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Descriptive Finding

The quality of fertility data in the web-based Generations and Gender Survey

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Abstract

BACKGROUND
The Generations and Gender Survey (GGS) enables investigating family-related events from a life course perspective. After its first round of face-to-face implementation, various factors resulted in the second round being implemented on the web. Despite its advantages, implementing a web-based GGS has its drawbacks – for instance, possible misreporting, and especially underreporting, of life history variables due to the lack of on-site guidance.

OBJECTIVE
To assess the quality of GGS second-round data collected through the web by verifying the accuracy of fertility histories.

METHODS
We compare the GGS data with population-based estimates from open access sources, the Human Fertility Database (HFD) and the United Nations Population Division (UN), using three cohort indicators and one period fertility indicator that are frequently used as summary measures. We restrict the analysis to the female fertility history data of countries where the second round of the GGS was implemented via the web and the data processing has been completed: Estonia, Norway, Finland, Denmark, and Sweden.

RESULTS
For the four indicators, the GGS estimates are consistent with the population-based estimates. With a few exceptions, HFD and UN estimates fall within the GGS confidence intervals (CIs).

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CONCLUSION
Overall, we found similarities that demonstrate the high quality of the data. Our assessment finds no systematic deviation for the cohort indicators and small scale underreporting for the period indicator (nevertheless, also usually within the CIs).

CONTRIBUTION
The high level of similarity is encouraging for the use of GGS second-round data and the implementation of web-based methods of data collection.

1. Introduction

The Generations and Gender Survey (GGS) is a longitudinal, individual-level, and open-access study focusing on family, the life course, and gender relations. It is part of the Generations and Gender Programme (GGP), created in 2000 with the aim of understanding demographic and social change (Gauthier, Cabaco, and Emery 2018; Vikat et al. 2007). The first round of the GGS took place between 2002 and 2012 in more than twenty countries, and its longitudinal design had a 3-year interval between waves. From the beginning, a big effort was made to harmonize the data, making it comparable cross-nationally, and the first round of the survey had a large impact on the demographic and sociological fields through the resulting emergence of cutting-edge research (Gauthier, Cabaco, and Emery 2018; Philipov, Klobas, and Liefbroer 2015; Neyer, Lappegård, and Vignoli 2013).

In the first round, the national teams chose their preferred mode of data collection. Some countries opted for computer-assisted personal interviewing (CAPI), while others chose paper and pencil interviewing (PAPI), and some deployed a mix of the two. Very few used computer-assisted telephone interview (CATI) together with self-administered paper questionnaire (SAPQ). Hence, face-to-face (F_2F) methodology was most frequently applied during the first round of the GGS (Gauthier, Cabaco, and Emery 2018; GGP 2018; Vikat et al. 2007).

For the second round of data collection, which started in 2020, Computer-Assisted Web Interviewing (CAWI) was used in the majority of countries (5 out of the 8 countries whose data had been released when this work was written, all of them with national coverage). Web-based surveys have advantages other than financial benefits. Their design is tailored to be user-friendly; tools such as control checks and drop-down and sub-menus can make them clearer and more straightforward; they are discrete when the respondent is answering sensitive questions that might suffer from the presence of an interviewer; and they can be quicker to complete (Lugtig and Toepoel 2016; Jäckle, Lynn, and Burton 2015; Vehovar and Manfreda 2008; Tuten, Urban, and Bosnjak 2002).

Furthermore, implementing a survey via the web is innovative. It makes surveying possible when a F2F design is hampered, for example by a pandemic, and if the country is large or has a very dispersed population.

In spite of its advantages, CAWI also has its drawbacks. Response rates tend to be lower than for F2F surveys (Vehovar and Manfreda 2008). When the target population is larger than the population with Internet access, under-coverage can produce biased estimates (Bethlehem and Biffignandi 2012), although as the GGS is implemented in countries with reasonably high Internet prevalence this should not be too problematic. Web surveys also tend to over-represent younger and more highly educated people (Tijdens and Steinmetz 2016).

