

# **The mortality of the Polish population according to the cause of death in the first half of 2021 compared with the situation in 2017-2019 and 2020**

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## **The mortality of the Polish population according to the cause of death in the first half of 2021 compared with the situation in 2017-2019 and 2020**

The COVID-19 pandemic caused a significant increase in the mortality of the Polish population. In 2020, the recorded number of deaths was 12.7% higher than what could be expected based on the mortality in the 2017-2019 period (95% CI 12.4-13.0%), which means an absolute excess of 53.9 thousand deaths<sup>1</sup>. Obviously, this excess of deaths was mostly due to deaths from COVID-19 (76.9% of excess deaths), but the remaining increase in mortality was due to deaths from other causes (including: ill-defined causes 38.4% of excess non-COVID-19 deaths, endocrine disorders 17.9%, cardiovascular diseases 13.7%, digestive tract diseases and nervous system diseases 7.3% and 7.2%, respectively)<sup>2</sup>. Analysing the relative difference in the observed and expected number of deaths for each of the major disease groups, we found that the highest increase (by 29%) was recorded for endocrine disorders, followed by genitourinary system diseases (by 19%) and nervous system diseases (by 17%). In total, the observed excess deaths versus expected deaths from all causes other than COVID-19 was 2.9%.

On 31 January this year, Statistics Poland published a news release entitled “Mortality in the first half of 2021. Deaths according to cause – preliminary data<sup>3</sup>.” According to these data, 270,662 people died in H1 2021, including 56,897 due to COVID-19 (U07). The published data allow us to ask how large an excess of deaths we are still facing, to what extent COVID-19 and to what extent other diseases are responsible for the excess of deaths in H1 2021, and for which groups of diseases that were the underlying cause of death the observed number of deaths differed the most from the number of deaths that could be expected. It is also important to answer the question of whether the excess mortality observed in 2020 for most disease groups is continuing, decreasing or perhaps increasing.

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<sup>1</sup> Naturally, the magnitude of this excess varies depending on the reference period and estimation method. For example, for 2019, it is 14.5%, or 60,400 deaths, while according to other prediction models we have used, the excess of deaths in 2020 over the expected number based on a ten-year course of weekly deaths to date ranges from 70,000 to 75,000.

<sup>2</sup> Percentages refer to the sum of excess deaths and not aggregate excess value that also takes into account death “deficits”.

<sup>3</sup> <https://stat.gov.pl/obszary-tematyczne/ludnosc/statystyka-przyczyn-zgonow/umieralnosc-w-pierwszym-polroczu-2021-roku-zgony-wedlug-przyczyn-dane-wstepne,10,2.html>

In order to answer these questions, we calculated the expected number of deaths in H1 2021 based on mortality in 5-year age groups in the first half of the years 2017-2019 and the population at those age groups on 31 June 2021, and subsequently calculated the percentage difference between the observed and expected values for the total population (Table 1), for men and women (Tables 2 and 3) as well as for residents of urban- and rural areas (Tables. 4 and 5). We compared the excess calculated this way for the total population with the excess of deaths calculated the same way for the entire year 2020 and its first and second halves (Figure 1). These excess values were estimated based on mortality in the corresponding periods of 2017-2019.

Calculations of the expected number of deaths were carried out according to the following formula:

$$O^R = \sum_{w=1}^{18} \frac{d_w}{l_w} L_w,$$

where

$O^R$  – expected number of deaths in the period R, where R – H1 2020, H2 2020, entire year 2020 or H1 2021,

W = 1,...,18 age group index: 0-4, 5-9,...,85+,

$d_w$ – number of deaths among people in the age group “w” in 2017-2019 (either the whole period or half-years),

$l_w$ – total population in the age group “w” in 2017-2019 (30 June),

$L_w$ – population in the age group “w” on either 30 June 2020 or 30 June 2021.

