

# Suicidality at the intersection of sex, sexual orientation, and gender expression among secondary school students in Hong Kong: a population-based study



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## Summary

**Background** Previous suicide research has seldom examined the collective impact of multiple social identities/positions, and suicidality among sexual and gender minority adolescents remains understudied in Chinese contexts. Using intersectionality as both a theoretical and analytical framework, we investigate the combined effects of sex, gender expression, and sexual orientation on suicidal ideation and suicide attempts among secondary school students in Hong Kong.

**Methods** Data from 8023 adolescents (mean age = 14.76, SD = 1.66; 44.56% girls) who participated in the 2021 wave of the Youth Sexuality Study (YSS) were included in analysis. Multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) estimated the prevalence of suicidal ideation and suicide attempts for adolescents across various combinations of social identities/positions (i.e., sex x gender expression x sexual orientation), assessed the extent to which these identities/positions accounted for the total variance in suicide behaviors, and examined the interactive intersectional effects (i.e., two-way or higher-level interactions) between the identities/positions.

**Findings** Girls categorized as non-heterosexual with nonconforming gender expression, girls categorized as non-heterosexual with neutral gender expression, and boys categorized as non-heterosexual with nonconforming gender expression reported the highest prevalence of suicidal ideation and suicide attempts. The total variance in suicidal ideation and suicide attempts attributable to the identities/positions were 12.60% and 10.50%, respectively. However, there were no significant interactive intersectional effects.

**Interpretation** Adolescents with multiple marginalized identities/positions showed the highest prevalence of suicidal ideation and suicide attempts. Comprehensive suicide prevention strategies should go beyond individual-level risk factors and promote holistic systemic changes. Intervention solely targeting one identity/position may not be sufficient.

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**Keywords:** Suicide; Adolescents; Sexual orientation; Gender expression; Intersectionality; Multilevel analysis

## Introduction

Suicide is a major global public health concern, claiming over 720,000 lives annually and ranking as one of the leading causes of death among adolescents.<sup>1</sup> In China, the suicide rate among adolescents aged 10 to 19 sharply increased from 1.59 to 2.83 per 100,000 people

between 2017 and 2021, posing new challenges to suicide prevention efforts.<sup>2</sup>

Suicidal ideation and suicide attempts are strong predictors of suicide death, disproportionately impacting certain population groups. Apart from biological factors, social factors have been identified to significantly

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### Research in context

#### Evidence before this study

We conducted a comprehensive search of PubMed and Web of Science for peer-reviewed articles published before August 09, 2024, using the following search terms: ("sexual minorit\*" OR "gender minorit\*" OR LGBT\* OR "sexual orientation" OR "gender identity" OR transgender OR "gender expression") AND (adolescen\* OR "middle school" OR "high school" OR "young people" OR children).

The existing research on suicide behaviors among Chinese sexual and gender minority adolescents is limited compared to Western contexts. Notably, no large-scale studies have been conducted in Hong Kong, where the sociocultural context is recognized to be different from other Chinese societies. Moreover, the predominant global literature has neglected to investigate how the intersection of multiple social identities and positions collectively shapes suicide risks. This constitutes a critical gap, as each individual possesses a unique combination of identities/positions, which consequently exposes them to varying degrees of risk within the broader social structures.

#### Added value of this study

Adopting an intersectionality perspective, this study marks a pioneering effort to examine how the intersectional effect of sex, gender expression, and sexual orientation influence suicidality among adolescents. Leveraging a large and representative sample of Hong Kong secondary school students, it enriched the currently limited knowledge of

suicide behaviors among sexual and gender minority adolescents in Chinese cultural settings.

By employing a novel analytical method called multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA), the findings revealed the substantial impact of these intersecting identities (i.e., sex, gender expression, and sexual orientation), with 12.60% and 10.50% of the total variance in suicidal ideation and suicide attempt being attributable to them. The highest prevalence of suicide behaviors was found among the groups with multiple marginalized identities/positions, i.e., girls categorized as non-heterosexual with nonconforming gender expression, girls categorized as non-heterosexual with neutral gender expression, and boys categorized as non-heterosexual with nonconforming gender expression.

#### Implications of all the available evidence

Identity- and position-based disadvantages are evident in suicide behaviors among adolescents. Comprehensive suicide prevention strategies should extend beyond individual-level risk factors to dismantle the systemic barriers contributing to suicidality. Interventions that focus solely on one identity or position may prove inadequate. Integrated programs that address the complex interplay of various identities and positions should be developed to promote resilience and improved mental health outcomes for adolescents from diverse backgrounds.

contribute to suicidality.<sup>3</sup> In other words, health disparities in suicidal tendencies also stem from the historical and current inequalities embedded in social structures. Gender and sexuality, as feminist theorists have consistently argued, are two intrinsically-intertwined systems of oppression that serve to establish and perpetuate patriarchal social structures, systematically disadvantaging and marginalizing women, gender minorities, and sexual minorities across various aspects of life.<sup>4</sup> The ideologies that distinguish between men's and women's social and economic roles, such as the traditional gendered divisions of labor, are built upon the reinforcement of heterosexual, monogamous relationships.<sup>5,6</sup> Thus, upholding and legitimizing the subjugation of women necessitates the marginalization of non-heterosexual and transgender identities/positions.<sup>4</sup> This interconnected nature of oppression rooted in sexism and heterosexism has been coined as "heteropatriarchy" in previous studies.<sup>4,7</sup>

Adolescence is a period of intense identity formation, heavily influenced by the internalization of social norms, including gender and sexual norms that perpetuate the impact of heteropatriarchy.<sup>8</sup> For sexual and gender minority adolescents, this journey is further complicated by societal stigma and potential family rejection.<sup>9</sup> Compared

to adults, these adolescents have less autonomy, fewer resources and support, and face greater challenges in navigating systems and advocating for their needs. Furthermore, the continued endorsement of inequitable gender and sexual norms by adolescents can reinforce the existing hierarchies, with lasting consequences across the lifespan and for future generations.<sup>8</sup> Therefore, research and policy initiatives focused on advancing equity should prioritize adolescent perspectives and experiences.

