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2021 Ukraine Iodine Survey Report

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TABLE OF CONTENTS

Back to Contents

LISTING OF FIGURES AND TABLES

ABBREVIATIONS

ECA	**Europe and Central Asia**
IGN	**Iodine Global Network**
HH	**Household**
IDD	**Iodine Deficiency Disorders**
PHC	**Public Health Centre of the Ministry of Health of Ukraine**
SES	**Socioeconomic status**
Stats4SD	**Statistics for Sustainable Development**
UISR after O. Yaremenko	**NGO "Ukrainian Institute for Social Research after Oleksandr Yaremenko"**
USI	**Universal Salt Iodisation**
WRA	**Women of Reproductive Age (15 to 49 years of age). For the purpose of this report, WRA implies non-pregnant and not breastfeeding an infant less than 6 months of age.**
WHO	**World Health Organisation**

Back to Contents

Foreword/acknowledgements

This study was conducted in difficult times for Ukraine. The original plans for the study were disrupted by the COVID-19 pandemic in 2020, which led to the suspension of the study for 1.5 years and a change in the data collection methodology. When the data was finally collected, its analysis was suspended for 2 months (February-March 2022) due to the outbreak of Russia's full-scale war in Ukraine. Due to the huge wave of migration, both internal and external, many women of reproductive age who make up the target group of the study have changed their place of residence, so the interpretation of the data by region may not be accurate. Nevertheless, despite certain limitations, the results of this study are an important source of data for continuing to lobby for mandatory salt iodisation in Ukraine.

Unfortunately, at the time of publication of this study, Ukraine is facing enormous challenges in meeting the needs of the Armed Forces, as well as the basic needs of the civilian population: water, heat and electricity, the shortages of which have been caused by Russia's invasion of Ukraine and the destruction of critical life support infrastructure, and the issue of salt iodisation, as well as many other important issues, is no longer a priority. In addition, the largest salt production facility, Artemsil, has been destroyed by the Russian occupiers, raising the question of the availability of salt production in Ukraine.

We are extremely grateful to the Center for Public Health of the Ministry of Health of Ukraine, represented by its Deputy Director Vladyslav Zbanatskyi, for supporting the idea of the study and providing information support in the regions.

We are also grateful to Director of the V.P. Komisarenko Institute of Endocrinology and Metabolism of the National Academy of Medical Sciences of Ukraine, which was a partner in the analysis of biologicaldata for iodine content, Doctor of Medical Sciences, Professor, Academician of the National Academy of Medical Sciences of Ukraine, Corresponding Member of the National Academy of Sciences of Ukraine Mykola Tronko for the overall coordination of the Institute's participation in the study, as well as Doctor of Medical Sciences, Professor Viktor Kravchenko, for organising the study and coordinating the work of the staff involved in the project. We would also like to thank Tetiana Bondar, PhD in Sociology, and Nam Nguyen, the study coordinators from O. Yaremenko Ukrainian Institute for Social Research, for organising the study preparation and timely data collection in compliance with high quality standards, despite the existing challenges. Finally, we would like to thank the UNICEF Ukraine Health, Nutrition and HIV/AIDS Programme team, Programme Manager (until early 2022) Andrii Slavutskyi, Nutrition Officer Kimberley Peek (until October 2021), and HIV/AIDS Specialist Olena Brahinska (until April 2022) for promoting the idea of conducting the study despite the constraints and for the overall coordination of the study.

Back to Contents

Executive Summary

BACKGROUND

A national survey in Ukraine in 2002 showed that women of reproductive age (WRA) were iodine deficient (median urinary iodine concentration (mUIC) 90 µg/l, which was below the WHO cut off of 100 µg/l, indicating adequacy of iodine nutrition). The fact that most women in Ukraine were entering pregnancy with insufficient iodine was of great concern. Iodine deficiency is especially damaging during pregnancy and early childhood; it may result in irreversible brain damage in the developing foetus and infant and impede a child's learning ability.[1]

WHO and UNICEF have called on all countries to legislate for iodisation of all food-grade salt as an equitable intervention to provide sufficient dietary iodine to move populations from possible insufficient intake among all or some groups, to optimal iodine status among all groups.[2] Quality controlled salt iodisation provides a small amount of iodine in addition to existing, highly variable, dietary sources of iodine. The number of countries (with data) that are classified with iodine deficiency has declined from 113 to 21 since 1990[3] , this is attributed primarily to the implementation of salt iodisation in these countries.

In 2013, the World Health Assembly recognised that control of iodine deficiency has and will contribute to many of the Millennium Development Goals (now replaced with similar Sustainable Development Goals), including poverty alleviation, reduction of infant mortality, improved maternal health, education for all, gender equity and private-public partnership.[4]

During the period 1996 to 2011, mandatory legislation for iodisation of at least some forms of food grade salt was implemented in 20 of the 21 UNICEF Europe and Central Asia (ECA) countries with UNICEF country offices.[5] Ukraine is the only country in this UNICEF region without some form of mandatory legislation for salt iodisation, which is reflected in low household use of adequately iodised salt (21% of households in 2002). Other data show that Ukraine is one of only two countries in the region classified as having insufficient iodine intake.[6]

A 2018 roundtable event in Ukraine led to agreement among national partners to renew efforts to legislate for salt iodisation to improve the health and development potential of children in Ukraine. A strong recommendation from the event was to update the evidence base for the use of adequately iodised household salt and for population iodine status at the national and sub-national levels in Ukraine. This recommendation resulted in the survey documented in this report which was conducted in the summer of 2021.

The national iodine survey was initially planned to start in April 2020; however, the Covid-19 pandemic meant it was delayed until July 2021.

OBJECTIVES OF THE SURVEY

The overall objective is to provide an evidence base, with information about household use of iodised salt, population iodine status, and programmatically relevant factors; that can be used to advocate for an appropriate strategy and programme to achieve optimal iodine status among the population in Ukraine and provide a baseline for its implementation.

The specific objectives of the survey are to obtain data for the following indicators that are representative at the national level and by 4 macro-regions/domains: North-Central (combined), South, East and West, and to enable additional disaggregation by urban-rural location at the national level:

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[1] World Health Organization (2014) Guideline: Fortification of food-grade salt with iodine for the prevention and control of iodine deficiency disorders. Geneva, Switzerland: WHO

[2] United Nations Children's Fund; World Health Organization. World Summit for Children-Mid-Decade Goal: Iodine Deficiency Disorders; Special Session; UNICEF-WHO Joint Committee on Health Policy: Geneva, Switzerland, 1994.

[3] Iodine Global Network Scorecard https://www.ign.org/newsletter/idd_may21_global_scorecard.pdf (Accessed 05 November 2021)

[4] Resolution WHA65.11, Nutrition. Maternal, infant and young child nutrition: Draft comprehensive implementation plan, Report by the Secretariat, in Sixty-Fifth World Health Assembly, Geneva, 21–26 May 2012, Resolutions and decisions, list of participants, WHO, Geneva, 2012:5–23 (A65/11)

[5] The Russian Federation is not one of the 21 countries with UNICEF country offices; however, it's the only other country in the same region without any current legislation for salt iodisation.

[6] Data extracted from: https://www.ign.org/cm_data/IGN_Global_Scorecard_2021_7_May_2021.pdf (accessed 5 November 2021).

1. To estimate the level of awareness and knowledge of the population regarding iodine deficiency and its prevention.
2. To estimate the proportion of households using adequately iodised salt.
3. To investigate whether the level of iodine in household salt is associated with location, education level, perceived household wealth, salt brand, or salt grain size/colour.
4. To estimate the population iodine status among women of reproductive age (WRA).
5. To estimate the consumption of foods with some naturally occurring iodine content (such as sea fish) and of specified salt-containing foods, such as bread and different types of cheese (as a potential source of iodised salt), among WRA.
6. To estimate the percent of WRA who regularly use iodine-containing supplements.
7. To investigate whether iodine status among WRA is associated with location, education level, perceived household wealth, the level of iodine in household salt, supplement use, or with consumption of foods which may contain iodine naturally.

SURVEY DESIGN

The Ukraine Iodine Survey was a cross-sectional survey designed primarily to provide representative estimates for iodine status among non-pregnant women of reproductive age (15 to 49 years of age) not breastfeeding an infant less than 6 months of age, and for household use of adequately iodised salt; nationally and by four macro-regions (North-Central, South, East and West).

The sample size and sample selection and survey methodology were developed to obtain the most representative data possible for the specific objectives within the allocated budget and while minimising public health risks from the Covid-19 pandemic.

MAIN RESULTS

Household use of adequately iodised salt (15 mg/kg or above) was low nationally at 21% of households. It was highest in the West macro-region (37%) and lowest in the North-Central and South macro-regions (13%). There was little difference in household use of adequately iodised salt by urban or rural residence. For salt containing any added iodine (>5mg/kg), the median iodine content was 28mg/kg, with a narrow confidence interval around this estimate, which indicates that iodised salt reaching the market in Ukraine is of well-controlled quality.

Nationally, WRA were found to be iodine deficient (mUIC was 90 µg/L). The only sub-national groups with a mUIC above the WHO cut off for adequacy of 100 µg/L were WRA in the South macro-region (mUIC 111 µg/L) and among the population of WRA using adequately iodised household salt (mUIC 111 µg/L). The mUIC was lowest in the East macro-region (73 µg/L).

Fourteen percent of WRA in the survey self-reported that they had ever been diagnosed with a thyroid disorder, however, the mUIC among this group was not noticeably different to the rest of the population.

Less than 5% of surveyed WRA reported to have used an iodine-containing supplement in the previous month. The sample size (n = 69) was too small to reliably assess mUIC, however, there was indication that WRA who reported taking iodine supplements had slightly higher mUIC than those who did not.

Awareness of iodine deficiency was relatively high, at 77% of WRA. Of WRA who were aware, just over 50% reported that household use of iodised salt or buying products made with iodised salt was the best method to prevent deficiency. Responses to the question about the best method to prevent iodine deficiency also included eating seafood or seaweed (26%) and taking iodine supplements (12%).

Consumption of foods (sea fish and cow's milk) with possible non-salt iodine content was not associated with improved mUIC. In fact, unexpectedly, the mUIC among WRA consuming these products more frequently was somewhat lower when compared with WRA who consumed them less frequently. Analysis of survey data on the consumption of salt-containing foods (that would have the potential to contribute to improving iodine nutrition IF they were made with iodised salt) found the following:

- There was relatively little variation in the reported frequency of consumption (and therefore volume) of each food type by macro-region, residence, wealth or educational level, although small differences were noted.
- Bread was consumed by 90% of WRA in the week before the survey, with an estimated daily per capita intake of between 100 to 200g among consumers.
- Approximately 70% of WRA consumed commercially produced bread.
- Calculation of approximate estimates for the potential iodine intake from food products included in the survey (IF salt used in their production was iodised) found a potential daily iodine intake of about 90µg iodine for all products combined (60% of the recommended nutrient intake for iodine). Bread (26µg) and smoked sausage (21µg) contributed the most. This calculation did not include the potential contribution to iodine intake from the use of iodised cooking/table salt.

SUMMARY DISCUSSION POINTS

The Ukraine national iodine survey 2021 showed that there has been no improvement in iodine nutrition over the past 20 years. WRA are still iodine deficient (median urinary iodine remained at 90 µg/L) and household use of salt iodised to at least 15 mg/kg is still at the same low percentage, approximately one fifth of the population. This makes Ukraine the poorest performing country in terms of iodine status and salt iodisation, within the UNICEF ECA region.

The survey shows that women in Ukraine are entering pregnancy with inadequate iodine nutrition. WHO states that the most susceptible groups for iodine deficiency are women of reproductive age, since iodine deficient in utero neonates are at high risk of irreversible mental impairment; and women providing breast milk to their children, as this may be the infant's only source of iodine during the first 6 months of life.

The most cost-effective proven intervention to prevent iodine deficiency is universal salt iodisation (which includes the iodisation of salt for use by the food industry and salt for animal feed). WHO and UNICEF have documented that policies on salt reduction and salt iodisation are compatible and complementary.

Despite WRA in the survey demonstrating relatively good knowledge about iodine deficiency and methods to prevent it, only 21% of households used iodised salt and almost none of the WRA had taken iodine-containing supplements in the previous month. This discrepancy between knowledge and practice may reflect a lack of awareness about the risk of iodine deficiency in Ukraine/to themselves.

Bread is a widely consumed food in Ukraine and legislation for iodisation of salt used in its production has previously been proposed. The fact that most households use commercially produced bread and that it is consumed at least weekly by approximately 90% of the population, indicate that legislation for iodisation of bakery salt, along with household salt, should increase iodine intake to an optimal level across the population. Iodisation of salt used for bread production alone could provide almost a fifth of adult iodine requirements.

Other significant contributions to iodine intake would be possible from the use of iodised salt in the production of smoked sausage, seasoning, and various types of cheese. There is no evidence from consumption estimates in this survey, or from experiences in other countries with similar dietary patterns, that iodine intake from these combined sources would come close to the tolerable upper intake level for iodine.

The national situation has changed dramatically since the planning and implementation of this survey (2019-2021) to the time of writing this report (mid 2022). The Russian invasion of Ukraine resulted in a significant movement of the population from East to West Ukraine and out of the country. It has also

led to changes in the supply and cost of salt and other foods. These factors greatly affect the applicability of the survey findings in terms of current regional differences, etc. However, it does not alter the urgent need to protect the population through mandatory salt iodisation. Indeed, the war, with the heightened risk of leakage of radioactive materials from nuclear power plants in the country, has increased the importance and urgency of doing this. The percentage thyroid uptake of iodine decreases in an iodine sufficient population[7], which could reduce the risk of high uptake of radioactive iodine.

RECOMMENDATIONS

The main recommendation from this survey is to use the evidence of poor iodine status among a vulnerable population group to advocate for recognition of the WHO guidance on fortification of food-grade salt with iodine. This would mean urgent implementation of legislation for quality-assured iodisation of all imported or domestically produced cooking/table salt and for iodised salt to be used in the food industry, at minimum in the bread industry.

Results reported here reflect the national situation before the Russian invasion of Ukraine in February 2022. The war has changed the national situation and the context of the survey findings, conclusions and recommendations. A specific section about this is included in the report.

[7] Moorthy D, Sood A, Ahluwalia A, Kumar R, Pandey RM, Pandav CS, Karmarkar MG, Padhy AK. Radioiodine kinetics and thyroid function following the universal salt iodization policy. Natl Med J India. 2001 Mar-Apr;14(2):71-4.

1. Introduction

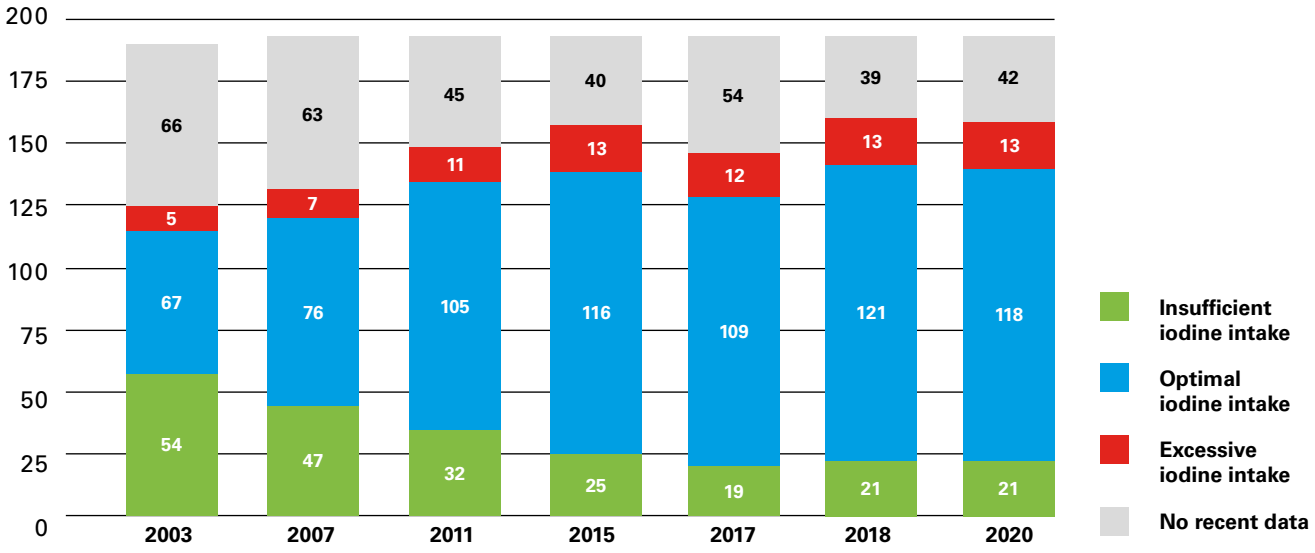
Iodine is a trace element that is essential for the synthesis of thyroid hormones by the thyroid gland. Thyroid hormones are involved in growth, development, reproductive function, and control of metabolic processes. Iodine deficiency is especially damaging during pregnancy and early childhood; it may result in irreversible brain damage in the developing foetus and infant and impede children's learning ability. Iodine deficiency is one of the most common causes of preventable impaired cognitive development globally. The most susceptible groups for iodine deficiency disorders (IDD) are women of reproductive age, since iodine deficient in-utero neonates are at high risk of irreversible mental impairment; and women providing breast milk to their children, as this may be the infant's only source of iodine during the first 6 months of life[8].

Approximately one third of the world's population live in areas where natural sources of iodine are low; therefore, requiring sustained iodine interventions. Universal Salt Iodisation (USI) is defined as iodisation of all food-grade salt (applies to salt used as an ingredient of food, both for direct sale to the consumer and for food manufacture[9]), and for animal feed.

USI is globally accepted as the most cost-effective public health strategy for achieving and sustaining optimal iodine among a population. In 1994, the Joint UNICEF/WHO Committee on Health Policy recommended that all food-grade salt used by households, by food processing industries, and for animal feed; should be fortified with iodine as a safe and sustainable strategy to ensure sufficient intake of iodine by all individuals. They called on all countries to ensure population access to iodised salt regardless of whether they had a documented problem of iodine deficiency disorders problem.[10] Specifically, iodisation of all food-grade salt is proposed as an equitable intervention to provide sufficient dietary iodine, additional to existing (highly variable) sources of iodine, to move populations from possible insufficient intake among all or some groups, to optimal iodine status among all groups.

In 2013, the World Health Assembly further recognised that IDD control contributed directly towards many of the Millennium Development Goals (now replaced with similar Sustainable Development Goals), including poverty alleviation, reduction of infant mortality, maternal health, education for all, gender equity and private-public partnership.[11]

Figure 1. The 2021 Global Scorecard of Iodine Nutrition



IDD newsletter May 2021 https://www.ign.org/newsletter/idd_may21_global_scorecard.pdf

[8] World Health Organization (2014) Guideline: Fortification of food-grade salt with iodine for the prevention and control of iodine deficiency disorders. Geneva, Switzerland: WHO

[9] Food and Agricultural Organization of the United Nations. CODEX Alimentarius: List of Standards Codex Standard for Food-Grade Salt, CX STAN 150–1985, Rev. 1–1997. Last modified 2012. Available online: http://www.fao.org/fao-who-codexalimentarius/search/en/?cx=018170620143701104933%3Aqq82jsfba7w&q=saltiodisation&cof=FORID%3A9&siteurl=www.fao.org%2Ffao-who-codexalimentarius%2Fstandards%2Flist-of-standards%2F%2520en%2Fen%2F&ref=&ss=3255j1784681j14 (accessed on 21 October 2021).

[10] United Nations Children's Fund; World Health Organization. World Summit for Children-Mid-Decade Goal: Iodine Deficiency Disorders; Special Session; UNICEF-WHO Joint Committee on Health Policy: Geneva, Switzerland, 1994.

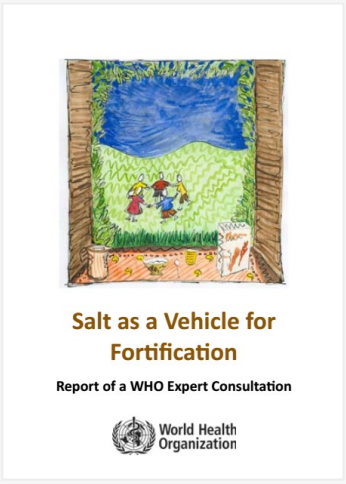
[11] Resolution WHA65.11, Nutrition. Maternal, infant and young child nutrition: Draft comprehensive implementation plan, Report by the Secretariat, in Sixty-Fifth World Health Assembly, Geneva, 21–26 May 2012, Resolutions and decisions, list of participants, WHO, Geneva, 2012:5–23 (A65/11)

To date, 126 countries have implemented mandatory legislation for iodisation of at least some forms of food-grade salt, usually including household (cooking and table) salt[12]. As a result of legislation combined with collaboration between national governments, the salt industry, international and national organisations, and academia, 86% of households globally use salt with some iodine.[13 14] Household use of adequately iodised salt, usually defined as salt with at least 15 mg/kg iodine[15], is not included in the UNICEF report since most data are sourced from surveys that used field-based qualitative salt iodine testing.

Primarily due to salt iodisation, the number of countries (with available national or sub-national data) classified with iodine deficiency has declined from 113 to 21 since 1990. The number of countries (with data) where the population is classified as having optimal iodine intake has increased from 67 in 2003 to 118 in 2020 (Figure 1).[16]

Two WHO reports, in 2008 (Box 1) and 2014 (Box 2), have confirmed the appropriateness of the original rationale for USI and verified that salt iodisation is compatible with salt reduction strategies if both are appropriately managed and monitored.

Historically, achieving optimal iodine intake through salt iodisation has been discussed in relation to iodisation of household salt alone. This is reflected in the use of the proxy indicator of > 90% household coverage with adequately iodised salt to show achievement of USI (WHO 2007 Guide for Programme



WHO EXPERT CONSULTATION OUTCOME

Excerpts from: World Health Organization (2008) Expert consultation on salt as a vehicle for fortification. Luxembourg, 21-22 March 2007.

"Monitoring of UI [urinary iodine] through existing programs is essential. Countries need to periodically adjust the levels of iodine fortification within the goal of salt consumption <5 g/day, depending on their own local data.

Policies for salt iodization and reduction of salt to <5 g/day are compatible, cost effective and of great public health benefit. At the country level, close collaboration between salt iodization and salt reduction programs as a coalition is urgently required so that their aims are congruent.

Ministries of health should make sure that the message to consume iodized salt does not promote excessive salt consumption and does not conflict with salt reduction policies.

Advocacy with policy makers will be necessary for implementing and appropriate legislation and regulation on salt iodization and salt reduction."

WHO USI GUIDANCE

Excerpts from: World Health Organization (2014) Guideline: Fortification of food-grade salt with iodine for the prevention and control of iodine deficiency disorders. Geneva, Switzerland: WHO

"Salt is considered an appropriate vehicle for fortification with iodine, for the following reasons:

(i) It is widely consumed by virtually all population groups in all countries, with little seasonal variation in consumption patterns, and salt intake is proportional to energy intake/requirements.

(ii) In many countries, salt production is limited to a few centres, facilitating quality control.

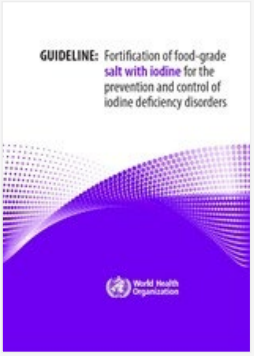
(iii) The technology needed for salt iodisation is well established, inexpensive and relatively easy to transfer to countries around the world.

(iv) Addition of iodate or iodide to salt does not affect the taste or smell of the salt or foods containing iodised salt, and therefore consumer acceptability is high.

(v) Iodine (mainly from iodate) remains in processed foods that contain salt as a main ingredient, such as bouillon cubes, condiments and powder soups, and hence these products become sources of iodine;

(vi) Iodisation is inexpensive (the cost of salt iodisation per year is estimated at US$ 0.02–0.05 per individual covered, and even less for established salt-iodisation programmes).

Additionally, the concentration of iodine in salt can easily be adjusted to meet policies aimed at reducing the consumption of salt in order to prevent cardiovascular disease."



Managers). However, there is now strong evidence that in most regions of the world, dietary patterns are shifting towards increased consumption of salt through industrially processed foods and condiments, with an associated decrease in the relative contribution of household salt to total salt intake. [17] [18] [19] This shift highlights the increasing necessity to advocate for iodisation of food industry salt and include food industry salt as a part of any regulatory monitoring process for USI and in assessments of iodised salt intake.

Many countries in the Europe and Central Asia (ECA) region, including Ukraine, have a relatively high quantity of bread consumption, making bread a significant source of dietary salt (and therefore potentially iodine) intake.[20] [21] The use of iodised salt in bread production has proven feasibility, with a demonstrated impact on iodine status in the Netherlands, Belarus and Australia.[22] [23] [24] The Nutrients paper calculated that the potential iodine intake from typical adult intakes of bread, if all salt used in bread baking in Ukraine is iodised at the level of 25 mg/kg iodine, would be about 30% of the recommended nutrient intake (RNI) for iodine for adults (150µg). It was therefore considered important to collect information about consumption of industrially produced and home-produced bread in different regions of Ukraine as part of the national iodine survey.

During the period 1996 to 2011, mandatory legislation for iodisation of at least some forms of food grade salt was implemented in 20 of the 21 UNICEF Europe and Central Asia (ECA) countries with UNICEF country offices[25]. All except 3 have implemented legislation that requires mandatory iodisation of all forms of food grade salt[26]. The only country in this UNICEF region without some type of mandatory legislation for salt iodisation is Ukraine.

According to documents from UNICEF Ukraine, the Ministry of Health in Ukraine and several members of the Ukrainian Parliament were interested to re-engage in dialogue about achieving optimal iodine nutrition among the Ukrainian population through Universal Salt Iodisation (USI). The UNICEF USI project in Ukraine aimed to support these government moves towards legislating for, and implementing, mandatory salt iodisation and its monitoring and enforcement.

Global recommendations are to obtain household-level data on salt iodine content and population-based UIC data every five years. The latest national iodine survey conducted in Ukraine took place in 2002, with a smaller study of Pregnant and Lactating women in 2013. To obtain new and reliable data about iodine deficiency and the use of iodised salt to inform USI/IDD policy advocacy and decisions, UNICEF and the Ministry of Health (MoH) agreed to include a task in their cooperative workplan to conduct a new national survey, conducted under the responsibility of the Public Health Centre (PHC), in collaboration with other national partners, and with technical support from international consultants.

The national iodine survey was initially planned to start in April 2020; however, the Covid-19 pandemic meant this was delayed until July 2021. Results reported here reflect the national situation before the full-scale nationwide Russian invasion of Ukraine in February 2022. The impact of the war on interpretation of the survey findings is discussed further in the final chapter.

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[12] Global Fortification Data Exchange. Chart: Year When Food Fortification Mandated. https://fortificationdata.org/chart-year-when-food-fortification-mandated (Accessed 05 November 2021)

[13] Global Nutrition Report: A strong case for salt iodization Excerpted from: Garrett GS, Gorstein J, Kupka R and Martinez H. Spotlight 3.2: Large-scale fortification as a means of addressing micronutrient deficiencies. In: Development Initiatives. 2018 Global Nutrition Report: Shining a light to spur action on nutrition. Bristol, UK: Development Initiatives; 2018. www.ign.org/newsletter/idd_feb19_global_nutrition_report_2018.pdf (Accessed 21 May 2019)

[14] Division of Communication, UNICEF. The State of the World's Children 2017; UNICEF: New York, NY, USA, 2017.

[15] International Council for Control of Iodine Deficiency Disorders; United Nations Children's Fund (UNICEF); World Health Organization (WHO). Assessment of Iodine Deficiency Disorders and Monitoring Their Elimination: A Guide for Programme Managers; World Health Organization (WHO): Geneva, Switzerland, 2007.

[16] Iodine Global Network Scorecard https://www.ign.org/newsletter/idd_may21_global_scorecard.pdf (Accessed 05 November 2021)

[17] James WP, Ralph A & Sanchez-Castillo C (1987) The dominance of salt in manufactured food in the sodium intake of affluent societies. The Lancet 329, 426–429.

[18] Reardon T, Tschirley D, Dolislager M, et al. (2014) Urbanization, diet change, and transformation of food supply chains in Asia. East Lansing MI Glob. Cent. Food Syst. Innov.

[19] Research Institute (IFPRI) IFP (2017) 2017 Global Food Policy Report. Washington, DC: International Food Policy Research Institute.

[20] Knowles, J. et al. Iodine Intake through Processed Food: Case Studies from Egypt, Indonesia, the Philippines, the Russian Federation and Ukraine, 2010–2015. Nutrients 2017, 9, 797; https://www.mdpi.com/2072-6643/9/8/797 (accessed 19 November 2021).

[21] Iodine Global Network Summary Report from the Pilot Implementation of the IGN Programme Guidance on the Use of Iodised Salt in Processed Foods https://www.ign.org/program-guidance-on-the-use-of-iodized-salt-in-industrially-processed-foods.htm ("Pilot implementation" file, with reference to results for North Macedonia and the Republic of Moldova) (accessed 19 November 2021).

[22] Gerasimov, G. Increasing iodine intakes in populations through the use of iodized salt in baking. IDD Newsl. 2009

[23] Petrenko, S.; Mokhort, T.; Gerasimov, G. Belarus celebrates a superb sustained USI program. Group 1998, 2001, 2009

[24] Li, M.; Eastman, C.J.; Ma, G. Iodized salt in bread improves iodine nutrition in Australia. Victoria 2014, 73, 162–166

[25] The Russian Federation is not one of the 21 countries with UNICEF country offices; however, it's the only other country in the same region without any current legislation for salt iodisation.

[26] In Turkey mandatory legislation only applies to table and cooking salt. In Romania, legislation is for mandatory iodisation of table and cooking salt and for salt used in the production of bread and bakery products, the use of iodised salt in other processed foods is voluntary. In Belarus, ocean fish and seafoods are exempt from the use of iodised salt; however, it is mandatory for all other food products.

2. Background and rationale for the 2021 national iodine survey in Ukraine

Iodisation of household salt and population iodine status in Ukraine, with comparison to other countries in the Europe and Central Asia Region

A 2002 national survey of nutrition among women of reproductive age (WRA), supported by UNICEF and the US Centers for Disease Control and Prevention (US CDC),[27] reported that according to the results of quantitative salt iodine testing (titration):

- 41.4% of households were using salt with no added iodine (< 5mg/kg)[28],
- 37.9% were using salt with inadequate levels of iodine (5-14.9mg/kg) and
- Only 20.7% of households were using salt with an iodine content above the internationally recommended level (15mg/kg).