Thus, the expected number of deaths can be interpreted as the number of deaths that would be expected if the mortality in H1 2021 as well as H1 and H2 and the whole of 2020, respectively, in the five-year age groups, were the same as in the corresponding periods of 2017-2019, with the actual age structure of the population from 2021 and 2020, respectively. **The excess of deaths calculated this way indicates in a somewhat simplified manner which group of patients suffering from a given group of diseases was most affected by the pandemic as expressed in increased mortality.**

The number of deaths among the total Polish population due to all causes in H1 2021 was 23.9% higher than would be expected based on the mortality in H1 2017-2019. On the other hand, as indicated by data presented in Table 1, the number of deaths from all causes excluding COVID-19 in H1 2021 was 2.2% lower than expected, while in the entire 2020 it

was 2.9% higher. An analogous situation applies to total men and women as well as residents of urban and rural areas (Tables 2-5). This lower-than-expected number of deaths does not, unfortunately, mean that if there were no deaths attributed to COVID-19, the mortality of the Polish population would be lower than expected. This is due to the fact that some of those who died from COVID-19 could have died due to causes currently defined as comorbidities, such as cancer or other chronic diseases, e.g. diabetes or COPD.

Considering the excess of deaths according to main disease groups, it can be concluded that, in relative terms, mortality caused by blood diseases and immunological mechanisms increased the most (in total by 118%, but with a relatively small number of deaths, the observed value of which was 319, while the expected – 146), as well as due to infectious and parasitic diseases (in total by 72%) (Table 1). Unfortunately, the lack of detailed data for 2021 does not allow us to determine which specific diseases are responsible for this excess.

Deaths due to mental and behavioural disorders exceeded the number expected in the first half of 2021 by almost 30%. Note the very large excess of deaths among women (by 60%) (Table 3), while the excess of deaths in rural area (44%) is twice as big as in urban area (22%) (Tables 4 and 5). Data from 2020 and previous years show that in this group of diseases, alcohol-related mental disorders are the cause of nearly 90% of deaths. It is therefore very likely that the COVID-19 pandemic leads to increased alcohol consumption or changed drinking patterns resulting in an increased risk of death, although the potential impact of reduced access to therapies and treatment cannot be omitted.

Deaths caused by endocrine, nutritional and metabolic disorders (E00-E90) exceeded the number expected in the first half of 2021 by 16.2%, while deaths from digestive tract diseases (K00-K93) by 11.6% (Table 1). Note that the excess mortality due to both groups of diseases was significantly higher in rural than urban areas (Tables 4 and 5). Data from 2020 and earlier years show that more than 90% of deaths from diseases in the E00-E90 group are deaths caused by diabetes, while in the case of digestive tract diseases, chronic liver disease (K70, K73, K74), which is largely caused by alcohol consumption, is responsible for more than 40% of deaths.

Figure 1 compares the excess number of deaths for the main disease groups in the first half of 2021 with the excess in the entire 2020 and its first and second halves. For greater clarity, the graph does not include blood diseases, immune mechanisms and infectious diseases, for which the excess number of deaths in 2021 was much higher than for the other disease groups. For the former disease group, it increased from -9.3% in 2020 to 119.0%, while for the latter from -10.9% to 72.2%.

For 4 disease groups, the excess of deaths in H1 2021 was higher than in 2020, with the excess of deaths in 2021 for cardiovascular diseases already significantly lower than in the second half of 2020. For 6 disease groups, the excess decreased or there was even a “deficit” of deaths (there were fewer deaths than expected).

The excess mortality caused by mental disorders increased considerably in 2021, which, bearing in mind the definite share of deaths arising from mental disorders caused by alcohol use, may indicate a **gradual increase** in health problems related to alcohol consumption. Also, the same factor may have contributed to the increased excess of deaths due to digestive system diseases, but in the case of this group of diseases, no further increase in excess mortality is observed compared to what it was in the second half of 2020.

What undoubtedly deserves attention is the lower than might be expected number of deaths from cancer throughout the entire 2020 and the first half of 2021 and respiratory diseases in the first half of 2021. This may be caused by the fact that deaths of people who suffered from these diseases and contracted COVID-19 were attributed to the latter disease, which is consistent with the recommendations for coding the cause of death. Further analyses will focus on explaining this phenomenon using additional data sources. This will require checking the medical histories of deceased individuals who had COVID-19 written as the initial cause of death.