Although the terms "sex" and "gender" are often used interchangeably, there are debates about differences between them. According to Krieger,<sup>10</sup> sex refers to sex assigned at birth, which is "a biological construct premised upon biological characteristics enabling sexual reproduction", while gender is "a social construct regarding culture-bound conventions, roles, and behaviors for, as well as relations between and among, women and men and boys and girls". However, Springer et al.,<sup>11</sup> have questioned the conceptual distinction between "sex" and "gender," contending that the two are inextricably linked, given the presence of complex phenomena that are simultaneously biological and social. Therefore, while our study adopted the term "sex" to reflect our measurement of biological sex, we wish to emphasize that biological sex has its social meaning in

terms of the gender roles determined by the male-dominated social system.<sup>12</sup>

Sex differences in suicidal ideation and suicide attempts have consistently been observed among adolescents, with girls exhibiting a higher likelihood of experiencing these issues.<sup>13,14</sup> Gender operates as a social construct that imposes societal expectations and norms upon individuals based on their assigned gender, rather than being an inherent nature. Consequently, the manifestation of gender can either conform to or deviate from one's expected gender roles (e.g., masculinity or femininity) within a specific context. Such visible conformity or nonconformity is often referred to as gender expression.<sup>15</sup> Studies have indicated that adolescents with nonconforming gender expression face increased vulnerability to bullying, psychological distress, suicidal ideation, and suicide attempts.<sup>16,17</sup> Similarly, as a 2018 systematic review of thirty-five studies indicated, sexual minority youth also experience elevated risks of suicidality compared to their heterosexual counterparts.<sup>18</sup>

Despite the established relationships between the aforementioned identities/positions (sex, gender expression, sexual orientation) and suicide behaviors, research on sexual and gender minority adolescents within Chinese contexts is relatively scarce. We identified two large-scale surveys of Chinese secondary school students. The first revealed that adolescents with same-sex romantic attraction and those with both-sex romantic attraction are more likely to experience suicide behaviors in the past year compared to their heterosexual and unsure peers.<sup>19</sup> The second indicated a higher risk of suicidality among transgender and gender nonconforming adolescents compared to their cisgender counterparts.<sup>20</sup> The cultural background of Chinese society is widely recognized to be distinct from that of Western societies. In the contemporary Chinese collectivist context, family remains the most fundamental social institution, with filial piety (*xiao*) holding significant importance.<sup>21</sup> Rooted in Confucian values, the obligation to have children and continue the family lineage is considered essential, and failure to fulfill this duty constitutes a serious act of filial insubordination, undermining the family's reputation (*mianzi*), which is prioritized over individual preferences.<sup>21</sup> This cultural context poses significant challenges and stigmatization for sexual and gender minorities, as their identities and practices may be viewed as conflicting with societal expectations and the preservation of family reputation in China.<sup>21,22</sup> A national Chinese population survey found that nearly one-third of respondents were unwilling to interact with sexual and gender minority groups.<sup>23</sup> The sociocultural context is further complicated in Hong Kong, where traditional Confucian values coexist with Christian influences stemming from the city's history as a former British colony. The Christian ideal upholds a heterosexual, monogamous, and lifelong model of marriage, with any deviation, such as non-

heterosexuality, often viewed as less acceptable or even condemned as sinful and immoral.<sup>21</sup> Moreover, faith-based organizations play a significant role in the operation of social services in Hong Kong, with a large proportion of primary and secondary schools being Christianity-associated.<sup>24</sup> Consequently, the sociocultural climate of Hong Kong is predominantly heteronormative, including within the education system, where anti-discrimination laws, inclusive school policy, and programs addressing homophobic and transphobic bullying are largely nonexistent or inadequate.<sup>25</sup> Notably, there is a lack of large-scale studies examining mental health and suicide behaviors among sexual and gender minority adolescents in Hong Kong.

Furthermore, no previous studies have investigated the collective impact of identities/positions on suicide behaviors among adolescents, neglecting the fact that each individual possesses a unique combination of social identities/positions which consequently exposes them to varying degrees of risk within the framework of heteropatriarchy. It also remains unknown to what extent the variations in suicidal ideation and suicide attempts among adolescents can be ascribed to the identities/positions that have been shaped by the construct of heteropatriarchy.

