



Selling World Health Organization's Alcohol "Best Buys" and Other Recommended Interventions in an Urban Chinese Population: Public Acceptability of Alcohol Harms Reduction Strategies in Hong Kong

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Background: To counter the harms caused by alcohol use, the World Health Organization (WHO) outlined a series of evidence-based recommendations, including the highly cost-effective "Best Buys" recommendations. While many Western countries have been actively introducing alcohol harms reduction strategies, it is unclear whether these cost-effective policies would be publicly acceptable in Asian regions with traditionally low alcohol consumption. This study examines the public acceptability of WHO-recommended alcohol harms reduction strategies in an Asian city with few extant alcohol regulations.

Methods: A cross-sectional telephone survey of Hong Kong Chinese residents aged 18–74 ($n = 4,000$) was conducted from January to August 2018. Respondents were asked about their perceptions of various WHO-recommended strategies and consequences of their implementation. After reducing the strategies into several policy categories by principal component analysis, multivariable linear regression was performed to identify factors associated with endorsement of the various policies.

Results: Among the "Best Buys", introduction of moderate beer/wine taxes (68.7%) and shortened alcohol retail hours (51.9%) were the most supported while bans on event sponsorships (19.5%) and public drinking events (17.7%) were the least popular. Strategies targeting young drinkers were particularly highly supported. Males, younger adults, Non-abstainers, and those who believed in drinking's social benefits were less likely to endorse stringent control measures ($p < 0.05$). Adults with higher household income were less supportive, partially due to concerns about infringements on local economy, lifestyles, and economic freedom. Women and older people were generally more supportive, partially because they perceived these policies would lower alcohol-related harms.

Conclusion: In order to reduce barriers to implementing WHO-recommended strategies in the region, it is imperative to increase awareness of alcohol-related harms and to strengthen beliefs in the effectiveness of these countermeasures, especially among men, young adults, and drinkers.

Keywords: public opinion, acceptability, perception, alcohol, policy, Chinese, survey

INTRODUCTION

Excessive alcohol use ranks among the top risk factors for disease, disability, and death throughout the world, and is correlated with a wide range of social harms such as interpersonal violence, impaired work performance, and domestic problems (1). In response to the well-noted harms of alcohol use, the World Health Organization (WHO) outlined a set of comprehensive, evidence-based recommendations, including: 1) the most cost-effective “Best Buys” policy actions which call for increasing alcoholic beverage excise taxes, restricting access to retailed alcoholic beverages, and comprehensive advertising, promotion, and sponsorship bans; 2) other interventions related to drink-driving, minimum pricing, minimum purchase age, sponsorship restriction, information provision, and interventions targeting harmful drinking (2). Although policy decisions are largely based upon evidence of cost-effectiveness, public acceptability is also an important but comparatively under examined consideration. Greater public acceptability can reduce enforcement costs, increase policy sustainability as well as improve community involvement and compliance.

Previous studies, predominantly conducted in Western countries, have noted that public acceptability of alcohol policies varies by the policy nature and by respondents’ characteristics. Although proven to be effective in evaluations, restrictive policies designed to affect behaviors (e.g., limiting access to alcohol) are, in general, less popular than policies that are less intrusive (e.g., educational measures) (3–5). Policies that focus on young people or target certain groups of drinkers are consistently more supported than population-wide measures that potentially affect all drinkers (6–8). Studies across different settings have reported that women, older adults, and abstainer or light drinkers are significantly more supportive of a range of alcohol policies than men, younger people, and frequent or heavy drinkers (7, 9–15). Fewer studies have investigated the effect of socio-economic status, with generally inconsistent results reported (13, 16–19). Moreover, perception of alcohol use in general and of specific regulations could potentially mediate the individual’s attitudes toward alcohol policy. For example, awareness or experience of harms from alcohol (18, 20, 21), beliefs about the negative consequences of drinking behaviors (22), and greater perceived strategy effectiveness (7, 23) have been found to be associated with greater support for alcohol control measures.

The preponderance of the existing evidence comes from high-income, Western countries with notably high alcohol use levels, high prevalence of alcohol-related harms (24–26), and stringent alcohol policies already in place. Acceptability of policies designed to reduce alcohol-related harms such as

random breath testing and restricted retail sale hours, have often been debated in terms of infringements on citizen’s civil liberties (27, 28). In contrast, public acceptability toward alcohol policies remains largely unclear in Asian regions, including Hong Kong which is characterized as a region with much lower levels of civil liberties than Western European countries, the US, and Australia where alcohol policies are often publicly debated (29). Hong Kong is currently an autonomous, special administrative region of China with a westernized legal system, liberal capitalist economy, and free trade policies distinct from those of Mainland China, allowing for rapid expansion of alcohol markets. Although the alcohol consumption level in Hong Kong is historically lower than that of Western countries and some Asian countries such as Japan and South Korea (1, 30–32), alcohol is commonly consumed in festive occasions and for social purposes (33). A population-based survey has revealed that alcohol-related harms were commonplace in public settings, and one-fifth of the Hong Kong population had been adversely affected by others’ drinking on various occasions, involving harms to their health, work, and interpersonal relationship. Young people and heavy drinkers are noted to be at high risk of different types of alcohol-related harms (34). While many national governments have been increasing alcohol taxes to reduce alcohol-related harms, Hong Kong eliminated the 20% tax on beer and 40% tax on wine in 2008 as part of a strategic plan to make the city a regional alcohol trading center (35). This move has made Hong Kong one of the very few places in the world where beer and wine are completely untaxed. Subsequent increases were observed in the importation and consumption of alcohol, (30, 36) with concomitant upsurge in the number of liquor licenses (37–39). Despite this, Hong Kong currently possesses no restriction on time and place of alcohol sales or the density of alcohol outlets; alcohol promotion/advertising through social media and sponsorship are completely unregulated; there is currently no minimum pricing regulation or mandatory warning labels on alcohol containers. Although minimum alcohol purchasing age of 18 was enacted in 2018, the regulation has been noted to be under-enforced (40). Apart from stringent drink-driving laws which significantly reduced drinking-related traffic crashes (41) and brief intervention services provided in selected hospitals (42), the scope of Hong Kong’s alcohol control policies falls short of the WHO recommended strategies, especially the “Best Buys” on alcohol taxation, availability, and advertising. Although implementation of WHO recommendations would likely curb the increasing trend of alcohol use and subsequent harms, it is unclear whether public acceptability for adopting various alcohol harms reduction policies would be comparable

to Western countries such as the US in a region with low alcohol consumption culture and few regulatory measures.

