Assessment of fertility indicators derived from GGP samples

Bulgaria, Hungary and Georgia

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Abstract

Before sample data is used for analysis and extrapolation to population-wide conclusions, it is advisable to make an assessment as to whether the sample is truly representative. This study examines the fertility data derived from the Generations and Gender programme (GGP) sample surveys in Bulgaria, Hungary and Georgia.

The conclusion is that the GGP sample data is essentially representative of the populations of Hungary and Georgia. However, discrepancies between the indicators derived from the GGP sample and from vital statistics for Bulgaria are significant; possible reasons for these anomalies are discussed.

1. Introduction

Before using survey data to extrapolate to population-wide conclusions, it is important to assess whether the survey sample is representative of the population. At the conclusion of the Fertility and Family Surveys (FFS), an evaluation was carried out on the inter-country comparability of the surveys and also the validity of the data sets for each country (Festy and Prioux, 2002). In comparison to that report, this study is a more focussed exercise, looking at whether the fertility indicators derived from the Generations and Gender Programme (GGP) survey samples are comparable to those derived from three country's birth registration data - Bulgaria, Hungary and Georgia. To gain extra insight into possible difficulties with survey data and/or indicators derived from vital statistics, comparisons were also made with data from other sample surveys from those countries. An assessment is then made as to whether the GGP samples of the three countries analysed are representative of the whole population of those countries with regard to their fertility.

The GGP's contextual data base (CDB) contains the best available demographic indicators for each country (for a full description of its scope see Spielauer, 2007). Frejka and Sardon (2004), in their extensive analysis, also derived fertility measures from the vital statistics of many developed countries and included, in addition, a breakdown of fertility by parity across cohorts. For Bulgaria and Hungary the measures from the CDB and Frejka and Sardon are almost identical – not surprisingly as they are derived from the same data sources. Frejka and Sardon did not include Georgia in their study.

Data from two other sample surveys - which are also designed to give a representative sample of each country's population - were used for comparison: the Fertility and Family Surveys (FFS) and the multi-wave World Values Survey (WVS). FFS data was available for Bulgaria (1997) and Hungary (1993). The WVS waves for the countries in this study were 1990, 1997 and 1999 for Bulgaria; 1991, 1998 and 1999 for Hungary; and 1996 for Georgia. The WVS is a cross-sectional and not a longitudinal survey, with new samples selected at each wave.

The measures compared in this study include the following: total fertility rate (TFR); period mean age at birth for all births; cohort mean age at first birth; completed cohort fertility (CCF); the parity structure by cohort; and the proportion of childless women by birth cohort. Not all these measures were available for comparison for all countries; only TFR and CCF were available for all three (and the CCF for Georgia covered only a limited number of cohorts).

The question of weighting should be discussed. The Hungarian and Georgian GGP surveys assigned weights to individual respondents to (theoretically) compensate for over- or under-sampling of types of individuals. However, for this analysis, the weights could not be applied in a straightforward manner; therefore, only the raw unweighted distribution was analysed. No weights had been assigned to the Bulgarian data, as the GGP sample data was considered by the Bulgarian GGP team to fairly reflect the Bulgarian population distribution.

1.1 Sample sizes

The number of respondents in each country's GGP, FFS and WVS surveys and year of each survey are shown in the following table. The Hungarian GGP survey data is a little different in that it an amalgam of two waves of surveys: however, the fertility data that is relevant to this analysis is from the second wave of 2004/2005.

	Bulgaria	Hungary	Georgia
GGP year of survey	2004	2004-5	2006
GGP male sample	5851	6315	4405
GGP female sample	7007	7223	5595
Year of birth, oldest respondents	1925*	1926	1926
Year of birth, youngest respondents	1986*	1983	1988
Youngest cohort for CCF estimate**	1969	1969	1971
FFS year of survey	1997	1992-3	-
FFS female sample	2367	3554	-
WVS year of survey 1	1990	1991	1996
WVS female sample 1***	269	296	664
WVS year of survey 2	1997	1998	-
WVS female sample 2	351	209	-
WVS year of survey 3	1999	1999	-
WVS female sample 3	395	332	-

* a fewer older/younger respondents were included, but these were discounted as the year's sample was not larger enough to carry out a meaningful analysis
** aged 35 at time of survey (this will be an under-estimate of completed fertility for women under 50)
*** for WVS sample sizes, only the age band used for comparative purposes is stated

1.2 Fertility measures

1.2.1 Total Fertility Rate (TFR)

In previous fertility surveys, one of the weaknesses was that only women (generally) of fertile ages were interviewed and therefore TFRs could only be calculated for a very limited range of years. This was attempted for the FFS in the evaluation of the project (Festy and Prioux, 2002). With the age span of respondents being much greater with the GGP, then valid TFRs can be calculated for a wider band of years. This band will now be discussed.

For women, their fertile lifespan is considered to be from 15 to 50. However, the proportion of births (particularly in the Eastern European countries in question) taking place after the age of 40 is very small; in fact in these countries, there are only a few births to women over 35. For men, of course, the potential age range is wider. For each year that we are trying to calculate the TFR, we need to have had respondents from as near the full range of fertile ages as possible. The table below shows what this band is for each country.

With only interviewing people over the age of 18, then a few births in very recent years will not have been counted as the individuals will have been too young to have been included in the sample, yet will already have had a child. Therefore, TFRs calculated for the most recent 2-4 years will be slightly under-estimated.

	Bulgaria	Hungary	Georgia
Oldest cohort	1925	1926	1926
Youngest cohort	1986	1983	1988
Earliest valid TFR*	1965	1966	1966
Last year all births recorded	2004**	2004***	2005

* This is given as the year of birth of oldest cohort + 40 years.
** As interviewing was done in October-December 2004, then the majority of births for that year had taken place
*** Most interviews were carried out in November-December 2004, though where people had removed then they were carried out in the following March-July.

TFRs calculated for before 1965-66 will also be under-estimated as the full range of fertile ages is truncated, as children born to people in their 40s (ie. cohorts born before 1925/6) are not included, and there could be a little under-estimation even up to 1975 (this is more probable for TFRs calculated from male data).

1.2.2 Period mean age at childbirth (all parities)

The band of years for which a valid estimate of this measure could be obtained is the same as for the TFR (see above).

The mean age at birth is influenced by three factors: changes in the age at which a woman gives birth to her first child, second child, etc.; changes in the spacing between children; and changes in the total number of children born. Higher parity births naturally take place at higher ages; therefore as higher parities become rarer, the mean age at childbirth may fall solely from this reason, even if the mean age at first birth (for instance) remains steady. The CDB only has data for Bulgaria and Georgia for this measure.

1.2.3 Completed cohort fertility (CCF)

Although period measures can be derived from sample surveys such as the GGP, they are more designed to provide indicators relating to cohorts (age bands). The band of cohorts for which valid fertility indicators can be calculated is given in the preceding table. The problem with estimating completed cohort fertility is that we can only know a woman's final parity once she has reached the end of her fertile life – and for men, there is no age defined to be the end of their reproductive life. The measures of CCF, therefore, cover only women in this analysis, although TFR values were derived from both men's and women's data.

In eastern European countries, such as those studied in this report, then early childbearing is the norm and families are small. Few children are born to women over the age of 35. Therefore, the youngest cohort for which CCF was calculated was those aged 35 at the time of survey. It is acknowledged that this will be an under-estimate – probably especially for Hungary, where the normal childbearing age band is now the oldest of the three countries.

1.2.4 Proportion of childless women by cohort and parity distributions

Information on the proportion of childless women by cohort was available for Hungary and Georgia in the contextual data base, but not available for Bulgaria. However, for Bulgaria and Hungary information on the proportions of each parity was available from Frejka and Sardon's analysis. The WVS data could also be used to estimate parity proportions.

Naturally the proportion of childless depends on the exact age when the respondent was observed. Cohorts down to those aged 35 were included in this analysis. However, as discovered from answers to the GGP questions on this subject, over a half of childless women in their late 30s plan (hope?) to have a child in the coming years. Therefore, whether the proportion of childless ultimately demonstrates an upward trend depends on whether the fertility ambitions of these women are realised.

1.3 Data sources and analysis details

1.3.1 GGP

For each measure discussed, a 5 year moving average was calculated. Each 5 year average was derived from between about 300 and 800 individuals (generally a bigger sample for the younger cohorts). For CCF and parity proportions, 95% confidence limits of the sample-derived measures were calculated: these are included in the Appendices.

1.3.2 Contextual data base (CDB)

The fertility data relates to the whole population, as derived from birth registration records and census estimates of population size. The CDB values were included in this analysis in the form provided online, generally as values relating to a single year or cohort, but sometimes one value for a 5 year period. If values were not available for every year, then the graphs interpolate between the values that are available.

For Georgia, two sets of values were included in the CDB for the TFR and period mean age at childbirth: both are plotted on the graphs.

1.3.3 Frejka and Sardon (F&S)

For TFR and CCF, the values they published relate to a single year or cohort. For parity distributions, the values were averages for 5 year cohort bands from 1930/1934 to 1965/1969. Their data was derived from each country's birth registration statistics, and so it is effectively the same as that in the contextual data base.

1.3.4 Fertility and Family Surveys (FFS)

The cohort fertility data from the FFS was generally for 5 year cohort bands, except for the oldest available cohort, where it was for a single year (1952) for Bulgaria or for 2 years (1951-2) for Hungary.

1.3.5 World Values Surveys (WVS)

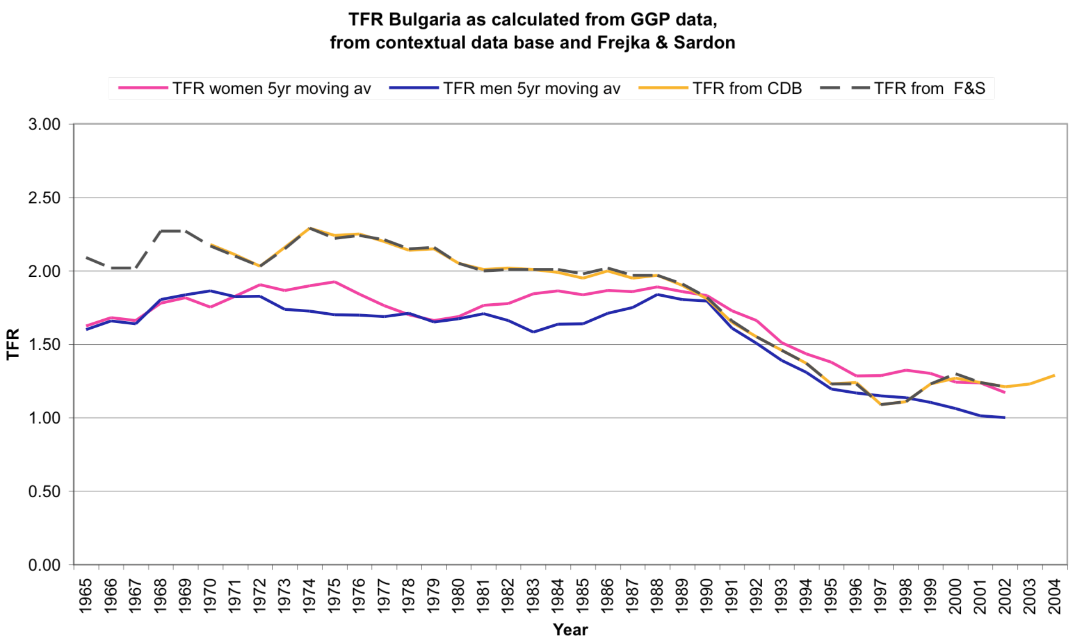
The WVS includes a question on how many children a respondent has had, and this information provides a useful comparison with other survey data. The year of birth of children was not asked, so the TFR could not be estimated, nor age of mother at birth.

The sample sizes are considerably smaller than the GGP or FFS, but are considered to be representative of the whole population of the country. Ten year moving averages were calculated for the CCF and parity proportions to counteract the smallness of the sample size. Only data for women over age 35 were included, as they have generally completed their reproductive life by this age in the countries studied. A total number of respondents of between 50 and 130 per 10-year age band was usual for the Bulgarian and Hungarian WVS surveys: for Georgia it was larger, being between 100 and 250.

Three WVS waves were available for Bulgaria and Hungary, but only one for Georgia. It was found that the CCF from each wave was (reassuringly!) similar for the same cohorts: therefore the values were averaged in the CCF comparison for Bulgaria and Hungary; from the three waves for most cohorts, or else from two or just one for the youngest cohorts.

2 Bulgaria data comparison

2.1 Comparison of TFRs



This shows good agreement for the years after 1989 between the TFRs derived from population-wide vital statistics and those calculated from the GGP sample. However, before that date the GGP-derived TFR is markedly lower. A full discussion of possible explanations for this discrepancy is given later.

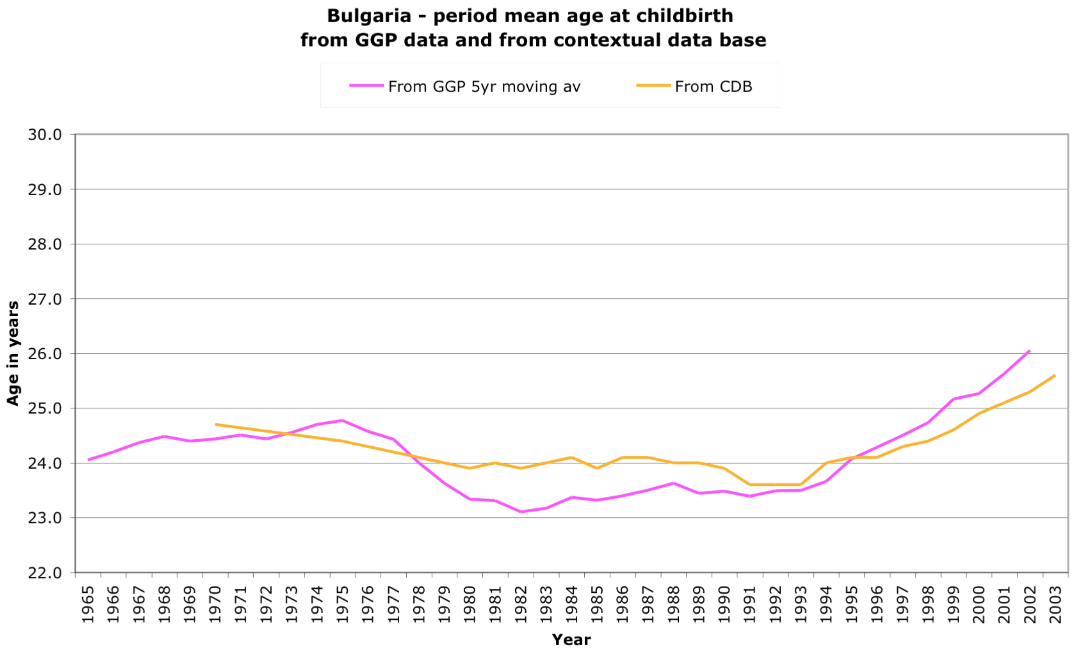
2.2 Comparison with TFR derived from Bulgarian FFS data

The FFS evaluation attempted a comparison with TFRs although it was only possible for a few years because of the limited range of ages of women sampled (Festy and Prioux, 2002). They concluded that "In most cases, the FFS overestimates the fertility levels as calculated from vital statistics. Bulgaria and Lithuania are exceptions to this rule".