Yet another important problem needs to be noted, the identification of which is made possible thanks to data published by Statistics Poland on causes of death in 2020 and 2021. According to information contained in death reports verified by coders, 41,451 people died due to COVID-19 in 2020, while according to on-going death reports – 26,518 deaths from COVID-19 were reported in 2020, i.e. 18,933 (42%) fewer deaths. In the first half of 2021, according to Statistics Poland, 56,897 people died from COVID-19, while according to on-going reports up to and including week 26 – approximately 46,000, i.e. 19% less. Thus, we are currently dealing with a large underestimation of COVID-19 mortality in on-going reports. This situation clearly shows that an accurate assessment of the impact of the pandemic on mortality in the Polish population in 2021 will only be possible after Statistics Poland prepares the final set of data on deaths in 2021, most probably at the end of 2022.

Table 1. Estimates of the age-standardized excess of deaths in H1 2021 compared to the first half of the years 2017-2019 according to the underlying cause of death (authors' calculations based on preliminary data from Statistics Poland) – **TOTAL POPULATION**

Cause of death	Observed deaths 2021 (O)	Expected deaths 2017-2019 (E)	O-E absolute excess	(O/E-1)*100 excess %
1	2	3	4	7
<b>Total non-COVID-19</b>	<b>213765</b>	<b>218472</b>	<b>-4707</b>	-2.2%
<b>of which:</b>				
Infectious and parasitic diseases (A00-B99)	1755	1019	736	72.2%
Neoplasms (C00-D48)	47082	55936	-8854	-15.8%
Blood diseases and immune mechanism disorders (D50-D89)	319	146	173	118.5%
Endocrine and metabolic diseases (E00-E89)	6108	5258	850	16.2%
Mental and behavioural disorders (F00-F99)	2445	1893	552	29.2%
Diseases of the nervous system (G00-G98)	3741	3467	274	7.9%
Diseases of the circulatory system (I00-I99)	92751	90883	1868	2.1%
Diseases of the respiratory system (J00-J99)	13584	16312	-2728	-16.7%
Diseases of the digestive system (K00-K93)	9689	8684	1005	11.6%
Diseases of the genitourinary system (N00-N99)	2529	2299	230	10.0%
Symptoms, signs and abnormal clinical findings (R00-R99)	20713	21568	-855	-4.0%
External causes of mortality (V01-Y98)	10383	9671	712	7.4%
Not yet determined	26			

Table 2. Estimates of the age-standardized excess of deaths in H1 2021 compared to the first half of the years 2017-2019 according to the underlying cause of death (authors' calculations based on preliminary data from Statistics Poland)

– MEN

Cause of death	Observed deaths 2021 (O)	Expected deaths 2017-2019 (E)	O-E absolute excess	(O/E-1)*100 excess %
1	2	3	4	7
<b>Total non-COVID-19</b>	<b>110038</b>	<b>112008</b>	<b>-1970</b>	<b>-1.8%</b>
<b>of which:</b>				
Infectious and parasitic diseases (A00-B99)	913	560	353	63.0%
Neoplasms (C00-D48)	25353	30638	-5285	-17.2%
Blood diseases and immune mechanism disorders (D50-D89)	160	69	91	131.9%
Endocrine and metabolic diseases (E00-E89)	2760	2316	444	19.2%
Mental and behavioural disorders (F00-F99)	1758	1467	291	19.8%
Diseases of the nervous system (G00-G98)	1657	1547	110	7.1%
Diseases of the circulatory system (I00-I99)	43002	41533	1469	3.5%
Diseases of the respiratory system (J00-J99)	7609	8852	-1243	-14.0%
Diseases of the digestive system (K00-K93)	5581	4995	586	11.7%
Diseases of the genitourinary system (N00-N99)	1105	1034	71	6.9%
Symptoms, signs and abnormal clinical findings (R00-R99)	11306	11250	56	0.5%
External causes of mortality (V01- Y98)	7426	7127	299	4.2%
Not yet determined	17			

Table 3. Estimates of the age-standardized excess of deaths in H1 2021 compared to the first half of the years 2017-2019 according to the underlying cause of death (authors' calculations based on preliminary data from Statistics Poland)  
– **WOMEN**