Therefore, we adopted an intersectionality perspective to guide the present study. Intersectionality is a theoretical and analytic framework positing that 1) individuals' experiences are collectively shaped by their overlapping identities/positions, and 2) the individual-level experiences are directly reflective of, and informed by, the interlocking structural discriminations (e.g., sexism, heterosexism).<sup>26</sup> The term intersectionality was first proposed academically to describe the oppression faced by black women,<sup>27</sup> and was later extended to other social identities/positions (e.g., sexuality, disability) that reflect a hierarchy of social power. We hypothesized that the incorporation of an intersectionality lens into suicide research may benefit suicide prevention in two significant ways: 1) directing the intervention efforts beyond individual-level processes and toward the systemic causes that disproportionately impact marginalized groups, and 2) identifying the high-risk intersectional groups which may need tailored interventions that effectively address their unique needs and circumstances.<sup>28</sup>

A novel method known as multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) has been proposed for quantitative intersectionality research. Multilevel modeling, which has been extensively applied in psychology and population health studies, is designed to analyze data with a hierarchical or nested structure. Common examples include patients (Level 1) nested within hospitals (Level 2). Following this idea, MAIHDA models individuals at the first level of analysis and the social strata defined by intersectional identities/positions at level 2. Each

stratum represents a distinct combination of the examined identities/positions, such as girls (sex) identified as non-heterosexual (sexual orientation) with non-conforming gender expression (gender expression). This method allows for estimating the prevalence of outcome for each stratum, measuring both between- and within-stratum variance, and examining intersectional effects across a large number of strata. Compared to traditional approaches (e.g., single-level regression with interaction terms), MAIHDA presents significant methodological advantages in modeling intersectionality including model scalability and parsimony, enhanced interpretability, and the automatic precision-weighting of all estimates via shrinkage.<sup>29–34</sup> Theoretically, MAIHDA treats the social strata as contextual factors and assumes that they equally influence the outcome, which is more conceptually consistent with intersectionality.<sup>26</sup> There has been increasing utilization of MAIHDA to explore health equity issues through an intersectionality lens.<sup>26,28,35</sup> However, the application of this novel analytical approach in suicide research has only been found in one study.<sup>28</sup> This study investigated suicidal thoughts and behaviors (STBs) at the intersection of gender, sexual orientation, race/ethnicity, and rurality in a sample of 189,800 adults in the USA.<sup>28</sup> It reported the highest STB rates among multiply marginalized groups, such as Hispanic and non-Hispanic Black bisexual women living in more rural areas.<sup>28</sup>

In summary, our study aimed to address the under-researched area of the influence of sexual orientation and gender expression on suicidality among Chinese adolescents, and in particular, the absence of an intersectionality perspective to examine the impact of heteropatriarchy. We investigated how sex, gender expression, and sexual orientation collectively contributed to suicidal ideation and suicide attempts within a representative sample of secondary school students in Hong Kong, using the newly-developed MAIHDA analytical approach.

## Methods

### Data

The data used in this study was extracted from the 2021 wave of the Youth Sexuality Study (YSS). The YSS, conducted by The Family Planning Association of Hong Kong (FPAHK), is a territory-wide survey targeting full-time students enrolled in Chinese-speaking secondary schools in Hong Kong, which represent over 90% of the secondary school student population.<sup>36</sup> The education system prior to tertiary education in Hong Kong was organized in a 6-3-3 structure, which consists of six years of primary school, three years of junior secondary school, and three years of senior secondary school. Consequently, secondary school students are generally between the ages of 12 and 18 years.

With the provision of 12 years of free primary and secondary education through public sector schools, secondary school students constitute the majority of Hong Kong adolescents. According to the data from Census and Statistics Department and Education Bureau,<sup>36,37</sup> Hong Kong had 333,362 adolescents aged between 12 and 17 in 2021, and 325,927 full-time students enrolled in secondary schools in 2021/22 school year.

Initiated in 1981, YSS has been conducted every five years. To ensure a representative sample, a cluster sampling was performed during the data collection in 2021, with schools serving as the sampling units and the four districts of Hong Kong (Hong Kong Island, Kowloon, New Territories West, and New Territories East) as the sampling clusters. The list of schools was obtained from the Education Bureau of the Hong Kong Special Administrative Region Government. Of the 455 schools in the sampling pool, 25 participated, and all students ( $n = 10,681$ ) were invited to the investigation between May and July 2021. With an overall response rate of 78.1%, 8343 participants were included in the dataset. Given that no more than 5% missing values were detected for the variables of interest, listwise deletion was applied, leading to a final sample size of 8023 for analysis. The flowchart detailing the construction of the analytic sample is presented in Fig. 1.

Informed consent to participate in the study was obtained from the participants or their legal guardian, stating that the participation was completely voluntary and anonymous. To prevent any potential bias, teachers were instructed to refrain from interacting with students during the survey process. Ethical approval was obtained from the Human Research Ethics Committee of the University of Hong Kong (HREC Number = EA200333).

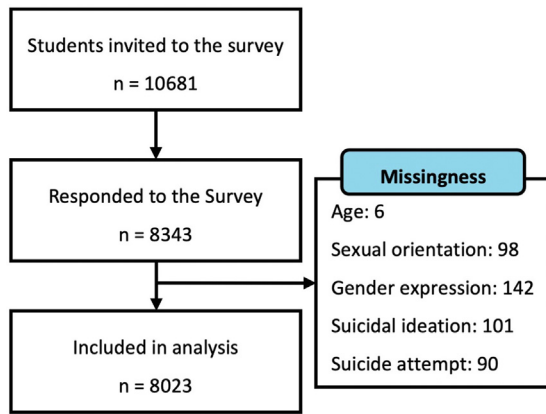
### Measures

Two outcome variables from the YSS study were examined: suicidal ideation and suicide attempts, with respondents indicating whether they had experienced each within the past 12 months.

The YSS incorporated measures of biological development, such as menstruation and nocturnal emission. Accordingly, the questionnaires were designed and distributed separately for boys and girls, with school-teachers administering the appropriate version based on the biological sex of the respondents.