Another possible disadvantage of implementing a survey through CAWI (and also through SAPQ – self-administered paper questionnaire) is the lack of assistance from an impartial and trained interviewer, which may hinder the respondent's understanding of certain questions. The absence of an interviewer also increases the chance that the respondent becomes fatigued, especially if the questionnaire is long. Such situations can lead to misreporting or, more likely, under-reporting (Conrad et al. 2017; Heerwegh and Loosveldt 2008; Vehovar and Manfreda 2008; Nielsen and Loranger 2006). This is the case with fertility histories, where the life history sections are generally very demanding: respondents are asked about certain types of events that can take place repeatedly, such as childbirth.

The Generations and Gender Survey (GGS) is an important source of information on family events, particularly fertility (Ciritel, De Rose, and Arezzo 2019; Philipov, Klobas, and Liefbroer 2015; Neyer, Lappegård, and Vignoli 2013; Spéder and Kapitány 2009). Vergauwen et al. (2015) have found fertility and nuptiality data from the first round of the GGS to be accurate. It is important to ensure that the second round – now implemented online – yields reliable data. The aim of this work is therefore to assess the quality of the GGS's second round of data, collected through the web, by verifying the quality/accuracy of fertility histories.

2. Data and methods

Our analysis focuses on the female fertility history data of five countries for which data processing has been completed to date (Puur et al. 2022; Dommermuth et al. 2021; Hägglund et al. 2022; Fallesen et al. 2022; Andersson et al. 2022). GGS data are available to researchers on the GGP website (http://www.ggp-i.org) upon signing the data agreement. In Estonia (2021–2022), Norway (2020), Finland (2021–2022), and Denmark (2021), the GGS was implemented entirely through web questionnaires (CAWI). In Sweden (2021) there was a mix of CAWI and SAPQ (sent by post). Considering that due to the lack of on-site guidance both of these modes of data collection can produce misreporting, especially under-reporting, and that most of the original sample was surveyed through the web (68% online vs. 32% postal), we analyzed Sweden together with the other four countries. As a robustness check we also analyzed the Swedish data for only respondents surveyed through the web, and the results (available upon request) barely differ.

The sampling frame of the web implementation is register data (total resident population); the five countries have individual sampling units; participants were approached via e-mail, post, and text message (SMS); and there were financial incentives (lottery) to respond to the survey, except for in Sweden. The response rate was 20% in Denmark, 29% in Estonia, 18% in Finland, 33% in Norway, and 27% in Sweden. Recent analyses of the data representativity of these web-based GGSs reveal similar biases to other social surveys conducted face-to-face (including an over-representation of women and higher-educated respondents) (GGP 2023; Simonsen et al. 2022; Dommermuth and Lappegård 2021). The average duration of the survey was 50 to 60 minutes. The fertility history data is in Section 2 of the questionnaire (GGP 2022).

Besides the date of birth of the female respondent, we use the information on the type of child (biological, adopted, or stepchild (lhi26); we include only biological children) and on the child's date of birth (lhi29). From this information we calculate age at childbirth, and consequently the indicators presented hereinafter. The number of respondents excluded from analyses due to missing information (Refusal, Don't know, etc.) was low (a maximum of 12%). Finally, we present results for the unweighted data, since weights are not yet available in all countries. Nonetheless, additional analyses for Estonia and Sweden conducted with weighted data (shown in the supplementary material) reveal similar results.

We calculate GGS estimates and their confidence intervals (CIs) for three cohort indicators and one period fertility indicator that are frequently used as summary measures. We then plot them against population-based estimates stemming from open-access sources. The cohort indicators are compared with the Human Fertility Database (HFD 2022) and the period indicator with the United Nations Population Division (UN 2022), where the latest estimates can be found (both of these data sources are open access and based on national registers and official statistics). Table 1 presents each indicator and displays a summary of the samples used to calculate each of them (computations were done using R and annotated code is available in the supplementary material).