To provide an evidence base for devising publicly-supported regulatory actions, this population-based survey examined the public acceptability and perceived consequences of various alcohol harms reduction strategies in Hong Kong. These policies include strategies that are based on WHO's "Best Buys" as well as other commonly promoted recommendations.

This study also attempts to identify the socio-demographic, attitudinal, and drinking-related factors associated with endorsement of various strategies, as well as the mediating effect of perception of policy consequences. The study results can help identify knowledge gaps in public understanding of alcohol-related issues and inform alcohol policy-making in Hong Kong as well as other economically-developed Asian regions.

TABLE 1 | Background characteristics of the study sample ($n = 4,000$).

	Males ($n = 1,737$)	Females ($n = 2,263$)		Total ($n = 4,000$)	Hong Kong population ^a
	% (n)	% (n)	$P(\chi^2)$	% (n)	%
Age (years)					
18–24	11.8 (205)	10.8 (245)	0.96	11.3 (450)	10.9
25–34	15.3 (265)	15.9 (359)		15.6 (624)	17.6
35–44	17.1 (297)	16.5 (374)		16.8 (671)	18.5
45–54	19.9 (345)	20.5 (463)		20.2 (808)	21.4
55–64	22.2 (386)	23.1 (522)		22.7 (908)	20.4
65–74	13.8 (239)	13.3 (300)		13.5 (539)	11.3
Marital status					
Currently married	64.9 (1,127)	69.9 (1,582)	0.002	67.7 (2,709)	61.1
Single, never married	33.7 (586)	28.6 (648)		30.9 (1,234)	30.4
Divorced/Widowed/Separated	1.0 (18)	1.2 (26)		1.1 (44)	8.5
Education					
Secondary or less	54.4 (937)	57.2 (1,288)	<0.001	56.0 (2,225)	65.1
Upper secondary Non-degree	7.1 (123)	7.0 (159)		7.1 (282)	11.4
University or above	38.1 (662)	35.6 (805)		36.7 (1,467)	23.5
Dependent children <18 years old					
No	81.0 (1,407)	79.1 (1,789)	0.18	79.9 (3,196)	NA
Yes	18.3 (318)	19.9 (451)		19.2 (769)	NA
Employment					
Employed at least part-time	67.7 (1,173)	43.9 (990)	<0.001	54.2 (2,163)	59.0
Homemaker	0.4 (6)	37.4 (846)		21.3 (852)	10.1
Unemployed	1.7 (29)	1.1 (25)		1.4 (54)	2.1
Full-time student	8.1 (114)	7.0 (158)		7.5 (299)	7.1
Retired	22.1 (383)	10.3 (234)		15.4 (617)	17.8
District of residence					
Hong Kong Island	19.1 (332)	18.2 (412)	0.03	18.6 (744)	16.4
Kowloon	32.1 (558)	28.9 (655)		30.2 (1,213)	30.7
New Territories	47.2 (820)	49.8 (1,127)		48.7 (1,947)	52.9
Monthly household income					
<25,000 HKD	34.5 (599)	38.8 (877)	<0.001	36.9 (1,476)	47.2
25,000–49,999 HKD	36.4 (633)	29.0 (657)		32.2 (1,290)	29.1
≥50,000 HKD	11.1 (193)	12.2 (275)		11.7 (468)	23.7
Drinking patterns					
Ever drinking	57.5 (999)	36.7 (830)	<0.001	45.7 (1,829)	NA
Past-year drinking	44.3 (769)	28.7 (649)	<0.001	35.5 (1,418)	NA
Binge drinking ^b	10.0 (174)	5.0 (112)	0.01	7.2 (286)	NA
Weekly drinking ^c	10.2 (177)	3.6 (82)	<0.001	6.5 (259)	NA

Totals for all categories may not sum to 4,000 due to missing data; NA, data not available.

^aBased on calculations from 2016 Population By-census.

^bHaving consumed five or more drinks on one occasion in the past 30 days.

^cHaving consumed alcohol at least once a week in the past year.

TABLE 2 | Endorsement of various alcohol harms reduction strategies, by past-year drinking status ($n = 4,000$).