Cause of death	Observed deaths 2021 (O)	Expected deaths 2017-2019 (E)	O-E absolute excess	(O/E-1)*100 excess %
1	2	3	4	7
<b>Total non-COVID-19</b>	<b>103727</b>	<b>106696</b>	<b>-2969</b>	<b>-2.8%</b>
<b>of which:</b>				
Infectious and parasitic diseases (A00-B99)	842	460	382	83.0%
Neoplasms (C00-D48)	21729	25371	-3642	-14.4%
Blood diseases and immune mechanism disorders (D50-D89)	159	76	83	109.2%
Endocrine and metabolic diseases (E00-E89)	3348	2945	403	13.7%
Mental and behavioural disorders (F00-F99)	687	430	257	59.8%
Diseases of the nervous system (G00-G98)	2084	1921	163	8.5%
Diseases of the circulatory system (I00-I99)	49749	49436	313	0.6%
Diseases of the respiratory system (J00-J99)	5975	7483	-1508	-20.2%
Diseases of the digestive system (K00-K93)	4108	3697	411	11.1%
Diseases of the genitourinary system (N00-N99)	1424	1266	158	12.5%
Symptoms, signs and abnormal clinical findings (R00-R99)	9407	10339	-932	-9.0%
External causes of mortality (V01- Y98)	2957	2557	400	15.6%
Not yet determined	9			



Table 4. Estimates of the age-standardized excess of deaths in H1 2021 compared to the first half of the years 2017-2019 according to the underlying cause of death (authors' calculations based on preliminary data from Statistics Poland)  
– URBAN AREA

Cause of death	Observed deaths 2021 (O)	Expected deaths 2017-2019 (E)	O-E absolute excess	(O/E-1)*100 excess %
1	2	3	4	7
<b>Total non-COVID-19</b>	<b>131639</b>	<b>132821</b>	<b>-1182</b>	<b>-0.9%</b>
<b>of which:</b>				
Infectious and parasitic diseases (A00-B99)	1208	629	579	92.1%
Neoplasms (C00-D48)	30261	36022	-5761	-16.0%
Blood diseases and immune mechanism disorders (D50-D89)	183	79	104	131.6%
Endocrine and metabolic diseases (E00-E89)	3684	3318	366	11.0%
Mental and behavioural disorders (F00-F99)	1369	1121	248	22.1%
Diseases of the nervous system (G00-G98)	2470	2319	151	6.5%
Diseases of the circulatory system (I00-I99)	56012	52269	3743	7.2%
Diseases of the respiratory system (J00-J99)	8694	9979	-1285	-12.9%
Diseases of the digestive system (K00-K93)	6340	5935	405	6.8%
Diseases of the genitourinary system (N00-N99)	1609	1605	4	0.2%
Symptoms, signs and abnormal clinical findings (R00-R99)	12200	13261	-1061	-8.0%
External causes of mortality (V01- Y98)	5969	5488	481	8.8%
Not yet determined	13			

Table 5. Estimates of the age-standardized excess of deaths in H1 2021 compared to the first half of the years 2017-2019 according to the underlying cause of death (authors' calculations based on preliminary data from Statistics Poland)

– RURAL AREA

Cause of death	Observed deaths 2021 (O)	Expected deaths 2017-2019 (E)	O-E absolute excess	(O/E-1)*100 excess %
1	2	3	4	7
<b>Total non-COVID-19</b>	<b>82126</b>	<b>82802</b>	<b>-676</b>	<b>-0.8%</b>
<b>of which:</b>				
Infectious and parasitic diseases (A00-B99)	547	309	238	77.0%
Neoplasms (C00-D48)	16821	19494	-2673	-13.7%
Blood diseases and immune mechanism disorders (D50-D89)	136	54	82	151.9%
Endocrine and metabolic diseases (E00-E89)	2424	2012	412	20.5%
Mental and behavioural disorders (F00-F99)	1076	746	330	44.2%
Diseases of the nervous system (G00-G98)	1271	1105	166	15.0%
Diseases of the circulatory system (I00-I99)	36739	36023	716	2.0%
Diseases of the respiratory system (J00-J99)	4890	6008	-1118	-18.6%
Diseases of the digestive system (K00-K93)	3349	2888	461	16.0%
Diseases of the genitourinary system (N00-N99)	920	756	164	21.7%
Symptoms, signs and abnormal clinical findings (R00-R99)	8513	8562	-49	-0.6%
External causes of mortality (V01- Y98)	4414	4306	108	2.5%
Not yet determined	13			