The sample sizes in that survey were too small to disaggregate reliably. However, the use of iodised salt did not appear to vary substantially by educational level or by socio-economic status (SES) of the women interviewed.

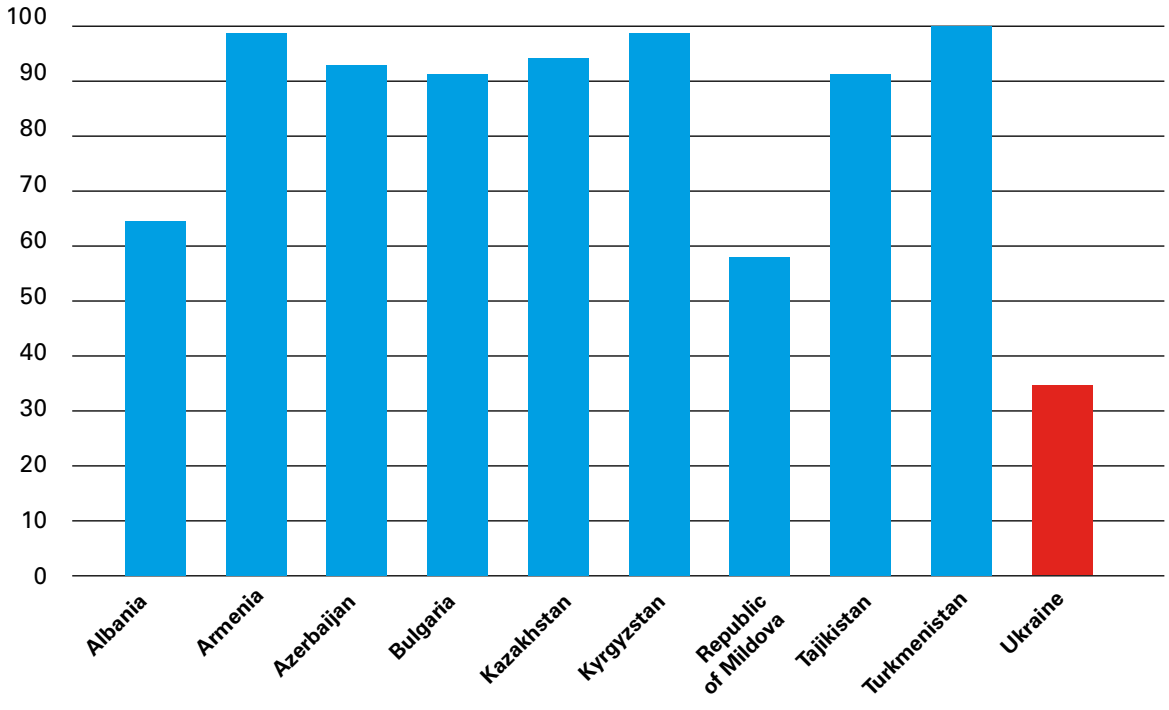
A more recent study of household iodised salt use was conducted as part of the 2012 MICS survey [29], using semi-quantitative testing of salt iodine (rapid test kit), which is only considered reliable for assessing whether salt has added iodine (colour change) or not (no colour change). The 2012 MICS survey reported:

- 64.1% of households were using salt with no added iodine
- The remaining 35.9% of households were using salt with some iodine.
- Households in the West region and higher wealth quintile households were more likely to use salt with some iodine.

UNICEF databases indicate that Ukraine has the lowest percent of households using iodised salt among countries in the UNICEF ECA region, among countries that have relatively recent data (See Figure 2)[30].

Primarily due to salt iodisation, the number of countries (with available national or sub-national data) classified with iodine deficiency has declined from 113 to 21 since 1990. The number of countries (with data) where the population is classified as having optimal iodine intake has increased from 67 in 2003 to 118 in 2020 (Figure 1).

Figure 2. Percent households with salt that were using salt with at least some iodine in UNICEF ECA countries (where data is available from surveys conducted from 2012 to 2021)



[27] Academy of Medical Science (AMS), Ministry of Health, Komisarenko Endocrinology and Metabolism under AMS, Institute of Occupational Health under ASM, State Statistics Committee, United Nations Children's Fund, Center for Disease Control and Prevention, USA. Report of the 2002 National Micronutrient Survey, 2004.

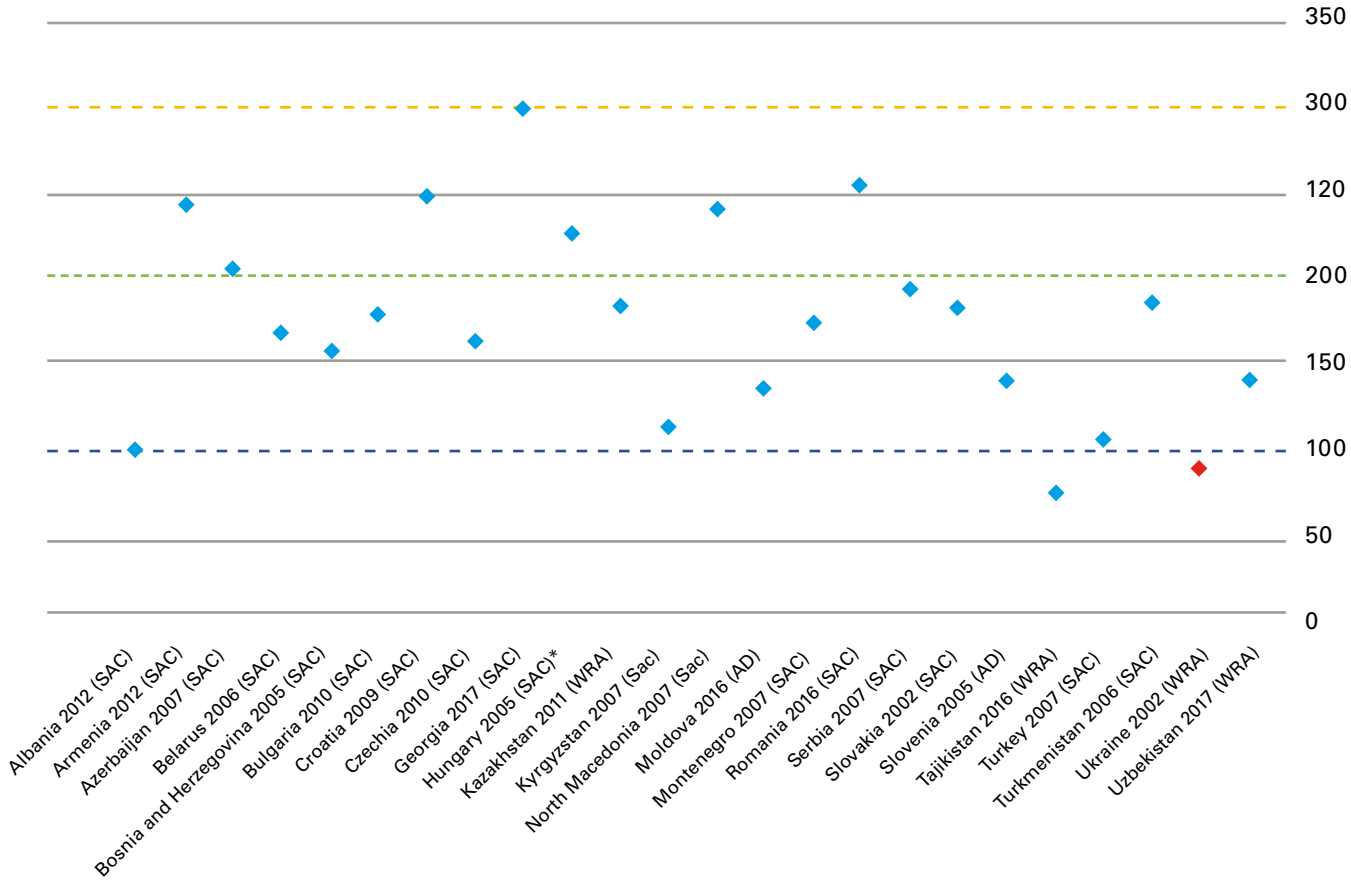
[28] A cut off of 5mg/kg was used to determine the likelihood of salt having added iodine rather than naturally occurring trace iodine.

[29] State Statistics Service and Ukrainian Center for Social Reforms, 2013. Ukraine Multiple Indicator Cluster Survey 2012, Final Report. Kyiv, Ukraine.

[30] https://data.unicef.org/resources/dataset/iodized-salt-consumption/ (accessed 5 November 2021).

Other global data show that Ukraine is also one of only two countries in the region with data that classifies it as having insufficient iodine intake (see Figure 3)[31]. The data from Ukraine are nearly 20 years old, highlighting the need for new evidence on population iodine status. The 2002 survey was only designed to provide a national estimate of status; therefore, disaggregation was unreliable. However, there was an indication of improved (although still borderline deficient) iodine status among women with higher education.

Figure 3. Median Urinary Iodine Concentration (µg/L) from National and Sub-national Surveys in ECA Countries. Global Scorecard of Iodine Nutrition, 2021 (year and population group provided)



SAC = School age children, WRA = Woman of reproducrive age, AD = Adolescents
***Hungury data are from a sub-national survey**

Lower limit for adequate iodine status among the population for School Age Children (SAC), Women of Reproductive Age (WRA) and Adolescents (AD)

Upper limit for adequate iodine status among the population for WRA and AD

Upper limit for adequate iodine status among the population for SAC [32]

Since the 2002 survey, continued efforts have been made by national and international partners to enforce mandatory iodisation of all food grade salt, or at least increase salt iodisation. Efforts have included advocacy at the policy level, working with bread producers to increase the use of iodised salt in bakeries, and consumer education about the benefits of using iodised instead of non-iodised salt. Some initiatives had temporary (regional) success; however, the national percent of households using iodised salt did not increase noticeably (2002 versus 2012 survey reports). The national situation and background to legislative efforts are well-summarised in a 2011 Food and Nutrition Bulletin supplement [33]. This Food and Nutrition paper included an illustration that iodine intake among a reported survey of women in Ukraine was strongly related to the iodine content of salt used in their households.

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[31] A Data extracted from: https://www.ign.org/cm_data/IGN_Global_Scorecard_2021_7_May_2021.pdf (accessed 5 November 2021).

[32] UNICEF 2018 Guidance on the Monitoring of Salt Iodization Programmes and Determination of Population Iodine Status https://www.ign.org/rp.htm?cmsaction=get_document&page_id=142003099 (accessed 5 November 2021).

[33] Van der Haar, F.; Gerasimov, G.; Qahoush Tyler, V.; Timmer, A. Universal salt iodization in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region during the decade 2000–09: Experiences, achievements, and lessons learned. Food Nutr. Bull. 2011, 32, S175–S294.

In December 2018, UNICEF Ukraine, in partnership with the Public Health Centre (PHC), held a round-table advocacy event for major stakeholders, including MoH, Ministry of Trade, Ministry of Agriculture, medical professionals from the Institute of Science, the World Health Organisation, and private sector partners. During the meeting, the medical significance and public health risk of iodine deficiency was discussed and the importance to work together towards the common goal of mandatory USI was highlighted. Agreement on this goal among all stakeholders was reported.

A representative from the largest salt producer in the country, Artemsil, informed participants of the company's existing technical abilities and capacity to produce sufficient quality-assured iodised salt for domestic use. Artmesil already produces large quantities of high-quality iodised salt for export.

In follow up to the roundtable event, UNICEF Ukraine has been supporting renewed efforts to legislate for salt iodisation to improve the health and development potential of children in Ukraine. A strong recommendation was to update the evidence base for the use of adequately iodised household salt and for population iodine status at the national and sub-national levels in Ukraine. This recommendation resulted in the survey documented in this report which was conducted in 2021.

The survey was designed to follow UNICEF guidance on conducting an iodine survey that was published in 2018 (see Appendix 1). Details of the design were discussed with many national partners then further developed by an international consultant during an inception visit to Kyiv in May 2019. Overall recommendations were to conduct the most comprehensive quality-assured survey possible within the funding, time and personnel resources available. High level recommendations included the following:

a. Ensure the survey design provided representative data for as many domains as feasible within available funding to provide a credible evidence-base for the situation in different parts of the country.

b. To include, where possible, programme-related information to inform future programme decisions, for example, salt type and labelling, the consumption of bread and other processed foods that could contribute to iodine intake if made using iodised salt, and the use of iodine-containing supplements.

3. Survey Objectives

GENERAL OBJECTIVE OF THE SURVEY

The overall objective is to provide an evidence base, with information about household use of iodised salt, population iodine status, and programmatically relevant factors; that can be used to advocate for an appropriate strategy and programme to achieve optimal iodine status among the population in Ukraine and provide a baseline for its implementation.

SPECIFIC OBJECTIVES OF THE SURVEY

The specific objectives of the survey are to obtain data for the following indicators that are representative at the national level and by 4 macro-regions/domains: North-Central (combined), South, East and West, and to enable additional disaggregation by urban-rural location at the national level:

1. To estimate the awareness and knowledge of the population regarding iodine deficiency and its prevention.

2. To estimate the proportion of households using adequately iodised salt.

3. To investigate whether the level of iodine in household salt is associated with location, education level, perceived household wealth, salt brand, or salt grain size/colour.

4. To estimate the population iodine status among women of reproductive age (WRA).

5. To estimate the consumption of foods with some naturally occurring iodine content (such as sea fish) and of specified salt-containing foods, such as bread and different types of cheese (as a potential source of iodised salt), among WRA.

6. To estimate the percent of WRA who regularly use iodine-containing supplements.

7. To investigate whether iodine status among WRA is associated with location, education level, perceived household wealth, the level of iodine in household salt, supplement use, or with consumption of foods which may contain iodine naturally.

The survey was designed to meet these objectives and it will not be valid to present results by other types of disaggregation below macro-region and urban-rural populations at the national level. For example, results at the oblast level will not meet an acceptable level of precision.

While iodine deficiency can affect everyone in society, the decision was made to focus data collection on WRA because they most closely represent pregnant women at conception and during pregnancy [34]. Pregnancy, particularly the first trimester, is considered the period of development most vulnerable to iodine deficiency due to the effect of iodine deficiency on foetal brain development.

School age children were not selected as the survey population group because iodine status among this group is not considered to represent iodine status among the key groups of women of reproductive age or pregnant women (see UNICEF Guidance [35]). In addition, many school age children in Ukraine receive free school meals, meaning their diet may differ from other population groups.

ADJUSTMENTS TO THE SURVEY OBJECTIVES THAT WERE REQUIRED IN RESPONSE TO THE COVID-19 PANDEMIC

The original protocol was written in 2019 for field work that year. Due to delays, the protocol was revised with the intention for field work to start in April 2020. The plan for the survey was then delayed further due to the Covid-19 pandemic and was reinitiated in March 2021. The final protocol was adapted to minimise the public health risk, by avoiding any contact between field workers and respondents inside people's homes. The main adaptations were a change from planned in-person household-based interviews to a screening interview and sample collection that took place at the respondent's door or outside the home, followed by a phone interview to ask the main survey questions. This compromised format increased the risk of a mismatch between salt and urine samples with the phone questionnaire responses, and meant that the scope of the questionnaire had to be reduced to be appropriate for a phone interview. Questions that were retained focused on the main survey objectives and removed any observational responses, for example, type of salt packaging.

[34] Conducting the survey among pregnant women was not considered due to current constraints in knowledge, for example, whether variable physiology during different trimesters of pregnancy alters interpretation of urinary iodine concentration, and the fact that a relatively high percent of women take vitamin and mineral supplements (potentially containing iodine) during pregnancy

[35] UNICEF Guidance on the Monitoring of Salt Iodization Programmes and Determination of Population Iodine Status 2017 https://sites.unicef.org/nutrition/files/Monitoring-of-Salt-Iodization.pdf

4. Methodology

SURVEY SCOPE

The Ukraine Iodine Survey was a cross-sectional survey designed primarily to provide representative estimates for iodine status among non-pregnant women of reproductive age (15 to 49 years of age) not breastfeeding an infant less than 6 months of age, and for household use of adequately iodised salt; nationally and by four macro-regions (North-Central, South, East and West).

The sample size and sample selection and survey methodology were developed to obtain the most representative data possible for the specific objectives within the allocated budget and while minimising public health risks from the Covid-19 pandemic.

OVERVIEW OF ORGANISATION OF THE SURVEY AND THE SURVEY POPULATION

Survey management, training and field work were conducted by the NGO "Ukrainian Institute for Social Research after Oleksandr Yaremenko" (UISR after O. Yaremenko) with support from international consultants.

The target population was all accessible households in the country at the time of the field work, conducted from July to September 2021 [36]. The survey collected data primarily from non-pregnant Women of Reproductive Age (WRA) who were not breastfeeding a baby less than 6 months old. This was because pregnancy and regular breastfeeding are known to affect an individual's iodine excretion. The use of the term "WRA" in the methodology, results, and discussion of results in this report includes these exclusions.

WRA were selected for interview, and urine and salt sample collection, based on an initial random household selection and consent process within randomly selected enumeration units/clusters (described further in the section on Sample Size Determination and Sampling Procedures). Information related to household characteristics, demographics, perceived wealth, iodised salt purchase, use of iodine-containing supplements, awareness of iodine deficiency and its prevention, frequency of consumption of foods that could be high in naturally occurring iodine and of key salt-containing foods, and estimated height and weight, were collected through administration of phone interviews using mobile-device based questionnaires.

Salt samples were requested from all households and sent to The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine where they were tested for the presence of iodine qualitatively using rapid test kits, followed by a random selection of 5 out of up to 8 salt samples from each cluster which were tested for iodine quantitatively using titration methodology (mg/kg) (additional detail provided in the Laboratory Analysis of Salt section below).

Urine samples were collected from the selected, consenting, WRA for analysis of urinary iodine concentration (UIC (µg/L)) and urinary creatinine concentration (UCC (g/L)), also at The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine (additional detail provided in the Laboratory Analysis of Urine section).

INCLUSION CRITERIA OF SURVEY PARTICIPANTS

Eligible non-pregnant woman (biologically female) of reproductive age (15 to 49 years of age), who was not breastfeeding an infant < 6 months of age, who gave consent to provide a urine sample. Referred to in this report as WRA.

[36] Exclusion areas for the sample include military zones, non-government controlled areas, and population in institutions.

- If the primary respondent did not consent to participate in the phone interview, it was conducted with any consenting adult (over 18) of either sex from the same household.

EXCLUSION CRITERIA OF PARTICIPANTS

- **Population living in military zones and in areas temporarily uncontrolled by the Government of Ukraine (according to the situation at the time of the study)**
- **Population living in institutions**
- **Eligible participants who declined consent to provide a urine sample**
- **Pregnant women and women breastfeeding an infant < 6 months of age**
- **WRA not present at the time of the survey (after 3 visits).**

SAMPLING DESIGN

The sampling process was a multi-stage sampling process within each of the following 4 macro-regions and related oblasts, that were agreed with stakeholders of the study:

1. North and Centre- City of Kyiv, Kyiv oblast, Zhytomyr oblast, Chernihiv oblast, Cherkasy oblast, Poltava oblast, Kirovohrad oblast, Vinnytsia oblast
2. East- Dnipropetrovsk oblast, Donetsk oblast (only government-controlled areas- GCA), Zaporizhia oblast, Luhansk oblast (only GCA), Kharkiv oblast, Sumy oblast
3. West- Ivano-Frankivsk oblast, Khmelnytsky oblast, Chernivtsi oblast, Lviv oblast, Rivne oblast, Ternopil oblast, Volyn oblast, Zakarpatia oblast.
4. South- Autonomous Republic of Crimea (not accessible), the city of Sevastopol (not accessible), Odesa oblast, Mykolayiv oblast, Kherson oblast

SAMPLING FRAME

The sampling frame used was the list of all voter registration units in the country, which was available through UISR after O. Yaremenko. The register contains information about voter registration units, including the number of registered voters in each of them. Each unit is uniquely identified with a code and is classified by Oblast and District as well as whether it is an urban or rural area. The macro-regions were formed as per the conventional allocation of Oblast to regions, see above.

Exclusions

Districts with codes 1 to 6 (including prisons, and closed polling stations), units very close to temporary uncontrolled areas, those with no inhabitants, and military districts were excluded from the sampling frame. A total of 174 districts were excluded. The biases introduced by these exclusions are not expected to significantly affect the estimates or their value for the purpose of developing national policy.

Given the resources available (which limited the study to 4 domains) and the precision requirements for the estimates, national stakeholders [37] and UNICEF suggested to group the North and Centre regions into a single macro-region because the characteristics of the two regions are similar enough for the purpose of this study. Table i, below shows the composition of the macro-regions in this study.

[37] Public Health Centre of MOH of Ukraine (PHC), NGO "Ukrainian Institute for Social Research after Olexander Yaremenko (UISR after O. Yaremenko), The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine

Table i. Composition of macro-regions for the national iodine survey

Macro-Region	Number Oblasts	Number Districts	Number registered voters	% listed voters	Number polling stations
North and Centre	8	62	9,481,060	32%	9,997
East	6	64	8,796,472	30%	7,327
West	8	51	8,068,370	27%	9,401
South	3	22	3,468,209	12%	3,175
National level	25	199	29,814,111	100%	29,900

INFORMATION REQUIREMENTS AND SAMPLING DECISIONS

It was decided that the level of precision for the key indicators needed to be the same for each macro-region, therefore, the sample needed to be equally allocated to macro-regions.

While it would be desirable for urban and rural estimates to be similar in terms of precision, the national split is 70%:30% urban:rural and the cost and effort required to provide the same precision for rural areas as for urban areas was too high. Therefore, a trade-off was agreed that within each macro-region a split of the sample for urban and rural voter registration units would be 60%:40%. This led to a split that will give slightly higher precision to urban estimates at the national level but keeps the rural estimates within levels of precision that will be programmatically relevant at the national level (higher than the precision of estimates expected for each macro-region level).

It is generally expected that sampling design aims to be self-weighting. However, the information requirements of this survey meant the adoption of a sampling design that would require derivation of complex sampling weights for analysis of the data.

SAMPLE SIZE DETERMINATION AND SAMPLING PROCEDURE

The survey aimed to obtain data from 520 households in each macro-region. Therefore, the total designed sample size for the country was 2,080 households.

Basis for the sample size decision

The decision for the sample size nationally and within each macro-region was based on the following requirements, research, and assumptions:

1. The national level estimates for the prevalence of households (HH) using adequately iodised salt and for the iodine status of the population of WRA required at least 5% precision.

2. The macro-region level estimates for the prevalence of households using adequately iodised salt and for the iodine status of the population of WRA required at least 10% precision.

3. That the national urban and rural level estimates for the prevalence of households using adequately iodised salt and for iodine status of the population of WRA required less than 10% precision

4. The number of samples at the macro-region level required to achieve these levels of precision, before accounting for any expected design effect, were:

   a. 72 samples for the percent of households using adequately iodised salt (HHIS)[38] (based on an expected prevalence of 25% households [39])

   b. 122 samples of individual spot urine samples to obtain the population median urinary iodine concentration (mUIC), accounting for intra-individual and inter-individual variation in iodine excretion [40].

5. Assumptions applied included:

   a. An expectation that there will be relatively high Intra Cluster Correlation (ICC) for both household use of iodised salt and iodine status and therefore a non-negligible design effect (deff). Without an evidence-based estimate of the deff, a design effect of at least 4 was assumed.

   b. Implementation of a multi-stage sampling scheme.

   c. An aim to obtain samples from 8 households at the last cluster level of the sampling scheme. This number of households was considered a suitable compromise between field costs and the aim of reducing the deff to around or below 4.

Based on the sample design it will not be appropriate to present results by levels of disaggregation that do not meet the required (acceptable) levels of precision. For example, the survey design will allow for reliable urban/rural estimates at the national level but not urban/rural estimates within each macro-region. Table ii shows the target number of households with a complete questionnaire and collection of a urine and a salt sample.

Table ii. Target survey sample sizes

	Target number by:		
	Cluster	Macro-region	National
# Clusters (total)		65	260
Urban	—	39	156
Rural	—	26	104
Target # HH with a urine sample from WRA and a salt sample for rapid testing (total)	8	520	2080
Urban	—	312	1248
Rural	—	208	832
Target # salt samples for quantitative testing (total)[41]	5	325	1300
Urban	—	195	780
Rural	—	130	520
Target # HH with completed phone interview (WRA or another adult HH member) (total)	8	520	2080
Urban	—	312	1248
Rural	—	208	832

HH = household WRA = Woman of Reproductive Age meeting survey inclusion criteria

[38] Households with adequately iodised salt = HHIS Adequately iodised salt = salt with iodine content >=15mg/kg

[39] State Statistics Service and Ukrainian Center for Social Reforms, 2013. Ukraine Multiple Indicator Cluster Survey 2012, Final Report. Kyiv, Ukraine

[40] Andersen S, et al. 2008. Reliability of studies of iodine intake and recommendations for number of samples in groups and in individuals British Journal of Nutrition, 99, 813–818

[41] Conducting rapid test kit analysis of salt for all (2,080) HHs. Quantitative analysis of iodine in salt for 5 HHs per cluster.

Sampling Stages

Practical aspects of the field work, including the ability to complete cluster work in a reasonable time, led to minor adjustments and the final sample allocation according to the different stages shown in Table iii. For example, the expected low proportion of households with WRA and potentially low response rates led to the design of a field work process that selected households where an eligible WRA consented to and provided a urine sample before arranging or conducting the phone interview.
The first two WRA in each cluster who gave consent were asked for additional consent to provide a

Table iii. Sampling stages

Stage	Sampling Unit	Frame	Units to be included*	Within	Sampling method
1	Macro-Region (MR)	Available from the list of voter registration units	All Units	Country	
2	District	Available from the list of voter registration units	Sample of 10	Each MR	Simple random sampling
3	Voter Registration Unit	Available from the list of voter registration units			
	Urban		39	From the sample of 10 districts per MR	Simple random sampling
	Rural		26	From the sample of 10 districts per MR	Simple random sampling
5	Household	To be built using a listing procedure	Sample	8 in each voter registration unit	Simple random sampling.
6	Eligible WRA	To be built at each household	Sample	1 in each household	If > one eligible and consenting WRA in the household, one recruited at random

* After national exclusion of districts with codes 1 to 6 (including prisons, closed polling stations), units very close to conflict areas, those with no inhabitants, and military districts

second urine sample at least 24 hours after collection of the first sample. This will allow for future analyses to estimate the inter and intra-individual variance in UIC and UCC from which to estimate the percent population of WRA with iodine intake below the recommended estimated average requirement (EAR).[42] The target of 2 WRA per cluster would provide 520 2nd samples nationally; however, the actual number of 2nd samples collected was expected to be lower than this.

A mapping of the selected clusters is shown in Appendix 2.

[42] An estimate of the prevalence of low iodine intake, in addition to an assessment of population iodine status from the median urinary iodine concentration, will provide important additional information on the proportion of the population of WRA who are at risk of iodine deficiency.

ETHICAL CONSIDERATION AND REVIEW

The survey tool (questionnaire) was divided into two sections. The first section was for household and WRA selection, and consent and sample collection, in the field; the second section was for the phone interview. Enumerators ensured that informed consent was obtained, and that confidentiality was maintained, before and during interviews and sample collection procedures. Participation in the survey was voluntary and based on the informed consent with no inducement of any form for participation. All interviews were conducted as privately as possible with the option for the interviewee to withdraw consent at any point in the process.

The final protocol and survey tools were submitted to the Central Commission for Ethics of the Public Health Center of the Ministry of Health of Ukraine for approval before commencing survey procedures. The reference for this expert examination was IRB2021-60.

SURVEY TOOLS (QUESTIONNAIRE)

The questionnaires were administered using a mobile device. The data entry platform was developed using Open Data Kit (ODK). All uploaded data was securely stored with limited access rights. All data are the property of the Ukraine Ministry of Health and will be available to personnel assigned by the National project lead during and after the field work.

The electronic tool was made available in English, Ukrainian and Russian. The final ODK version of the questionnaires and sample collection and receipt forms are available from UNICEF Ukraine.
Key modules from the first section, conducted in the cluster and administered at the doorway or outside the identified household. I.e., the household consent and sample collection form.

a. Introduction/survey context and consent

b. Location

c. Household identifiers

d. Selection of WRA

   i. Consent

   ii. Age

   iii. Phone number

   iv. Pregnancy/lactation status

   v. Urine sample collection (and 2nd urine sample collection where relevant)

   vi. Salt sample collection

Key modules from the second section, administered via phone interview to the selected consenting WRA (or another adult in the same household, if the selected WRA refused to consent to participate). I.e., the phone interview form:

   vii. Education

   viii. Self-estimated height and weight (only for WRA who provided urine sample)

   ix. Awareness and practices in relation to iodine deficiency and iodised salt

   x. Use of iodine-containing supplements

   xi. Frequency of consumption of key foods contributing to salt intake

   xii. Frequency of consumption of key foods potentially containing natural iodine.

xiii. Household composition

xiv. Perceived household wealth

xv. Household salt brand, labelling as iodised.

Some of these proposed questions, for example, perceived wealth and highest level of education, were based on standardised modules used by the National Statistics Office of Ukraine. Some were developed by the UN and other organisations for use in a number of iodine and other food/nutrition surveys, for example, awareness of iodine deficiency and food frequency questions. In addition, many questions were refined based on the national context, cognitive interviewing outcomes, and programme inputs and priorities specific to Ukraine.

Cognitive interviewing

UISR after O. Yaremenko conducted cognitive interviewing for sections of the questionnaire that had not been applied in Ukraine before and where the national context was highly relevant. For example, sections on awareness of iodine deficiency, brand of salt used and frequency of consumption of certain foods. The primary purpose was to investigate how well questions performed when asked of potential survey respondents, were they correctly understood and easy to answer accurately. Cognitive testing ensures that a survey question captures the intent of the question and, at the same time, makes sense to respondents. Questions that were improved based on the outcome of this process.

Pre-test and translation

The final draft survey tool was translated into Ukrainian and Russian and back-translated by a person independently from the original translation. Paper-based versions of the household questionnaire were also available to each team for use as a back-up if needed, and training was provided on managing any paper-based data collection.

TRAINING

Enumerators and supervisors were recruited to match the skill needs of the survey, taking into account any important regional factors. Enumerators had prior experience with mobile-based interviewing and other survey procedures.

The 6-day training was conducted remotely via a video call platform with Ukrainian and English translations. It included theory and practical application in the form of a field-based mapping exercise, role-plays, observation, and feedback. Presentations included those on the survey background, questionnaire content, sample collection methods, and pilot-testing of all procedures. A full day was spent pilot testing the household selection and interview protocols, sample labelling and completion of sample transfer forms.

