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For discussion and
recommendations

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IN-DEPTH REVIEW OF USE CASES FOR ALTERNATIVE POPULATION BASES

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This report examines actual and potential needs among users of official statistics for population statistics produced using bases other than usual residence: referred to as 'alternative population bases'. The report attempts to clarify the difference between such alternative population bases and the growing phenomenon of alternative sources of population data, which is also occupying a great deal of current high-level discourse in official statistics. The principal conclusion of the report is that dedicated engagement with users to identify their needs is likely to reveal a growing demand for such alternative population counts. The report finds that as yet, the production of such statistics is relatively limited.

The Bureau is invited to discuss the issues, challenges and recommendations (Sections V and VI) identified in this paper and consider the need for further work.

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I. EXECUTIVE SUMMARY

A. Introduction

1. This report has been prepared to inform an in-depth review by the Bureau of the Conference of European Statisticians (CES), examining the use cases for alternative population bases. The primary objective of the report is to assess the current international landscape regarding the production and use of population statistics derived from alternative bases. This entails an examination of the spectrum of alternative bases currently in existence; the requirements identified by National Statistical Offices (NSOs) and other public bodies for such data; and the methodologies employed by countries for gauging user demand for these demographic counts. Consequently, the overarching aim is to elucidate the degree of alignment between the production of alternative population bases and the actual needs of users, as well as comprehending the underlying engagement processes with these users in order to discern and respond to those needs.

B. Scope

2. The usual resident count typically serves as the primary reference for population estimates. The scope of this report, therefore, encompasses alternatives to this—i.e. all population bases *other than* usual residence, including but not limited to workplace and short-term residents.

3. Population counts, whether based on usual residence or another base, are most often computed from census data. This report, however, is not about data sources, but rather about the resulting statistics. Whether population statistics are produced using census data, survey data or any other data source (and indeed, whether census data are gathered via direct enumeration, compiled from administrative data sources, or a combination of these approaches—a very topical issue for many NSOs at present), they can still be computed according to a variety of different bases, depending on the variables included in the data source(s). It is imperative to emphasize that this report is *not* an inquiry into the merits of administrative data or other sources for the conduct of censuses and/or the generation of official population statistics. Instead, its focus lies in evaluating whether these sources are presently employed or envisaged for use in the context of alternative population bases.

C. Methodology

4. This report was prepared following a blend of desk research and the collection of questionnaire responses from various NSOs: principally those which had indicated a willingness to contribute during a CES consultation, plus some which were approached directly by the authors. A short questionnaire was sent to a selection of NSOs and international organizations¹, yielding a total of nine responses². The questionnaire encompassed three key sections: covering the population bases currently used by NSOs to generate population statistics; their prospective production plans; and the nature and extent of engagement conducted with their users to gauge demand. These responses, in conjunction with the insights

¹ The questionnaire is reproduced in Appendix I.

² Replies based on the template were received from Albania, Canada, Ireland, Mexico, New Zealand, Poland, United Kingdom, and Eurostat. The Russian Federation provided a written contribution on the topic in general. The Netherlands and Italy indicated that they did not have relevant material to contribute.

garnered through desk research, gave the authors a comprehensive perspective on the diverse activities and approaches employed for the production of population statistics with alternative population bases.

D. Key findings

5. This research has ascertained that the provision of statistics using alternative population bases is a practice currently adopted by only a small number of countries, and is far from being widespread. In Canada, New Zealand and the United Kingdom, such products are produced actively, while in other countries, the principal or only population counts are those based on usual residence.

6. Furthermore, the demand for alternative counts varies substantially and is intricately tied to local population dynamics and the policy imperatives therein. For instance, Canada highlighted a case in which a significant population segment spends time in a province different from that of their usual residence, while New Zealand noted a specific need to understand populations utilizing their healthcare services, irrespective of the residency status of the members of that population.

7. It is noteworthy that the same countries which report active production of statistical products with alternative population bases are those which also report being particularly proactive in their approach to user engagement around this topic, often implementing dedicated user engagement initiatives. This may indicate that when comprehensively consulted, users do tend to indicate a demand for such alternative counts which NSOs may wish to work towards fulfilling.

E. Conclusions

8. The research conducted for this report has highlighted the fact that a small number of countries are making dedicated efforts to produce alternative population counts, in an effort to cater to specific user demands identified through active engagement programmes.

9. It is evident from this review, therefore, that **proactive user engagement** on the part of the NSO is a pivotal factor in ensuring the correct identification of user requirements with respect to population counts and other population statistics. When users are asked whether they would find value in alternative population bases, it seems that such a need will likely be identified; and when such products are offered, they appear to be of use to some user groups.

10. The localized nature of demographic patterns, policy considerations and political dynamics means that there is wide variation in user requirements across different countries. Nonetheless, these requirements are seldom entirely unique. Thus it seems likely that these conclusions, drawn on the basis of experience in a small number of countries, might well apply to other countries if they were to conduct similar user consultations regarding population statistics.

11. A secondary conclusion which came to light from the questionnaire responses was a generalized tendency to conflate the ideas of ‘alternative population base’ and ‘alternative data source for population statistics’, although in reality these are two entirely different things. The international official statistics community may therefore wish to consider developing a **more detailed definition and explanation of the term ‘alternative population base’ and to clarify how this is distinct from questions related to data sources**, and to raise awareness of this by ensuring its incorporation within internationally-agreed guidance.