In measuring sexual orientation, seven categories were employed in the survey, encompassing heterosexuality, homosexuality, bisexuality, pansexuality, asexuality, others, and don't know. However, due to limited numbers of respondents in some categories, options 2 to 6 were merged, resulting in a condensed three-category variable (i.e., heterosexuality, non-heterosexuality, and don't know).

Gender expression was measured by asking respondents to indicate the extent to which their perceived or expressed gender conformed to societal expectations



**Fig. 1:** Flowchart of analytic sample construction from the 2021 Youth Sexuality Study.

of masculinity or femininity. Responses were recorded on an 11-point scale, ranging from 0 (completely conforming) to 10 (completely nonconforming), with 5 as the midpoint. Due to small numbers in some options on the original scale, we transformed this scale into a three-category variable for analysis: scores 0–4 represented conforming gender expression, a score of 5 indicated neutral gender expression, and scores 6–10 denoted nonconforming gender expression.

The summary statistics for the original measures of sexual orientation and gender expression are presented in [Appendix Table S1](#). Due to insufficient sample sizes, we were unable to incorporate other social identities or positions, such as race/ethnicity, into analysis, and adjusting for these variables is not appropriate in a descriptive intersectional context.<sup>38</sup> Nonetheless, we included them in descriptive analysis to better contextualize the sample.

### Data analysis

Multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) was conducted to examine how sex, sexual orientation, and gender expression collectively impacted on suicidal ideation, and suicide attempts in the past 12 months, with individuals (Level 1) nested within intersectional social strata (i.e., every possible combination of sex, sexual orientation, and gender expression, 16 strata, Level 2). Two kinds of models were built. The first kind was an age-adjusted simple intersectional model. This was a multilevel logistic model with random intercepts for social strata that conflated additive and interaction effects:

$$\text{logit}(\text{Outcome}_{ij}) = \beta_0 + \beta_1 \text{Age}_{ij} + \mu_j \quad (1)$$

where  $\text{Outcome}_{ij}$  was the probability of suicidal ideation/suicide attempts for individual  $i$  in social stratum  $j$ ;  $\beta_0$ , the intercept, indicated the log-odds of the outcome for an “average” stratum;  $\mu_j$ , the stratum residuals, represented

the random effects that quantified the extent to which the log-odds of the outcome in social stratum  $j$  deviated from that of the “average” stratum, and  $\beta_1$  was the log-odds of the outcome for age. Based on this model, we estimated the predicted prevalence of the outcome variables for each social stratum by converting the stratum-specific log-odds into probabilities, and calculated the Variance Partition Coefficient (VPC) to assess the proportion of total variance in the outcome determined by between-strata differences, using the latent response formulation:

$$\text{VPC} = \frac{\sigma_u^2}{\sigma_u^2 + \pi^2/3} \times 100\% \quad (2)$$

where  $\sigma_u^2$  was the variance between strata and  $\pi^2/3$  represented the non-estimated within-stratum variance which was set to correspond to the variance of the standard logistic distribution.

The second kind was an age-adjusted intersectional interaction model that incorporated sex, sexual orientation, and gender expression as fixed effects:

$$\begin{aligned} \text{logit}(\text{Outcome}_{ij}) = & \beta_0 + \beta_1 \text{Age}_{ij} + \beta_2 X_{1ij} + \beta_3 X_{2ij} \\ & + \beta_4 X_{3ij} + \beta_5 X_{4ij} + \beta_6 X_{5ij} + \mu_j \end{aligned} \quad (3)$$

where  $\beta_{2-6}$  were the log-odds of the outcome for their respective social identity/position dimensions; and  $\text{Outcome}_{ij}$ ,  $\beta_0$ ,  $\beta_1$ , and  $\mu_j$  had the same meanings as in equation (1).

This model not only estimates the odds ratios (ORs) and 95% credible intervals for each social identity/position dimension but also allows for the “removal” of additive effects from these dimensions, which in turn means that the stratum-level residual terms capture the excess risk due to interactive intersectional effect (i.e., two-way or higher-level interactions between strata). We also re-calculated the VPC and computed the Proportional Change in Variance (PCV), which quantifies the extent to which the total between-stratum variance can be attributed to the additive effects:

$$\text{PCV} = \frac{\sigma_{u(1)}^2 - \sigma_{u(2)}^2}{\sigma_{u(1)}^2} \times 100\% \quad (4)$$

where  $\sigma_{u(1)}^2$  and  $\sigma_{u(2)}^2$  are the between-stratum variances from the simple intersectional model and intersectional interaction model respectively.

To estimate the models using Markov Chain Monte Carlo (MCMC) method, we employed the R package “brms” for our analysis. Vague prior probability distributions were specified for all parameters. A burn-in period of 5000 iterations and 10,000 total iterations were adopted in the estimation. The posterior samples were evaluated by visual inspection of trace plots and formal assessment of the Gelman-Rubin diagnostic, which indicated model convergence.



### Role of the funding source

The funding source had no role in the study design; data collection, analysis, or interpretation; writing of the report; or decision to submit the article for publication.

### Results

8023 adolescents (mean age = 14.76, SD = 1.66) were included in the analysis. The descriptive statistics of the study variables are shown in [Table 1](#). 21.21% of respondents reported having considered suicide in the past 12 months, while 6.46% indicated they had attempted suicide during this period. The sample sizes and observed prevalence of suicidal ideation and suicide attempts for 16 social strata are detailed in [Appendix Table S2](#).