The fact that the GGP and FFS both encountered a similar mismatch for Bulgaria between survey-derived TFRs and population TFRs is very interesting, especially as it is in the opposite direction to that encountered in most other countries. It would tend to give one suspicions that data derived from the vital statistics may not be accurate. Unfortunately, however, this argument does not completely follow through when we look at the FFS comparison. The TFR was only able to be compared with FFS data for the years 1989-1996 , and it was only for the years 1989 to 1993 that the FFS-derived TFR was lower than the population TFR. However, what we have seen from the GGP-derived TFRs is that there is good comparability for those particular years, in fact all years after 1989. For the GGP sample, it is for the years before 1989 that the discrepancy is seen.

2.3 Period mean age at childbearing

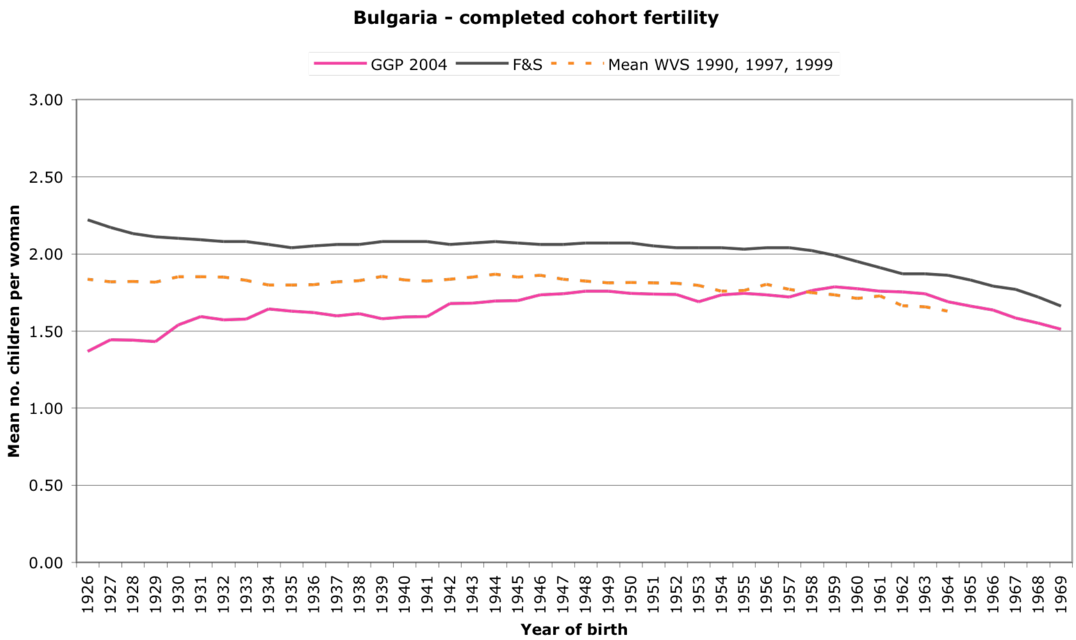
There are differences in the mean age at childbirth of up to one year as derived from the GGP data and from vital statistics, although the trends are similar: for both, the mean age starts to increase abruptly after 1992/1993 after a period of stability.



The reason for a lower mean age at childbearing for GGP respondents for years before 1994 could be that larger families were under-sampled, or they may have emigrated since the births occurred. If women with higher parity births were not included in the GGP sample, then the mean age at childbearing would be less.

Why should the difference be the inverse for the most recent years? It could be because more educated women are more likely to participate in a survey such as the GGP – and they have a higher age at first (and subsequent) birth (Betts, 1996).

2.4 Comparison of CCF

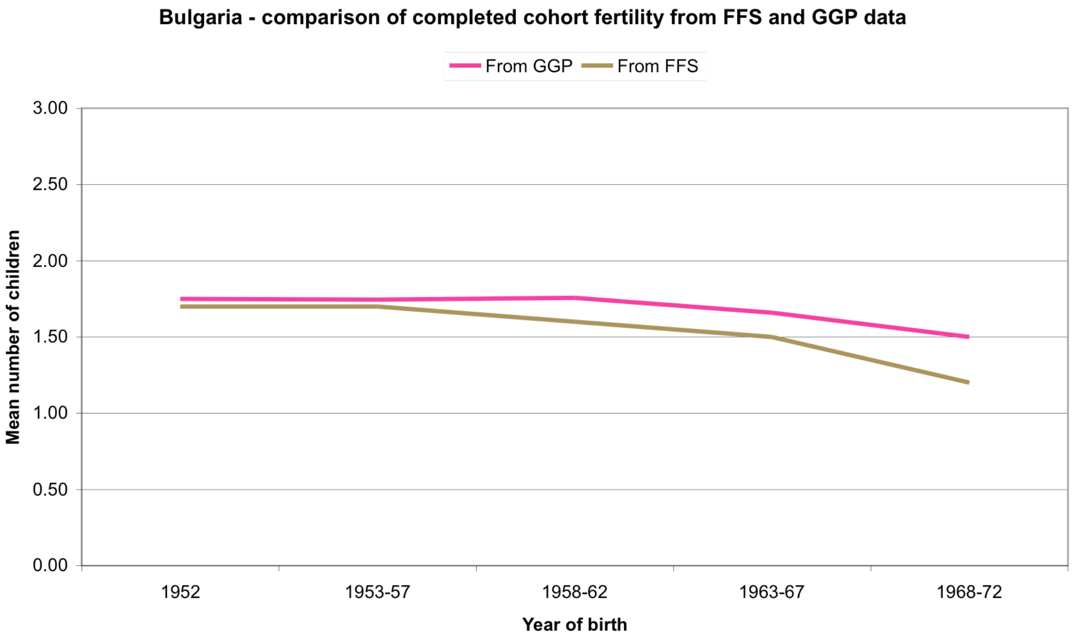


As seen previously in the TFR measure, there is a significant difference between the CCF derived from vital statistics and that from GGP sample data (the Frejka and Sardon data is plotted rather than that from the CDB as it covers a longer time period, and has identical values for comparable years). For cohorts born before 1960 the CCF from population-wide statistics gives estimates around 0.2-0.5 children per woman higher than the GGP CCF, with the difference widening the older the cohorts. Even for most recent cohorts, the GGP is still lower by around 0.1 child per woman. The closing of the gap for the younger cohorts is probably a reflection of the increased closeness of the TFR measures since 1989, as seen in the earlier subsection.

The overall trends seen in the three data sets are also different. The CCF derived from GGP data would suggest a small rise in fertility from the oldest cohorts, who have a completed fertility of under 1.5, up to those born between 1948 and 1960, when CCF was up to 1.8. In contrast, population-wide data suggests a fall from the earliest cohorts, followed by stability for cohorts born between 1930 and 1958 at a level of just over 2 children per woman, after which there was a fall below replacement level. The WVS mean lies between the values of the GGP and Frejka & Sardon, with a very steady level of around 1.8 across the whole band of cohorts.

Appendix 1 shows the confidence limits of the GGP and WVS sample statistics. What should be noted is that the population (F&S) values are significantly different from not only the GGP sample, but also from all three WVS samples. For earlier cohorts, the WVS and GGP samples are also significantly different from each other, although they approach each other for more recent ones. Further discussion of the mismatch is in a later subsection .

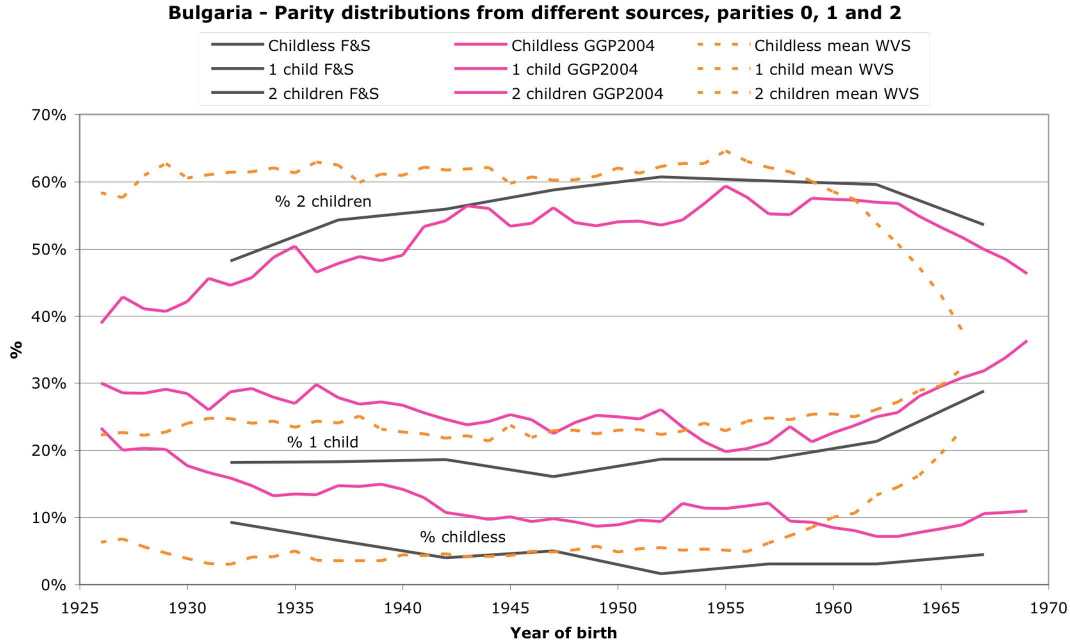
2.5 Comparison of completed cohort fertility from GGP and FFS

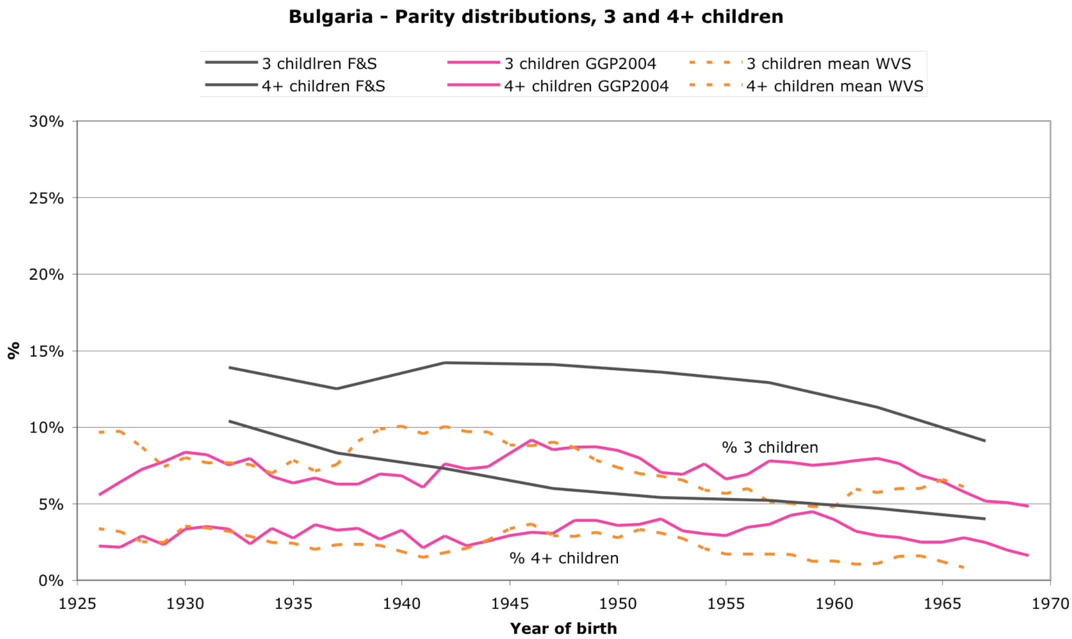


The Bulgarian FFS was carried out in December 1997 and included only women aged between 18 and 45, ie. those born between 1952 and 1979 (UNECE, 2001). As the FFS took place several years before the GGP, then the CCF of later cohorts will, of course, diverge, as the younger women in the FFS sample had not completed their reproductive life at the time of the survey. (One of the main advantages of the GGP sampling a wide age band of respondents is that comparisons can be made with previous surveys.)

There is a small difference between the CCF of the oldest cohort sampled (1.7 for the FFS compared to 1.75 for the GGP) but this is within the confidence limits of the surveys. The FFS value of 1.7 for the 1952 cohort is within the confidence limits of the GGP sample and all three WVS samples. The fact that five independent surveys (three waves of the WVS, the FFS and the GGP) all give a similar estimate of cohort fertility but significantly below the population estimates suggests that the problem may lay with the values derived from Bulgaria's vital statistics.

2.6 Parity structure: comparison with Frejka and Sardon and the WVS





The significant mismatches between Frejka and Sardon's data and the GGP derived data, as well as the WVS samples, give cause for concern (see Appendix 1 for confidence limits of samples). If the former are reflections of the true population, then it would appear that childless and 1-child women have been significantly over-sampled and women with 2, 3 and 4+ children have been under-sampled in the GGP. The differences hold across all the cohort groups analysed. Clearly this explains why the CCF derived from GGP data is too low.