II. INTRODUCTION

12. The Bureau of the Conference of European Statisticians (CES) regularly reviews selected statistical areas in depth. The aim of the in-depth reviews is to improve coordination of statistical activities in the UNECE region, address emerging issues, and facilitate exchange of best practices and mutual learning.

13. The CES Bureau initially selected the topic of ‘use cases for alternative population bases’ in February 2020. At the time, a majority of countries were in the final preparatory stages for their censuses and therefore did not have experts available to prepare the review. It was decided to wait until a later date to conduct the review. In February 2023 the CES Bureau selected the topic for review in October 2023, now that most countries have conducted their censuses of the 2020 round and are in a position to benefit from the learning that they offer.

III. SCOPE OF THE STATISTICAL AREA COVERED

14. When we talk about ‘the population’ of a place, in everyday discourse, we generally have a fairly clear, commonly held idea of what we mean: *the people who live there*.

15. But as with all things in statistics, when we look more closely there is much to be unpacked here, both in terms of what is meant, specifically, by these words (i.e. ‘the people’ and ‘live’), and in terms of what exactly it is that we are interested in and why we need to know it.

16. Population counts can be made according to one of several different bases—where people usually live, where they are legally resident, where they hold citizenship, where they own or rent property, where they pay taxes, where they work or study, etc. A population base is a subset³ of the total population defined according to a specific set of criteria (more complete definitions of terms are given in section III.A below). The evolution of the use of these different bases and their appearance in international recommendations – in particular, the ‘usually resident’ base and the development of its detailed definition in the United Nations Economic Commission for Europe (UNECE) region – was presented in a working paper by Eurostat (Lanzieri, 2019) at the 2019 UNECE-Eurostat Expert Group Meeting on Population and Housing Censuses. The paper examines the currently used concepts and definitions and the practices followed to determine the size and location of the population across European Union (EU) countries.

17. The *CES Recommendations for the 2020 Censuses of Population and Housing* recognize that countries may wish to produce additional population counts using other bases, but call for countries to produce a count for international comparisons using the ‘usually resident’ base⁴. This recommendation rests on the assumption that the most policy-relevant information about the spatial distribution of people is where they usually spend the night, since it corresponds to where people have their homes, pay taxes and consume domestic goods and services.

18. Yet, where people spend their daytime – at work or school, on roads, in commercial centres, in transport hubs, in leisure facilities or outdoor spaces – might conceivably be more relevant for making certain kinds of decisions about service provision. The allocation of resources for health services, electricity, waste collection or communications infrastructure might be better based on information about where people are during the day, while information

³ (which may be a full subset, i.e. the totality)

⁴ See Chapter V, paragraphs 392-393 in UNECE (2015).

about commuting routes and times would help inform transport planning and the provision of new homes.

19. Existing analyses have looked at this question from several angles, ranging from the imperatives deriving from data sources (for example, what can be achieved through direct enumeration in a conventional census, and what can be gleaned with administrative data sources), to the more philosophical ones (what does ‘population’ really mean?).

20. This report contributes to these wider discussions by focusing principally on *use cases* for such alternative counts: why they might be needed, what they might be used for, and, crucially, how NSOs can find out about these needs and uses. The rationale for this is that **the need and potential use for new or alternative statistics should be primary to considerations about how they are to be produced.**

A. Definitions

21. The discussion that follows in this report depends upon a common understanding of several concepts. We therefore give brief definitions here, but it should be noted that there is a current CES Task Force dedicated to examining and revising some of these definitions and their descriptions and explanations, as part of the wider project to revise and update the CES Recommendations on Population and Housing Censuses for the 2030 round⁵.

1. Population

22. According to the CES Recommendations, a population is “any set of persons attributed to a geographic entity who meet defined criteria at the census reference time; these criteria should help to identify the qualifying adjectives (labels) that clarify which particular population is being referred to (such as the usually resident population or the working population). To meet national requirements, a country may have an interest in various ‘populations’. It is recommended that the qualifying adjectives (labels) attributed to the national populations are as close as possible to the meaning given in the international context.” (paras. 385-6, p. 76). It is worth noting the spatial component to the definition. We may be interested in all the people, or only those with a particular characteristic, but whichever is the case there must always be a boundary to specify the area in which we are counting.

2. Population to be enumerated

23. This is defined in the CES Recommendations as “the set of persons whom the country decides should be covered by the census, regardless of their subsequent exclusion from any specific population count” (para. 387, p. 76). In other words, it is the group of people that form the target population of the data collection activities (be that direct enumeration or compilation of data from registers or administrative sources). A country might collect data on everyone present at a point in time, but then only produce official statistics referring to those who are usually resident, for example.

⁵ The terms of reference of this Task Force can be found [here](#), and a progress report of the group’s work so far was given at the September 2023 meeting of the CES Group of Experts on Population and Housing Censuses, for which slides from the presentation given are available [here](#).

3. *Population base*

24. According to the CES Recommendations a population base is “the population used for the compilation of statistical aggregates in a particular tabulation. This may be a sub-set, or the whole, of the ‘population to be enumerated’. A country may adopt more than one population base (for different statistical purposes), but one of these should always be the population base used for international comparisons purposes (more often the ‘usually resident’ population).” (para. 388, p. 67). This definition is given in the context of recommendations for a census, and hence the definition implies that it will necessarily be a subset of the population enumerated *in the census*. But in principle it could be wholly or partly different, potentially including members who are neither actually enumerated nor intended to be enumerated in a census.