Training topics covered included:

i. Using the cluster maps, the data platform, and conducting listing within a selected cluster. Including a pilot test of the mapping and household selection process.

ii. Interview techniques, intense review and practice of the 2 questionnaires, and data entry using mobile devices. Reviewing questionnaires and upload of final files

iii. Salt and urine collection procedures, including sample labelling, transfer, and laboratory receipt, checking that all ID (QR) codes are correct.

iv. Supply and field logistics, including community entry, identification of survey households, encouraging participation, knowing when to request replacement households, and behaviour at the household and in the community.

v. Pilot test of the complete questionnaires and all procedures, including preparing the transfer of (proxy) urine and salt samples to the laboratory.

vi. Team supervisors received additional training on checking household selection, data and interview checks, reviewing questionnaires and upload of final files, as well as other logistical issues they were responsible for.

vii. Understanding and being able to implement the sampling design at the relevant stages.

viii. The use of PPE appropriate for the task, participation in a covid-19 testing schedule, and other covid-19 related protective measures

UISR after O. Yaremenko conducted training at the Institute of Endocrinology on the sample receipt forms and sample management to ensure correct QR code scanning, linkage of the household QR code with a unique lab QR code per sample, and correct sample storage.

The Laboratory conducted internal training with quality assurance measures for all laboratory tests.

FIELD WORK TEAM

Team composition

Number of field teams (2 person teams)	22
Number of field team supervisors	12

Survey Coordination and Planning Team

Survey planning, preparation, implementation, monitoring, and follow up was coordinated by the national UISR after O. Yaremenko team plus a national survey coordinator.

Survey Field Team

- Enumerators: worked in pairs to map dwellings in selected clusters, randomly select households, identify consenting eligible WRA, and collect urine and salt samples which were posted to The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine. Enumerators also conducted phone interviews with the consenting, eligible WRA who provided the urine specimens (or another consenting adult from the same household where needed).

- Supervisors: provided oversight of their team's field work throughout the field work period. They checked the listing and selection of households was correct and reviewed submitted forms. Supervisors also helped manage financial and logistical administration of the field work, sample transport, and liaised with selected communities and the coordination team.

- Community Mobilisers: In some communities a respected/known resident, or head of local authority, was identified to give advanced notice to the community about the purpose of the survey and the date and time of arrival of the survey team. They also assisted in household mapping, and (where necessary) provided a listing of households, buildings, and landmarks/establishments in a cluster.

FIELD WORK IMPLEMENTATION

Survey Data Platform

A survey data platform was developed by Statistics for Sustainable Development (Stats4SD) to support the data collection and store the data in a structured format.

The field work consisted of 3 phases. In each phase, the data platform provided information to the field teams, and then the teams collected data and uploaded the data to the platform:

1. Initial listing of dwellings: The platform included pre-determined maps of cluster boundaries for enumerators to use in the initial listing of dwellings. Enumerators collected a complete list of all residential dwellings within the cluster. The listing was uploaded to the platform, from which a random sample of 8 initial dwellings was automatically generated and made available to the enumerators with a corresponding location map.

2. Household visit: Enumerators visited the dwellings, following the field process described in figure 4 to select the household and respondent, and completed the household consent and sample collection form. Submissions were uploaded to the data platform as soon as internet connection allowed.

   a. A randomly selected listing of replacement dwellings was available to the team supervisor and the central UISR after O. Yaremenko team and provided to enumerators on request after the first 8 dwellings had been visited. Three visits to a selected household were required before a replacement could be requested, unless it was clear after fewer visits that either the household was unoccupied or that no consenting and eligible WRA was resident.

3. Phone survey: After the household visit, the platform automatically processed the household visit data and key identifying information for successful household visits was provided to the enumerators within the phone interview form. The field team conducted the phone interview, and results were uploaded to the platform with the correct household ID to enable matching of the different interviews.

In addition to supporting the enumerators, the platform provided real-time updates on the survey progress to the supervisors and support staff at UISR after O. Yaremenko, with automatically generated summaries of households visited per cluster, the number of samples collected, and the number of interviews conducted.

The process of listing and random selection of dwellings required internet access. A back-up procedure for conducting this process off-line was made available to each team in case it was required.

Household and WRA Selection and Identifiers

Figure 4 illustrates the field process for selecting dwellings; households within the dwelling (not usually required); and eligible, consenting WRA.

There were 3 main components to the survey.

i. Spot urine sample from each selected, eligible and consenting WRA

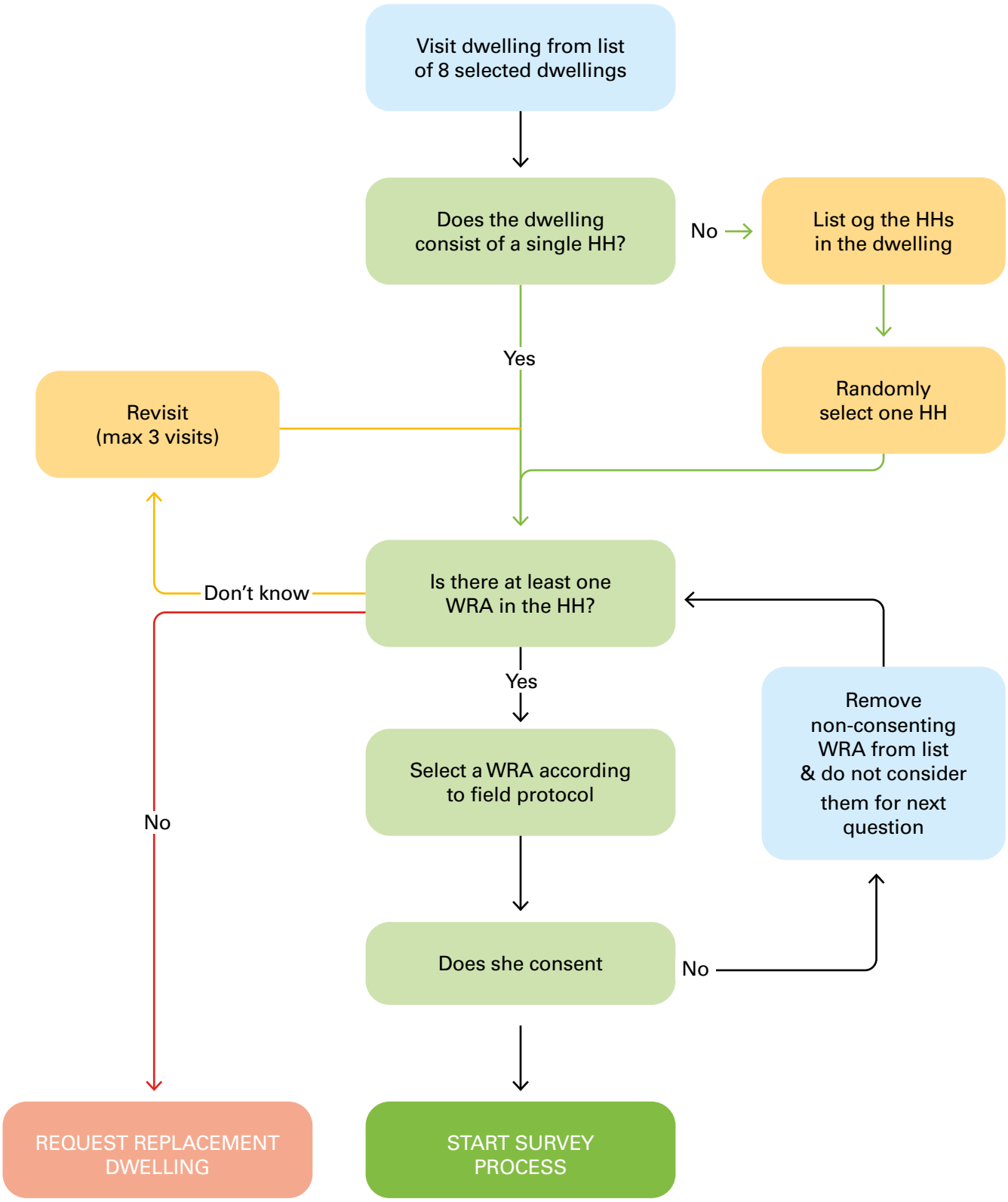
ii. Salt sample from each HH

iii. Phone interview, preferably with selected WRA

The household consent and sample collection form required collection of a single spot urine sample as a condition of inclusion in the final survey sample. If no eligible WRA in a selected household consented to provide a urine sample then a replacement dwelling was requested, regardless of whether a salt sample or phone interview was possible.

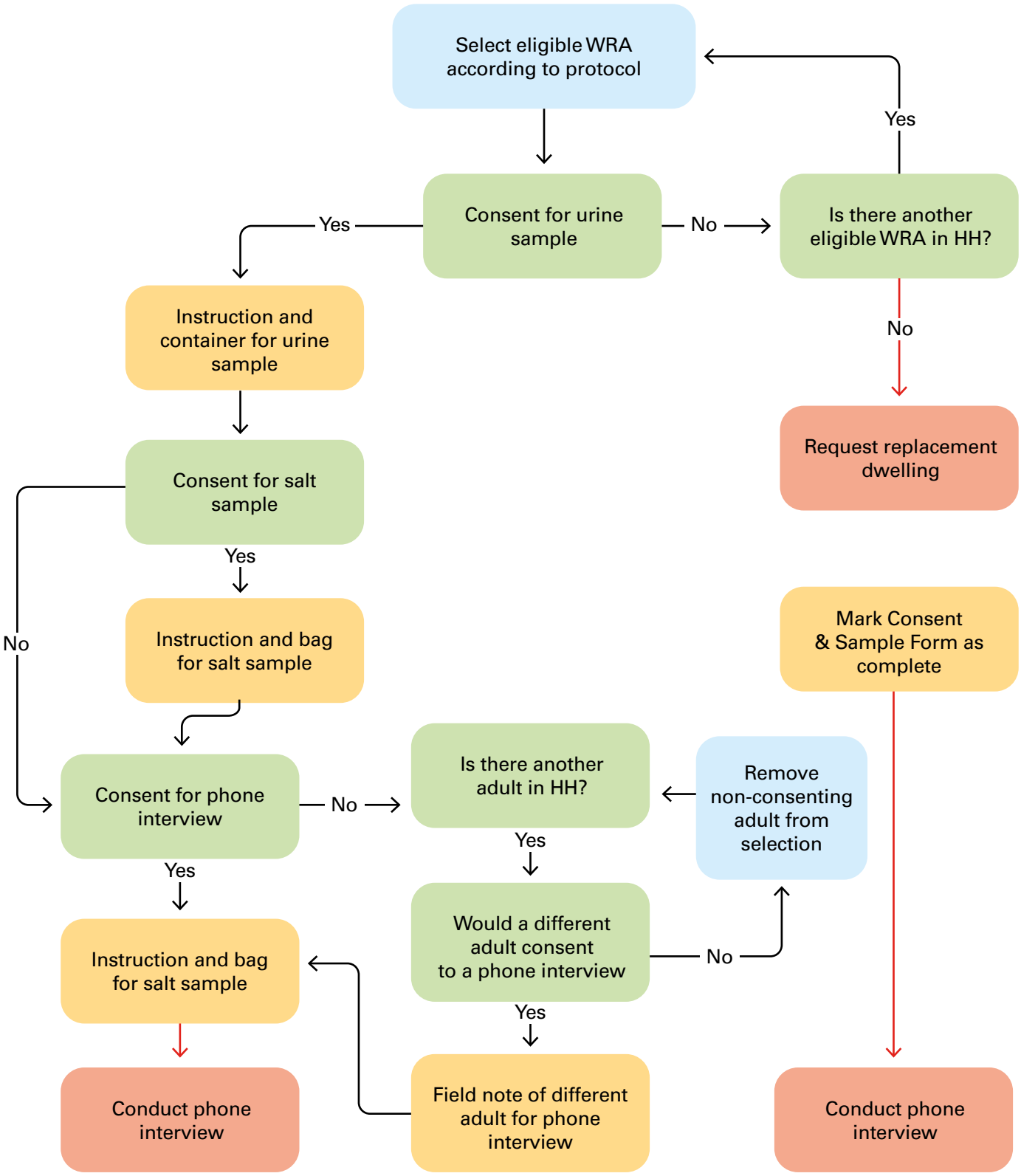
If an eligible WRA in a selected household consented to provide a urine sample but not a household salt sample, the planned protocol was continued, with collection of a urine sample and a request to consent to a phone interview.

Figure 4. Field process for selecting dwellings, households and WRA



If an eligible WRA in a selected household consented to provide a urine sample (with or without a salt sample) but did not consent to the phone interview, the urine (and salt) samples were collected and sent for analysis. If another adult living in the household provided consent to the phone interview then their contact details and preferred time and date for the phone interview were recorded. An entry field in the phone interview confirmed whether the phone interviewee was the same WRA who provided a urine sample or another adult from the same household. Figure 5 shows this process in flow chart format.

Figure 5. Sample Collection, Consent and Protocol Flow



Once an eligible WRA consented to participate in the survey then the household listing location, information about the WRA (from the household form and the phone interview), the urine sample, and the salt sample were all linked by a common (HH) QR code. Where consent was given for a 2nd urine sample (max 3 HHs per cluster) then an additional QR code with an extra letter was used to identify the second urine sample. The HH QR code was composed of the Cluster ID number with a sequential number following (to identify each household).

Sample management

The survey teams collected HH salt samples into QR labelled plastic bags with ziplock seals. All samples from one cluster were placed in an opaque bag labelled with the cluster QR code which was then packaged and posted to the The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine in Kyiv. Salt samples were stored and posted separately from urine samples.

Urine samples were stored in QR-labelled collection containers which were placed into cool bags with ice packs immediately on receipt. Samples were then stored in refrigerators in the local area until ready for posting. All urine samples from one cluster were placed in a plastic bag labelled with the cluster QR code then packaged into foil cool bags with ice packs and posted to The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine in Kyiv as soon as possible after collection.

A laboratory focal person was informed to expect delivery whenever samples were posted, they collected the samples from the designated post office and processed them as quickly as possible, as described in the Laboratory analysis sub-section below.

LABORATORY ANALYSIS

The analyses of urinary iodine, urinary creatinine and salt iodine concentration were conducted by The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine. This laboratory has quality-assured experience in conducting these analyses [43] [44].

All survey collection supplies and laboratory sample management and analysis supplies were subjected to lot iodine screening prior to use.

Laboratory analysis of iodine and creatine in urine samples

When urine samples were received by The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine the following process was followed for each sample:

i. Three x 2ml tubes were prepared, each with a unique lab QR code.

ii. The household QR code on the urine container from the field was scanned into an ODK sample receipt form along with each of the three 2ml tube QR codes.

iii. 2ml of urine was pipetted into each of the three x 2ml tubes.

iv. One 2ml tube was sent to the urinary creatinine lab and stored in the fridge (unless that laboratory knew they would experience a delay of more than 2 days before analysis, in which case it was stored in the freezer at -20oC and thawed at the time of analysis. Overall, 30% of samples were frozen before testing [45]).

[45] T Due to the war in Ukraine and movement of laboratory staff, it is not possible to ascertain whether any difference in UCr results was noted or suspected according to the different storage methods

[46] https://www.cdc.gov/labstandards/pdf/equip/EQUIP_Booklet.pdf

v. The Remaining two x 2ml tubes were stored in the iodine laboratory freezer at -20oC and thawed at the time of analysis.

vi. The sample receipt form with the scanned QR codes and any notes on sample quantity or quality was saved, checked, and uploaded to the survey data platform.

Spot urine samples from each WRA were analysed in duplicate for urinary iodine concentration (UIC) (µg/L) using ammonium persulfate digestion with spectrophotometric detection of the Sandell-Kolthoff reaction [46]. Repeat analyses were conducted in most cases where the duplicate tests measurements were more than 15% different from each other or where the UIC result was above 300µg/L.

Urinary creatinine concentration (UCC) (g/L) was analysed using the creatinine alkaline picrate reagent kits, BioSystems S.A.Barcelona (Spain), repeat analysis was only conducted where the initial test result was out of the expected range or when internal QC samples indicated a problem with the run.

Where a second urine sample was collected from one WRA this was also analysed in duplicate for UIC and singly for UCC, as above.

The US CDC provided standardised samples (characterised to NIST traceable materials) that were used as bench QCs and also provided blind QCs (samples with different iodine levels to the bench QCs) for use throughout the urinary sample analysis period. Routine quality control graphs were plotted on each day of analysis.

Laboratory analysis of iodine in salt samples

When The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine received salt samples, the following process was followed for each sample:

i. The QR code on each salt package was scanned into the sample receipt form.

ii. The weight of the salt sample was entered into the form along with notes on grain size and colour.

iii. A sample receipt form with the QR codes and any notes on sample quantity or quality were saved, checked, and uploaded to the survey data platform.

All salt samples were tested for the presence of iodine using the MBI rapid test kit.

A random selection of 5 samples with at least 25g of salt was made for each cluster (where less than 5 bags had 25g of salt, the 5 bags with the most salt in them were selected). These 5 samples were analysed using quantitative analysis, using titration. Analysis of iodine in salt (mg/kg) was conducted on a single sample, with routine re-testing of 20% of the total sample.

Quality control samples with different amounts of iodine were prepared prior to analysis of survey samples and routine quality control graphs were plotted on each day of analysis.

Salt samples with less than 5mg/kg were considered as non-iodised. This allows for the presence of natural trace iodine in the salt that does not indicate intentional iodisation.

DATA MANAGEMENT AND ANALYSES

Data management

As data was collected, it was stored and made accessible via the platform. When data collection was complete, the data was extracted for analysis. The data from different sources (consent and sample collection, phone interview, salt sample, urine sample, salt analysis and urine analysis from the lab) was then merged into a single file. Although the sampling process was designed to allow for this merging using unique identifiers for each cluster and each household, in each merging process some data could not be automatically matched, and a manual process had to be used to match as many records as possible. Unmatched results were not used in the cross tabulation analyses.

Household survey data analysis

Sampling weights were computed based on the sampling scheme. These were further adjusted in two ways; a) based on the final number of respondents to the household survey (household weights) and b) based on the final number of analysed urine samples (lab weights).

Data were analysed using the statistical package R. The computation of estimates for result tables used the sampling scheme, accounting for over-dispersion due to the design effect (deff), and the relevant sampling weight to remove bias due to non-pure random sampling. The sampling scheme was a stratified (with macro-regions and urban/rural as strata) clustered design in three stages: Oblast within Macro-Region, Voter Registration Unit within selected Oblast, and Household within selected Voter Registration Unit.

Laboratory data analysis

Results from 362 urine samples and 210 salt samples could not be matched with the household data. The Russian war in Ukraine caused delays in sample analyses and created difficulties with follow up to attempt to match these samples. These unmatched results were still linked to information about macro-region and urban/rural residence; therefore, they could be used with all other results to compute the tables for national, macro-region and residential levels (using lab weights).

Only matched (household-lab) results were used to compute results for urinary iodine and salt iodine disaggregated by categories such as respondent educational level or wealth perception (using household weights).

Each urine sample was analysed twice. The planned methodology was to conduct a third analysis if the difference between the two initial readings was > 15%. Due to the challenging situation for the laboratory in Ukraine, this procedure was not always followed. In most cases where duplicate urinary iodine results were >15% apart the difference was related to a very low UIC value and the fact that the sensitivity of the test is not as reliable at that level. It was decided to include these results in the analysis because they do would affect the overall programmatic interpretation regarding iodine status among WRA. In 8 cases where repeats were > 15% apart, the data was not used because the UIC value was outside the expected range of sensitivity for the method, the difference between repeat analyses was very large, and /or the two values were in different (programmatic) categories of iodine status from each other. For all included samples the value used in the analysis was the average of the two readings, unless a third measurement was available when the average of the two closest values was used.

Sampling weights for urinary iodine results were computed based on the laboratory data included in the final analysis. Computation of weighting estimates followed the same principles used for analysing as for the analysis of the household data.

For salt iodine and urine iodine content, the median confidence intervals were computed following a bootstrap approach with 1000 bootstrap samples generated in each case. It was a nonparametric bootstrap procedure with stratified resampling and the specification of sampling weights. Finally, normal confidence intervals were generated using the bootstrap bias correction.

The food frequency questions from the phone interview were used along with referenced typical portion sizes to estimate the approximate potential iodine intake from each food if it had been produced using salt iodised to 25 mg/kg. See the table in Appendix 3 for the assumptions that were used as the basis for iodine intake estimates from these food consumption frequencies.

LIMITATIONS AND CONSTRAINTS

The main limitations to survey implementation were:

1. Restrictions on travel to non-Government controlled regions of East Ukraine (in 2021), which meant some oblasts could not be included in the sample frame.

2. Restrictions on household entry and contact with household members due to the Covid-19 pandemic. This meant that most questions needed to be asked via phone interview rather than in person.

   a. The number of expected responses was slightly reduced because of this since some of the selected WRA who provided a urine sample did not wish to provide their contact details or did not want to participate in a phone interview for other reasons.

   b. The number of planned questions was reduced to make the interview more manageable and likely to be completed by phone. For example, the original questionnaire contained additional questions on awareness and knowledge about iodine deficiency and iodised salt, and the source of that knowledge.

   c. Some responses had to rely on the response from the WRA rather than observation as had been initially planned, for example, brand of cooking salt, and type of vitamin and mineral supplement used.

   d. Some of the analysed salt and urine samples could not be matched with the phone interview, however all could be matched with macro-region and residence type.

3. Non-consent to provide a urine sample from some eligible WRA. This was somewhat overcome through strong training and field worker skill in encouraging participation, along with continual management and discussion among the survey supervisors and coordinators to address any issues as they arose.

4. Military aggression from Russia throughout Ukraine started on February 24th, 2022. All laboratory activities were stopped for approximately one month (about 60% of urine samples were analysed prior to this period). Electricity supplies were unaffected, and urine samples remained frozen at -20oC.

5. Interpretation of the survey results, nationally and by macro-region, will be compromised by the high level of population dispersal, internally and internationally, since the war started. This will be referred to in more detail in the discussion and recommendations.

5. Results and Discussion

OVERVIEW OF SURVEY CATEGORIES, RESPONSE RATES, AND CHARACTERISTICS

The tables in this section show results for WRA who responded to the phone interview and had a matched urine sample (n = 1,666, 99% of all respondents), unless otherwise stated. As stated in the methods, WRA in this survey refers to non-pregnant women of reproductive age who were not breastfeeding a baby less than 6 months old.

Eighteen phone interviews were conducted with a member of the household who was not the WRA who provided the urine sample. The plan to interview other household members was agreed in case of a high refusal rate for interviews from the participating WRA, with the intention that analysis and interpretation of such responses would have been conducted separately to responses from participating WRA. However, given that the sample for non-participating WRA response was low, these 18 survey responses have been excluded from the analyses.

Domain/Macro-region

North-Central	City of Kyiv, Kyiv oblast, Zhytomyr oblast, Chernihiv oblast, Cherkasy oblast, Poltava oblast, Kirovohrad oblast, Vinnytsia oblast
West	Ivano-Frankivsk oblast, Khmelnytsky oblast, Chernivtsi oblast, Lviv oblast, Rivne oblast, Ternopil oblast, Volyn oblast, Zakarpatia oblast
East	Dnipropetrovsk oblast, Donetsk oblast (only government-controlled areas- GCA), Zaporizhia oblast, Luhansk oblast (only GCA), Kharkiv oblast, Sumy oblast
South	Autonomous Republic of Crimea (not accessible), the city of Sevastopol (not accessible), Odesa oblast, Mykolayiv oblast, Kherson oblast

Wealth perception

Category 1.	Forced to save on food
Category 2.	Enough food and necessary clothing, shoes but need to save or borrow for items such as a nice suit, cell phone, vacuum cleaner
Category 3.	Enough for food, clothing, shoes, and other purchases. Need to save or borrow to buy expensive things (such as a TV, refrigerator)
Category 4.	Enough for food, clothing, shoes, expensive shopping. Need to save or borrow for purchases such as a car, or property
Category 5.	Can make any necessary purchases at any time
Hard to say / I do not know	

Cross tabulation categories have the following definitions. The perceived wealth categories are combined as Category 1 and 2, Category 3, Category 4 and 5 for all result tables except table 2.

There were only 56 (50 weighted) responses of "Hard to say/I do not know" to the question about perceived wealth. Therefore, these responses are not included in cross tabulations for wealth perception due to the small number and difficulty in interpretation.

Highest educational level achieved

Educational level of the WRA providing the urine sample	Incomplete secondary	No education received, or Incomplete secondary education (Primary or Basic secondary 8-9 complete years), or Professional technical education (vocational school)
	Complete secondary	Complete secondary or Secondary special education with a junior specialist diploma (Technical college, Specialised school/college), or Incomplete higher education
	Complete higher	Complete higher education (Bachelor, Specialist, Master's degree), or Scientific degree (PhD)

This section presents most results in tabular or graphic form, followed by a description. Results in all tables give the weighted n and percent, except where otherwise stated. 95% CI = 95% confidence interval.

Table 1 shows that the response rate for the main survey indicator of urinary iodine was above 90% nationally and for all sub-national categories except the East macro-region, where it was 87%. This macro-region also had the lowest response rates for collection of salt and measurement of salt iodine, partly due to a higher number of households reportedly having no salt at the time of the survey visit. In other macro-regions the percent of target salt samples with RTK and titration results for iodine was over 80%. Nationally three quarters of participating WRA agreed to participate in and completed the phone interview process.

These high response rates reflect the exceptional dedication and skill of field workers who conducted the survey under difficult restrictions imposed by the Covid-19 pandemic. Credit must also go to The State Institution "V.P. Komisarenko Institute of Endocrinology and Metabolism" of the National Academy of Medical Sciences of Ukraine who, despite extensive challenges, continued and completed the analyses of salt and urine samples during the early months of the Russian invasion of Ukraine.

The target (unweighted) number for matched questionnaires, RTK, and urinary iodine results was 520 for each macro-region. The actual response rate achieved was lowest among WRA in the South macro-region (61.4%) followed by the East macro-region (73.9%). Field teams reported a cultural reluctance to sharing information that was not unexpected for these two regions. In addition, some salt and urinary iodine results could not be matched with a phone interview. There was not a large difference in response rate for interviews, tested salt sample and tested urine samples between urban and rural areas.

Table 1. Overview of survey sample (unweighted n) and response rate (%). (HH = Household)

Survey sample characteristic	Target HHs (n)*	Eligible HHs visited (n)	Matched question-naire and HH ID (n)**	Response rate for matched interview (%)	Salt samples tested by RTK(n)***	HHs with no salt (n)
National	2,080	1,684	1,570	75.5	1,796	284
North-Central	520	440	424	81.5	456	64
West	520	475	443	85.2	463	57
East	520	430	384	73.9	421	99
South	520	339	319	61.4	456	64
Urban	1,248	1,025	957	76.7	1,082	166
Rural	832	659	613	73.7	714	118

Survey sample characteristic	Response rate RTK (%)	Target salt samples for titration (n)	Salt samples with a titration result (n)	Response rate salt iodine (%)	Urine samples collected (n)	Urine samples with iodine result (n)****	Response rate for urine samples (%)
National	86.4	1,300	1,062	81.7	1,930	1,925	92.5
North-Central	87.7	325	284	87.4	492	491	94.4
West	89.0	325	274	84.3	485	484	93.1
East	81.0	325	231	71.1	461	452	86.9
South	87.7	325	273	84.0	492	490	94.2
Urban	86.7	780	634	81.3	1,165	1,159	92.9
Rural	85.8	520	428	82.3	765	758	91.1

*Targeted for urine and salt sample collection and phone interview

** Number of complete phone interviews with WRA that could be matched with household ID. The number of salt and urine samples collected was higher than the number of matched interviews

***RTK – Rapid test kit (qualitative)

**** Eight urine samples were not linked to macro-region or residence type; therefore, the total n (1,925 samples) is higher than the total by macro-region or by urban-rural residence (n = 1,917).

The urban: rural targeted distribution for complete survey responses was 60:40, Table 2 indicates that the achieved ratio was 67:33. Table 2 also shows the number of complete responses from households reporting perceived wealth according to the 5 categories established by the National Statistics Office of Ukraine. These categories are explained at the start of this section, with Category 1 being the lowest perceived wealth. Subsequent cross tabulations in this report use combined wealth categories, numbers for these combined categories are also included in Table 2. Households responding with "Hard to Say/Do not know" (n = 48) are not included in subsequent tables in this report due to the small number and difficulty in interpretation. The majority (over 85%) of households reported a perceived wealth in the lowest 3 categories.

As described in the "laboratory data analysis" section above, all except 8 of the analysed salt and urine samples could be matched with macro-region and residence, however, some salt and urine samples could not be matched with the phone interview. Therefore, numbers and percentages in Table 2 for responses for national, macro-region, and residence are higher than the total for wealth and education categories. The difference in sample sizes for salt and urinary iodine by cross tabulation category also applies to Tables 4, 5 and 9 and Figures 7, 9, and 11.

Table 2. Overview of household characteristics (for households with matched questionnaire and urine and/or salt sample)

			Number of Households with complete responses	
	Survey sample characteristic	Weighted percent	Unweighted	Weighted
	NATIONAL	100.0	1,925	2,251
Macro-region	North-Central	30.3	491	682
	West	23.2	485	523
	East	28.1	453	632
	South	18.4	492	414
Residence	Urban	66.9	1,164	1,505
	Rural	33.1	757	746
Wealth perception, as reported	Category 1	6.0	81	93
	Category 2	32.7	554	503
	Category 3	45.0	667	692
	Category 4	10.1	149	156
	Category 5	3.4	50	52
	Hard to say / Do not know	2.7	48	42
Wealth perception categories used in this report	Categories 1 & 2	39.9	635	596
	Category 3	46.3	667	692
	Categories 4 & 5	13.8	199	207
Education level of the WRA respondent	Incomplete secondary	16.3	275	251
	Complete secondary	51.1	782	786
	Complete higher	32.5	492	500

Table 2 indicates that the education level of participating WRA was relatively high, approximately 83% of participating WRA had completed secondary or a higher educational level. This high level of education is expected as indicated in the 2012 MICS report [47]. However, education levels cannot be compared between the two surveys since the 2012 MICS reported on the percentage of WRA currently attending or completed each level of education.

