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# Survey sampling in wartime: addressing challenges for cross-national and longitudinal studies

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## Abstract

Conflict situations pose unique challenges before survey sample design, three of which are examined in this paper in the context of the ongoing full-scale war in Ukraine. Firstly, defining the population becomes a complex task as a result of substantial population changes. This includes internal displacement, a significant proportion of the population emigrating (but with a potential future return), and a considerable number of individuals actively engaged in combat who are currently unreachable for interviews. Secondly, defining households, particularly for longitudinal studies, is complicated by the temporary separation of many families. Thirdly, accurate accounting for vacant and demolished dwellings is essential, as national statistics often lack precise and reliable data in these areas. This study outlines the design of two samples: one for a cross-national European Social Survey in Ukraine (ESS), and the other for the longitudinal household panel study, UKRAINS. By carefully addressing these complex sampling challenges, it is possible to develop high-quality probability samples that account for population mobility and unpredictability in a wartime context.

**Keywords:** sample design, population definition, eligibility, conflict, war.

## 1. Introduction

Conflict situations bring significant changes to populations, and these need to be reflected in sample design to ensure accurate representation. Unlike the usual population dynamics in peaceful times, which include births, deaths, and relatively stable immigration and emigration patterns, conflict introduces large-scale and unpredictable changes. The full-scale invasion of Ukraine by Russia in 2022 exemplifies these challenges, presenting unique obstacles for survey sampling.

Firstly, the conflict has led to the non-coverage of territories temporarily occupied by Russian forces, areas of active fighting, and adjacent unsafe regions. Additionally,

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there has been a substantial internal displacement, with people moving from Eastern and Southern Ukraine to safer areas in Central and Western Ukraine (UNHCR, Regional Bureau for Europe, 2024). The war has also resulted in significant emigration, primarily of women and children, as men are largely prohibited from leaving the country during the war (UNHCR, Regional Bureau for Europe, 2024). Furthermore, individuals currently serving in the military are not accessible for surveys.

Household structures have also been profoundly affected, many of which are temporarily separated. The two main types include: a household where the wife (and children, if any) has left the country for safety while the husband remains in Ukraine, and another where one member is serving in the military while the other stays home. Despite the physical separation, these households often continue to function as cohesive units, maintaining financial and emotional support and intending to reunite as soon as circumstances allow (e.g. the war ends).

The conflict has also resulted in a large proportion of vacant dwellings. Families may have moved abroad, joined the military, or relocated within the country to safer areas. The proportion of vacant houses varies by region, urban versus rural settings, and proximity to the frontline, reflecting the perceived safety of these areas. Reliable information on vacant housing is difficult to obtain prior to sampling, with many estimates lacking precision.

These complexities create a new context for planning survey sample design. This paper addresses these challenges through two separate designs: a cross-national survey and a longitudinal household survey. After a look at the Ukrainian context and literature review of the survey sampling in conflict, we follow with a brief description of the two studies, their objectives, and their designs. We then discuss the impact of wartime on the definition of a population, the associated challenges, and our solutions for a sample design. Next, we address the difficulties in defining households and our approaches to these issues. Vacant houses problem and how they are accounted for in the sample design is explored next. Finally, we describe sampling-related challenges during fieldwork. The discussion section summarizes the main challenges in detail and concludes with suggestions for future studies in similar conflict situations.

## 2. Ukrainian context

The Russian invasion of Ukraine began in 2014 with the annexation of Crimea, followed by the occupation of large parts of Eastern Ukraine, including the regional centers of Luhansk and Donetsk. This led to a significant internal displacement, with many internally displaced persons (IDPs) relocating to areas under Ukrainian control. It is estimated that the initial stage of the war resulted in approximately 1.4 million IDPs moving to safer locations within Ukraine (Mikheieva & Kuznetsova, 2023). This is

around 3% of the total population of Ukraine of 45.4 million estimated as of 2014 (Kulu et al., 2022). The Minsk I and II agreements (OSCE, 2014; OSCE, 2015) led to a cessation of active conflict until 2022, allowing IDPs to settle and survey organizations to interview them in their new homes. This period provided invaluable experience in surveying IDPs, residents near frontlines, those in occupied territories, and decommissioned military personnel (e.g. Cafiero et al., 2021; ILO Decent Work Technical Support Team and Country Office for Central and Eastern Europe, 2016). During this time, active fighting was confined to the frontline and occupied territories, leaving the rest of Ukraine relatively safe.

