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QUALITY OF REGISTERS

**The population statistics in Iceland
Analysis of population estimation methods of Statistics Iceland**

Note by the Statistics Iceland

SUMMARY

1. The paper examines the population estimation methods of Statistics Iceland, especially in the light of its comparability with traditional censuses and international guidelines. The paper concludes that the main problems lie in overestimation due to delays in or avoidance of de-registrations from the Icelandic National Population Register. The paper also suggests some actions that can be taken in order to deal with the overestimation of the population.

I. INTRODUCTION

2. Population statistics have been the core business of national administrations from the first censuses in the 18th and 19th century. The national statistical institutes (NSIs) were more often than not established as a result of the need to organise this activity. Over the decades, the NSIs have come to a consensus on the main definitions, i.e., how to demarcate the resident population, who to count migration, and how do identify deaths and live births.

3. From its inception Eurostat has received the demographic statistics from the Member States on the basis of gentlemen's agreement.

4. In the fifties and sixties of the last century, all of the Nordic countries fundamentally changed the way how they produced yearly population statistics. Instead of basing them on decennial censuses and estimations based on records of vital events and migration in between, the countries started to rely wholly on comprehensive population registers. Population statistics that are based on population registers may differ from traditional statistics in a number of ways. In European context it is, however, important that regardless of the source or methods used, the statistics are

comparable, so that no person is missing and no person is double counted, when aggregating the individual national figures.

5. The European Union has currently one regulation in place in which the resident population is defined. This is the regulation on population and housing census, in which there is an option to replace the concept of “usual residence” with the concept of legal or registered residence.¹

6. In this context it is important that the register statistics are compared to those using traditional means of estimating the population. The differences must be highlighted, and plans must be made wherever there are possibilities of convergence. Otherwise the user would be ill served. The present paper examines the population statistics of Statistics Iceland with this view.

7. The paper is organised in the following way: First there is a review of the current practice of Statistics Iceland to the population stock. The main part of the paper deals with indications or evidence for inaccuracies in the population estimation, as measured against the international guidelines. The paper concludes with a discussion of the main findings.

II. REGISTER BASED STATISTICS

A. Register based statistics

8. Statistics Iceland bases the population estimates on the National Population Register (NPR), which is an administrative register maintained since 2006 by the ministry of justice. The register was originally established by Statistics Iceland in 1952 for both statistical and administrative purposes.

B. The residence *criterion in Iceland*

9. The definition of the legal residence in the NPR is similar to the definition of usual residence, with the exception of how migrants are determined. We won't go into details but suffice it to say that for internal migration no threshold of duration of stay is applied and for external immigration, the threshold is usually 6 months but can be as low as 3 months. This, however, only applies to foreign citizens, Icelandic citizens may immigrate whenever they like without any question of their intention to stay. No threshold is applied to external emigration, either for Icelandic or foreign citizens, except in case of inter-Nordic migration where there is a 6 months threshold by multi-lateral agreement.

C. Timely final data

10. Statistics Iceland uses the NRP at the end of the year for estimating the population at that time. All migration flows that have been registered during the year are taken into account, but birth and death data referring to the reference year which are registered in the first 6 weeks of the following year are added to / subtracted from the data before publication.

¹ Regulation (EC) No 763/2008 of the European Parliament and of the Council, OJ L 218, 13.8.2008, p. 14.

III. COMPARING CENSUS AND SURVEY DATA WITH POPULATION ESTIMATES

A. Comparison with traditional censuses

11. Statistics Iceland has taken two population and housing censuses since the start of the NRP, in 1960 and 1981. In both cases the census records were compared with the population records. The net difference at both times was less than 1%, while the gross difference was somewhat higher, especially in 1981 (Table 1).

	1.12.1960	31.1.1981
Register population	177 292	229 567
Persons with residence abroad ¹	-1 700	-3 193
Persons registered abroad but with residence in Iceland		900
Not found in registers ¹	100	596
Census population	175 680	227 870
Gross deviance from Census population (%)	1.0	2.1
Net difference between NRP and Census (%)	0.9	0.7

Sources: Manntal á Íslandi 1. desember 1960. Skýrsla um manntalið 31. janúar 1981

¹ Exact figures from 1960 not provided.

B. Comparison with the labour force survey

12. The comparison with Census data is also supported by the experience of the Icelandic Labour Force Survey. In order to provide the best estimates for the national employment, the LFS must adjust the population figures by the number of persons estimated to have their usual residence abroad, including third level students, who are allowed by law to retain their domicile in Iceland. The survey uses the 6 months criterion when asking about the reason for non-response. The latest published data are from 2002, when an average of 3.0% of the population 16–74 years old resided abroad over the period 1991–2002.² Making some assumptions about the age structure of persons abroad (relatively fewer children and older persons), we can thus expect that in this period approximately 2.9% of the registered population were actually staying abroad for 6 or more months.