[47] State Statistics Service and Ukrainian Center for Social Reforms, 2013. Ukraine Multiple Indicator Cluster Survey 2012, Final Report. Kyiv, Ukraine

Tables 3a and 3b present a breakdown of wealth and education indicators by macro-region and urban/rural residence. Results indicate that households in the North-Central macro-region had the highest percentage with perceived wealth in categories 4 & 5 (18.3%), the East macro-region had the lowest percent of higher wealth households (6.7%), and the South macro-region had the highest percent of lowest wealth households (54.2% in categories 1 & 2). Perceived wealth was not notably different between urban and rural areas of residence. (Table 3a)

Educational indicators showed the highest percentage of WRA reporting incomplete secondary education were in the East (18.5%) and South (22.2%) macro-regions. In contrast, the highest percentage of WRA who completed higher education were in the South (36.1%). WRA in rural areas tended to have a higher percent who did not complete secondary education (18.5%) and a lower percentage of WRA who had completed higher education (24.7%) when compared with WRA in urban areas (15.5% and 36.0% respectively). (Table 3b)

Table 3a. Overview of wealth perception by sub-groupsample)

		Percent distribution of households by wealth perception			
		Weighted number	Categories 1 & 2 (%)	Category 3 (%)	Categories 4 & 5 (%)
NATIONAL		1,613	40.3	46.0	13.7
Macro-region	North-Central	509	41.5	40.2	18.3
	West	452	30.1	54.2	15.7
	East	460	43.0	50.2	6.7
	South	192	54.2	32.3	13.5
Residence	Urban	1,064	39.2	46.1	14.8
	Rural	549	42.4	45.9	11.7

Table 3b. Overview of educational level by sub-group

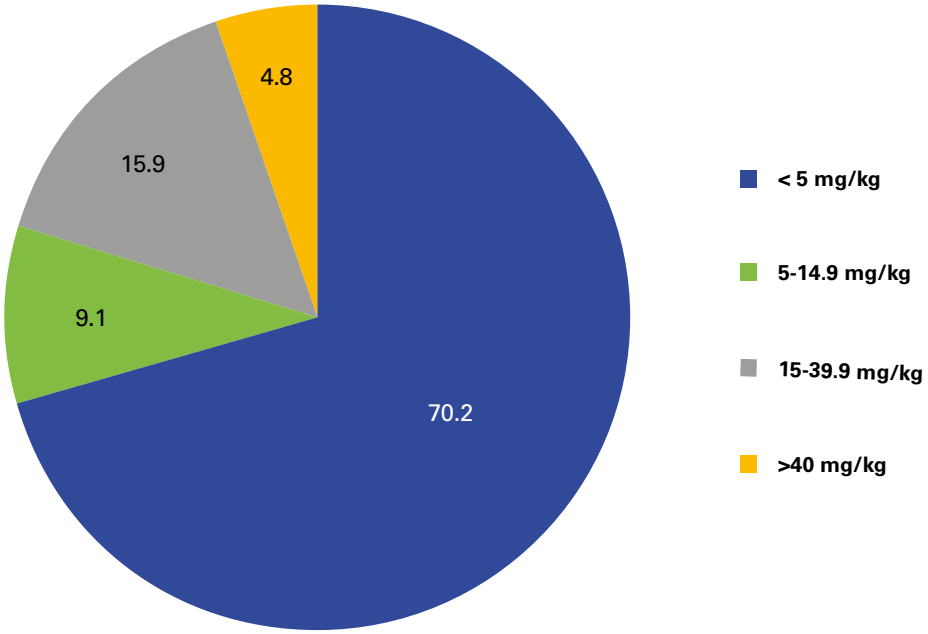
		Percent distribution of households by education level of WRA			
		Weighted number	Incomplete secondary (%)	Complete secondary (%)	Complete higher (%)
NATIONAL		1,663	16.5	51.3	32.2
Macro-region	North-Central	530	16.2	50.5	33.3
	West	452	12.4	56.8	30.8
	East	487	18.5	50.9	30.6
	South	193	22.2	41.8	36.1
Residence	Urban	1,105	15.5	48.5	36.0
	Rural	558	18.5	56.8	24.7

Differences in the weighted number to those presented in Table 2 are due to: exclusion of the 50 "do not know" responses for Wealth (n = 1,613 instead of 1,662); and due to rounding for Education, making a total of 1,663 in this table instead of 1,662 in table 2.

SALT IODINE

Figure 6 shows results from the quantitative titration method for the percentage of survey households using non-iodised salt (<5mg/kg) (70.2%), salt with iodine at a level lower than nationally recommended (5-14.9 mg/kg) (9.1%), salt with iodine within the nationally recommended levels (15-39.9 mg/kg)

Figure 6. Percent of households using salt with different iodine content (mg/kg, titration method) nationally, for all households with complete, matched, information



(15.9%) and using salt with iodine over this level (>40mg/kg) (4.8%).

Because only a small percentage of samples were found to contain salt with iodine above 40 mg/kg, this category was combined with the category of 15-39.9 mg/kg to assign a single category for adequately iodised salt that was used in the cross tabulation by sub-national factors (see Table 4).

Table 4 shows the median salt iodine results for all samples with some added iodine (>5mg/kg). Salt samples with less than 5mg/kg were considered as non-iodised since this accounts for the presence of natural trace iodine in the salt that does not indicate intentional iodisation [48].

Nationally, only 21% of households used salt with iodine equal to or above 15 mg/kg (Table 4). The percentage of households using adequately iodised salt by macro-region was highest in the West

[48] Gorstein J, et al. Performance of rapid test kits to assess household coverage of iodized salt. Public Health Nutr. 2016 Oct;19(15):2712-24. doi: 10.1017/S1368980016000938.

Table 4. Household salt iodine by category (no iodine, some iodine and adequate iodine) and median and mean mg/kg for samples with some iodine, by survey characteristics

		Households with salt tested by titration (n)	Percent of samples in each salt iodine category			Salt samples with >= 5mg/kg iodine by titration		
			No added iodine <5 mg/kg	Any added iodine >=5 mg/kg	Adequate iodine >=15 mg/kg	Weighted number	Median iodine content mg/kg	Mean iodine content mg/kg
National		1,308	70.2 (64.3, 75.5)	9.1 (6.3, 13.0)	20.7 (16.4, 25.8)	347	27.5 (25.9, 29.4)	25.2 (22.7, 27.7)
Macro-region	North-Central	417	80.8 (72.6, 86.9)	6.2 (2.9, 12.9)	13.0 (8.0, 20.4)	50	24.3 (18.4, 31.3)	22.8 (18.2, 27.5)
	West	305	54.7 (40.6, 68.1)	8.6 (4.8, 14.8)	36.7 (25.4, 49.8)	125	30.7 (28.5, 33.4)	28.8 (26.3, 31.3)
	East	335	67.8 (52.7, 80.0)	10.6 (4.4, 23.5)	21.6 (12.6, 34.5)	82	28.0 (22.0, 35.3)	25.9 (19.5, 32.3)
	South	251	74.9 (64.5, 83.1)	12.4 (6.3, 22.9)	12.7 (7.6, 20.4)	90	15.3 (7.6, 23.6)	19.0 (13.4, 24.6)
Residence	Urban	853	69.1 (62.0,75.4)	9.3 (5.8, 14.5)	21.6 (16.5, 27.8)	216	27.5 (25.3, 30.8)	25.1 (22.0, 28.2)
	Rural	453	72.3 (61.0,81.3)	8.7 (4.7, 15.6)	19.0 (11.8, 29.2)	131	27.5 (23.5, 30.6)	25.3 (21.3, 29.4)
Wealth perception*	Categories 1 & 2	321	72.6 (64.7, 79.3)	6.2 (3.7, 10.3)	21.2 (15.3, 28.6)	103	30.7 (28.2, 34.2)	28.0 (24.6, 31.4)
	Category 3	401	64.7 (56.2, 72.3)	6.8 (4.0, 11.4)	28.5 (21.4, 36.8)	14	27.5 (25.2, 29.0)	27.4 (24.6, 30.3)
	Categories 4 & 5	135	68.3 (55.2, 79.0)	9.9 (5.0, 18.8)	21.8 (13.5, 33.3)	37	30.1 (19.4, 44.0)	26.3 (21.0, 31.5)
Education level of the WRA respondent*	Incomplete secondary	134	64.7 (53.3, 74.7)	11.6 (6.1, 20.9)	23.7 (15.3, 34.8)	52	28.0 (21.8, 35.8)	25.5 (20.9, 30.1)
	Complete secondary	444	65.9 (57.7, 73.2)	8.0 (5.1, 12.4)	26.2 (19.3, 34.4)	157	28.1 (24.4, 30.4)	26.9 (23.8, 29.9)
	Complete higher	297	73.2 (65.0, 80.0)	5.1 (2. 9, 8.8)	21.7 (15.5, 29.6)	82	28.0 (23.3, 31.3)	28.2 (24.5, 31.9)

*The total number of households with salt tested by titration was 857 for these categories, see Table 2.

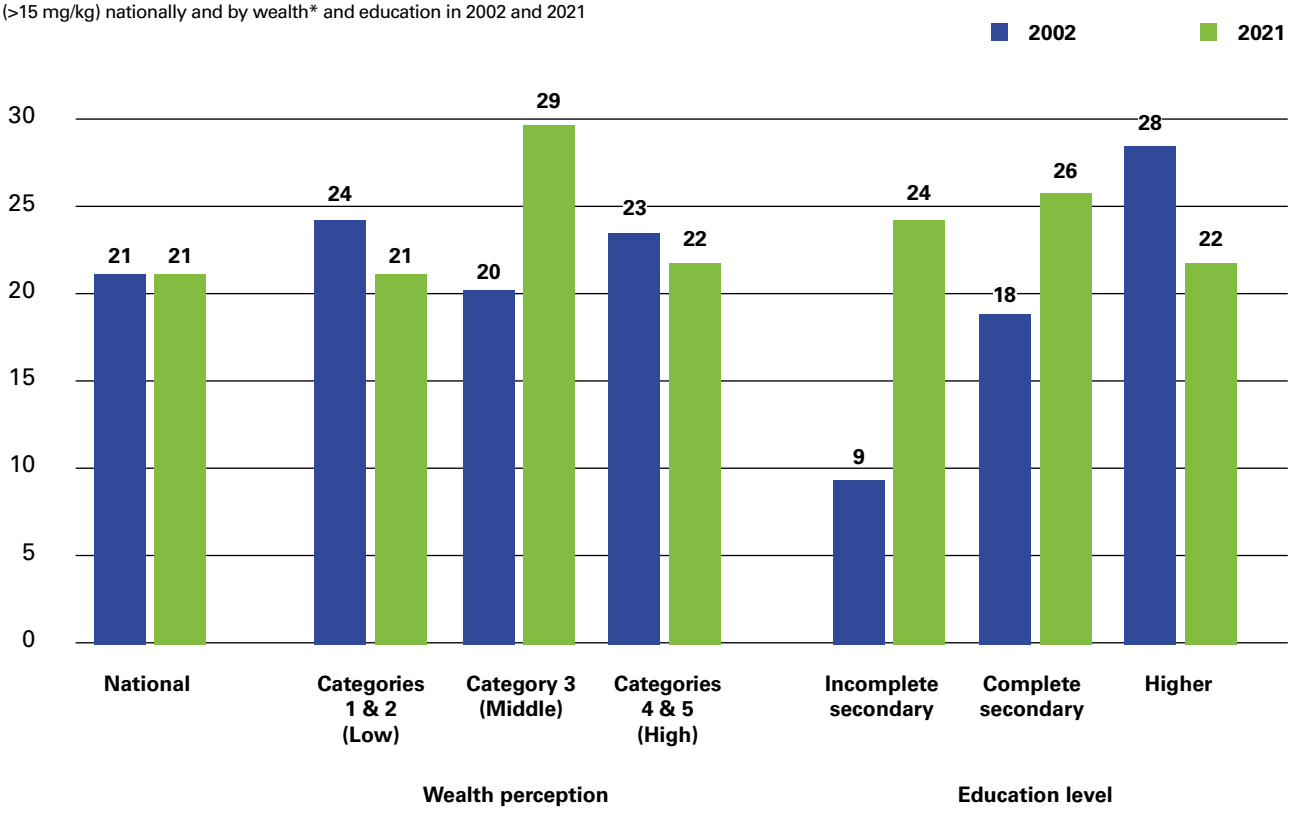
(36.7%) and very low in the North-Central (13.0%) and South (12.7%) macro-regions. Findings for the percentage of households using non-iodised salt was the reverse of this.

There was little difference in the percentage of households using non-iodised and adequately iodised salt between urban and rural residence types, or by perceived wealth or highest educational level. There was some indication in Table 4 that a higher percentage of households in the middle wealth category were using adequately iodised salt (28.5%) compared to the other wealth categories (21.2% and 21.8%). There was little notable difference in iodine content of salt according to educational level of the interviewed WRA.

However, WRA with the highest education were found to have the lowest use of adequately iodised salt (21.7%) when compared with salt used by WRA with lower educational levels.

For the 347 households using salt with some added iodine (>5mg/kg), the median salt iodine content was 27.5 mg/kg, and the mean was 25.2 mg/kg, both within the nationally recommended range (Table 4). The tight 95% CI around both values, together with the low percentage of households (9% nationally) using salt with inadequate added iodine (5-14.9 mg/kg), indicate that iodised salt available in Ukraine at the time of the survey was well iodised with good quality control at production. However, the median and mean salt iodine were lower, and the confidence interval ranges broader in the South, indicating that the salt supply there may have a lower quality of production or a longer time

Figure 7. Comparison of the percent of households using adequately iodised salt (>15 mg/kg) nationally and by wealth* and education in 2002 and 2021



*The 2002 survey assessed wealth as low, middle, and high. For illustration, this has been used as equivalent to the categories 1 &2, 3 and 4 & 5 in this graph, although the categories were not developed in the same way.

The total sample size for salt tested by titration was higher at the national level than for cross tabulation by perceived wealth and educational level (see Table 2).

on shelves before purchase. (Figure 8, shown later, indicates that a higher percentage of households in the South macro-region use salt from the main national producer; whether this is related to these findings is unclear.)

The last national survey to assess salt iodine content using titration was the 2002 survey.[49] Figure 7 compares the percent of households found to be using adequately iodised salt (>15 mg/kg) between the 2 surveys. The national percent was identical at 21%, while the trend in percentages by perceived wealth and education level were quite different. In 2002 only 9% of households with WRA with the lowest educational level were using adequately iodised salt, this had increased to 24% in 2021. Among WRA with the highest education level the percentage of households using adequately iodised salt decreased from 28% in 2002 to 22% in 2021.

[49] Academy of Medical Science (AMS), Ministry of Health, Komisarenko Endocrinology and Metabolism under AMS, Institute of Occupational Health under ASM, State Statistics Committee, United Nations Children's Fund, Center for Disease Control and Prevention, USA. Report of the 2002 National Micronutrient Survey, 2004

Table 5 shows results for the percent of households using salt with some iodine versus no iodine using the qualitative rapid test kit (RTK). A similar percent of salt samples (74%) was found to be non-iodised using this method as was found using titration (70%) (titration was performed on a subset of all samples tested using the RTK). Similar (but not identical) patterns in the use of non-iodised and iodised (any level of iodine) salt within the different the categories were found for RTK as for titration.

Appendix 4 shows a more detailed analysis of the performance of the RTK compared with titration to assess the presence of any iodine (>0mg/kg) and of added iodine (>5mg/kg) in the salt samples from this survey. The agreement rate between the methods for assessing salt with some added iodine (>5 mg/kg) was high at 90.6%. This has implications for the use and interpretation of RTK results in any future survey in Ukraine, indicating that RTK results using the same type and model of test kit used in the 2021 survey can be effectively used to detect salt with at least some added iodine. The RTK is not recommended for quantitative assessment of salt iodine content based on the degree of colour change [50].

National level rapid test kit results (colour change) for households using salt with any added iodine from the previous 2002 micronutrient survey and the 2012 MICS survey were 31.3% and 35.9%, respectively. The 2002 result is higher than was found by titration in the same survey, and results for both years are higher than found using RTK in the 2021 survey (25.7%). The 2002 survey included an analysis of the performance of the RTK. The results indicate that the model of test kit used in 2002 had lower performance indicators (agreement rate of 65.2%) and applicability than the model of test kit used in 2021.

Similar to this 2021 survey, the 2012 MICS survey RTK-based results showed a higher use of iodised salt in the West macro-region when compared with any other region.

Table 5. The presence of iodine in household salt (semi-quantitative analysis using the MBI rapid test kit (RTK)), by survey characteristic

		Household salt tested with RTK (n)	% (95% CI) salt with colour change for households with RTK results	
			No colour change (no iodine)	Colour change (some iodine)
National		2,136	74.3 (69.1, 79.0)	25.7 (21.0, 30.9)
Macro-region	North-Central	633	82.3 (73.9, 88.5)	17.7 (11.6, 26.1)
	West	503	56.0 (44.0, 67.4)	44.0 (32.6, 56.1)
	East	608	75.4 (63.5, 84.3)	24.6 (15.7, 36.5)
	South	392	83.4 (75.3, 89.2)	16.6 (10.8, 24.7)
Residence	Urban	1,409	71.7 (65.1, 77.5)	28.3 (22.5, 34.9)
	Rural	726	79.5 (69.6, 86.8)	20.5 (13.2, 30.4)
Wealth perception*	Categories 1 & 2	547	73.2 (67.3, 78.5)	26.8 (21.5, 32.7)
	Category 3	648	68.3 (60.9, 74.8)	31.7 (25.2, 39.1)
	Categories 4 & 5	205	67.4 (55.8, 77.2)	32.6 (22.8, 44.2)
Education level of the WRA respondent*	Incomplete secondary	230	76.8 (69.1, 83.0)	23.2 (17.0, 30.9)
	Complete secondary	738	69.1 (61.9, 75.4)	30.9 (24.6, 38.1)
	Complete higher	471	70.1 (63.5, 75.9)	29.9 (24.1, 36.5)

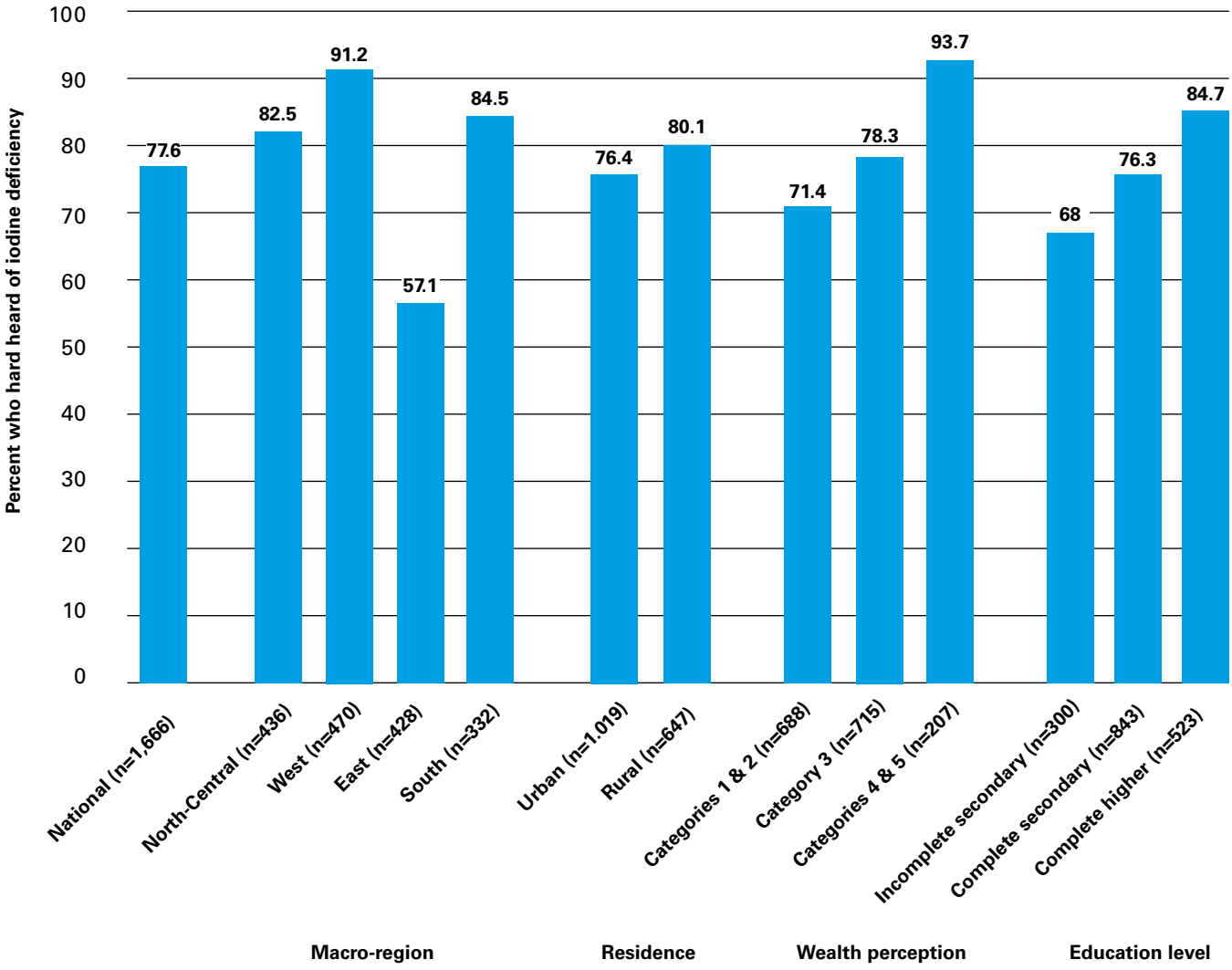
*The total number of households with salt tested by RTK was lower for these categories, see Table 2.

[50] Gorstein J, et al. Performance of rapid test kits to assess household coverage of iodized salt. Public Health Nutr. 2016 Oct;19(15):2712-24. doi: 10.1017/S1368980016000938.

AWARENESS OF IODINE DEFICIENCY AND ITS PREVENTION

Figure 8 indicates that over three quarters of respondents reported an awareness of iodine deficiency. Awareness was noticeably lower in the East, at less than 60%, compared with 91% in the West, macro-region. There was little difference in awareness between urban and rural areas. The figure shows a trend towards increasing awareness of iodine deficiency with increasing perceived wealth and educational attainment. The same trend in awareness by these factors was found in the 2002 survey.

Figure 8. Respondent awareness of iodine deficiency



For WRA who reported an awareness of iodine deficiency a follow up question was asked to find out what they believed was the best method to prevent it. The results are shown in Table 6. Almost 1,100 WRA were asked this open question (response options were not provided). The most frequent responses were categorised as "the use of iodised salt in food preparation or at the table" (45.8%) and "to eat seafood or seaweed" (26.3%). A further 10.1% thought that the best method to prevent iodine deficiency was to consume products known to be made with iodised salt, while 12.1% said to take iodine-containing supplements.

Combining the responses for using iodised salt in food preparation with responses for consuming products known to be made with iodised salt indicates that over 50% of the WRA aware of iodine deficiency (about 35% of the total sample of WRA) recommended a preventative method involving the use of iodised salt. However, only 21% of the total sample used iodised salt at home. From the information available, it cannot be determined whether WRA could not access iodised salt in their local stores, they did not perceive themselves to be at risk of iodine deficiency personally or had other reasons for not using it.

Looking at the combined responses involving the use of iodised salt to prevent iodine deficiency, Table 6 indicates that WRA in the West macro-region were more likely to think iodised salt was the best method (68%) than WRA in the other 3 macro-regions (all were approx. 50%). This corresponds with the finding that the highest use of adequately iodised salt is by WRA in the West.

Table 6. Respondent knowledge of the best method to prevent iodine deficiency (only for respondents who had heard of iodine deficiency and reported to know a method to prevent it)

		Number respondents who reported to know a method to prevent iodine deficiency	Reported as the most effective method to prevent iodine deficiency (%)					
			Use iodised salt in food preparation or to add to food at the table	Consume products known to be made with iodised salt	Take iodine supplements	Eat seafood/ seaweed	Other	Do not know
National		1,072	45.8	10.1	12.1	26.3	2.4	3.3
Domain	North-Central	301	38.9	9.7	19.4	26.0	1.4	4.6
	West	389	58.2	10.0	4.2	21.3	3.4	2.9
	East	164	39.5	9.5	19.0	27.5	1.5	3.0
	South	218	37.8	12.6	5.5	40.2	3.9	0.0
Residence	Urban	694	43.0	9.9	12.2	30.2	2.0	2.8
	Rural	378	51.2	10.6	11.9	19.0	3.0	4.3
Wealth perception	Categories 1 & 2	366	45.0	5.9	13.5	29.7	2.6	3.2
	Category 3	494	49.5	12.2	10.3	22.1	3.0	2.8
	Categories 4 & 5	179	41.5	11.9	14.5	30.6	1.0	0.5
Education level of the WRA respondent	Incomplete secondary	142	47.9	10.7	12.4	23.1	2.5	3.3
	Complete secondary	524	46.2	12.8	11.1	24.7	2.4	2.8
	Complete higher	406	44.6	6.3	13.4	29.5	2.5	3.8

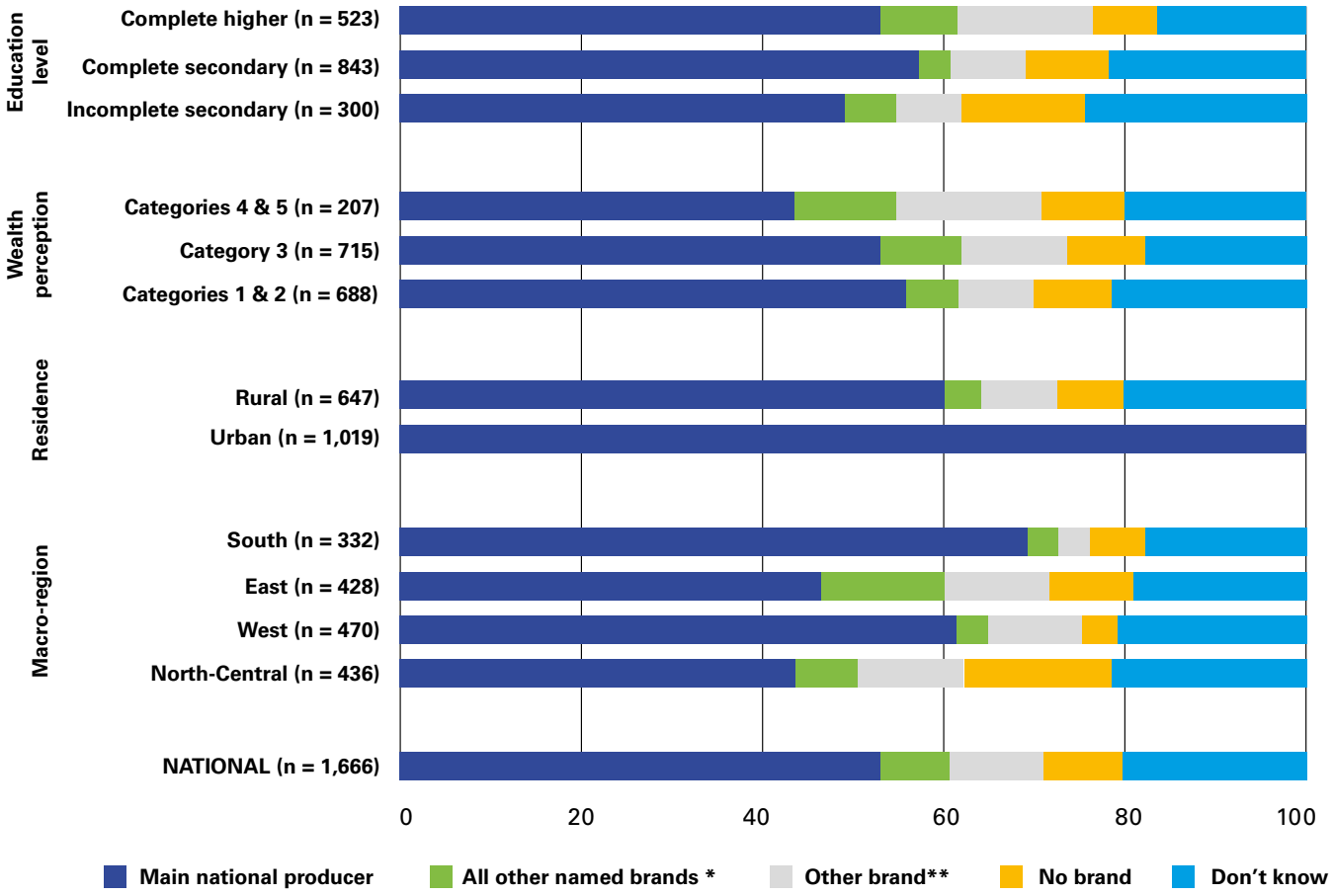
Response options were NOT read out to the respondents during the interview.

Interestingly, WRA from households with factors generally associated with higher socio-economic status (urban residence, highest perceived wealth and highest educational level) were less likely than their peers in the comparative categories (rural residence, lower perceived wealth and lower educational level) to have responded with a prevention method related to iodised salt. Furthermore, they were more likely than their peers to have given the response "eat seafood/seaweed" (approx. 30% of WRA in urban areas and of highest wealth and education gave this response). The percentage of WRA responding that seafood/seaweed was the best prevention method was notably higher in the South macro-region, possibly because this area is more coastal, and these products may be more available. The percentage of WRA who responded that taking iodine supplements was the best method to prevent iodine deficiency varied by macro-region (approx. 19% of WRA in the North-Central and East macro-regions, compared with 4-5.5% of WRA in the West and South macro-regions.