The full-scale invasion launched on February 24, 2022, marked a dramatic escalation, with Russia attempting to occupy most, if not all, of Ukraine. Military engagements occurred in Central, Eastern, and Southern Ukraine, and Russian missiles, along with military drones, targeted the entire country, leaving no place safe for civilians. This resulted in around 8.2 million individuals leaving Ukraine, at least temporarily, and around 8 million being internally displaced in the first months of the war (Rogoza, 2023). This is a substantial proportion of 37.3 million population living in Ukraine-controlled territories as of 2019 (Rogoza, 2023). Following the invasion, martial law was imposed, prohibiting males of military age (18-60) from leaving Ukraine, except under specific conditions.

Some people have returned home, but as of February 2024 the number of new IDPs moving to safer areas within Ukraine who remain displaced is estimated at 3.7 million (IOM UN migration, 2024). An estimated 6.4 million people remain abroad as of the end of 2023 (UNHCR, Regional Bureau for Europe, 2024). Of those who are abroad 6.0 million are hosted in countries across Europe with 88 percent of them being women and children (UNICEF, 2024). Of those who stayed in Europe the most common countries for Ukrainians to find refuge as of 2023 was Germany (1.03 million), Poland (994,000), and Czech Republic (448,000). Those outside of Europe, just over 400,000, are mainly in Canada (220,000) and the USA (over 100,000) (UNHCR, Regional Bureau for Europe, 2024). Separately, 2.8 million Ukrainians have registered residence in Russia since 2022, including 19,500 forcibly deported children (Rogoza, 2023).

Since the beginning of the full-scale invasion Ukraine has experienced profound additional demographic changes: mass casualties among soldiers and civilians, including children; a significant decline in birth rates due to excess mortality and deteriorating living conditions; large-scale relocations from Eastern to Western Ukraine; substantial emigration; demographic shifts in major cities such as Odesa, Dnipro, Lviv, and Kyiv due to both evacuation and relocation; the movement of entrepreneurs and manufacturing to safer areas; and extensive destruction of civilian infrastructure, particularly housing (Libanova and Pozniak, 2022).

Despite the ongoing conflict, some Ukrainians, estimated at 900,000 (UNHCR, Regional Bureau for Europe, 2024) as of the end of 2023 have returned from abroad to their homes, and additionally 298,000 returned from abroad to a different location from their original home, while many of homes still remain under occupation or near the frontline. Additionally, some IDPs continue to return to their homes within Ukraine, particularly in de-occupied areas. Many, however, are still awaiting the opportunity to return, with estimates of those remaining abroad about 6.4 million (UNHCR, Regional Bureau for Europe, 2024).

## 3. Literature on sampling in conflict situations

In any context, the primary goal of a sampling statistician is to obtain a representative sample of a population in the most cost-efficient manner. Representativeness is ensured by giving everyone in the population a chance to be selected, with this chance being known as a specific probability (Kish, 1965). Sampling in conflict situations shares the same fundamental challenges as in other contexts but faces two additional significant issues: large population movements, such as an influx of refugees to neighboring countries or internal displacement of people (Anguilera et al., 2020; Mneimneh et al., 2014; Lubbad, 2024), and often a lack of up-to-date sampling frame information, which quickly becomes unrepresentative of the new reality of population distribution (Anguilera et al., 2020; Mneimneh et al., 2014; Lubbad, 2024; Box and Thomas, 1944). Similar challenges are encountered in surveys conducted in post-conflict situations, partly due to the population movement back home after temporary shelter in other parts of the country or abroad (Lynn, 2004).

