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***Census data in demographic analysis
of family formation and fertility***

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Importance of census data for demographic analysis

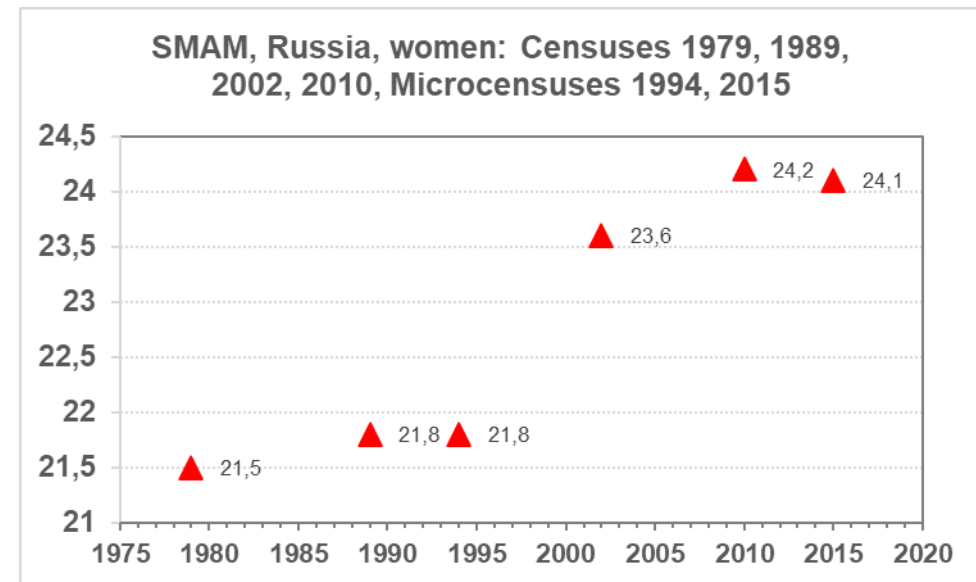
- Each census is a starting point for a new cycle of obtaining annual population estimates by sex and age. Population censuses are the only option in the absence of a reliable population register. Electronic registers make it possible to conduct population censuses at least every year or even every month. But they are not created in all countries, e.g. Russia does not yet have such a register;
- Censuses provide data on the distribution of the population by sex, age, marital status, education level, migration status, etc., which are basic for using them as the denominator for calculating all demographic rates (frequencies) that measure the intensity of demographic events;
- Census data on the marital status, on the number of children ever born is an invaluable source for studying the processes of transformation of marriage and fertility patterns, and in turn, it gives us an earth for population projections and for study of the sustainability of the demographic reproduction regimes.

Census distribution of the population by sex, age, and marital status: SMAM

The **Singulate Mean Age at Marriage (SMAM)**, the mean age at first marriage among those who ever marry. It is computed from the proportions who are never married in each age group.

Proposed and introduced in wide practice by John Hajnal. This indicator strongly recommended by the UN for active use as internationally comparable in comparative studies

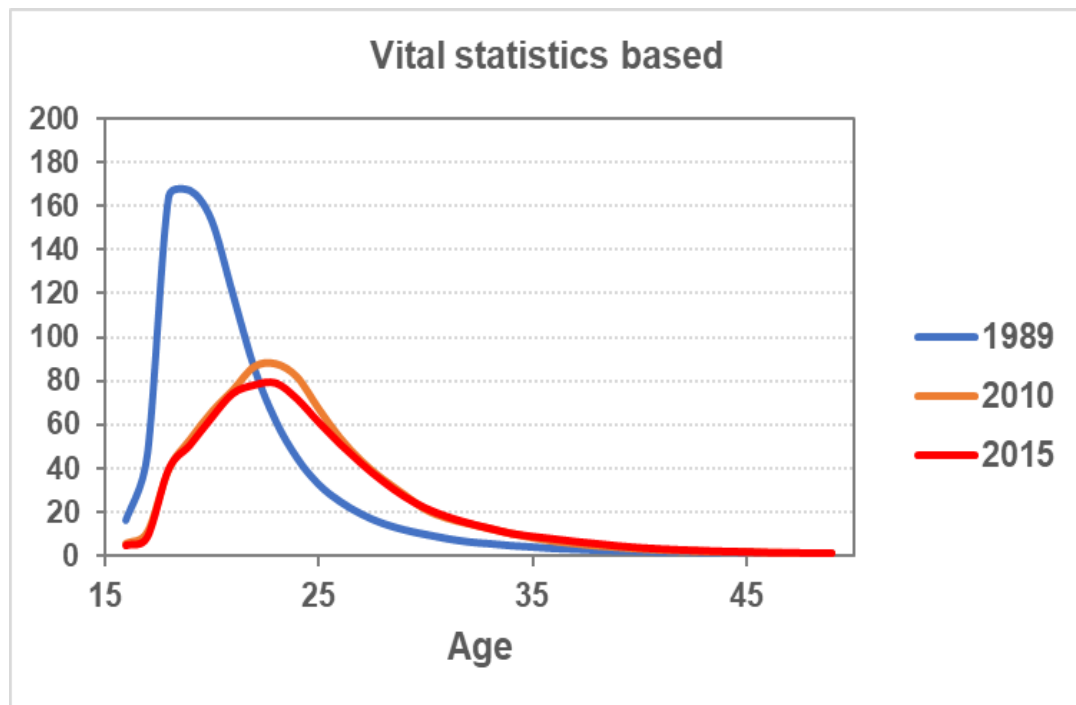
See: *Manual X. Indirect Techniques for Demographic Estimation*. United Nations. 1983. ST/ESA/SER.A/81, pp.225-229; *Patterns of First Marriage: Timing and Prevalence*. United Nations. 1990. ST/ESA/SER.R/111