4. *Population count*

25. A population count, as defined in the CES Recommendations, is “the aggregate obtained by the simple addition of individual records from the enumerated population base” (para. 389, p. 76). This is contrasted with a population estimate, which is obtained through statistical estimation methods. Similarly to population base, the definition given for a population count in the United Nations Statistics Division’s (UNSD) Principles and Recommendations is, understandably, somewhat specific to censuses: “A “population count” may be a subset of or the whole of the enumerated population. A country may have one or more population counts, all derived from the enumerated population.” (para. 4.23, p. 176). More broadly, though, a population count could be any set of aggregated records from a population base, whether gathered/produced in the context of a census or otherwise.

5. *Usual residence*

26. Both regional (CES) and global (UNSD) census recommendations, as well as the EU regulations for censuses (EC 2008; EU 2017 a & b) state that countries should produce a count of the ‘usually-resident’ population for purposes of international comparison. UNSD offers the following definitions and guidance for its application (para. 2.48, p.40):

“In general, “usual residence” is defined for census purposes as the place at which the person lives at the time of the census, and has been there for some time or intends to stay there for some time. It is recommended that countries apply a threshold of 12 months when considering place of usual residence according to one of the following two criteria:

(a) The place at which the person has lived continuously for most of the last 12 months (that is, for at least six months and one day), not including temporary absences for holidays or work assignments, or intends to live for at least six months;

(b) The place at which the person has lived continuously for at least the last 12 months, not including temporary absences for holidays or work assignments, or intends to live for at least 12 months.”

27. The 2020 CES Recommendations specifically recommend the latter of these two options (known as ‘the 12-month criterion’) as the base to be used for international comparisons, and further specify that the same definition should be applied not only at the national level but also

for relevant territorial subdivisions within a country (para. 393, p. 78). They also offer a definition of the ‘place of usual residence’ as “the geographic place where the enumerated person usually spends their daily rest, assessed over a defined period of time including the census reference time.” (para. 392, p. 78).

28. While UNSD acknowledges that “countries will determine the definition of a usual resident according to their own particular circumstances”, they nevertheless stress that a count of usual residents should be produced.

6. *Alternative population base*

29. An alternative population base refers to a subset of the enumerated population according to a criterion other than usual residence (either *instead of* or *as well as* the usual residence criterion). It is calculated and used as the basis for a specific analysis, study, or measurement instead of the conventionally-used usual resident population base typical of official population figures. This approach is often employed to explore or measure a particular phenomenon from a unique perspective. For example, a population base oriented around a geographical or occupational definition allows for an analysis that makes for much more targeted observations and subsequently policy recommendations. **It is important for a correct understanding of the rest of this report that ‘alternative population base’ is not a synonym for ‘alternative source of population data’.** A population base is a group defined according to some specified criteria, without reference to the source of data used to identify them.

B. Usual practice in population statistics

30. As stated above, when we talk about ‘the population’, in lay terms we are most often referring to people who *live* in a place. But it is worth interrogating why exactly we tend to rely so heavily on the idea of counting people in the place in which they usually live. Is it because it is truly, conceptually, the information we want, or is it that it is the simplest to define and capture in a standardized way? UNSD’s Principles and Recommendations offer some insight:

“Countries are most interested in the count and distribution of usual residents because usual residence is generally the best indication of where people will demand and consume services, and a count of usual residents is therefore most relevant for planning and policy purposes.” (para. 4.24, p. 176).

31. This gives us first a clue as to at least part of the answer of why we, as a society, want to know ‘where people live’—conceptually speaking, what we really want to know is where people demand and consume services (as well as where they will do so in the future) or where they expose themselves to a certain risk or opportunity, so that we can plan, provide or mitigate accordingly.

32. Using usual residence as an indicator of demand for products and services in this way rests on one or both of two assumptions: first, that most consumption of goods and services takes place in the home; and/or second, that the distances travelled on a daily basis by people who spend the daytime outside their homes are sufficiently small, that counting them where they usually spend the night is an extremely close proxy for where they are consuming the most services or making the greatest use of infrastructure. Indeed, housing itself is a very great part of that consumption of services and infrastructure: informing decisions about where homes will need to be built, and of what kinds and sizes, is a core use of population data.

33. These two assumptions have probably been reasonably true for most people, most of the time, but are certainly not universally the case. This is illustrated, for example, by the Guardian (2016), in which 2011 census data on commuting distances of workers in England and Wales were mapped in an attempt to visualize the economic footprint of cities, revealing the enormous distances travelled on a daily basis by a minority of workers, and the resulting very large ‘catchment areas’ of cities in terms of the places of usual residence of workers who spend their days in those cities.

34. In addition to this conceptual argument, a second, more practical reason for the heavy reliance on counting people where they live is that it offers a clear protocol for avoiding duplication or omission—counting each person once and only once (including avoiding such under- or overcoverage at the international level, by having a set of rules that allows people who cross borders to be allocated to one and only one country). Regional and global guidance around usual residence helps countries to navigate thorny questions about whom to include and exclude and how to deal with edge cases (people with multiple residences, children who move between more than one parental household, homeless and roofless people, transboundary workers, military and diplomatic personnel, nomads and seafarers and so on).

35. There is no such clear-cut ‘standard practice’ when it comes to alternative population bases. Whilst broad agreement exists internationally for the definition of usual residence, alternative population bases are currently subject to potentially infinite definitions. Production of statistics using these bases (e.g. ‘daytime population’, ‘worker population’ etc.) is therefore determined by the specific case in question, e.g. by stated user requirements, and/or by the data source being used, in contrast with counts based on the usual resident population base, which are almost universally produced by NSOs and understood by their users.

