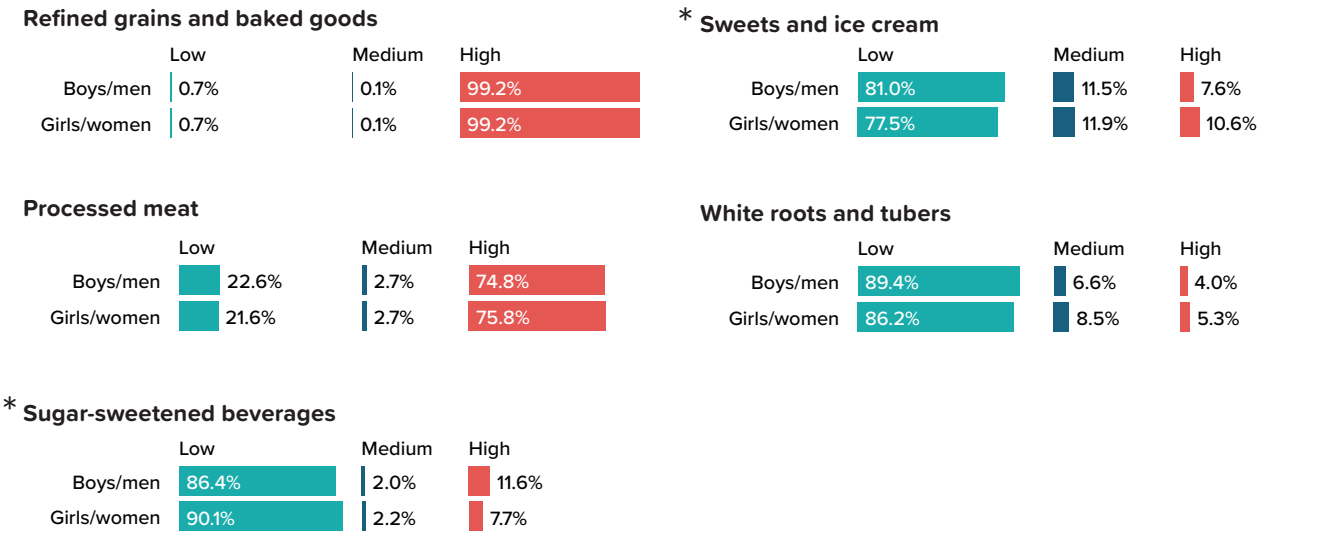
We first examined ranges of consumption for the 16 healthy food groups. Differences in the ranges of consumption of several food groups drove the observed difference in the GDQS positive between boys/men and girls/women (**Figure 3**). Consumption of protein sources such as fish and shellfish, poultry and game meat, and eggs was higher among boys/men than girls/women ($p<0.05$). Other food groups for which consumption was higher for boys/men included liquid oils, dark green leafy vegetables, deep orange tubers, and legumes ($p<0.05$). Consumption of fruit was low for both sexes, with higher consumption (including citrus and deep orange fruits) among girls/women than boys/men ($p<0.05$).

Although there were no significant differences in mean GDQS positive between adolescents and adults for either males or females, some differences in ranges of consumption of healthy food groups were observed. Adult men consumed more other vegetables ($p=0.002$) and poultry and game meat ($p=0.031$) than adolescent boys (data not shown). Adult women consumed more citrus fruits ($p<0.001$) but fewer legumes ($p=0.024$) than adolescent girls (data not shown).

When looking at ranges of consumption for the unhealthy food groups, consumption of refined grains and baked goods was high for both boys/men and girls/women, as is often seen in LMIC settings (**Figure 4**). What stands out is the large proportion (approximately three-quarters) of both boys/men and girls/women with high consumption of processed meat. Consumption of all other unhealthy food groups was low, which is noteworthy given the ongoing nutrition transition in Viet Nam.

For five of the seven unhealthy food groups, no significant differences were observed in ranges of intakes between boys/men and girls/women. The only differences observed were for sugar-sweetened beverages and sweets and ice cream, two food groups for which more than three-quarters of the population had a low range of consumption. Boys/men had a higher consumption of sugar-sweetened beverages ($p=0.022$) than girls/women, but a lower consumption of sweets and ice cream ($p=0.046$).

Figure 4. Percentage of Males and Females Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups



Only food groups with high consumption for at least 5% of either target group are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

Consumption of high-fat dairy was low (**Figure 5**). For red meat, significant consumption differences were observed between boys/men and girls/women ($p<0.001$). One-fifth (19.5%) of girls/women vs. 12.5% of boys/men had a medium range of consumption, which is considered healthy. However, almost two-thirds (63.5%) of boys/men and more than half (53.7%) of girls/women had a high range of consumption of red meat, which is considered unhealthy.