Table 1: Summary and description of the sample sizes for each indicator and country

Cohort Total Fertility Rate (CTFR by 40) & Cohort Mean Age at Childbearing (CMAC by 40)						Cohort Parity Distribution (CPD by 44)					
Cohort	Estonia	Norway	Finland	Denmark	Sweden	Cohort	Estonia	Norway	Finland	Denmark	Sweden
1961	85	-	-	-	-	1961	86	-	-	-	-
1962	117	-	-	-	158	1962	117	-	-	-	158
1963	103	-	-	-	141	1963	103	-	-	-	141
1964	113	-	-	-	147	1964	113	-	-	-	147
1965	129	9	-	-	174	1965	129	9	-	-	174
1966	98	68	-	-	133	1966	98	68	-	-	133
1967	105	75	31	-	137	1967	105	76	31	-	137
1968	127	83	36	-	153	1968	127	83	36	-	153
1969	112	82	32	-	129	1969	112	82	32	-	129
1970	118	74	19	-	109	1970	118	74	19	-	109
1971	129	77	23	125	121	1971	131	77	23	126	121
1972	121	75	28	156	134	1972	122	76	28	157	134
1973	116	66	26	162	97	1973	116	67	26	164	97
1974	116	74	32	137	150	1974	116	75	33	139	150
1975	105	63	22	138	112	1975	106	63	22	139	112
1976	123	60	34	133	124	1976	124	60	35	134	124
1977	110	72	72	124	106	1977	111	72	73	124	106
Total (N)	1927	878	355	975	2125	Total (N)	1934	882	358	983	2125

Period Total Fertility Rate (PTFR - three preceding years as the reference period)										
Age group	Estonia		Norway		Finland		Denmark		Sweden	
	Women = 4112		Women = 2598		Women = 1893		Women = 4536		Women = 3381	
	Births	Women-years	Births	Women-years	Births	Women-years	Births	Women-years	Births	Women-years
15–19	11	703.00	0	696.08	0	615.91	1	1394.08	1	911.83
20–24	47	1334.58	18	1147.50	14	926.00	32	2263.75	13	978.16
25–29	200	1792.50	108	1233.25	59	1035.91	209	2244.33	115	1335.00
30-–34	249	2169.00	120	1187.16	90	953.50	277	2056.25	194	1541.08
35–39	145	2086.08	61	1037.83	63	957.50	98	1740.83	92	1557.25
40–44	22	1976.25	12	1104.91	11	747.75	30	2046.16	25	1789.25
45–49	3	1679.83	1	1017.41	0	342.41	3	1798.50	1	1514.50
Total (N)	677	11741.25	320	7424.16	237	5579	650	13543.92	441	9617.08

The first indicator is the Cohort Total Fertility Rate (CTFR). Also known as Completed Family Size, the CTFR is the average number of live births of a given cohort (Preston, Heuveline, and Guillot 2001). To make it consistent with the HFD and to allow analysis of a longer series we calculate it up to age 40. We also calculate the Cohort Mean Age at Childbearing (CMAC) up to age 40 and by birth order – first, second, and third birth. The third indicator is Cohort Parity Distribution (CPD) – parities zero, one, two, and three or higher (to make it consistent with the HFD we consider women at age 44).