C. Alternative population bases

36. While usual residence is the basis for the main or only official population count produced by the NSOs of many countries, there are plenty of others that can theoretically be produced. The CES Recommendations make it clear that there may be specific national needs for other counts, which could be produced using bases other than usual residence. With reference to a census, this may be a subset of usual residents, or it may necessitate defining a ‘population to be enumerated’ that encompasses more than only usual residents (for example, if a country wishes to produce a count of short-term residents, or indeed of non-resident nationals, for countries with a significant diaspora).

37. The UNSD Principles and Recommendations also note that, in addition to usual residence and ‘population present’ (a simple *de facto* count of those present at the census moment, irrespective of residence), countries may have specific needs for other counts. These can include ‘service populations’, in cases “where a significant proportion of the population providing or using services in an area are not usual residents of that area” (para. 4.44, p. 180), such as daytime, workplace and visitor populations.

38. Censuses (whether traditional, combined or based on registers or other administrative sources) are not the only potential source of data for alternative population counts. Information could be obtained from the sources used for migration, tourism and business statistics, among others. The aim here is not, therefore, to consider merely ‘what can be produced with census data?’, but more broadly, ‘what kinds of population counts might be needed and for what purposes?’.

39. It is clear that people who commute to work, school or other activities are making use of services and infrastructure both at the destination and during their journey. Hence, a business deciding on the location for a lunch café will be more interested in where people spend their lunch breaks, than in where they sleep. A council allocating resources to maintain roads will direct them to areas where the most vehicles are driven, more than where they are parked overnight. In fact, many such decisions require information on *both* place of residence and place of work or study, since it is the route between the two that matters (e.g. for providing public transportation).

40. Movement between locations is not necessarily a daily occurrence. Some people are seasonal workers; others maintain two homes and move between them at intervals. Students often spend term time living alone, in group accommodation or as part of a multi-student household, and vacation periods as part of a family household. Tourists visit places for widely varying lengths of time. There are also circumstances in which particular incentives or disincentives affect where people register themselves as ‘living’, in countries with a population register, so that their officially-recorded usual residence is not an accurate reflection of where their actual consumption occurs. Yet, such official registration might still be relevant for some decision-making purposes, such as the estimation of tax revenues. The same may be true for people who own and pay tax on a property, but do not occupy it.

41. Each of these scenarios suggests a need for a population count that would be indicative of the real demand on services and infrastructure. Yet, in the context of censuses as usually conducted, we go to great lengths to allocate individuals to one place and only one place. If a person has two homes, we assign them to the one where they spend the longest; if tourists stay or intend to stay for less than 12 months, we do not count them as usual residents. This ‘all or nothing’ approach is very helpful for the practical purposes of producing a census usual resident count, but masks a great deal of nuance that could be useful for the users of statistics. And as time goes on, it may be that there are ever more such cases. If the share of regularly mobile people in a population is small, then assigning each such person 100 per cent to one, ‘principal’ location is an acceptable solution (as opposed to assigning ‘portions’ of a person to different locations in proportion to the time spent in each). But as the share of the mobile population grows, the information lost by doing so grows as well.

42. Knowing where people spend different portions of their time, rather than only their nightly rest, is important not just for examining their consumption patterns but also for assessing their exposure to risk. The risk profile of an event is influenced by the duration over which a population is exposed to the potential for such an event. When examining the risk associated with - let's say - an extreme tidal surge in London breaching the Thames Barrier and inundating central London, it is imperative to recognize that the risk profile varies significantly throughout the day, in proportion to the number of people who would be affected by such a disaster. With millions of commuters regularly travelling to central London offices and returning to their residences in the surrounding home counties, the number of people who would be affected by a flooding event would be much lower if such an event were to occur at 2 a.m. as opposed to 2 p.m. Understanding the intricacies of a risk profile like this is of utmost importance for organizations such as the United Kingdom’s Health and Safety Executive, a body dedicated to assessing and mitigating risks.

43. It is important to emphasize that the primary objective of this report is to shed light on the various use cases of alternative population bases: that is, the demand for and utility of analysis derived from alternative population bases, rather than the methodologies and data sources responsible for their generation. In other words, the in-depth review by the CES Bureau which we aim to inform with this report will be one focused on questions around who seeks

these alternative population bases, why they are sought, the specific purposes they serve, and how their relevance and applicability can be substantiated.

44. This caveat aside, it must be acknowledged that the landscape of data sources and methodological approaches in population statistics is currently undergoing very rapid evolution. Transitions to administrative and non-conventional data sources, and increasing emphasis on integration of data from multiple sources, make it far more feasible to even contemplate the very idea of producing population statistics in other ways than by conducting a census. This opens the door to possibilities for counts other than usual residence. At the same time, the evolving user landscape, with an ever-increasing emphasis on timeliness, creates an expectation of population statistics that are more directly policy-relevant, able to answer the exact questions asked by policymakers rather than only an approximation of their questions.

45. This discussion also holds particular relevance at a juncture where new recommendations for censuses are being formulated at both the regional (CES) and global (UNSD) levels, since, although censuses are not the only source for population statistics nor necessarily the best source for alternative counts, they remain the principal such source. Any new or expanded definitions should align with, and ideally be incorporated into, these internationally-agreed frameworks.