HOUSEHOLD SALT BRAND, LABELLING AND INTENDED USE

Figures 9 and 10 show the responses from WRA about the brand of salt used for cooking in their household and whether the package was labelled as iodised at the time of purchase (these were reported as part of the phone interview, so the brand and packaging were not observed by the interviewer). Over 50% of WRA reported using salt from the main national salt producer and approximately one third of WRA who reported to use this brand said the package was labelled as iodised. For households using other named brands of salt, responses were spread across 7 other-named brands with <2% of households reporting the use of any single other named brand. Together, these other named brands accounted for only 7% of responses (of which 60% were reported to be labelled as iodised). Due to the low percentage, other named brands are presented as a combined category in Figures 9 and 10. Almost 10% of WRA reported using salt from brands that were not named/listed in the questionnaire (of which 53% were reported to be labelled as iodised), another 10% reported using salt with no branding

Figure 9. Reported household cooking salt brand by survey characteristics (%)

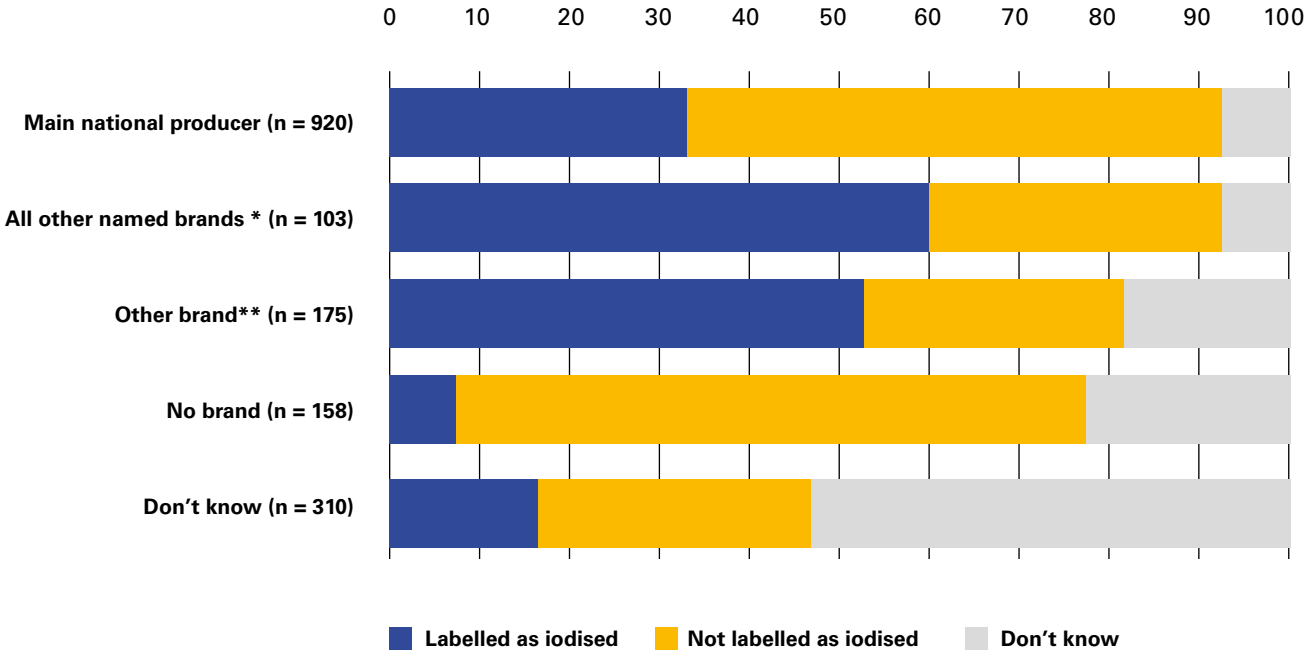


* 7 named brands were listed on the questionnaire along with the leading national producer, these are combined here as "All other named brands".
** "Other brands" is the term used when WRA responded that they used a brand that was not one of these 8.

(8% of which were reported to be labelled as iodised), and 20% did not know the brand of salt (18% of which were reported to be labelled as iodised).

A higher percentage of WRA in the South macro-region reported using salt from the leading national producer (70%) than reported for the North-Central and East macro-regions (approx. 47%). WRA in the

Figure 10. Percent of household cooking salt brands by reported labelling as iodised (n = 1,666)



* 7 named brands were listed on the questionnaire along with the main national producer, these are combined here as "All other named brands".
** "Other brands" is the term used when WRA responded that they used a brand that was not one of these 8.

North-Central macro-region reported a notably higher use of salt with no brand name (17% compared with <10% for other macro-regions). A higher percentage of WRA with a higher educational level reported using salt from "other named" brands or "other" (non-named) brands (approx. 23%) than WRA in the other two educational levels (13% for both).

WRA were asked whether salt used to add to food at the table was generally different or the same as that used for cooking (Table 7). Over three-quarters of WRA responded that the same salt was used for both purposes; therefore, a separate analysis for brands and labelling of table salt was not conducted for this report.

In addition, WRA were asked whether their household made their own pickled vegetables and, if so, whether a special pickling salt was used for this purpose. Of 350 WRA in households that made their own pickled vegetables, only 10% used a special pickling salt. There was some variation by macro-region, residence, wealth and education; however, numbers were generally too low to consider other salts as significant potential separate sources of iodine (Table 7).

The fact that generally only one type of salt is used in the household means that if the main source of household salt is iodised, the population will benefit from additional iodine through table, cooking, and pickling salt.

Table 7. Household salt type and use

		Number respondents	Same salt used for cooking and as table salt (%)			Number of households making pickled vegetables	Special salt used for pickling vegetables (%)		
			Yes	No	Do not know		Yes- special pickling salt	No- general household salt used	Do not know
National		1,666	76.1	17.0	6.9	350	10.4	83.4	6.2
Macro-region	North-Central	436	83.2	10.6	6.2	99	7.3	81.8	10.9
	West	470	78.8	18.6	2.7	134	14.4	83.8	1.9
	East	428	63.4	23.0	13.6	49	10.9	84.8	4.3
	South	332	82.5	15.5	2.1	68	4.9	82.9	12.2
Residence	Urban	1,019	74.4	17.1	8.5	208	8.3	81.3	10.4
	Rural	647	79.6	16.7	3.8	142	12.9	85.9	1.2
Wealth perception	Categories 1 & 2	688	75.8	18.2	6.0	150	6.4	85.0	8.6
	Category 3	715	76.7	15.2	8.1	149	10.7	85.9	3.4
	Categories 4 & 5	207	74.2	20.8	5.0	38	18.5	79.6	1.9
Education level of the WRA respondent	Incomplete secondary	300	68.6	20.4	10.9	64	6.6	85.2	8.2
	Complete secondary	843	77.4	15.7	6.9	178	15.7	78.5	5.8
	Complete higher	523	78.0	16.9	5.0	108	2.9	91.3	5.8

Table 8 provides information about the grain size and colour of salt samples collected. Most survey households reported using salt of normal (standard) grain size (86.6%) and clean appearance (64%). A slightly higher percentage of households in the North-Central macro-region reported using salt with a large grain size (20.8%) compared to other macro-regions. Household salt categorised as "dirty" in appearance by the laboratory were more likely to have come from households in the South macro-region (58.5%) or in rural areas (43.8%), and to have higher perceived wealth (38.1%) as well as a more highly educated interviewed WRA (33.6%), when compared with other categories in the same cross tabulation.

Table 8. Household salt grain type and colour by survey characteristics and level of iodine in the salt

		Number of samples	Any issues with salt grain*			
			Grain Type		Grain Colour	
			Normal Grain	Large grain	Dirty	Not Dirty
National		1,938	86.6	13.4	36.0	64.0
Macro-region**	North-Central	492	79.2	20.8	34.2	65.8
	West	482	92.0	8.0	33.3	66.7
	East	469	89.5	10.5	31.8	68.2
	South	495	91.2	8.8	58.5	41.5
Residence**	Urban	1,167	86.1	13.9	32.4	67.6
	Rural	771	87.7	12.3	43.8	56.2
Wealth perception	Categories 1 & 2	639	91.5	8.5	28.5	71.5
	Category 3	677	90.4	9.6	31.0	69.0
	Categories 4 & 5	200	88.6	11.4	38.1	61.9
Education level of the WRA respondent	Incomplete secondary	278	89.0	11.0	26.3	73.7
	Complete secondary	790	92.0	8.0	31.3	68.7
	Complete higher	496	87.9	12.1	33.6	66.4
Salt iodine mg/kg for samples tested by titration**	Median (and 95% CI) iodine mg/kg *(for samples with iodine >5mg/kg)*	347***	20.1 (9.0, 26.5) *n = 322*	6.3 (6.3, 31.7) *n = 25*	23.3 (9.0, 27.0) *n = 132*	8.5 (7.9, 28.0) *n = 215*

* Only 31 salt samples (1.5% of total) were reported to have any notable differences other than grain size/colour. The small number means that they are not reported here.
**These results are for all salt samples collected and analysed by titration as having > 5mg/kg iodine. Includes samples without a matching household interview. 95% CI were calculated using bootstrapping methodology.
***The 347 samples each had a recorded grain size and colour category. Therefore, the n for all columns combined = 694.

Analysis of the median salt iodine for salt with some added iodine (> 5mg/kg) found the highest median levels for normal size grain and "dirty" grain. When interpreting the median iodine results, it needs to be considered that the salt iodine data for salt with iodine of 5mg/kg or above was highly skewed and many samples had the same mg/kg result at the lowest levels. Given this and the relatively small sample size for some groups, the median coincided with the minimum value in the range and with the lower 95% CI value of the sample median in some cases. This may explain why the median salt iodine mg/kg for "not dirty" salt is much lower than for "dirty" salt when the 95% CI for the 2 categories are very similar. In addition, the sample size for salt with any iodine for "large" grain size salt was very small (n = 25); therefore, it is difficult to draw conclusions from the low median mg/kg iodine result in the table, especially when it can be noted that the 95% CI for mg/kg iodine is similar to that for other types of salt.

IODINE STATUS, THYROID DISEASE, AND USE OF IODINE SUPPLEMENTS

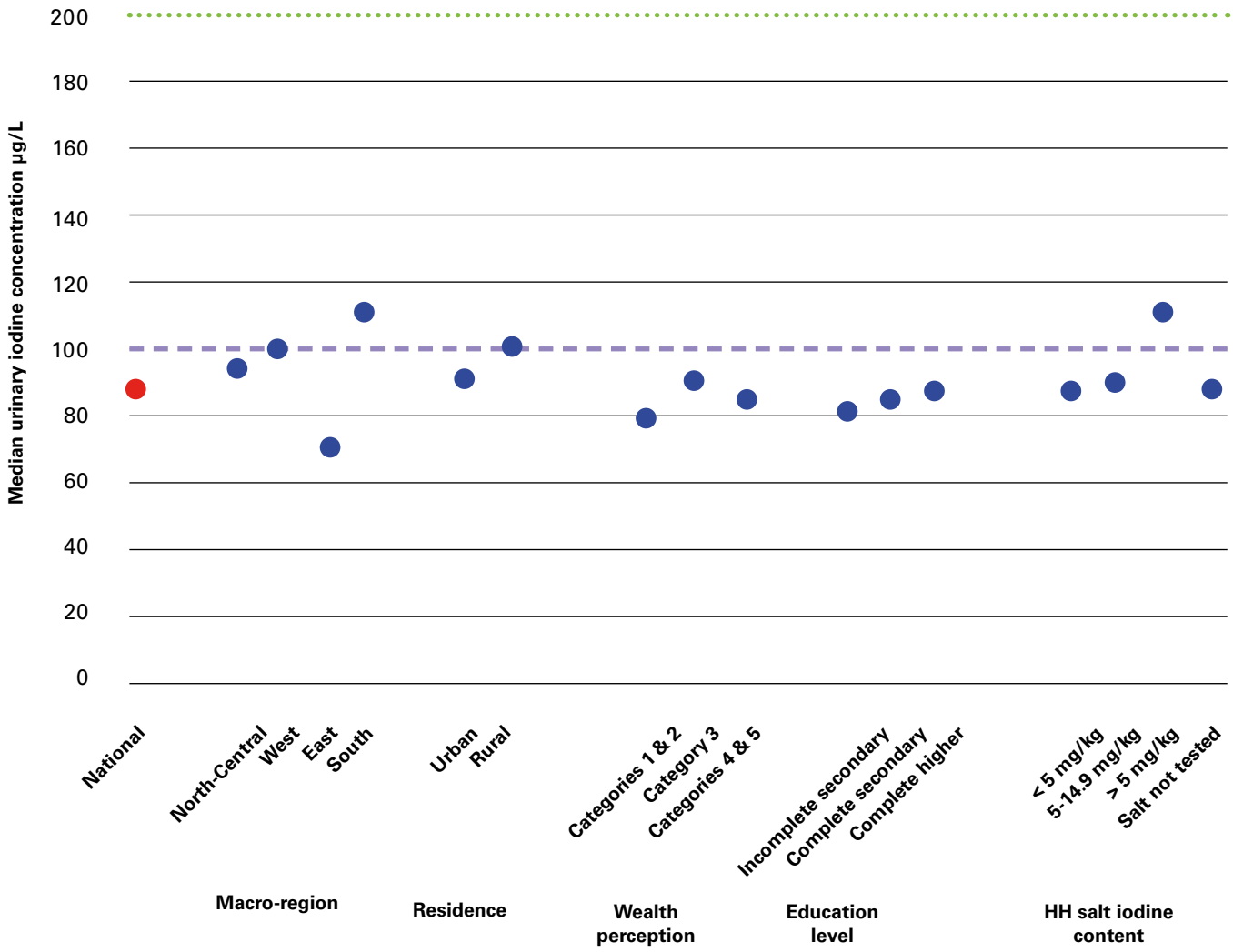
Iodine status among non-pregnant WRA is defined at the population level using the median UIC. WHO says that optimal iodine nutrition for WRA is defined as a median urinary iodine concentration (mUIC) for the population between 100 and 199 µg/L. National survey results shown in Figure 11 and Table 9 shows that, at the national level, iodine nutrition among WRA in Ukraine is below optimal, with a median UIC (mUIC) of 90.4 µg/L. The upper 95% CI of 95.9 µg/L is also below 100 µg/L meaning that the population mUIC is statistically lower than the WHO recommended cut-off for adequacy.

The 2002 national micronutrient survey reported an overall (national) mUIC of 89.7 µg/L among WRA, which indicates that no improvement in population iodine status has happened in nearly 20 years and that women in Ukraine are still entering pregnancy with low iodine stores. This will inevitably be having an impact on foetal brain development and national socio-economic development.

Adequate iodine nutrition is indicated for WRA living in the South macro-region (mUIC 111.2 µg/l), which appears to be statistically different to the lowest observed iodine status among WRA living in the East macro-region. This survey did not collect sufficient information to determine why iodine intake may be higher in the South, especially when the use of iodised salt is lower in this macro-region. Iodine intake might be related to greater availability of (iodine-containing) seafood and seaweed products (although Table 11 does not indicate a higher intake of sea fish by WRA in the South). It could also be that the iodine level in groundwater in the region is higher, which would affect the iodine content of locally grown produce and locally sourced drinking water. A British Geological Survey document on iodine in groundwater states that: "continental areas are more likely to be affected [by iodine deficiency] than coastal areas…. And mountainous areas have a greater tendency [for iodine deficiency] than lowlands".[51] This generalised statement would imply that iodine levels could be expected to be lowest in the more mountainous West of the country, whereas this survey showed that lowest iodine intake was observed among WRA in the East. The use of iodised salt was notably higher among WRA in the West macro-region, which may have helped to counteract the effect of potentially low groundwater iodine.

[51] British Geological Survey, 2000. Water Quality Factsheet: Iodine. https://washmatters.wateraid.org/publications/inorganic-water-quality-parameters-iodine

Figure 11. Median UIC among WRA nationally and by category



The total number of urine samples tested for iodine was lower for perceived wealth and educational level than for residence type, macro-region and national, see Table 2.

Figure 11 and Table 9 show that the only other sub-group found to have adequate iodine nutrition is WRA from households using adequately iodised salt (mUIC of 110.8 µg/L, 95% CI 94.4 to 129.4 µg/L). This corresponds with evidence from numerous surveys and studies in other countries. A similar association was also found from a more in-depth analysis of the Ukraine 2002 micronutrient survey results that estimated iodine intake (based on UIC levels) and found that iodine intake among WRA was only sufficient (> the RNI of 150 µg/L) for the group using adequately iodised salt at home.[52] These associations present significant support for a change in policy to introduce legislation for mandatory salt iodisation in Ukraine, to protect the population from the known effects of insufficient iodine intake that appears to have been the case for at least 20 years.

[52] Van der Haar, F; Gerasimov, G.; Qahoush Tyler, V.; Timmer, A. Universal salt iodization in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region during the decade 2000–09: Experiences, achievements, and lessons learned. Food Nutr. Bull. 2011, 32, S175–S294

The mUIC among WRA in the South and WRA from households using adequately iodised salt was only just above the cut off for adequacy and the lower 95% confidence interval was below this cut off. This indicates that the true mUIC in both cases is borderline adequate/inadequate and that additional iodine intake from quality-controlled iodisation of all food grade salt is needed to ensure protection. Additional dietary intake from salt would not move the mUIC above the upper level for adequate iodine nutrition.

Table 9. Median urinary iodine concentration (mUIC) µg/L with 95% CI among Women of Reproductive Age (WRA) by survey characteristics, level of iodine in household salt.

		Number of urine samples with iodine result	Median UIC (µg/L)	Lower 95% confidence interval**	Upper 95% confidence interval**
National		2,252	90.4	84.1	95.9
Macro-region	North-Central	682	96.4	87.6	104.5
	West	522	99.5	86.4	112.9
	East	632	72.5	62.2	84.3
	South	412	111.2	95.9	124.8
Residence	Urban	1,502	86.9	80.1	92.6
	Rural	746	99.1	89.8	109.7
Wealth perception*	Categories 1 & 2	605	80.6	72.6	87.4
	Category 3	705	89.5	80.5	99.2
	Categories 4 & 5	210	85.9	69.7	99.4
Education level of the WRA respondent*	Incomplete secondary	256	81.9	70.8	92.9
	Complete secondary	800	85.5	78.7	93.1
	Complete higher	507	85.9	76.8	97.1
HH salt iodine content	< 5mg/kg	912	88.7	77.2	97.5
	5- 14.9mg/kg***	119	91.6	78.5	108.9
	>15 mg/kg	267	110.8	94.4	129.4
	Salt not tested	949	88.2	80.1	97

*The total sample size for UIC was lower for cross tabulation by perceived wealth and educational level than for other categories (see Table 2).
** 95% CI were calculated using bootstrapping methodology.
***The sample size for this category (n = 109 unweighted) is too small to consider the mUIC as reliable. Generally, a sample size of at least 200 is required to provide reasonable confidence in the mUIC value. [53]
The unweighted number of urine samples with an iodine result at the national level was 1,925 (see Table 1).

[53] Andersen S, Karmisholt J, Pedersen KM, Laurberg P (2008) Reliability of studies of iodine intake and recommendations for number of samples in groups and in individuals. Br J Nutr 99:813–818

The survey included questions about each WRA's history of thyroid disease to assess if there was any relation between thyroid problems and iodine status. Figure 12 shows that 14% of WRA (n = 200) reported any history of thyroid disease. The percentage reporting a diagnosis was highest among WRA in the West macro-region (20.4%) and lowest among WRA in the East macro-region (6.4%). Among those reporting a diagnosis of thyroid disease, 70% said that the diagnosis was made over 60 months previously.

Figure 12. Respondent self-reported history of thyroid disease (n = 1,666)

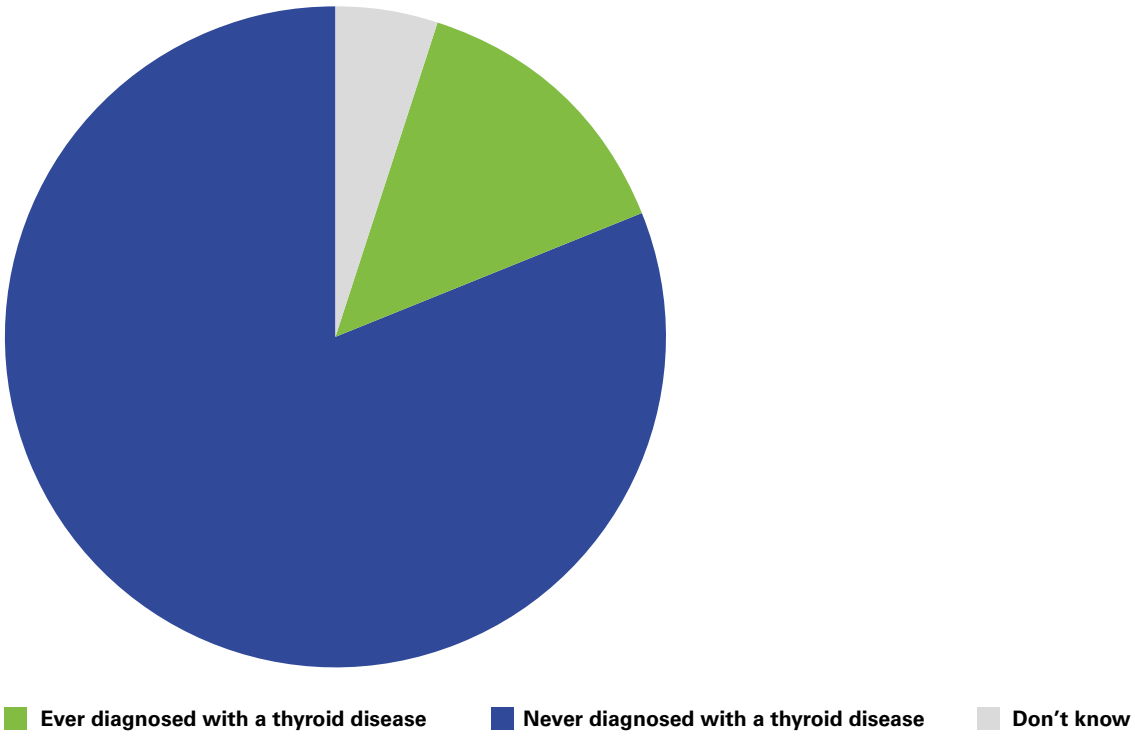


Table 10 shows iodine status among WRA by self-reported history of thyroid disease. Iodine status was found to be less than optimal among (and not notably different between) WRA by history of thyroid disease.

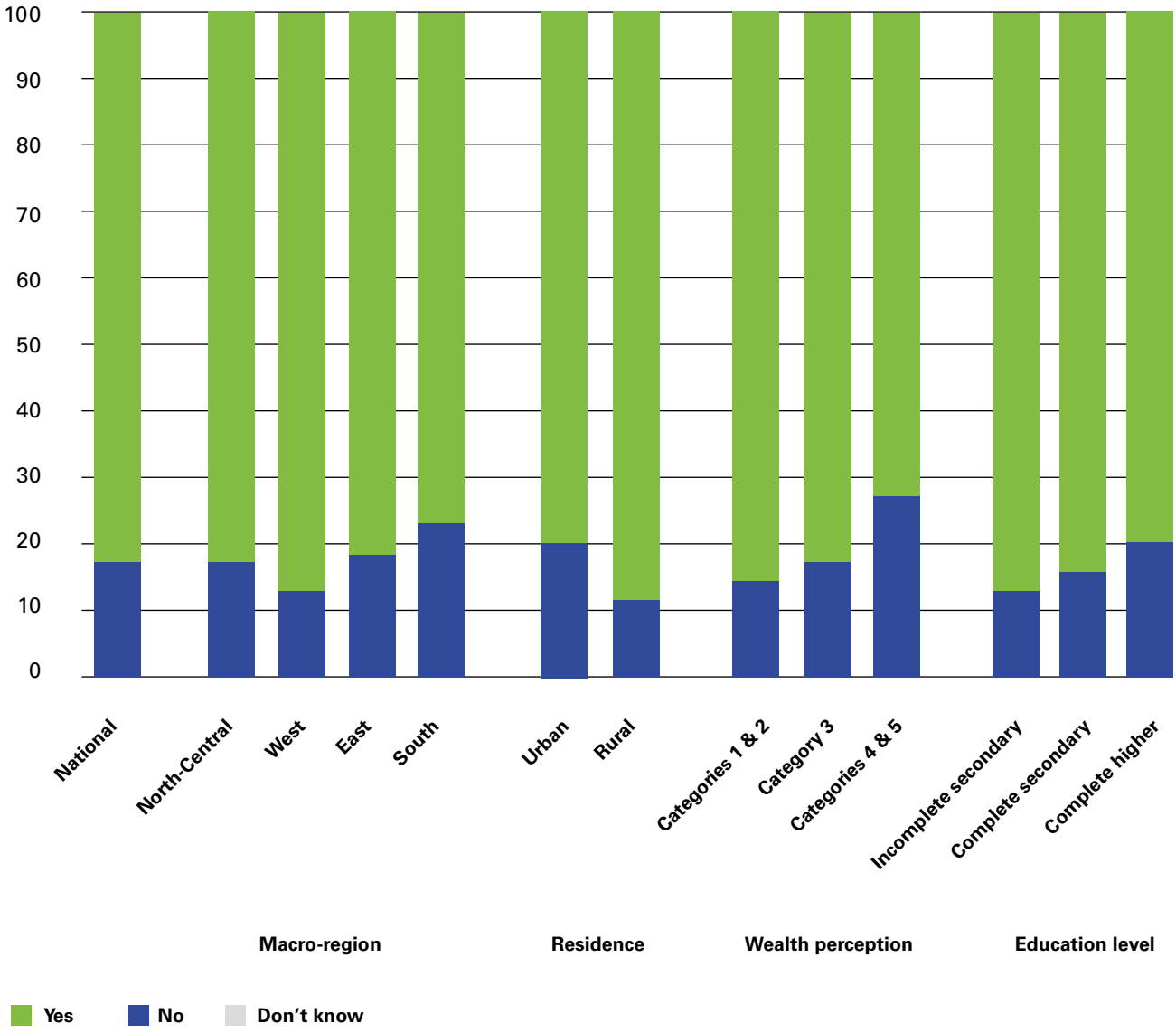
Table 10. Median UIC among Women of reproductive age (WRA) by self-reported thyroid disease history

		Number of urine samples with iodine result	Median UIC	Lower 95% confidence interval	Upper 95% confidence interval
History of thyroid disease (self-reported)	None	1,260	84.1	79.3	89.9
	Diagnosed	216	90.3	79.2	100.4

WRA were asked about their use of vitamin and mineral supplements during the month before the survey (see Figure 13). A follow-up question was then asked to determine whether the supplement contained iodine or not.

Only 17% of all surveyed WRA reported that they had taken any vitamin and / or mineral supplements in the month prior to the interview, as shown in Figure 13. 26% of these 264 WRA said that the supplement contained iodine (30% did not know). The mUIC of the 69 WRA (4.5% of the total sample) who had taken iodine-containing supplements was 101.0 µg/L (95% CI 81.2 µg/L to 119.9 µg/L). The sample size was too small to consider this a reliable result; however, it indicates that taking supplements may be associated with improved iodine status.

Figure 13. Self-reported use of vitamin and mineral supplements (not specifically iodine-containing) by WRA in the month before the survey



Nationally, 26% of these 264 WRA (n = 69, unweighted, 4.5% of the total sample) reported that the supplement contained iodine

The 2002 national micronutrient survey also investigated the use of supplements among WRA. 2.5% of WRA reported taking iodine-containing supplements, indicating this practice has not changed significantly during the 20 years between surveys.

CONSUMPTION OF FOODS WITH THE POTENTIAL TO IMPROVE IODINE INTAKE

The phone interview included questions about recent consumption of sea fish and commercial cow's milk since both can be a significant, although highly variable, source of iodine. In the case of cow's milk, the iodine content may relate to whether the animal feed is supplemented with iodine. [54] [55] Results are shown in Table 11.

A preliminary question, before asking specifically about commercial cow's milk consumption, asked about the type of milk most typically consumed during the week before the survey, results are shown in Figure 14. A surprisingly high percentage of WRA (44.0%) reported that they did not drink any type of milk or milk-substitute product. This response was particularly high in the East macro-region (59.3%) but did not vary notably within other categories.

Figure 14. Type of milk typically consumed by WRA in the week before the survey (self-reported)

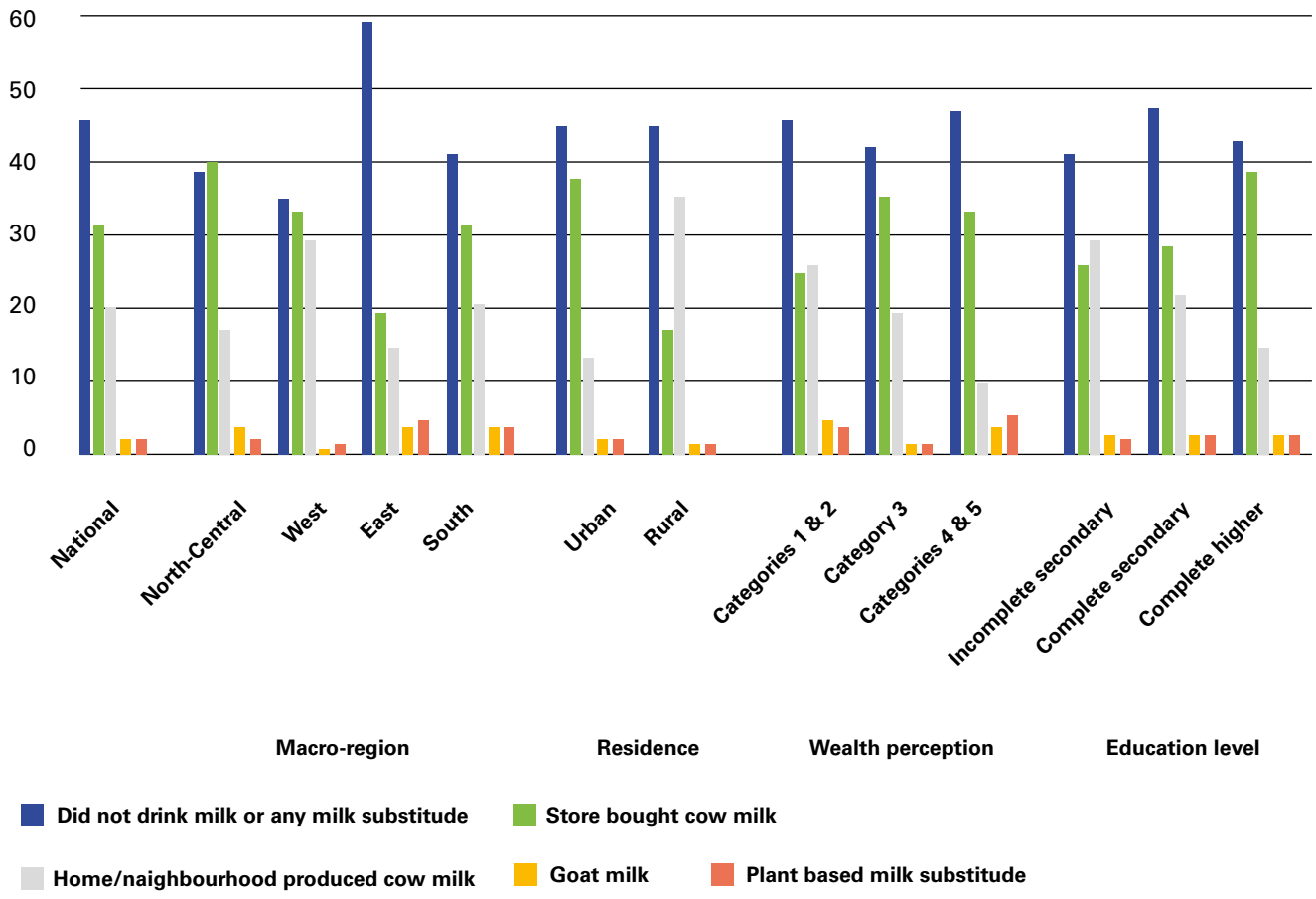


Figure 14 shows a trend toward a higher use of store bought compared with home /neighbourhood produced cow's milk, by urban residence (compared with rural), higher wealth and higher educational level.