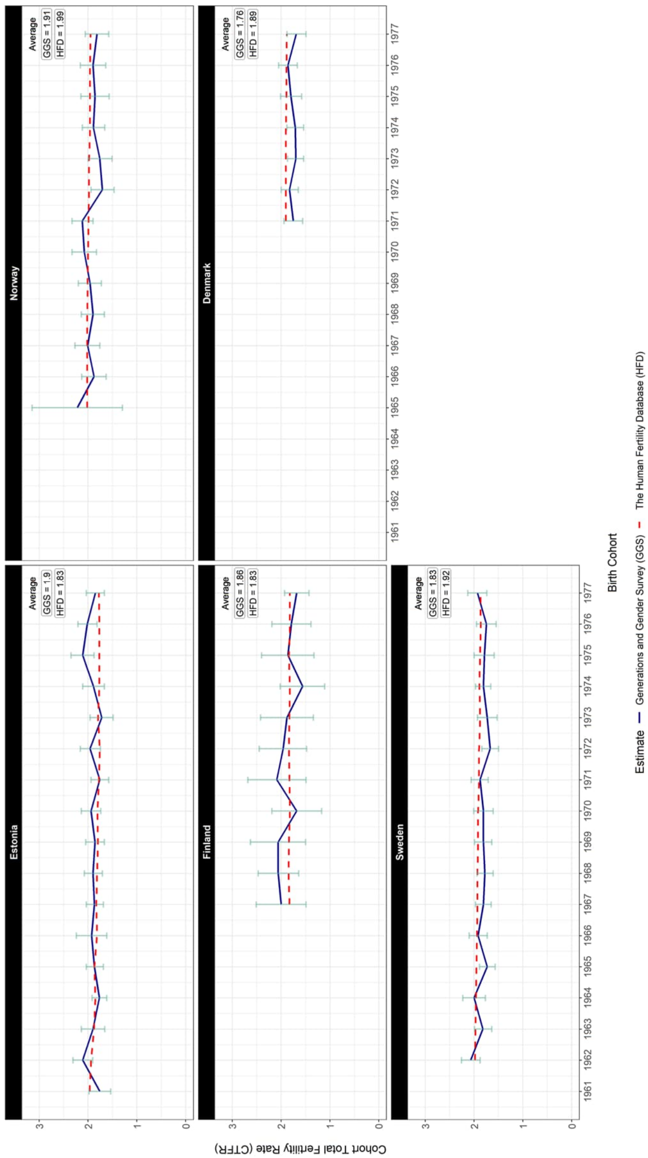
The final indicator is the Period Total Fertility Rate (PTFR), or simply Total Fertility Rate (TFR), which is interpreted as the average number of children that would be born to a woman during her lifetime if she were to experience the currently observed age-specific fertility rates (ASFR) throughout her reproductive years (15 to 49 years old) (Preston, Heuveline, and Guillot 2001). In order to provide the most current information, reduce sampling error, and avoid the problem of displacement of births, we consider the three last years before the survey as the reference period to calculate it (Schoumaker 2013; Moultrie 2013).

3. Results

Figure 1 presents the results of the CTFR. Overall, the observed pattern is twofold: (1) the estimates from GGS and HFD are quite similar both in level and slope; (2) with very few exceptions, the HFD estimates fall within the confidence intervals (CIs) of the GGS estimates. Unlike the HFD curves, the GGS curves present some erratic patterns (spikes); however, this is to be expected due to small counts (Vergauwen et al. 2015). Regarding under-reporting specifically, there is no consistent evidence in Estonia, Norway, or Finland. Even though the GGS curve is below the HFD curve for the younger cohorts in Norway and Finland, the HFD estimates are within the CIs, and in Finland (the country with the smallest sample, as shown in Table 1), despite the larger CIs, no systematic deviations were found. In Denmark and Sweden the GGS estimates are consistently below the HFD curve, though the HFD estimates fall within the CIs (except for rare cases such as the Danish cohorts born in 1973 and 1974 and the Swedish cohorts born in 1965 and 1972).