Strategies	Supporting respondents %			Overall, $n = 4000$
	Past-year drinkers, $n = 1418$	Past-year abstainers, $n = 2582$	$P(\chi^2)$	
	% (95% CI)	% (95% CI)		% (95% CI)
“Best Buys”				
Increasing taxes				
Implementing a moderate beer and wine tax (e.g., 5–10%)	57.6% (55.0–60.2)	74.6% (72.9–76.3)	<0.001	68.7% (67.2–70.1)
Re-introducing a heavy 30% beer and wine tax	24.8% (22.6–27.1)	50.4% (48.5–52.4)	<0.001	41.4% (39.9–43.0)
Restricting physical availability of retailed alcohol				
Convenience stores not being permitted sell alcohol after a certain time	35.5% (33.0–38.0)	60.7% (58.8–62.6)	<0.001	51.9% (50.3–53.4)
Introducing “Last Order Times” in bars	30.0% (27.7–32.5)	52.2% (50.3–54.2)	<0.001	44.5% (42.9–46.0)
Restricting exposure to alcohol advertising				
Banning large alcohol advertisements on public billboards and public transport	23.7% (21.5–25.9)	40.9% (39.0–42.8)	<0.001	34.9% (33.4–36.4)
Banning all alcohol advertising on TV, radio, and magazines	21.5% (19.5–23.8)	41.1% (39.2–43.0)	<0.001	34.2% (32.8–35.7)
Greater social media regulation of alcohol advertisements	26.2% (24.0–28.6)	36.5% (34.7–38.4)	<0.001	32.9% (31.4–34.4)
Other WHO-recommended strategies				
More alcohol-related education especially for young people	93.5% (92.0–94.6)	97.6% (96.9–98.1)	<0.001	96.1% (95.5–96.7)
Enforcement of current random breath testing of drivers	88.8% (87.1–90.4)	94.4% (93.4–95.2)	<0.001	92.4% (91.6–93.2)
Drinking age verification at stores	79.1% (76.9–81.2)	86.0% (84.6–87.3)	<0.001	83.6% (82.4–84.7)
Increasing awareness of programmes like AA for problem drinkers	75.3% (73.0–77.5)	87.6% (86.2–88.8)	<0.001	83.3% (82.1–84.4)
Drinking age verification at bars and restaurants	76.3% (74.1–78.5)	84.1% (82.6–85.4)	<0.001	81.4% (80.1–82.6)
Mandatory health warning labels on alcoholic beverages and advertisements	59.2% (56.6–61.7)	76.3% (74.6–77.9)	<0.001	70.3% (68.8–71.7)
Limiting the number of alcohol serving establishments outside of the tourist areas	25.2% (23.0–27.5)	49.1% (47.1–51.0)	<0.001	40.7% (39.2–42.3)
Setting a minimum alcohol price	27.3% (25.1–29.7)	37.3% (35.4–39.2)	<0.001	33.7% (32.3–35.2)
Banning alcohol event sponsorship	14.4% (12.7–16.4)	22.3% (20.7–23.9)	<0.001	19.5% (18.3–20.8)
Restricting high publicity drinking events	9.7% (8.3–11.4)	22.1% (20.5–23.7)	<0.001	17.7% (16.5–18.9)

METHODS

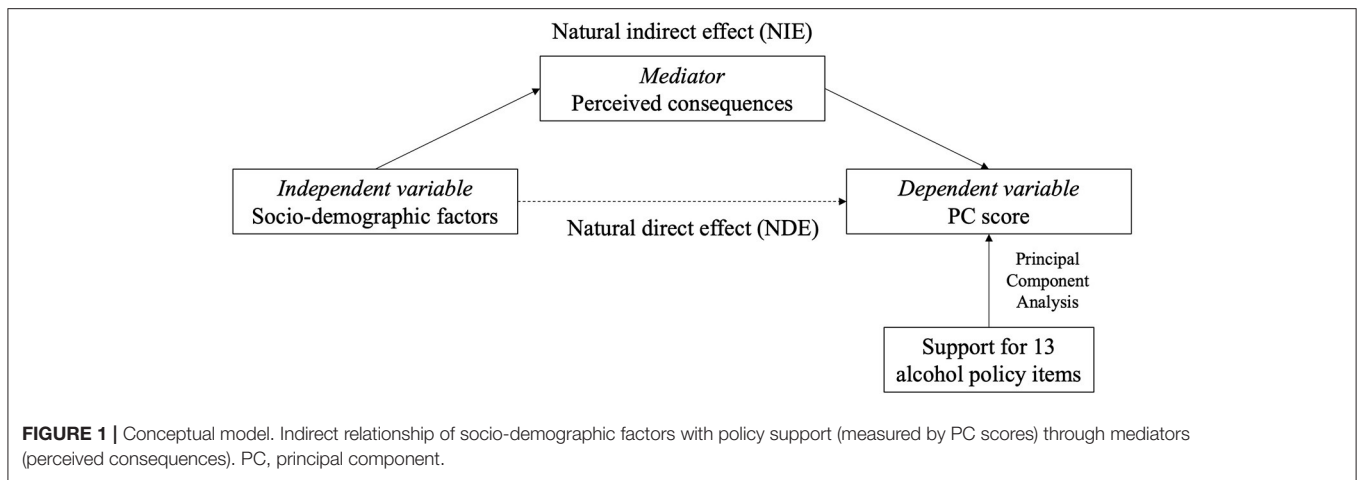
Chinese Hong Kong permanent residents were the target population of this study. An anonymous cross-sectional telephone survey using a structured questionnaire was conducted from January to August, 2018 in Cantonese. Random telephone numbers were selected from up-to-date telephone directories, which is a comprehensive list of landline numbers. For unanswered calls, four other independent calls were made at different times before considering the number to be invalid. The eligible individual whose birthday was the closest to the date of interview was invited to join the study. Verbal informed consent was obtained from respondents after assurances of anonymity. The response rate (completed interviews divided by the number of households contacted) was 62.5%. A final sample of 4,000 respondents was recruited and included in data analysis. Ethical approval was obtained from Ethics Committee of The Chinese University of Hong Kong.

Measurements

The study instrument asked the respondents for their socio-demographic information (Table 1). Respondents who reported ever drinking a full alcohol serving (a can of beer/a glass of wine/a shot of spirits) were classified as ever drinkers. Those who did so in the past 12 months were classified as past-year drinkers and those who had consumed at least five alcohol servings on

one occasion in the preceding 30 days were classified as past-month binge drinkers. Respondents who reported drinking at least once a week were classified as weekly drinkers. General attitudes toward alcohol use were assessed by asking respondents whether they think (yes/no): “alcohol is a public health issue in Hong Kong”, “habitual drinking is bad for health”, “occasional drinking is good for health”, “not knowing how to drink is bad for work”, and “drinking has noticeable social benefits”.