While there appear to be a systematic differences in level between the two data sets, at least the trends parallel each other quite well when comparing the GGP data and Frejka and Sardon for parities 0, 1 and 2. Childlessness fell for earlier cohorts before reaching a low and stable level. The proportion of 1-child families has started to rise for more recent cohorts, while the proportion of 2-child families reached a peak before falling. If we look at the trends in the WVS data, however, the cohorts from 1926 through to 1955 were really very steady, and do not exhibit the trends seen in the GGP and Frejka and Sardon.

One observation that may put into question Frejka and Sardon's data is the extremely low level of childlessness they record, reaching a minimum of just 1.6% for the 1950-1954 cohort. Because some women (commonly 5-10%) always have physical limitations in their fertility, this level would seem to be unrealistically low. However, the Frejka and Sardon level of childlessness is fairly centrally placed within the confidence limits of the WVS data, particularly for earlier cohorts.

If we look at the WVS data for higher parities, we see that for 1-child women, the GGP data is comparable to the WVS, but both give a higher proportion than Frejka and Sardon. For 2-child women, the proportion in the WVS is higher than both the GGP and Frejka and Sardon. For 3- and 4+ child women, the WVS and GGP samples are statistically similar, but both sets are considerably lower than Frejka and Sardon.

2.7 Why the significant difference between fertility measures for Bulgaria from sample surveys and vital statistics?

The following five potential explanations are proposed (although it is also possible, perhaps even likely, that they may all be partly true):

i. The number of births before 1989 may have been over-counted. Could the number of births have been over-counted perhaps, possibly because of financial or other incentives to local authorities (particularly prior to the regime change in 1989)?

ii. There may have been an under-estimate of the number of fertile women before 1989. One possible source of error is in estimating the number of Roma (or Turks) in the population. In the official census of 2001, 371000 Roma were recorded - around 5% of the population - and this proportion is accurately reflected in the GGP sample. However, unofficial estimates suggest that the total Roma population in Bulgaria may be as high as 700000-800000 (Marushiakova and Popov, 1995). The Roma people do not like to be registered in censuses and the Bulgarian majority are happy for them to be under-counted. As the Roma (and Turks) have completely different fertility characteristics to the native Bulgarian population (see following sub-section of this report), then this could be a plausible explanation. If births to Roma women were recorded correctly, but not the total Roma population (of fertile women in particular), then this could account for an over-estimate of the country's official TFR and CCF.

iii. Another cause for the discrepancy could be because of migration. The population remaining in Bulgaria to be sampled in 2004 may be different from the original population, from which vital statistics were derived. This could have happened because larger families have emigrated, leaving singles and small families behind. Emigration of ethnic Turks, who are the largest ethnic minority in Bulgaria (over 9% of the population in 2001), and who have significantly higher fertility than native Bulgarians, could be an explanation.

Another possibility is immigration into Bulgaria in recent years of singles (workers) and small families.

iv. Differential mortality could be another potential cause. If women with large families have a lower life expectancy, then they may not be still available for being included in a survey, some years after the birth of their children. This could, perhaps, be the case for older Roma women.

v. The GGP sample could be biased, giving over-representation to childless individuals and small families compared to large families. Although the opposite situation has been seen more often in other countries (as discussed in the previous subsection on the FFS data), it is not inconceivable that people less involved with immediate family needs may have more time and inclination to participate in a survey of this kind. Because of the marginalised status of the Roma population, then under-representation of them is likely. Even though the proportion of Roma included in the GGP (5.1% of the female sample) is a little larger than the proportion of the population recorded in the last census of 2001 (4.7%), this may still be an under-estimate of the total Roma population. By comparison, the WVS survey of 1997 included a slightly smaller proportion (3.7% of the sample).

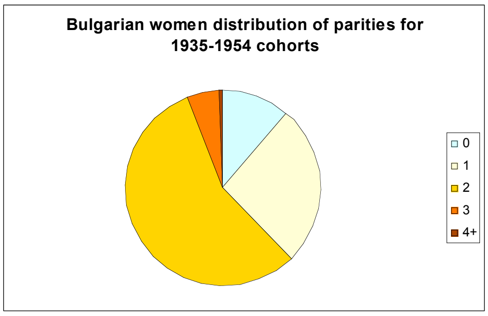
2.8 Parity distributions by ethnicity

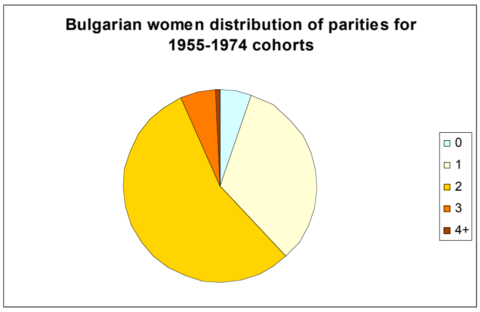
In Bulgaria, there are significant minorities of Turks and Roma, and their fertility patterns were compared to the ethnic Bulgarian population. A recent study has described the ethnic variations in fertility in Bulgaria between the three main groups (Koytcheva and Philipov, 2008), and this examination of the GGP data confirms their conclusions.

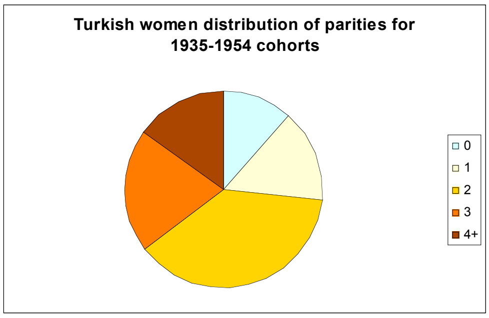
Because the numbers involved in the minority groups were small, then the cohort groupings had to be quite large to be able to make valid comparisons. Therefore there are just two cohort groups in this comparison (1935-1954 and 1955-1974). The parity distributions for the different ethnic groups are represented as pie charts (see below).

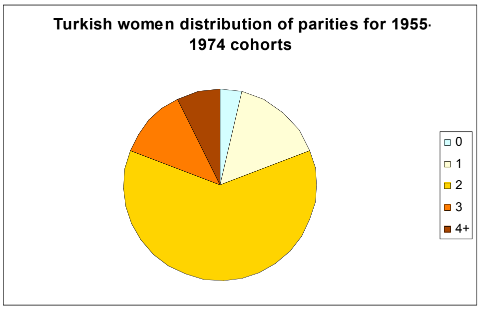
These show dramatically how the major ethnic groups in Bulgaria have completely different fertility patterns. For ethnic Bulgarians, families of 4 and more children have been almost non-existent over the whole period, while this was the norm for Roma women in the cohorts born up to the 1950s. One-child families have been the fertility outcome for over a quarter of Bulgarian women across all cohorts. There has actually been little change in the distribution of parities from the older cohorts to the younger ones for ethnic Bulgarians, while family sizes have shrunk markedly for the Turkish and Roma minorities. The fertility patterns of the Turkish minority is between the two extremes of the native Bulgarians and the Roma population, and the 2-child norm is increasingly becoming established in their community.

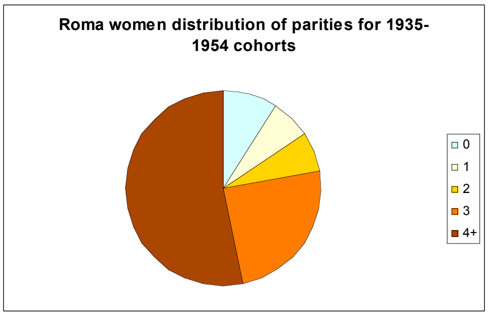
The WVS survey of Bulgaria in 1997 included a question on ethnicity (not included in the other waves). This confirmed the different fertility patterns of the main ethnic groupings as seen in the GGP data.

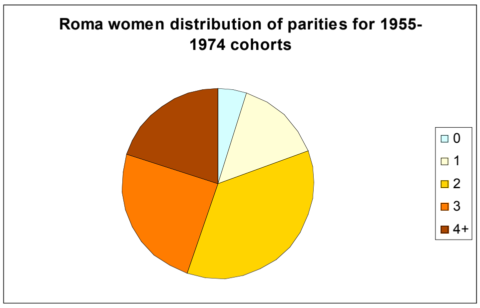










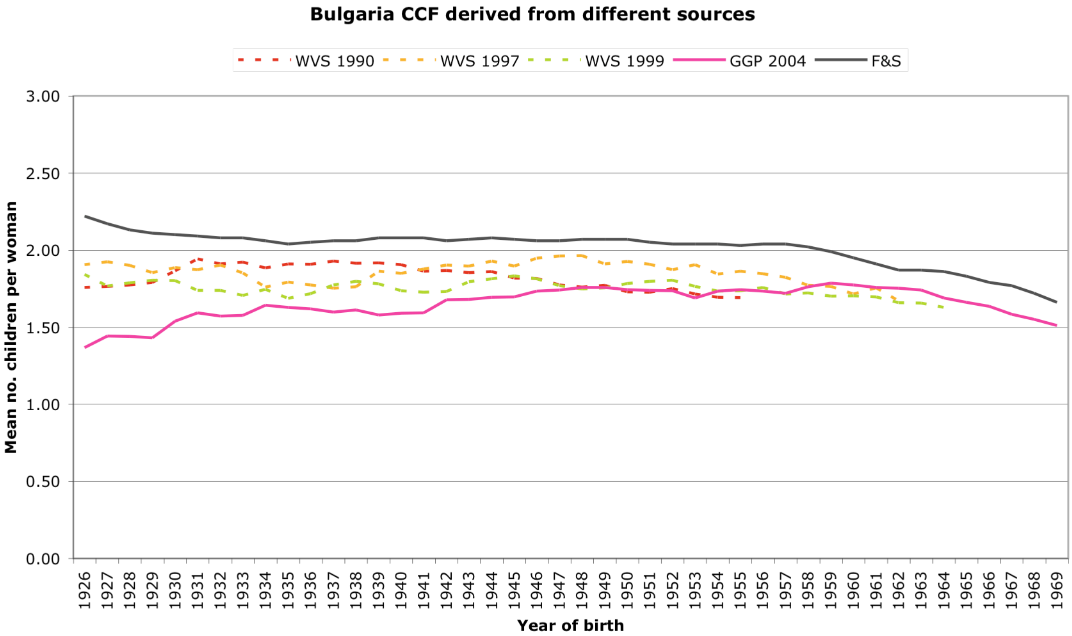


2.9 Discussion of discrepancies of Bulgarian data

If we look again at the five possible explanations for the significant difference in fertility rates between the sample surveys and the rates based on vital statistics, can we find any evidence favouring one over the other?

Firstly, it is considered unlikely that differential mortality would affect cohorts aged under 60 at the time of survey (ie. women born after 1944).

Next, if we consider migration, we should be able to detect a change in cohort fertility and a decline in larger families and/or rise in the proportion of smaller families between the three waves of the WVS of 1990, 1997 and 1999. Because this was a period of turbulence and population movement (the emigration of Turks was cited earlier), then differences between the waves should be detectable. However, the graph below shows there is no discernable trend between the different waves of the WVS and the confidence limits plotted in Appendix 1 show that the waves are not significantly different. Therefore this explanation is considered to be less likely than the others.



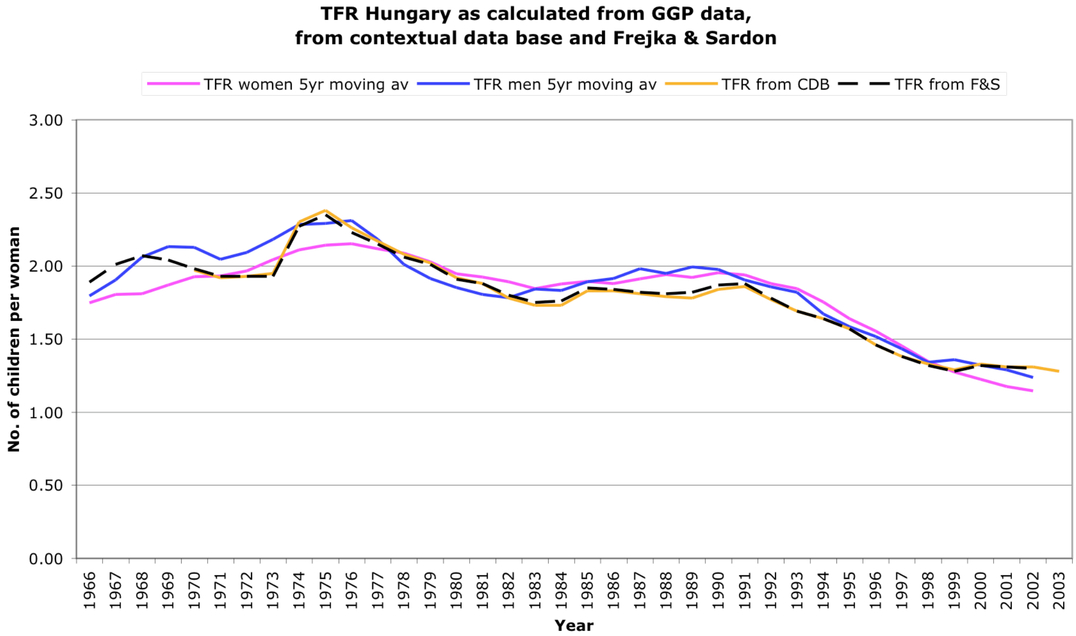
As the three waves of the WVS and the GGP showed similar proportions of women with 1, 3 and 4+ children, that would tend to give increased confidence that these are solid estimates of the true population. However, there is also the possibility that all sample surveys carried out in Bulgaria face the same challenge of correctly sampling all segments of the population, in particular the Roma minority. Comparing the GGP with the WVS, it would seem possible that the GGP has over-sampled childless women and under-sampled 2-child women – thus giving a somewhat too low estimate of overall fertility.

An alternative, and not necessarily contradictory, conclusion is that the population estimates based on vital statistics could be erroneous, either because of over-counting births (before 1989), or under-estimating the population – in particular from under-counting the number of Roma resident in Bulgaria.