Sea fish consumption (based on reported frequency of consumption and a set portion size) was lowest in the West macro-region and among WRA in the middle wealth category. Otherwise, there was no notable difference between intake within categories. Commercial cow's milk consumption (the same basis for the estimate as above) was highest in the East macro-region and higher among WRA in rural areas than urban areas (Table 11).

[54] Van der Haar, F.; Gerasimov, G.; Qahoush Tyler, V.; Timmer, A. Universal salt iodization in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region during the decade 2000–09: Experiences, achievements, and lessons learned. Food Nutr. Bull. 2011, 32, S175–S294 Includes evidence of sea fish contributing to iodine intake in Ukraine.

[55] O'Kane SM, et al. Cow Milk Consumption Increases Iodine Status in Women of Childbearing Age in a Randomized Controlled Trial. J Nutr 2018;148:401–408

Table 11. Approximate daily consumption of sea fish (g) and commercial cow's milk (ml) among WRA who reported consuming these products in the week prior to the survey

		Commonly consumed foods known to be a (non-salt) source of iodine	
		Sea fish	Commercially produced cow's milk
Number of respondents		1,666	1,666
% Respondents who did NOT consume the product in the week before the survey*		54.8%	69.0%
Number of respondents who consumed the product at least once		746	445
		Approximate average daily per capita consumption for WRA who reported having consumed the product at least once (see national n above)	
		Grams	Millilitres
National		32	119
Macro-region	North-Central	35	126
	West	24	94
	East	34	162
	South	33	90
Residence	Urban	32	113
	Rural	32	149
Wealth perception	Categories 1 & 2	33	101
	Category 3	29	110
	Categories 4 & 5	36	140
Education level of the WRA respondent	Incomplete secondary	32	115
	Complete secondary	32	121
	Complete higher	33	118

*The response for store bought cow's milk is based on which milk or plant-based milk substitute was typically consumed in the week before the survey rather than ever consumed in the week before.
See Appendix 3 for details of the assumptions used as the basis for intake estimates

Back to Contents

To test whether a higher intake of sea fish or commercial cow's milk was related to iodine status among WRA in this survey, the mUIC was assessed for WRA consuming these products less than 3 times a week or 3 more times a week. These results are shown in Table 12. The frequency of intake of these foods did not appear to be associated with iodine status, which was less than optimal among all sub-groups. In fact, unexpectedly, mUIC was higher among WRA who consumed these products less often, however, there was a large degree of overlap in the 95% confidence intervals indicating that the difference is unlikely to be significant.

Table 12. Median UIC among Women of reproductive age (WRA) by recent intake of potentially iodine-containing foods

		Number of urine samples with iodine result	Median UIC	Lower 95% confidence interval	Upper 95% confidence interval
Consumed sea fish in the week prior to the survey	< 3 times	1,348	86.3	80.5	92.3
	>= 3 times	211	75.6	64.3	90.4
Consumed commercially produced animal milk in the week prior to the survey	< 3 times	173	98.6	86.4	116.8
	>= 3 times	258	85.5	71.7	98.6

WRA were also asked about the frequency of consumption of commonly consumed salt-containing foods to assess potential iodine intake from these foods IF all salt used in their production was iodised according to national regulations for salt iodisation.

Table 13 gives an overview of the percent WRA who reported no consumption of each product and an estimate for daily per capita intake of each food for WRA who reported having consumed the product at least once. The calculations were based on estimated serving sizes for each food, multiplied by the number of times the respondent reported consuming the food in the previous week. The method is described further in Appendix 3.

There was relatively little variation in the reported frequency of consumption (and therefore volume) of each food type by macro-region, residence, wealth or educational level. Hard / soft and brined cheese, salted fish, and pickled vegetable consumption tended to be lower in the West macro-region when compared with other macro-regions. Small differences were noted in the frequency of consumption between urban - rural residence type for hard / soft cheese, salted fish, and pickled vegetables (rural lower for all), and for cottage cheese (rural higher). Hard / soft cheese, brined cheese, and smoked sausage appeared to be more frequently consumed among WRA with the highest level of education, while pickled vegetables were more commonly consumed among WRA with incomplete secondary education. Differences by perceived wealth were only notable for cottage cheese, where consumption was highest among WRA with lower perceived wealth.

Bread is a widely consumed food in Ukraine and legislation for iodisation of salt used in its production has been proposed. Table 14 provides information about the type of bread typically consumed, as reported by respondents, in case this will help assess which types of bread should be included in any future legislation on the use of iodised salt in processed food and what impact this could have on iodine intake.

Table 13. Approximate daily consumption of common salt-containing foods (g) among WRA who reported consuming these products at least once in the week prior to the survey

		Commonly consumed salt-containing food								
		Bread	Hard / soft cheese	Brined cheese	Cottage cheese	Pastries	Seasoning	Salted fish	Smoked sausage	Pickled vegetable
Number of respondents		1,666	1,169	1,169	1,169	1,666	1,666	1,666	1,666	1,666
% Respondents who did NOT consume the product in the week before the survey		10.6%	10.6%	57.2%	33.7%	57.7%	68.1%	64.1%	31.4%	67.6%
Number of respondents who consumed the product at least once		1,442	1,030	483	758	696	505	592	1136	528
		Approximate average daily per capita consumption (g) for WRA who consumed the product (see n above)								
National	99	19	14	46	10	1	10	40	33	
Macro-region	North-Central	100	20	17	50	10	1	10	39	39
	West	105	16	11	45	10	2	8	38	27
	East	91	21	14	44	10	1	12	43	32
	South	102	19	14	47	10	1	11	41	36
Residence	Urban	98	20	14	44	10	1	11	41	35
	Rural	102	16	13	50	11	1	9	38	29
Wealth perception	Categories 1 & 2	103	18	14	52	10	2	11	38	36
	Category 3	97	18	12	41	10	1	9	40	29
	Categories 4 & 5	95	22	16	49	11	1	11	45	26
Education level of the WRA respondent	Incomplete secondary	99	19	14	48	11	1	12	41	33
	Complete secondary	99	18	14	47	10	2	10	40	34
	Complete higher	101	20	13	43	9	1	10	40	30

See Appendix 3 for details of the assumptions used as the basis for estimates used, and Appendix 5 for additional frequency of consumption estimates for each food

Table 14. Type of bread most frequently consumed in the week prior to the survey among WRA who reported consuming bread

			Type bread most frequently consumed (%)							
		Number of respondents	White	Dark rye	Wheat	Sourdough	Lavash/ pita/ wrap	Other	2+ types	Do not know
National	1,518	49.3	46.6	24.2	5.3	3.3	0.9	7.2	0.8	
Macro-region	North-Central	436	43.5	45.8	25.0	7.1	6.5	2.0	5.6	74.1
	West	470	56.3	64.6	24.4	4.7	1.4	0.2	6.1	60.1
	East	428	42.9	29.7	26.7	3.7	2.5	0.0	11.0	76.5
	South	332	61.3	43.1	16.0	5.5	2.2	1.1	5.5	76.1
Residence	Urban	1,019	45.4	41.7	26.8	6.9	4.6	1.1	8.2	72.7
	Rural	647	56.8	55.7	19.3	2.3	1.0	0.4	5.4	67.7
Wealth perception	Categories 1 & 2	688	50.3	44.6	25.3	4.4	2.4	1.2	8.0	65.3
	Category 3	715	50.7	49.9	24.6	4.4	2.9	0.6	4.8	73.0
	Categories 4 & 5	207	43.7	43.7	21.4	10.4	7.7	0.0	8.2	77.3
Education level of the WRA respondent	Incomplete secondary	300	52.3	36.8	25.1	4.2	0.8	1.7	6.3	64.2
	Complete secondary	843	51.8	48.1	22.1	3.6	2.4	0.8	7.7	68.6
	Complete higher	523	43.6	49.0	27.3	8.5	6.1	0.7	6.9	78.3

Table 14 shows that the most popular type of bread was white bread at 49.3%. Highest reported use of white bread was in the South macro-region (61.3%), in rural areas (56.8%) and among the two lowest perceived wealth categories and two lowest educational categories (approximately 50-52%). The second most popular bread was dark rye (46.6% of respondents), with highest popularity among WRA in the West macro-region (64.6%) and lowest popularity in the East macro-region (29.7%). Dark rye bread was more frequently consumed among WRA in rural (55.7%) than urban (41.7%) areas. Wheat bread was consumed by about a quarter of WRA and was least frequently consumed by WRA in the South macro-region (16.0%) and in rural areas (19.3%). Sourdough and lavash/pita/wrap types of bread were consumed by 5.3% and 3.3% of surveyed WRA, respectively.

These sourdough and lavash/pita/wrap bread types were more popular among WRA in the North-Central macro-region (7.1% and 6.5%, respectively), WRA with higher perceived wealth (10.4% and 7.7%, respectively) and WRA with the highest educational level (8.5% and 6.1%, respectively) and WRA in urban areas (6.9% and 4.6% respectively).

For consumers of products shown in Table 13, the potential iodine intake from each product was calculated based on: approximate estimates for daily per capita intake (see Table 13), the approximate percent of salt in the product, an assumption that salt was iodised to a level of 25 mg/kg, and that 30% of iodine was lost from production through to the final product at the time of consumption. See Appendix 3 for additional details of this methodology. The results for potential iodine intake (in µg) are shown in Figure 15.

Figure 15 indicates that the highest potential daily intake of iodine is estimated to come from using iodised salt in bread production (contributing a daily per capita intake of 26 µg iodine, using conservative estimates for the daily per capita consumption – bread has a relatively low salt content but a relatively high volume of typical consumption), smoked sausage production (contributing a daily per capita intake of 21 µg iodine - smoked sausage has a medium salt content with a medium volume of typical consumption), and in seasoning production (contributing a daily per capita intake of 11 µg iodine - seasoning has a high salt content with a relatively low volume of consumption).

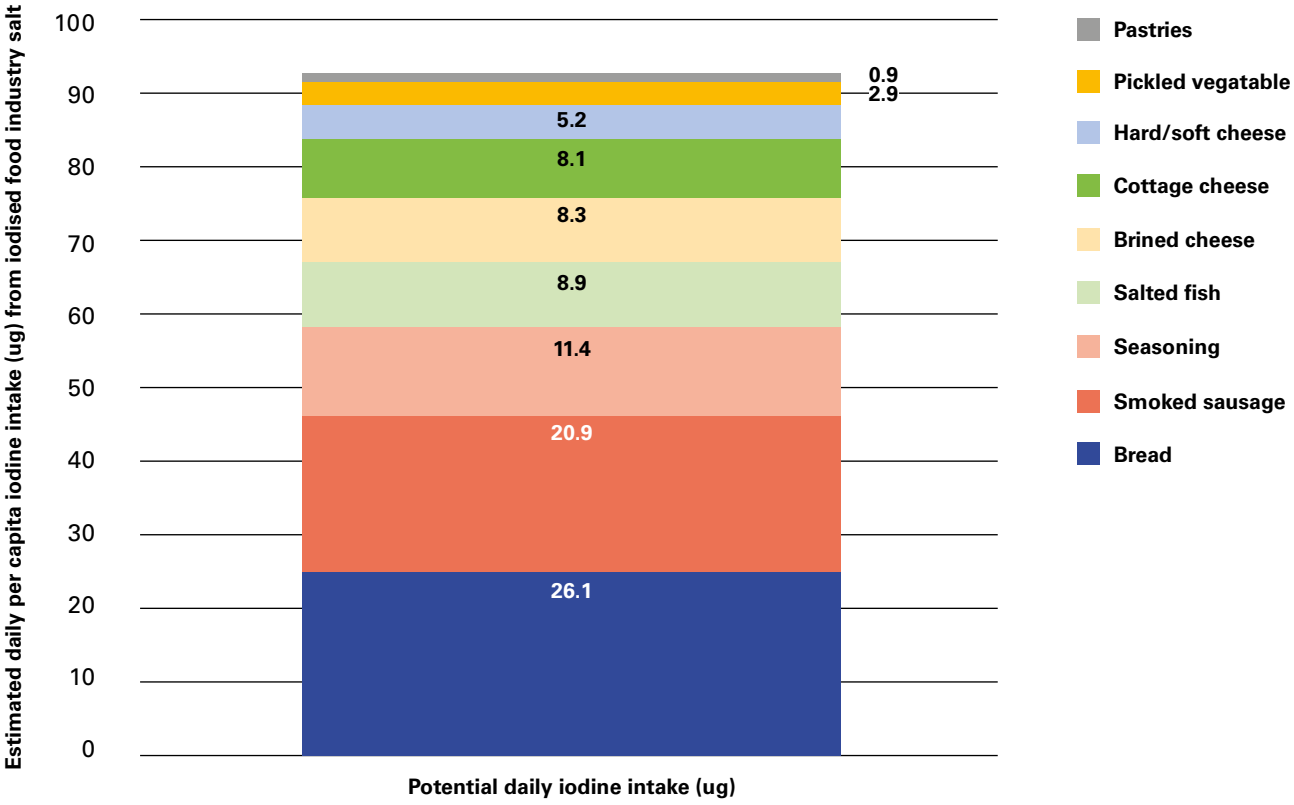
Salted fish, brined cheese and cottage cheese are the next biggest contributors to estimated salt, and therefore to potential iodine, consumption (8 to 9 µg iodine per capita per day) among WRA. Followed by hard / soft cheese consumption (5 µg iodine), then pickled vegetables (3 µg iodine) and pastries (1 µg iodine).

These intake figures in Figure 15 can be compared with the internationally recommended Estimated Average Requirement (EAR) and Recommended Nutrient Intake (RNI) for iodine for non-pregnant WRA, which are 95 µg and 150 µg per day respectively, and with the Tolerable Upper Intake Level (UL) for iodine for adults, which is 1,100 µg/day [56].

The approximate daily per capita iodine intakes presented here only apply to consumers of the products. The most widely consumed products included in this survey were bread and hard / soft cheese, both were consumed by approximately 90% of WRA in the week before the survey nationally (Table 13). At the sub-population level, reported consumption of these products varied by different cross tabulation factors. Lowest bread consumption was reported among WRA in the highest wealth category (83%) and the highest was among WRA living in the West macro-region (98%). For hard / soft cheese, the variation in any consumption in the previous week varied from 82% in the North-Central macro-region to 94% in the West macro-region. The high frequency of bread consumption across all sub-population groups means that bread could be an important source of iodine for much of the population, if the salt used in its production was iodised. The text above emphasises that these estimates are based on some broad assumptions and are, therefore, very approximate. However, it illustrates that, IF these foods were made with iodised salt, they could make a significant contribution to moving iodine intake among the population from insufficient to optimal.

[56] Institute of Medicine (US) Panel on Micronutrients. Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc. Washington (DC): National Academies Press (US); 2001.

Figure 15. Potential daily iodine intake (µg) from commonly consumed salt-containing products if all food industry salt iodised to 25 mg/kg



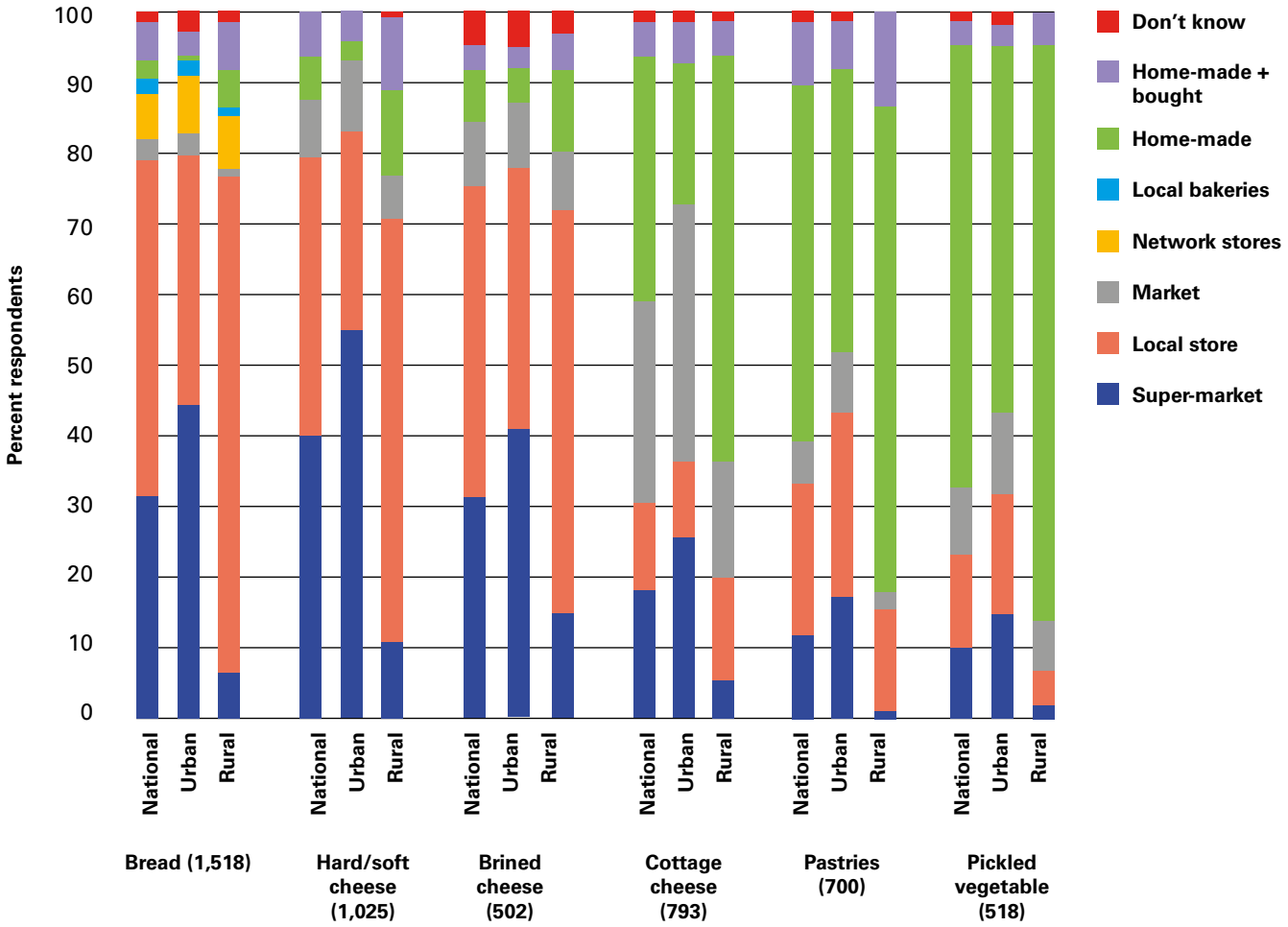
The Estimated Average Requirement (EAR) and Recommended Nutrient Intake (RNI) for iodine for non-pregnant WRA are 95 µg and 150 µg per day respectively (see reference in the footnote).
See Appendix 3 for details of the assumptions used as the basis for iodine intake estimates.

Regulation and monitoring the use of iodised salt are most feasible for industrially processed (as compared with artisanal/homemade) foods. To obtain an idea about the proportion of salt-containing foods that are industrially produced, the survey included a question about the most typical source of some of the foods (store/market or homemade, etc.) (see Figure 16) and also a question about whether the product was commercially packaged (sealed and labelled), see Figure 17 [57]. More detailed results with a breakdown of these factors by each category are shown in Appendix 5.

Over 70% WRA nationally and in urban and rural areas reported buying bread, hard/soft cheese and brined cheese from a supermarket or local store (Figure 16). Over 60% of WRA also reported that these same products were bought in commercial packaging, except for WRA in rural areas, where a lower percentage (53%) reported buying brined cheese in commercial packaging (Figure 17).

[57] Seasoning, salted fish, and smoked sausage were not included due to constraints on the length of interview and national partners advised that these products are usually commercially produced.

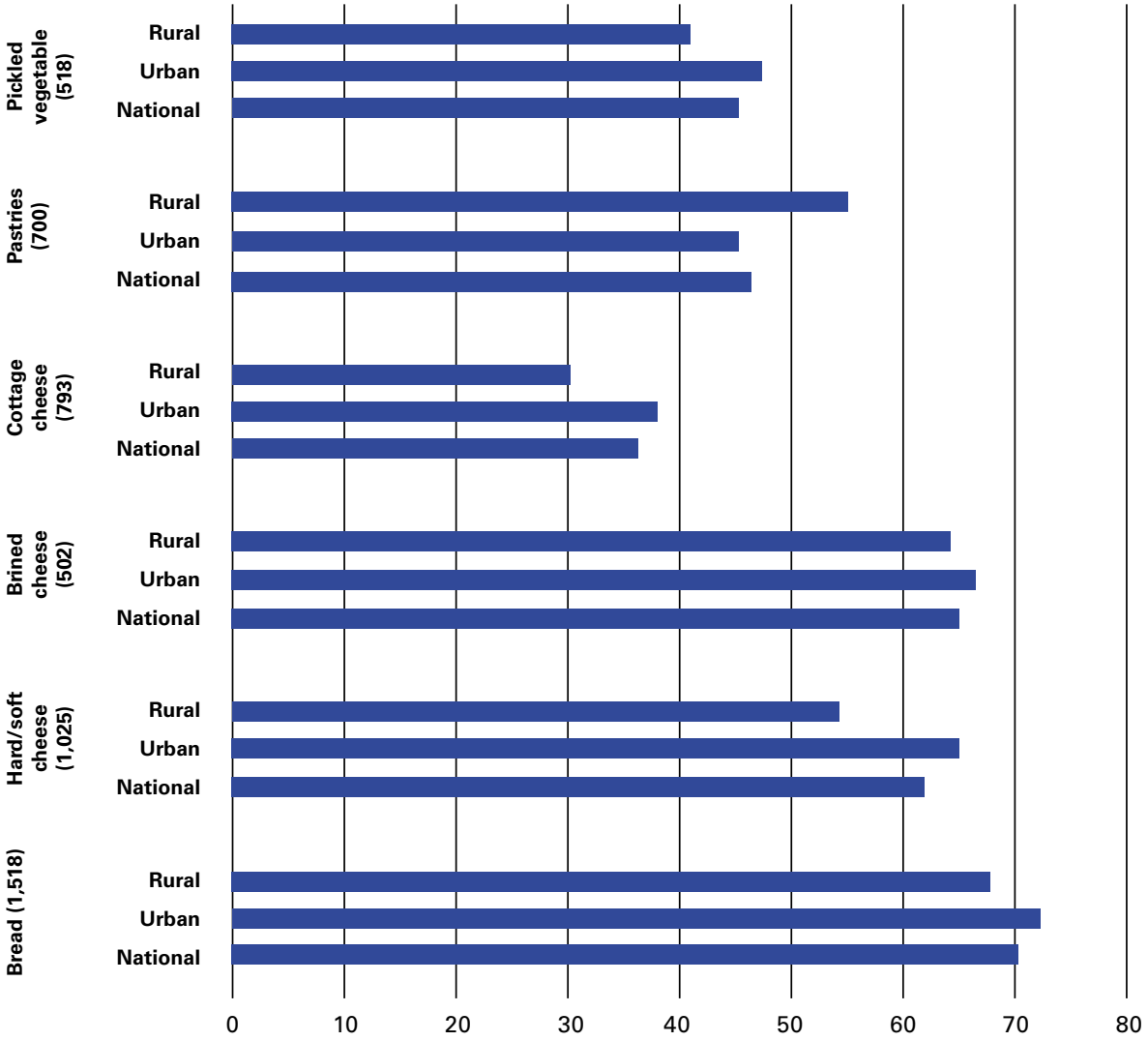
Figure 16. The most frequent source of common salt-containing foods as reported by WRA (for foods consumed in the week preceding the survey)



Information in this figure is only for respondents who reported having consumed each product during the week prior to the survey (n in brackets after product name).
See Appendix 5 for a more detailed breakdown of product sources by other cross tabulations, such as macro-region and perceived wealth.

The majority of cottage cheese, pastries and pickled vegetables were bought at a market or homemade (particularly in rural areas) (Figure 16) and a relatively low percent was sourced in commercial packaging (< 40% for cottage cheese) and between 40% to just over 50% for pastries and pickled vegetables (Figure 17).

Figure 17. Percent of common salt-containing foods reported by WRA to be purchased in commercial packaging (for foods consumed in the week preceding the survey)



Information in this figure is only for respondents who reported having consumed each product during the week prior to the survey (n in brackets after product name).
See Appendix 5 for a more detailed breakdown of product sources by other cross tabulations, such as macro-region and perceived wealth.

This information about the percentage of each industrially produced product strengthens the argument that iodisation of salt in bread would be an appropriate strategy to improve iodine status (alongside iodisation of household salt) and that its implementation could be effectively regulated and monitored.

An argument sometimes made against salt iodisation is that the main risk period for the impact of iodine deficiency is during pregnancy and pregnant women can take iodine supplements. The disadvantages to this as a solution are:

- Sufficient iodine for optimal foetal development is essential from the start of pregnancy and many women either do not know they are pregnant or do not seek antenatal care, or start supplementation, until mid-first trimester, or into the second trimester.
- There is little evidence that an approach of supplementation has worked during the 20 years when it has been known that iodine deficiency is a national problem. The use of iodine-containing supplements before pregnancy (4.5% of the 2021 survey population) and during pregnancy remains low (estimated to be between 4% to 40%, see baby box data in the text box).

- Salt iodisation would provide additional iodine to all, at a level that would not risk iodine intake above optimal levels and does not require the level of education and behaviour change needed to achieve universal use of iodine-containing supplements prior to conception.

- Women with higher socio-economic status are more likely to take supplements, meaning it is not an equitable intervention.

Baby box data, 2019

Baby Box Monitoring is the process of systematic collection, analysis and reporting of information to ensure timely and quality inputs for the Ukrainian Government's Baby Box project implementation.The Baby Box is one off kit, which includes a set of necessary things (such as clothes, toys, nappies, etc.) for the newborn child and is distributed when mother and child are discharged from the maternity hospital. Monitoring was conducted through periodic, nationally representative,face-to-face and I or phone interviews with women who delivereda live birth in the previous 3 to 4 weeks. Information from UNICEF Ukraine in 2019.

The monitoring survey round in August 2019 included additional questions about the use of iodised salt and iodine-containing supplements, the sample size was 790 women.The results were as follows:

- 49.5% of interviewed women reported that they use iodised salt for cooking or in the kitchen.
- Of 330 women who said they did not use iodised salt, 86% were not able to give a reason why ("don't know" response).
- 76% of women said they had taken a micronutrient supplement while pregnant
- 58% reported taking an iodine containing supplement, however, investigating the ingredients of the supplements they named as taking most regularly indicates that the actual percent using iodine containing supplements was lower.
- The actual percent using iodine containing supplements probably ranged from 4% (women who reported taking the iodomarin supplement) to 34% (women who reported taking the iodomari n supplement plus those who did not know or could not remember the name of the supplement).

The percentage of households participating in the baby box monitoring who reported using iodised salt is probably higher than actual use (the 2021 national survey indicates that only 30% of all households in Ukraine were using salt with any added iodine). However, the data indicate that most households either have no problem using iodised salt or do not have any clear objection to using it.

6. Conclusion and Recommendations

The Ukraine national iodine survey 2021 shows that WRA are still iodine deficient, and that household use of salt iodised to at least 15 mg/kg is still very low. Iodine status remains the second lowest in the region, and the use of iodised salt remains the lowest among countries in the region with national data (see Figures 3 and 2).

As noted in the introduction, Ukraine is the only country of the 21 countries within the UNICEF Europe and Central Asia (ECA) region (countries with UNICEF country offices) without some form of mandatory legislation for salt iodisation[58].

WHO guidance states[59] that:

- A median urinary iodine concentration < 100 µg/L indicates insufficient iodine intake.
- Insufficient iodine intake is especially damaging during pregnancy and in early childhood, it may result in irreversible brain damage in the developing foetus and infant and impede children's learning ability.
- The most susceptible groups for iodine deficiency disorders (IDD) are women of reproductive age, since iodine deficient in utero neonates are at high risk of irreversible mental impairment, and women providing breast milk to their children, as this may be the infant's only source of iodine during the first 6 months of life.
- The most cost-effective proven intervention to prevent iodine deficiency is universal salt iodisation (which includes the iodisation of salt for use by the food industry and salt for animal feed).
- Countries that focus on iodisation of table salt alone may not achieve optimal population iodine nutrition meaning it is necessary to include iodised salt in processed foods (see the introduction section for more details on the rationale).
- Policies on salt reduction and salt iodisation are compatible. Monitoring of salt intake, salt iodisation, and iodine status at the national level would provide the evidence for any necessary adjustment to the salt iodine content over time to ensure that individuals consuming the recommended amount of sodium continue to consume sufficient iodine.

Results from this survey show a clear improvement in iodine status among the population of WRA using iodised household salt. Alongside this, estimates based on information about food consumption indicate that iodisation of salt used for bread production in Ukraine could provide almost a fifth of adult iodine requirements. The finding that bread intake does not differ significantly by macro-region, residence or wealth indicates that iodisation of bakery salt would benefit most of the population. Only a small percentage (<6%) of WRA reported to eat homemade bread. If iodisation of household salt was mandatory, then the salt in homemade products would also be a source of iodine. As noted in the introduction, the use of iodised salt in bread production has proven feasible and acceptable, with evidence of impact, in a number of countries.

Other significant contributions to iodine intake are possible from using iodised salt in the production of smoked sausage, seasoning, and various types of cheese. With no evidence that iodine intake from these combined sources would come close to the tolerable upper intake level for iodine.

At the time of the 2021 survey in Ukraine, Artemsil, the main, state-owned, national salt producer, was one of the largest in Europe and was producing quality-assured iodised salt for many European countries where iodised salt was required by law. Without legislation in Ukraine, most of the salt produced for the domestic market was not iodised. Evidence from this survey indicates that this is putting the population at risk of constrained socio-economic development because of insufficient iodine intake.

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[58] Seasoning, salted fish, and smoked sausage were not included due to constraints on the length of interview and national partners advised that these products are usually commercially produced.

[59] World Health Organization (2014) Guideline: Fortification of food-grade salt with iodine for the prevention and control of iodine deficiency disorders. Geneva, Switzerland: WHO

The main recommendation from this survey is to advocate for recognition of the above WHO statements and urgently implement legislation for quality-assured iodisation of all imported or domestically produced cooking/table salt and for iodised salt to be used in the food industry, at minimum in the bread industry.

The Russian invasion of Ukraine in February 2022 has changed the national situation and the context of these conclusions and recommendations, see the specific section about this below.

LIMITATIONS TO THE CONCLUSIONS AND RECOMMENDATIONS IN THIS REPORT

The national situation has changed dramatically since the planning and implementation of this survey (2019-2021) to the time of writing this report (mid 2022).