IV. OVERVIEW OF STATISTICAL ACTIVITIES IN THE AREA

A. International practices

46. Among the international organizations to which the request for information on current practices was sent, only Eurostat provided a reply, in which it was explained that they neither produce, plan to produce, nor are aware of any user requirements pertaining to alternative population bases. Their emphasis is very strongly on promoting and supporting harmonization of usual residence counts among European Union countries via their censuses.

47. However, it can well be assumed that there would be very strong use cases for alternative counts among other international bodies. For instance, disaster relief agencies, those working with refugees and migrants, and bodies working in countries or territories with very poor official data infrastructures, would likely benefit from counts based on actual presence, short-term movement, resource use, legal documentation status etc.

48. Any further work in this area will need to have a particular focus on engaging international entities to ensure that such needs are correctly identified and met, and that any concepts or definitions that are developed are relevant to these use cases.

B. National practices

49. Beyond official statistics, several private sector entities, ranging from academic institutions to private companies catering to business needs, have produced their own population bases to meet their specific user demands. Among these, the necessity for population statistics that vary throughout the day emerges as the most imperative requirement among users. As an illustration, Esri has created the 2021 [Esri Daytime Population dataset](#), designed to differentiate demographic profiles between day and night, with the aim of serving both commercial entities and those delivering public services, such as emergency services. Similarly, the British mobile phone network operator O2 has developed the [O2 Motion dataset](#) utilizing its own mobile telephone data. The company provides these extensive datasets to organizations spanning both the public and private sectors as an alternative source of information on

population movements. Notably, ONS has incorporated O2 Motion data into their research efforts to develop novel methods for population estimates. These examples highlight the private sector's efforts to address user requirements that NSOs may find it challenging to fulfil on their own using conventional approaches. However, the private sector has not yet established itself as a credible provider for population data built on alternative bases, and as such, users continue to rely primarily on official statistics.

1. What alternative population bases have been used in NSOs to produce population statistics?

50. The vast majority of population statistics produced by NSOs are based on the concept of usual residence and are produced using data from the census. As well as, or in some cases instead of, usual residence, some NSOs use *de facto* presence (actual presence in a dwelling on census night, irrespective of residence) for census population counts. While interesting to note the changes taking place in this regard, for example in Ireland and New Zealand (both of which report a move from *de facto* to usual residence in their censuses), it remains the case that population counts based on where people spend the night, whether *de facto* (actual) or *de jure* (usual) are still 'conventional' counts, rather than alternative ones in the sense intended for this report.

51. Ireland reported that *de facto* counts were produced using information on all persons present in the dwelling on the night of the census, irrespective of their usual residence status, gathered via the paper census questionnaire that has been used in Irish censuses up to and including 2022. The experimental series [Irish Population Estimates from Administrative Data Sources](#) (IPEADS), based entirely on administrative records, has been able to produce unofficial usual-residence-based population counts for 2020 and 2021.

52. New Zealand reported that they only shifted to usual residence as the basis for their national and sub-national population estimates in the mid-1990's. Prior to this such estimates were *de facto* based, i.e. based on location at the collection reference date as opposed to the usual location. This shift, StatsNZ reports, was made because the *de jure* (residence-based) estimates better meet most customer needs, e.g. for electoral, education and health systems. It was not until the 1980's that the New Zealand census produced 'census usually resident population counts' suitable as a base for resident population estimates. However, it was Stats NZ running its first post-enumeration survey in 1996 that was the catalyst for switching official population estimates from *de facto* to resident.

53. Statistics Poland reported in detail on the population counts they produce—which, while based on a conventional concept of 'living in a place', depart from the standard concept of usual residence by using a shorter length-of-stay criterion which permits them to identify shorter-term population movements. The Polish national legislation obliges Statistics Poland to develop counts of population size and structure uniformly for all territorial division units (communes) in the country. The total population number of the communes represents the population number in Poland. The population as delineated by the national definition comprises persons who live (stay) or are going to stay in a commune for a period of over three months. This means that the population number in a given commune includes permanent inhabitants (persons who are registered there or who permanently live there without registration), excluding those inhabitants who moved for over three months to another commune in the country, and including permanent inhabitants of Poland who came to the commune from other place in the country for over three months. Immigrants staying in Poland temporarily are not included in the population of a commune, whereas permanent inhabitants of Poland staying temporarily abroad (regardless of the period of their absence) are counted in the population of a given commune.

54. Among the responding countries and organizations, only Canada, New Zealand and the Russian Federation provided information on alternative bases used to produce population statistics within the NSO. Albania, Poland and Mexico reported that they are not currently working with any alternative population bases and have no specific plans to do so. Eurostat also has no plans to do so or to work with countries to do so. They add that the Eurostat proposal for comprehensive new legislation for European statistics on population and housing (ESOP), integrating infra-annual, annual, multi-annual and decennial statistics on population topics, retains and attempts to reinforce the use of a population definition based on a 12-month usual residence concept. This proposal is currently being reviewed by the European Parliament and the Council as part of the legislative process.

55. Canada informed us that while usual residence is the current priority for combined census research, they recognize the potential for other ‘alternative population bases’ which could be derived in addition to more ‘traditional’ residence definitions. The growth of the non-permanent resident population in Canada has triggered policymakers, politicians, journalists and academics, among others, to request statistics on this population group, to answer emerging questions on housing and the labour force that have surfaced recently in Canadian public discourse.