How to resolve which is correct? Detailed analysis is required of the recent census results to see whether the number of children purported to have been born in previous years (particularly before 1989) appear subsequently in census returns. The United Nations (1983) has compiled a document which aims to illuminate population estimates when data availability is limited or of questionable accuracy. Cho *et al* (1986) have also described a method based on census returns.

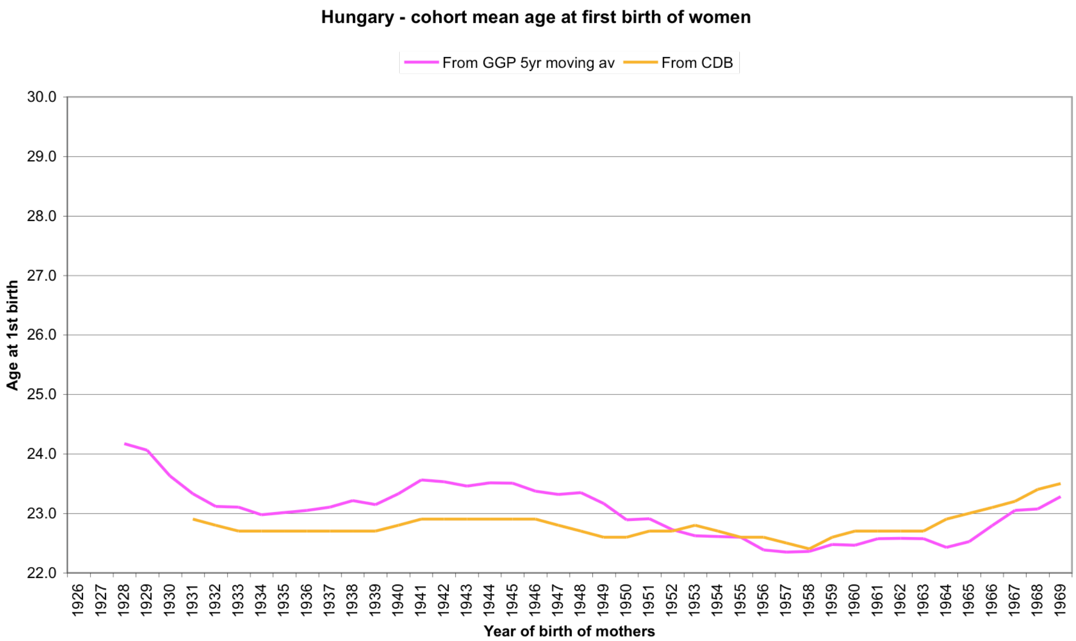
3. Hungary data comparison

3.1 Comparison of TFRs



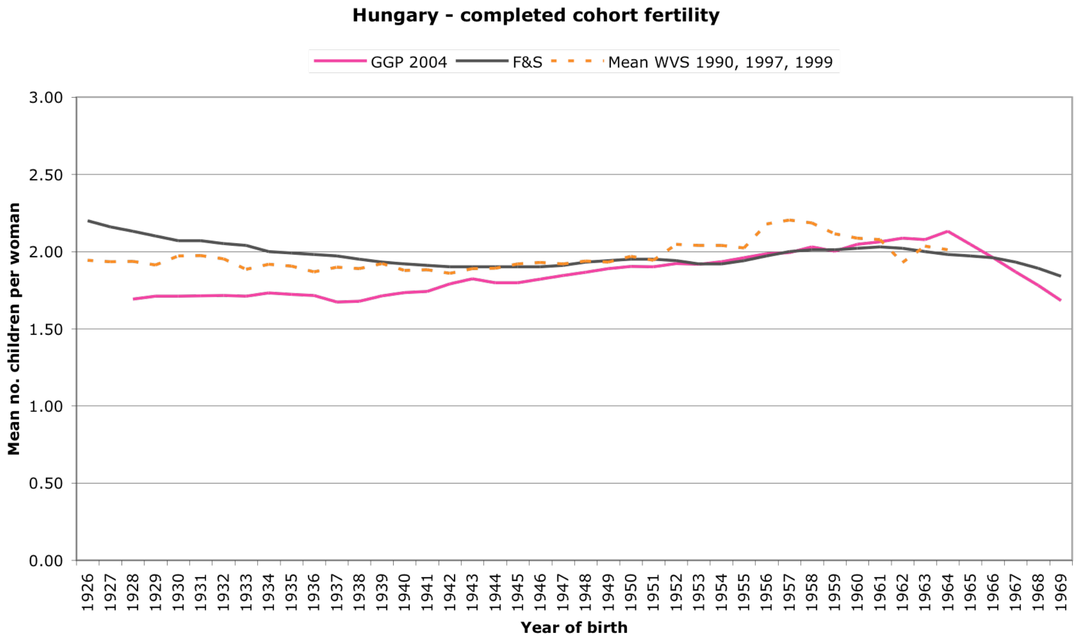
There is good agreement over most of the time period, although there may be a slight over-estimation for the period 1986-1995 from the GGP sample – perhaps because of over-sampling of families with children. Otherwise the trends are reflected very well.

3.2 Cohort mean age at first birth



The difference between the two is in the opposite sense to that for period data of mean age at childbearing, and is particularly noticeable for older cohorts. As the influence of declining higher parities is not an influence on this measure, then it could be because of some over-sampling of more highly educated women. In contrast, for the younger cohorts, the slight mismatch could be because of the greater accessibility to interviewers of women with young children, as they are at home more.

3.3 Comparison of CCF



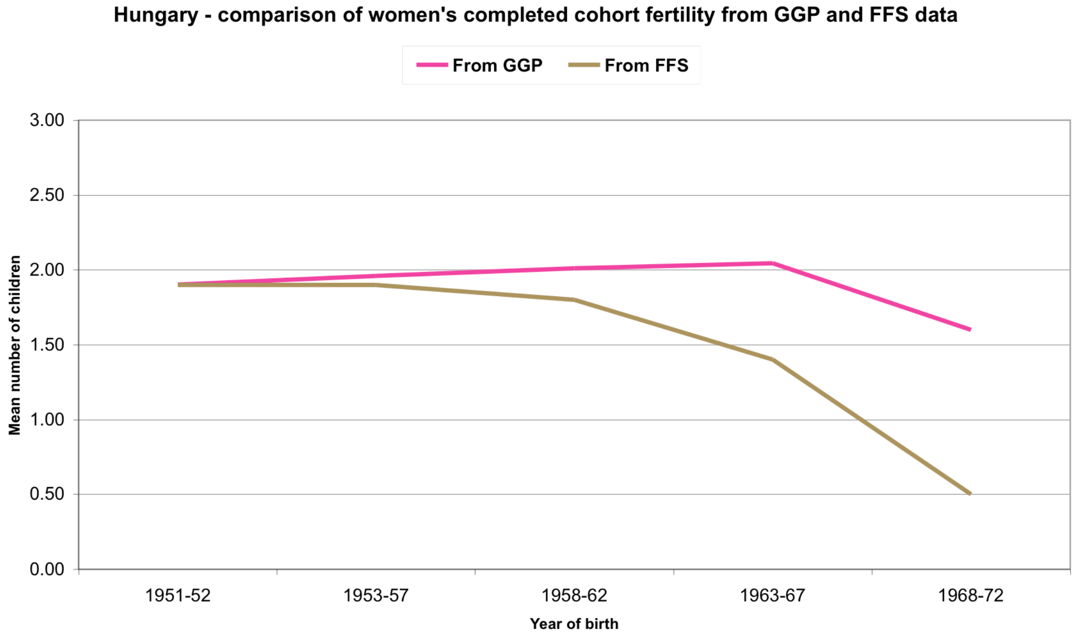
There is a much closer match between the CCF derived from the GGP data and the population data (again Frejka and Sardon's data is used) in Hungary than in Bulgaria. Older cohorts show the same direction of mismatch, with the CCF derived from vital statistics being significantly higher than the GGP sample for cohorts prior to 1944 (see Appendix 2 for confidence limits).

Both the WVS sample and CDB show that cohort fertility was under 2 for cohorts born between 1934 and 1956, with the trough being for the cohorts born at the end of the Second World War. The subsequent rise in cohort fertility, reaching a peak with the late 1950s - early 1960s cohorts, is more pronounced in the GGP sample than in the Frejka and Sardon trend. Since then cohort fertility has been falling.

The Frejka and Sardon CCF trend line falls within the confidence limits of all the WVS surveys (except for the very youngest cohorts who have probably not completed their fertility). The GGP confidence band is within the limits of the WVS confidence limits for later cohorts, though for older cohorts, there would seem to be a suggestion that the GGP estimate is too low.

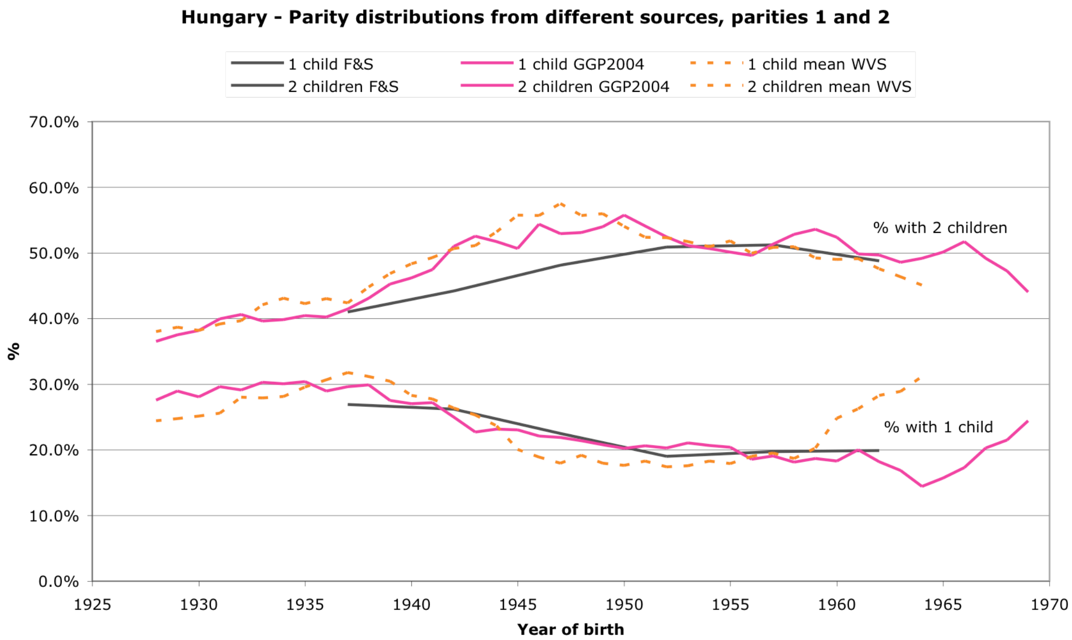
3.4 Comparison of completed cohort fertility from GGP and FFS

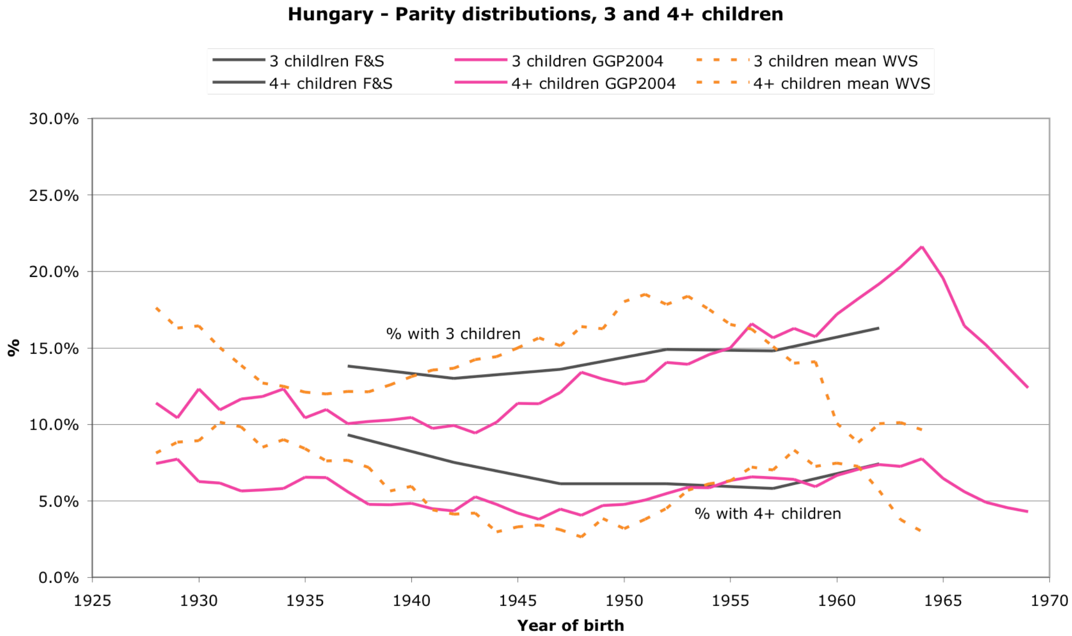
The Hungarian FFS survey was carried out between November 1992 and December 1993 and included women aged 18-41 (as well as a smaller sample of men) (UNECE, 1999). The agreement between the FFS and GGP data for the oldest cohort of women is exact – which is perhaps a little surprising, as a few additional children could have been expected to have been born to women aged only 41-42 at the time of the FFS sampling. However, it is reassuring to see such good agreement between these two data sets.



3.5 Parity structure: comparison with Frejka and Sardon and the WVS

This sub-section deals with the proportion of women with 1 child or 2, 3 or 4 and more children. The proportion of women who remain childless will be discussed in more depth in the following sub-section, as for Hungary there is the additional data source of the contextual data base to consider.