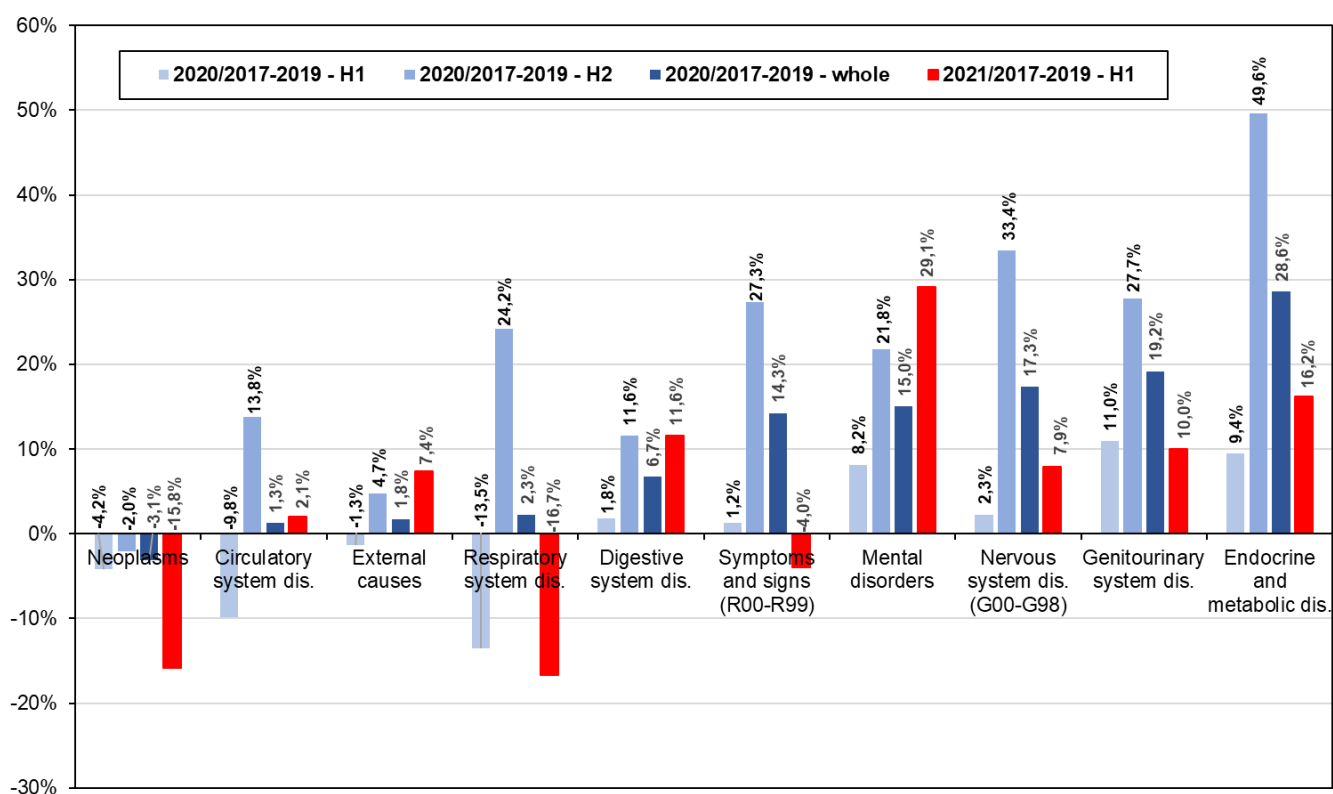


Figure 1. Percentage excess of the observed number of deaths in 2020 (the first and second half of the year) and in the first half of 2021 over the number expected based on mortality in the corresponding periods of the years 2017-2019 according to main groups of causes (authors' calculations based on data from Statistics Poland)