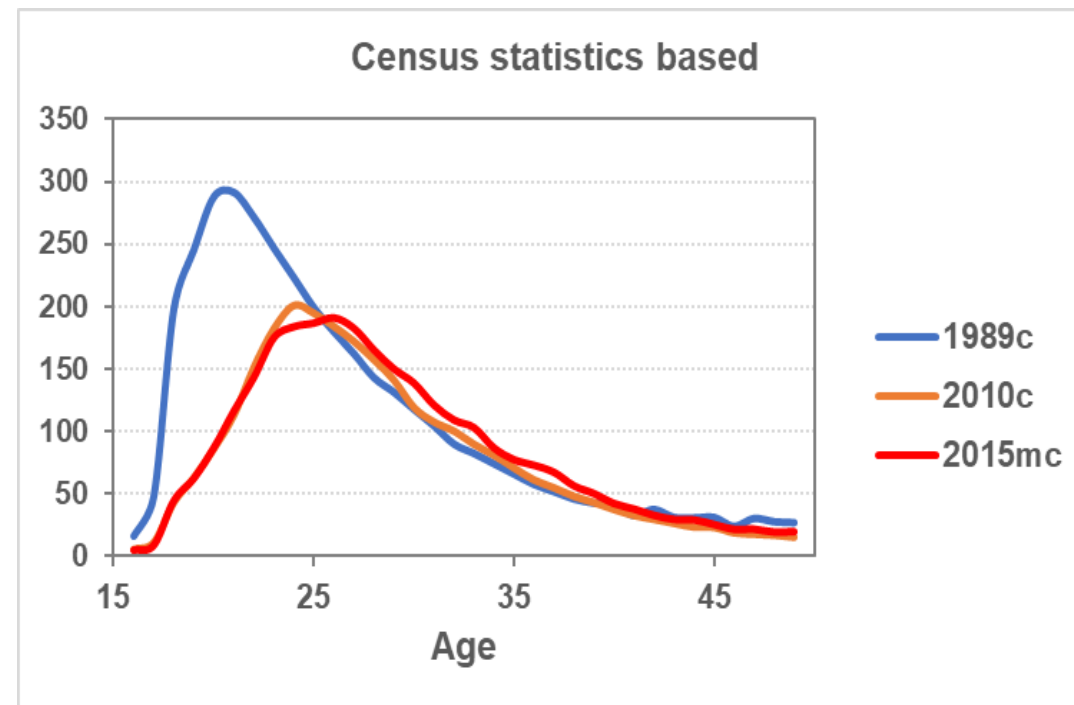
Census distribution of the population by sex, age, and marital status: basis for occurrence-exposure Rates

- The most common demographic indicators of the measurement of processes depending on the age of people are the so-called *Rates of the 2nd Kind (or unconditional rates or frequencies)*. They are the most often one can find in demographic and statistical reference books. When calculating them, the number of demographic events (marriages, births, deaths) is related with the number of persons of a given age in a given year. At the same time, not all representatives of this age can initiate the events under study. For example, only those women who have not given birth before can give birth to a child of the first order (nulliparous women), and only those who have never had the experience of marriage can enter into their first marriage (never-married people by exact age);
- Census data make it possible to use ***Rates of the 1st kind or occurrence-exposure rates (or conditional rates or intensities)***, which are calculated only for populations who are de facto at risk of a demographic event: the marriage rate for never married, the fertility rate for first children for childless women, etc. These rates are preferred to unconditional rates because they are in line with the principle of correspondence between the nominator and the denominator.