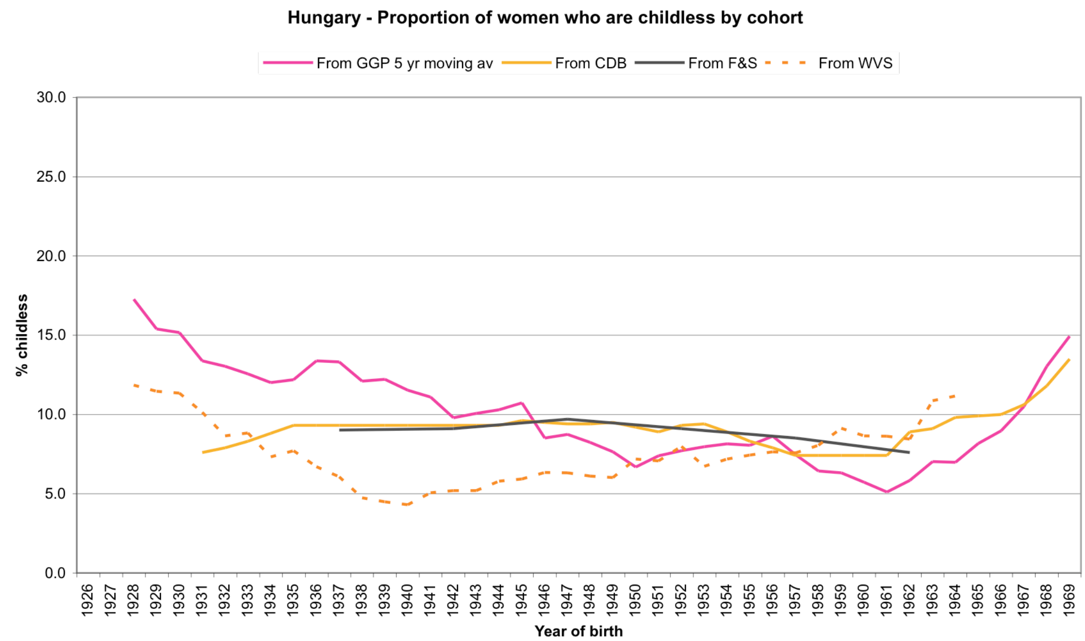
There is considerably better agreement for Hungary than for Bulgaria, with no systematic differences between the data sets. The Frejka and Sardon trend lines lie within the confidence limits of the GGP and WVS samples for most of the cohorts for 1-child mothers and 3-child mothers (Appendix 2). For 2-child mothers the Frejka and Sardon line is significantly below the GGP sample for cohorts born before 1951, and towards the bottom edge of the WVS confidence limits. The reverse pattern is seen for mothers of 4+ children, with the Frejka and Sardon line being significantly higher for earlier cohorts.

The overall trends are reflected similarly in the Frejka and Sardon data, the GGP and the WVS, although the peak in 2-child families would appear to happen for later cohorts according to Frejka and Sardon compared to the GGP sample. Later childbearing in Hungary compared to Bulgaria is the likely explanation of the divergence of the WVS data for the youngest cohorts.

3.6 Comparison of proportion childless

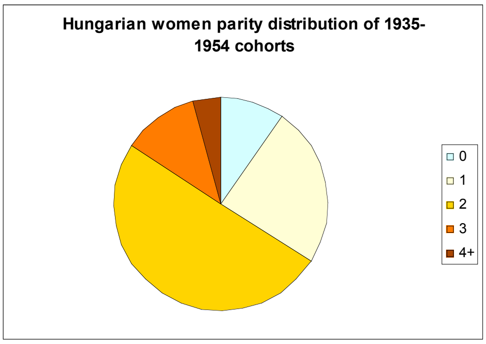
The agreement between CDB data for childlessness and the GGP sample for Hungary appears to be good, except for a potential over-sampling of childless women in the oldest age brackets (see graph below). Childlessness has traditionally been below around 10% in Hungary, dipping even below that for the cohorts born in the late 1950s and early 1960s.

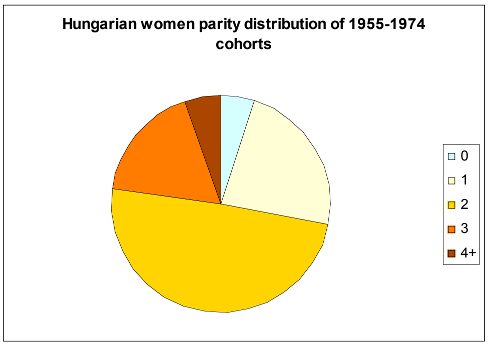
It is not surprising that the proportion of childless given in the CDB and Frejka and Sardon is very close, as they are derived from the same base data, the Hungarian vital statistics. The childless rate derived from the WVS sample is noticeably lower than the GGP sample and the population estimates: however, it is within the confidence band (see Appendix 2).

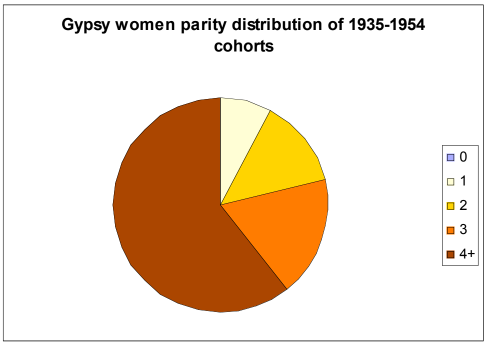


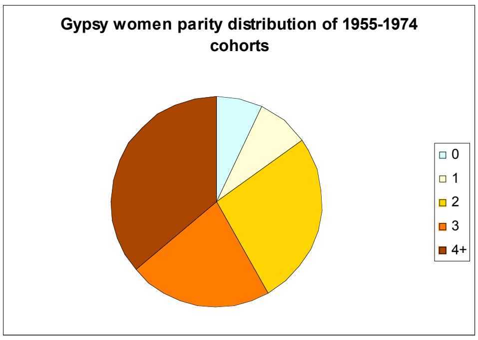
3.7 Parity distributions by ethnicity

In Hungary, the most significant ethnic minority is the Roma (called Gypsies in the Hungarian GGP survey) and 'those of Roma origin' who account for roughly 2% of the population (these two categories were differentiated in the questionnaire, but in this analysis were combined).









If we look at the parity distributions in Hungary for ethnic Hungarians compared to those of the Gypsy (Roma) population, a similar contrast is found to that seen in Bulgaria, though rather less stark than there (native Hungarians do sometimes have 4 children!). Once again, over half of the Gypsy women had families of over 4 children in the earlier cohorts, though this had declined with the younger cohorts (though they still had larger families than the Roma in Bulgaria).

In Hungary, an higher proportion of native Hungarians had 3 children comparing the younger cohorts with the older ones, with also a slight increase in 4+ child families. This is a reflection of the rise in fertility in Hungary already seen on the TFR and CCF graphs. Hungary managed in the latter part of the 1960s and 1970s to increase the fertility of its native population while at the same time decreasing the fertility of its Gypsy population.

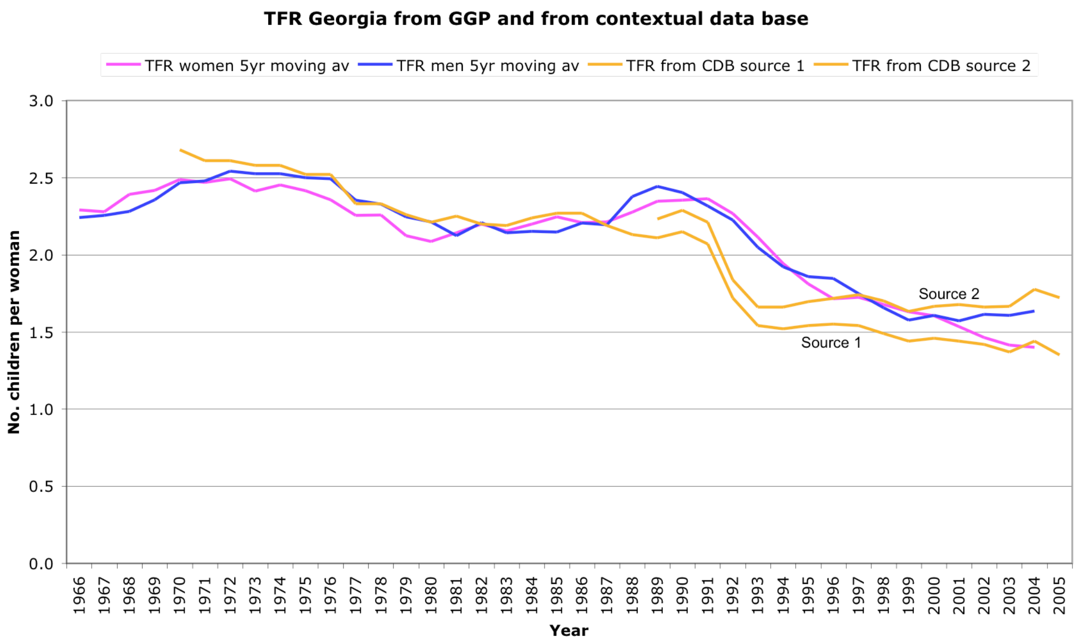
3.8 Discussion of validity of Hungarian data

The comparison of the fertility measures derived from the GGP and those derived from vital statistics give good assurance that the levels and trends are accurately portrayed, particularly for cohorts born after about 1950. For the older cohorts, there may have been some over-sampling of childless women and 2-child women, and under-sampling of women with 3 and 4+ children. Alternatively, there could have been some birth registration or census problems in earlier years, as potentially seen in Bulgaria, but to a much lesser extent.

Comparing the lines of the three WVS waves suggests that migration has not had an impact on changing the CCF of the cohorts.

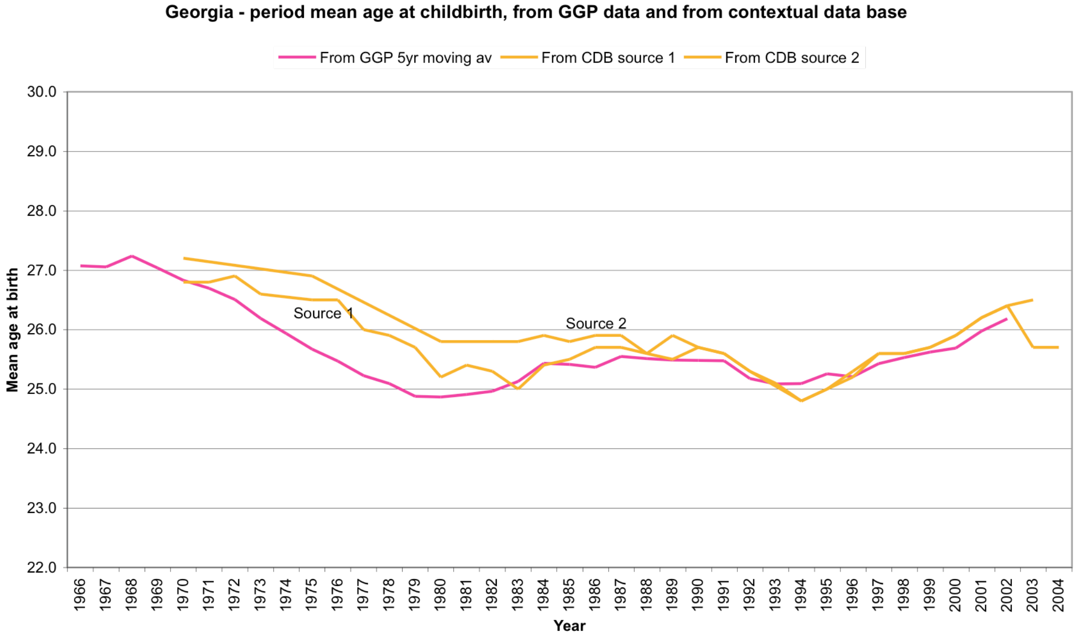
4. Georgia data comparison

4.1 Comparison of TFRs



This shows very good agreement, except for the period between 1988 and 1995, when the GGP data gives a higher estimate than the data derived from vital statistics. It is interesting that two different data sources for the national TFRs are given in the contextual data base: from the graph above, it would appear that the one from the Demographic Yearbook of Georgia, 2005 (source 2) matches the GGP data better than that from the publication “Recent demographic developments in Europe, 2005” (source 1).

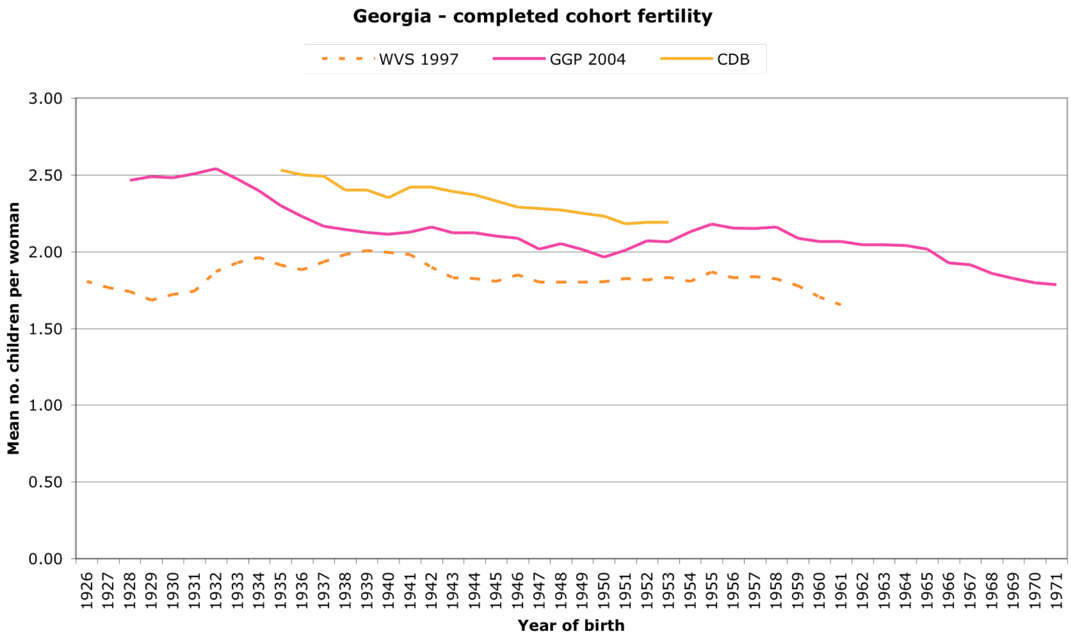
4.2 Period mean age at childbearing



The match between the three data sets is good after around 1985. For the years before then, perhaps under-sampling of larger families would explain the fact that the GGP data gives a lower age at childbearing than both sources cited in the CDB.