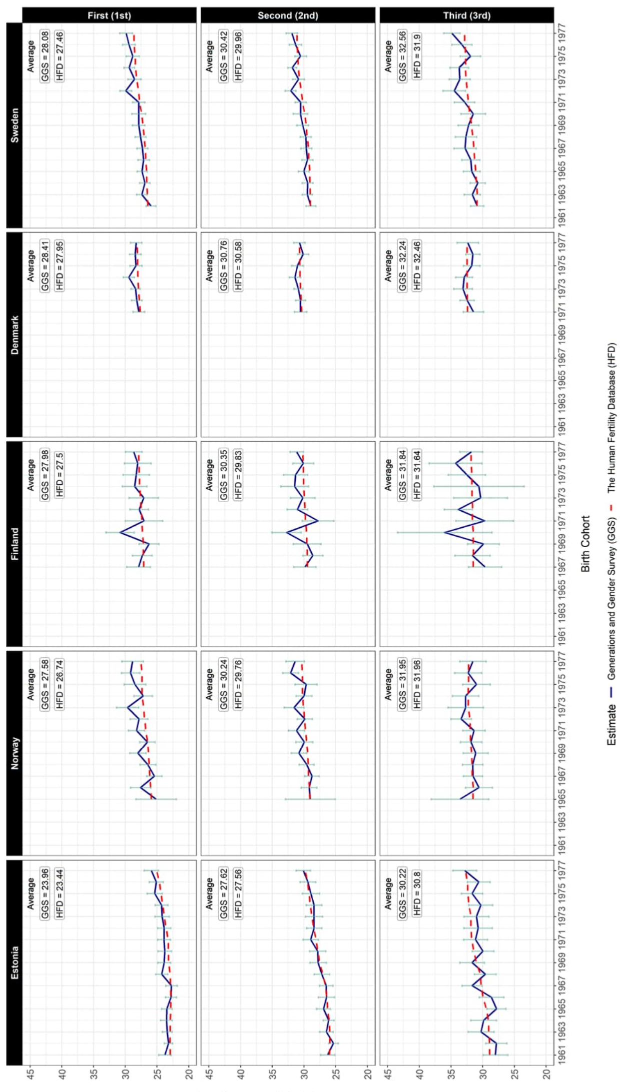
Figure 2 displays the cohort mean age at childbirth by birth order (CMAC). Similar to the results found for the CTFR, the GGS and HFD curves are consistent with each other – and, although in all countries the GGS mean age at first birth is consistently higher than the HFD estimates, the differences are small. Moreover, in practically every country and birth order (except for in very rare instances), the HFD estimates are within the GGS CIs. Higher CIs and spikes are again seen in Finland, yet the HFD estimates tend to fall within the CIs and no systematic deviations were found.

Figure 1: Female cohorts' total fertility rate (CTFR) by age 40, GGS vs. HFD



Source: Own elaboration, based on GGS second round data (CIs represented as vertical bars).

Figure 2: Female cohorts' mean age at childbearing (CMAC) by age 40 and by birth order, GGS vs. HFD

