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2018-2023 年臺灣大學生自殺之社會人口學與學業特徵

Sociodemographic and academic characteristics associated with university student suicide in Taiwan, 2018-2023

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中文摘要

背景：年輕族群的心理健康問題與自殺風險一直是全球關注的議題。近年來，臺灣大專校院學生日益增加的自殺率特別受到的關注。本研究旨在識別影響臺灣大專校院學生自殺的風險因素。

方法：本研究使用臺灣教育部提供 2018 至 2023 年間大學生自殺身亡資料，對象為年齡小於 30 歲的大專校院學生。大學生的社會人口特徵（性別、居住地點及學校類型）以及學業特徵（科系類別、年級、延畢生、休學生、特殊教育需求生、國際學生和進修部學生）的數據是來自教育部統計處及其相關網站。研究採用 Poisson 迴歸模型計算這些特徵與自殺的發生率比（Rate Ratios, RRs）及其 95%信賴區間（CIs），並進行性別分層分析，納入交互作用項檢驗性別差異。此外，本研究亦計算每個特徵的族群可歸因分率（Population Attributable Fractions, PAF)。

結果：在 2018 至 2023 年間，共有 363 名大學生自殺身亡。自殺風險在年齡超過 23 歲的學生中明顯增加（RR=2.76, 95% CI 2.22-3.42），尤其在女性學生中增加幅度更為明顯(RR=3.66, 95% CI: 2.68–4.99)；相比住在家中的學生，居住於私人租賃處的學生自殺風險更高（RR=2.47, 95% CI 1.97-3.11）。與二至四年級的在學生相比，延畢學生的自殺發生率較高（RR=1.86, 95% CI 1.27-2.72）；此外，休學學生（RR=1.50, 95% CI 1.08-2.07）和具有特殊教育需求的學生（RR=6.01, 95% CI 3.81-9.48）也呈現較高的自殺風險，且這些風險在女性學生中增加的幅度更為明顯。與全體大學生的自殺率相比，主修人文學（RR=2.26, 95% CI 1.12-4.57）、外國語文學（RR=1.58, 95% CI 1.09-2.28）、本國語文學（RR=2.06, 95% CI 1.10-

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3.87）、新聞與圖書資訊學（RR=1.95, 95% CI 1.04-3.66）以及社會福利學（RR=1.90, 95% CI 1.17-3.10）的學生自殺發生率較高。

結論：本研究顯示某些大學生群體的自殺風險增加。針對這些群體設計適當的干預措施，應成為自殺防治工作的重點，以滿足其特定需求並減少自殺事件的發生。

關鍵字：大學生、自殺、性別、特徵、科系

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Abstract

Introduction: The mental health issues and suicide risks in young people have been a persistent global concern for years. Recently, there has been a particular focus on the increasing suicide incidence among university students in Taiwan. This study aimed to identify risk factors for suicide among university students in Taiwan.

Methods: Data for suicide in university students aged <30 years (2018-2023) were from student death reports provided by Taiwan's Ministry of Education. Data for university student population by sociodemographic characteristics (sex, residence, and the type of university) and academic characteristics (major, year in undergraduate programs, delayed graduation, leave of absence, special educational needs, overseas students, and continuing education) were retrieved from the websites of the Ministry of Education. Poisson regression models were applied to calculate rate ratios (RRs) and their 95% confidence intervals (CIs) associated with these characteristics. Analyses were stratified by sex, with interaction terms used to assess sex differences. The population attributable fractions (PAF) were calculated for each characteristic.

Results: There were 363 university student suicides in 2018-2023. Suicide risk was higher in students aged > 23 years (RR=2.76, 95% CI 2.22-3.42) than in younger students. Compared with students living at home, suicide risk increased in those living in privately rented accommodations (RR=2.47, 95% CI 1.97-3.11). Compared with

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undergraduates in years 2-4, suicide incidence was higher in those who delayed their graduation (RR=1.86, 95% CI 1.27-2.72). Suicide risk increased in students who had taken a leave of absence (RR=1.50, 95% CI 1.08-2.07) and those with special educational needs (RR=6.01, 95% CI 3.81-9.48). These associations varied by sex, with stronger associations observed among female students. Compared with the overall suicide rate among students, students with a major in Humanities (RR=2.26, 95% CI 1.12-4.57), Foreign Language (RR=1.58, 95% CI 1.09-2.28), Local Language (RR=2.06, 95% CI 1.10-3.87), Journalism and Library Information (RR=1.95, 95% CI 1.04-3.66), and Social Welfare (RR=1.90, 95% CI 1.17-3.10) had a higher incidence of suicide.

Conclusion: This study showed increased suicide risk in some subgroups of university students. Suicide prevention efforts could usefully target these groups by implementing interventions that address their specific needs.

Keywords: University students, Suicide, Sex, Characteristics, Major

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1. Introduction

Suicide is a critical global public health issue. According to the World Health Organization (WHO), more than 720,000 individuals die by suicide annually worldwide (WHO, 2024). In Taiwan, the Ministry of Health and Welfare reported 3,898 suicide deaths in 2023, resulting in a suicide rate of 16.7 per 100,000 population, making it the 11th leading cause of death (Ministry of Health and Welfare, 2024). Among young people aged 15-29 years, suicide is the third leading cause of death globally (WHO, 2024). Notably, there was a recent increase in suicides among young populations in several countries, including Australia, Canada, Japan, South Korea, the UK, and the US (Bertuccio et al., 2024; Padmanathan et al., 2020). In Taiwan, suicide is the second leading cause of death among young people aged 15-24 years (Ministry of Health and Welfare, Taiwan, 2024). The suicide rate (per 100,000) in this age group showed an upward trend in recent years, doubling from 5.1 in 2014 to 10.9 in 2023 (Ministry of Health and Welfare, 2024).

Suicide among university students has emerged as a growing public health concern. A recent rise in suicide rates among university students was observed in countries such as Japan and the UK (Gunnell et al., 2020; Uchida & Uchida, 2017). While some studies indicated that university students may have a lower risk of suicidal ideation and attempts compared to their non-university-attending peers of the same age (Mortier et al., 2018), other research showed that students currently enrolled in university may have twice the risk of dying by suicide compared to those who completed their studies (Lageborn et al., 2017). It is therefore important to further investigate the characteristics associated with suicide among university students.