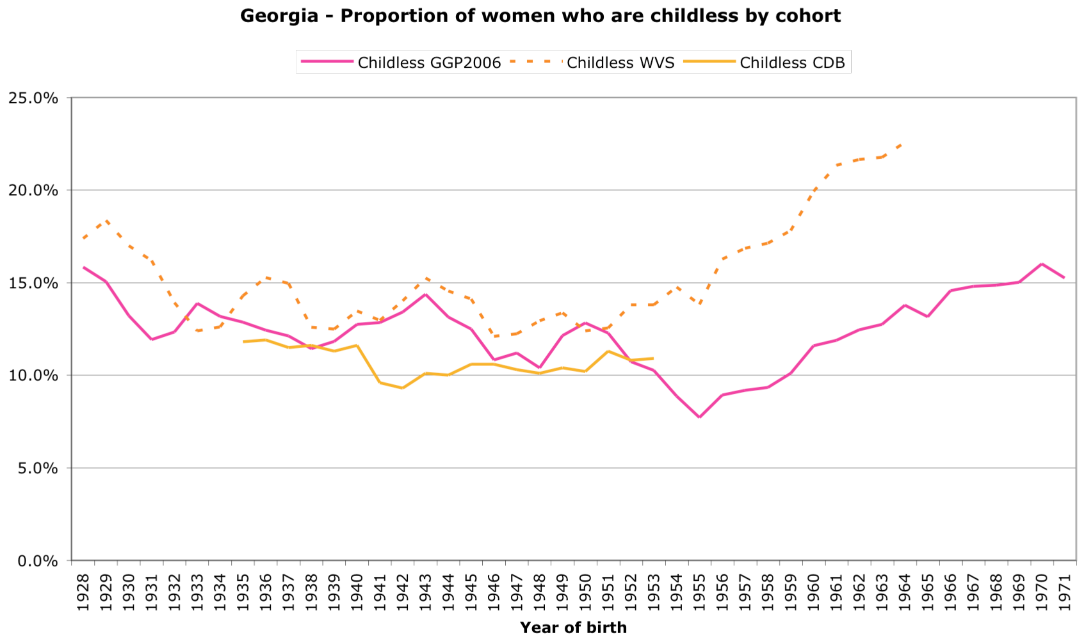
The fall in mean age at childbearing before 1980 could well be (partially) explained by a decline in higher parity births. The recent increase in age at childbearing has been less acute for Georgia than for Bulgaria or Hungary; however, it has still increased by around 18 months since 1993/1994.

4.3 Comparison of CCF



The number of years for which comparable data is available is rather small for Georgia (Frejka and Sardon did not include Georgia in their study of low-fertility countries). As with Bulgaria, there is a significant mismatch between GGP data and population data (see Appendix 3 for confidence limits), again with the CDB giving higher values. Unlike in Bulgaria and Hungary, the fertility rate derived from the 1997 WVS data is significantly lower than both the GGP sample and the CDB.

4.4 Comparison of proportion childless



The GGP sample for Georgia shows some quite erratic variations in the proportion of childless, even after applying a 5-year moving average, which are not reflected in the CDB data. We can only assume these are a result of relatively small samples. The absolute level of childlessness is slightly higher than for Hungary, generally hovering somewhat above the 10% level.

Except for the proportion of childless women, we do not have estimates of the parity proportions from vital statistics. However, we can compare the GGP and WVS samples (see Appendix 3). There is no significant difference in the proportion of 1-child, 2-child and 3-child mothers. However, the WVS has a higher proportion of childless women and a lower proportion of women with 4+ children than the GGP sample: hence the reason for the CCF being higher for the GGP sample than the WVS sample.

4.5 Discussion of validity of Georgian data

The close match in the TFRs between at least one of the data sources in the CDB and the GGP sample gives confidence of the validity of the GGP sample. The good match of the proportions of most parities with the WVS is also reassuring. The fact that the CCF is significantly lower from the GGP sample than the CDB causes some concern: there is, perhaps a greater likelihood here that the cause is a slight over-sampling of childless women and perhaps under-sampling larger families (a problem which the WVS would seem to have suffered from even more).

5. Discussion of issues relating to all three countries

5.1 Comparison of TFRs derived from male data and from female data

Calculation of the TFR from male data is a rarity. The assumption could be that males may under-report their number of children or misreport their years of birth. There is also the problem, described above, of defining the fertile life of males: however, most men do in fact have their children before the age of 40 in Eastern European countries.

However, this analysis shows that TFR values calculated from male data do not differ markedly from that derived from female data. For Georgia and Hungary there is no noticeable difference for any time period. For Bulgaria, there may be a slight tendency for the TFR derived from women's data to be higher than that derived from men's data for recent years. This could be as expected – women with small children are more often at home, while the men are out of the house; this can lead to women with younger children being over-represented.

5.2 Why do older cohorts have too low a CCF in the GGP samples?

As all three country comparisons show a similar mismatch between population data and GGP sample data for older cohorts, one might ask why this should be the case.

One possibility is differential mortality. If women with more children have a higher mortality, then they would be unavailable for sampling in the GGP survey. Higher fertility is associated with some sub-populations such as the Roma, who also experience higher mortality and lower life expectancy.

Having more children is associated with rural residence and lower education (see later section for discussion on this): so were these women either unavailable because of death or incapacity or under-sampled because of their unwillingness to participate or inaccessibility to the interviewers? It is also possible that older women, who have lived through certain levels of oppression under the communist system, are more reticent about participating in a very personal survey such as the GGP – and perhaps especially the less educated ones.

5.3 Comparison of results from the GGP and WVS

Being able to compare the fertility estimates based on the GGP observations with data from other sample surveys - in particularly the WVS which samples the whole adult population - is of tremendous value. In cases where all the surveys essentially agree, such as in Hungary, one has greater confidence that they are all accurately sampling the resident population.

Although the WVS has comparatively small sample sizes, it does have the advantage of multiple waves, all sampled independently. For Bulgaria and Hungary, where three WVS waves could be compared, there were no significant differences in the results between them across the majority of the cohort range, and yet there were differences between the WVS values and the GGP values. This suggests three things: that migration has not significantly modified the population fertility profile of those countries; that the WVS methodology appears to repeatedly produce similar sample mixes; and there are significant differences in the sampling methodologies of the WVS and the GGP.

For the older cohorts in Hungary, and across most of the cohort range in Bulgaria, the WVS gives a higher estimate of the CCF than the GGP sample, but lower than the values derived from vital statistics. In Georgia, however, the WVS estimate of the CCF was lower than both the GGP estimate and the vital statistics-derived value. For all three countries, the WVS appears to give a very steady estimate of the CCF across the cohorts, while the Bulgarian and Hungarian GGP samples shows an initial trend of increasing CCF from the oldest cohorts, in contrast to the population-derived values which show a decline.

The following account summarises the similarities and disparities of the parity proportions for each country. In Bulgaria, the WVS and GGP samples show similar proportions of 1-child, 3-child and 4+ child mothers, while the Frejka & Sardon values are significantly higher for the higher parities and lower for the lower parity. The WVS and Frejka and Sardon values are similar for childless and 2-child mothers, while the GGP samples significantly more childless women and fewer 2-child mothers. For Hungary, there is no systematic difference between the values of Frejka and Sardon, the GGP and the WVS for any parity. In Georgia, the proportions of childless, 1-child, 2-child and 3-child women are similar for the WVS and GGP, but there is divergence for mothers of 4+ children, where the GGP has a significantly bigger proportion.

To conclude, it would seem that it is more difficult to obtain an accurate sample of the population who have no children or who have large families – those at the extremities of the fertility range, yet those which therefore have the greatest influence on the fertility rates. The disparities between the surveys for these parities in particular highlight this challenge.

6. Conclusion

To conclude, this data validation analysis would appear to give confidence that the GGP sample data is essentially representative of the populations of Hungary and Georgia. There are some concerns about the Bulgarian GGP sample, although trends in fertility would appear to be correctly portrayed. The different sample surveys, which give comparable results, would also suggest that it is possible that there are weaknesses in the birth registration and/or population data of Bulgaria and so this could be the reason for the apparent non-comparability.

7. Acknowledgement

This paper is the result of work carried out during an internship at the Population Activities Unit of the United Nations Economic Commission for Europe. The GGS data used in the analysis were obtained from the GGP Data Archive and were created by the organisations and individuals listed at:
http://www.unece.org/pau/ggp/acknowledge.htm.

For further details of the GGP see United Nations (2005) and Vikat et al (2007).

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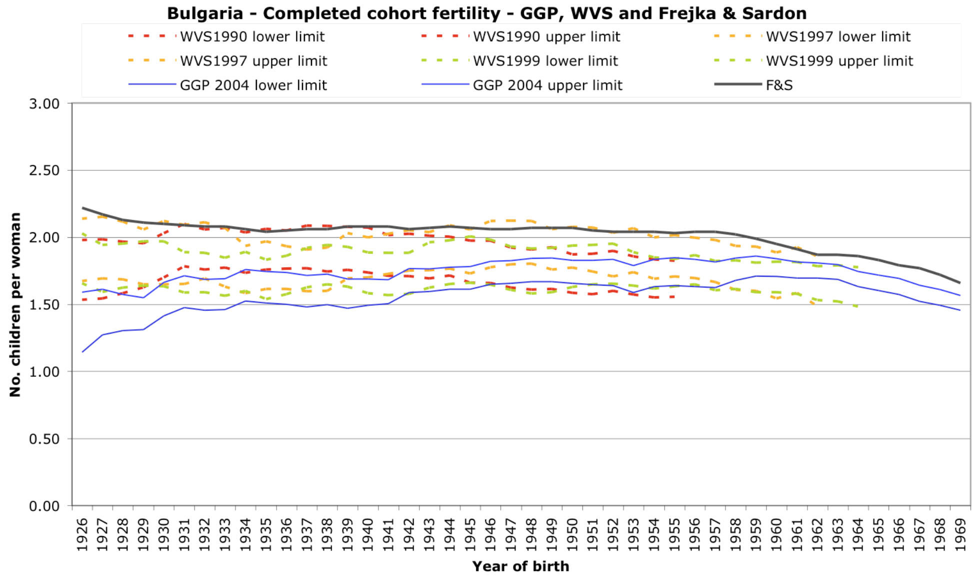
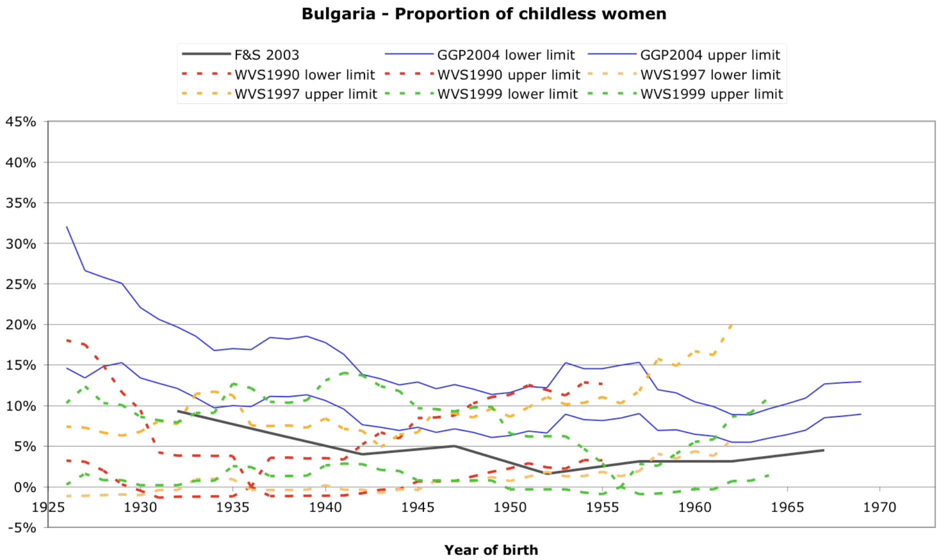
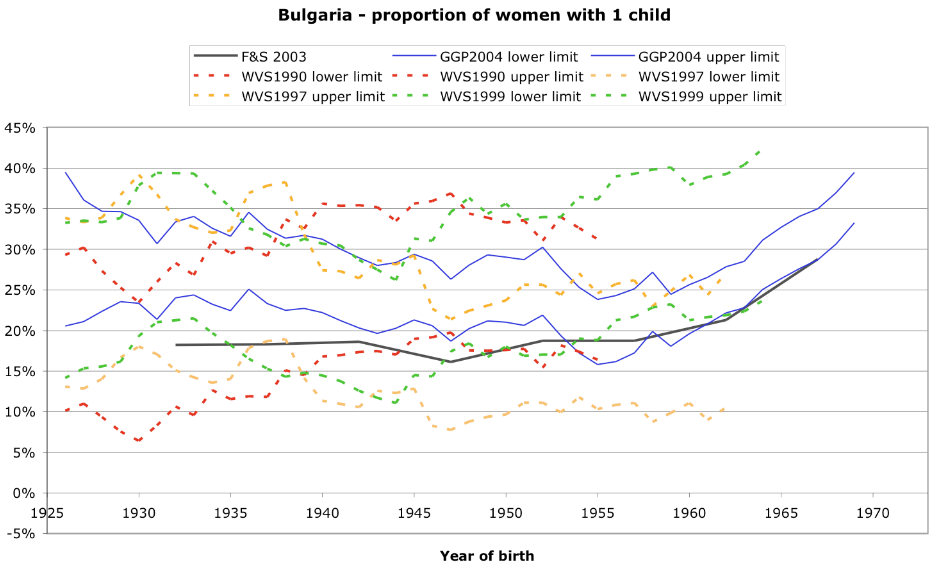
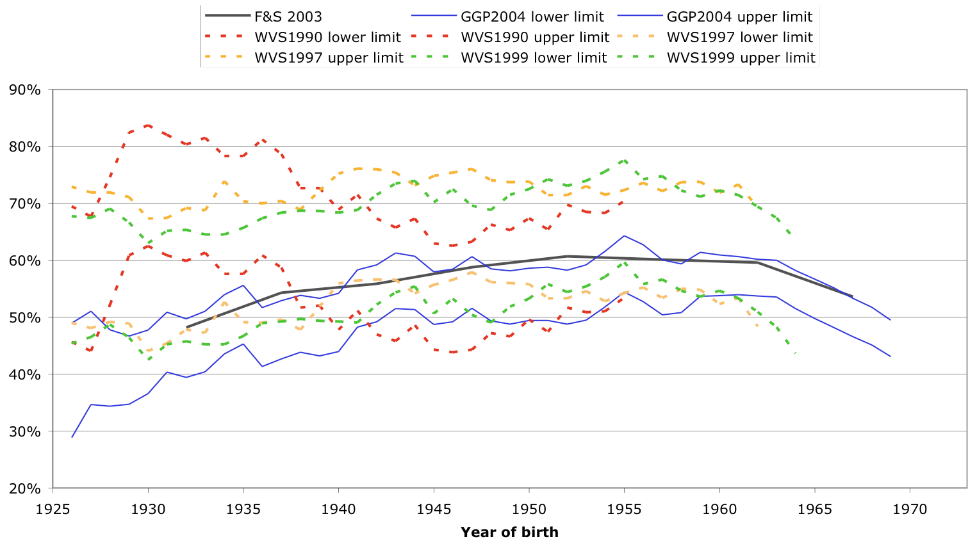
Appendix 1: Confidence limits of CCF and parity proportions, Bulgaria