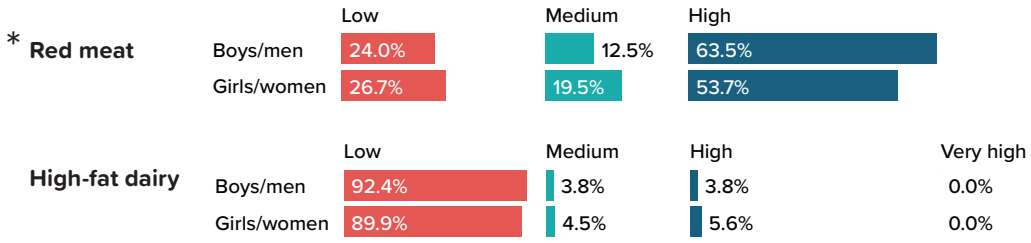
For the nine food groups that contribute to the GDQS negative, the only difference within males or females by age was for the consumption of processed meat ($p<0.001$) (**Figure 6**). Almost two-thirds (60.6%) of adolescent boys and more than three-quarters (76.4%) of adult men had high consumption of processed meat.

Food Level Results

Consumption patterns for processed meat and red meat warrant further investigation, in part because of the high consumption, but also because of the observed differences in consumption between sexes and between age groups.

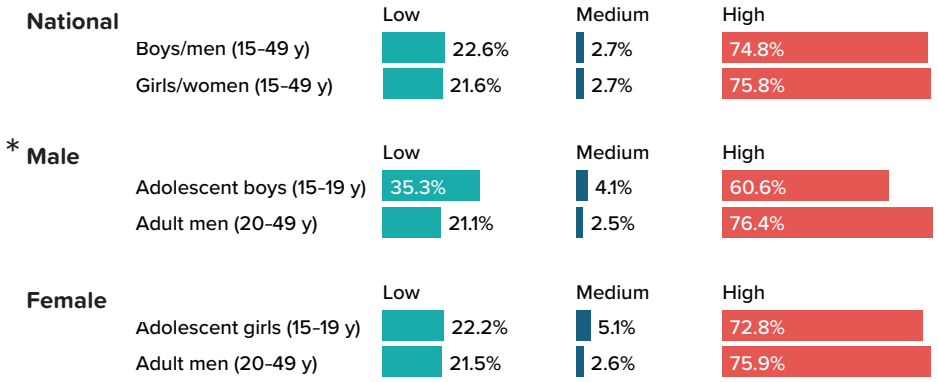
While consumption of red meat was higher for boys/men than for girls/women ($p<0.001$), the types of red meat consumed were similar (data not shown). For both males and females, pork and beef were the most consumed types of red meat. Pork meat (medium fat) was consumed by 39.5% of boys/men and 31.2% of girls/women, and beef (grade I, lean) was consumed by almost one-fifth (19.8%) of boys/men and 13.5% of girls/women.

Figure 5. Percentage of Males and Females Consuming Low, Medium, and High Amounts of GDQS Food Groups That Are Unhealthy When Consumed in Excess



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

Figure 6. Percentage of Adolescents and Adults Consuming Low, Medium, and High Amounts of Processed Meat, by Sex



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

Processed meat consumption was particularly high for adult men compared to adolescent boys ($p=0.011$). The most consumed types of processed meat were salted minced pork (which is sometimes fried) and pork sausages.

Conclusion

Using the 2019 GNS dietary data to tabulate the GDQS revealed insights that are relevant for future policy and programmatic decisions in Viet Nam. The GDQS results highlight that the risk of poor diet outcomes — both in terms of nutrient inadequacy and risk of NCD — was slightly higher for girls/women than for boys/men. Nevertheless, several consumption patterns among boys/men — such as the lower consumption of fruits and higher consumption of red meat than among girls/women — are concerning. It is apparent that policy and program interventions still need to consider targeting boys/men and girls/women to improve diet quality for both sexes.

The GDQS positive was higher for boys/men than for girls/women, and this was driven by higher consumption of several healthy food groups. Although no difference in the GDQS negative sub-metric was observed between males and females, the high consumption of red meat and processed meat for both boys/men and girls/boys raises concerns. By contrast, consumption of five of the seven unhealthy food groups was low among both males and females, a very positive finding in light of the ongoing nutrition transition. Hopefully, this trend can be maintained.

Some differences were observed between adolescents and adults, the most prominent one being higher consumption of processed meat, particularly among adult men compared to adolescent boys.

These findings call for nutrition policies and programmatic interventions that target adolescents and adults of both sexes, not only focusing on the more traditionally recognized vulnerable groups such as pregnant women and young children. Within the context of the nutrition transition – and the associated dietary patterns seen across various countries undergoing this transition – additional strategies may be warranted to maintain low consumption of foods high in sugar, such as sugar-sweetened beverages, sweets and ice cream, and juice. Furthermore, it would be desirable to promote the consumption of whole grains to decrease the consumption of refined grains and baked products and to identify ways to increase the consumption of fruits (e.g., by ensuring safe fruits are widely available and affordable). Innovative interventions are needed to limit the consumption of processed meat and to promote moderate consumption of red meat. For example, when developing food-based dietary guidelines, a specific portion size for red meat could be included.

About Art Piece #6: Fruits

Drawing inspiration from slices of fruit, this artwork celebrates the world of fruits, encompassing all GDQS fruit-related food groups.

The same data visualization technique as the foundational piece is used to represent the GDQS data in this art piece. However, here an individual's GDQS data are depicted along four quarter-circular paths that, when combined, form a complete circle.