Based on the WHO’s “Best Buys” and other recommendations for reducing alcohol-related harms, the authors first compiled a list of measures that are commonly implemented in other regions. Then, 17 policies that are most relevant to the current policy gap of Hong Kong were included in the instrument under four main categories to assess the public acceptability (Table 2). Respondents were asked whether they support (support/no opinion/against): 1) tax increases: introducing a 30% beer/wine tax; implementing a moderate (5–10%) beer/wine tax; 2) restriction of retailed alcohol availability: introducing “last orders” in bars; reducing retailed alcohol sale time; limiting location of alcohol establishments; 3) advertisement restrictions: banning alcohol advertising on TV, radio, and magazines; regulating social media advertisement; banning large alcohol advertisement on public billboards/public transport; and 4) other regulations: ID request for alcohol purchases in stores/restaurants and bars; minimum alcohol pricing; restricting number of alcohol serving establishments outside of tourist



areas; banning alcohol event sponsorship; restricting high publicity drinking events; promoting alcohol-related education; mandating health warning labels; enforcing random breath test; promoting services for problem drinkers.

Prior to the commencement of the study, the authors conducted a focus group where drinking ($n = 5$) and Non-drinking ($n = 5$) participants who were purposively selected to represent a wide range of drinking levels, ages, and occupations were asked what they perceived to be the positive or negative consequences of various WHO-recommended strategies. A variety of answers were collected, for example, “it will be bad for business and the economy”, “it will negatively affect Hong Kong’s lifestyle”, “it will improve image of Hong Kong as a healthy city”, “it will make Hong Kong oppressive”, “it will save money on law enforcement”. Formulated based on these findings and pilot survey results, the instrument asks whether the respondents agree (yes/no) that implementing the various strategies would: 1) reduce alcohol-related harms in Hong Kong, 2) hurt business and the economy, 3) negatively affect local lifestyles, 4) infringe on economic freedom (applicable to marketing restrictions only), or 5) other.

Statistical Analysis

Principal component analysis (PCA) was conducted to identify the general pattern of the support for 17 items of alcohol policies recommended by the WHO, by linearly combining them into a smaller set of principal components (PCs) with minimum loss of information. The Kaiser-Meyer-Okin (KMO) measure was used to test the adequacy of sample size, which is indicated by a KMO value larger than 0.5. Bartlett’s sphericity test was conducted to examine whether the correlation between variables is satisfactory for PCA. PCs with eigenvalues larger than one were retained for further analyses according to Kaiser’s rule. Orthogonal varimax rotation was used to identify the group of policy items that are highly correlated with only one single PC. Given the sample size ($n = 4,000$), PC loadings of 0.3 or higher were considered significant for interpretative purposes (43). The analysis generated a score for

each identified PC for each participant, and this score was used as the indicator of support for different alcohol policy categories. To test the robustness of PCA results, sensitivity analysis was conducted: 1) because the assumption of PCA that the total variance is equal to common variance may not be fully met, we conducted a maximum likelihood factor analysis as an alternative approach for data reduction; 2) simple unit weighting was used to generate factor scores, calculated by the sum of items that load on a factor, and this factor score was used as the alternative indicator of support for different alcohol policy categories in multivariable models; 3) Cronbach’s alpha was calculated to test the coherency of items within each factor.

Univariable linear regression was conducted separately for each identified principal component to examine the association between demographics, attitudinal, and drinking-related factors and PC score. Variables that were significant at $p < 0.20$ level were further included in two sets of stepwise multivariable linear regression models (44). The first model included only socio-demographic candidate variables; the second “all variables model” included attitudinal and drinking-related candidate variables, with significant demographic factors controlled for. Coefficients (β) were reported with 95% confidence intervals (CIs). Statistical significance was set at $p < 0.05$. Due to a high percentage of missing data for income (19.2% of the sample), an “unknown” indicator variable was included as one of the income categories in the multivariable analyses. Statistical tests indicated that respondents with missing data on income were more likely to be young, highly educated, and employed ($p < 0.05$). Causal mediation analysis (45) was used to test the mediation effects of perceived consequences in any significant associations between the socio-demographic variables with the policy endorsement measured by PC scores (Figure 1). The total effect of socio-demographic factors on policy endorsement was decomposed into natural direct effect and natural indirect effect (mediation) through perceived consequences. All statistical analyses were performed using Stata 14.0 (Stata Corp LP, College Station, TX, USA).

TABLE 3 | Principal component analysis of 13 policy items by five principal components (PCs)—rotated PC loadings.

Alcohol policy item	Age verification for young drinkers	Taxation and pricing	Availability restriction	Advertisement restriction	Sponsorship and events restriction
Requesting ID at stores	0.706	0.001	0.008	-0.002	-0.002
Requesting ID at bars and restaurants	0.706	0.001	-0.003	0.007	0.001
Implementing a moderate beer and wine tax	-0.001	0.719	-0.016	0.042	-0.185
Re-introducing a heavy 30% beer and wine tax	-0.054	0.373	0.094	0.153	0.060
Setting a minimum alcohol price	0.027	0.581	-0.017	-0.129	0.275
Convenience stores not being permitted to sell alcohol after a certain time	0.012	-0.005	0.601	0.003	-0.033
Introducing “Last Order” in bars	0.005	-0.012	0.585	0.031	-0.054
Limiting the number of alcohol serving establishments outside of the tourist areas	-0.014	-0.008	0.535	-0.054	0.101
Banning large alcohol advertisements on public billboards and public transport	0.001	0.009	-0.004	0.592	-0.010
Banning all alcohol advertising on TV, radio, and magazines	0.001	0.007	-0.002	0.597	-0.031
Greater social media regulation of alcohol advertisements	0.013	-0.042	-0.005	0.497	0.104
Banning alcohol event sponsorship	0.006	-0.054	-0.015	0.019	0.661
Restricting high publicity drinking events	-0.010	-0.013	0.006	0.003	0.651

PC, principal component. Bold values indicate the policy items loaded on each principal component.