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Research on suicide among university students remains relatively limited at the international level. Findings from these existing studies indicated that some sociodemographic and academic characteristics may influence suicide risk among university students. Male university students were found to have a higher risk of suicide compared to female students in recent studies from Japan and the UK (Gunnell et al., 2020; Uchida & Uchida, 2017). Certain academic characteristics, such as the year and major of study, were also found to be associated with suicide risk among university students. In the UK, university students beyond their first year were found to have an increased risk of suicide compared to first-year students (Gunnell et al., 2020). Similarly, in Japan, university students nearing graduation, as well as those who had taken a leave of absence or extended their academic years, were found to have a higher risk of suicide (Uchida & Uchida, 2017). A Swedish nationwide study revealed an association between university study programs and student suicide, showing that female students in nursing and natural sciences had a higher suicide risk than those with a major in education. Further, both male and female university students in nursing and healthcare-related programs showed an increased risk of self-harm (Lageborn et al., 2023). Beyond sociodemographic and academic characteristics, additional factors found to be associated with suicide vulnerability among university students included receiving financial assistance, academic difficulties, and social isolation (McLaughlin & Gunnell, 2021; Westefeld et al., 2005).

There has been a concerning rise in youth suicide in Taiwan over the past decade. Suicide rates among individuals aged 10–24 shifted from a downward trend (2005–2014) to an upward trend beginning in 2014, with an average annual increase of 11.5% between 2014 and 2019 (Chang et al., 2023). Notably, the rate of increase was significantly higher among young females than males (annual percent change: 18.0% vs. 8.3%) (Chang et al., 2023). Furthermore, the suicide mortality rate among university students increased from

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2.4 to 7.2 per 100,000 between 2016 and 2023 (Campus Safety and Disaster Prevention Reporting and Response Center, 2024). Despite these alarming trends, there has been no prior analysis specifically examining suicide among university students in Taiwan to identify associated risk factors or potential sex differences. Given the disproportionately greater increase in suicide rates among young females, investigating sex-specific risk factors is crucial to understanding and addressing this emerging public health concern.

Based on these findings, certain university students may be exposed to unique suicide risk factors during their academic years, highlighting the need for further investigation into suicide in this population. However, national studies on suicide in this group remain limited. To address this gap, this study analyzed data for a national sample of suicides among university students in Taiwan from 2018 to 2023. Specifically, this study aimed to address the following research questions:

(1) What were the sociodemographic and academic characteristics associated with suicide rates among university students?

(2) What were the differences in suicide rates across university majors of study?

(3) Were there sex differences in the patterns of association between sociodemographic and academic characteristics and suicide among university students?

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2. Materials and methods

2.1 Data

2.1.1 Study population

Data for the student person-years were derived from the annual statistical reports of the Department of Statistics, Ministry of Education, Taiwan. The student enrollment data reported by the Ministry of Education are based on the academic year, which spans from August 1 of the previous year to July 31 of the following year. We converted the academic year-based data to calendar year-based data using linear interpolation. To focus on the university student population aged 17-29 years, we excluded students enrolled in the first to third years of five-year junior college programs (typically enrolling junior high school graduates aged 14 years), open universities, religious colleges, and students aged 30 and older.

2.1.2 Data for suicide in university students

Data for university student suicide (2018-2023) were from the Campus Security Report Center (CSRC) of the Ministry of Education, Taiwan. According to the Ministry of Education's "The Campus Safety and Disaster Incident Notification Operation Points," incidents of self-harm involving students must be reported to the CSRC within the legally mandated timeframe. The report includes information such as the time and location of the incident, basic student characteristics such as sex and age, a summary of the event in free text, school response measures, and recommendations for prevention strategies.

In cases where a student dies as a result of self-harm (i.e., suicide), schools are required to complete not only the CSRC report but also an additional form, the "Death Summary Form", which includes further information about the deceased student such as major and year of study, student status, family structure, academic performance, and

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residence. It also records school interventions, methods of self-harm, possible contributing factors, and a narrative of the school's responses.

Between 2018 and 2023, the CSRC recorded a total of 400 suicide deaths among university students. In this study, cases were excluded if the deceased was aged 30 or older (n = 19), a first- to third-year student in a five-year junior college program (n = 14) or enrolled in an open university (n = 3) or religious college (n = 1). After these exclusions, a total of 363 suicide cases were included in data analysis to examine the sociodemographic and academic characteristics associated with suicide among higher education (i.e., undergraduate and postgraduate) students. The analysis of suicide by the major of study was restricted to 330 suicides among undergraduate students.

2.2 Characteristics

2.2.1 Sociodemographic characteristics

Sociodemographic characteristics investigated in the study included sex, age (17–22 and 23–29 years), and residence (home, university dormitory, or private rented accommodation). The number of students residing in dormitories and rented accommodations was obtained from the Ministry of Education Statistics Database, while the number of students living at home was estimated by subtracting the total number of students living in university dormitory or rented accommodations from the overall student enrollment.

2.2.2 Academic characteristics

(1) Type of universities

Universities were categorized into four types: public comprehensive universities, public universities of science and technology, private comprehensive universities, and private universities of science and technology.

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(2) Top universities

"Top" universities were identified based on the Ministry of Education's "Aim for the Top University Project". Universities that received funding through this program and were not classified as science and technology universities were categorized as top universities, while all other universities were classified as non-top universities.

(3) Year of study

Undergraduate students were categorized into three academic year groups: first-year undergraduates, second-year and higher undergraduates (excluding those with extended enrollment), and undergraduates with extended enrollment (i.e., delayed graduation).

(4) Student status

Five student statuses were considered, as follows.

(a) Students on leave of absence: Students registered as being on leave during the second semester of the previous academic year, based on enrollment records.

(b) Students with special education needs: Include those with physical disabilities, emotional and behavioral disorders, and other conditions who registered in the Ministry of Education's special education support program. Information about suicide among students with special needs was only available starting from 2020.

(c) Overseas students: Foreign nationals formally enrolled in degree programs at a Taiwanese university, including international students, overseas Chinese students, students from Hong Kong and Macau, and students from mainland China.

(d) Continuing education undergraduate students: Undergraduate students enrolled in continuing education programs.

(e) In-service postgraduate students: Postgraduate students with a full-time job.

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2.2.3 Major of study

The classification of study major categories was based on the Ministry of Education's Standard Classification of Study Major Categories, which assigns specific study major codes to different fields of study. Study majors classified under the "99 - Other Fields" category were excluded from the analysis due to the small number of enrolled students. The Ministry of Education's classification system consists of four hierarchical levels. The top level includes 11 categories, and the second level consists of 27 categories, while the most detailed level consists of 174 categories. To ensure a sufficient number of suicides and stable estimates of suicide risk, we regrouped the second-level categories (n=27) into 20 study major categories. A detailed classification of major categories can be found in Appendix Table 1.