56. The Russian Federation mentioned that Rosstat is undertaking experimental calculation of new indicators, including populations using a second home, temporary populations, and circular and ‘pendulum migration’, calculated on the basis of depersonalized data obtained from mobile telephone operators.

57. While usual residence continues to predominate as the basis for counts, it is worth noting that there are variations in the actual application of the term ‘usual residence’ for either practical or conceptual reasons. In Canada, for example, the application of the concept of usual residence is based on self-declaration, and includes non-permanent residents (NPRs). This means that specific statistics on NPRs can be computed. These estimates are based not only on census data but on administrative sources (temporary residence permits) from the federal immigration department, Immigration, Refugees and Citizenship Canada.

58. It is also important to note a comment from New Zealand that “some demand for de facto and peak population estimates has re-emerged in recent years, given a growing visitor population in New Zealand generally, and in some local areas specifically.” A diverse visitor population including tourists, students, seasonal workers and working holiday-makers can place demands on local infrastructure including housing, but can also be an important segment of the labour market, albeit largely invisible in current official statistics. However, all the visitor populations are highly seasonal, so measurement requires some flexibility in reference dates.

2. What needs have countries and other organizations identified for alternative population counts?

59. While it is relatively easy to brainstorm *hypothetical* use cases for alternative counts, this is a different matter to identifying *actual stated demand* among users of statistics, and to discovering what use is made of such counts when they are produced.

60. One specific need identified by Canada is the case of a province, Alberta, that has a large ‘shadow population’ (people who spend extensive amounts of time in one municipality of Canada but declare their primary residence elsewhere in another municipality for census purposes). If usual residence based on self-declaration—the means of determining usual residence typically employed for the Canada-wide census—were used as the criterion for

determining the population base in such places, this would create a situation in which funding and provincial policies would be mis-allocated. Therefore the province has a special mandate to conduct its own municipal census.

61. Canada also identified a demand for counts of NPRs, which are used to develop and evaluate policies on housing, labour market (notably labour shortages), linguistic dynamics, etc.

62. New Zealand reports several use cases that have been identified and are being met by statistical producers other than the NSO. These include health service user statistics based on a population of those using or potentially using health services in New Zealand. The population therefore includes not only usual residents, but also people visiting New Zealand, as well as people who have emigrated from New Zealand. This work is being done by Manatū Hauora (Ministry of Health). An important driver for its development is to mitigate bias in health-based indicators, especially regarding geography and ethnicity. In principle, for example, the ethnicity of numerators and denominators are drawing from the same health-based data, and not using census-based ethnicity data which has been collected in a different way.

63. The Russian Federation noted a growing demand for information on population movements within cities and urban agglomerations, which could potentially be more easily met with novel data sources such as mobile positioning data than with conventional census information on usual residence.

64. Mexico reported that while National Institute of Statistics and Geography (INEGI) is not currently aware of any specific demand, they are aware in general that there is a growing demand from users and stakeholders for alternative counts.

65. Poland reported that has no plans to develop population counts using alternative bases. Work on strengthening the definition of the resident population (using more administrative sources, exchanging unidentifiable data via mirror statistics) is be carried out under the new legislative initiative of the European Commission, i.e. the ESOP Regulation.

66. The United Kingdom reported on the findings of their 2021 consultation response report on proposed census outputs. 173 respondents gave information about whether they would use alternative population counts, if ONS were to produce them. Among these,

- 65 per cent would use the workplace population base
- 61 per cent would use the workday population base
- 50 per cent would use the out-of-term population base
- 53 per cent would use the non-UK born, short-term resident population base
- 51 per cent would use the second address population base
- 5 per cent would use another population base if it were available
- 24 per cent would not use any of the proposed alternative population bases.

67. According to the same consultation, Local Government organizations in the United Kingdom were among the most vocal proponents for alternative population bases. For example, Cheshire East Council stated:

“Data on the workplace population at MSOA [middle layer super output area] level [...] would be extremely useful in informing our response to emergency situations such as floods, as such responses (e.g.

evacuation/rescue efforts) need to take account of the number of people potentially present (or travelling to/from) the affected areas and the geographical distribution of people within those areas.”

68. Manchester City Council explained in the consultation why they would find alternative population bases useful:

“It is essential that we have an understanding of our workplace population in 2021, even if it is to indicate those missing due to lockdown, so that we can make policy decisions about recovery and the future of the city centre. Cross tabbed with ethnic group, sexual orientation and other protected characteristics it will inform our equality strategies.”

69. The consultation responses from local government demonstrated that users need alternative population bases for the calculation of risk, as well as for understanding demand for goods and services at particular times of day. Furthermore, user needs often go beyond just simply the population base itself, but often require tabular breakdowns by other variables such as age, sex and occupation.

70. Ireland did not share information about specific user requirements in their response; however, they did emphasize that their strategic planning for future outputs is shaped by the emerging European Union (EU) regulatory framework, which underscores the imperative for substantially enhanced individual and household level statistics. This regulatory framework enhances the call for the standardization of the usual resident population base across EU Member States. Although it does not explicitly mention alternative population bases, one could foresee the potential extension of this framework to encompass such alternatives.

3. *How have countries and organizations determined these needs? How have they consulted and engaged with stakeholders to establish changing demands for population counts?*

71. Canada, the United Kingdom and New Zealand have undertaken extensive stakeholder consultations around their initiatives to transform their censuses and related production of population and migration statistics .

