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Short Term Regional and Age-Specific Disparities in Suicide Epidemiology in Poland

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SUMMARY

Introduction: Despite declining trends in the first two decades of the 21st century, Poland remains a country with relatively high suicide rates. Developing national suicide prevention programmes starts from analysing trends in suicide rates and identifying high risk groups. The aim of this study was to examine suicide epidemiology trends in Poland with a specific focus on age groups and regional differences.
Method: This epidemiological analysis examined suicide statistics from 2017 to 2022. We calculated and analysed standardised suicide rates (SDR) across different age groups and regions in Poland using data acquired from Police Headquarters statistics. Percentage changes for the whole study period were determined. Official data on the Polish population was obtained from the Central Statistical Office.
Results: Throughout the analysed period, SDR calculated for all ages remained stable, declining by only 2% from 2017 to 2022. The highest SDR were noted in the 55-59 and 60-64 age groups (19,4 and 19,1 per 100 000, respectively, in 2022). Between age groups, notable disparities in trends of changes of SDR values were observed. The greatest increases of 21.6% and 19.6% were noted in the youngest (13-18) and eldest (85+) age groups, respectively. The largest regional increase by 14.4% concerned the Warmian-Masurian region, followed by the Opolskie region by 13.51%. Both regions have some of the lowest GDP values among Polish regions.
Conclusion: In Poland suicide rates have increased significantly among adolescents, the eldest and those living in economically disadvantaged regions. The obtained results highlight the need for implementing tailored preventative programmes.

Keywords: Suicide trends; High-risk age groups; Regional variations; Poland; Prevention programs.

INTRODUCTION

Suicide is a major public health concern worldwide. According to the World Health Organisation (WHO), nearly 800,000 people die by suicide each year, and it is the second leading cause of death among 15-29-year olds globally. Suicide rates vary across countries and regions, with the highest rates generally observed in low- and middle-income countries. Risk factors for suicide include mental illness, substance abuse, social isolation, and access to lethal means. Prevention efforts include improving access to mental health care, reducing stigma surrounding mental illness, and implementing policies to restrict access to means of suicide.

Despite declining trends in suicide rates in the first two decades of the 21st century, Poland continues to have a high suicide death rate [1]. According to data from the World Health Organisation, the suicide rate in Poland was around 11.3 per 100,000 population in 2019. This is higher than the average suicide rate in Europe, which is around 10.5 per 100,000 population [2]. Among Poles aged 30-34 suicide is the leading cause of death and among adolescents, suicide is the second leading cause of death, preceded only by road injuries [3]. In Poland, the suicide mortality pattern by age groups resembles that of less developed countries where suicides are more prevalent among individuals of working age rather than late old age [4]. There is also a significant disparity in the standardised

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death rate between male and females, with males experiencing a rate seven times higher than that of females, whilst globally it is approximately 2.3 times higher. Roughly 90% of male suicides and 80% of female suicides are carried out by the means of hanging [1,5]. This study aims to explore changes in suicide epidemiology during the 2017-2022 period in Poland, with a specific focus on age and regional disparities. By the analysis of recent suicide trends, we hope to distinguish high risk populations and therefore aid national health authorities in the development of tailored suicide prevention programmes.

METHODS

Figures on suicidal behaviour reported by the Polish Police were obtained for the study. These data are publicly available through the National Police Headquarters website (http://bip.kgp.policja.gov.pl/). The figures for suicide deaths and suicidal behaviour (deaths + attempts) are presented separately and sorted by region, age group, etc.

Poland consists of 16 administrative regions (provinces). Suicide data is collected by 17 regional police headquarters. Warsaw, the capital, has its own separate police headquarter, thus Warsaw statistics were included in this study in the Mazovia province (to which Warsaw administratively belongs).

Since 2017, the Polish Police has significantly changed its data collection methodology, so the period 2017-2022 was selected for analysis. For the purposes of this study, we used data only on suicide deaths by region and age group. For clarity of presentation of results, only those aged 13+ were included. Only isolated cases of suicide were recorded in those younger than 13.