In simple intersectional models ([Table 2](#)), the VPCs identified that the total variance in suicidal ideation and suicide attempts attributable to between-stratum differences was 12.60% and 10.50%, respectively. [Figs. 2 and 3](#) present the predicted prevalence and corresponding 95% credible intervals of suicidal ideation and suicide attempts for each intersectional stratum. Substantial heterogeneity was evident, with prevalence estimates ranging from 9.8% to 47.1% for suicidal ideation and from 3.5% to 19.1% for suicide attempts. Marginalized strata, comprising adolescents with non-heterosexual orientation and/or non-conforming or neutral gender expression, exhibited higher prevalence estimates for both outcomes. The highest prevalence of

suicidal ideation was observed among girls categorized as non-heterosexual with nonconforming gender expression (47.1%, 95% CI: 41.6%–54.1%), followed by girls categorized as non-heterosexual with neutral gender expression (44.8%, 95% CI: 38.2%–50.8%), and boys categorized as non-heterosexual with nonconforming gender expression (35.9%, 95% CI: 25.3%–45.3%). Similar patterns were found in the prevalence estimates of suicide attempts, with the highest value observed among girls categorized as non-heterosexual with neutral gender expression (19.1%, 95% CI: 14.4%–24.7%), followed by girls categorized as non-heterosexual with nonconforming gender expression (17.3%, 95% CI: 12.3%–22.0%), and boys categorized as non-heterosexual with nonconforming gender expression (15.2%, 95% CI: 9.9%–21.8%).

In the age-adjusted intersectional interaction model of suicidal ideation, the variance partition coefficient (VPC) and proportion of conditional variance (PCV) were 0.17% and 98.80% respectively, suggesting that almost all the between-stratum variance in suicidal ideation can be attributed to the additive main effects of sex, gender expression, and sexual orientation. The model of suicide attempts yielded similar results with a VPC of 0.52% and a PCV of 95.52%. None of the interactive intersectional effects were significant (see [Appendix Table S3](#)). Upon examining the unitary terms ([Table 2](#)), it was evident that strata including girls had a noticeably higher likelihood of experiencing suicidal ideation (OR = 1.86, 95% CI: 1.64–2.22) and suicide attempts (OR = 1.73, 95% CI: 1.36–2.41), as did strata including adolescents with nonconforming gender expression (suicidal ideation: OR = 1.55, 95% CI: 1.25–1.78; suicide attempt: OR = 1.73, 95% CI: 1.26–2.47). Strata including non-heterosexual adolescents were more prone to have suicidal ideation (OR = 1.93, 95% CI: 1.59–2.44) and suicide attempts (OR = 2.31, 95% CI: 1.67–2.91), while strata including adolescents uncertain about sexual orientation were less likely to experience suicidal ideation (OR = 0.70, 95% CI: 0.59–0.88).

### Discussion

To the best of our knowledge, this study is the first attempt to explore the effect of sex, gender expression, and sexual orientation on suicidality among adolescents, not only within the sociocultural context of Chinese (Hong Kong) society, but also as a pioneering endeavor in global research. The observed disparities across the intersectional strata accounted for a considerable proportion of the total variance in suicide behaviors among adolescents, implying that the impact of the identities/positions (i.e., sex, gender expression, and sexual orientation) is substantial. It is crucial to acknowledge that these identity/position-based disadvantages are not solely attributed to biological factors but are deeply ingrained in the oppression system of heteropatriarchy. Consequently,

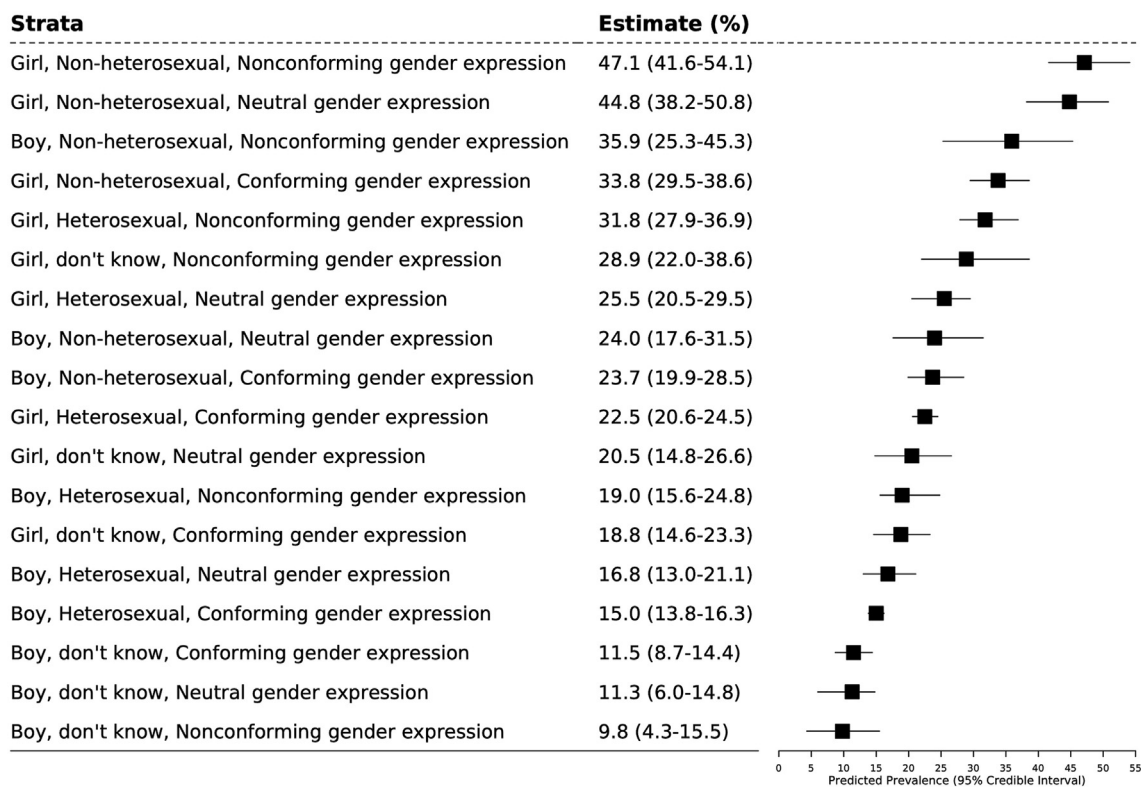
Variables	n (%)
Dimensions of social identity/position	
Sex	
Boy	4448 (55.44)
Girl	3575 (44.56)
Gender expression	
Conforming	5675 (70.73)
Neutral	1277 (15.92)
Nonconforming	1071 (13.35)
Sexual orientation	
Heterosexual	5345 (66.62)
Non-heterosexual	1374 (17.13)
Don't know	1304 (16.25)
Covariates	
Race/ethnicity	
Chinese	7848 (97.97)
Non-Chinese	163 (2.03)
Birthplace	
Hong Kong	6389 (79.76)
Outside Hong Kong	1621 (20.24)
Outcomes	
Suicidal ideation	1702 (21.21)
Suicide attempt	518 (6.46)