Age-specific first marriage rates of the 2nd kind (frequencies, left panel) and of the 1st kind (intensities, right panel): Russia, women, 1989, 2010, 2015



frequencies



intensities

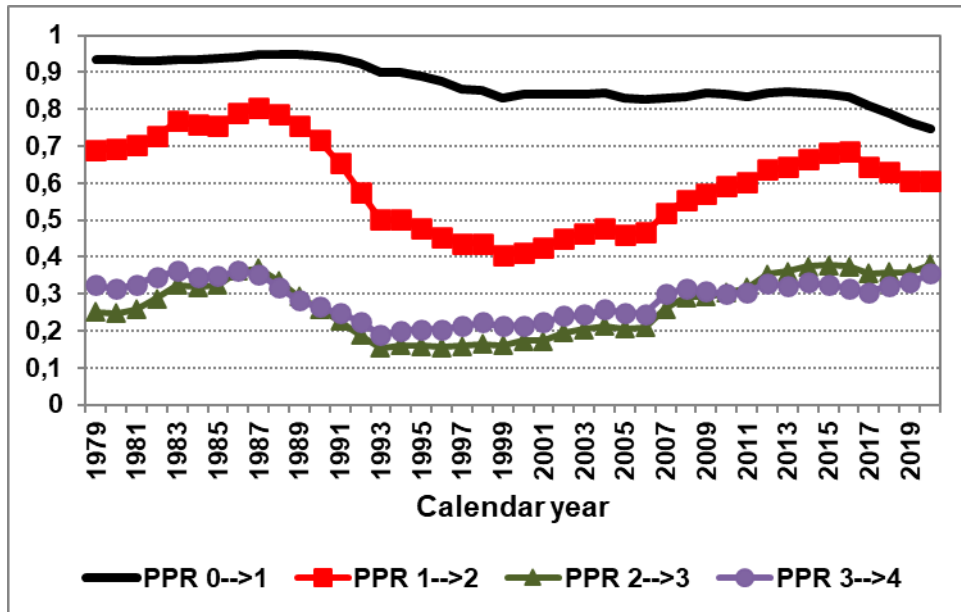
Census distribution of women by number of children ever born: Age- and Parity-specific Fertility Tables

- Conditional fertility rates which are further converted into probabilities serve as the major input for the construction of the period fertility tables. This approach was selected for the international **Human Fertility Database**, the most reliable set of comparable fertility data, because it allows us to at least partly account for the effects of mortality and migration on population exposure;
- For countries where age- and order-specific data on births are available for a short period only, population census are used to derive the initial age-parity distribution, which is then annually updated by cumulating fertility of cohorts over their childbearing age. The use of a “golden” census often makes it possible to construct the period fertility tables for an extended period of time prior to the year when the age-parity distribution for women aged 45 or older can be constructed entirely from the time series of cohort fertility rates by age and birth order.

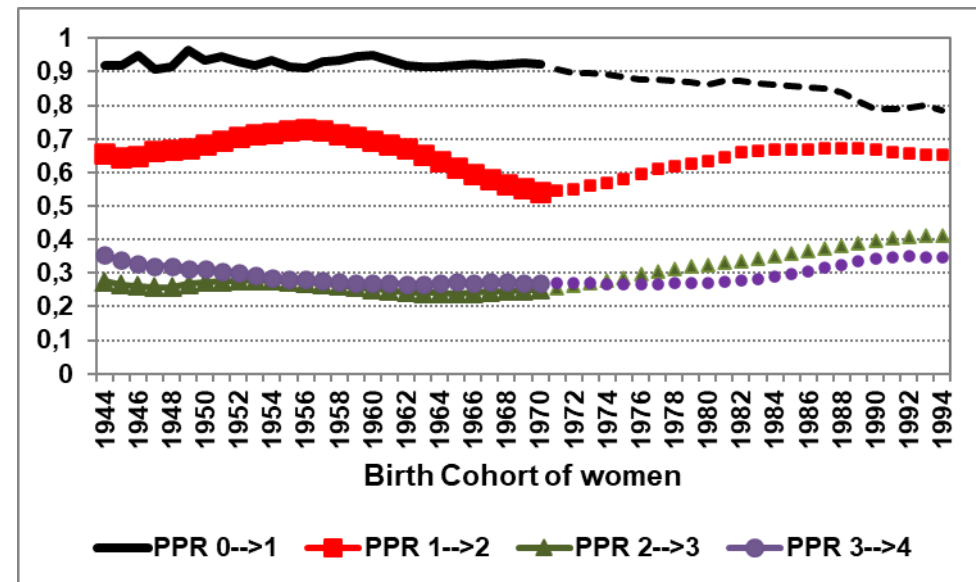
See: Jasilioniene A., Jdanov D.A., Sobotka T. et al. (2015). Methods Protocol for the Human Fertility Database. <https://www.humanfertility.org/Docs/methods.pdf>