RESULTS

This study sampled 1,737 male and 2,263 female Hong Kong residents. The demographic characteristics of the study sample (Table 1) were comparable to the Hong Kong Census population (46) in gender, age, and area of residence. However, our sample had a higher proportion of university-educated adults and a lower proportion of high-income individuals compared to the general population. Our overall sample had a higher proportion of housewives, which is likely due to the extensive calling hours of the telephone survey. The proportions of ever drinker and past-year drinker were 57.5 and 44.3% among males and 36.7 and 28.7% among females. Of all respondents, 7.2% were past-month binge drinkers and 6.5% drank at least once a week.

Acceptability of the WHO “Best Buys” and Other Recommendations

Among all the WHO “Best Buys”, the most publicly-supported strategies were introducing 5–10% beer/wine taxes (68.7%), restricting alcohol retail hours (51.9%), and limiting bar service hours (44.5%) (Table 2). Among other WHO-recommended strategies, there was very high public support for interventions such as youth-oriented education (96.1%), enforcement of random breath tests (92.4%), and age verification for alcohol purchases at stores (83.6%) and at bars/restaurants (81.4%). By contrast, the least popular measures were sponsorship bans on high-publicity events such as concerts and sporting events (19.5%) and bans on public drinking events (e.g., Hong Kong Wine Festival) (17.7%). Past-year abstainers are significantly more supportive of all strategies than past-year drinkers ($p < 0.05$).

Socio-Demographic and Attitudinal Factors Associated With Strategy Endorsement

The result of Bartlett’s sphericity test ($p < 0.001$) suggested that the correlation between various policy items was satisfactory, and a KMO value of 0.77 indicated an adequate study sample size for PCA. Following Kaiser’s rule, six PCs were retained, which explained a total of 71.9% of the variance. All of the 17 policy items assessed had at least one rotated PC loading above 0.3 and therefore none were excluded from the model (43). The PC structure and rotated PC loadings are displayed in Supplementary Table 1. Of the 17 policy items, 13 were reduced into five components which were labeled as “Age Verification for Young Drinkers”, “Taxation and Pricing”, “Availability Restriction”, “Advertising Restriction”, and “Sponsorship and Events Restriction”. The remaining four policy items (enforcing random breath test, mandating health warning labels, promoting services for alcoholics, and promoting alcohol-related education), which were collapsed under the same “Other policies” component, did not appear to represent a conceptually coherent factor and none of these items are part of the WHO “Best Buys”. This component was therefore excluded from further analysis. Subsequently, we reran the PCA after excluding these four policy items and confirmed that the same five PCs above were identified (Bartlett’s sphericity test $p < 0.001$; KMO = 0.76; 78.4% of variance explained) (Table 3). The determinants for each of these five PCs were examined using univariable and multivariable regression analyses where PC score was the dependent variable (Table 4).

Results of the socio-demographic regression model showed that female respondents and older adults were significantly more supportive of all policy categories than males and younger adults.

TABLE 4 | Socio-demographic, attitudinal, and drinking-related factors associated with endorsement of alcohol harms reduction strategies measured by PC scores.

	Age verification for young drinkers		Taxation and pricing		Availability restriction		Advertising restriction		Sponsorship and events restriction	
	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b
Socio-demographic factors	<i>Coef. (95% CI)</i>		<i>Coef. (95% CI)</i>		<i>Coef. (95% CI)</i>		<i>Coef. (95% CI)</i>		<i>Coef. (95% CI)</i>	
Gender										
Male	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Female	0.32 (0.24, 0.41) [†]	0.29 (0.21, 0.38) [†]	0.15 (0.07, 0.22) [†]	0.11 (0.04, 0.18) [§]	0.34 (0.25, 0.44) [†]	0.34 (0.25, 0.44) [†]	0.32 (0.22, 0.42) [†]	0.24 (0.14, 0.34) [†]	0.25 (0.17, 0.34) [†]	0.19 (0.11, 0.28) [†]
Age										
18–34	Ref.	Ref.	Ref.	Ref.	1.00	Ref.	Ref.	Ref.	Ref.	Ref.
35–54	0.11 (0.01, 0.22) [*]	0.05 (–0.05, 0.16)	0.14 (0.02, 0.36) [*]	0.09 (–0.01, 0.19)	0.39 (0.28, 0.51) [†]	0.25 (0.13, 0.37) [†]	–0.24 (–0.35, –0.13) [†]	–0.11 (–0.22, 0.01)	–0.06 (–0.17, 0.05)	–0.11 (–0.22, –0.004) [*]
55–74	0.40 (0.29, 0.51) [†]	0.30 (0.18, 0.41) [†]	0.28 (0.14, 0.42) [†]	0.24 (0.14, 0.35) [†]	0.63 (0.50, 0.76) [†]	0.45 (0.32, 0.58) [†]	–0.54 (–0.10, –0.07) [*]	–0.49 (–0.96, –0.03) [*]	0.27 (0.16, 0.39) [†]	0.21 (0.09, 0.33) [§]
Marital status										
Currently married	–	–	Ref.	–	–	–	–	–	–	–
Single, never married	–	–	–0.11 (–0.22, 0.00) [*]	–	–	–	–	–	–	–
Divorced/ separated/widowed	–	–	–0.27 (–0.61, 0.07)	–	–	–	–	–	–	–
Education										
Secondary or less	–	–	Ref.	Ref.	–	–	–	–	–	–
Upper secondary	–	–	–0.21	–0.19	–	–	–	–	–	–
Non-degree	–	–	(–0.35, –0.06) [§]	(–0.34, –0.05) [§]	–	–	–	–	–	–
University or above	–	–	–0.12 (–0.21, –0.02) [*]	–0.09 (–0.18, –0.01) [*]	–	–	–	–	–	–
Employment										
Unemployed	–	–	Ref.	–	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Employed	–	–	–0.13 (–0.22, –0.04) [§]	–	–0.42 (–0.53, –0.30) [†]	–0.29 (–0.40, –0.18) [†]	–0.35 (–0.46, –0.24) [†]	–0.27 (–0.38, –0.16) [*]	–0.33 (–0.43, –0.23) [†]	–0.26 (–0.36, –0.16) [†]
Monthly household income										
<25,000 HKD	–	–	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
25,000–49,999 HKD	–	–	0.03 (–0.07, 0.12)	0.03 (–0.06, 0.12)	–0.15 (–0.27, –0.03) [*]	–0.11 (–0.23, 0.01)	–0.17 (–0.30, –0.05) [§]	–0.13 (–0.25, –0.01) [*]	–0.22 (–0.33, –0.11) [†]	–0.20 (–0.31, –0.10) [†]
≥50,000 HKD	–	–	–0.27 (–0.40, –0.14) [†]	–0.22 (–0.35, –0.09) [§]	–0.07 (–0.23, 0.10)	–0.01 (–0.16, 0.16)	–0.25 (–0.42, –0.08) [§]	–0.10 (–0.27, 0.07)	0.15 (0.01, 0.30) [*]	0.14 (–0.01, 0.29)
Unknown	–	–	–0.14 (–0.25, –0.04) [§]	–0.16 (–0.26, –0.05) [§]	–0.01 (–0.25, 0.02)	–0.14 (–0.27, –0.01) [*]	–0.37 (–0.51, –0.23) [†]	–0.38 (–0.52, –0.24) [†]	–0.23 (–0.36, –0.11) [†]	–0.24 (–0.36, –0.12) [†]

