Journal Health Sciences Perspective

Ilam University of Medical Sciences Publications

Assessing Suicide-Related Mortality and Disability: A Population-Based Analysis of DALY and YLL in Ilam

Yousef Veisani [1], Fathola Mohamadian [2]✉

[1] Non-Communicable Disease Research Center Ilam University of Medical Sciences, Ilam, Iran
[2] Department of Environmental Health Engineering, School of Public Health, Ilam University of Medical Sciences, Ilam, Iran

Article Info

Article type:
Original article

Article History:
Received: Apr. 12, 2025
Revised: May. 12, 2025
Accepted: June. 10, 2025
Published Online: June. 28, 2025

✉ ***Correspondence to:***
Fathola Mohamadian
Department of Psychology, Psychosocial Injuries Research Center, Ilam University of Medical Sciences, Ilam, Iran

Email:
mobinmohamadian@yahoo.com

A B S T R A C T

Introduction: Suicide remains a serious public health concern, contributing significantly to premature death and long-term disability. This study examines the suicide burden in Ilam Province, Iran, from 2010 to 2019 by calculating Disability-Adjusted Life Years (DALY) and Years of Life Lost (YLL) to better understand its impact on the population.

Materials & Methods: We conducted a retrospective cross-sectional analysis using data from official health records and forensic reports. Suicide mortality rates were calculated separately for men and women and standardized using the WHO World Standard Population in 2000. To ensure statistical reliability, we used Poisson regression models to generate 95% confidence intervals (CIs).

Results: The highest suicide rates were recorded in 2010, with 45.0 per 100,000 among female (95% CI: 37.4–53.4) and 25.7 per 100,000 among male (95% CI: 20.3–32.4). YLL also peaked that year 2010, reaching 1,757.1 per 100,000 for men and 561.3 per 100,000 for women. By 2019, the burden had decreased, with standardized YLLs of 420.4 per 100,000 for men (95% CI: 397–445) and 235.1 for women (95% CI: 220–252). While suicide rates were higher among female, men accounted for a greater share of YLL and DALYs highlighting the higher lethality of suicide attempts in male.

Conclusion: The findings underscore notable gender differences in suicide burden, with distinct implications for public health planning. Targeted prevention strategies are urgently needed, particularly those that address the higher fatality rates in men. Future efforts should include expanded suicide surveillance, a closer examination of socioeconomic risk factors, and the integration of longitudinal mental health assessments to support more effective, evidence-based interventions in Ilam Province.

Keywords: Suicide burden, Disability-Adjusted Life Years, Years of Life Lost, epidemiology, public health intervention

➢ **How to cite this paper**
Veisani Y, Mohamadian F. Assessing Suicide-Related Mortality and Disability: A Population-Based Analysis of DALY and YLL in Ilam. *Journal of Health Sciences Perspective*. 2025; 1(3):62-68.

Publisher: Ilam University of Medical Sciences

Introduction

Suicide remains one of the most pressing public health challenges worldwide. Beyond the emotional toll on families and communities, it contributes significantly to premature death and long-term disability. The social and economic costs are substantial, making it critical to understand the scale of the problem through comprehensive epidemiological studies (1).

Ilam has consistently reported suicide rates that are well above the national average. These persistently high figures point to deeper, possibly region-specific social, cultural, and economic factors that influence suicidal behavior in this part of the country (2, 3). While previous studies have examined some of these risk factors ranging from mental health challenges to demographic patterns there's still a noticeable gap when it comes to using standardized methods to quantify the actual burden of suicide in the region (4, 5).

Although much of the existing literature has focused on the psychological or social roots of suicide and the design of intervention programs (6, 7), few studies have adopted a quantitative approach to assess the burden using models specifically calibrated to Iran's demographic realities. Moreover, many studies lack age-standardized data, which limits their usefulness in cross-regional or international comparisons (8). By incorporating WHO-recommended standardization methods, this study ensures that the burden estimates are both reliable and globally comparable.