Period (left panel) and Cohort (right panel) Fertility Tables by Age and Parity, Russia, women: Parity Progression Ratios by age of 50

Period tables

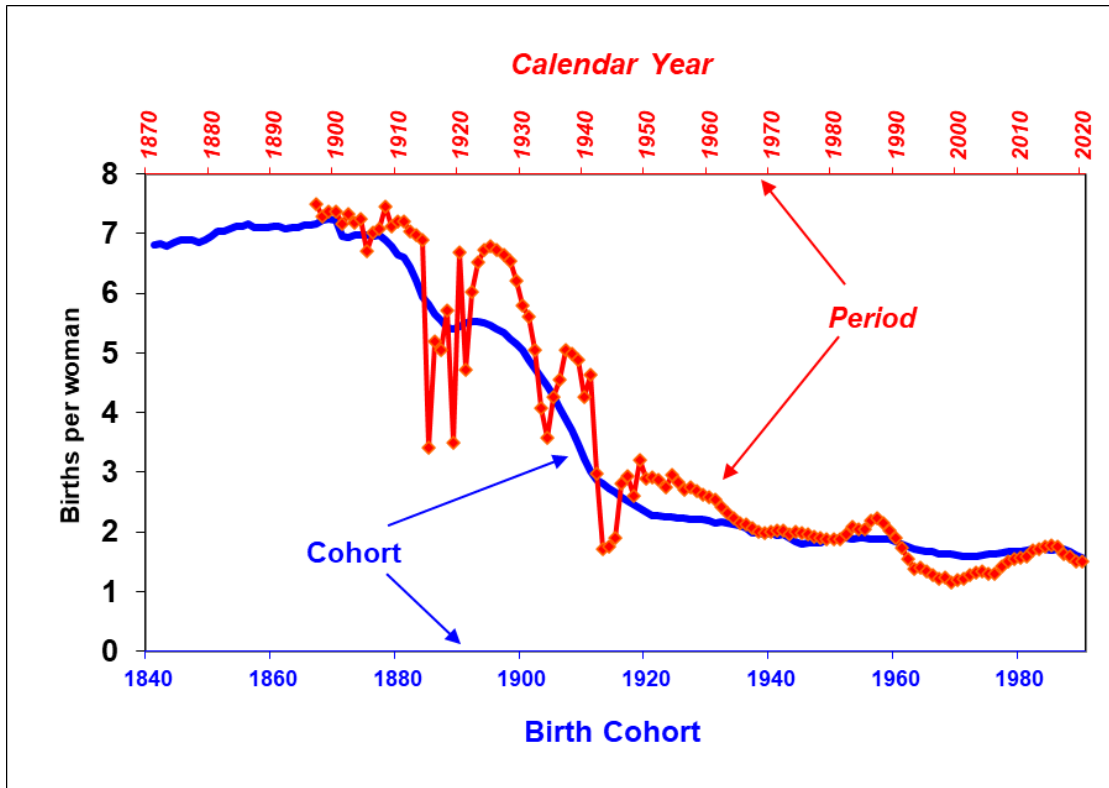


Cohort tables



Population census data are used!

Census data in historical studies of fertility change: Completed Cohort and Period Total Fertility During the Demographic Transition in Russia (average number of births to a woman by age 50): birth cohorts 1841-1990, period 1897-2020



Reconstruction of historical fertility dynamics would not be possible without the appropriate use of census data on the number of children ever born to women.

This is not only indicative for Russia, but also for most countries of the world, since the series of data obtained from their vital statistics are either not long enough, or have gaps, or are unreliable at some more or less long periods of history.

Source: Zakharov S.V. (2008). Russian Federation: From the first to second demographic transition. *Demographic Research*. Vol. 19, p.910 (<http://www.demographic-research.org/Volumes/Vol19/24/>). (Updated for 2020 data)

Thank you for your attention!