(Continued)

TABLE 4 | Continued

	Age verification for young drinkers		Taxation and pricing		Availability restriction		Advertising restriction		Sponsorship and events restriction	
	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b
Attitudinal factors										
Alcohol use is a public health issue		0.25 (0.16, 0.34) [†]		0.14 (0.07, 0.22) [†]		0.35 (0.25, 0.44) [†]		–		0.42 (0.33, 0.51) [†]
Habitual drinking is bad for health		0.43 (0.26, 0.59) [†]		0.53 (0.39, 0.67) [†]		0.34 (0.16, 0.51) [†]		0.42 (0.23, 0.61) [†]		0.17 (0.01, 0.33)*
Occasional drinking is good for health		0.17 (0.83, 0.26) [†]		–		–0.11 (–0.21, –0.01)*		–0.12 (–0.22, –0.01)*		–
Not knowing drink is bad for business		–		–		–		–		–0.10 (–0.19, –0.02)*
Drinking has noticeable social benefits		0.17 (0.06, 0.27) [§]		–		–0.18 (–0.29, –0.07) [§]		–0.47 (–0.58, –0.35) [†]		–0.18 (–0.29, –0.08) [§]
Drinking-related factors										
Past-year drinking										
Abstainer		Ref.		Ref.		Ref.		Ref.		Ref.
Non-binge drinker		0.01 (–0.1, 0.10)		–0.30 (–0.39, –0.22) [†]		–0.42 (–0.53, –0.31) [†]		–0.31 (–0.43, –0.19) [†]		–0.12 (–0.22, –0.02)*
Binge drinker		–0.58 (–0.75, –0.40) [†]		–0.60 (–0.74, –0.45) [†]		–0.86 (–1.05, –0.67) [†]		–0.49 (–0.69, –0.39) [†]		–0.22 (–0.40, –0.05)*

* $p < 0.05$.§ $p < 0.01$.† $p < 0.001$.^aModel 1 included socio-demographic factors.^bModel 2 ("All Variable Model") further included attitudinal, drinking-related factors based on Model 1; AOR, adjusted odds ratio derived from stepwise multivariable logistic regression using univariable significant level $p < 0.20$ as candidate variable.

TABLE 5 | Perceived consequences of implementing alcohol harms reduction strategies among participants and by past-year drinking status ($n = 4,000$).