2.3 Statistical analysis

We calculated the suicide rate per 100,000 student-years by sociodemographic and academic characteristics. Poisson regression was used to estimate incidence rate ratios (RRs) and their corresponding 95% confidence intervals (CIs). Sex-stratified analyses were conducted to examine the patterns in male and female students. Sex interactions were examined by comparing models with and without appropriate interaction terms using the likelihood ratio test. We then calculated population attributable fraction (PAF) estimates for each characteristic using the estimated rate ratio and the corresponding population proportion. All statistical analyses were conducted using the statistical software package Stata/MP 15.0.

2.4 Ethics statement

The research was approved by National Taiwan University Research Ethics Committee (202008HS030).

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3. Results

3.1 Sociodemographic characteristics

A total of 363 university student suicides were identified during the study period, including 192 males (53%) and 239 individuals (66%) aged 17–22 years. The suicide rate was 5.8 per 100,000 among university students.

Table 1 presents the distributions of university student suicides by sociodemographic and academic characteristics, and Table 2 shows the results by sex. Overall, older university students aged 23–29 showed a 2.8-fold higher risk of suicide than the younger group aged 17–22 (RR = 2.76, 95% CI 2.22–3.42). This pattern was more marked in female students (RR = 3.66, 95% CI 2.68–4.99) than in male students (RR = 2.14, 95% CI 1.58–2.90) (p for sex interaction = 0.016). Suicide risk also varied by place of residence, with students living in rental housing showing a 2.5-fold higher risk than those residing at home (RR = 2.47, 95% CI 1.97–3.11). There was no difference in suicide risk in male and female university students (RR = 1.10, 95% CI 0.89–1.35, reference group: females). The highest proportion of suicides was attributable to living in rental housing (PAF = 24.37%), followed by being aged 23–29 years (PAF = 21.77%), particularly among female students (PAF = 26.76%).

3.2 Academic characteristics

There was no evidence that suicide risk varied by university type, undergraduate vs postgraduate status, or overseas vs non-overseas student status (see Table 1). Students from top universities showed a 1.5-fold higher suicide risk than those at non-top universities (RR = 1.45, 95% CI 1.09–1.93). Additionally, students who had taken a leave of absence from university showed a 1.5-fold higher suicide risk compared to those who had not (RR = 1.50, 95% CI 1.08–2.07), and the increased risk was mainly found in

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females (RR = 2.10, 95% CI 1.37–3.24; p for sex interaction = 0.038). Students with special education needs showed a 6-fold higher risk of suicide compared to their counterparts (RR = 6.01, 95% CI 1.81–9.48). This association was more marked in females (RR = 11.69, 95% CI 6.46–21.18) than in males (RR = 3.39, 95% CI 1.66–6.91) (p for sex interaction = 0.009). The highest proportion of suicides was attributable to students with special education needs (PAF = 6.20%), particularly among female students (PAF = 8.51%), whereas the remaining academic characteristics had low PAF values (<5%).

3.3 Undergraduate vs postgraduate students

Table 3 shows the rate ratios of suicide across different characteristics in undergraduate and postgraduate students, and Table 4 shows sex-stratified results. Older undergraduate students aged 23–29 had a 4.7-fold higher suicide risk than younger students aged 17–22 (RR = 4.67, 95% CI 3.67–5.94). This pattern was more marked in female undergraduate students (RR = 6.68, 95% CI 4.78–9.34) than in male undergraduate students (RR = 3.34, 95% CI 2.36–4.73) (p for sex interaction = 0.005).

Undergraduate students from top universities had a 1.7-fold higher suicide risk than those from non-top universities (RR = 1.66, 95% CI 1.20–2.30). Undergraduate students experiencing delayed graduation had an increased suicide risk compared to those in their second or later years of study (RR = 1.86, 95% CI 1.27-2.72); the association was mainly found in females (RR = 3.75, 95% CI 2.35–6.01) (p for sex interaction = 0.001). The highest proportion of suicides was attributable to being aged 23–29 among undergraduate students (PAF = 21.84%), particularly in female students (PAF = 26.91%), followed by 2 (PAF = 13.03%), Other academic characteristics were associated with relatively low PAF values (<5%).

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3.4 Suicide risk by major of study

Table 5 presents the rate ratios of suicide across different majors of study in undergraduate students. Compared to the overall undergraduate population, suicide risk increased in students with a major in Humanities (RR=2.26, 95% CI 1.12-4.57), Foreign Language (RR=1.58, 95% CI 1.09-2.28), Local Language (RR=2.06, 95% CI 1.10-3.87), Journalism and Library Information (RR=1.95, 95% CI 1.04-3.66), and Social Welfare (RR=1.90, 95% CI 1.17-3.10). There was no statistical evidence for sex differences (Appendix Table 2). The population attributable fractions for majors of study were relatively low, with all values below 5%.

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4. Discussions

4.1 Main finding

This study identified 363 university student suicides in Taiwan from 2018 to 2023, corresponding to a suicide rate of 5.8 per 100,000 student-years. Older students aged 23–29 had a 2.8-fold higher suicide rate than younger students aged 17–22. Students living in rental housing were 2.5 times more likely to die by suicide compared to those living at home. Suicide risk was elevated among students from top universities (1.5-fold), those who had taken a leave of absence (1.5-fold), and students with special education needs (6.0-fold) compared to their counterparts. The population attributable fraction was highest for students living in rental housing (24.37%), followed by older students aged 23–29 (21.77%), postgraduate students from top universities (PAF = 13.03%), students with special education needs (6.20%), and the remaining characteristics had low PAF values (<5%).

The associations of suicide with leave of absence status and special education needs were stronger in female than male students. No difference in suicide risk was observed between undergraduate and postgraduate or overseas vs non-overseas students. Among undergraduate students, those who experienced delayed graduation had a 1.9-fold higher suicide risk compared to students in their second or later years of study, with a stronger association in female than male students. Undergraduate students majoring in Humanities, Foreign or Local languages, Journalism and Library Information, and Social Welfare had higher suicide risks than peers in other majors. No statistical evidence of sex differences was found in the association between study majors and suicide risk.