IV. BIRTH RECORDS FROM ABROAD

13. It is also possible to assess the size of the registered population that actually lives abroad by looking at the evidence of their fertility.

A. Evidence from birth records

14. Every year, the births of children with Icelandic parentage are reported to the National Registry. Some of the mothers are registered with domicile abroad, others with their legal residence in Iceland. If we assume that all the mothers in the last category were actually resident abroad, we can make some rough estimations using the birth rate that we can observe directly (births with Icelandic parentage but foreign residence) to estimate the size of the unknown population.

² Statistics Iceland: *Labour Market Statistics*. 2002

15. Some assumptions have to be made. We restrict our calculations to Icelandic citizens aged 16 to 74 years, both because of the comparability with the LFS, and because we need to cut off at some upper age limits as deaths of Icelandic citizens with permanent residence abroad is severely underreported. We also assume that the age and sex structure of the two populations (the registered and non-registered abroad) are similar and that the crude birth rate is the same.

16. Between 1 January 2005 and 1 January 2010 there were 2 537 births registered from a population of average 23 304 Icelandic citizens aged 16–74 years and registered with a foreign residence. In the same period, 241 births were recorded abroad of Icelandic citizens who were registered in Iceland. The crude birth rate thus indicates that 1.1% of all Icelandic citizens aged 16–74 years with legal residence in the country, actually live abroad. Making the same assumptions about the age structure as above, we may thus expect that approximately 1% of the registered population consists of Icelandic citizens living abroad.

V. THE PROBLEM OF DEREGISTRATION

A. Deregistration is a problem

17. As in other countries using registers, the estimation of emigrants is the most problematic, as these – especially when of foreign background – tend not to have any reason to deregister when leaving the country. These will eventually be removed from the registers, but any extra delay will inevitably lead to an overestimation of the population stocks at each point in time.

18. The average effect of delays in deregistration can be calculated in a simple way. In the 21 years under observation, the total number of emigrants was 81 546. According to the records the average delay in deregistration was 114 days. This amounts to an average overestimation of the population 1 209 persons due to reporting delays in the period 1987–2007. This is balanced, but not fully offset, by an underestimation of 742 persons due to reporting delays of immigration (table 2). The average difference is 467 persons in overestimation. Considering that the average population in Iceland in the period 1 January 1987 to 1 January 2008 was 274 454, the average overestimation of the population of Iceland due to imbalances in the registrations can thus be estimated as 0.2%.

19. When looking at the individual sources, own reports and administrative sources are the biggest contributors to the underestimation of immigration and emigration, respectively. It is also interesting to note that inter-Nordic migration performs considerably better than internal means of administering migrations records.³

³ A note of caution. The administrative sources for immigration are mainly those of the Directorate of Immigration. The date of migration is thus usually the issuance date of the residence permit. The administrative sources for the emigration date are less reliable. These are mainly the expiration date of the residence permit or the next calendar month after the last payment of income tax (Erla Hallsdóttir, National Registry, 6 April 2010). The validity of these dates has not been examined.

Table 2. Under- and overestimation of the population due to reporting delays of immigration and emigration 1987–2007

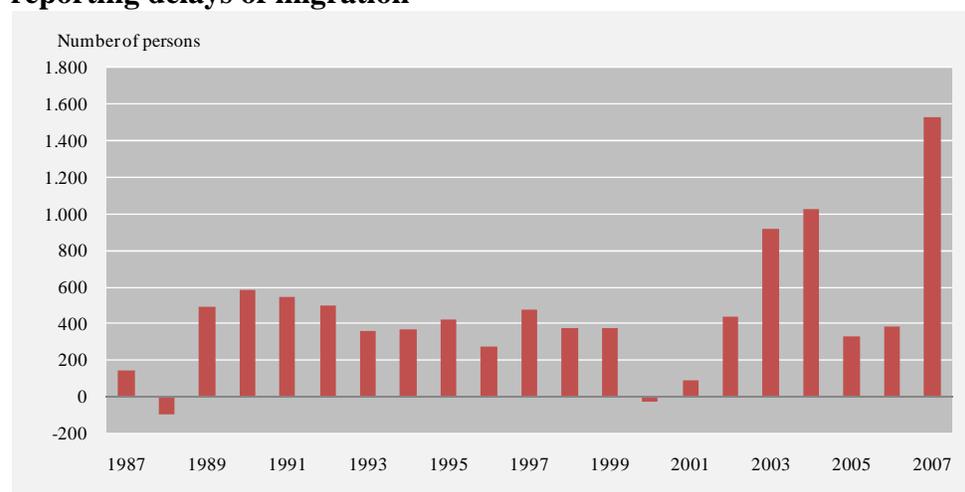
Source	Immigration			Emigration		
	Total	Average lag - days	Effect	Total	Average lag - days	Effect
Total	99.503	57,2	742	81.546	113,7	1.209
Reporting forms	17.192	50,4	113	15.551	127,8	259
Inter-Nordic	45.475	33,0	195	50.083	30,2	197
Enterprises	606	60,3	5	4.292	104,5	58
Administrative ¹	33.171	91,5	398	9.332	557,6	683
Other ²	3.059	102,3	38	2.288	97,3	22