The main goal of this research is to estimate YLL and DALY rates for suicide over a decade, providing a detailed and data-driven understanding of the suicide burden in Ilam. By using age-standardized calculations and robust statistical tools, the study offers a foundation for more accurate assessments. It also highlights gender-based differences in suicide outcomes, shedding light on how mortality and disability from suicide vary between men and women. This research aims to quantify the burden of suicide in Ilam Province, Iran, over a ten-year period (2010–2019), using internationally recognized metrics Disability-Adjusted Life Years (DALY) and Years of Life Lost (YLL) to measure its true impact.

Materials and methods

Study Design

This study takes an observational epidemiological approach to assess the burden of suicide in Ilam Province between 2010 and 2019. Using a retrospective cross-sectional design, we analyzed demographic and health-related data to estimate two key indicators: Disability-Adjusted Life Years (DALY) and Years of Life Lost (YLL).

Population and Data Sources

We included all recorded suicide cases across Ilam Province during the study period 2010-2019, drawing from official health registries and forensic records. Population estimates were based on demographic projections, allowing us to accurately reflect gender distribution and population changes over time. The data included both fatal and non-fatal suicide incidents, ensuring a comprehensive understanding of suicide outcomes in the region.

Calculating DALY and YLL

To measure the impact of suicide, we calculated YLL using the standard Global Burden of Disease (GBD) methodology:

$$YLL = \sum (N \times L)$$

where N is the number of deaths by suicide and L represents the standard life expectancy at the age of death.

We then calculated DALYs by combining the YLL with Years Lived with Disability (YLD):

$$DALY = YLL + YLD$$

YLD was estimated using established disability weights for suicide attempts, capturing the long-term burden of non-fatal cases that lead to ongoing physical or mental health challenges.

Assuming a brief duration of pre-suicidal mental illness, an effective disability weight in the range of 0.05–0.08 was applied to reflect the limited contribution of morbidity to the overall DALY estimates. This conservative approach accounts for both the short duration and relatively low documented prevalence of psychiatric conditions preceding suicide within the study population. Disability weights were sourced from the Global Burden of Disease 2019 study (9), while assumptions regarding illness duration were informed by established psychiatric epidemiological data (10, 11).

Standardization for Comparison

To ensure the results could be compared across different populations and time periods, we standardized the YLL and DALY rates using the WHO World Standard Population in 2000 (12). This direct age-standardization approach accounts for differences in age structure and improves comparability across regions and studies.

Statistical Analysis

All burden estimates were reported per 100,000 population. We used Poisson regression models to calculate 95% confidence intervals (CIs) and assess the reliability of the results. Analyses were conducted in Stata ver.16 and SPSS ver.26, ensuring statistical robustness and reproducibility. We also examined trends across gender and over time to identify any shifts in the epidemiological patterns of suicide burden.

Findings

Suicide Mortality and Burden Indicators

From 2010 to 2019, the study recorded suicide deaths in Ilam province with notable variations across gender and time. The overall suicide death rate fluctuated between 8.8 to 45.0 per 100,000 population, with females consistently exhibiting higher rates compared to males in most years. The highest suicide rate was recorded in 2010, with 45.0 (95% CI: 37.4-53.4) per 100,000 females, compared to 25.7 (95% CI: 20.3-32.4) per 100,000 males. Conversely, the lowest recorded rates were observed in 2016, where males had 10.9 (95% CI: 7.7-15.2) and females had 5.6 (95% CI: 3.3-8.9) per 100,000 population (Table1).

Table 1. Estimated Suicide Death Rate (Raw vs. Standardized) with 95% CI in Ilam province 2010-2019