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4.2 Strengths and limitations

To our knowledge, this is among the few studies of suicide among university students using a nationwide database. We identified certain specific indicators, such as delayed graduation, and some academic characteristics, such as certain majors of study, that were associated with university student suicide. This study has several limitations that should be acknowledged. First, although the CSRC provided detailed information on suicide cases, the accuracy of reporting relies on institutional compliance and may be affected by underreporting or misclassification, particularly in cases where the intent of suicide was not immediately clear. Second, enrollment data from the Ministry of Education were reported by academic year and required interpolation to estimate calendar year person-years, which may have led to minor measurement errors. Third, to focus on university students aged 17–29, we excluded older students aged 30 and above. As the Ministry of Education's data on enrolled students did not provide age breakdowns for most characteristics, we were unable to examine age differences. Fourth, although several academic and sociodemographic characteristics were examined, data on certain factors such as personal or familial socioeconomic positions and mental health diagnoses were unavailable, and their associations with suicide risk could not be investigated. Fifth, the relatively small number of suicides in certain subgroups, such as postgraduate in-service students, and students in specific majors, may have limited the statistical power to detect associations or interaction effects. Finally, in estimating the population attributable fraction for each characteristic, we assumed that the risk factors could be completely modified. However, many of the examined characteristics in our study are not fully modifiable in practice. As a result, the estimated PAFs may overstate the proportion of suicide cases that could realistically be prevented through interventions targeting these characteristics.

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4.3 Comparison with previous studies

Our finding that older university students were at increased risk of suicide aligns with prior studies from the UK and the US, where an older age among university students was similarly associated with heightened suicide risk (Gunnell et al., 2020; Silverman et al., 1997). This pattern may reflect broader population trends in which suicide rates increase with age, particularly during the transition from adolescence to early adulthood (Bertuccio et al., 2024). Within the context of higher education, older age students may also face academic or psychosocial challenges, such as delayed graduation, social isolation, or the pressure of entering the labor market. These factors may cumulatively elevate suicide risk in this subgroup.

Our study identified increased suicide risk among university students living in private rental housing compared to those living at home. To date, few studies have examined the relationship between residence and suicide risk among university students. A recent cross-sectional study from Turkey found no statistical evidence to suggest an association between place of residence and suicide risk (Erdem, 2024), which contrasts with our findings. Our results suggest that living arrangements may represent an underexplored risk factor for suicide risk in university students. Students living off-campus may be at higher risk due to limited access to peer networks and university services, and financial stress due to high rent, particularly in urban areas.

We found increased suicide risk among students from “top” universities in Taiwan. Although academic stress has consistently been identified as a risk factor for suicidal behavior in university settings (Hawton et al., 1995; McLaughlin & Gunnell, 2021; Stanley et al., 2009), the elevated risk observed in our study may reflect a broader concern of psychosocial and institutional stressors beyond academic demands alone. In Taiwan, the strong societal emphasis on academic credentialism, combined with parents’ high

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expectations for their children's academic achievement(Huang & Gove, 2015), places considerable pressure on young people to gain admission to prestigious universities, often requiring years of intensive exam preparation. This narrow focus on academic achievement may come at the expense of emotional development, social competence, and identity formation during key developmental periods(Chou et al., 2013).

Students in such high-pressure academic environments may therefore enter university with limited coping skills, making them more vulnerable to stressors encountered during higher education. This concern is partly reflected in the increasing use of mental health services in "top universities like National Taiwan University and National Cheng Kung University, where the number of students seeking counseling has risen significantly in recent years (National Cheng Kung University, 2024; National Taiwan University, 2024). These trends emphasize the ongoing mental health needs within highly competitive academic settings.

Both delayed graduation and leave of absence were associated with increased suicide risk in our study. The finding is consistent with evidence from Japan, where university students repeating academic years and those who were held back were found to have increased suicide risk (Uchida & Uchida, 2017). Similarly, studies from the UK found an increased suicide risk among students who had been suspended from university (McLaughlin & Gunnell, 2021). A recent study from Japan also reported increased suicide rates among postgraduate students who had taken a temporary leave of absence (Marutani et al., 2024), highlighting the mental health needs associated with disrupted academic progression.

A notable finding from our study was the markedly increased (6.0-fold higher) suicide risk among university students with special education needs. Although limited research has addressed suicide risk in this subgroup within higher education settings, prior

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studies noted increased vulnerability to suicidal behavior among students with disabilities (Wachter & Bouck, 2008). A survey study from the US also showed that students with disabilities were three times more likely to have suicide attempts compared to their non-disabled peers (Aguilar & Lipson, 2021). In Taiwan, students categorized as having special education needs include those with physical disabilities or emotional and behavioral disorders. These groups may experience distinct psychosocial stressors and support needs. Further research is needed to investigate the mental health needs and pathways leading to increased suicide risk among students with special education needs, particularly within the context of higher education.

In contrast to previous studies, we did not observe an overall sex difference in suicide risk among university students. Prior studies consistently demonstrated higher suicide rates among male university students compared to their female counterparts (Gunnell et al., 2020; Lageborn et al., 2017; McLaughlin & Gunnell, 2021; Uchida & Uchida, 2017). In Taiwan, recent suicide trends in young people aged 10-24 showed a greater increase in females than in males (Chang et al., 2023), and one of the factors contributing to this pattern could be the more rapid increase in suicide by jumping in young females than males (Chang & Chang, 2023). Furthermore, our sex-stratified analyses found that certain characteristics, including being aged 23-29, taking a leave of absence, delayed graduation, and having special education needs, were more strongly associated with suicide risk among female students than male students.

One possible explanation for the stronger association between factors such as being aged 23–29, taking a leave of absence, delayed graduation, or having special education needs and suicide risk among female students may be related to culturally influenced gender roles and societal expectations. In Taiwan and other East Asian societies, women often face intense pressure to conform to normative timelines for education, employment,

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marriage, and family. Since women's social value is usually linked to family roles, pursuing personal goals can create conflicting pressures (Iida, 2022). As a result, deviations from expected academic or career paths, such as taking a leave of absence or experiencing delayed graduation, may be seen as personal failure, leading to social stigma, family criticism, and increased feelings of frustration, shame, or isolation. These pressures, connected to traditional gender role expectations, may thus contribute to the higher suicide risk among female students. However, few studies have examined sex as a moderator of academic or sociodemographic risk factors, and our findings highlight the need for further research into sex-specific mechanisms behind suicide risk in university students.

