

# ABOUT MORTALITY DATA FOR CROATIA

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## GENERAL

Due to certain data issues regarding the previous time intervals (see section Data Quality issues for details), the Human Mortality Database (HMD) data series for Croatia begins in 2001 only. Therefore, most of the information included in this file refers to the post-2000 period. Population exposure data for the analysed time span are based on the official annual population estimates for the years 2000-2010 and the official post-censal estimates based on the 2011 census for the years since then.

The earliest evidence on population censuses in the present territory of Croatia dates back to the 14th century, when it was conducted in the city of Dubrovnik exclusively (Matko, 2005). This enumeration was undertaken for military purposes and the original data do no longer exist. The first modern census in Croatia was held in 1857 when the country was under the rule of the Habsburg Monarchy. Since then, 15 censuses have been conducted – five under Austro-Hungarian auspices (in 1869, 1880, 1890, 1900, and 1910), two in the so-called *First* or *Royal Yugoslavia* (in 1921 and 1931), six in the *Second* or *Socialist Yugoslavia* (in 1948, 1953, 1961, 1971, 1981, and 1991), and the last two in the twenty-first century (in 2001 and 2011), in what had become the Republic of Croatia.

The first Statistical Office of Croatia was founded in Zagreb in 1875. Today, the main organization responsible for the production and the dissemination of population statistics is the Croatian Bureau of Statistics (hereafter CBS), officially established in 1992. The CBS released the results of the 2001 and 2011 censuses in electronic format and many aggregate tables are available online (see <http://www.dzs.hr/>). The 1991 Census results were published in printed format, but detailed tabulations are also available electronically upon request. The data from the population censuses held in 1961, 1971, and 1981 are available at the CBS in Belgrade but they have not been digitally transcribed. This task requires extra work for a considerable fee. Data for all previous censuses were printed in periodical census books on various topics.

Although the data on births and deaths in Croatia had been recorded in parish registers for centuries, civil vital statistics registration in Croatia was established and reached full national coverage after the Second World War only.

Vital statistics data cover all persons who were born or who died in a particular calendar year and were listed in the birth and death registers. Since 1998, official statistics exclude the births and deaths of all those not considered as usual residents.

The quality and completeness of international migration statistics in Croatia depends on each resident's legal responsibility to register changes in his/her place of permanent residence. The CBS receives the data from the Ministry of the Interior

Affairs that has the legal authority for collecting the information. The statistical definition of an international migrant is based upon the concept of “usual residence”. According to this concept, an immigrant or an emigrant is a person who has crossed the national border with the intention of moving in (for the immigrants) or staying away (for the emigrants) for at least one year.

### **Sources of Data**

In Croatia, demographic data exist both in printed and electronic format. Most of the population and vital statistics count data currently included in the HMD were obtained directly from the CBS in electronic format<sup>1</sup>. The vital statistics data used in the HMD were purchased from the CBS. They originate from an unpublished electronic database of individual records of births and deaths maintained in the national statistical office since the mid-1980s.

The primary data sources on birth and death counts are birth and death registers maintained in registrar’s regional/local district offices. The data on live births are collected via the Statistical Report on Births (the DEM-1 form), while data on deaths are collected using the Statistical Report on Deaths (the DEM-2 form). Those statistical forms and reports gathered by registrars form the basis for birth and death statistics in Croatia.

Vital statistics tabulations are released annually in the so-called *First release publications* called *Vital statistics of the Republic of Croatia/Natural Change in Population in the Republic of Croatia*. They have been available online since 2000. Starting from 2009, a detailed yearly statistical report titled *Natural Change in Population* is available both in print and in electronic format (as online .pdf files). Data on migration statistics are also available online since 2002 in the *First release publications* titled *Migration of population in the Republic of Croatia*. Similarly, the online version of first releases *Population estimates of the Republic of Croatia* is available since 2007.

In most cases, published data are less detailed than those internally available at the CBS, especially in terms of age. For example, published data include population and vital events combined into age groups up to the open age category (usually 85 and older) while unpublished data are available by single years of age. The more detailed data are, however, available for purchase from the CBS. Detailed information on the data sources for each type of records in the HMD and corresponding notes are available from the reference and note files<sup>2</sup>.

### **TERRITORIAL COVERAGE**

Small territorial changes took place after the Second World War but not since 1998. The current HMD data series includes only data for the 21<sup>st</sup> century which are not affected by any territorial changes.