This artwork focuses on the following three GDQS food groups:

Deep orange fruits | *Red-orange thick strokes (portrayed as wavy lines in the main piece)*

Citrus fruits | *Yellow to white circles*

Other fruits | *Peach thick strokes (portrayed as wavy lines in the main piece)*

Unveiling Zambia's Emerging Health Challenge: Fighting Non-Communicable Diseases

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National Food and Nutrition Commission (NFNC), Lusaka, Zambia

Introduction

Although malnutrition poses a significant threat to the nation's health and development, dietary data for the country had been lacking in Zambia until recently. The first national food consumption survey was undertaken more than 50 years ago in 1971, followed by a survey in 2012. The 2012 survey was limited to two provinces leaving significant knowledge gaps. Recognizing the pressing need for dietary data to inform targeted nutritional interventions, Zambia undertook the 2024 National Food Consumption and Micronutrient Status Survey (NFCMSS) (National Food and Nutrition Commission [NFNC] et al., 2024).

The 2024 NFCMSS targeted children ages 6-59 months, adolescent girls ages 10-14 years, and women of reproductive age (15-49 years), including pregnant and lactating women. The sample size was 2,506 for children, 1,380 for adolescent girls, and 2,932 for women. The purpose of the survey was to assess the population's micronutrient status by analyzing both dietary intake and biochemical markers. The results fill the current knowledge gap regarding the adequacy of micronutrient intakes and the status, magnitude, and distribution of micronutrient malnutrition — information needed to design cost-effective interventions. Assessing dietary intake allows for levels of inadequate intake of specific nutrients to be estimated, food sources that do or do not provide adequate nutrients to be identified, and intake gaps to be determined for food-based interventions.

Zambia has struggled over the years to combat both under- and overnutrition in women. The 2013-14 Zambia Demographic and Health Survey (ZDHS) showed that the prevalence of undernutrition was 10% (BMI <18.5 kg/m^2) while the prevalence of women classified as overweight or obese (BMI ≥ 25 kg/m^2) was 23%, with a substantial difference between urban (32%) and rural (15%) areas (Central Statistical Office [CSO] et al. 2014). Furthermore, the ZDHS survey highlighted a significant increase in the prevalence of women classified as overweight or obese (BMI ≥ 25 kg/m^2) since the previous survey in 2007 (from 12% to 23%). These trends raise concerns about the anticipated overweight and obesity statistics for 2024, especially among those committed to addressing this public health issue.

Given these alarming statistics, investigation into the diet quality of women in Zambia is merited, particularly to identify issues related to these patterns and to explore whether other differences between rural and urban areas mirror the disparities in the rising prevalence of overweight and obesity.

To investigate these issues, we used the quantitative 24-hour dietary recall data collected as part of the 2024 NFCMSS to tabulate the Global Diet Quality Score (GDQS). The GDQS is a food-based indicator of diet quality that reflects the risk of both nutrient inadequacy and outcomes related to non-communicable diseases (NCDs). For details on how the quantitative 24-hour dietary recall data were processed to tabulate the GDQS, refer to the Annex. The analysis described here was carried out for women (ages 15-49 years), including pregnant and lactating women. Survey design parameters were specified, and sampling weights were applied in the statistical analyses.

Our analysis provides insights into the factors contributing to the escalation of the above-mentioned problem among women in Zambia and investigates differences in patterns between urban and rural areas. Below, we describe these findings and the policy and program implications.

Results

Overall Diet Quality

Women ages 15-49 years had a mean overall GDQS of 18.6. Almost one-fifth (17.5%) were at high risk for poor diet quality outcomes (GDQS < 15), in terms of both risk of poor nutrient adequacy and increased risk for NCD-related outcomes. Furthermore, about three-quarters of women (69.7%) were at moderate risk for poor diet quality outcomes (GDQS ≥15 and

<23), and 12.7% were at low risk for poor diet quality outcomes (**Figure 1**).

The prevalence of women classified as being at high risk of poor dietary outcomes was double in urban areas (24.0%) compared to rural areas (12.2%) (p<0.001). This mirrors the difference in overweight and obesity prevalence between urban and rural areas reported in the 2013-2014 ZDHS survey (CSO et al. 2014). One may wonder what drives such a wide difference between women living in urban and rural areas.

GDQS Positive and GDQS Negative Sub-Metrics

To understand the differences in these diet quality results between urban and rural areas in Zambia, we examined the results for the GDQS positive and GDQS negative sub-metrics. The GDQS positive sub-metric gives us insight into healthy food consumption patterns, as it comprises only healthy food groups. The GDQS negative sub-metric gives us insight into unhealthy food consumption patterns, as it comprises food groups that are unhealthy and food groups that are unhealthy when consumed in excess. The GDQS positive has a possible range of 0 to 32 while the GDQS negative has a possible range of 0 to 17. For both sub-metrics, a higher score is desired and reflects healthier food consumption patterns for that metric.