Data on the numbers of Poland's population by age group and region were obtained from the Central Statistical Office. Through the website (https://bdl.stat.gov.pl/bdl/start), anyone can get a glimpse of the official demographic data.

In our study, we employed an age-specific standardisation method to analyse suicide mortality trends across different regions and age groups within Poland. Specifically, the number of suicides recorded in each age group was standardised against the population size of the same age group within the respective region or the entire country, as provided by the Central Statistical Office of Poland (GUS). This approach involved calculating age-specific suicide rates by dividing the total number of suicides in each age group by the total population of that age group in the same region. Suicide death rates (SDR) were reported as standardised numbers per 100,000 people in our study (age-standardised suicide rates). Epidemiological standardisation indicators are measures that are used to adjust for differences in population characteristics when comparing health outcomes across different groups or time periods. The standardisation process involves applying a mathematical formula to adjust for the differences in the distribution of the standardisation indicator (e.g. age, or region) between populations or time periods. This adjustment allows for more accurate comparisons of health outcomes and disease rates, and can help identify differences in health disparities across populations. This standardisation is consistent with the official reporting of suicide by the World Health Organisation.

We utilized a linear regression model to define the trend line, which is mathematically represented by the equation $y=mx+b$. This model was chosen to identify and illustrate linear trends over time in the suicide data across different age groups. The m is the slope of the line and b is the intercept. The x and y represent the distance of the line from the x-axis and y-axis, respectively.

Finally, the study presents the SDR for each age group and region of Poland from 2017 to 2022 and calculates percentage changes in the SDR.

RESULTS

Across the study period, an overall decrease in suicide death rates by 1.7% was observed in the studied population (from 15.83 per 100 000 in 2017 to 15.55 per 100 000 in 2022). The greatest suicide mortality rates were seen in the 55-59 and 60-64 age groups (19.38 and 19.07 per 100 000 in 2022, respectively) while the 13-18 age group had the lowest (6.41 per 100 000 in 2022).

Rates for the 55-59 age group were consistently high; however, a significant fall from 23.04 per 100 000 in 2017 to 19.38 per 100 000 in 2022 was observed. In this age group suicide mortality fell regularly between 2017 and 2020, then rose briefly in 2021 before dropping again in 2022. This overall decrease by 15.9% was the greatest among all ages. Declining rates were also observed among Poles aged 40 or older excluding the 75-79 and 85+ population.

The largest increases in suicide mortality rates concerned the youngest and eldest age groups.

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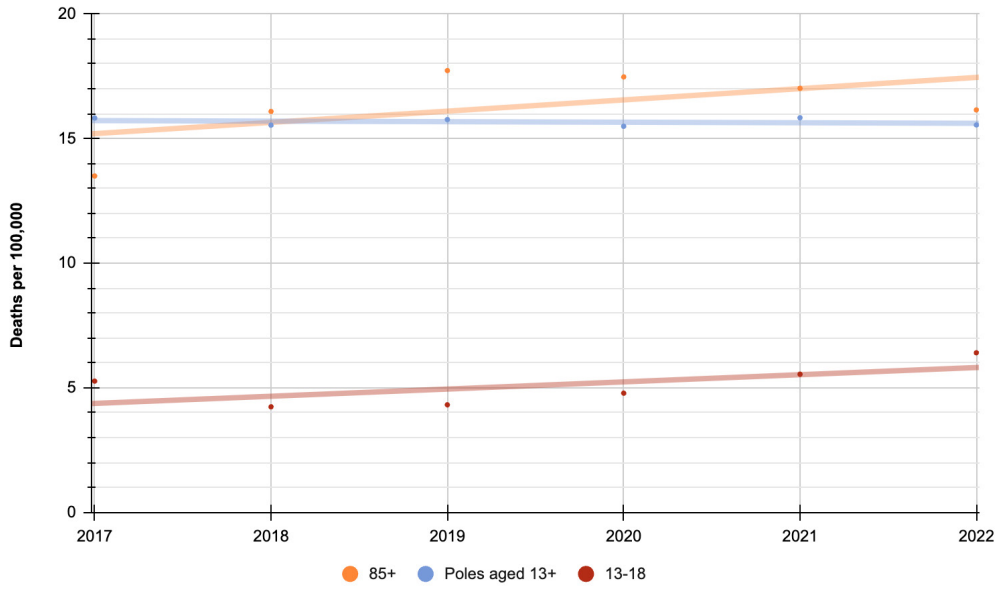
Table 1: Suicide death rates by age with percentage change across 2017-2022