Our finding of varying suicide risk across different majors of study among university students adds to a small but growing body of evidence. We identified a higher suicide risk among undergraduate students majoring in Humanities, Foreign Languages, Local Languages, Journalism and Library Information, and Social Welfare compared to the overall population. A recent Swedish study showed higher suicide risk among female students in nursing and natural sciences compared to those majoring in education (Lageborn et al., 2023). Another Japanese study showed elevated suicide risk among medical students and lower risk among those in the humanities (Uchida & Uchida, 2017). By contrast, our data did not show increased risk among undergraduate students majoring in nursing or medicine and health sciences. The inconsistency of findings across countries may be attributable to differences in the classification of study majors, study periods, or some country-specific contextual factors influencing suicide risk by major of study. It is possible that students with pre-existing vulnerabilities to suicide may be more likely to enter certain majors of study (Lageborn et al., 2023). Alternatively, the unique stressors encountered within specific majors, such as academic demands or limited perceived

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career prospects, may contribute to psychological distress during university years. In Taiwan, recent years have seen rapid industrial growth in technology and engineering, leading to significantly varying starting salaries for graduates across different majors. For example, graduates from engineering or computer science majors typically receive higher starting salaries, while those from arts, humanities, and journalism majors often face lower initial salaries (Ministry of Labor, 2025). This salary disparity may cause students in certain lower-paying fields to develop a more pessimistic outlook about their future, potentially contributing to increased psychological pressure and suicide risk.

4.4 Implications

The findings of this study have several implications for future research and suicide prevention strategies in university settings. First, the associations between suicide risk and certain characteristics, such as age, residence, year of study, major of study, and special education status, highlight the importance of targeted, group-specific interventions. For instance, older students, or those experiencing leave of absence or delayed graduation, may require focused support to address academic uncertainty, psychological distress, and social isolation, suggesting a need for community outreach and online mental health support.

Second, the higher suicide risk among students from “top” universities points to the potential adverse impact of highly competitive academic environments. Future studies should examine how institutional culture, high expectations, and perfectionism contribute to psychological distress. Preventions that promote healthy achievement and increase mental health awareness in students, teachers, and staff across universities may be especially relevant in higher education settings.

Third, this study shows that both leave of absence and delayed graduation are associated with higher suicide risk. Universities could regard such academic disruptions

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as early warning signs and implement some surveillance or screening services to identify and support students in need. Reintegration support could include both academic and psychological resources. Additionally, students with special education needs showed markedly higher suicide risk, indicating gaps in support in the university setting. Institutions should re-evaluate the accessibility and effectiveness of services for these students, addressing difficulties in academic, social, and psychological adjustment through inclusive and responsive mental health care.

Lastly, the differential impact of certain risk factors by sex, such as the increased suicide risk associated with leave of absence, delayed graduation, and special education status among female students, highlights the importance of sex-sensitive approaches in both prevention and intervention. Future research should explore how potential sex-specific vulnerability to academic and sociodemographic stressors in university students. This is particularly urgent in light of the greater increase in suicide rates in female students than male students in Taiwan.

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5. Conclusion

This study identified several sociodemographic and academic characteristics associated with increased suicide risk among university students in Taiwan. These included an older age, living in private rental housing, delayed graduation, taking a leave of absence, attending “top” universities, and having special education needs. Elevated suicide risk was also found in students with specific majors of study, including Humanities, Foreign Languages, Local Languages, Journalism and Library Information, and Social Welfare. These findings highlight the importance of developing targeted mental health and suicide prevention strategies for these student groups within universities. Efforts should focus not only on strengthening campus-based mental health services but also on addressing environmental and academic stressors that may contribute to mental health problems and increased suicide risk.

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Tables

Table 1 Rate ratios and population attributable fractions of suicide among university students with different characteristics in Taiwan, 2018-2023 (N=363)

	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)
Sociodemographic characteristics						
Sex						
Female	171 (47.1)	3,091,644	5.53	1.00		
Male	192 (52.9)	3,167,055	6.06	1.10	(0.89 , 1.35)	4.64
Age						
17-22	239 (65.8)	5,267,436	4.54	1.00		
23-29	124 (34.2)	991,263	12.51	2.76	(2.22 , 3.42)	21.77
Residence[a]						
Home	148 (42.7)	3,408,664	4.34	1.00		
Student dorm	52 (15.0)	1,481,260	3.51	0.81	(0.59 , 1.11)	-4.75
Rental	147 (42.4)	1,368,775	10.74	2.47	(1.97 , 3.11)	24.37
Academic characteristics						
Type of university						
Public-Comprehensive	101 (27.8)	1,695,112	5.96	1.00		
Public-Science and technology	32 (8.8)	702,948	4.55	0.76	(0.51 , 1.14)	-2.72
Private-Comprehensive	114 (31.4)	1,791,308	6.36	1.07	(0.82 , 1.40)	1.91
Private-Science and technology	116 (32.0)	2,069,331	5.61	0.94	(0.72 , 1.23)	-2.00
Top university						
No	308 (84.8)	5,573,271	5.53	1.00		
Yes	55 (15.2)	685,428	8.02	1.45	(1.09 , 1.93)	4.72
Postgraduates						
No	331 (91.2)	5,553,980	5.96	1.00		
Yes	32 (8.8)	704,720	4.54	0.76	(0.53 , 1.10)	-2.75
Leave of absence						
No	322 (88.7)	5,767,754	5.58	1.00		
Yes	41 (11.3)	490,945	8.35	1.50	(1.08 , 2.07)	3.74
Special educational needs[b]						
No	249 (92.6)	4,119,014	6.05	1.00		
Yes	20 (7.4)	55,020	36.35	6.01	(3.81 , 9.48)	6.20
Overseas students						
No	341 (93.9)	5,927,647	5.75	1.00		
Yes	22 (6.1)	331,052	6.65	1.16	(0.75 , 1.78)	0.81

[a] Information for residence was missing in 16 suicides.

[b] Data for the "Special educational needs" category became available from 2020.