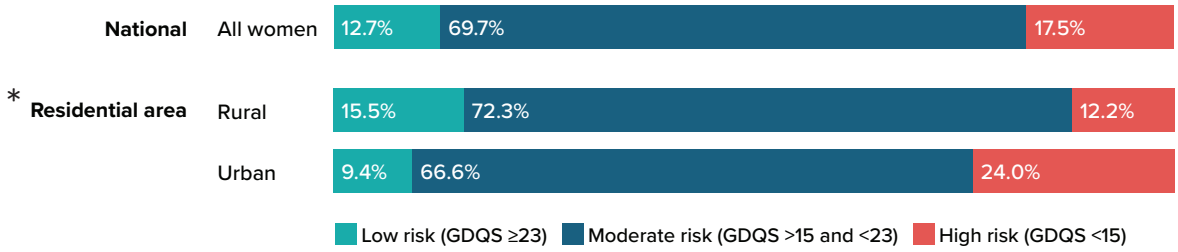
The mean GDQS positive was 7.3, raising an alarm across residential areas (**Figure 2**). Notably, the GDQS positive was similar in rural and urban areas, suggesting that poor nutrient adequacy is prevalent in both areas.

The mean GDQS negative was 11.3, with differences between women living in urban and rural areas (p<0.001). The mean GDQS negative score was 12.0 in rural areas and lower at 10.4 in urban areas.

Food Group Level Results

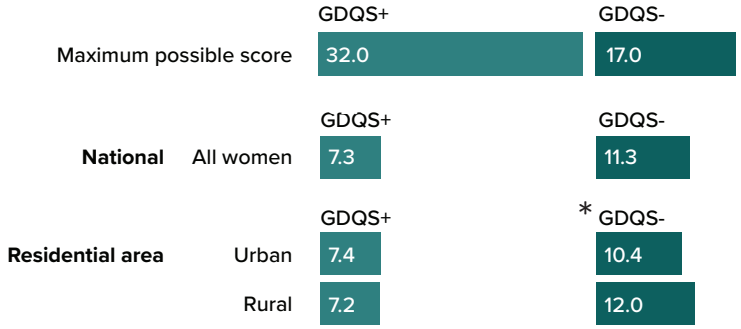
To better understand what caused the difference in metric scores between urban and rural areas, we examined the food groups consumed in those areas and whether consumption was low, medium, or high (**Figure 3**). We conducted these analyses separately for the GDQS positive sub-metric and the GDQS negative sub-metric.

Figure 1. Percentage of Women at Low, Moderate, and High Risk of Poor Diet Quality Outcomes, by Residential Area



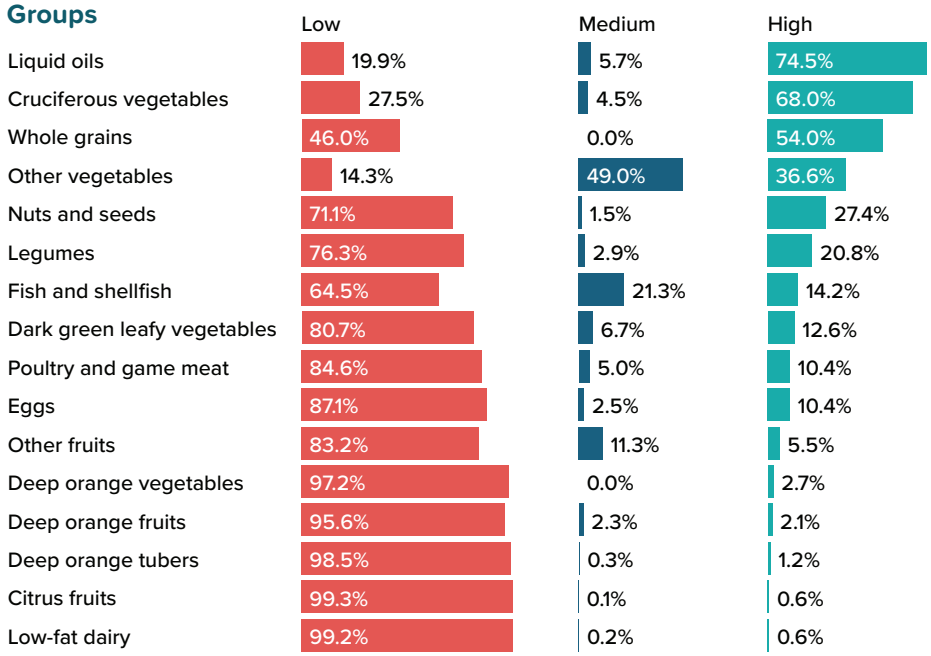
Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