Sampling theory has made significant advances in the field of selection where no sampling frame is available (e.g. West, 2016), for hard-to-reach populations (e.g. Raifman et al., 2022), or even where the population is highly mobile (Raifman et al., 2022; Reichel and Morales, 2017). By combining these methods with classic selection techniques driven by the context of the available sampling frame information, statisticians can develop probability samples in conflict situations. Common solutions to the lack of up-to-date sampling frame and population distribution information include using satellite imagery to define first-stage clusters (Anguilera et al., 2020; Mneimneh et al., 2014; Lubbad, 2024), satellite photographs with random point estimates and circles around them as clusters (Shannon, 2012), multiple frames, respondent-driven samples (Mneimneh et al., 2014; Khoury, 2019), and random walk samples (Shannon, 2012; Spagat, 2012).

Simultaneously, several considerations must be addressed: due to safety concerns, some insecure areas may be excluded (Mneimneh et al., 2014), or access to affected communities may be limited (Spagat, 2012; Mneimneh et al., 2014). When situations

rapidly change, flexibility in sample design is required to reflect new security concerns and population flows (Mneimneh et al., 2014). Importantly, noncontact and nonresponse (Mneimneh et al., 2014; Lubbad, 2024) and mistrust (Lubbad, 2024) may also be higher. Additionally, new sampling frames may become available during conflicts, such as ration card lists in WWII UK (Box and Thomas, 1944), UNICEF immunization lists in Afghanistan, and food distribution lists in Kosovo (Mneimneh et al., 2014).

Ukraine has successfully conducted social surveys during the ongoing armed conflict since 2014, primarily via face-to-face mode, and since COVID-19 also via phone mode (largely mobile phones) (Paniotto, 2022). Among survey errors, the war has impacted coverage error, unit nonresponse, and measurement error (for sensitive questions) but has not affected sampling error, item nonresponse, interviewer error, or processing error (Paniotto, 2022). In the Ukrainian context, coverage error results from the inability to survey occupied territories by Russia, and to a lesser extent, areas near the frontline. However, this noncoverage in terms of population percentage does not equate to the proportion that lived in these areas before the war. A significant portion of that population have moved to safer parts of Ukraine, where they are reachable and can be interviewed by a survey organization. Similarly, areas close to the frontline have negligible populations remaining, while most residents have moved to other parts of Ukraine or abroad (Paniotto, 2022).

A separate consideration involves newcomers to occupied territories, where Russia has intentionally illegally settled Russians (Myroshnychenko, 2023). Although they reside in the geographically recognized territory of Ukraine, they never lived there before and did not have Ukrainian citizenship. Including or excluding them from the population is a theoretical consideration that should reflect research aims. In practice, while the war is ongoing and Russia controls these territories, it is likely that there will not be access for an objective social survey of Russian settlers in Ukrainian territories. Such proportions are not negligible, as it is estimated that 500,000 – 800,000 illegal new Russian settlers have been living in Crimea since 2014 (Ostiller and The Kyiv Independent news desk, 2023), while the Crimean population in the 2001 Census was just over 2 million (Wikipedia contributors, 2024); and 40,000 Russian citizens settled in Mariupol as of 1 July 2023 with Russians planning for this number of go over 300,000 with pre-invasion population of Mariupol of around 420,000 (Myroshnychenko, 2023).

Estimating population totals and density in Ukraine presents an additional challenge. With significant population movements, an outdated Census from 2001, and no reliable administrative data depicting the full population picture, innovative methods are required. Sarioglo and Ogay (2022) propose an innovative method of population estimation by modelling population size, density, and location using mobile network and mobile phone operators' data combined with administrative registers and a social survey on mobile device usage. This approach provides timely estimates of population

size across regions and localities and potentially their changes. Yet, the approach is limited to Ukraine-controlled territories where Ukrainian mobile service is available. In areas not controlled by Ukrainian government Russia blocks the mobile signal to Ukrainian networks, and data usage of mobile phones becomes unavailable, thus preventing population estimates in occupied territories.