¹ Directorate of Immigration, municipalities, National Registry's own investigation
² Mainly birth certificates, marriage records and divorce papers

Source: Statistics Iceland

20. The averages don't tell the full story, as migration is neither evenly spread over the year nor are the efforts of the National Registry to deregister suspected delinquent emigrants. We can use the back data that we have for assessing the over- or underestimation on each 1 January 1987–2007. Although we are dealing with right-truncated data, as we can only observe delays that have been registered at the time of writing this paper, we should not be overly concerned, as we have already amassed three years worth of data since 1 January 2007. The result of the back-calculation is shown in figure 1, with the columns indicating what should be added to or subtracted from the published population data on 1 January each year. The large deviation in 2007 suggests that many of the migrant workers entering the country in 2005 and 2006 had already left by the end of 2006 without this being reflected in the registers until much later.

Figure 1. Over- or underestimation in population estimates 1 January 1987–2007 due to reporting delays of migration



21. Delays in the registration of births and deaths may also contribute to errors of estimation of stock data. In the case of Iceland these are, however, minimal. The average delay for the registration of births and deaths in 1988–2007 was 3 and 19.6 days, respectively. When calculating the population stock, account is always taken of birth and death records that are received in the first

month after the reference date, so that the errors are confined to the relatively small amount of records that are received after the 30 day period.

VI. ACCOUNTING ISSUES

22. The accounting practice for migration data differs from that of birth and death data in the Icelandic population statistics. Only births or deaths that occur in the reference year are counted, provided that these have been recorded before the end of the first six weeks of the subsequent year. In estimating the population stock at the end of the year, however, no knowingly dead persons are counted even if they were reported late and they died prior to the reference year. Same applies conversely to births. This causes some but insignificant amount of statistical adjustment.

23. In contrast to birth and death events, migration records that were registered in the reference year are all counted, regardless of when the migration event actually happened. Also, in contrast to the birth and death events, migration events that happened in the reference year, but were recorded in the first six weeks of the subsequent year are not counted with the reference year, but with the subsequent year. The only exceptions allowed, are made in order to keep families together in the end of the year register.

24. As all migration events are counted, the errors in estimation that this accounting practice causes are close to zero in the long run. In times of change in the direction of migration flows this may, however, lead to over- or underestimation of the population. This is because of the differentials in the reporting lag for immigration and emigration. Each recording year, records from the previous years tend to be weighted towards emigrations, while the current records have a bias towards immigration. Such a change would, however, marginally affect the stock estimates (the average difference is -0.007% of the average population 1987–2007) while marginally improving the estimates by reducing the variance somewhat.

VII. SHORT-TERM AND LONG-TERM MIGRATION

25. As discussed in a second paper⁴, the migration statistics in Iceland essentially counts migration events whenever the intention is to stay for more than three months (six months for Nordic persons). That paper, however, shows that this does not matter when it comes to net migration. Considering only migration in which the migrant will stay for at least 12 months, the net migration is almost the same as when all migrations are counted. The average effect on the population stocks is less than 0.005%.

VIII. THIRD LEVEL STUDENTS ABROAD

A. Secondary residence can be registered for students

26. In the international guidelines third-level students should be recorded at their actual residence. In Icelandic law they are allowed to maintain their legal residence in Iceland, provided the study is outside of the Nordic countries. These students are, however, required to register their

⁴ Ómar Harðarson, “Long-term and short term migration in Iceland”, presented at the Joint UNECE/Eurostat Expert Group Meeting on Register-Based Censuses, The Hague, 10-11 May 2010.

secondary residence. Some of them do. According to data 2002–2009,⁵ approximately 0.34% of the population were registered with a secondary residence abroad.

IX. NON-REGISTRATION

A. Non-registration is also problematic but less so

27. Neither the LFS nor other regular surveys of Statistics Iceland have an indication on non-registered residence in Iceland. These would involve three categories with regard to register status:

- 1). persons with registered domicile abroad,
- 2). persons with short-term permits and an Icelandic PIN who have overstayed their residence permits, and
- 3). non-registered or illegal persons.