72. In New Zealand this has centred on consulting stakeholders for feedback on proposals for an Administrative Population Census as well as on their wider Data Investment Plan. Consultations have focused on resident population, aligned with current census counts and population estimates and projections. They state that “There has been no formal feedback requesting alternative population concepts or bases.”

73. In Canada, there is a regular programme of consultations with key demographic stakeholders (subnational jurisdictions, other departments, the general public, academics, etc.) aimed at ensuring relevance of population statistics. There is also a ‘Census Futures’ sub-project currently underway which has a multi-year communications plan to consult with stakeholders, data users, and the general public.

74. Mexico, Ireland and Poland have not conducted dedicated consultation related to potential demand for alternative population bases, but all stated that they are open to considering this as part of future strategies. In Poland, for instance, consultations are carried out only on the application of the population definition based on the concept of 12 months stay in the context

of expanding the number and quality of administrative and non-administrative data sources. The main discussants/stakeholders are representatives of local government and the scientific and research community. Ireland plans to run a seminar with stakeholders on the Future of the Census in February 2024.

75. Given its current stage in the census cycle, Albania is focused on its September 2023 census and has therefore not engaged in any dedicated stakeholder consultation on this topic.

76. The United Kingdom carries out regular user engagement throughout the census cycle. ONS runs a regular programme of engagement which includes user consultations, roundtables, bespoke senior engagement, conference attendance, and parliamentary engagement, among others.

77. In the past decade ONS has carried out four census consultations:

- Beyond 2011 (2013): on the provision of a traditional census vs an admin-based system in 2021
- Census topic consultation (2015): on the proposed topics for the 2021 census
- Census outputs consultation (2021): on the proposed outputs for the 2021 census
- Future of the census consultation (2023): on the provision an admin-based population statistics system. This consultation is still ongoing at the time of writing.

78. Each consultation, while having a different emphasis, had a common goal in thoroughly assessing user need for population counts. It must be recognized that user requirements change over time. Hence, returning to users repeatedly is an important feature of a meaningful strategic approach to user engagement.

79. The Census outputs consultation, carried out in 2021, had a specific focus on what statistical outputs users required from the 2021 census data. For alternative population bases, the [consultation document](#) proposes the same alternative population bases as were [produced in 2011](#): workplace, workday, out-of-term, short-term, and second address. Users were asked which alternative bases they would use, if any, and how they might use them. The exercise gave ONS the evidence they need to prioritize the outputs they produce.

80. Within the organizational design of ONS, it should be noted that user engagement and communications are distinct operational functions that exist separately from the teams that produce statistical products and analysis. So, for example, several stakeholder engagement teams and external communications team exist to lead on engagement activity such as consultations and to manage relationships with stakeholders. These are activities which would not typically be undertaken by analysts themselves.

V. ISSUES AND CHALLENGES

81. The production and use of alternative population bases is encumbered by an array of challenges. These challenges encompass conceptual, methodological and dissemination-related aspects. The most salient among these challenges are as follows:

82. **Data issues.** The inherent cross-sectional nature of census data from a traditional (direct enumeration-based) census inevitably leads to a decline in the precision of population estimates

during inter-censal periods. Given that a census is typically the paramount source for population statistics, the accuracy of the resulting population counts therefore similarly fluctuates significantly over time. If alternative counts are to be produced using the same data as their source, they too will suffer from the same limitations. Where other sources are proposed as alternatives, such as administrative sources which are the focus of many NSOs' current efforts, these bring their own limitations, discussed at length elsewhere. In particular, sources of data on daytime movements such as mobile telephone data, vehicle movements, public transport transaction data, and even social media data, each bring their own particular risks of selectivity bias or other related challenges.

83. Seasonal and other cyclical fluctuations. Seasonality can impact data sources, especially with collection intervals exceeding a year. Cross-sectional population counts become less useful when populations fluctuate seasonally. For instance, the workplace population of a French ski resort during winter is likely significantly larger than in the summer months; while the socio-economic characteristics of the population in an agricultural area will differ between planting time and harvest time. While census data cannot control for seasonality, administrative data holds more promise in this regard, with some NSOs aspiring to publish monthly population estimates using such data sources. Any efforts to compute population figures on alternative bases must acknowledge these impacts of seasonality and be clear about the specific time and conditions to which they pertain. Indeed, even a daytime population count based on measurements of movement will clearly be different if produced on a weekday or a weekend. It would need to be decided whether user needs would best be served by a count that is specific to a certain day or period of the week or some average, smoothed or otherwise adjusted figure.

84. Clarity of communication with users. The provision of alternative population estimates can foster confusion among users. While expert statisticians are expected to discern the disparities between various population bases, novice users are less likely to appreciate such distinctions. For instance, "the population of London" is often cited as 8 million people, but this figure represents only the usual resident population, with the workday population estimated to exceed 10 million. Creators of media content for general audiences, such as journalists, tend to simplify their messages, often neglecting nuanced distinctions. To mitigate this issue, NSOs that publish alternative bases have resorted to strategies like staggering the release of statistical data and providing clear explanations and guides to avoid confusion.

85. Understanding and articulating the added value of statistics on alternative population bases. The perception of added value associated with alternative population bases varies widely. As seen from the country replies in this report, this variation in perceived value applies even at the level of the NSO, with some placing great emphasis on them while others do not. If we are to argue that daytime, workplace, short-term or other alternative bases provide added value compared to sticking with the status quo and producing only usual-residence-based figures, it is necessary to show either (or both) that they are easier/cheaper/faster to produce, or that they provide information that is sufficiently different from that provided by classical usual residence figures. That is, we need to ask whether they provide the user with information that serves their purposes, and that could not be gleaned from the existing products. Hence, we have to investigate whether they are anything more than simply 'fun'. We may marvel at interesting commuter movement patterns or tourist flows, especially when made into entertaining maps, animations etc., but a serious commitment to producing these figures has to be made on the basis of clearly-articulated need and evidence of usefulness.