**Table 1:** Descriptive analysis of study variables (n = 8023).

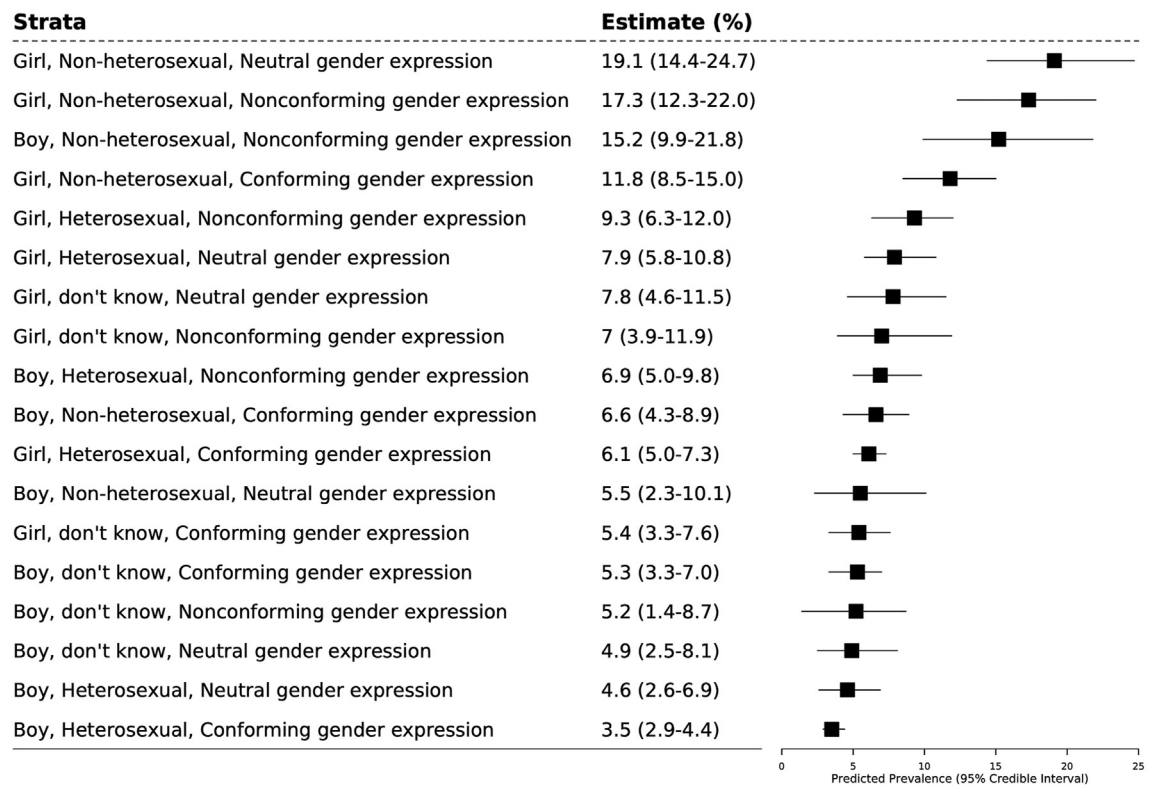
Fixed effects	Suicidal ideation		Suicide attempt	
	Simple model	Interaction model	Simple model	Interaction model
	OR (95% CI)		OR (95% CI)	
Intercept	0.31 (0.17, 0.56)	0.18 (0.10, 0.31)	0.07 (0.03, 0.16)	0.03 (0.01, 0.09)
Age	1.00 (0.97, 1.03)	1.00 (0.96, 1.03)	1.01 (0.95, 1.06)	1.00 (0.94, 1.06)
Sex (ref: Boy)				
Girl		1.86 (1.64, 2.22)		1.73 (1.36, 2.41)
Gender expression (ref: Conforming)				
Neutral		1.18 (0.97, 1.41)		1.38 (0.95, 1.85)
Nonconforming		1.55 (1.25, 1.78)		1.73 (1.26, 2.47)
Sexual orientation (ref: Heterosexual)				
Non-heterosexual		1.93 (1.59, 2.44)		2.31 (1.67, 2.91)
Don't know		0.70 (0.59, 0.88)		0.97 (0.69, 1.38)
Random Effects	Estimate (95% CI)		Estimate (95% CI)	
Between-stratum variance	0.69 (0.47, 1.08)	0.08 (0.003, 0.19)	0.62 (0.41, 0.92)	0.13 (0.005, 0.38)
Summary statistics				
Variance partition coefficient (VPC)	12.60%	0.17%	10.50%	0.52%
Proportional change in variance (PCV)		98.80%		95.52%

Simple model = age-adjusted simple intersectional model, Interaction model = age-adjusted intersectional interaction model, OR = odds ratio, CI = credible interval. The absence of one in the credible interval suggests that the OR is significant.