The Russian invasion has resulted in a significant movement of the population from East to West Ukraine and out of the country. It has also led to changes in the supply and cost of salt and other foods. These factors greatly affect the applicability of the survey findings in terms of current regional differences, etc. However, it does not alter the urgent need to protect the population through mandatory salt iodisation. Indeed, the war, with the heightened risk of leakage of radioactive materials from nuclear power plants in the country, has increased the importance and urgency of doing this. The percentage thyroid uptake of iodine decreases in an iodine sufficient population [60], indicating a reduced risk of high uptake of radioactive iodine.

The Artemsil salt works in Donetsk (East Ukraine) had to stop production due to damage and ongoing risks from the war [61]. The only other national salt producer that the author of this report could find information about, is in Drohobych (Lviv oblast in West Ukraine) and does not have the capacity to supply sufficient salt even for Lviv oblast. It is also state-owned and reportedly requires modernisation of all aspects of production [62]. Reports indicate that there is no capacity for salt iodisation at this site and it is recommended that iodisation facilities are included as part of any modernisation plan.

The online news report mentioned above states that a larger share of the national salt supply now originates from Turkish and Romanian producers. Both these countries (as well as other neighbouring countries from where salt may now be sourced) have legislation for mandatory iodisation of cooking and table salt; therefore, the percentage of iodised salt on the market may have increased since the time of the survey. However, at the time of writing, there is no evidence to support this.

[60] S Moorthy D, Sood A, Ahluwalia A, Kumar R, Pandey RM, Pandav CS, Karmarkar MG, Padhy AK. Radioiodine kinetics and thyroid function following the universal salt iodization policy. Natl Med J India. 2001 Mar-Apr;14(2):71-4.

[61] https://www.txtreport.com/news/2022-05-26-europe-s-largest-salt-producer-artemsil-shut-down-due-to-fighting-in-donbass.H16aggaD9.html

[62] https://golossokal.com.ua/en/pidpryjemstva/drohobytska-solevarnia-zbilshyla-obsiahy-vyrobnytstva.html

ADVOCACY POINTS FROM THE UKRAINE NATIONAL IODINE SURVEY 2021

- The Ukraine national iodine survey 2021 shows that women of reproductive age (WRA) in Ukraine remain iodine deficient, and that only about a fifth of households use salt iodised to at least 15 mg/kg. The estimates for these indicators have not changed since the last survey in 2002, which highlighted the risk of this situation to national socio-economic development, and led to advocacy for mandatory salt iodisation at that time.

- Iodine status in Ukraine remains the second lowest in the UNICEF Europe and Central Asia (ECA) region, and the use of iodised salt remains the lowest among countries in the region with national data.

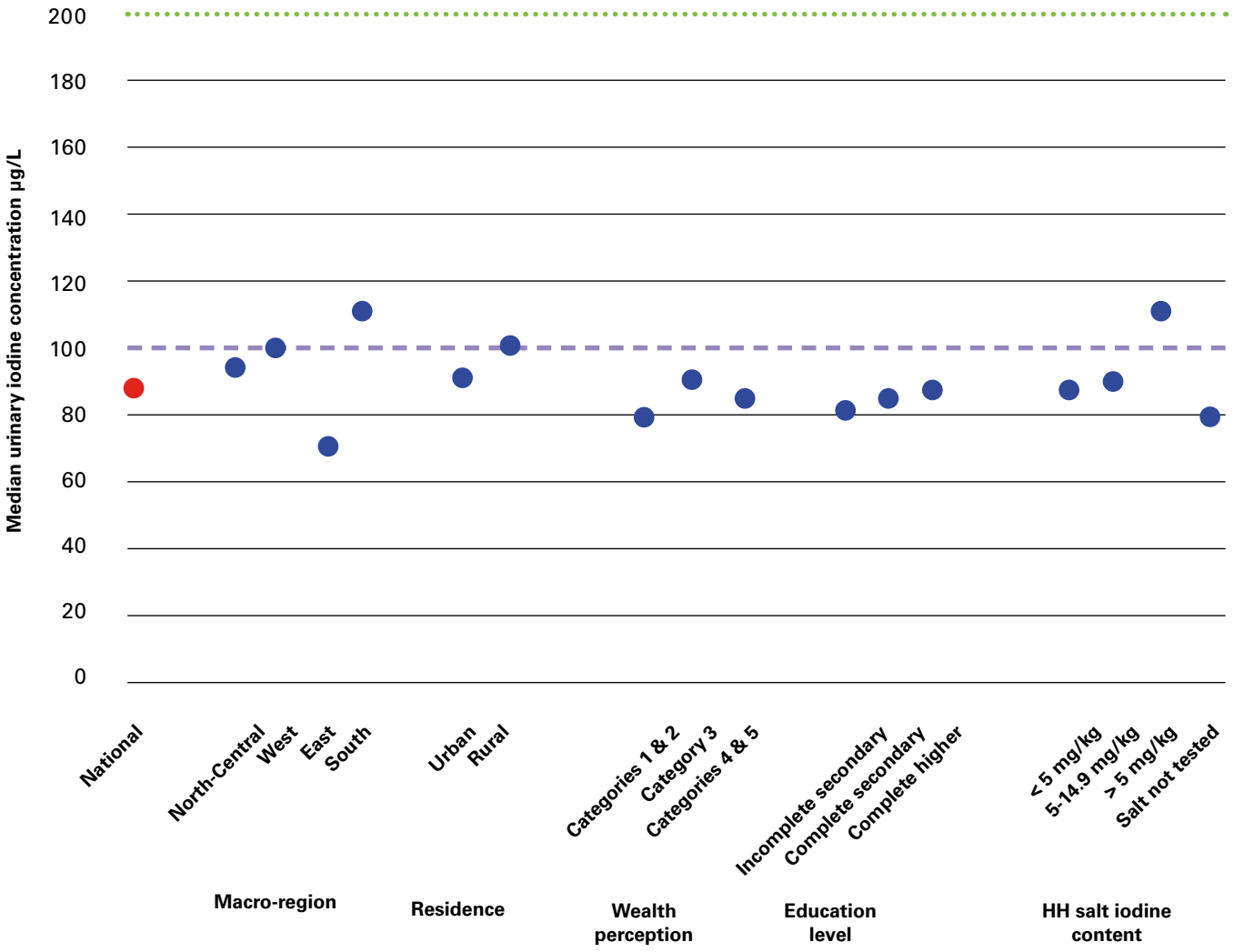
    - A median urinary iodine concentration (mUIC) < 100 µg/L indicates insufficient iodine intake. The national mUIC among WRA in 2021 was 90 µg/L.

    - Insufficient iodine intake is especially damaging during pregnancy and in early childhood. Iodine deficiency may result in irreversible brain damage in the developing foetus and infant and impede children's learning ability.

    - It is, therefore, most important that women of reproductive age (women entering pregnancy) have adequate iodine for the early stages of foetal brain development, and that pregnant and breastfeeding women have adequate iodine intake for optimum foetal and infant development. Exclusively breastfeeding infants for the first 6 months is important for their nutrition and development, however, this means that breastmilk will be the infant's only source of iodine during the first 6 months of life.

- Results from the 2021 survey show adequate iodine status among the national population of WRA using adequately iodised household salt, indicating the effectiveness of this intervention. The iodine status of WRA in the South macro-region was also found to be adequate, possibly due to its more coastal, less mountainous, situation. However, the mUIC was only just above the cut off for adequacy for both groups and the lower 95% confidence interval was below this cut off, indicating that the true mUIC is borderline adequate/ inadequate. (See chart below).

Median UIC among WRA nationally and by category



- Iodine intake from quality-controlled iodisation of all food grade salt is needed to protect the whole population. Dietary intake from quality-controlled iodised salt would not increase the median UIC to or above the upper level for adequate iodine nutrition.
- Ukraine remains the only country of the 21 countries within the UNICEF ECA region without some form of mandatory legislation for salt iodisation .
- The government and national partners urgently need to follow WHO and UNICEF guidance which states that:
  i. The most cost-effective, proven, intervention to prevent iodine deficiency is universal salt iodisation (which includes the iodisation of salt for use by the food industry and salt for animal feed).
    - Countries that focus on iodisation of table salt alone may not achieve optimal population iodine nutrition meaning it is necessary to include iodised salt in widely used, salt containing, industrially processed foods.

  ii. Policies on salt reduction and salt iodisation are compatible. Monitoring the population's salt (and iodised salt) intake and iodine status, while implementing strong regulation/quality control iodised salt production and import, would provide the evidence for any necessary adjustment to the salt iodine content over time to ensure that individuals consuming the recommended amount of sodium continue to consume sufficient iodine.

- Food consumption estimates from the 2021 survey indicate that iodisation of salt used for bread production in Ukraine could provide almost a fifth of adult iodine requirements. Bread intake was found to be similar across macro-regions, by residence type, and wealth categories, therefore, iodisation of bakery salt would equitably benefit most of the population.
    - The use of iodised salt in bread production has proven feasible and acceptable, with evidence of impact, in a number of countries
    - Only a small percentage (<6%) of WRA reported to eat homemade bread. If iodisation of household salt was mandatory, then the salt in homemade products would also be a source of iodine.
    - The high percentage of population using industrially produced bakery products strengthens the argument that iodisation of salt in bread would be an appropriate strategy to improve iodine status (alongside iodisation of household salt) since its implementation could be effectively regulated and monitored.
- Using iodised salt in the production of smoked sausage, seasoning, and various types of cheese would also contribute significantly to population iodine intake.
- There is no evidence currently that iodine intake from these combined sources would come close to the tolerable upper intake level for iodine.
- The Russian war in Ukraine, with the heightened risk of exposure to radioactive materials, has increased the importance and urgency of ensuring adequate iodine nutrition. The percentage thyroid uptake of (potentially radioactive) iodine decreases in an iodine sufficient population .

The main recommendation from the 2021 survey is to advocate for recognition of the above WHO and UNCIEF recommendations and urgently implement legislation for quality-assured iodisation of all imported or domestically produced cooking/table salt and for iodised salt to be used in the food industry, at minimum in the bread industry.
The Russian invasion has resulted in a significant movement of the population from East to West Ukraine and out of the country. It has also led to changes in the supply and cost of salt and other foods. These factors greatly affect the applicability of the survey findings in terms of current regional differences, etc. However, it does not alter the urgent need to protect the population through mandatory salt iodisation.

IODINE SUPPLEMENTS

An argument sometimes made against salt iodisation is that the main risk period for the impact of iodine deficiency is during pregnancy and that pregnant women can take iodine supplements. The disadvantages to this as a solution are:

- Sufficient iodine for optimal foetal development is essential from the start of pregnancy and many women either do not know they are pregnant or do not seek antenatal care, or start supplementation, until mid-first trimester, or into the second trimester.
- There is little evidence that an approach of supplementation has worked in Ukraine during the 20 years when it has been known that iodine deficiency is a national problem. The use of iodine-containing supplements before pregnancy (4.5% of the 2021 survey population) and during pregnancy remains low (Baby Box data from 2019 produced estimates of iodine containing supplement use between 4% to 34%, more likely towards the lower end of that range from the information provided).
- Salt iodisation would provide additional iodine to all women, at a level that would not risk iodine intake above optimal levels and does not require the level of education and behaviour change needed to achieve universal use of iodine-containing supplements prior to conception.
- Women with higher socio-economic status are more likely to take supplements, meaning it is not an equitable intervention.
- Sufficient iodine intake is essential for the mental and physical development of all population groups. Encouraging the use of supplements prior to and during pregnancy would not benefit other population groups.

APPENDICES

APPENDIX 1.
Global Recommendations for Conducting an Iodine Survey

At the end of 2015 UNICEF and the Iodine Global Network (IGN), held a technical working group meeting to discuss latest advances in understanding of how monitoring of salt iodisation and assessment of population iodine status could be improved. UNICEF used the outcomes from this meeting to develop an updated guidance document for national programme managers[1].

This updated UNICEF guidance document, along with other documents result in the following key recommendations relevant to the iodine survey in Ukraine:

The adequacy of iodine intake should be examined among different subsets of the population, especially among groups vulnerable to deficiency. Data for geographic or programmatically relevant sub-groups of the population will provide more programmatically useful information than a nationally representative survey alone.

Rapid test kits (RTKs) should only be used to differentiate between non-iodised and iodised salt. More precise methods, such as titration or other validated quantitative assessment tools are required to measure the percentage of salt that is inadequately iodised or adequately iodised.

The median urinary iodine concentration (mUIC) indicating an acceptable range of 'adequate' iodine intake among school-age children can be widened from 100–199 µg/L (in the 2007 Guide) to 100–299 µg/L. A 2013 study assessing thyroid function and iodine status found that the mUIC range of 100–299 µg/L was not associated with any thyroid dysfunction. There is currently no data to indicate that this widened range can be applied to other groups such as women of reproductive age. However, ongoing studies among this and other population groups (including pregnant women) aim to provide stronger rationale for the mUIC cut off and range of mUIC indicating adequate iodine intake among these groups.

As also recommended in the 2007 guide, the mUIC indicator can only be used to define whether a population is iodine deficient, has adequate iodine, or possibly has excessive iodine intake. UIC data from spot urine samples cannot be used to identify the iodine status of an individual and, therefore, cannot be used to quantify the proportion of the population with iodine deficiency or iodine excess (i.e., it is not valid to present data for the percentage of the population with iodine deficiency or other categories of iodine status).

Processed foods (including condiments) can be an important current or potential source of iodised salt. A household survey should, therefore, try to capture some measure of intake of key processed foods known to be widely consumed by the population group being assessed. Where the use of vitamin and mineral supplements is common, their use should also be included. These data can be used to help explain possible improvements in iodine status that cannot be associated with any change in the use of iodised household salt.

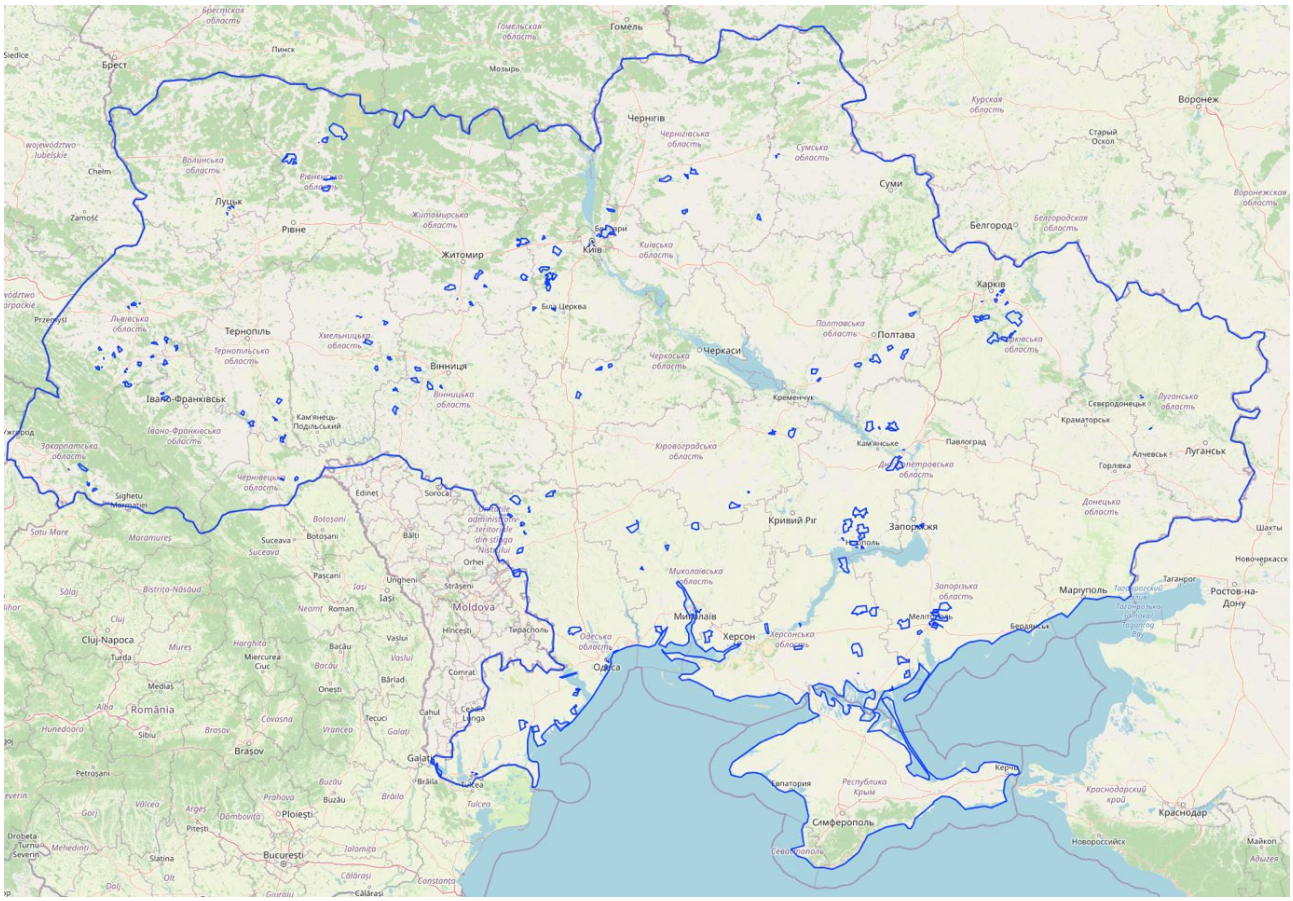
Information on salt grain type and packaging should be obtained where possible, so it can be used to determine if there is any association of salt quality with iodine content.

A number of technical recommendations on analysis and presentation of survey data were also proposed and were taken into account in the design of the Ukraine survey tool, tabulations and data analysis plan.

[1] UNICEF Guidance on the Monitoring of Salt Iodization Programmes and Determination of Population Iodine Status. 2018 https://www.unicef.org/nutrition/files/Monitoring-of-Salt-Iodization.pdf (Accessed April 2019)

APPENDIX 2.
Map of the final survey sample clusters

The blue outlines within the map of Ukraine highlight each of the 260 sampled clusters.



[2] Example: Milevska-Kostova N, Karanfilski B, Knowles J, Codling K, Lazarus JH. Modelling the contribution of iodised salt in industrially processed foods to iodine intake in Macedonia. Restani P, editor. PLOS ONE. 2022 Jan 28;17(1):e0263225.

APPENDIX 3.
Data management details

Determination of approximate food intake estimates from food consumption data and information on the approximate portion size.

Daily food consumption estimates were based on this calculation: (portion size x reported number of times the food was consumed during the week before the survey) divided by seven days. The following estimated portion sizes were used in this calculation, based on the sources provided and triangulated with information on portion sizes from studies into the use of processed food in the region (Moldova and North Macedonia)[2].

Food type	Estimated portion size	Source
Sea fish	100g	An average (possibly smaller than average) portion size based on recommendations from a variety of European countries https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-9_en
Milk	250ml	An average (possibly smaller than average) portion size based on recommendations from a variety of European countries https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-7_en
Bread	120g	Larive Ukraine. Bakery Chain in Ukraine; Ministry of Economic Affairs, Agriculture and Innovation: The Hague, The Netherlands, 2011 estimated bread consumption to be 240g/pers/day. CEIC data estimates 280g/day for bread and bakery products https://www.ceicdata.com/en/ukraine/household-consumption. 120g was used as a conservative portion size estimate based on this information.
Hard / soft cheese	40g	An average (possibly smaller than average) portion size based on national Ukraine recommendations for hard cheese: RECOMMENDATIONS OF MOH FOR HEALTHY NUTRITION OF ADULTS, approved on 8.12.2017 and from a variety of European countries for soft cheese: https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-7_en
Brined cheese	40g	An average portion size based on recommendations from a variety of European countries for brined cheese: https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-7_en
Cottage cheese	120g	An average portion size based on national Ukraine recommendations for hard cheese: RECOMMENDATIONS OF MOH FOR HEALTHY NUTRITION OF ADULTS, approved on 8.12.2017
Pastries	30g	An estimate based on national advice and similar information from Moldova.
Seasoning	3g	From websites for carious products such as Knorr, Marigold and Vegeta. Serving sizes vary from 1 to 5g.
Salted fish	35g	Conservative estimate based on Estonia recommended intake, from https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-9_en
Smoked sausage	100g	Average estimate based on recommended intakes from different countries in https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-8_en
Pickled vegetable	100g	Average estimate based on recommended serving sizes from different jars of pickled vegetables produced in Eastern Europe

Determination of approximate iodine intake estimates from food consumption and other data.

Column label:	A	B	C	D	F	G	H
Food product	Estimated average daily per capita consumption (g)	Salt content	Estimated daily salt intake from the product (g)	Potential iodine intake (µg) from daily intake (g) of the product	Potential % EAR for iodine from typical daily intake of the product	Potential % RNI for iodine from typical daily intake of the product	Potential % UL for iodine from typical daily intake of the product
Calculation for each column:		(% product weight)*	A * B	C * 25µg * 70% (to account for iodine losses)	D / 95 µg (EAR iodine for WRA)	D / 150 µg (RNI iodine for WRA)	D / 600 µg (UL iodine for WRA)
Bread			1.5	26.1	27.4%	17.4%	4.3%
Smoked sausage	99.3		1.2	20.9	22.0%	13.9%	3.5%
Seasoning	39.8	1.5%	0.6	11.4	12.0%	7.6%	1.9%
Salted fish	1.4	3.0%	0.5	8.9	9.4%	5.9%	1.5%
Brined cheese	10.2	45.0%	0.5	8.3	8.8%	5.6%	1.4%
Cottage cheese	13.6	5.0%	0.5	8.1	8.5%	5.4%	1.3%
Hard / soft cheese	46.1	3.5%	0.3	5.2	5.5%	3.5%	0.9%
Pickled vegetable	18.7	1.0%	0.2	2.9	3.0%	1.9%	0.5%
Pastries	32.7	1.6%	0.1	0.9	0.9%	0.6%	0.1%
For all selected products	10.1	0.5%	0.5	9.0	9.5%	6.0%	1.5%

*The percent salt content of foods and the calculations above were based on work conducted in a number of countries the Iodine Global Network during the development of Programme Guidance on the use of Iodised Salt in Processed Foods[3]

[3] IGN Programme Guidance on the Use of Iodised Salt in Processed Foods
https://www.ign.org/program-guidance-on-the-use-of-iodized-salt-in-industrially-processed-foods.htm (Accessed July 2022)

APPENDIX 4.
Rapid test kit performance

Tables App4a to c show a more detailed analysis of the performance of the RTK compared with titration to assess the presence of iodine (>0mg/kg) and of added iodine (>5mg/kg) in the salt samples from this survey. The results indicate that the RTK provides a good agreement with the more quantitative titration results when the cut off for iodised salt is set at 5mg/kg (91% agreement) than it is set at > 0mg/kg (24% agreement) (Table App4c).

Table App4. Performance of rapid test kit, compared with quantitative titration method, for assessing presence of iodine in salt.

Table App4a – using a cut off of >0mg/kg iodine to define iodised salt

		Salt iodine with quantitative test (Titration)		
		0 mg/kg	> 0 mg/kg	Total
Semi-quantitative test (RTK)	Iodine absent (RTK, no colour change)	17 (1.7%)	990 (98.3%)	1,007
	Iodine present (RTK, colour change)	0 (0%)	295 (100%)	295

Table App4b - using a cut off of >5mg/kg iodine to define iodised salt

		Salt iodine with quantitative test (Titration)		
		< 5 mg/kg	> 5 mg/kg	Total
Semi-quantitative test (RTK)	Iodine absent (RTK, no colour change)	899 (89.3%)	108 (10.7%)	1,007
	Iodine present (RTK, colour change)	15 (5.1%)	280 (94.9%)	295

Table App4c – RTK performance indicators with different cut offs to define iodised salt

		Cut off used to define iodised salt	
		0mg/kg	5mg/kg
Household use of iodised salt by RTK		22.7%	22.7%
Household use of iodised salt by Titration		98.7%	29.8%
RTK Sensitivity	Ability to identify true positives	23.0%	72.2%
RTK Specificity	Ability to identify true negatives	100.0%	98.4%
AR =	Agreement rate (accuracy)	24.0%	90.6%
PPV =	Positive predictive value	100.0%	94.9%
NPV =	Negative predictive value	1.7%	89.3%

APPENDIX 5.
Detailed food consumption, source, and packaging tables

All the following food-related tables are based on self-reported consumption estimates and other information from the interviewed WRA

Table App5a. Frequency of consumption of sea fish and estimated intake (among sea fish consumers) in the week prior to the survey

			Number of days sea fish consumed over the past week						
		Number of respondents	0	1 to 2	3 to 4	5 to 7	Don't know	Number of respondents who consumed sea fish at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,666	54.8	30.5	10.1	4.3	0.3	746	223
Macro-region	North-Central	436	59.5	25.2	9.4	5.1	0.8	211	248
	West	470	58.2	36.3	4.6	0.9	0.0	190	167
	East	428	48.3	30.4	15.6	5.5	0.2	251	241
	South	332	51.3	31.1	10.9	6.7	0.0	94	234
Residence	Urban	1,019	53.0	32.3	9.7	4.8	0.2	517	223
	Rural	647	58.6	26.9	10.9	3.0	0.5	229	225
Wealth perception	Categories 1 & 2	688	59.8	25.3	11.4	3.5	0.0	262	231
	Category 3	715	55.4	32.2	9.0	3.1	0.3	329	206
	Categories 4 & 5	207	40.7	38.5	9.0	10.9	0.9	129	255
Education level of the WRA respondent	Incomplete secondary	300	58.0	27.9	10.0	4.1	0.0	115	221
	Complete secondary	843	56.8	29.7	10.1	3.4	0.0	368	221
	Complete higher	523	50.9	32.4	10.0	6.0	0.8	263	228

* Intake estimate only for WRA who reported to have consumed sea fish in the past week. The calculation was based on an estimated portion size of 100g[4] and an assumption that only one portion was consumed per day for the reported number of days when sea fish was consumed (the intake calculation was performed using actual number of days, as asked in the questionnaire, not the range of days shown in the table).

[4] An average (possibly smaller than average) portion size based on recommendations from a variety of European countries

Table App5b. Type of milk or plant-based milk substitute consumed in the week before the survey

			Number of days sea fish consumed over the past week					
		Number of respond-ents	Don't drink milk or any milk substitute	Store bought cow milk	Home/ neighbourhood pro-duced cow milk	Goat milk	Plant based milk substitute	Don't Know
NATIONAL		1,666	44.0	31.0	20.4	2.0	1.9	0.6
Macro-region	North-Central	436	38.2	39.7	17.1	2.6	1.9	0.4
	West	470	35.6	33.2	29.0	0.9	1.1	0.2
	East	428	59.3	19.1	15.8	2.1	2.5	1.2
	South	332	40.9	31.6	20.7	3.1	3.1	0.5
Residence	Urban	1,019	44.0	38.3	12.5	2.3	2.1	0.9
	Rural	647	44.1	16.5	36.2	1.6	1.6	0.0
Wealth perception	Categories 1 & 2	259	46.3	24.3	24.6	2.6	2.0	0.2
	Category 3	332	41.9	35.2	19.4	1.3	1.2	0.9
	Categories 4 & 5	124	46.8	34.2	9.5	3.2	5.0	1.4
Education level of the WRA respondent	Incomplete secondary	300	40.9	24.5	29.2	2.6	2.2	0.7
	Complete secondary	843	46.1	27.9	21.5	1.9	1.8	0.8
	Complete higher	523	42.2	39.2	14.2	2.1	2.1	0.4

https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-9_en

Table App5c. Frequency of consumption of store-bought cow milk and its estimated intake (among commercial cow milk consumers) in the week prior to the survey

			Number of times respondent consumed store bought cow milk in the past week						
		Number of respondents	0	1 to 2	3 to 4	5 to 7	Don't know	Number of respondents who consumed the product at least once	Approximate average weekly per capita consumption (ml)*
NATIONAL		515	13.2	35.0	28.2	23.3	0.4	445	834
Macro-region	North-Central	167	12.8	27.0	24.6	35.5	0.0	184	885
	West	182	7.3	45.0	33.1	14.6	0.0	139	660
	East	75	21.7	31.5	28.3	16.3	2.2	71	1134
	South	97	18.0	41.0	26.2	14.8	0.0	50	632
Residence	Urban	415	14.2	33.8	28.1	23.6	0.2	362	788
	Rural	106	8.7	40.2	28.3	21.7	1.1	83	1041
Wealth perception	Categories 1 & 2	163	20.3	38.6	25.9	14.6	0.6	125	708
	Category 3	257	9.2	37.5	31.0	22.2	0.0	237	772
	Categories 4 & 5	78	6.7	24.0	22.7	46.7	0.0	71	980
Education level of the WRA respondent	Incomplete secondary	74	13.4	41.8	26.9	17.9	0.0	57	805
	Complete secondary	226	12.6	38.7	28.2	19.7	0.8	207	850
	Complete higher	221	13.8	28.6	28.6	29.0	0.0	181	825

* Intake estimate only for WRA who reported to have consumed store-bought cow milk in the past week. The calculation was based on an estimated portion size of 250ml[5] and an assumption that only one portion was consumed per day for the reported number of days when milk was consumed (the intake calculation was performed using actual number of days, as asked in the questionnaire, not the range of days shown in the table).

[5] An average (possibly smaller than average) portion size based on recommendations from a variety of European countries https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-7_en

Table App5d. Frequency of consumption of bread and its estimated intake (among bread consumers) in the week prior to the survey.

			Number of times respondent consumed store bought cow milk in the past week									
		Number of respondents	0 times	1-5 times	6-10 times	11-15 times	16-21 times	22-35 times	Don't know	Number of respondents who consumed bread at least once	Approximate average weekly per capita consumption (g)*+	Approximate average weekly per capita consumption (g)*++
NATIONAL		1,666	10.6	15.2	21.7	22.2	18.9	10.3	1.0	1,442	695	1,390
Macro-region	North-Central	436	15.1	18.3	22.5	18.3	17.2	7.9	0.6	700.7	701	1,401
	West	470	2.2	8.4	17.7	25.0	24.8	21.9	0.0	737.8	738	1,476
	East	428	15.4	18.2	25.4	18.9	15.6	4.1	2.5	637.2	637	1,274
	South	332	6.7	14.5	19.2	34.7	18.7	6.2	0.0	710.6	711	1,421
Residence	Urban	1,019	12.9	17.0	22.0	23.3	15.7	8.2	0.8	686.2	686	1,372
	Rural	647	6.1	11.6	21.1	20.2	25.2	14.5	1.3	711.6	712	1,423
Wealth perception	Categories 1 & 2	688	9.7	12.6	19.1	24.6	22.5	10.6	0.9	722.1	722	1,444
	Category 3	715	10.2	17.1	24.3	21.7	13.6	12.1	0.9	676.6	677	1,353
	Categories 4 & 5	207	17.3	15.9	20.5	18.2	24.5	3.2	0.5	665.5	665	1,331
Education level of the WRA respondent	Incomplete secondary	300	12.8	13.1	19.0	21.9	23.0	9.9	0.4	690.2	690	1,380
	Complete secondary	843	8.1	15.7	20.8	23.3	19.8	10.9	1.4	689.7	690	1,379
	Complete higher	523	13.6	15.3	24.4	20.9	15.5	9.7	0.7	707.2	707	1,414

* Intake estimate only for WRA who reported to have consumed bread in the past week. The calculations were based on estimated serving size of 120g[6] (+) and 240g (++) multiplied by the number of times the respondent reported consuming bread (the intake calculation was performed using actual number of times, as asked in the questionnaire, not the range of days shown in the table).