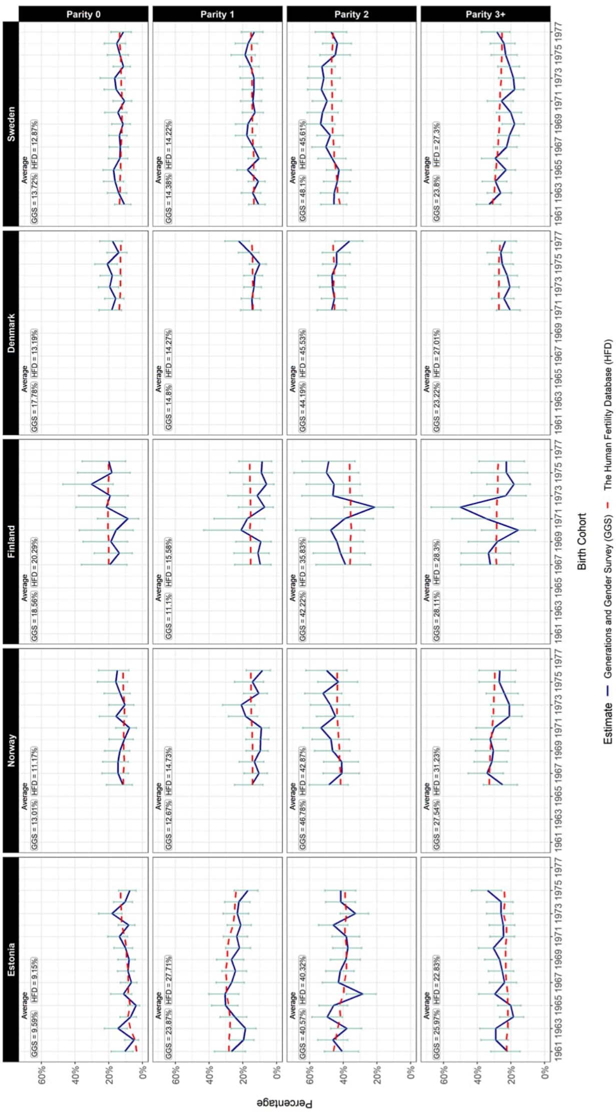


Source: Own elaboration, based on GGS second round data (CIs represented as vertical bars).

Figure 3 shows the distribution of women by birth cohort and parity (CPD). The results corroborate the same twofold pattern found for CTFR and CMAC; that is, high similarity between both curves and HFD estimates falling within GGS CIs (although Figure 3 shows bigger spikes and CIs than the other two figures). The only striking exception is the distribution of childlessness (Parity 0) in Denmark, where the GGS curve stands above the HFD curve – notwithstanding the HFD estimates often falling within the CIs. On this particular finding for Denmark the Human Fertility Database recommends the cautious use of childlessness estimates, since they could be underestimated (HFD 2022). In general, no systematic deviations or consistent underreporting were identified. Although the GGS estimates appear below the HFD estimates for Parity 1 in Estonia, Norway, and Finland and for Parity 3+ in Denmark and Sweden, the HFD estimates tend to fall within the CIs.

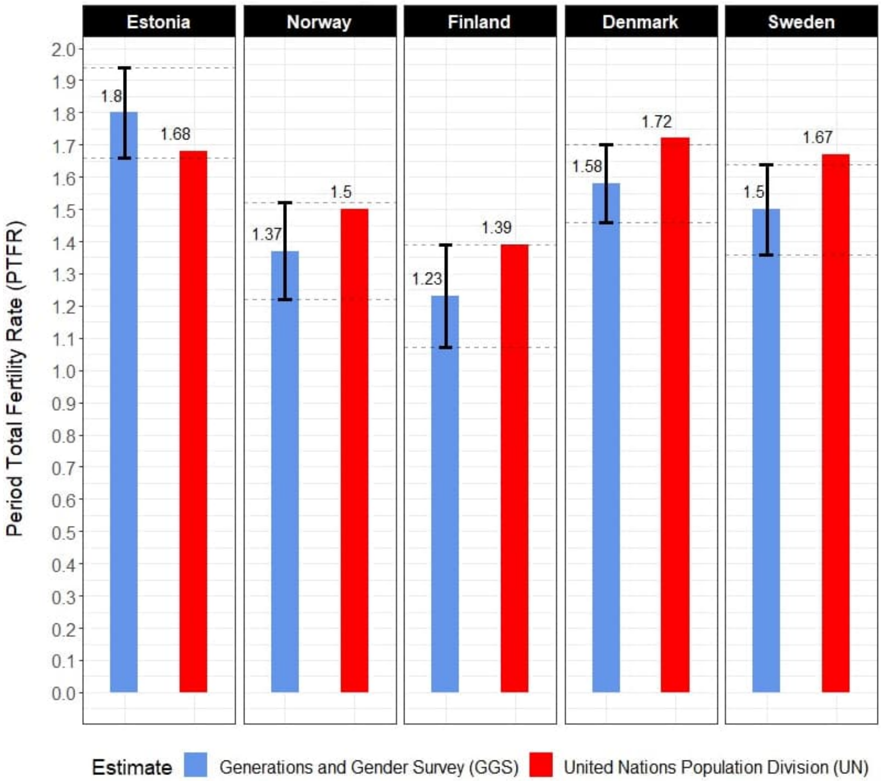
Finally, Figure 4 presents the results of the PTFRs. Overall, we found estimates similar to those from the United Nations Population Division (UN). Except for Denmark and Sweden, the UN estimates fall within the GGS CIs (Estonia: lower bound = 1.66 and upper bound = 1.93; Norway: lower bound = 1.21 and upper bound = 1.52; Finland: lower bound = 1.07 and upper bound = 1.39). But even for Denmark and Sweden the upper bound estimate is virtually equal to the HFD estimate (1.70 vs. 1.72 respectively for Denmark, and 1.64 vs. 1.67 respectively for Sweden). Except for Estonia, the GGS estimate is lower than the UN estimate, which evidences some level of under-reporting – albeit on a small scale – since, as already documented, the UN estimates tend to fall within the CIs.