Year	Male				Female			
	Deaths	Pop.	Raw (95% CI)	Standardized (95% CI)	Deaths	Pop.	Raw (95% CI)	Standardized (95% CI)
2010	73	284,580	25.7 (20.3-2.4)	23.2 (18.3-29.2)	123	273,420	45.0 (37.4 53.4)	43.5 (36.1-52.4)
2011	46	292,740	15.7 (11.5-0.9)	14.1 (10.3-19.3)	48	281,260	17.1 (12.6-22.8)	16.3 (12.0-22.0)
2012	61	295,880	20.6 (15.8-6.5)	19.1 (14.6-24.8)	67	284,278	23.6 (18.3-30.0)	22.8 (17.5-29.2)
2013	38	303,450	12.5 (9.0-17.1)	11.3 (8.1-15.5)	44	291,550	15.1 (11.1-20.2)	14.6 (10.6-19.7)
2014	37	311,100	11.9 (8.5-16.4)	10.8 (7.7-15.0)	9	298,900	3.0 (1.4-5.7)	2.8 (1.3-5.3)
2015	40	321,300	12.4	11.2 (8.1-15.2)	30	308,700	9.7 (6.6-13.8)	9.2 (6.3-13.2)

			(9.0-16.9)					
2016	36	331,500	10.9 (7.7-15.2)	10.2 (7.2-14.3)	18	318,500	5.6 (3.3-8.9)	5.3 (3.1-8.5)
2017	37	344,250	10.7 (7.7-14.7)	9.9 (7.1-13.7)	30	330,750	9.1 (6.1-13.0)	8.6 (5.8-12.6)
2018	54	357,000	15.1 (11.4-9.7)	14.2 (10.7-18.8)	31	343,000	9.0 (6.1-12.7)	8.6 (5.8-12.4)
2019	33	374,850	8.8 (6.1-2.3)	8.2 (5.7-11.7)	38	360,150	10.6 (7.5-14.5)	10.1 (7.1-14.0)

Years of Life Lost (YLL)

The YLL estimates illustrate the premature mortality burden of suicide, capturing both raw and standardized rates. Across the study period, males exhibited higher YLL rates than females, with peak values observed in 2010, where the YLL rate for males reached 1,757.1 per 100,000 (standardized: 1,702.8, 95% CI: 1,665-1,851), while females exhibited an YLL rate of 561.3 per 100,000 (standardized: 540.4, 95% CI: 521-582). The lowest burden was documented in 2014, with males showing an YLL rate of 289.4 per 100,000 (standardized: 277.5, 95% CI: 260-296) and females 137.3 per 100,000 (standardized: 131.4, 95% CI: 120-144) (Table2).

Table 2. Estimated YLL Rate (Raw vs. Standardized) for Male & Female (with 95% CI) in Ilam province 2010-2019.

Year			Male (YLL Rate)		Female (YLL Rate)	
	Male YLL	Female YLL	Raw	Standardized 95% CI	Raw	Standardized 95% CI
2010	5000	1535	1757.1	1702.8 1665-1851	561.3	540.4 521-582
2011	2000	720	683.2	657.1 635-702	256.2	246.1 230-263
2012	2930	1060	990.3	955.7 928-984	372.9	356.8 339-376
2013	1600	760	527.4	506.6 485-530	260.6	249.3 233-266
2014	900	410	289.4	277.5 260-296	137.3	131.4 120-144
2015	1240	620	385.9	369.8 350-391	200.8	192.6 178-208
2016	1020	515	308.0	295.7 277-315	161.7	155.4 141-171
2017	1400	715	406.6	391.2 371-414	216.2	207.4 192-224
2018	1675	825	469.3	452.5 429-475	240.6	230.1 214-247
2019	1395	690	372.2	357.8 340-387	191.5	183.1 169-199

Disability-Adjusted Life Years (DALY)

Integrating both premature mortality and disability due to suicide attempts, the DALY burden followed similar trends. The highest DALY rate was recorded in 2010, with males having 1,838.8 per 100,000 (standardized: 1,783.1, 95% CI: 1,745-1,832), while females exhibited 582.8 per 100,000 (standardized: 562.1, 95% CI: 544-582). A declining trend was observed in subsequent years, reaching 436.3 per 100,000 for males (standardized: 420.4, 95% CI: 397-445) and 246.3 per 100,000 for females (standardized: 235.1, 95% CI: 220-252) in 2019 (Table3).

Table 3. Estimated DALY Rate (Raw vs. Standardized) for Male & Female (with 95% CI) in Ilam province 2010-2019.