Figure 2. Mean GDQS Positive and GDQS Negative Among Women, by Residential Area



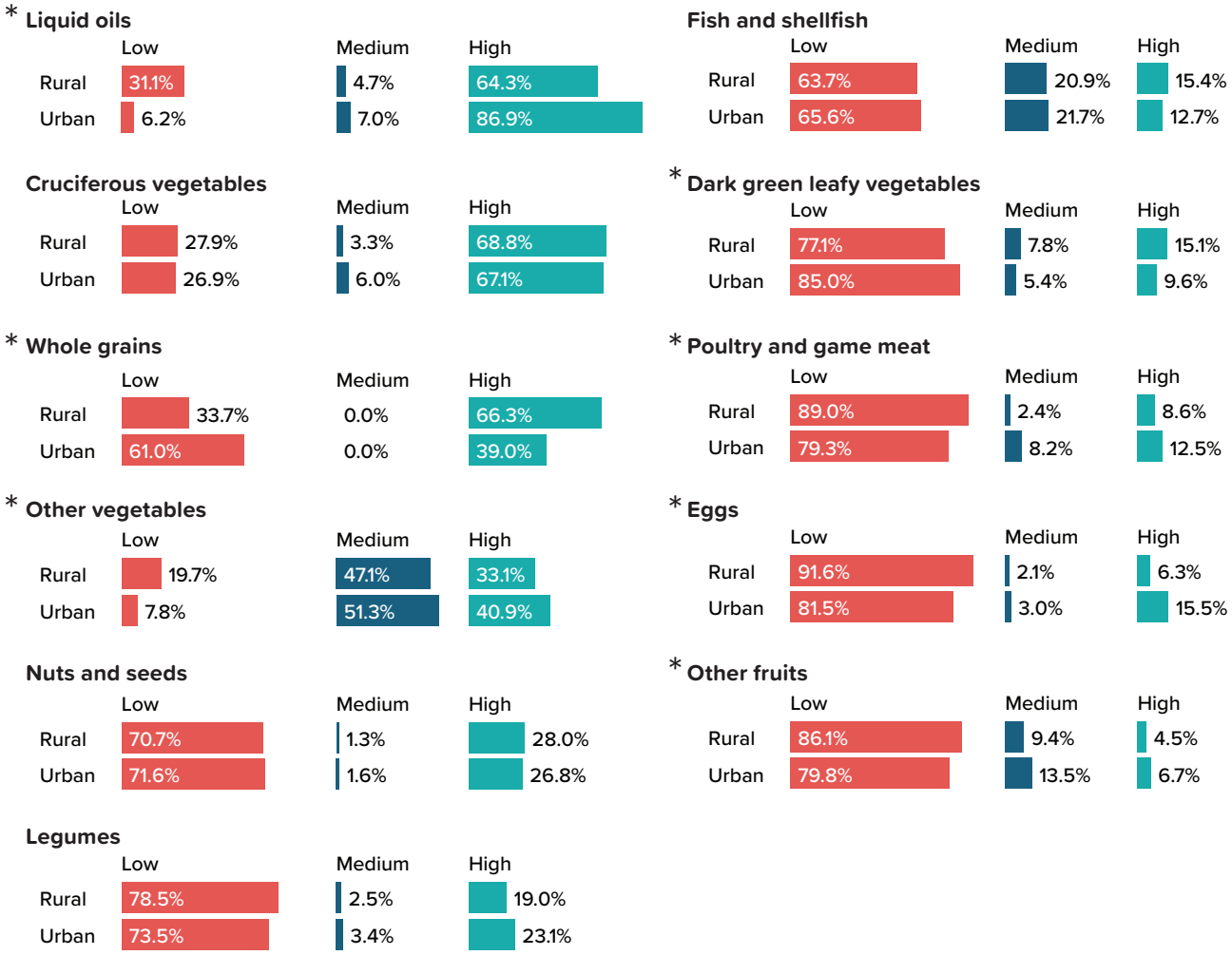
Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at p<0.05.

Figure 3. Percentage of Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

Figure 4. Percentage of Women Consuming Low, Medium, and High Amounts of Healthy GDQS Food Groups, by Residential Area



Only food groups with high consumption for at least 5% of either urban or rural are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

* Indicates a statistically significant difference at $p<0.05$.

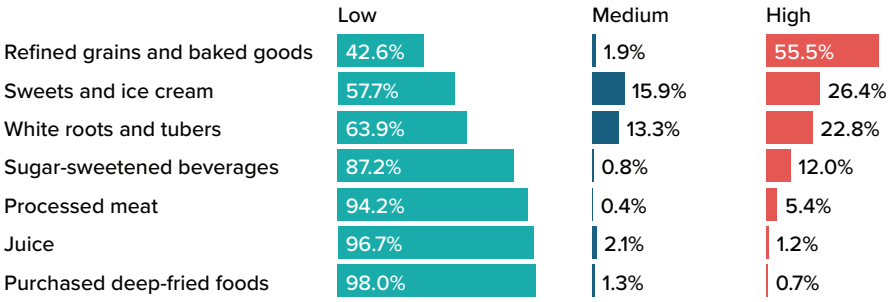
Analysis of the healthy food groups revealed that about two-thirds of women had high consumption of liquid oils and cruciferous vegetables, about half had high consumption of whole grains, and about one-third had high consumption of other vegetables and nuts and seeds. Consumption of nutrient-dense foods such as animal-source lean protein (i.e., fish and shellfish, poultry and game meat, low-fat dairy, eggs), fruits (i.e., citrus fruits, deep orange fruits, other fruits), vegetables (i.e., dark green leafy vegetables, deep orange vegetables), and tubers (i.e., deep orange tubers) and was low (**Figure 3**).

Although the mean GDQS positive was similar for women living in urban and rural areas, some differences in ranges of consumption were observed (**Figure 4**). For some healthy food groups, consumption was higher in the rural areas (i.e., whole grains, dark green leafy vegetables), whilst for other food groups, consumption was higher in urban areas (i.e., liquids oils, other vegetables, poultry and game meat, eggs, and other fruits).