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Table 2 Rate ratios and population attributable fractions of suicide among university students with different characteristics by sex in Taiwan, 2018-2023 (N=363)

	Male						Female						Interaction p value for rate ratios
	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	
Sociodemographic characteristics													
Age													0.016
17-22	131 (68.2)	2,601,245	5.04	1.00			108 (63.2)	2,666,191	4.05	1.00			
23-29	61 (31.8)	565,810	10.78	2.14	(1.58 , 2.90)	16.93	63 (36.8)	425,453	14.81	3.66	(2.68 , 4.99)	26.76	
Residence[a]													0.56
Home	82 (44.3)	1,763,340	4.65	1.00			66 (40.7)	1,645,324	4.01	1.00			
Student dorm	26 (14.1)	663,978	3.92	0.84	(0.54 , 1.31)	-3.42	26 (16.0)	817,282	3.18	0.79	(0.50 , 1.25)	-5.79	
Rental	77 (41.6)	739,737	10.41	2.24	(1.64 , 3.06)	22.44	70 (43.2)	629,038	11.13	2.77	(1.98 , 3.88)	26.52	
Academic characteristics													
Type of university													0.68
Public-Comprehensive	53 (27.6)	909,774	5.83	1.00			48 (28.1)	785,337	6.11	1.00			
Public-Science and technology	22 (11.5)	408,309	5.39	0.92	(0.56 , 1.52)	-0.98	10 (5.8)	294,639	3.39	0.56	(0.28 , 1.10)	-4.43	
Private-Comprehensive	57 (29.7)	837,523	6.81	1.17	(0.80 , 1.70)	4.26	57 (33.3)	953,785	5.98	0.98	(0.67 , 1.44)	-0.69	
Private-Science and technology	60 (31.3)	1,011,449	5.93	1.02	(0.70 , 1.47)	0.58	56 (32.7)	1,057,883	5.29	0.87	(0.59 , 1.27)	-4.80	
Top													0.27
No	162 (84.4)	2,759,238	5.87	1.00			146 (85.4)	2,814,033	5.19	1.00			
Yes	30 (15.6)	407,817	7.36	1.25	(0.85 , 1.85)	3.15	25 (14.6)	277,611	9.01	1.74	(1.14 , 2.65)	6.20	
Postgraduates													0.95
No	173 (90.1)	2,761,900	6.26	1.00			158 (92.4)	2,792,080	5.66	1.00			
Yes	19 (9.9)	405,155	4.69	0.75	(0.47 , 1.20)	-3.32	13 (7.6)	299,565	4.34	0.77	(0.44 , 1.35)	-2.31	
Leave of absence													0.038
No	175 (91.1)	2,897,862	6.04	1.00			147 (86.0)	2,868,940	5.12	1.00			
Yes	17 (8.9)	269,193	6.32	1.05	(0.64 , 1.72)	0.39	24 (14.0)	222,704	10.78	2.10	(1.37 , 3.24)	7.36	

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Table 2 (Continued)

	Male						Female						Interaction p value for rate ratios
	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	
Special educational needs[b]													0.009
No	132 (94.3)	2,068,947	6.38	1.00			117 (90.7)	2,050,067	5.71	1.00			
Yes	8 (5.7)	37,039	21.60	3.39	(1.66 , 6.91)	4.03	12 (9.3)	17,982	66.73	11.69	(6.46 , 21.18)	8.51	
Overseas students													0.74
No	181 (94.3)	2,997,646	6.04	1.00			160 (93.6)	2,929,915	5.46	1.00			
Yes	11 (5.7)	169,409	6.49	1.08	(0.59 , 1.98)	0.40	11 (6.4)	161,730	6.80	1.25	(0.68 , 2.29)	1.27	

[a] Information for residence was missing in 16 suicides.

[b] Data for the "Special educational needs" category became available from 2020.

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Table 3 Rate ratios and population attributable fractions of suicide among undergraduate (n=331) and postgraduate (n=32) students with different characteristics in Taiwan, 2018-2023

	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)
Undergraduates only						
Age						
17-22	239 (72.2)	5,131,045	4.66	1.00		
23-29	92 (27.8)	422,935	21.75	4.67	(3.67 , 5.94)	21.84
Top						
No	290 (87.6)	5,117,495	5.67	1.00		
Yes	41 (12.4)	436,485	9.39	1.66	(1.20 , 2.30)	4.91
Year of study[a]						
Second or later year	229 (73.4)	4,030,504	5.68	1.00		
First year	53 (17.0)	1,238,979	4.28	0.75	(0.56 , 1.02)	-5.83
Delay Graduation	30 (9.6)	284,496	10.54	1.86	(1.27 , 2.72)	4.20
Division of continuing education						
No	289 (87.3)	4,678,147	6.18	1.00		
Yes	42 (12.7)	875,832	4.80	0.78	(0.56 , 1.07)	-3.66
Postgraduates only						
Top						
No	18 (56.3)	455,776	3.95	1.00		
Yes	14 (43.8)	248,943	5.62	1.42	(0.71 , 2.86)	13.03
In-service students						
No	31 (96.9)	519,069	5.97	1.00		
Yes	1 (3.1)	185,651	0.54	0.09	(0.01 , 0.66)	-31.52

[a] Information for the year of study was missing in 19 suicides.

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Table 4 Rate ratios of and population attributable fractions suicide among undergraduate and postgraduate students with different characteristics by sex in Taiwan, 2018-2023 (N=363)

	Male						Female						Interaction p value for rate ratios
	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	
Undergraduates only													
Age													0.005
17-22	131 (75.7)	2,519,862	5.20	1.00			108 (68.4)	2,611,183	4.14	1.00			
23-29	42 (24.3)	242,038	17.35	3.34	(2.36 , 4.73)	17.00	50 (31.6)	180,897	27.64	6.68	(4.78 , 9.34)	26.91	
Top													0.45
No	151 (87.3)	2,513,109	6.01	1.00			139 (88.0)	2,604,386	5.34	1.00			
Yes	22 (12.7)	248,791	8.84	1.47	(0.94 , 2.30)	4.08	19 (12.0)	187,694	10.12	1.90	(1.17 , 3.06)	5.69	
Year of study[a]													0.001
Second or later year	129 (79.6)	1,954,019	6.60	1.00			100 (66.7)	2,076,485	4.82	1.00			
First year	24 (14.8)	639,533	3.75	0.57	(0.37 , 0.88)	-11.10	29 (19.3)	599,447	4.84	1.00	(0.66 , 1.52)	0.10	
Delay Graduation	9 (5.6)	168,348	5.35	0.81	(0.41 , 1.59)	-1.17	21 (14.0)	116,148	18.08	3.75	(2.35 , 6.01)	10.28	
Division of continuing education													0.26
No	153 (88.4)	2,296,609	6.66	1.00			136 (86.1)	2,381,538	5.71	1.00			
Yes	20 (11.6)	465,291	4.30	0.65	(0.40 , 1.03)	-6.36	22 (13.9)	410,542	5.36	0.94	(0.60 , 1.47)	-0.91	
Postgraduates only													
Top													0.43
No	11 (57.9)	246,129	4.47	1.00			7 (53.8)	209,648	3.34	1.00			
Yes	8 (42.1)	159,026	5.03	1.13	(0.45 , 2.80)	4.70	6 (46.2)	89,917	6.67	2.00	(0.67 , 5.95)	23.06	
In-service students													1.00
No	19 (100.0)	309,116	6.15	1.00			12 (92.3)	209,952	5.72	1.00			
Yes	0 (0.0)	96,038	0.00	0.00		-31.07	1 (7.7)	89,613	1.12	0.20	(0.03 , 1.50)	-31.71	

[a] Information for the year of study was missing in 19 suicides.