Figure 3: Distribution of the female population at age 44 by birth cohort and parity, GGS vs. HFD



Source: Own elaboration, based on GGS second round data (CIs represented as vertical bars).

Figure 4: Females' period total fertility rate (PTFR – 3 preceding years as the reference period), GGS vs. UN



Source: Own elaboration, based on GGS second round data. (GGS and UN estimates displayed in the Figure; CIs represented as vertical bars with horizontal dashed lines).

4. Discussion and conclusion

Given that the GGS has been an important source for investigating family-related events and fertility in particular, and considering potential misreporting, especially under-reporting, in web-based surveys, this work aims to assess the quality of the data in the second round of the survey. First, we calculated three cohort indicators and one period fertility indicator using female fertility history data from five countries where web questionnaires were implemented and for which data processing has been completed to date. We then compared the GGS estimates with population-based estimates stemming from open-access sources (HFD 2022; UN 2022).

Overall, we found similarities that demonstrate the high quality of the GGS second-round data. The results show that the GGS estimates are consistent with population-based data. Specifically, and with few exceptions, the estimates from the external population-based sources fall within the GGS CIs. Furthermore, although some differences and some larger confidence intervals (CIs) can be observed, no systematic deviations were found for the cohort estimates. Regarding under-reporting specifically, we found that some PTFRs were slightly under-reported. The differences were greatest for Denmark and Sweden, but even then the GGS upper bound estimates were virtually equal to the UN values. Overall, even in the cases where the GGS estimates were lower than the comparison estimates (HFD or UN), the latter tended to fall within the CIs. Noteworthy, for the PTFR, Estonia's GGS estimate was actually slightly higher than that provided by the UN. Even though our study was motivated by a concern that web-based data collection might produce incomplete fertility histories, this finding suggests that we cannot always assume that survey measures are biased downward.

In a nutshell, considering that the GGS is long (which is usually not a desirable feature, especially in web mode), and its life history section is very demanding (which raises concerns about the reliability of the data), GGS data collected through web questionnaires proved to be of high quality, and the results from this study (1) encourage the use of this very recently collected data; (2) encourage more data collection through web methods – not only for the GGS itself but also for other surveys. In a context of increasing pressure on survey funding and necessary innovation in the face of events that compromise survey implementation, such as the COVID-19 pandemic, data collection through the web, if well planned and designed, can be a clever and efficient tool.

As a final remark, it is important to highlight that the data used in this work comes from countries that are very similar, especially the Scandinavian countries (Norway, Finland, Denmark, and Sweden). Additionally, this paper deals with five countries where individual sampling frames were used to administer the self-completed web survey. Hence, future research should further investigate whether the results found here are valid for other countries participating in the second round of the GGS, including those that use different sampling frames (for example, household) to administer the GGS online.

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