When we examined consumption of the seven unhealthy food groups that contribute to the GDQS negative metric, the data showed that women have high consumption of refined grains and baked products, sweets and ice cream, and white roots and tubers (**Figure 5**).

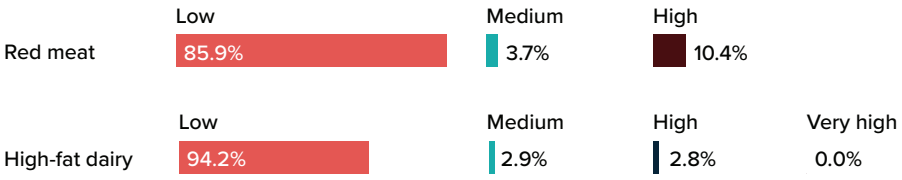
Data for the two food groups that are unhealthy when consumed in excess (red meat and high-fat dairy) showed that most women had a low range of consumption for both food groups (**Figure 6**).

Figure 5. Percentage of Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

Figure 6. Percentage of Women Consuming Low, Medium, and High Amounts of GDQS Food Groups That Are Unhealthy when Consumed in Excess

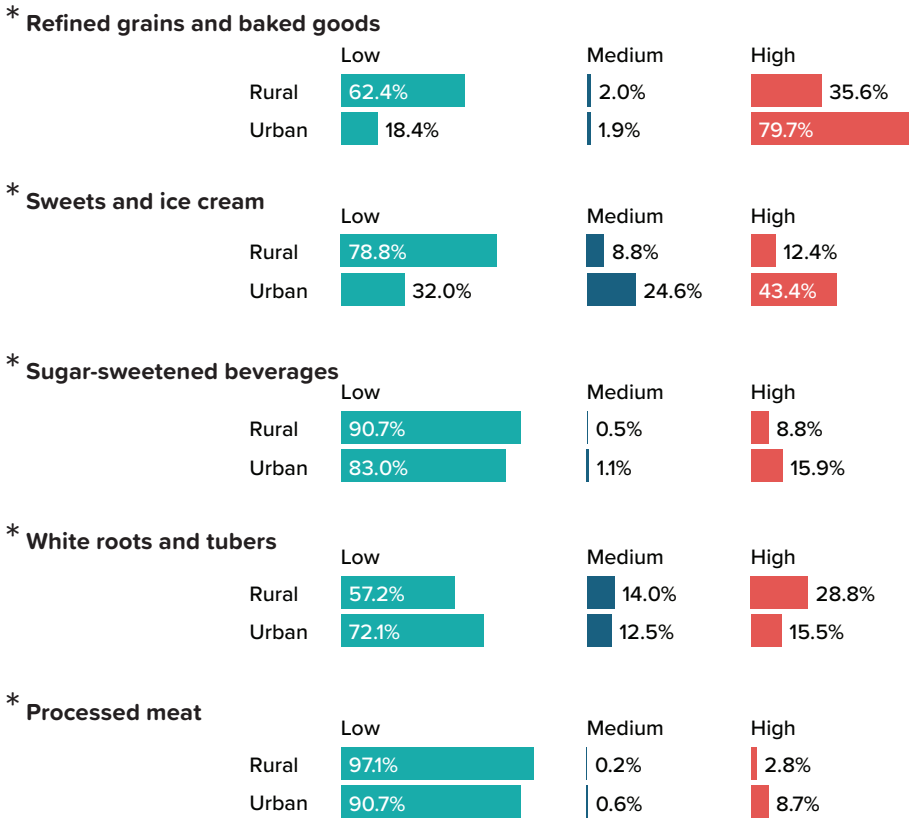


Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.

Consumption of most unhealthy foods differed between urban and rural areas, with higher consumption of refined grains and baked goods as well as sweets and ice cream in the urban areas ($p<0.001$) and higher consumption of white roots and tubers in the rural areas ($p<0.001$) (**Figure 7**). Although consumption was less prevalent for sugar-sweetened beverages and processed meat, high consumption of these food groups was more prevalent in urban areas than in rural areas ($p<0.05$). Overall, populations living in urban areas in Zambia are more exposed to refined and processed foods that tend to provide fewer important nutrients but more calories than the body needs, causing excess body fat.

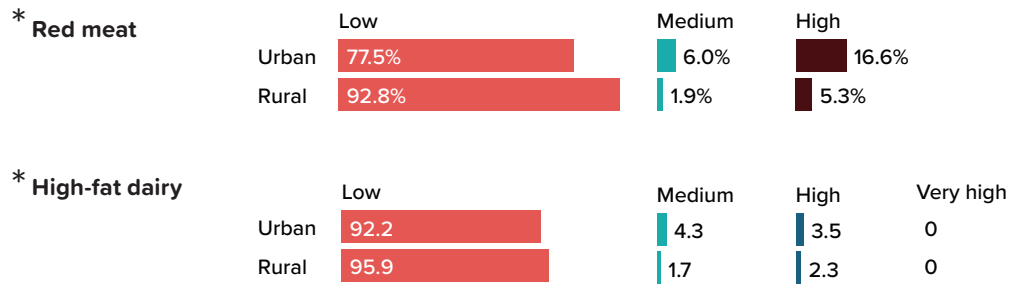
Differences by residential area were also observed in ranges of consumption for the two food groups that are unhealthy when consumed in excess (**Figure 8**).