Finally, the Ukrainian context also poses challenges for longitudinal studies. Establishing a longitudinal panel before the start of a war has substantial advantages, as continuing through the war can provide invaluable information on opinion and life changes. However, this also brings methodological challenges. A two-wave opinion study by PONARS collected in December 2019 via face-to-face mode and in October 2022 via telephone in Ukraine faced significant challenges due to large population movements, especially from Eastern parts of Ukraine (Rickard et al., 2023). This resulted in substantial attrition with important differences across regions, with higher attrition rates in areas with higher civilian fatalities, often concentrated on the frontline and in occupied territories. This is critical for opinion surveys in Ukraine because Eastern Ukraine had different political attitudes, including those towards Russia and NATO, compared to Western Ukraine prior to the full-scale war. The task of a methodologist is to disentangle true changes in opinion from changes due to attrition caused by the war. Here, attrition combines two factors: typical nonresponse and eligibility definition, where a significant portion of the population may become ineligible. Rickard et al. note that they excluded Ukrainians who moved abroad (to Western countries or to Russia) between the first and second waves of data collection, which may include substantial proportions of Eastern Ukrainians. Such exclusion may lead to observed changes in opinions, which need to be accounted for when analyzing longitudinal data for pre- and post-war analysis.

## 4. Sampling theory and conflict

The first step in planning a sample design is to define the population we aim to represent. This population consists of units of analysis and should be entirely driven by the theoretical needs of the research, without consideration of practical challenges, sampling frame limitations, or other constraints. For example, in the Ukrainian context, we might be interested in residents or households currently living in Ukraine (encompassing the entire 1991 recognized territory).

The first challenge faced by survey data collection in conflict zones is the safety of interviewers, particularly in face-to-face surveys. Data cannot be collected in occupied territories or areas near the frontline, resulting in non-coverage. Addressing this issue involves acknowledging these limitations in the analysis and interpretation of results, as there is little scope for a practical solution.

The next step in sample design is to ensure the probability nature of the sample, meaning every eligible unit of the population should have a known, nonzero chance of being selected. In the Ukrainian context, accurate pre-full-scale-war population statistics, specifically population estimates for electoral districts and precincts (from 2019), can serve as a convenient sampling frame. Since the start of a full scale invasion significant population changes have occurred across these districts and precincts which is crucial to recognize in the design.

Incorporating a longitudinal aspect into a panel adds a time dimension to the population definition. In peaceful circumstances, this involves accounting for mortality and incorporating newborn children into the study. Migration considerations include people who have left the population and, through boosts, recent immigrants (including population rejoiners). In conflict situations, these aspects still need to be addressed, but additional challenges arise. Solutions are required to represent newly deoccupied territories when they become safe, to include households when they rejoin, to account for substantial future internal movements when parts of the country become deoccupied and safe, and to reflect changes in the population when the war is over.

## 5. Data

We explore two surveys planned for Ukraine to be conducted during the war: Round 11 of the European Social Survey (ESS) and a longitudinal household survey (UKRAINS).

The ESS is a cross-national survey conducted biannually in 20-30+ countries. It is a cross-sectional, face-to-face survey of adults (15+ years old) aiming for an effective sample size of 1,500 per country (or 700 in very small population countries). Its main goal is to provide data on attitudes, beliefs, and behavior patterns for cross-country comparison, enabling time-trend analysis for some core questions (European Social Survey European Research Infrastructure Consortium [ESS ERIC], 2021). Round 11 took place in 2023-2024, with Ukraine participating.

The ESS methodology focuses on cross-country comparability, ensuring consistency in questionnaire design, fieldwork procedures, nonresponse correction, and sample design. The ESS survey in Ukraine is planned within this context.

The second survey planned for Ukraine is the longitudinal household survey (UKRAINS). Its aim is to represent the people of Ukraine longitudinally in their household context, starting in the current situation and following them into the long-term future. The goal is not only to track individuals currently living in Ukraine, but also to be able to represent Ukrainian population as it changes in the future, and to represent household structure in its novel temporary state, where some households are separated.

The planned sample size is 4,000 households in wave 1, with around 12,800 adult (18+) individual interviews.