**Table 2: Parameter estimates for simple intersectional models and intersectional interaction models (n = 8023).**



**Fig. 2:** Predicted prevalence of suicidal ideation and the 95% CIs for every intersectional stratum. **Note.** Squares indicate the predicted prevalence of suicidal ideation for each social stratum; whiskers represent 95% credible intervals.



**Fig. 3:** Predicted prevalence of suicide attempts and the 95% CIs for every intersectional stratum. **Note.** Squares indicate the predicted prevalence of suicide attempts for each social stratum; whiskers represent the 95% credible intervals.

comprehensive suicide prevention efforts for adolescents should not only focus on identifying individual-level risk factors but also promote systemic changes.<sup>28</sup>

In recent decades, Hong Kong has made strides in advancing gender equality. However, research has paradoxically shown that more gender-equal areas may experience wider gender gaps in suicide rates and mental health issues,<sup>39,40</sup> possibly due to women and girls now facing a “double burden” - balancing increased economic and political participation alongside the persistence of traditional female responsibilities and social norms.<sup>39</sup> After all, substantive legal and societal progress towards gender equality is a relatively recent development, with the UN Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW) only being instituted in 1981.<sup>39</sup> Therefore, sustained efforts are necessary to systematically promote gender mainstreaming in Hong Kong, encompassing both the integration of gender perspectives into legislation, policies, and programs spanning all levels, as well as broader promotion among diverse social groups, including non-governmental organizations, businesses, and schools.<sup>41</sup> Introducing gender education during adolescence, when gender becomes a more significant socializing factor, could cultivate early gender awareness and self-awareness.<sup>41</sup>

Moreover, the existing anti-discrimination ordinances in Hong Kong prohibit discrimination against a person on the grounds of sex, marital status, pregnancy, disability, family status, and race, but they do not include protections based on sexual orientation and gender identity (SOGI).<sup>42</sup> Enacting SOGI-based anti-discrimination policies would provide a critical legal foundation for developing institutional support and mitigating societal biases against sexual and gender minority populations. Research has indicated that policies and practices aimed at mitigating homophobic and transphobic environments have a substantial impact on reducing the disparity in suicide rates among these groups.<sup>43,44</sup> In the educational setting, Taiwan’s Gender Equity Education Act offers valuable insights for Hong Kong.<sup>45</sup> The Act mandates that schools provide a safe, inclusive environment for all students, including SOGI-diverse populations, and requires all teachers to deliver ongoing gender equity education. Violations of the Act will result in penalties, including legal and financial consequences, based on their severity. Furthermore, developing and implementing ethical guidelines and training programs incorporating anti-prejudice content for educators, counselors, and social workers is essential.<sup>46</sup> The training should feature up-to-date evidence



and discussions on sexual and gender diversity issues while fostering safe spaces for these professionals to openly discuss their value dilemmas.<sup>25,47</sup> Facilitating intergroup contact, such as conversations with SOGI minority individuals and outreach to their communities, has also been suggested to help professionals build empathy and understanding, ultimately equipping them to better support and advocate for sexual and gender minority students in their practice.<sup>25,47</sup>

Based on a population-representative sample, we compared the prevalence of suicidal ideation and suicide attempts across a variety of intersectional groups of Hong Kong adolescents simultaneously and identified the heterogeneity within each identity/position. The highest prevalence was found among the groups with multiple marginalized identities/positions, i.e., girls categorized as non-heterosexual with nonconforming gender expression, girls categorized as non-heterosexual with neutral gender expression, and boys categorized as non-heterosexual with nonconforming gender expression. This finding aligns with other intersectionality studies that have demonstrated elevated health risks among individuals with multiple marginalized identities.<sup>26,28</sup> This highlights that intervention solely targeting one identity/position may not be sufficient. We recommend that policy and education should move beyond a one-size-fits-all approach and take into account the complex interplay of social identities/positions and power dynamics to ensure the inclusivity, equity, and effectiveness of the suicide prevention and intervention.

Our unitary term analyses confirmed the sex differences in suicidal ideation and suicide attempts and the vulnerability of adolescents with non-heterosexual orientation and those with nonconforming gender expression. Starting from early adolescence, females face an elevated susceptibility to internalizing disorders (e.g., depression, anxiety, and phobias), which means they bear a heavier load of fears and self-directed negative emotions, experiencing a heightened sense of loss, hopelessness, and feelings of helplessness to improve their circumstances.<sup>48</sup> Despite the biological differences, the specific suffering experienced by girls/women is also rooted in their economic and social circumstances.<sup>49</sup> Girls/women are usually socialized to be submissive, emotional, and tolerant, while boys/men are expected to be dominant and instrumental in their conduct.<sup>50</sup> These gender role expectations, along with the resulting socioeconomic disparities, potentially contribute to the increased vulnerability of girls/women to internalizing disorders and suicidal tendencies. In addition, the double burden of balancing increased economic and political participation and the persistence of traditional female responsibilities and social norms may represent another potential source of mental health challenges for girls/women.<sup>39</sup> However, it should be noted that gender role stereotypes also take a toll on boys/men's mental health. Traditional notions of