Figure 7. Percentage of Women Consuming Low, Medium, and High Amounts of Unhealthy GDQS Food Groups, by Residential Area



Only food groups with high consumption for at least 5% of urban or rural women are presented. Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

Figure 8. Percentage of Women Consuming Low, Medium, and High Amounts of GDQS Food Groups That Are Unhealthy When Consumed in Excess, by Residential Area



Sampling design (i.e., stratification and clustering) and sampling weights were accounted for in the statistical analyses.
* Indicates a statistically significant difference at $p<0.05$.

Food Level Results

While the GDQS food group results provide a useful guide for considering potential policy and programmatic actions that may be needed in Zambia, we were interested in gaining an even deeper understanding of the different consumption patterns between urban and rural areas to explore whether further detail about food consumption patterns could offer additional insight to guide evidence-based solutions for emerging health problems in Zambia. To this end, we examined the specific foods and beverages in food groups of concern that were most often reported as consumed. Because of the difference in the mean GDQS negative between urban and rural areas, we focused on the unhealthy food groups with relatively high consumption, namely refined grains and baked goods, sweets and ice cream, and white roots and tubers.

When looking at refined grains and baked goods, women living in urban areas had a higher consumption of refined breakfast maize flour (53.5% vs. 17.8%), white bread (made with refined grains) (31.8% vs. 4.9%), and white rice (20.4% vs. 8.9%). When these foods are processed, the bran and germ are removed, therefore, refined grains tend to have less fiber than whole grains. Fiber is an important nutrient that is required for healthy digestion and helps protect against NCDs. Refined grains are not only linked to NCDs but also to higher body weight. Although grains are an important source of energy, with foods such as *nshima*, bread, and rice commonly consumed, our GDQS analysis shows that the country can promote healthier options for the population, for example, advocating for the use of more nutrient-dense whole grains and fewer refined grains in the preparation of these foods. Some whole grains such as *mungaiwa*, a straight-run maize flour, already are consumed across the country, with high consumption among two-thirds (62.0%) of women in rural areas and one-third (35.8%) of women in urban areas.

Similarly, urban areas exhibited notably higher consumption of sugary foods and, to a lesser extent, sugary drinks than rural areas, highlighting a worrisome trend in dietary preferences. Why lament the high consumption of added sugar? High sugar consumption leads to fat accumulation in the body, which in turn leads to overweight/obesity and increases the risk of NCDs such as diabetes and heart disease. The GDQS data show that two-thirds (68.9%) of women living in urban areas had a high consumption of table sugar compared to one-fourth (23.6%) of women living in rural areas. Additionally, the consumption of sweet biscuits was more prevalent among women in urban areas (5.0%) than those in rural areas (2.4%). Conversely, sugar cane consumption was higher in rural areas (4.0%) than in urban areas (1.6%).

Consumption of white roots and tubers was also notably higher among women living in rural areas, specifically white sweet potato (19.1% vs. 9.7%), cassava (17.4% vs. 8.4%), and cassava flour (20.3% vs. 4.6%). Certainly, the promotion of healthier alternatives would be crucial for improving dietary patterns. While the consumption of white roots and tubers remains high, particularly in rural areas, there is a need to advocate for more nutritious options. Two excellent alternatives are orange sweet potatoes and yellow cassava, which are rich in essential vitamins and minerals and offer significant health benefits.

Conclusion

With the high level of nutrient intake inadequacy among women in Zambia, as reported in the 2024 NFCMSS, the current trends of unhealthy food consumption among Zambian women pose a significant challenge to achieving the goal of eradicating all forms of malnutrition by 2030. Looking into the future calls for action in the form of awareness campaigns to educate the population about the potential health risks associated with excessive consumption of highly processed foods and high-sugar foods such as refined grains, baked goods, and sweets, especially in urban settings.

Considering the health risks involved with the above-listed foods, implementing a higher tax on unhealthy products would reduce demand for these foods and at the same time generate revenue for the nutrition sector to reinvest into public health initiatives focused on promoting the consumption of healthy foods. Additionally, implementing a comprehensive policy to promote the consumption of whole grains, especially in urban areas, is crucial for public health. While the consumption of white roots and tubers continues to be prevalent, promoting the adoption of orange sweet potatoes and yellow cassava emerges as a viable policy alternative. These efforts need to be made in conjunction with efforts to improve the nutrient adequacy of diets across the country.

Annex
Methods Used for the GDQS Analyses Presented in the Country Stories

Quantitative 24-hour dietary recall data from national or large-scale surveys recently conducted in Ethiopia, Niger, Nigeria, Viet Nam, and Zambia were used to tabulate the GDQS results reported in each country story. The surveys in all five countries were designed to assess the type and amounts of foods consumed and the nutrient adequacy of the diet to help inform national programs and policies.

For the analyses presented in the country stories, only dietary data collected from respondents for the first day of the 24-hour dietary recall were used. The steps undertaken by each country institution to tabulate the GDQS using the country survey data are described below.