Consequences of strategies	Endorsing respondents %			$P(\chi^2)$	Overall, $n = 4,000$
	Past-year drinkers, $n = 1,418$	Past-year abstainers, $n = 2,582$			
Drinking Age Verification for Young Drinkers	% (95% CI)	% (95% CI)			% (95% CI)
Will reduce underage drinking	77.4 (75.1–79.5)	85.0 (83.6–86.4)	<0.001		82.4 (81.1–83.5)
Is bad for business and economy	28.7 (26.3–31.0)	28.4 (26.7–30.2)	0.99		28.5 (27.1–29.9)
Will negatively affect local lifestyle	26.9 (24.6–29.2)	26.8 (25.1–28.5)	0.82		27.0 (25.6–28.4)
Tax and Price Increases					
Will reduce alcohol-related harms in Hong Kong	51.5 (48.9–54.1)	61.0 (59.1–62.9)	<0.001		57.9 (56.3–59.4)
Is bad for business and economy	48.3 (45.7–50.9)	37.9 (36.0–39.8)	<0.001		41.7 (40.1–43.2)
Will negatively affect local lifestyle	40.3 (37.7–42.8)	33.2 (31.4–35.0)	<0.001		35.7 (34.3–37.2)
Restriction of Availability					
Will reduce alcohol-related harms in Hong Kong	61.5 (58.9–64.0)	72.6 (70.9–74.3)	<0.001		68.9 (67.4–70.3)
Is bad for business and economy	52.7 (49.8–55.7)	45.0 (44.1–47.0)	<0.001		48.5 (47.0–50.0)
Will negatively affect local lifestyle	48.8 (46.2–51.4)	36.2 (34.4–38.1)	<0.001		40.9 (39.4–42.4)
Advertisement Bans					
Will reduce alcohol-related harms in Hong Kong	31.5 (29.2–34.0)	35.5 (33.2–36.9)	0.01		34.1 (32.6–35.6)
Is bad for business and economy	39.2 (36.7–41.8)	31.0 (29.2–32.8)	<0.001		34.0 (32.5–35.5)
Will negatively affect local lifestyle	25.8 (23.6–28.1)	24.9 (23.2–26.6)	0.63		25.3 (24.0–26.7)
Will infringe economic freedom	47.0 (44.4–49.6)	37.6 (36.5–39.9)	<0.001		40.3 (38.8–41.8)
Sponsorships and Events Bans					
Will reduce alcohol-related harms in Hong Kong	30.5 (28.2–33.0)	38.0 (36.2–39.9)	<0.001		35.6 (34.1–37.1)
Is bad for business and economy	52.4 (49.8–55.0)	42.5 (40.6–44.4)	<0.001		46.2 (44.6–47.7)
Will negatively affect local lifestyle	30.5 (28.2–33.0)	29.0 (27.2–30.8)	0.39		29.7 (28.3–31.1)
Will infringe economic freedom	51.7 (49.1–54.3)	40.7 (38.8–42.6)	<0.001		(43.1–46.2)

Adults who were unemployed were significantly more supportive of all policy categories except age verification for young drinkers. Highly educated respondents were less supportive of taxation and pricing policies. High income was positively associated with endorsement of sponsorship restriction, but negatively associated with support for advertising restriction and taxation and pricing measures. Having dependent children did not show any significant association with support for the five policy categories.

The full regression model suggested that after adjusting for socio-demographic variables, those perceiving alcohol as a local public health issue were more likely to endorse all policy categories except advertising restriction. Concern for drinking's health harms was significantly associated with higher endorsement of all policy categories. On the other hand, those who believed in the health benefits of occasional drinking showed greater support for age verification but lower support for availability and advertising restrictions. Belief that drinking is advantageous in business undermined the support for sponsorship and event restrictions whereas perception of alcohol's social benefits predicted lower endorsement of availability and marketing restrictions. Drinkers, particularly binge drinkers, were significantly less supportive of most policy categories than past-year abstainers.

In sensitivity analysis, maximum likelihood factor analysis retained 10 policies items which loaded on four factors labeled “Age Verification for Young Drinkers”, “Availability Restriction”,

“Advertisement Restriction”, and “Sponsorship and Events Restriction” (Supplementary Table 2). Although the taxation and pricing strategies were removed from the model, the four remaining factors were consistent with components from PCA. The Cronbach's alpha coefficient of four subscales were >0.80 , suggesting satisfactory internal reliability of the identified factors. We tried conducting unit weighting for factor scores, and the significant socio-demographic, attitudinal, and drinking-related factors identified by multivariable models were not substantively different from the original findings for these four policy categories.

Perceived Consequences of WHO-Recommended Strategies

Table 5 describes the possible positive and negative consequences of implementing the five major policy categories as perceived by the participants. These results and findings of acceptability level altogether demonstrated a general pattern that the perceived effectiveness in mitigating alcohol-related harms is counterbalanced by public concerns about lifestyle infringements and detriment to the local economy. The majority of respondents believed that age verification for young drinkers (82.4%), restriction of alcohol availability (68.9%), and alcohol price increases (57.9%) would be able to reduce alcohol-related problems in Hong Kong (Table 5). Restriction of alcohol availability was perceived to be the most likely to hurt local business and economy (48.5%), followed by sponsorship and

TABLE 6 | Mediation effects of perceived consequences in associations between socio-demographic factors and support for alcohol harms reduction strategies measured by PC scores, adjusted for other socio-demographic factors.

Mediation effects	Age verification for young drinkers		Taxation and pricing		Availability restriction		Advertising restriction		Sponsorship and events restriction	
	NDE, NIE (coefficient)	% mediated ^b	NDE, NIE (coefficient)	% mediated ^b	NDE, NIE (coefficient)	% mediated ^b	NDE, NIE (coefficient)	% mediated ^b	NDE, NIE (coefficient)	% mediated ^b
Mediators of female gender effect^a										
Reduces alcohol-related problems	0.21*, 0.08*	28.9%	0.11*, 0.02*	17.9%	0.33*, 0.11*	24.1%	0.23*, 0.10*	31.3%	0.18*, 0.07*	26.7%
Hurts local business and economy	NS	–	NS	–	0.43*, 0.01*	2.5%	NS	–	NS	–
Infringes on economic freedom							0.30*, 0.03*	8.7%	NS	–
Mediators of older age effect^a										
Reduces alcohol-related problems	0.29*, 0.10*	24.7%	NS	–	0.50*, 0.07*	11.7%	0.27*, 0.07*	21.2%	0.37*, –0.02*	NA
Negatively affects lifestyles	NS	–	NS	–	NS	–	NS	–	0.37*, –0.02*	NA
Mediators of employment effect^a										
Reduces alcohol-related problems	NC	–	NC	–	–0.35*, –0.05*	12.4%	NS	–	–0.37*, –0.06*	13.6%
Hurts local business and economy	NC	–	NC	–	NS	–	–0.36*, 0.03*	NA	NS	–
Negatively affects lifestyles	NC	–	NC	–	–0.43*, 0.01*	NA	–0.38*, 0.04*	NA	NS	–
Mediators of high income effect^a										
Reduces alcohol-related problems	NC	–	NS	–	–0.35*, –0.05*	12.4%	–0.19*, –0.04*	17.0%	–0.08*, –0.04*	36.7%
Hurts local business and economy	NC	–	–0.11*, –0.01*	7.2%	NS	–	NS	–	–0.10*, –0.02*	13.8%
Negatively affects lifestyles	NC	–	–0.11*, –0.02*	12.9%	–0.43*, 0.01*	NA	–0.20*, –0.03*	13.4%	NS	–
Infringes on economic freedom							–0.16*, –0.06*	28.3%	–0.10*, –0.02*	16.1%