Age group	SDR 2017	SDR 2018	SDR 2019	SDR 2020	SDR 2021	SDR 2022	Change (%)
13-18	5,27	4,24	4,32	4,79	5,55	6,41	21,6%
19-24	13,59	13,80	14,97	14,94	15,42	14,60	7,4%
25-29	15,13	14,78	16,00	17,27	16,89	16,35	8,1%
30-34	15,91	14,65	16,26	16,03	17,09	17,91	12,6%
35-39	14,74	13,89	16,10	14,38	15,84	16,43	11,4%
40-44	16,08	15,87	14,94	15,93	15,96	14,90	-7,4%
45-49	16,66	17,42	17,43	15,97	16,69	15,54	-6,7%
50-54	19,13	18,73	17,25	17,48	17,76	18,02	-5,8%
55-59	23,04	22,00	18,77	18,46	20,76	19,38	-15,9%
60-64	19,33	20,35	19,33	19,55	17,77	19,07	-1,4%
65-69	16,10	14,80	16,37	15,45	15,15	14,44	-10,3%
70-74	14,81	16,35	15,96	14,14	14,20	12,76	-13,8%
75-79	13,08	14,75	14,45	14,21	13,15	14,75	12,8%
80-84	16,40	12,44	15,12	15,83	16,40	15,97	-2,6%
85+	13,50	16,09	17,73	17,48	17,02	16,15	19,6%
Poles aged 13+	15,83	15,54	15,76	15,49	15,84	15,55	-1,7%

Figure 1: Overall downward trend in the studied population and upward trends in the 13-18 and 85+ age groups (linear trend line)



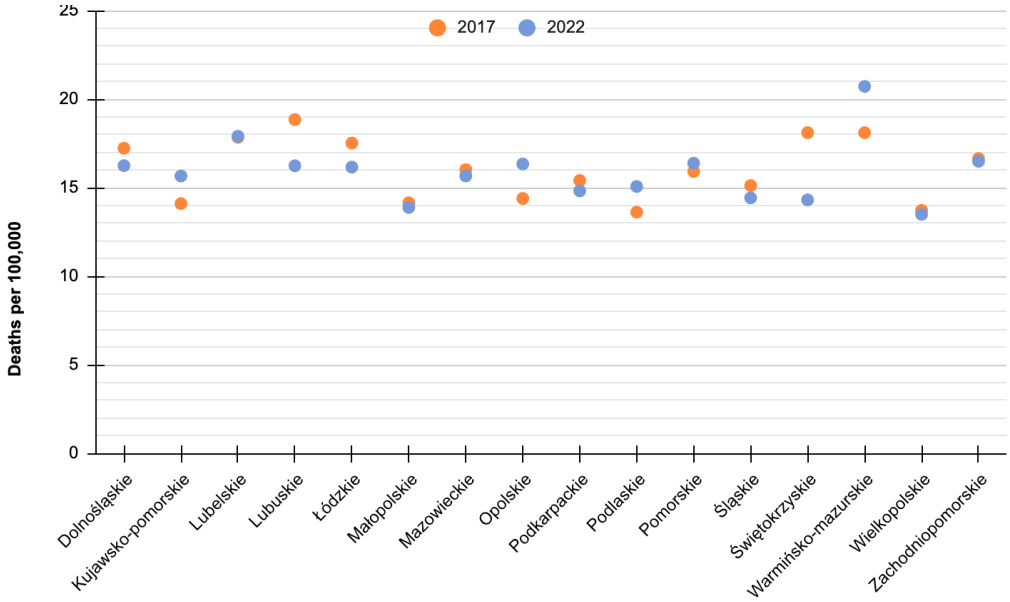
In the 13-18 population, rates increased by 21.6% (from 5.27 per 100 000 in 2017 to 6.41 per 100 000 in 2022). Initially, rates dropped between 2017 and 2018, but since 2018 they have been steadily rising. The second largest increase of 19.6% was seen in the 85+ age group (rising from 13.5 per 100 000 in 2017 to 16.15 per 100 000 in 2022).