[6]Larive Ukraine. Bakery Chain in Ukraine; Ministry of Economic Affairs, Agriculture and Innovation: The Hague, The Netherlands, 2011 estimated bread consumption to be 240g/pers/day. CEIC data estimates 280g/day for bread and bakery products https://www.ceicdata.com/en/ukraine/household-consumption. The calculation was conducted using estimates of 120 and 240g/pers/day – for days when bread consumed- to provide a reasonable range for consideration.

Table App5e. Type of bread most frequently consumed in the week prior to the survey among WRA among WRA who consumed bread

			Type bread most frequently consumed (%)							
		Number of respondents	Dark rye	Wheat	White	Lavash/ pita/wrap	Sourdough	Other	2+ types	Don't know
NATIONAL		1,518	46.6	24.2	49.3	3.3	5.3	0.9	7.2	0.8
Macro-region	North-Central	436	45.8	25.0	43.5	6.5	7.1	2.0	5.6	74.1
	West	470	64.6	24.4	56.3	1.4	4.7	0.2	6.1	60.1
	East	428	29.7	26.7	42.9	2.5	3.7	0.0	11.0	76.5
	South	332	43.1	16.0	61.3	2.2	5.5	1.1	5.5	76.1
Residence	Urban	1,019	41.7	26.8	45.4	4.6	6.9	1.1	8.2	72.7
	Rural	647	55.7	19.3	56.8	1.0	2.3	0.4	5.4	67.7
Wealth perception	Categories 1 & 2	688	44.6	25.3	50.3	2.4	4.4	1.2	8.0	65.3
	Category 3	715	49.9	24.6	50.7	2.9	4.4	0.6	4.8	73.0
	Categories 4 & 5	207	43.7	21.4	43.7	7.7	10.4	0.0	8.2	77.3
Education level of the WRA respondent	Incomplete secondary	300	36.8	25.1	52.3	0.8	4.2	1.7	6.3	64.2
	Complete secondary	843	48.1	22.1	51.8	2.4	3.6	0.8	7.7	68.6
	Complete higher	523	49.0	27.3	43.6	6.1	8.5	0.7	6.9	78.3

Table App5f. Place of purchase for the most frequently consumed bread in the week prior to the survey among WRA who consumed bread

			Place of purchase for most frequently consumed bread (%)								
		Number of respondents	Super-market	Local store	Market	Network store	Local bakery	Home- made	Home-made + bought	Don't know	Percentage of respondents consuming mainly commercial packaged bread
NATIONAL		1,518	31.6	47.7	2.3	7.4	2.0	2.6	4.7	1.7	70.2
Macro-region	North-Central	373	39.4	34.5	2.7	9.4	3.4	3.4	3.8	3.6	72.6
	West	456	12.9	66.5	0.2	6.1	2.0	4.3	7.7	0.2	60.0
	East	377	47.2	38.3	4.4	6.1	0.2	0.0	2.0	1.7	75.6
	South	312	23.2	56.4	1.7	8.8	1.7	2.2	5.5	0.6	77.3
Residence	Urban	912	45.1	35.3	3.0	7.7	2.3	0.9	3.4	2.2	71.9
	Rural	606	6.7	70.6	1.0	6.9	1.3	5.6	7.1	0.8	67.1
Wealth perception	Categories 1 & 2	634	24.3	53.8	2.6	9.6	1.2	3.6	3.6	1.4	65.4
	Category 3	654	36.3	48.0	2.0	4.4	1.5	1.8	4.4	1.7	71.2
	Categories 4 & 5	175	34.1	35.2	3.8	12.1	6.0	1.1	6.0	1.6	78.0
Education level of the WRA respondent	Incomplete secondary	272	26.4	53.1	2.9	5.4	2.9	2.1	3.8	3.3	62.4
	Complete secondary	783	26.3	49.7	2.6	8.2	1.5	3.3	6.7	1.7	68.4
	Complete higher	463	43.0	41.5	1.7	7.1	2.4	1.5	1.9	0.9	77.4

Table App5g. Type of bread packaging (indicating scale of production) by type and place of purchase for the most frequently consumed bread in the week prior to the survey among WRA who consumed the different types of bread

			Type of Bread Packaging (%)		
		Number of respondents	Commercially packaged	Unpackaged	Don't Know
Type of bread reportedly consumed	Dark Rye	675	66.2	32.7	1.0
	Wheat	322	70.5	27.5	2.0
	White	735	67.1	32.5	0.4
	Lavash/ pita/wrap	46	80.9	19.1	0.0
	Sourdough	75	79.5	20.5	0.0
	Other	15	70.0	30.0	0.0
	More than 1 type frequently consumed	116	80.0	17.9	2.1
	Don't know	9	83.3	8.3	8.3
Place of reported purchase	Supermarket	440	88.0	11.3	0.8
	Local store	813	63.5	35.7	0.8
	Market	35	70.3	27.0	2.7
	Network store	117	62.4	37.6	0.0
	Local bakery	33	33.3	63.3	3.3
	Home made				
	Home made + bought	85	62.5	30.6	6.9
	Don't know / no regular consumption	13	38.9	11.1	50.0

* Intake estimate only for WRA who reported to have consumed brined cheese in the past week. The calculation was based on an estimated portion size of 40g[8] and an assumption that only one portion was consumed per day for the reported number of days when brined cheese was consumed (the intake calculation was performed using actual number of days, as asked in the questionnaire, not the range of days shown in the table).

[8] An average portion size based on recommendations from a variety of European countries for brined cheese: https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-7_en

Table App5h. Frequency of consumption of hard or soft cheese and its estimated intake in the week prior to the survey

			Previous week hard or soft cheese consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	# respondents who consumed hard/soft cheese at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,169	10.6	18.9	36.8	19.2	13.9	0.7	1,030	131.2
Macro-region	North-Central	267	18.2	15.8	30.9	16.4	18.2	0.6	268	143.4
	West	418	6.1	24.8	46.3	15.1	7.4	0.3	366	109.9
	East	240	6.5	15.0	31.4	28.3	16.7	2.0	268	146.8
	South	244	13.5	18.2	35.1	17.6	15.5	0.0	128	133.8
Residence	Urban	747	9.9	16.4	35.5	20.7	16.8	0.7	685	139.6
	Rural	422	11.9	23.6	39.3	16.2	8.1	0.8	344	114.5
Wealth perception	Categories 1 & 2	448	14.7	19.1	34.6	20.1	10.3	1.2	343	125.5
	Category 3	522	8.3	20.3	39.8	18.4	12.9	0.4	496	127.1
	Categories 4 & 5	162	6.9	15.4	33.1	19.4	25.1	0.0	163	153.5
Education level of the WRA respondent	Incomplete secondary	189	12.5	21.2	29.4	22.5	13.1	1.2	139	132.5
	Complete secondary	576	11.6	20.4	35.8	19.6	11.8	0.9	514	126.4
	Complete higher	404	8.7	15.9	40.7	17.3	17.1	0.2	377	137.3

* Intake estimate only for WRA who reported to have consumed hard or soft cheese in the past week. The calculation was based on an estimated portion size of 40g[7] and an assumption that only one portion was consumed per day for the reported number of days when cheese was consumed (the intake calculation was performed using actual number of days, as asked in the questionnaire, not the range of days shown in the table).

[7] An average (possibly smaller than average) portion size based on national Ukraine recommendations for hard cheese: RECOMMENDATIONS OF MOH FOR HEALTHY NUTRITION OF ADULTS, approved on 8.12.2017 and from a variety of European countries for soft cheese: https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-7_en

Table App5i. Place of purchase for hard/soft cheese consumed in the week prior to the survey among WRA who consumed this cheese

			Previous week hard or soft cheese consumption - number of days (%)						
		Number of respondents	Supermarket	Local store	Market	Home-made	Home- made + bought	Don't know	% respondents consuming mainly commercially packaged hard / soft cheese
NATIONAL		1,025	40.2	39.3	8.4	6.1	5.8	0.3	61.4
Macro-region	North-Central	208	49.3	28.5	12.2	8.5	1.5	0.0	72.5
	West	387	18.8	59.7	2.7	6.8	11.7	0.3	50.0
	East	222	64.1	18.3	11.0	3.7	2.2	0.7	70.8
	South	208	31.5	48.0	10.2	4.7	5.5	0.0	50.0
Residence	Urban	677	54.9	28.7	9.7	3.0	3.5	0.1	65.1
	Rural	348	10.9	60.1	5.7	12.4	10.3	0.6	53.1
Wealth perception	Categories 1 & 2	379	30.6	41.6	13.9	9.2	4.6	0.0	54.0
	Category 3	468	43.0	41.4	5.4	4.6	5.0	0.6	65.5
	Categories 4 & 5	147	48.5	30.1	6.1	4.3	11.0	0.0	58.6
Education level of the WRA respondent	Incomplete secondary	160	31.9	43.3	12.1	8.5	4.3	0.0	55.8
	Complete secondary	495	34.7	41.2	7.7	7.9	8.1	0.4	58.8
	Complete higher	370	50.5	35.2	7.9	2.6	3.2	0.5	66.8

Table App5j. Type of hard / soft cheese packaging (indicating scale of production) by type and place of purchase in the week prior to the survey among WRA who consumed hard / soft cheese

			Type of Hard / Soft Cheese Packaging (%)		
		Number of respondents	Commercially packaged	Unpackaged	Don't Know
Place of purchase of consumed hard / soft cheese	Supermarket	359	83.9	15.1	1.0
	Local store	431	47.9	50.9	1.2
	Market	88	23.0	77.0	0.0
	Home made				
	Home made + bought	50	50.0	46.7	3.3
	Don't know	4	100.0	0.0	0.0

Table App5k. Frequency of consumption of brined cheese and its estimated intake (among brined cheese consumers) in the week prior to the survey

			Previous week brined cheese consumption- number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed brined cheese at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,169	57.2	15.4	17.7	6.5	1.9	1.3	483	95.44
Macro-region	North-Central	267	58.5	10.6	17.3	8.2	4.8	0.6	135	120.13
	West	418	46.0	27.4	18.7	7.2	0.3	0.5	209	77.84
	East	240	67.9	7.2	16.7	4.1	0.7	3.4	84	99.46
	South	244	62.2	11.5	18.2	5.4	2.0	0.7	55	95.77
Residence	Urban	747	58.9	13.2	18.9	5.0	2.7	1.3	305	99.58
	Rural	422	53.6	19.8	15.5	9.6	0.3	1.3	178	88.33
Wealth perception	Categories 1 & 2	448	66.8	11.3	14.3	5.7	1.0	1.0	131	94.50
	Category 3	522	56.0	19.2	16.9	5.2	1.3	1.5	231	86.25
	Categories 4 & 5	162	40.6	14.3	28.0	11.4	5.1	0.6	103	114.01
Education level of the WRA respondent	Incomplete secondary	189	54.9	11.7	21.6	6.2	1.9	3.7	66	101.31
	Complete secondary	576	59.8	16.4	13.3	7.5	1.7	1.4	227	95.20
	Complete higher	404	53.9	15.7	22.7	5.1	2.4	0.2	190	93.67

Table App5l. Place of purchase for brined cheese consumed in the week prior to the survey among WRA who consumed brined cheese

			Place of purchase for brined cheese (%)						
		Number of respondents	Supermarket	Local store	Market	Home- made	Home- made + bought	Don't know	Percent of respondents consuming mainly commercially packaged brined cheese
NATIONAL		502	31.5	44.4	9.0	7.0	4.2	3.8	65.2
Macro-region	North-Central	110	47.8	32.6	10.1	7.2	1.4	0.7	68.5
	West	213	19.9	62.6	4.7	6.2	3.8	2.8	64.3
	East	83	40.4	27.7	9.6	5.3	4.3	12.8	66.3
	South	96	19.3	31.6	22.8	12.3	12.3	1.8	58.3
Residence	Urban	337	41.3	36.8	9.5	4.4	3.8	4.1	66.1
	Rural	165	14.8	57.4	8.7	11.5	4.4	3.3	63.2
Wealth perception	Categories 1 & 2	147	22.2	46.7	14.8	8.9	3.0	4.4	58.2
	Category 3	242	33.5	46.4	7.9	5.9	2.9	3.3	68.1
	Categories 4 & 5	94	36.5	36.5	4.8	7.7	8.7	5.8	62.9
Education level of the WRA respondent	Incomplete secondary	74	29.6	38.0	12.7	12.7	1.4	5.6	59.7
	Complete secondary	233	25.1	50.2	7.7	8.1	5.5	3.4	67.6
	Complete higher	195	40.3	39.3	9.4	3.7	3.7	3.7	63.8

Table App5m. Type of brined cheese packaging (indicating scale of production) by type and place of purchase in the week prior to the survey among WRA who consumed brined cheese

			Type of Brined Cheese Packaging (%)		
		Number of respondents	Commercially packaged	Unpackaged	Don't Know
Place of purchase of consumed brined cheese	Supermarket	146	82.8	14.0	3.2
	Local store	221	66.8	33.2	0.0
	Market	48	15.6	84.4	0.0
	Home made				
	Home made + bought	20	50.0	50.0	0.0
	Don't know	16	30.0	5.0	65.0

Table App5n. Frequency of consumption of cottage cheese and its estimated intake (among cottage cheese consumers) in the week prior to the survey

			Previous week cottage cheese consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed cottage cheese at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,169	33.7	17.2	31.5	12.1	4.4	1.1	758	322.6
Macro-region	North-Central	267	45.5	13.0	22.4	11.2	5.2	2.7	171	350.8
	West	418	12.5	22.0	44.0	17.6	3.8	0.0	343	314.9
	East	240	45.9	16.0	27.2	5.8	4.1	1.0	156	304.9
	South	244	39.2	16.2	27.0	11.5	5.4	0.7	89	329.0
Residence	Urban	747	38.3	18.4	28.9	9.4	3.7	1.3	463	307.3
	Rural	422	24.7	15.0	36.6	17.3	5.9	0.5	295	346.7
Wealth perception	Categories 1 & 2	448	35.6	14.7	26.5	16.7	5.4	1.0	258	361.1
	Category 3	522	30.1	20.5	37.3	7.7	3.5	0.9	375	286.4
	Categories 4 & 5	162	36.4	14.2	27.8	15.3	4.0	2.3	107	344.8
Education level of the WRA respondent	Incomplete secondary	189	33.5	13.0	33.5	14.3	3.7	1.9	104	334.7
	Complete secondary	576	33.3	16.6	31.3	13.0	4.8	1.0	385	332.2
	Complete higher	404	34.0	20.0	31.1	9.9	4.1	1.0	269	304.3

* Intake estimate only for WRA who reported to have consumed cottage cheese in the past week. The calculation was based on an estimated portion size of 120g[9] and an assumption that only one portion was consumed per day for the reported number of days when cottage cheese was consumed.

[9] An average portion size based on national Ukraine recommendations for hard cheese: RECOMMENDATIONS OF MOH FOR HEALTHY NUTRITION OF ADULTS, approved on 8.12.2017

Table App5o. Place of purchase for cottage cheese consumed in the week prior to the survey among WRA who consumed cottage cheese

			Source of cottage cheese most frequently consumed (%)						
		Number of respondents	Super-market	Local store	Market	Network store	Local bakery	Home- made	% of respondents consuming mainly commercially packaged cottage cheese
NATIONAL		793	18.2	12.6	28.2	34.7	5.1	1.3	36.5
Macro-region	North-Central	152	25.0	9.4	30.0	28.3	2.2	5.0	45.7
	West	358	5.0	15.7	28.3	45.5	5.2	0.3	19.8
	East	124	36.1	8.9	27.8	21.5	5.7	0.0	46.8
	South	159	23.3	12.2	24.4	30.0	8.9	1.1	46.0
Residence	Urban	489	26.2	10.8	36.2	20.1	5.3	1.5	38.5
	Rural	304	5.4	15.5	15.5	57.9	4.7	1.0	30.4
Wealth perception	Categories 1 & 2	293	13.7	8.0	34.4	39.3	3.4	1.1	30.2
	Category 3	377	19.2	14.2	24.7	35.3	5.5	1.1	40.8
	Categories 4 & 5	104	22.7	19.1	26.4	24.5	5.5	1.8	33.3
Education level of the WRA respondent	Incomplete secondary	128	16.8	11.2	28.0	41.1	0.9	1.9	32.3
	Complete secondary	385	14.3	12.5	26.9	39.9	5.1	1.3	33.9
	Complete higher	280	24.5	12.8	30.3	24.8	6.2	1.5	40.5

Table App5p. Type of cottage cheese packaging (indicating scale of production) by type and place of purchase in the week prior to the survey among WRA who consumed cottage cheese

			Type of Cottage Cheese Packaging (%)		
		Number of respondents (reporting to have consumed cottage cheese)	Commercially packaged	Unpackaged	Don't Know
Place of purchase of consumed cottage cheese	Supermarket	116	88.7	9.9	1.4
	Local store	96	43.8	56.2	0.0
	Market	223	2.8	96.3	0.9
	Home made				
	Home made + bought	45	20.5	79.5	0.0
	Don't know	8	36.4	18.2	45.5

Table App5q. Frequency of consumption of fried or baked pastry pies and their estimated intake (among consumers) in the week prior to the survey

			Previous week pastries consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed pastries at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,666	57.7	14.4	20.4	5.5	1.3	0.7	696	70.6
Macro-region	North-Central	436	67.5	12.8	14.3	3.2	1.5	0.6	172	69.8
	West	470	47.1	16.4	26.8	8.2	1.3	0.2	239	71.7
	East	428	57.6	12.9	21.7	5.3	0.8	1.6	200	70.1
	South	332	55.7	17.5	18.6	5.2	2.6	0.5	85	70.1
Residence	Urban	1,019	59.1	14.4	19.9	4.5	1.1	0.9	445	68.2
	Rural	647	54.9	14.4	21.4	7.2	1.8	0.4	252	74.9
Wealth perception	Categories 1 & 2	688	54.2	14.6	22.9	5.8	1.8	0.6	292	73.3
	Category 3	715	59.1	14.7	19.0	5.4	0.9	0.9	301	66.7
	Categories 4 & 5	207	60.2	14.5	18.6	5.4	1.4	0.0	88	73.7
Education level of the WRA respondent	Incomplete secondary	300	49.6	11.3	30.3	6.6	0.7	1.5	138	74.6
	Complete secondary	843	56.4	14.9	19.9	6.6	1.8	0.5	367	72.6
	Complete higher	523	63.9	15.1	16.1	3.2	0.9	0.7	191	63.7

* Intake estimate only for WRA who reported to have consumed pastry pies in the past week. The calculation was based on an estimated portion size of 30g[10] and an assumption that only one portion was consumed per day for the reported number of days when pastry pies were consumed.

[10] An estimate based on national advice and similar information from Moldova.

Table App5r. Place of purchase for fried or baked pastry pies consumed in the week prior to the survey among WRA who consumed pastry pies

			Source of pastries most frequently consumed (%)						
		Number of respondents	Super-market	Local store	Market	Network store	Local bakery	Home- made	% of respondents consuming mainly commercially packaged pastries
NATIONAL		700	11.8	22.0	6.4	49.9	8.9	1.0	46.7
Macro-region	North-Central	142	13.9	19.1	6.9	56.1	4.0	0.0	53.2
	West	241	6.3	19.2	0.8	58.6	15.1	0.0	53.5
	East	158	18.0	25.2	9.7	38.3	5.8	2.9	38.3
	South	159	8.3	27.4	13.1	41.7	9.5	0.0	46.0
Residence	Urban	421	17.8	26.1	8.7	39.6	6.5	1.3	45.1
	Rural	279	1.2	14.7	2.4	68.5	13.1	0.0	53.8
Wealth perception	Categories 1 & 2	309	7.7	23.2	9.4	51.7	6.4	1.7	41.3
	Category 3	292	13.5	21.1	5.0	49.5	10.2	0.7	50.3
	Categories 4 & 5	79	16.9	23.6	3.4	47.2	9.0	0.0	56.5
Education level of the WRA respondent	Incomplete secondary	147	10.9	29.7	11.6	42.0	5.8	0.0	33.3
	Complete secondary	365	10.2	20.4	5.6	51.9	10.8	1.1	50.8
	Complete higher	188	15.5	19.6	4.6	51.5	7.2	1.5	51.1

Table App5s. Type of fried or baked pastry pies packaging (indicating scale of production) by type and place of purchase in the week prior to the survey among WRA who consumed pastry pies

			Type of pastry pie packaging (%)		
		Number of respondents (reporting to have consumed pastry pies)	Commercially packaged	Unpackaged	Don't Know
Place of purchase of consumed brined cheese	Supermarket	65	77.1	20.5	2.4
	Local store	137	38.7	61.3	0.0
	Market	45	15.6	77.8	6.7
	Home made				
	Home made + bought	70	54.0	41.3	4.8
	Don't know	6	28.6	42.9	28.6

Table App5t. Frequency of consumption of commercial (not home-made) spice additive (bouillon/vegeta) and its estimated intake (among consumers) in the week prior to the survey

			Previous week seasoning consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed seasoning at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,666	68.1	5.6	13.5	5.6	5.7	1.6	505	10.1
Macro-region	North-Central	436	76.2	6.0	9.1	2.6	4.2	1.9	116	9.4
	West	470	58.2	6.0	15.0	9.1	9.7	2.0	180	11.1
	East	428	69.3	4.5	16.4	4.1	4.3	1.4	142	9.5
	South	332	65.8	6.2	15.0	8.8	4.1	0.0	67	9.7
Residence	Urban	1,019	69.6	5.2	13.6	4.6	5.5	1.5	319	10.1
	Rural	647	65.1	6.5	13.3	7.5	6.1	1.6	186	10.
Wealth perception	Categories 1 & 2	688	67.7	5.2	14.5	4.8	6.6	1.2	202	10.5
	Category 3	715	69.6	5.7	12.4	6.2	5.0	1.2	216	9.9
	Categories 4 & 5	207	63.6	7.3	15.5	6.4	5.0	2.3	76	9.1
Education level of the WRA respondent	Incomplete secondary	300	63.9	4.4	18.2	5.8	5.8	1.8	94	9.9
	Complete secondary	843	66.2	4.9	13.4	7.0	7.4	1.1	279	10.9
	Complete higher	523	73.3	7.1	11.4	3.0	3.0	2.2	132	8.6

* Intake estimate only for WRA who reported to have consumed spice additives in the past week. The calculation was based on an estimated portion size of 3g[11] and an assumption that only one portion was consumed per day for the reported number of days when spice additives were consumed.

[11] From websites for carious products such as Knorr, Marigold and Vegeta. Serving sizes vary from 1 to 5g.

Table App5u. Frequency of consumption of dried salted fish and its estimated intake (among consumers) in the week prior to the survey

			Previous week salted fish consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed salted fish at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,666	64.1	17.3	13.7	3.4	1.3	0.3	592	71.2
Macro-region	North-Central	436	69.1	14.2	13.2	2.5	0.8	0.4	162	69.0
	West	470	67.9	22.1	7.1	2.0	0.9	0.0	145	56.7
	East	428	57.7	15.0	19.7	5.3	1.6	0.6	203	80.8
	South	332	57.5	20.2	15.5	4.1	2.6	0.0	82	77.1
Residence	Urban	1,019	64.0	15.7	14.9	3.5	1.5	0.3	394	75.2
	Rural	647	64.2	20.3	11.1	3.2	0.9	0.4	198	63.2
Wealth perception	Categories 1 & 2	688	62.9	17.4	13.4	4.8	1.5	0.0	240	75.8
	Category 3	715	66.0	16.4	14.2	2.6	0.5	0.3	250	65.7
	Categories 4 & 5	207	61.1	18.6	13.6	2.7	2.7	1.4	83	75.6
Education level of the WRA respondent	Incomplete secondary	300	61.5	16.4	13.8	7.3	1.1	0.0	105	81.2
	Complete secondary	843	63.8	17.6	14.0	2.8	1.5	0.4	306	69.7
	Complete higher	523	66.0	17.2	13.1	2.4	0.9	0.4	181	67.9

* Intake estimate only for WRA who reported to have consumed dried salted fish in the past week. The calculation was based on an estimated portion size of 35g[12] and an assumption that only one portion was consumed per day for the reported number of days when dried salted fish were consumed.

[12] Conservative estimate based on Estonia recommended intake, from https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-9_en

Table App5v. Frequency of consumption of smoked or half smoked sausage and its estimated intake (among consumers) in the week prior to the survey

			Previous week smoked sausage consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed smoked sausage at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,666	31.4	14.3	37.0	12.6	4.3	0.3	1,136	278.7
Macro-region	North-Central	436	40.3	16.2	28.4	10.4	4.3	0.4	314	272.0
	West	470	16.6	13.5	52.7	15.3	2.0	0.0	377	266.1
	East	428	36.3	11.7	33.3	12.1	6.0	0.6	307	298.4
	South	332	28.9	17.5	33.0	14.4	6.2	0.0	138	284.2
Residence	Urban	1,019	34.7	14.4	33.2	12.3	5.3	0.2	719	284.4
	Rural	647	24.9	14.2	44.6	13.3	2.7	0.4	417	268.7
Wealth perception	Categories 1 & 2	688	30.4	16.0	38.9	10.9	3.5	0.3	451	267.1
	Category 3	715	29.6	13.2	39.7	13.4	4.0	0.1	521	279.1
	Categories 4 & 5	207	36.9	12.6	25.7	16.7	7.2	0.9	137	315.6
Education level of the WRA respondent	Incomplete secondary	300	33.9	12.0	37.6	11.3	5.1	0.0	182	285.4
	Complete secondary	843	31.5	13.0	38.5	13.5	3.3	0.2	582	277.8
	Complete higher	523	30.0	17.5	34.3	11.9	5.6	0.6	372	276.8

* Intake estimate only for WRA who reported to have consumed smoked or half smoked sausage in the past week. The calculation was based on an estimated portion size of 100g[13] and an assumption that only one portion was consumed per day for the reported number of days when smoked or half smoked sausage were consumed.

[13] Average estimate based on recommended intakes from different countries in https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-8_en

Table App5w. Frequency of consumption of pickled vegetables and their estimated intake (among consumers) in the week prior to the survey

			Previous week pickled veg consumption - number of days (%)							
		Number of respondents	0 days	1 day	2-3 days	4-5 days	6-7 days	Don't know	Number of respondents who consumed pickled vegetables at least once	Approximate average weekly per capita consumption (g)*
NATIONAL		1,666	67.6	12.6	14.0	3.6	1.6	0.6	528	228.6
Macro-region	North-Central	436	69.6	9.1	14.0	4.2	2.8	0.4	159	272.3
	West	470	61.1	18.8	16.3	2.6	0.7	0.4	174	186.8
	East	428	71.0	11.3	12.3	3.7	0.6	1.0	136	221.0
	South	332	68.6	11.9	12.4	4.1	2.6	0.5	60	250.9
Residence	Urban	1,019	68.5	12.0	12.6	4.3	2.0	0.6	342	242.8
	Rural	647	66.1	13.8	16.7	2.3	0.5	0.5	186	202.5
Wealth perception	Categories 1 & 2	688	63.3	12.1	16.0	4.6	2.9	1.1	231	254.3
	Category 3	715	71.9	12.2	11.8	3.0	0.7	0.4	205	205.4
	Categories 4 & 5	207	65.2	17.2	15.4	2.3	0.0	0.0	77	184.1
Education level of the WRA respondent	Incomplete secondary	300	58.9	17.1	17.5	4.4	1.8	0.4	112	229.1
	Complete secondary	843	66.7	12.4	14.2	4.2	1.8	0.7	279	235.9
	Complete higher	523	73.7	10.6	11.8	2.2	1.1	0.6	138	213.4

* Intake estimate only for WRA who reported to have consumed pickled vegetables in the past week. The calculation was based on an estimated portion size of 100g[14] and an assumption that only one portion was consumed per day for the reported number of days when pickled vegetables were consumed.

[14] Average estimate based on recommended serving sizes from online search of market for different jars of pickled vegetables produced in Eastern Europe.

Table App5x. Place of purchase for pickled vegetables consumed in the week prior to the survey among WRA who consumed pickled vegetables

			Source of pickled veg most frequently consumed (%)						
		Number of respondents	Super-market	Local store	Market	Network store	Local bakery	Home- made	% of respondents consuming mainly commercially packaged pickled veg
NATIONAL		518	10.4	13.0	9.7	62.6	3.3	0.9	46.4
Macro-region	North-Central	143	10.6	9.9	9.9	67.7	0.6	1.2	60.8
	West	152	1.1	6.9	0.6	84.0	6.9	0.6	87.5
	East	118	22.5	28.2	16.2	31.7	0.7	0.7	33.7
	South	105	8.3	3.3	20.0	61.7	6.7	0.0	36.8
Residence	Urban	341	14.9	17.2	11.2	52.1	3.2	1.4	47.4
	Rural	177	2.1	5.3	6.8	81.6	4.2	0.0	40.7
Wealth perception	Categories 1 & 2	236	11.9	15.3	13.6	56.4	2.5	0.4	28.9
	Category 3	201	10.6	9.6	8.2	69.7	1.9	0.0	57.6
	Categories 4 & 5	66	5.1	17.9	3.8	60.3	10.3	2.6	87.0
Education level of the WRA respondent	Incomplete secondary	109	14.3	21.4	10.7	52.7	0.9	0.0	38.5
	Complete secondary	262	8.8	13.0	9.1	62.5	4.9	1.8	45.2
	Complete higher	147	10.7	6.4	9.3	71.4	2.1	0.0	60.5

Table App5y. Type of pickled vegetable packaging (indicating scale of production) by type and place of purchase in the week prior to the survey among WRA who consumed pickled vegetables

			Type of pickled vegetable packaging (%)		
		Number of respondents (reporting to have consumed pickled vegetables)	Commercially packaged	Unpackaged	Don't Know
Place of purchase of consumed brined cheese	Supermarket	49	60.7	39.3	0.0
	Local store	59	52.9	47.1	0.0
	Market	55	23.1	75.0	1.9
	Don't know	5	25.0	25.0	50.0