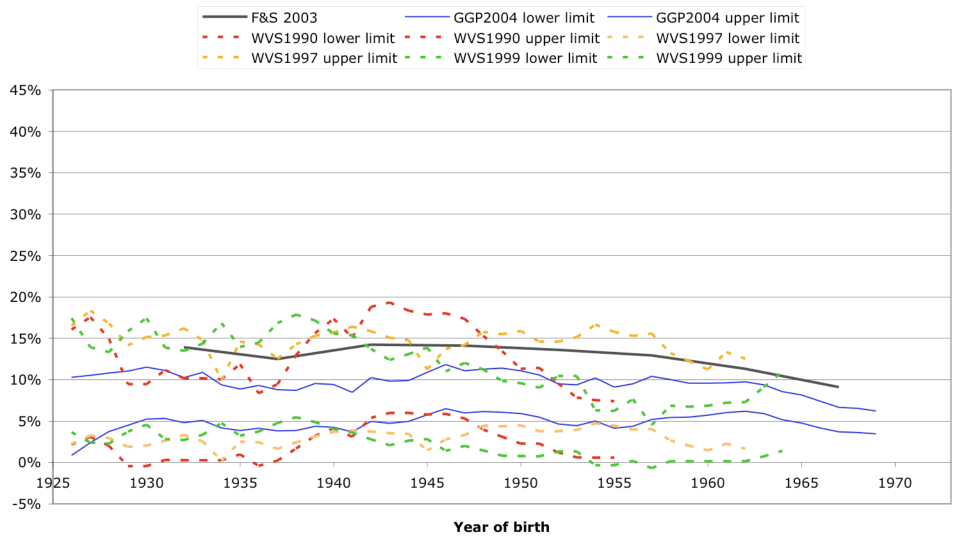




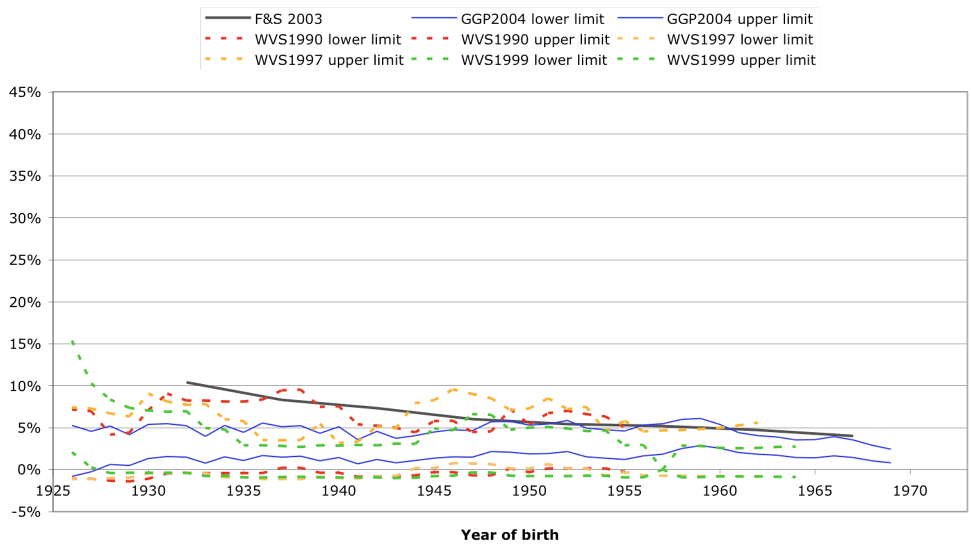
Bulgaria - proportion of women with 2 children



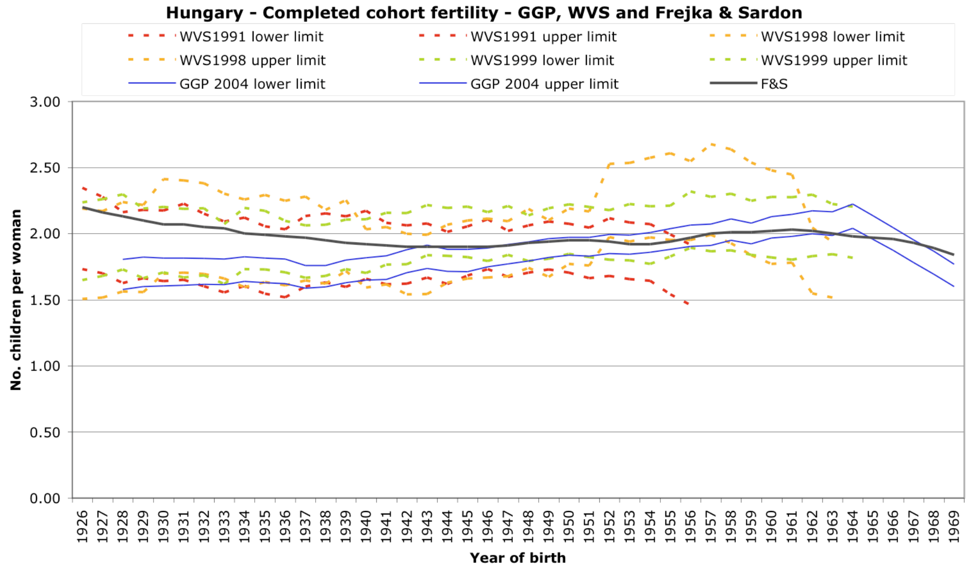
Bulgaria - Proportion of women with 3 children

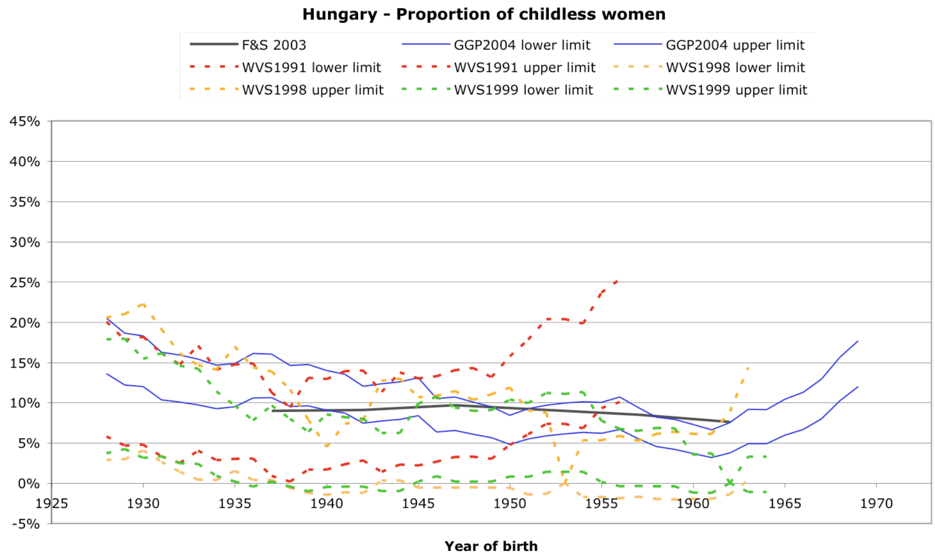


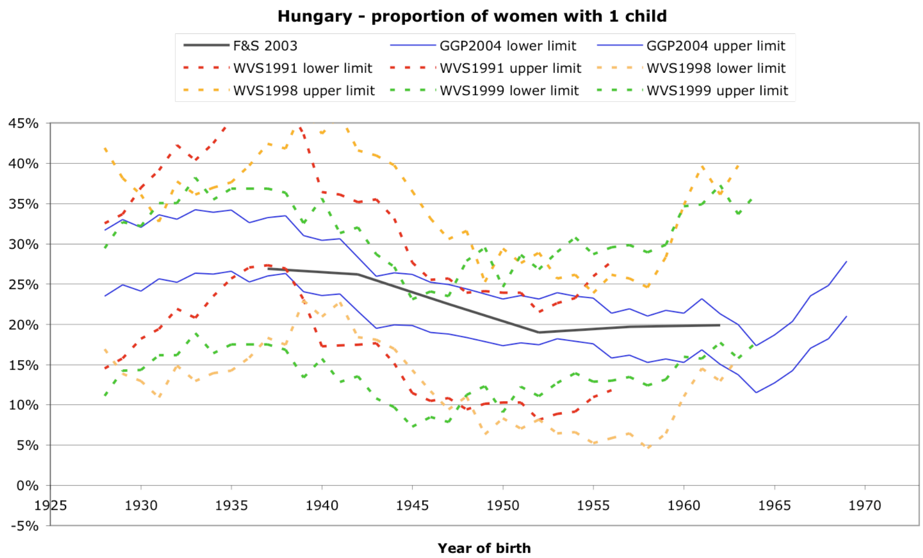
Bulgaria - Proportion of women with 4+ children

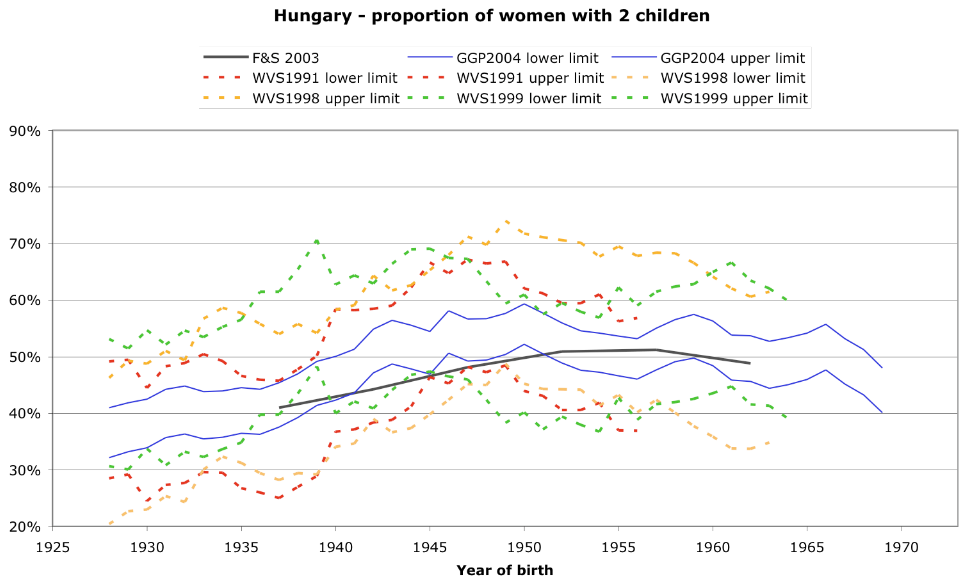


Appendix 2: Confidence limits of CCF and parity proportions, Hungary








Hungary - proportion of women with 2 children
F&S 2003
GGP2004 lower limit
GGP2004 upper limit
WVS1991 lower limit
WVS1991 upper limit
WVS1998 lower limit
WVS1998 upper limit
WVS1999 lower limit
WVS1999 upper limit
90%
80%
70%
60%
50%
40%
30%
20%
1925
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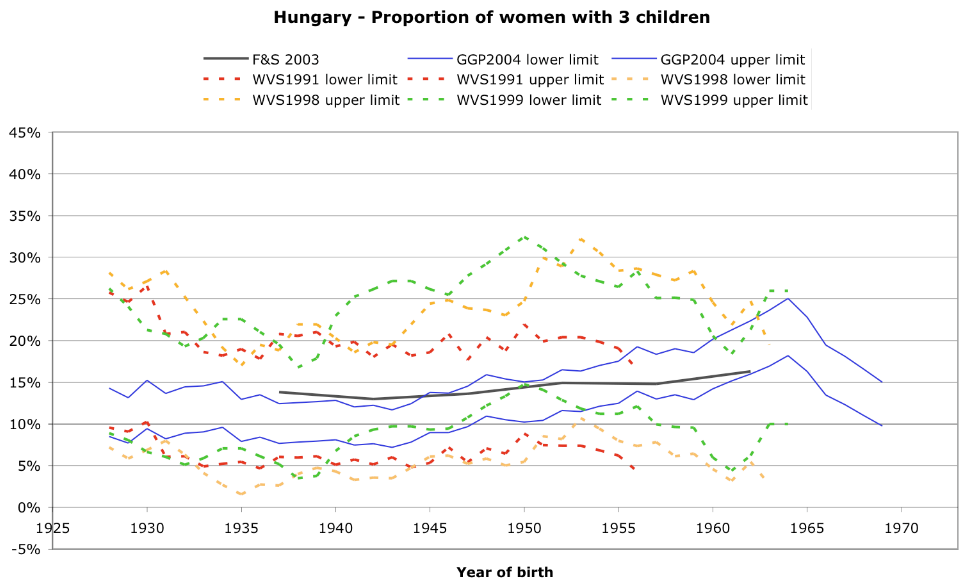
1945
1950
1955
1960
1965
1970
Year of birth