This study also analysed differences in suicide rates between voivodeships in Poland. As seen in Table 2, the highest suicide mortality rate was observed in the Warmian-Masurian voivodeship, peaking at 20.72 per 100 000 during the study period. Whereas, the lowest suicide rates were seen in the Wielkopolska voivodeship, being 13.50 per 100 000 in 2022.

Table 2: Suicide mortality rates across voivodeships during 2017-2022 with percentage change

Vovoideship	SDR 2017	SDR 2018	SDR 2019	SDR 2020	SDR 2021	SDR 2022	Change (%)
Dolnośląskie	17,23	16,83	17,82	16,68	16,20	16,25	-5,70%
Kujawsko-pomorskie	14,11	15,53	14,33	13,99	15,88	15,66	11,04%
Lubelskie	17,85	17,38	16,52	16,82	18,09	17,91	0,32%
Lubuskie	18,85	17,41	19,95	16,79	20,67	16,24	-13,83%
Łódzkie	17,53	18,12	16,06	15,13	15,51	16,17	-7,76%
Małopolskie	14,15	13,55	14,72	16,19	14,31	13,89	-1,88%
Mazowieckie	16,03	16,58	16,10	16,15	16,19	15,67	-2,24%
Opolskie	14,40	14,12	14,87	12,29	14,38	16,34	13,51%
Podkarpackie	15,41	15,20	12,72	14,35	14,93	14,83	-3,80%
Podlaskie	13,62	13,48	16,63	16,60	14,75	15,07	10,64%
Pomorskie	15,92	16,53	15,66	14,98	15,87	16,39	2,92%
Śląskie	15,12	15,04	13,90	14,35	15,24	14,43	-4,58%
Świętokrzyskie	18,12	16,56	17,48	17,22	18,01	14,32	-20,97%
Warmińsko-mazurskie	18,11	17,28	19,53	19,65	18,27	20,72	14,42%
Wielkopolskie	13,73	12,92	14,60	13,53	13,77	13,50	-1,65%
Zachodniopomorskie	16,65	17,64	17,94	16,43	16,96	16,50	-0,93%

Figure 2: Changes in suicide death rates across voivodeships between 2017 and 2022.



With regard to changes in suicide death rates across voivodeships in the studied years (Figure 2), increases were observed in the Kujawsko-pomorskie, Lubelskie, Opolskie, Podlaskie, Pomorskie, and Warmińsko-mazurskie regions. The remaining voivodeships encountered overall decreases, with the largest observed in the Świętokrzyskie region (20.97%) and Lubuskie region (13.83%).

The Warmińsko-mazurskie voivodeship saw the largest increase of 14.42% (from a rate of 18.11 per 100 000 in 2017 to 20.72 per 100 000), but year-to-year changes experienced alternating increases and decreases.

The second greatest increase of 13.51 percent was observed in the Opolskie voivodeship (from 14.4 to 16.3 per 100 000 population).

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Across the study period, the incidence of suicide death was vastly higher among males than females. In 2017, 85.74% of all suicide deaths concerned males. A difference in trends between the two genders is noted. The suicide death rate in males decreased by 4.03 % from 24.33 per 100 000 in 2017 to 23.35 per 100 000 in 2022. Whereas the suicide death rates in females increased by 14.51% from 3.79 per 100 000 in 2017 to 4.34 per 100 000 in 2022.