Step 1 entailed processing the quantitative 24-hour dietary recall data to derive the amount (in grams) consumed for each food and ingredient consumed (by respondent). Recipe calculations were applied to derive amounts of ingredients consumed and yield factors were applied where appropriate to derive amounts in the form in which the food was consumed (e.g., amount of cooked rice consumed).

In **Step 2**, each food or ingredient listed in the dataset was classified into the corresponding GDQS food group. To ensure consistency across countries, *Intake* provided countries with an extensive global food database in which more than 7,000 food items are classified into the correct GDQS food group.

In **Step 3**, the total amount (in grams) of all foods/ingredients reported as consumed per GDQS food group were summed (by respondent). The amounts of food classified in the high-fat hard cheese subgroup were multiplied by a factor of 6.1 to account for the difference in nutrient density between hard cheese and other dairy.

In **Step 4**, the total amount of each food group consumed was assigned a range of consumption (i.e., low, medium, or high, and very high for high-fat dairy) based on the defined GDQS scoring. The gram cutoff for each category of consumption is food group-specific (refer to **Table 1, Columns 4–7,** in **Part I**).

In **Step 5**, each respondent was assigned points for each GDQS food group, according to that respondent's range of consumption for a given GDQS food group (refer to **Table 1, Columns 8–11,** in **Part I** to see how points are assigned for each GDQS food group).

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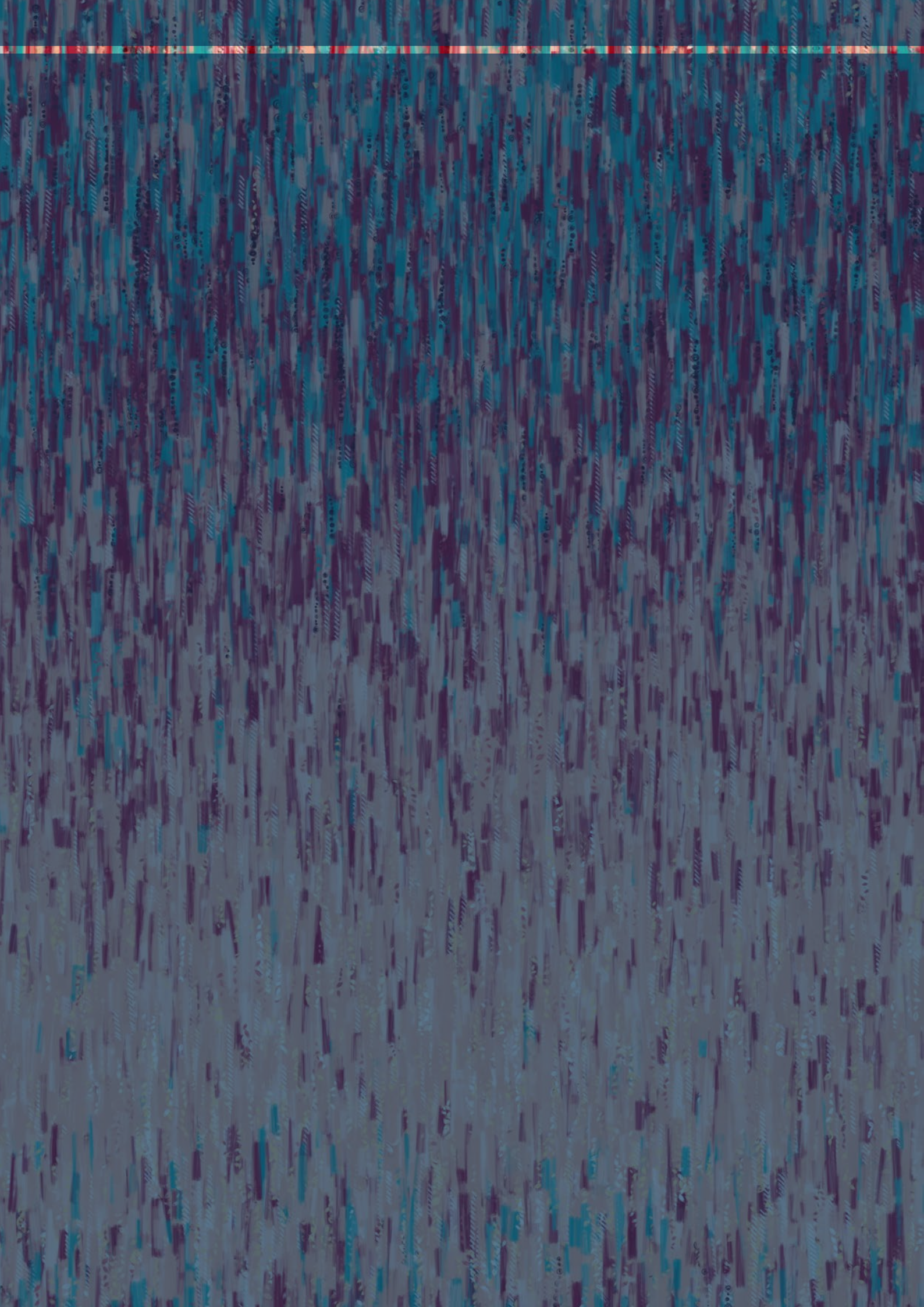

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