## 6. Population definition and noncoverage in the context of conflict

The ESS employs a standard population definition across all participating countries, including all persons aged 15 or older living in private dwellings. This definition, essential for cross-national and time-series comparability, presents several challenges in the current Ukrainian context:

- Ukrainians abroad: Ukrainians who are abroad are not part of the population definition. An estimated 6 million people left Ukraine in early 2022. This substantial proportion, relative to the pre-war population of around 40 million, includes many who intend to return but are currently not in Ukraine. These individuals are excluded from the Ukrainian ESS population but may be included in ESS surveys in their current countries of residency.
- Servicemen Not Living at Home: Between 600,000 and 1 million people are estimated to be in service, often not living at home. These individuals, part of the Ukrainian population more broadly, are now excluded from ESS definition as they do not reside in private dwellings.
- Unsafe Areas for Face-to-Face Interviews: Around 20% of Ukrainian territory is currently occupied by Russians, including Crimea and major cities like Luhansk, Donetsk, and Mariupol. Unsafe areas also include frontline and nearby areas, which are reached by Russian shelling. Interestingly, the population definition would technically include many Russians who moved into the vacated homes of Ukrainian families who fled the war following the invasion. In Crimea, it is estimated that 400,000 Russians have relocated since the Russian occupation, accounting for 20% of Crimea's 2013 population. However, due to non-coverage, it is not possible to study this subgroup.

When the war ceases, the data will quickly become outdated in terms of population representation. Comparison to future ESS rounds will be problematic as changes in opinions will be confounded with population shifts. However, the ESS sample design aims to represent individuals aged 15+ currently living in private dwellings in Ukraine.

UKRAINS aims to represent the current and future Ukrainian population. It considers the return of people currently abroad, servicemen rejoining their families post-war, and internal population movements following de-occupation. To achieve this, UKRAINS plans for:

- Sample refreshments to include de-occupied territories;
- Sample refreshments across Ukraine to include returning households;

- Include servicemen as panel members, initially through proxy interviews;
- Include family members currently abroad in split households, if at least one member remains in a private dwelling in Ukraine.

The definition for UKRAINS is: people living in private dwellings in Ukraine and their household members.

Non-coverage of unsafe territories, as described for ESS, also applies to UKRAINS. However, in a longitudinal context, the definition of unsafe territories may change with frontline movements and de-occupation. People returning to de-occupied territories, both IDPs and those returning from abroad, will need to be represented. Some individuals may have remained in their homes throughout the occupation and thus would not have a chance to be included in the initial panel selection. These individuals would need to join the panel upon de-occupation. To represent all three categories of people, a separate sample from de-occupied territories is necessary. This approach should account for the double selection probabilities of returning IDPs or other people, who might be selected initially in safer areas and again upon their return. A sampling statistician may consider excluding such people based on their previous chance of selection. However, reselecting them through a refreshment sample can mitigate the effects of attrition potentially heightened by shifts in life circumstances or geographic relocation. Consequently, it may be more practical to conduct a representative sampling in recently de-occupied territories, adjusting for the dual selection probabilities associated with internally displaced persons (IDPs) or other individuals migrating from previously safer regions of Ukraine. A simple representative sample in de-occupied territories also avoids challenges of household eligibility definition, particularly in cases where only some members of a household relocated from other parts of Ukraine, while others remained during the occupation. In such situation a selection of the household would be automatic into a sample, but sample selection probabilities would be calculated separately for each household member, reflecting their previous circumstances at the time of the original panel selection.

Since Russia's full-scale invasion in February 2022, many Ukrainians have returned home for various reasons, including the reduced likelihood of Kyiv, Central, and Northern Ukraine being occupied and better protection from Russian air threats. However, safety is not guaranteed, and larger population movements are expected when the war ends. Therefore, two types of refreshments are needed: during the war to account for those returning home from abroad, and post-war to account for a potentially larger internal movement and further returns from abroad.

In terms of the timeline UKRAINS aims to represent life events since the beginning of the full-scale invasion. As the panel has not been in field at that time, retrospective data collection through an event history calendar (EHC) is planned. This will gather detailed information on major life events for all panel members since February 2022,

regardless of their start time in the panel. This approach will allow for the study of war experiences and their influence on future life decisions.