The dominant suicide method was hanging, accounting for 79.78% of all suicides across the studied period. The second most frequent method was jumping from a height (6.89%) and the third most frequent throwing under a moving vehicle (2.52%). Twenty percent of cases were previously treated for a psychiatric disorder and 18.42% had a history of alcohol abuse.

The most common reason of suicide was mental illness/ mental disorder (19.73%) followed by family disagreements/ family violence (4.73).

The state of consciousness in most instances was not determined, however out of all detected substances, alcohol was most prevalent (10.28%).

Figure 3: Suicide death rates by gender across 2017 to 2022.

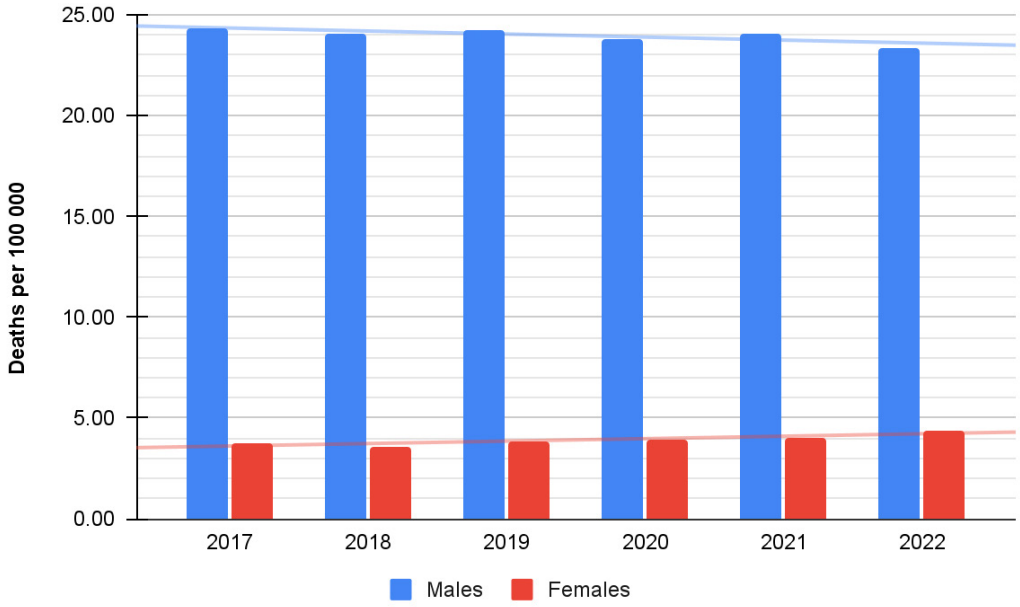

Table 3: Sociogeographic characteristics of population who died by suicide in Poland in the period 2017-2022 (based on data from Police Headquarters).

	Number of suicides TOTAL = 65190	%
Health status		
No data available	33626	53,91
Physical illness	3894	6,24
Treated for psychiatric disorder	12628	20,25
Treated for alcohol addiction	2082	3,34
Treated for drug addiction	258	0,41
Abused alcohol	11492	18,42
Permanently disabled	482	0,77
Used illicit drugs	728	1,17
Contact with institutions		
Unable to determine	52876	84,77
Contact with other institution	450	0,72