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<sup>1</sup> See <http://www.mortality.org/hmd/HRV/InputDB/HRVref.pdf> for details

<sup>2</sup> See <http://www.mortality.org/hmd/HRV/InputDB/HRVnote.pdf> and <http://www.mortality.org/hmd/HRV/InputDB/HRVref.pdf>

## **DEATH COUNT DATA**

### ***Coverage and Completeness***

In the period covered by the HMD, data on deaths are considered complete and of good quality. As stated in the *Vital Records Act* of Croatia, deaths must be registered within three days and death certificates must be established by medical doctors or other authorized persons. If a death occurs in a medical institution, the institution is responsible for its reporting. Otherwise, family members who lived with the deceased or other people/institutions related to the deceased must report the death and provide all required information to the vital statistics office. A specific procedure exists to report late registered deaths to the CBS. This procedure has a negligible impact on national mortality statistics since those events constitute a very small fraction of the overall death counts.

Until 1997, data on deaths were processed according to the deceased's permanent residence (including Croatian citizens living abroad). Since 1998, data on deaths have been based on the place of usual residence of the deceased, so as to follow a new definition of place of residence introduced with the 2001 census. The HMD data series includes data since 2001 and are not affected by changes in death registration. Nevertheless, death for period prior 2001 are published as part of the HMD Input database and users should take into account a possible inconsistency in early data.

Special tabulations of death counts by age and year of birth (Lexis triangles) and sex, for the 1983 – 2019 period have been obtained from the CBS<sup>3</sup>.

## **POPULATION COUNT DATA**

### ***Coverage and Completeness***

The "*place of usual residence*" concept was introduced for the first time in the 2001 Census. According to that concept, the official population count includes only people whose usual residence is in Croatia, that is either people currently living in Croatia or people living abroad with the intent of returning within a year of departure. However, this definition has been taken loosely as people living abroad but with close ties to Croatia (economically and socially) were also included in the total population as estimated at the time of the 2001 Census (CBS, 2012).

The 2011 Census used the "place of usual residence" concept, with an *intention to stay* question introduced as an additional criterion on whether to include a person in the total population (CBS, 2012). The 2011 Census included all persons whose usual place of residence on 31 March 2011 at midnight (census reference date) was in Croatia. The usual place of residence is based on where a person spends most of his/her time. However, the CBS does not have a good grasp about international migration patterns and is believed to severely under-estimate the number of

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<sup>3</sup> See <http://www.mortality.org/hmd/HRV/InputDB/HRVref.pdf> for details

Croatians living abroad, especially since 2013, when the country joined the European Union.

Although the CBS does not recognize it, official emigration numbers in Croatia are very likely to be significantly underestimated. This happens because many people leave the country without officially reporting their move despite the obligations to do so and they are still counted in the population total. Immigration data for Germany and other EU countries show that the underestimation of unregistered emigrants increased during the economic crisis, especially since 2013 when Croatia joined the EU. Unregistered emigrants are still considered as usual residents despite residing (or having an intention to stay) abroad for longer than a year. For more details see Data Quality Issues section. Consequently, population data are over-estimated and mortality estimates under-estimated to an extent that is difficult to quantify.

### ***Specific Details***

Unusually large fluctuations in the size of the young cohorts (children) observed over time are explained by rapid changes in fertility levels in the second half of the 1990s. The steadily declining population at ages 5-64 is explained by both the long-term process of fertility reduction and substantial out-migration recorded since the 1990s.

## **BIRTH COUNT DATA**

### ***Coverage and Completeness***

Data on births have been based on the usual resident population since 1998. Live births statistics are considered to be complete and of good quality. There is a 30 day deadline to register a birth.

Monthly statistical reports of registered births are submitted to the CBS within three days after the end of each month.

During the period currently covered by the HMD, Croatia has been using the World Health Organization definition of live births. A live-born child (*live birth*) is defined as a newborn exhibiting any sign of life at birth, whether breathing, beating of the heart, pulsation of the umbilical cord, or voluntary movements. If a child dies soon after birth, he/she is first registered as a live birth and then as a death. A stillborn child (*stillbirth*) is defined as a product of conception after complete expulsion or extraction from his/her mother, who showed no evidence of life, providing that the pregnancy lasted for at least 22 weeks and that the child weighted at least 500 grams. Note that up to the year 2000, the definition was very similar except for the cut off duration of gestation for a stillbirth which was set at 28 weeks.

Total births by month have been collected starting from 1950.