Year	Frequency		Male (DALY Rate)		Female (DALY Rate)	
	Male DALY	Female DALY	Raw	Standardized 95% CI	Raw	Standardized 95% CI
2010	5230	1593	1838.8	1783.1 1745–1832	582.8	562.1 544–582
2011	2200	875	751.4	725.6 701–751	311.2	298.3 283–315
2012	3150	1323	1065.1	1027.5 995–1060	465.4	447.9 429–467
2013	1760	1007	579.9	556.4 533–580	345.4	330.8 314–349
2014	1060	597	340.7	326.2 309–345	199.9	191.5 178–206
2015	1445	756	449.9	432.3 411–454	244.9	234.3 219–250
2016	1185	607	357.5	343.9 325–363	190.6	182.3 168–198
2017	1600	827	464.8	447.9 424–473	250.1	238.6 223–256
2018	1905	949	533.8	514.3 487–541	276.7	264.1 247–283
2019	1635	887	436.3	420.4 397–445	246.3	235.1 220–252

Discussion

This study highlights clear gender disparities in the burden of suicide in Ilam Province, Iran. Although women consistently showed higher suicide rates, men bore a heavier burden in terms of Years of Life Lost (YLL) and Disability-Adjusted Life Years (DALY) largely due to the higher lethality of suicide methods used by men. This pattern is consistent with global findings, where men often choose more fatal means, resulting in a greater loss of life years and a deeper public health impact (1, 13).

Over the ten-year study period, we observed a general decline in the overall suicide burden. This positive trend may reflect improvements in mental health services, shifts in socio-economic conditions, or increased access to healthcare. However, the presence of occasional spikes in burden suggests that certain vulnerabilities remain, reinforcing the need for ongoing monitoring and flexible, responsive prevention strategies (5, 14).

From a public health standpoint, the findings point to the need for gender-sensitive approaches in suicide prevention. Women may benefit most from expanded psychosocial support and community engagement, while strategies aimed at men should focus on reducing access to lethal methods and promoting help-seeking behaviors particularly among those at high risk. Understanding how suicide burden changes

over time also gives policymakers valuable insights for refining intervention plans and adjusting them to local realities (15).

On the methodological front, this study demonstrates the usefulness of standardized burden estimation techniques. By applying WHO age-standardized methods, we ensured that our findings are not only locally meaningful but also comparable with national and international data. This level of consistency is vital for informing broader public health decisions and aligning regional policies with global health goals (16).

The gender differences we observed reflect what other research has also shown men are more likely to use fatal methods and less likely to engage with mental health services (6, 7, 17). Interestingly, Ilam's declining suicide burden sets it apart from other regions in Iran, where suicide rates have remained steady or even increased. This contrast underscores the value of conducting localized analyses, as national trends can often mask regional successes or challenges (18).

Limitations

Like any study, this one has its limitations. Relying on official registries means there's a risk of underreporting, especially in cases where suicide attempts are misclassified or inconsistently coded in mortality records. While we used WHO-standardized methods, slight inaccuracies in YLL estimates may have occurred due to changing life expectancy trends and demographic shifts within the province. Another important limitation is the lack of psychiatric data; without this, we couldn't fully explore the role of mental health conditions or comorbidities that often underlie suicidal behavior.

Conclusion

This research offers a detailed picture of the suicide burden in Ilam Province over the past decade, bringing attention to gender differences, changing trends, and the practical value of using standardized burden metrics. While suicide rates were higher among women, men experienced greater losses in terms of YLL and DALY emphasizing the need for prevention strategies tailored to each gender's unique risks and needs.

Looking ahead, future research should aim to integrate a wider range of data—especially socioeconomic variables and mental health records to build a more holistic understanding of suicide risk in Ilam. Such insights can support more effective, targeted interventions and help shape a comprehensive prevention strategy that's grounded in both local realities and global best practices.

Acknowledgements

We thank our colleagues from Ilam University of Medical Sciences, who provided insight and expertise that greatly assisted the research.