masculinity, which prioritize self-reliance, emotional stoicism, and toughness, can create barriers for them in addressing emotional struggles and seeking help.<sup>51</sup> This may also lead boys/men to resort to more violent and lethal methods of suicide, which serves as a potential explanation of gender paradox in suicide: while women experience suicidal ideation and suicide attempts more frequently, men have a higher rate of suicide mortality.<sup>52</sup> As a result, promoting gender equity and eliminating gender role stereotypes is crucial for improving health outcomes for both genders. For sexual and gender minority adolescents, they face unique stressors such as interpersonal prejudice and discrimination, concealment of their minority identities/positions, and internalized stigma within the heteropatriarchy discourse,<sup>53</sup> which contribute to their heightened vulnerability in terms of mental health and suicidality. We found that adolescents who responded "I don't know" to the question of sexual orientation had a lower level of suicidality than heterosexual adolescents. Some scholars have suggested that people who provide such kind of response may not fully understand the meaning of this question.<sup>54,55</sup> These people may be less sensitive to the impact of their identities/positions.

Typically, it is believed that men experience heightened societal pressure when deviating from traditional gender roles compared to women. For instance, previous research has shown that the association between gender nonconformity and anxiety/depressive symptoms is notably more pronounced among young men than young women.<sup>15</sup> However, our study did not find any significant interactive intersectional effect between these identities/positions. This may be due to the following factors: 1) our study considered a broader range of identity/position dimensions compared to previous studies, and 2) the sample size for certain strata may have been insufficient to detect interactive effects, as MAIHDA tends to generate more cautious estimates for smaller strata (typically those with multiple marginalized identities/positions) through shrinkage. It is also possible that no genuine interactive effect existed, however, this does not negate or undermine the concept of intersectionality. Rather than being viewed solely as a testable theory, intersectionality is better understood as an analytical framework that guides how we structure our questions.<sup>56</sup> Instead of focusing exclusively on statistical interactions, it is essential to acknowledge that the axes of marginalization collectively illuminate patterns of inequity.<sup>56</sup> We should prioritize addressing the needs of populations proportional to the harm they experience and challenge the oppressive systems that perpetuate these inequalities.<sup>56</sup>

### Limitations and future directions

First, due to data restriction, our analysis included a limited number of social identities/positions, which may have obscured variations among sexual orientations

and gender expressions. Prior studies have revealed that bisexual individuals face a higher risk of mental distress and suicidality compared to their gay/lesbian counterparts,<sup>57</sup> potentially attributed to reduced visibility and community support.<sup>58</sup> Knowledge of psychological distress among individuals with other sexual orientations, such as asexual and pansexual, remains limited. A study of Australian LGBTQ youth aged 14–21 compared suicidal ideation and suicide attempts among pansexual, asexual, and queer youth with those of gay youth, revealing that pansexual youth exhibited a higher risk of suicidal ideation compared to their gay peers, while no other significant differences were identified.<sup>59</sup> Additionally, a previous study of US high school students indicated significant variations in psychological distress between those with moderate and high levels of non-conforming gender expression.<sup>17</sup> Although we employed a different measurement and included a neutral gender expression option in our study, we may have lost some information by collapsing the categories of the original measure. Furthermore, we were unable to incorporate gender identity into analysis due to insufficient representation of transgender respondents, a challenge also encountered by other intersectionality studies, some of which have relied on imperfect proxies for gender identity.<sup>26,28,35</sup> To fill these gaps, future studies should leverage larger datasets that capture a broader range of sexual and gender identities or intentionally oversample minority populations to enable more nuanced intersectionality analyses. Second, we did not directly measure structural-level factors in our study, nor did we investigate the underlying mechanisms that contribute to the inequalities produced by the social identities/positions. In future studies, it may be valuable to explore the impact of the structural discrimination directly and identify potential mediators to better inform the intervention. Third, suicidality encompasses a spectrum of behaviors spanning from suicidal ideation to suicide attempts with varying degrees of medical severity, to completed suicide, which increases the complexity of the relationships between social identity/position and suicidality. For instance, although females exhibit higher rates of suicide attempts compared to males, the gender differences tend to diminish as the severity of suicide attempts increases.<sup>60</sup> Future studies could consider incorporating suicide attempts with different severity levels and completed suicides as outcomes. Fourth, while our sample represents more than 90% of the secondary school student population in Hong Kong, the generalizability of our findings may be constrained by the exclusion of adolescents enrolled in international schools, which typically have a more diverse racial and ethnic composition and may hold more progressive attitudes toward LGBTQ+ issues due to their global values, as well as those enrolled in special needs schools, residing in correctional facilities, or unable to

attend school for various reasons. Lastly, our results may be subject to social desirability bias, given the stigma associated with suicidality and minority identities/positions, although we attempted to mitigate this by assuring respondent anonymity and minimizing the influence of teachers during the survey process.

#### Contributors

Z.L. and P.S.F.Y. formulated the research question. Z.L. and P.S.F.Y. contributed to the analysis and methodology. Z.L. completed the draft of this paper, and P.S.F.Y. made critical suggestions and edits to the draft. Both authors have read and agreed to the final version of the manuscript.

#### Data sharing statement

The data that support the findings of this study are available from the Family Planning Association of Hong Kong, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Family Planning Association of Hong Kong.

#### Editor note

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#### Declaration of interests

None.

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#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.lanwpc.2024.101252>.

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