## **DATA QUALITY ISSUES**

### ***Data prior to 2001***

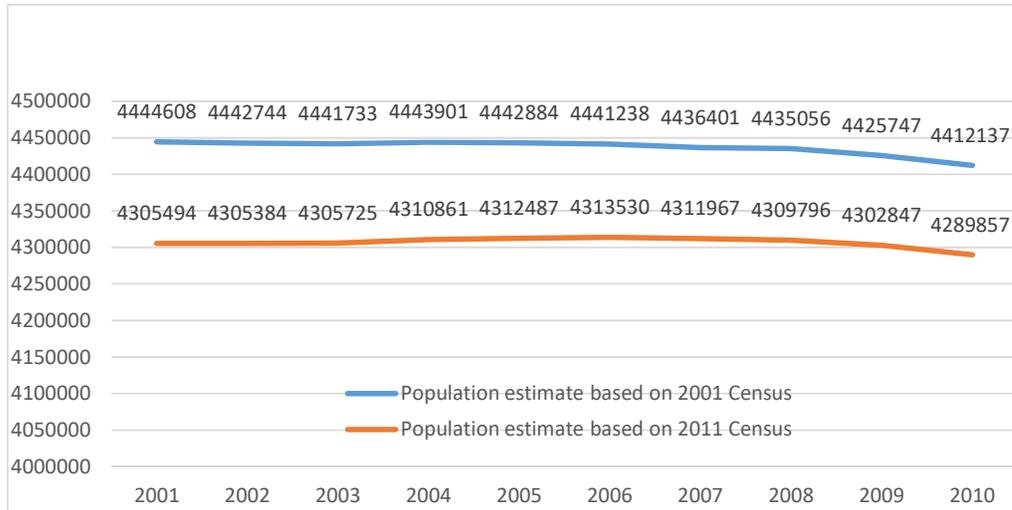
Data are available for the years before 2001 but we decided not to include them in the HMD series due to access, coverage and quality issues. In the 1990s, the CBS published total population estimates (all ages and both sexes combined). This was due, first of all, to the 1991-1995 war, with its several hundred thousands of refugees and internally displaced persons, and second to the incomplete territorial coverage of the official statistics during the period 1991-1997. Population estimates by age and sex have been published in Yugoslavian demographic yearbooks for the period before 1990 (all the way back to the 1950s) but they have not been revised after each decennial population census, and they would need to be thoroughly investigated before they can be used. The CBS did, however, update its population estimates by age and sex for the 1980s after the 1991 census data were released. These updated data are available upon request.

### ***Inconsistency between the 2001 and 2011 censuses***

Although the data for both censuses are based on the "usual place of residence" concept, they show inconsistencies. First of all, this is because the question on intention to stay was not included in the 2001 Census, and, second and more importantly, due to the fact that the 2001 Census included persons who had been living abroad for more than a year, but who returned on a regular basis to Croatia. By contrast, such persons have been excluded from the 2011 Census official population numbers.

Official inter-censal population estimates have been constructed by the CBS from the 2001 and 2011 censuses as well as from the inter-censal birth, death, and harmonized migration counts for 2001-2010 (CBS, 2013b). These revised population numbers are compatible with the post-censal population estimates for year 2012 and onwards, and they are used in the HMD to produce the population exposure data.

When these recent inter-censal estimates are compared with the previously released 2001 post-censal estimates, the difference in total population numbers is quite substantial (Figure 1).