28. Evidence from the 1981 Census, as well as other informal information, suggests that the first group is probably the most numerous. In 1981 approximately 0.4% of the resident population were actually registered abroad at the time of the census. No analysis exists as to how many of those subsequently changed their registration. Some may have, others not. Analysis of registration data from 1987–2007 above suggests that registration delays of immigrants contributed to a 0.3% underestimation of the average population in that period.

29. The 1981 Census also revealed that time a total of 0.3% of the population could not be found in registers at all. With the opening of the borders due to the EEA agreement in 1995 and consequently the Schengen treaty in 1999 this proportion can be expected to be even higher today.

X. DISCUSSION AND CONCLUSION

2.9% gross overestimation

30. The analysis above reveals that the main weakness of the Icelandic population statistics is the overestimation of the population stocks due to problems of de-registration. When comparing Census data to population registers in 1960 and 1981, the number of persons who were registered but not belonging to the resident population was between 1.0 and 1.4% of the total population. The Icelandic Labour Force Survey puts these groups higher, or on the average 2.9% in the period 1991–2002). We can use this estimate as the best approximation of the size of overestimation.

31. We could also assess, using crude birth rates that perhaps 1.0% of the population are persons of Icelandic origin with actual residence abroad, but registered in Iceland. Furthermore, about 0.4% of the registered population remain on average on the registers due to reporting delays. Other recognisable errors are insignificant. Unexplained errors amount thus to approximately 1.5% of the population, i.e. persons with residence abroad from 6 months or more, who do not change their legal residence in Iceland.

32. Without further study it is impossible to know more about this group, except that they may come in four groups that are necessary to differentiate:

⁵ In 2000 and 2001 special effort was made to clean the registers of ineligible second residence registrations. Information from Skúli Guðmundsson, National Registry, 8 April 2010.

- 1). Persons of Icelandic origin who leave the country for work or long term change of residence but never deregister;
- 2). Foreign persons who leave the country for good and never deregister;
- 3). Persons who leave the country for purposes of study;
- 4). Other errors (including overestimation of the overestimation, like using 6 months criteria instead of 12 months etc.).

1.4% gross underestimation

33. There are also errors due to non-registration of immigrants. The 1981 census found 1 496 persons, or 0.7% of the population that could not be found in registers or were registered abroad. There is no reason to believe that the actual figure of non-registration lies today below that of 1981. If the underestimation due to non-registration of immigrants has increased proportionally like the overestimation due to non-registration of emigrants, then we could expect this underestimation to be up to 1.4% of the total population.

1.4% gross underestimation

34. This gives us the final figure that the net overestimation of the Icelandic population using the concept of legal residence is approximately 1.5%, compared to the concept of usual residence.

Actions

35. It is possible to replace the current method of register based statistic with some model based approach, in order to produce comparable statistics as the rest of Europe. That would, however, also do away with all of the benefits of having registers, such as timeliness, ease of use and consistency of the datasets. We would not advise this.

36. A version of the model approach would be to apply weights to the records in the database. This would require extensive research into how to calibrate the proper weights, and for establishing the validity of the results. This is probably doable, but out of scope for this paper.

37. For Statistics Iceland, the obvious course of action is to find ways to identify students that are abroad, or persons who have left the country, in a more timely fashion than is possible for the administration who maintains the registers. This is somewhat akin to the parallel register of “lost” persons that, e.g., Statistics Denmark maintains.⁶

38. Finally, it is possible to introduce procedures to revise the population figures in light of later evidence. It may be convenient for users that all population data published immediately are final and not subject to revision. This convenience can, however, be sacrificed in the cause of historically more correct and comparable time series.

⁶ Cf. Danmarks Statistik: “Notat om omlægning af befolkningsstatistikken, herunder en analyse af konsekvenserne for statistikken ved skiftet af tidsafgrænsningsmetode”. 29. september 2008.
www.dst.dk/adm2006/External/Hkv/GetStatLevelFileT4.aspx?sysrid=58401, extracted 16 November 2009.

Conclusion

39. The method of estimating the population using the concept of legal or registered residence at Statistics Iceland has its merits and drawbacks.
40. The main drawback is that non-registration of departures and delays in de-registrations cause an overestimation of the population stock, which is only partially offset by non-registration or reporting delays of immigrants. The total overestimation can be expected to be around 1.5%.
41. The main advantage is the timely production of consistent, ready-to-use end-of-the-year statistics, which is possible in the first three months after the end of the reference year.
42. Statistics Iceland should work towards methods and procedures to increase the comparability of the register based statistics with the rest of Europe.