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Table 5 Rate ratios and population attributable fractions of suicide among undergraduate students in different majors of study in Taiwan, 2018-2023 (N=330)

University major category	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)
All	330 (100.0)	5,707,735	5.78			
Education	8 (2.7)	117,235	6.82	1.18	(0.59 , 2.38)	0.37
Arts	34 (9.8)	508,607	6.68	1.16	(0.81 , 1.65)	1.37
Humanities	8 (3.1)	61,094	13.09	2.26	(1.12 , 4.57)	1.34
Foreign language	31 (9.4)	339,408	9.13	1.58	(1.09 , 2.28)	3.33
Local language	10 (3.5)	83,934	11.91	2.06	(1.10 , 3.87)	1.54
Social and behavioral sciences	16 (4.7)	169,794	9.42	1.63	(0.99 , 2.69)	1.84
Journalism and library information	10 (3.1)	88,615	11.28	1.95	(1.04 , 3.66)	1.46
Business	24 (7.4)	534,569	4.49	0.78	(0.51 , 1.18)	-2.14
Management and administration	21 (6.6)	461,028	4.56	0.71	(0.45 , 1.13)	-2.37
Law	5 (1.2)	79,145	6.32	1.09	(0.45 , 2.64)	0.13
Natural sciences, mathematics and statistics	16 (4.3)	276,734	5.78	1.00	(0.61 , 1.65)	0.00
Information and communication technologies	17 (5.9)	400,963	4.24	0.73	(0.45 , 1.19)	-1.91
Engineering	40 (11.3)	935,578	4.28	0.74	(0.53 , 1.03)	-4.46
Manufacturing and construction	8 (2.3)	188,713	4.24	0.73	(0.36 , 1.48)	-0.89
Agriculture, forestry, fisheries and veterinary medicine	7 (2.7)	81,871	8.55	1.48	(0.70 , 3.13)	0.68
Medicine and health science	20 (6.3)	263,258	7.60	1.31	(0.84 , 2.06)	1.43
Nursing	14 (3.9)	233,715	5.99	1.04	(0.61 , 1.77)	0.15
Social welfare	17 (3.5)	154,426	11.01	1.90	(1.17 , 3.10)	2.39
Services related	5 (1.6)	180,955	2.76	0.48	(0.20 , 1.16)	-1.68
Hotel, catering and tourism	21 (6.6)	548,095	3.83	0.66	(0.43 , 1.03)	-3.35

*Information for study major was missing in six males and five females.

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Appendix

Appendix Table 1. Subjects and codes included in the university majors in the broader major categories

University major category	Code	Detailed field
Education	01111	General education
	01112	Adult education
	01113	Special education
	01114	Education administration
	01115	Curriculum and instruction
	01116	Education technology
	01117	Educational assessment, testing and measurement
	01118	Vocational and technological education
	01121	Teacher education for pre-school teachers
	01131	Teacher education for general subject area
	01141	Teacher education for specific subject area
	01199	Other education
Arts	02111	Visual arts
	02112	Visual communication design
	02121	Applied arts
	02122	General design
	02123	Products design
	02124	Spatial design
	02125	Fashion design and management
	02131	Fine art
	02132	Sculpture
	02141	Arts and crafts
	02142	Folk arts
	02151	Music
	02152	Performing arts
	02191	General arts
	02192	Art administration
	02199	Other arts
Humanities	02211	Religion
	02221	History
	02222	Anthropology and ethnology
	02223	Documentation

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	02231	Philosophy
	02299	Humanities not elsewhere classified
Foreign language	02311	Foreign languages and literatures
	02312	Translation and interpretation
	02313	Chinese as a second language
	02399	Other languages and literatures
Local language	02321	Taiwan languages and literatures
	02322	Chinese languages and literatures
	02323	Mandarin Chinese
Social and behavioral sciences	03111	Economics
	03121	Political science
	03122	International relations
	03131	Psychology
	03141	Sociology
	03142	Geography
	03143	Area studies
	03191	Development studies
	03199	Other social and behavioral sciences
Journalism and library information	03211	Mass communications
	03212	Journalism
	03213	Electronic media
	03214	Communications
	03221	Museums
	03222	Library and archival science
	03299	Other journalism and library information
Business	04111	Accounting and taxation
	04121	Finance
	04122	Public finance
	04123	Insurance and risk management
	04141	International trade
	04142	Public relations
	04143	Marketing and advertising
	04161	Wholesale and retail sales
	04191	General business
	04199	Other business and administration
Management and administration	04131	Business administration
	04132	Logistics management

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	04133	Medical management
	04134	Public administration
Law	04211	General law
	04212	Professional law
	04299	Other law
Natural sciences, mathematics and statistics	05111	Biology
	05121	Biotechnology
	05122	Microbiology
	05123	Biochemistry
	05124	Bioinformatics and genetics
	05191	Nutrition science
	05199	Other life sciences
	05211	Environmental resources
	05212	Ecology
	05221	Natural environments and wildlife
	05291	Safety and hazards-resistant
	05292	Soil and water conservation
	05299	Other environment
	05311	Chemistry
	05321	Geoscience
	05322	Atmospheric and space sciences
	05323	Marine science
	05331	Physics and applied physice
	05332	Astronomy
	05399	Other physical sciences, chemistry and earth sciences
	05411	Mathematics
	05421	Statistics
	05499	Other mathematics and statistics
Information and communication technologies	06111	Computer use
	06121	Database and network design and administration
	06131	Information technology
	06132	Software development
	06133	System design
	06134	Computer applications
	06199	Other information and communication technologies
Engineering	07111	Chemical engineering
	07112	Material engineering