Hungary - Proportion of women with 3 children
F&S 2003
GGP2004 lower limit
GGP2004 upper limit
WVS1991 lower limit
WVS1991 upper limit
WVS1998 lower limit
WVS1998 upper limit
WVS1999 lower limit
WVS1999 upper limit
45%
40%
35%
30%
25%
20%
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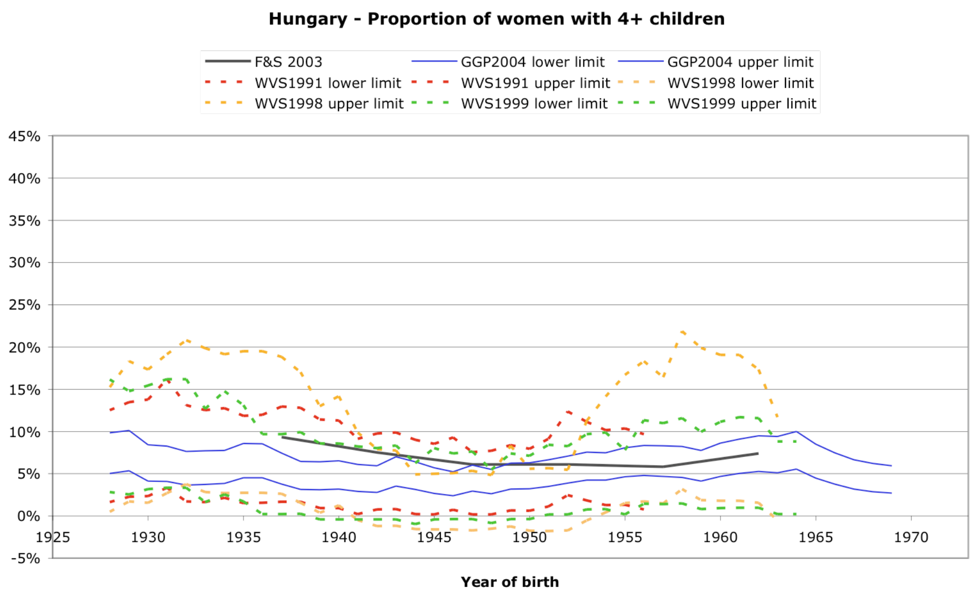
1955
1960
1965
1970
Year of birth


Hungary - Proportion of women with 4+ children
F&S 2003
GGP2004 lower limit
GGP2004 upper limit
WVS1991 lower limit
WVS1991 upper limit
WVS1998 lower limit
WVS1998 upper limit
WVS1999 lower limit
WVS1999 upper limit
45%
40%
35%
30%
25%
20%
15%
10%
5%
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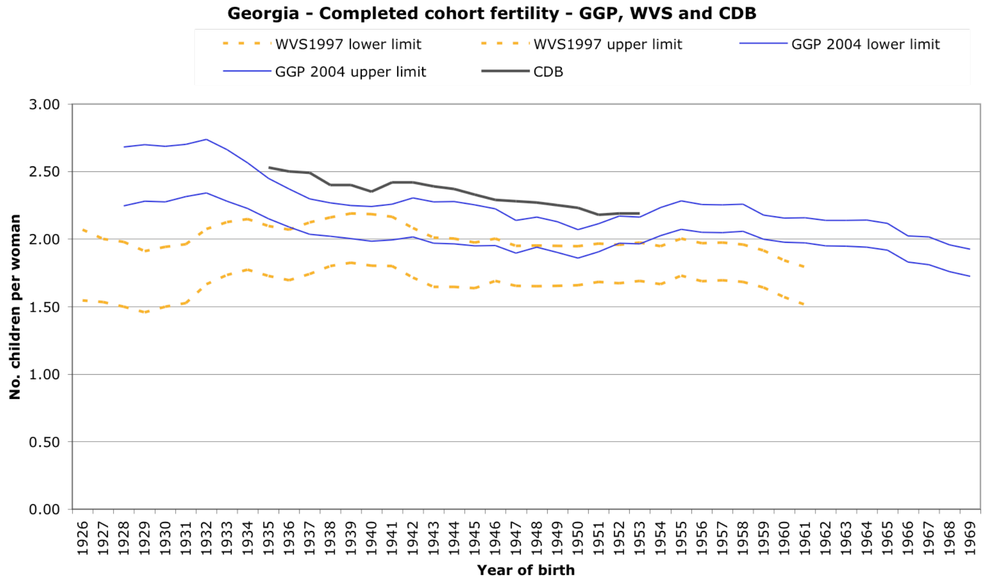
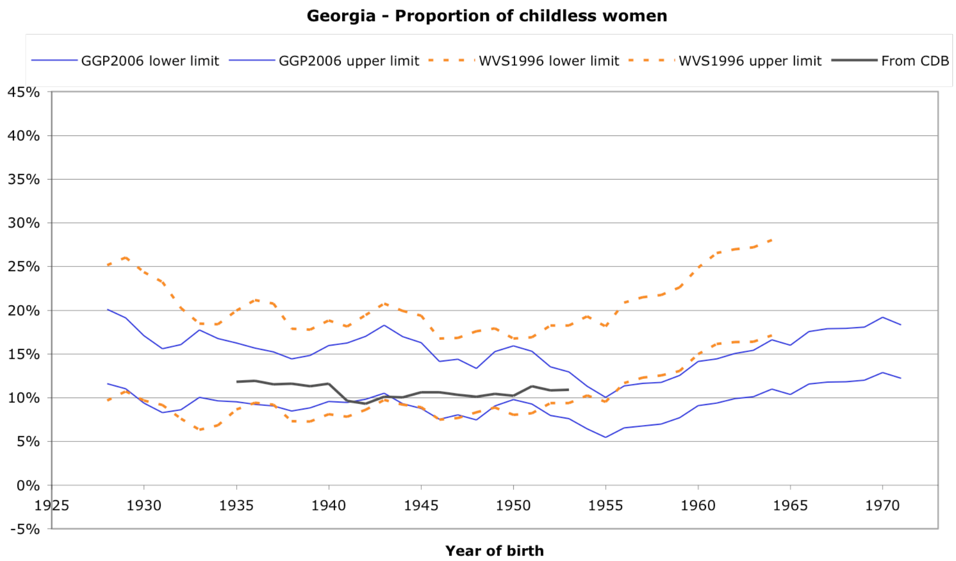
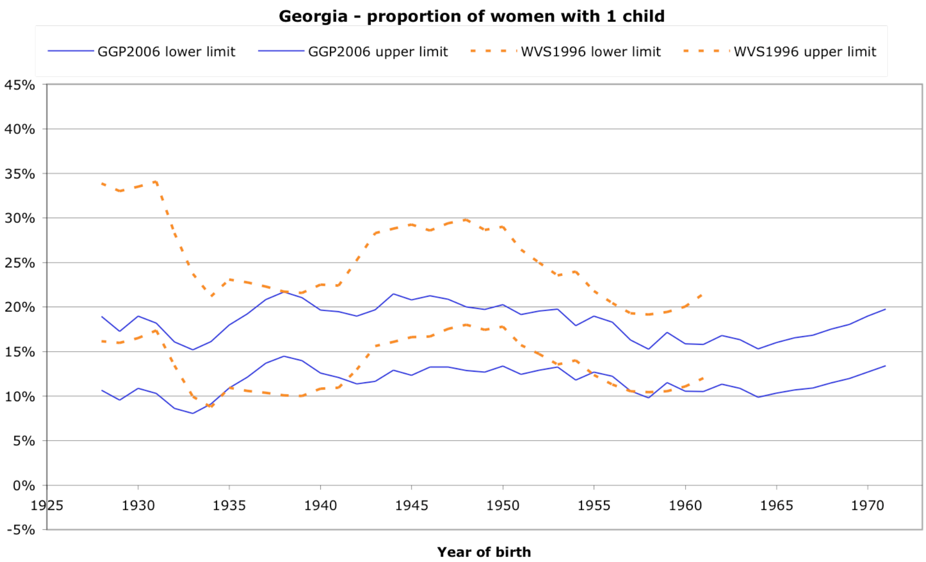
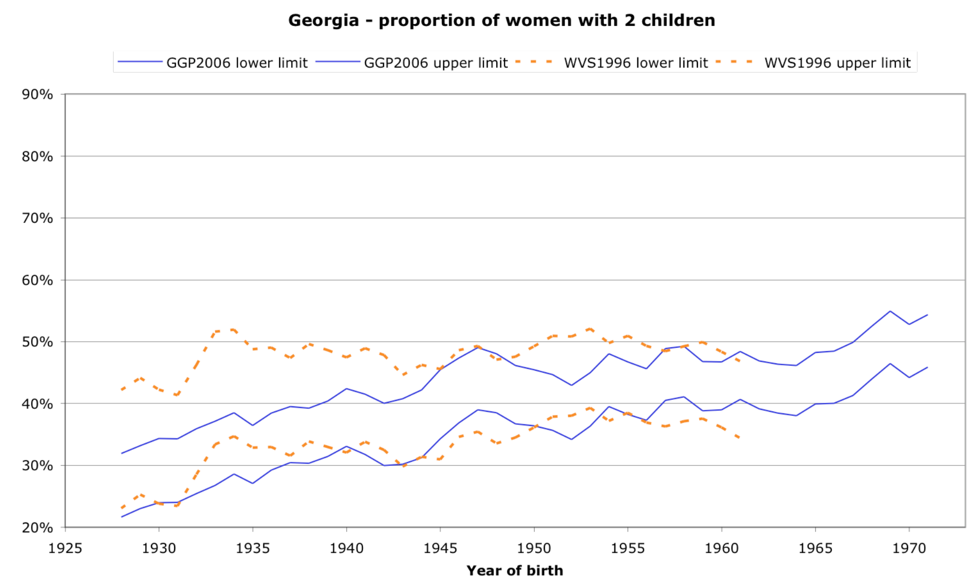
Year of birth

Appendix 3: Confidence limits of CCF and parity proportions, Georgia








Georgia - proportion of women with 2 children
GGP2006 lower limit
GGP2006 upper limit
WVS1996 lower limit
WVS1996 upper limit
90%
80%
70%
60%
50%
40%
30%
20%
1925
1930
1935
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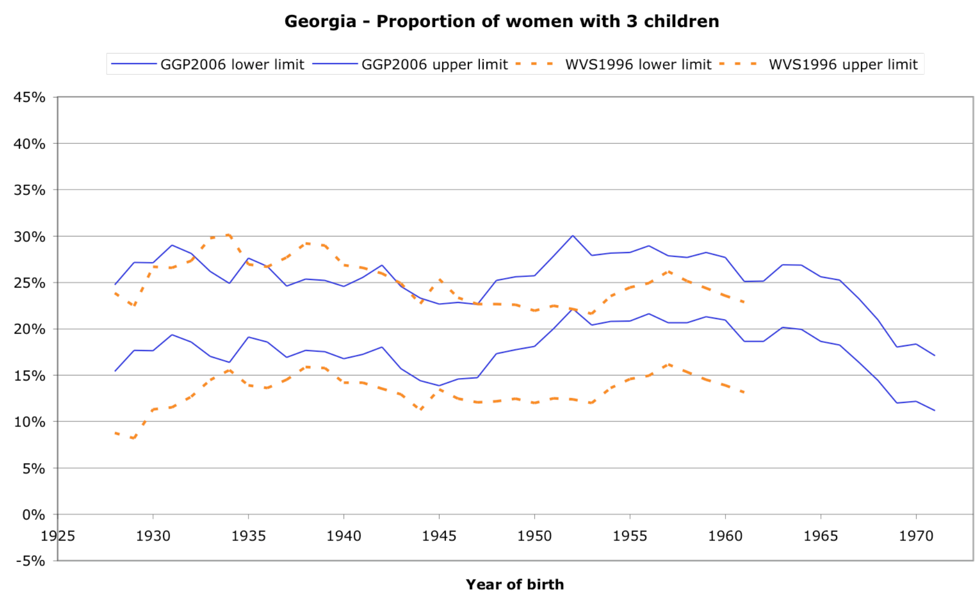
1965
1970
Year of birth


Georgia - Proportion of women with 3 children
GGP2006 lower limit
GGP2006 upper limit
WVS1996 lower limit
WVS1996 upper limit
45%
40%
35%
30%
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5%
0%
-5%
1925
1930
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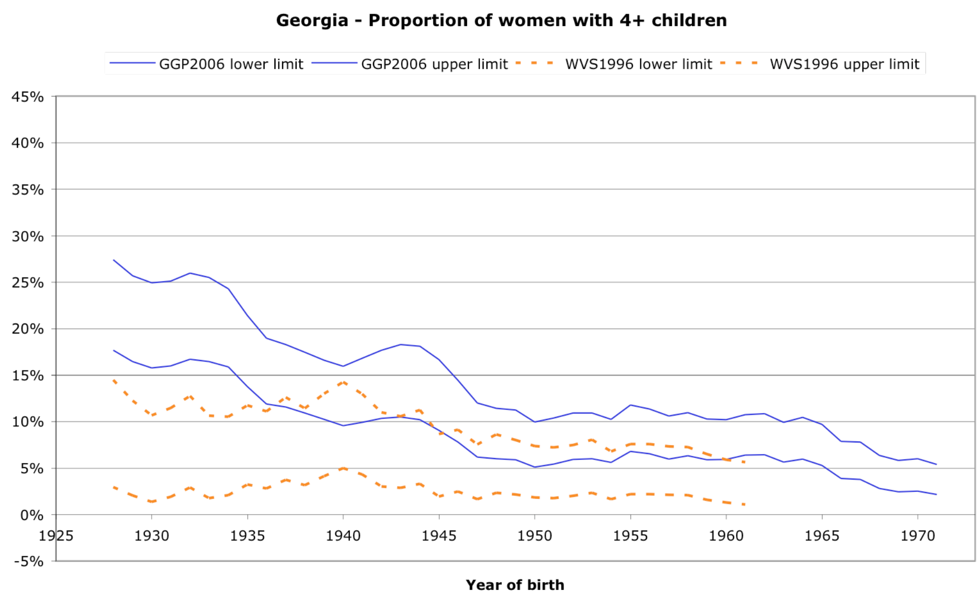
1950
1955
1960
1965
1970
Year of birth


Georgia - Proportion of women with 4+ children
GGP2006 lower limit
GGP2006 upper limit
WVS1996 lower limit
WVS1996 upper limit
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
-5%
1925
1930
1935
1940
1945
1950
1955
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1965
1970
Year of birth