Ethics approval

This study was conducted in full accordance with ethical research standards. All individual data were anonymized to protect confidentiality. The study received approval from the Ethics Committee of Ilam University of Medical Sciences (ethics code: IR.MEDILAM.REC.1400.157).

Financial support

This research was supported by Ilam University of Medical Sciences.

Conflict of interest

The authors report no conflict of interest in this study.

Authors' contributions

The study was designed and conducted by Y.V., F.M. also drafting of the manuscript was prepared by Y.V., and F.M. Statistical Analysis was done by Y.V. In final step all coauthors have approved a final version of the manuscript.

References

1. Organization WH. Suicide worldwide in 2021: global health estimates: World Health Organization; 2025.
2. Hassanipour S, Kazemi H, Ghayour A-R, Kazemi-Najafabadi A, Nikbakht H-A, Ghaem H. Epidemiological trend of suicide in center of Iran from 2012 to 2016. Clinical epidemiology and global health. 2019;7(4):559-63.
3. Izadi N, Mirtorabi SD, Najafi F, Nazparvar B, Nazari Kangavari H, Hashemi Nazari SS. Trend of years of life lost due to suicide in Iran (2006–2015). International journal of public health. 2018;63:993-1000.
4. Ferrari AJ, Norman RE, Freedman G, Baxter AJ, Pirkis JE, Harris MG, et al. The burden attributable to mental and substance use disorders as risk factors for suicide: findings from the Global Burden of Disease Study 2010. PloS one. 2014;9(4):e91936.
5. Naghavi M. Global, regional, and national burden of suicide mortality 1990 to 2016: systematic analysis for the Global Burden of Disease Study 2016. bmj. 2019;364.
6. Wu Y, Schwebel DC, Huang Y, Ning P, Cheng P, Hu G. Sex-specific and age-specific suicide mortality by method in 58 countries between 2000 and 2015. Injury prevention. 2021;27(1):61-70.
7. Rotejanaprasert C, Thanutchapat P, Phoncharoenwirot C, Mekchaiporn O, Chienwichai P, Maude RJ. Global spatiotemporal analysis of suicide epidemiology and risk factor associations from 2000 to 2019 using Bayesian space time hierarchical modeling. Scientific Reports. 2025;15(1):12785.
8. Yang E, Chen F, Yang Y, Zhang Y, Lin H, Zhang Y, et al. Global trends in depressive disorder prevalence and DALYs among young populations: a comprehensive analysis from 1990 to 2021. BMC psychiatry. 2024;24(1):943.
9. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The lancet. 2020;396(10258):1204-22.
10. Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, Lee S. Suicide and suicidal behavior. Epidemiologic reviews. 2008;30(1):133.
11. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Archives of general psychiatry. 2005;62(6):593-602.
12. Klein RJ. Age adjustment using the 2000 projected US population: Department of Health & Human Services, Centers for Disease Control and …; 2001.
13. Azizpour Y, Asadollahi K, Sayehmiri K, Kaikhavani S, Abangah G. Epidemiological survey of intentional poisoning suicide during 1993-2013 in Ilam Province, Iran. BMC public health. 2016;16:1-12.
14. Nejad AB, Behzadi A, Ahmadi ZO, Barouni M. Determining the burden of suicidal behaviors using the DALY approach: a case study in Iran (2018-2021). Addiction & Health. 2023;15(3):185.
15. Chudasama YV, Khunti K, Gillies CL, Dhalwani NN, Davies MJ, Yates T, et al. Estimates of years of life lost depended on the method used: tutorial and comparative investigation. Journal of Clinical Epidemiology. 2022;150:42-50.
16. Langlois PH, Canfield MA, Swartz MD. Poisson versus logistic regression in a descriptive epidemiologic analysis of data from a Birth Defects Registry. Birth Defects Research Part A: Clinical and Molecular Teratology. 2013;97(10):702-7.
17. Collaborators G. Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2015;385(9963):117-71.
18. Kleiman EM, Glenn CR, Liu RT. The use of advanced technology and statistical methods to predict and prevent suicide. Nature reviews psychology. 2023;2(6):347-59.