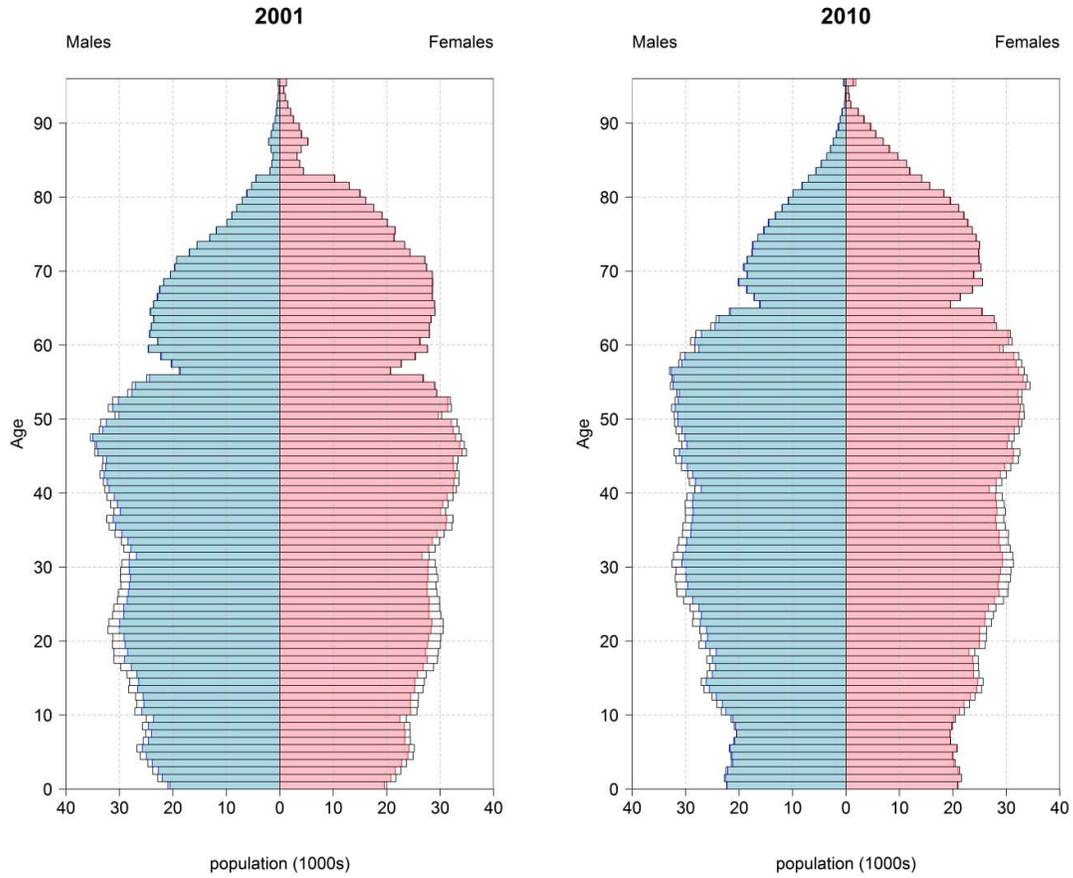


**Figure 1. Comparison of population estimates (31.12) based on the 2001 Census (i.e. post-censal estimates) with those based on the 2011 Census (i.e. inter-censal estimates), Croatia, 2001 – 2010, all ages and both sexes combined**

Source: CBS (2013b)

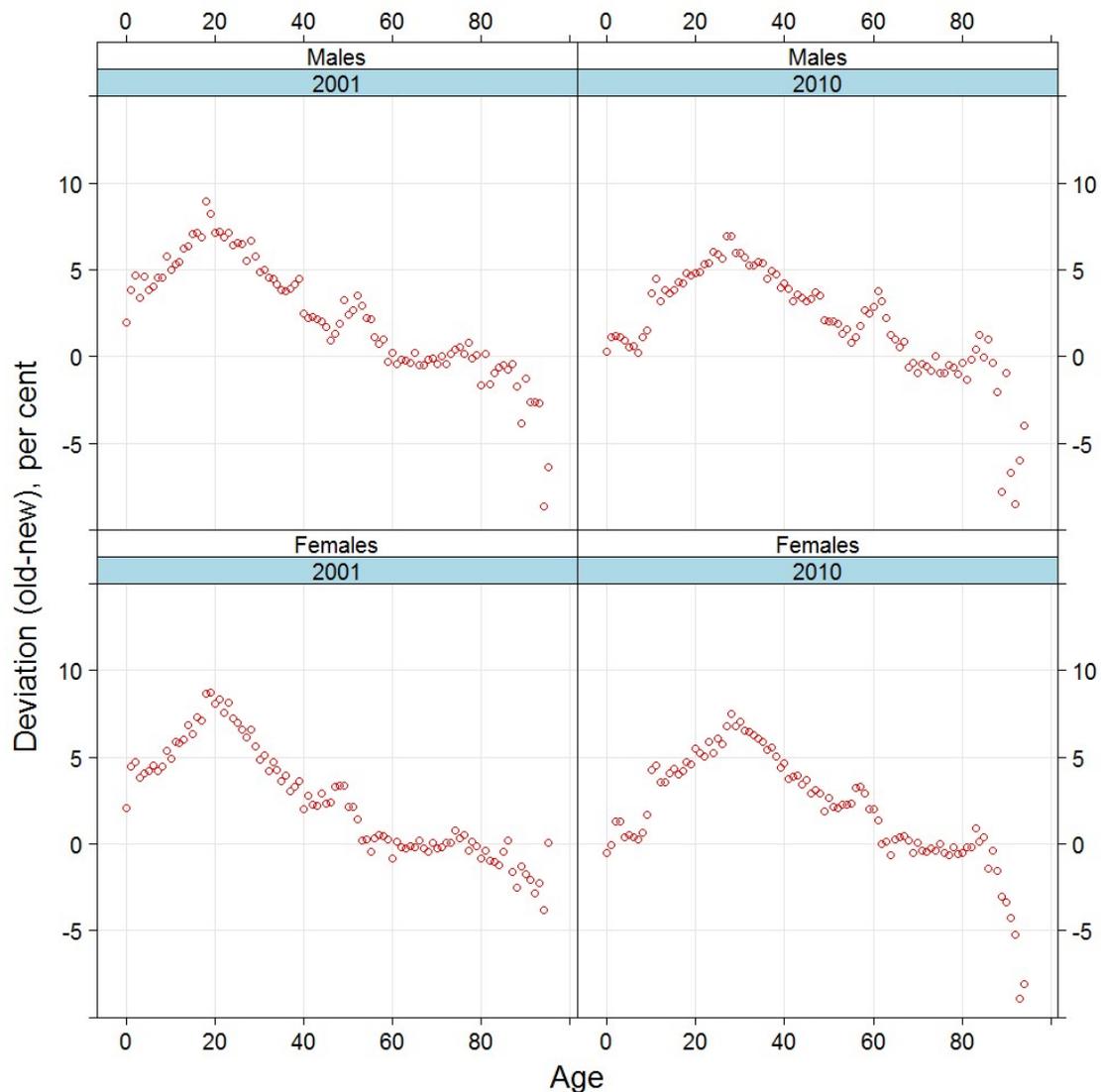
As can be seen from Figure 2, the adjustment mostly affected young adults, that is those with the highest rates of geographic mobility (up to age 30). Correction of the 2001 Census data affected males and females equally, and resulted in the difference between the adjusted and unadjusted population estimates for the whole inter-censal period 2001–2010. One could expect that this difference would increase notably by 2010 as a result of under-reported emigration which normally accumulates with time. However, it did not happen in Croatia as the gap did not increase much but shifted towards older ages (right-hand panel of Figure 2).