A separate group of interest includes IDPs. Those residing in private dwellings within government-controlled areas can be selected through an address-based sample. This includes IDPs who reside on their own or with relatives and / or friends in safer parts of Ukraine. However, representing IDPs in temporary shelters (such as hotels, hostels, and schools) presents a challenge. When practical restrictions prevent interviewing these individuals, future refreshment samples may include them once their circumstances stabilize.

In the current context of Ukraine, defining a household presents unique challenge, partly due to the presence of multiple households cohabiting in the same dwelling. This arrangement often arises as families host relatives or friends from less secure regions, or as households join relatives in rural areas with alternative heating sources, particularly during winter, in response to Russian targeting of Ukrainian infrastructure. Given these dynamics, different researchers may adopt distinct household definitions tailored to their specific research questions. In this context, a practical approach for a sampling statistician may involve selection of all individuals residing at the same dwelling (i.e. the same postal address) and collecting data on key household dynamics. Questions addressing shared meals, financial arrangements, and prior household compositions would provide flexibility, enabling researchers to apply various household definitions according to their analytical needs.

The population definition related to split households is discussed in the following section.

## 7. Household survey of split households

ESS primarily focuses on individual opinions, beliefs, and behavior, rendering household context relatively insignificant. Conversely, UKRAINS is a household panel study that examines life decisions and choices, where household context is crucial. The standard household definition—comprising individuals who live together and share finances and meals—may not accurately reflect the current situation in Ukraine, where many households are temporarily split.

For example, a husband serving at the frontline for over a year, while his wife and children remain at their family home, still supports his family financially, communicates frequently, and plans to return home post-war. Despite the physical separation, they consider themselves one household. Another example involves a wife and children who have relocated to a safer European country, while the husband remains in Ukraine, unable to leave due to wartime restrictions. They maintain financial ties, communicate daily, and intend to reunite once it is safe. We refer to these as temporarily split households.

At the data collection stage, we could define households in several ways: as those who lived together before February 2022, as those who currently share finances, or based on individuals' own definitions of their household as they see it today. However, it is critical to include all household members at the panel's start to fully understand the household context, encompassing members not currently residing at the dwelling. UKRAINS plans to include servicemen who belong to the household as panel members, conduct brief proxy interviews while they are serving, and conduct full interviews upon their return. The study also intends to interview household members abroad via online video calls, continuing these interviews over time. This approach will enable the study of household dynamics including when members from abroad return to Ukraine.

While some servicemen and Ukrainians living abroad will be represented in the study, not all of them will be included. Households without a member residing in a private dwelling will be excluded from the initial wave, for example where a single servicemen lived alone before deployment or households where all members have moved abroad. However, they will be represented in future refreshments if they return to live in a private dwelling in Ukraine.

## 8. Vacant and demolished houses

Ukraine does not have a named register available to sampling statisticians, making an address-based sample a viable option. For the ESS sample design, 2019 electoral precincts are used as clusters, each containing an average of around 1,500 individuals aged 18 and over, with a range of about 300 to 4,000 per precinct. By estimating average household sizes, we can approximate the number of households per precinct in 2019. However, many dwellings are now vacant or demolished, and the population distribution has changed significantly.

The most efficient sample allocation is an equal probability sample, which, at the cluster selection stage, implies a proportional to population size (PPS) allocation. This ensures that clusters with larger populations have a higher chance of being selected, reflecting their relative size. Ideally, the most recent population size information would be used, including only current residents and excluding those who have temporarily left their homes. Unfortunately, high-quality, up-to-date statistics at the precinct level are not available.

To address this, the plan is to select all dwellings—vacant or not—and then screen for occupancy among the selected dwellings. Since the exact number of vacant dwellings is unknown, the selection must include both occupied and vacant dwellings in proportions representative of the cluster. Importantly, as the screening will follow the selection of clusters, the PPS should reflect the total number of dwellings, including both

occupied and vacant ones. The 2019 statistics provides a good estimate of the total number of dwellings even at the time of the war. Thus, clusters can be selected using PPS according to the total number of dwellings.