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	07121	Environmental engineering
	07122	River and ocean engineering
	07131	Nuclear engineering
	07132	Energy engineering
	07141	Electrical and electronic engineering
	07151	Mechanical engineering
	07161	Vehicle engineering
	07162	Aerospace engineering
	07163	Naval architecture engineering
	07191	Industrial engineering
	07192	Textile engineering
	07193	Biomedical engineering
	07194	Interdisciplinary engineering
	07199	Other engineering and engineering trades
Manufacturing and construction	07211	Food science
	07231	Textiles
	07241	Mining and extraction
	07311	Architecture
	07312	Landscape design
	07313	Urban planning
	07321	Civil engineering
	07322	Surveying engineering
	07399	Other architecture and construction
Agriculture, forestry, fisheries and veterinary medicine	08111	Crop production
	08112	Livestock production
	08121	Horticulture
	08191	Agricultural chemistry
	08192	Agricultural biotechnology
	08193	Agricultural economics and extension
	08194	Plant protection
	08199	Other agriculture
	08211	Forestry and forest product
	08311	Fishery science
	08312	Aquaculture
	08411	Veterinary medicine
Medicine and health sciences	09111	Dentistry and dental science
	09121	Medicine and medical science

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	09141	Medical laboratory and technology
	09151	Physical therapy
	09152	Occupational therapy
	09153	Speech language pathology and audiology
	09159	Other therapy and rehabilitation
	09161	Pharmacy and pharmaceutical science
	09171	Traditional and complementary medicine and therapy
	09191	Public health services
	09199	Other medicine and health related topics
Nursing	09131	Nursing and midwifery
Social welfare	09211	Gerontological services
	09212	Care of the disabled
	09221	Child care and youth services
	09231	Social work
	09299	Other social welfare
Services related	10111	Domestic services
	10121	Hair and beauty services
	10141	Athletics
	10142	Sports exercise science and technology
	10221	Occupational health and safety
	10321	Law enforcement
	10411	Transportation management
	10412	Shipping management
	10413	Air transportation management
	10414	Navigation service
	10499	Other transport services
Hotel, catering and tourism	10131	Hotel and catering
	10151	Travel and tourism
	10152	Recreation sports and leisure
	10199	Other hospitality, tourism and personal service

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Appendix Table 2. Rate ratios and population attributable fractions of suicide among undergraduate students in different majors of study by sex in Taiwan, 2018-2023 (N=330)

	Male						Female						
University major category	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	N (%)	Person years	Rate (per 100,000)	Rate ratio	(95% CI)	PAF(%)	Interaction p value for rate ratios
All	172 (100.0)	2,822,875	6.09	1.00			158 (100.0)	2,884,860	5.48	1.00			
Education	4 (2.3)	39,929	10.02	1.64	(0.61 , 4.43)	0.90	4 (2.5)	77,306	5.17	0.94	(0.35 , 2.55)	-0.15	0.44
Arts	11 (6.4)	185,818	5.92	0.97	(0.53 , 1.79)	-0.19	23 (14.4)	322,789	7.13	1.30	(0.84 , 2.01)	3.26	0.45
Humanities	4 (2.3)	29,604	13.51	2.22	(0.82 , 5.98)	1.26	4 (2.5)	31,490	12.70	2.32	(0.86 , 6.26)	1.42	0.95
Foreign language	13 (7.6)	104,048	12.49	2.05	(1.17 , 3.60)	3.73	18 (11.3)	235,360	7.65	1.40	(0.86 , 2.27)	3.13	0.31
Local language	3 (1.7)	24,487	12.25	2.01	(0.64 , 6.30)	0.87	7 (4.4)	59,447	11.78	2.15	(1.01 , 4.58)	2.31	0.92
Social and behavioral sciences	5 (2.9)	72,689	6.88	1.13	(0.46 , 2.75)	0.33	11 (6.9)	97,105	11.33	2.07	(1.12 , 3.81)	3.47	0.27
Journalism and library information	4 (2.3)	29,683	13.48	2.21	(0.82 , 5.96)	1.26	6 (3.8)	58,932	10.18	1.86	(0.82 , 4.20)	1.72	0.79
Business	11 (6.4)	212,438	5.18	0.85	(0.46 , 1.56)	-1.14	13 (8.1)	322,132	4.04	0.74	(0.42 , 1.30)	-3.03	0.74
Management and administration	10 (5.8)	191,265	5.23	0.86	(0.45 , 1.62)	-0.97	9 (6.9)	269,763	4.08	0.61	(0.31 , 1.19)	-3.79	0.47
Law	4 (2.3)	35,590	11.24	1.84	(0.68 , 4.97)	1.05	1 (0.6)	43,555	2.30	0.42	(0.06 , 2.99)	-0.88	0.19
Natural sciences, mathematics and statistics	11 (6.4)	157,738	6.97	1.14	(0.62 , 2.11)	0.80	5 (3.1)	118,996	4.20	0.77	(0.31 , 1.87)	-0.97	0.47
Information and communication technologies	12 (7.0)	288,688	4.16	0.68	(0.38 , 1.22)	-3.36	5 (3.1)	112,275	4.45	0.81	(0.33 , 1.98)	-0.73	0.75
Engineering	39 (22.7)	799,531	4.88	0.80	(0.57 , 1.13)	-5.99	1 (0.6)	136,047	0.74	0.13	(0.02 , 0.96)	-4.26	0.080
Manufacturing and construction	5 (2.9)	114,022	4.39	0.72	(0.30 , 1.75)	-1.15	3 (1.9)	74,691	4.02	0.73	(0.23 , 2.30)	-0.70	0.98
Agriculture, forestry, fisheries and veterinary medicine	5 (2.9)	44,204	11.31	1.86	(0.76 , 4.52)	1.32	2 (1.3)	37,667	5.31	0.97	(0.24 , 3.91)	-0.04	0.44
Medicine and health sciences	9 (5.2)	115,458	7.80	1.28	(0.65 , 2.50)	1.13	11 (6.9)	147,800	7.44	1.36	(0.74 , 2.50)	1.81	0.90
Nursing	1 (0.6)	30,277	3.30	0.54	(0.08 , 3.87)	-0.49	13 (8.1)	203,438	6.39	1.17	(0.66 , 2.05)	1.16	0.46
Social welfare	6 (3.5)	27,134	22.11	3.63	(1.61 , 8.19)	2.46	11 (6.9)	127,292	8.64	1.58	(0.86 , 2.91)	2.49	0.11
Services related	3 (1.7)	67,732	4.43	0.73	(0.23 , 2.28)	-0.66	2 (1.3)	113,223	1.77	0.32	(0.08 , 1.30)	-2.73	0.38
Hotel, catering and tourism	12 (7.0)	252,542	4.75	0.78	(0.43 , 1.40)	-2.01	9 (5.6)	295,553	3.05	0.56	(0.28 , 1.09)	-4.77	0.46

*Information for study major was missing in six males and five females.

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