86. Lack of international consistency. The absence of international coherence in defining population bases diminishes their utility in a transnational context. This inconsistency is driven partly by the diverse data sources employed, such as data from enumeration-based

(‘traditional’) censuses and those which use combined approaches, or which rely only on registers and other administrative sources; and partly by the newness of ideas which have not yet been subject to international collaboration to develop agreed concepts. For example, defining precisely whom to include in a count of a city’s daytime population would depend on many component parts, such as defining the length and starting time of the ‘workday’, the geographical limits of the area to be covered, the kinds of people to be included (employees, students, tourists, shoppers...), the thresholds for frequency or length of time to be included, etc. These could well be envisaged to vary widely by context, so any internationally-agreed definitions would be a very long way off. Yet, in the absence of such agreements, the comparability and cross-contextual understanding of such figures is greatly limited.

VI. CONCLUSIONS, RECOMMENDATIONS AND FURTHER WORK

87. The research conducted for this report has highlighted the fact that a small number of countries are making dedicated efforts to produce alternative population counts, in a bid to cater to specific user demands identified through active engagement programmes.

88. It is evident from this review, therefore, that **proactive user engagement** on the part of the NSO is a pivotal factor in ensuring the correct identification of user requirements with respect to population counts and other population statistics. Where users are asked explicitly whether they would find value in alternative population bases, it seems that such a need will likely be identified; and when such products are offered, they appear to be of use to some user groups.

89. The localized nature of demographic patterns, policy considerations, and political dynamics means that there is wide variation in user requirements across different countries. Nonetheless, these requirements are seldom entirely unique. Thus it seems likely that these conclusions, drawn on the basis of experience in a small number of countries, might well apply to other countries if they were to conduct similar user consultations regarding population statistics. That is, it can be expected that the same kinds of user need for statistics made from alternative population bases will exist in a wide range of national contexts. The use cases discussed above are largely applicable across countries. It is to be recommended, then, that **NSOs wishing to improve their relevance to user needs should consider consulting stakeholders about what kinds of alternative population bases they would be interested in, and why**. This could inform future decisions about new statistical products.

90. A secondary conclusion which came to light from the questionnaire responses was a generalized tendency to confound the ideas of ‘alternative population base’ and ‘alternative data source for population statistics’, although in reality these are two entirely different things. The ‘base’, as explained above, is the population used for the compilation of statistical aggregates in a particular tabulation. A given source—whether it is census data, data collected from a survey, a national population register or a statistical register built from linked administrative datasets—can often contain enough information to permit the production of tabulations based on various different bases (e.g. census data are often sufficient to produce population counts based on usual residence, habitual weekday-time and night-time locations, etc.). The fact that a country has moved or is considering moving towards admin-based systems for its census does not constitute an alternative population base, but rather an alternative data source. It may, however, necessitate a switch in the precise base used to produce the core statistics on usual residence, since registers or other administrative sources may contain information only on registered residence rather than intention to stay.

91. The international official statistics community may therefore wish to **consider developing a more detailed definition and explanation of the term ‘alternative population base’** and how this is distinct from questions related to data sources, and to raise awareness of this by ensuring its incorporation within internationally-agreed guidance. This could be included in the current work to revise the CES Recommendations on Population and Housing Censuses, and/or the concurrent project to revise the United Nations Statistics Division (UNSD) Principles and Recommendations for Population and Housing Censuses. Such expanded definitions could include explanations in general terms of what is meant by some specific alternative bases such as ‘workplace’ and ‘workday’, although, given the small number of countries currently producing such figures, it would not yet be appropriate to propose developing shared standard definitions for these.

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APPENDIX: TEMPLATE SENT TO COUNTRIES

The following template was sent to those countries which had indicated, either during the February 2023 meeting of the CES Bureau or during the associated online consultation, a willingness to contribute their experiences to the preparation of this paper. Responses were received from Albania, Canada, Ireland, Mexico, New Zealand and Eurostat, in addition to the material provided by Poland and the United Kingdom as co-leads of the review. The Russian Federation provided a written note.

Has your office already produced population counts based on bases other than usual residence?

- *If so, which bases? When? Why?*
- *Give brief details about the sources and methods used*
- *Give examples of how these data have been used. Provide links or attach documents if available*

Does your office have plans to develop population counts using alternative bases?

- *If so, why are you planning to do this?*
- *If in response to user demand, which kinds of users and what have they asked for? Have they indicated what uses they will make of this information?*
- *How do you intend to collect or produce this information? Explain the use of censuses and surveys for this purpose as applicable*

Has your office consulted, or does it plan to consult on user/stakeholder demand for alternative population counts?

- *If so, give details. How have you consulted? With whom? When?*
- *What are your plans in this regard?*

Is any other statistics producer (whether official, academic, or private sector) producing population counts based on alternative bases in your country?

- *If so, please share links, citations, or documents. If not in English, please give us a summary*
- *How have these data been used?*

Are you aware of any research or policy decisions that have been informed by alternative population counts?

- *This could be yours or counts produced by others*
- *Please share details and add links to use cases of alternative population counts.*