	Number of suicides TOTAL = 65190	%
Contact with an church institution	52	0,08
Contact with a crisis intervention center	20	0,03
Contact with a social welfare center	422	0,68
Contact with a medical facility	7444	11,93
Contact with the police	1440	2,31
Reason for suicide		
Physical illness	2034	3,26
Mental illness/mental disorder	12304	19,73
Committing a felony or misdemeanor	316	0,51
Other	2666	4,27
Conflict with people outside the family	144	0,23
Bullying, cyberbullying, abuse	10	0,02
Sudden loss of livelihood	486	0,78
Family disagreements/family violence	2952	4,73
Unwanted pregnancy	6	0,01
Undetermined	35712	57,25
HIV carrier/AIDS patient	14	0,02
Deterioration or sudden loss of health	1712	2,74
Problems at school or work	440	0,71
Death of a loved one	1006	1,61
Permanent disability	200	0,32
Threat or loss of residence	90	0,14
Love disappointment	2582	4,14
Poor economic conditions/debts	1916	3,07
Work or school status		
Unemployed	10316	16,54
No data	32968	52,86
Short-term job	4434	7,11
Permanent job	8786	14,09
Self-employed	1734	2,78
Farmer	2262	3,63
University student	468	0,75
Primary school student	1406	2,25
Methods		
Other	714	1,14
Hanging	49760	79,78
Throwing under a moving vehicle	1574	2,52
Jump from a height	4300	6,89
Self-harm/ superficial injury	470	0,75
Self-immolation	152	0,24

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	Number of suicides TOTAL = 65190	%
Suffocation	550	0,88
Injury to the circulatory system	1072	1,72
Drowning	648	1,04
Using a firearm	974	1,56
Gas/fumes poisoning	422	0,68
Poisoning by chemical agents/toxins	272	0,44
Poisoning by illicit drugs	30	0,05
Ingestion of other drugs	780	1,25
Ingestion of sleeping pills/psychotropic drugs	656	1,05
Marital status		
No data available	6762	10,84
Single	20042	32,13
Informal relationship	2398	3,84
Divorced	5370	8,61
Separated	286	0,46
Widowed	4298	6,89
Married	23218	37,22
State of consciousness		
No data available	51208	82,10
Under the influence of alcohol	6410	10,28
Under the influence of medications	742	1,19
Under the influence of illicit drugs	154	0,25
Sober	4092	6,56
Education		
No data available	45368	72,74
Middle school	790	1,27
Primary	3886	6,23
Partial primary	324	0,52
Post-secondary	44	0,07
Secondary	4580	7,34
Higher education	1690	2,71
Vocational	5692	9,13
Source of income		
No data available	25890	41,51
Retirement	8320	13,34
Dependent on another person	4754	7,62
Not on a fixed income	5532	8,87
Work	14040	22,51
Pension	3148	5,05
Allowance/alimony	690	1,11

Sociodemographic characteristics such as marital status, education, source of income, and work or school status are also provided in Table 3, likewise in many cases no data was available.

DISCUSSION

Our study found an overall decrease during the period spanning from 2017 to 2022. This outcome is consistent with other research that also revealed a decline in suicide death rates in previous years in Poland [4]. Partially, this phenomenon can be attributed to the improving economic conditions in Poland, including the declining unemployment rate, rising average salaries, and decreasing rates of both relative and extreme poverty [1].

Among all age groups, the greatest increase of 21.6% was observed among youth, with suicide rates consistently increasing since 2018. This rising trend represents a shift from past years, when the number of suicide deaths in this demographic was falling [4]. Over the last couple of years, a decline in children's mental health has been perceived, with studies showing increased psychological distress, suicide-related behaviours, and suicide attempts [6-8].

The increase in suicide deaths clearly occurred after the COVID-19 pandemic. In Poland, the lockdown policy from the very beginning was based on the closure of schools and the shift to on-line learning. There was also data showing an increase in domestic violence during the lockdown period in Poland [9]. In addition, for minors in the early days of the pandemic, it was forbidden to leave home unaccompanied by an adult. According to the report by the Foundation Dajemy Dzieciom Siłę, almost one in three respondents (30.8%) felt that their well-being had worsened during the period under review [10]. Girls complained of worse well-being significantly more often than boys. During the first period of the pandemic, 4.4% of respondents mutilated themselves more often than before the pandemic, while 2.9% of respondents aged 15-17 attempted suicide [10].

According to the Supreme Audit Office, the psychiatric health care system for children and adolescents in Poland does not provide comprehensive and accessible care, and therefore requires systemic changes [11]. In addition, more accessible and tailored prevention programmes should also be implemented, such as school-based suicide-prevention [12].