The observed relative deviations (in per cent) between the unadjusted and adjusted population estimates (Figure 3) are not unusual. They do exist in many EU countries. They are the result of intense unobserved migration flows which are not known in real time but can only be deduced from a cohort comparison of two successive census population distribution, accounting for the births and deaths in the intervening interval.



**Figure 2. Comparison of population estimates (31.12) based on the 2001 Census (transparent) with those based on the 2011 Census (filled) , Croatia, 2001 and 2010**

Source: As for Figure (1)



**Figure 3. Deviations between population estimates (31.12) based on the 2001 Census (unadjusted) with those based on the 2011 Census (adjusted); Croatia, 2001 and 2010, per cent**

Source: As for Figure (1)

## **REVISION NOTES**

### ***Changes with the December 2017 revision:***

**Life tables:** All life tables have been recalculated using a modified methods protocol. The revised protocol (Version 6) includes two changes: 1) a more precise way to calculate  $a_0$ , the mean age at death for children dying during the first year of life and 2) the use of birth-by-month data (where and when available) to more accurately estimate population exposures. These changes have been implemented simultaneously for ALL HMD series/countries. For more details about these changes, see the revised Methods Protocol (at <http://v6.mortality.org/Public/Docs/MethodsProtocol.pdf>), particularly section 7.1 on Period life tables and section 6 and Appendix E, on death rates. The life

tables calculated under the prior methods (Version 5) remain available at [v5.mortality.org](http://v5.mortality.org) but will not be further updated in the future.

***Changes with the March 2020 revision:***

Population estimates for 2000 adjusted for the results of the 2001 Census have been added. As a result, this update added one year (2001) to the HMD mortality series for Croatia.

**ACKNOWLEDGEMENTS**

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## APPENDIX 1: DESCRIPTION OF ORIGINAL DATA USED FOR HMD CALCULATIONS

### DEATHS

Period	Type of Data	Age grouping	Comments	RefCode(s)
2001–2020	Annual counts of deaths by sex, age and birth cohort (Lexis triangles)	0, 1, 2, ..., maximum age, unknown age		2, 5, 9, 13, 20, 22

### POPULATION

Period	Type of Data	Age grouping	Comments	RefCode(s)
2000–2010	Revised intercensal population estimates by age and sex (as of December 31st)	0, 1, 2, ..., 100+, unknown age	Usual resident population. Definition of usual residence has been adjusted with one which was applied in 2011 Census. Also, migration data have been harmonized with the EU standards	3 14
2011–2020	Annual post-censal population estimates by age and sex (as of December 31st)	0, 1, 2, ..., 100+	Usual resident population following the 2011 Census.	4 6 10 15 21 24

### BIRTHS BY SEX

Period	Type of Data	Age grouping	Comments	RefCode(s)
2001–2020	Annual counts of live births by sex			1, 7, 11, 16, 18, 25

### BIRTHS BY MONTH

**Type of data:** Annual live birth counts by month

**Period covered:** 1950–2020

**RefCode(s):** 8, 12, 17, 19, 23