There is no high-quality list of dwellings within each electoral precinct. After cluster selection, enumeration is necessary, involving enumerators listing all dwellings in the cluster. During this stage, demolished dwellings and non-private buildings can be excluded. A set number of dwellings (e.g. 25) is then randomly selected in each PSU, and interviewers can determine occupancy during visits. Some vacant dwellings may not be detected and might be classified as non-contacts. Nevertheless, this sampling design ensures equal selection probabilities for occupied dwellings, and their PPS representation.

## 9. Challenges during fieldwork

Several challenges can arise during the fieldwork stage. The situation may change between the drawing of the sample and the data collection. For example, in our experience with the ESS, the Ukrainian-controlled part of the Donetsk region was deemed safe at the time of drawing the sample, and two clusters were selected in this region. However, by the time of enumeration, the safety situation had deteriorated. While the overall sample size remained unchanged and enumeration proceeded in many other PSUs, we decided to randomly allocate additional dwellings from the Donetsk region across the rest of the sample. Some flexibility in the design and ability to adapt to a rapidly changing situation is therefore necessary, and planning for different scenarios in advance can be beneficial.

Another challenge is related to males aged 25-60 who can be conscripted into military service. While many men volunteer for service or join when called, some avoid service and hide in their homes. This can create difficulties for interviewers listing household members, as these men may not be reported to avoid detection. This issue can be partially mitigated through interviewer training and assurances of confidentiality, but some proportion of this subgroup may still be omitted during the war. To address this, we plan to reassess household composition at the end of the war, allowing for updates and corrections to previous responses, including the addition of any household members not initially listed.

We also anticipate that the reported dwelling vacancy rate may be underrepresented. In unsafe regions, a neighbor might look after multiple vacant dwellings and may be reluctant to report these vacancies due to fear that such dwellings could be targeted by criminals. While this issue does not affect population representation, it can

lower apparent response rates, as genuinely vacant houses will be counted as non-contacts. Again, interviewer training and assurances of confidentiality can help mitigate this problem.

## 10. Discussion and conclusions

While theoretical sampling concepts such as population and household definitions are relatively straightforward in many survey contexts, conflict situations necessitate a much more careful consideration of these definitions, especially for longitudinal and household surveys. Population movement within a country, emigration and return patterns at the onset of conflict, and the continued movement as some areas become safer or more dangerous, occupied, or deoccupied, create a fluid population that still needs to be accurately represented at each point in time through high-quality sample design.

This paper provides practical solutions to sampling in a conflict situation in Ukraine during a full-scale war. A cross-sectional study, such as the ESS, is easier to plan since its purpose is to capture a snapshot of the population at a single point in time. Although the population described in such a study may quickly become outdated, it remains relevant to a critical historical moment in the country's life. However, analysts must be aware of missing subgroups: IDPs living in non-private households, servicemen (who now constitute a larger proportion of the population than in non-conflict circumstances), and individuals who are abroad unless specifically covered.

For a household longitudinal study, additional considerations are necessary to ensure continuous representation of the population, reflecting all its changes. While it is challenging to plan for the unknown, different scenarios can be considered. This includes tracking people who flee for safety and through sample refreshment accounting for those who return to their old homes as areas become safe or are deoccupied. Incorporating split households into the design can involve including household members who are currently away (even long-term) if one member of the household can be interviewed. These away members can be interviewed via proxy or video interviewing to provide a complete household context.

Finally, post-stratification may be challenging or significantly limited compared to times of peace, as earlier statistics may no longer accurately reflect the current population due to drastic changes. Even fundamental demographic characteristics, such as age by gender distribution, have undergone substantial shifts during the full-scale war. A large number of males aged 25-60 are in military service, while many young females and children have moved abroad. Additionally, in less safe regions, there are significantly fewer children than before.

Unlike in many other surveys where post-stratification can help correct for non-coverage, the current context in Ukraine lacks reliable statistics for territories occupied

by Russia or frontline areas. Therefore, using poststratification to adjust for noncoverage may not be an option.

Although this paper describes two studies in Ukraine in the context of 2023–2024, the challenges outlined are similar to those encountered in other conflict situations. Our sampling experience may serve as a valuable starting point for planning sample designs in similar circumstances elsewhere.

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