In addition, an alarming increase of 19.6% was observed among Poles aged 85 years or older (from a rate of 13.50 per 100 000 to 16.15 per 100 000). It is concerning that the number of suicide deaths among the eldest is rising. Continuation of this trend may result in this age group having the highest suicide mortality rate among all demographics which is already seen in several European nations [13].

There are distinct variations in the characteristics of suicide among the elderly population. Among older adults, the prevalence of any psychiatric disorder or psychiatric therapy declines with age [14]. People aged 85 and above are less likely to have had a previous suicide attempt, had a past psychiatric admission, or used psychiatric services a month prior to dying by suicide [15]. However, a major percentage had contact with their general practitioners a month before death, emphasising the importance of suicide prevention programmes in primary care [15,16].

Suicidal behaviour in older adults has been strongly associated with functional impairment, physical illness, a feeling of loneliness, and a loss of meaning of life. Older adults with a wish to die more often have negative judgments about their age, in particular relating to a sense of worth and dignity [17].

Poland, like other European nations, is experiencing an aging population. It is likely that the absolute number of suicides among the eldest will rise. Therefore, it is essential to prioritise mental health support systems tailored to the needs of older adults. This includes strengthening social welfare programmes, enhancing mental health screenings, and recognising the impact of physical health and disabilities on suicide risk in older individuals.

As for regional disparities, the largest percentage increase in suicide rates concerned the warminsko-mazurskie voivodeships (14.42%). Differences between regional suicide rates may be associated with socioeconomic inequalities [18,19]. Despite improving economic conditions in Poland, the warminsko-mazurskie voivodeship remains one of the most economically disadvantaged regions in the country. It is characterised by the highest unemployment rate, the highest rate of people receiving social assistance benefits, and one of the lowest GDP per capita [20].

Generally, in many countries, a correlation between lower socio-economic status and higher suicide rates has been found. Different patterns of suicides were observed within various social patterns, with higher frequencies among individuals who are not married, those who are unemployed, and those belonging to lower socioeconomic strata [18]. In almost all studies, it was observed that people from lower socioeconomic backgrounds had a greater likelihood of dying by suicide compared to their counterparts in higher socioeconomic groups [18].

The landmark study done by Fiete Näher et al. examined these relationships in detail [21]. The study found that when unemployment in an area goes up by 1%, the suicide rate in that area increases by 1.20%. On the other hand, when incomes increase by 1%, the suicide rate decreases by 0.39%. Conversely, a 1% decrease in the incomes of single individuals is linked to a 0.54% increase in the suicide rate [21].

In a longitudinal study conducted in the United States, researchers discovered that both an individual's socioeconomic status and their subjective social status were predictive factors for heightened levels of depressive symptoms and an increased risk of

suicidality [22]. This casualty has also been found to work in the reverse direction, with depressive disorders frequently exhibiting considerable impairments in social functioning [23].

Limitations of the Study

The analysis covered only the years 2017-2022, which might not account for long-term trends or the impact of prolonged risk factors. In the study, we have focused on describing general trends, but we did not conduct a deeper analysis of psychological, social, or economic factors related to the increase in suicide rates. The inclusion of possible further factors such as gender, previous suicide attempts, etc. could significantly advance the scientific field being studied. Thus the study does not provide a deeper understanding of the reasons behind the increase in suicide rates in specific groups and regions. In an ecological study analysing only general trends, it is not possible to analyse individual participants. Only an approach that incorporates such a large-scale analysis (in line with the hierarchy of evidence in evidence-based medicine) would provide insight into the real causes of the observed phenomena. However, a better understanding of short-term regional trends and by age group is an important first step towards formulating better, targeted suicide prevention programmes in Poland. To our knowledge, no such studies on Poland have been undertaken in the literature to date.

CONCLUSIONS

In Poland suicide rates have increased significantly among adolescents, the eldest and those living in economically disadvantaged regions. The obtained results highlight the need for implementing tailored preventative programmes.

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DISCLOSURE STATEMENT

The authors report there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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