* $p < 0.05$.^aEffect of independent variables: gender (male vs. female); age (18–34 years vs. 55–74 years); employment (unemployed vs. employed); income (<25,000 HKD vs. ≥50,000 HKD).^b% mediated=NIE/(NDE+NIE), NDE, natural direct effect. NIE, natural indirect effect; NA, not available; NS, the mediational effect is not significant; NC, causal mediation analysis was not conducted due to Non-significant association between the socio-demographic factor and policy support.

event bans (46.2%). Almost half of the respondents agreed that bans of alcohol sponsorship (44.7%) and advertising (40.3%) would be an infringement on economic freedoms. Alcohol availability restrictions (40.9%) and tax and price increases (35.7%) were perceived to be the most likely to undermine local lifestyles. Past-year abstainers had higher expectancies of strategy effectiveness in reducing harms whereas drinkers expressed more concerns on negative consequences on the economy, lifestyle, and economic freedom.

Mediation Effects of Consequence Perception on Strategy Endorsement

Based on the results from multivariable regression (Table 4), the perceived consequences were examined as potential mediators in causal mediation analysis (45). Partial mediating effects were found in the association between some significant socio-demographic factors and the endorsement of different policies (Table 6). The results showed that women, older people, and unemployed people were more supportive of various alcohol policies partially because of greater belief that these restrictions would reduce alcohol-related problems (mediation proportion range: 11.7–31.3%, $p < 0.05$). By contrast, those with high household income were less supportive partially due to worries for negative impacts on local business, lifestyles, and economic freedom (mediation proportion range: 7.2–28.3%, $p < 0.05$). The complete results of mediation analysis are presented in Supplementary Table 3.

DISCUSSION

This population-based study was the first to examine the public acceptability of alcohol control policies and the associated factors in the China region. Our findings noted that among the WHO's "Best Buys" on alcohol taxation, availability, and advertising that are highly relevant to the current policy gap of Hong Kong, the most strongly supported were introduction of moderate alcohol taxes, restrictions on time of retail alcohol sales, and limiting bar service hours. Aside from the "Best Buys", youth-oriented interventions such as age verification for young drinkers and education provisions are highly popular. This finding indicates, as in other countries, that interventions aimed at young people have much less public resistance (3). Reducing alcohol service hours and tax increases were previously found to be the least popular policies in England, (47) Canada, (26) Australia, (6) and Sweden (48) where varying levels of taxes and service hour restrictions already exist. The high levels of support for these measures in Hong Kong likely reflects the considerable lower prevalence of habitual drinking in Hong Kong (44.3% of males and 28.7% of women were past-year drinkers) as compared with most Western countries (1). The relatively high level of acceptance for a moderate 5–10% tax may also reflect the zero tax on beer and wine that is unique to Hong Kong. In our sample, however, past-year drinkers were consistently less likely to support stricter regulation. It is likely that drinkers, particularly heavy and frequent drinkers, perceive alcohol control measures as inconveniences and an infringement on their lifestyle. Compared with South Korea where alcohol policies are more lax than

Western countries, Hong Kong residents were slightly more supportive for increasing taxes, restricting alcohol availability, and age verification for young drinkers, but are more resistance to marketing restriction (9). This may be related to the low prevalence of severe alcohol-related harms and pervasive *laissez-faire* economy among the population.

Our results indicate that the skepticism about policy effectiveness may be a major barrier to public support. In contrast to some Western countries where as much as half of the population supported various alcohol advertising restrictions (49–51), banning alcohol marketing, particularly sponsorships, was the least endorsed policy among Hong Kong residents. While age verification and restricting alcohol availability were seen as the most effective in alcohol harms reduction strategies, marketing restrictions were perceived as the least effective by the Hong Kong public. Our results are consistent with prior findings that the perceived effectiveness is strongly associated with public support for policy (7, 23). In general, the public acceptability in Hong Kong was greater for strategies that were perceived to be effective in mitigating alcohol-related problems while being unlikely to harm economic interests. Our results largely corroborate findings from previous international studies suggesting that females and older adults were consistently more supportive of stringent population-level alcohol policies (7, 9–11, 13–15). In our study, we noted that older people and women also had greater optimism about the policy's effectiveness in reducing alcohol-related harms which may also partially explain their greater endorsement of more stringent regulations. Other possible reasons for greater support among these population subgroups may be the higher likelihood of second-hand harms (harms due to others' drinking) among women (e.g., domestic violence, marital problems, caretaking of drinking family members) (3, 52, 53) and greater awareness of the health-related alcohol harms among older adults as compared to younger drinkers (3, 54). Our results showed that parents of minor were not more likely to support greater alcohol regulation. This finding may be explained by the comparatively low rate of binge drinking and severe alcohol-related harms (e.g., from traffic crashes and drinking events) among young people than in Western settings.

In addition to perceived effectiveness, perception of possible consequences of various strategies was associated with levels of public support. The public skepticism toward alcohol policies largely comes from concerns of possible negative consequences on local business and economy rather than infringements on individual civil liberties. Hong Kong has consistently ranked as the freest economy in the world (55) and the *laissez-faire* economic culture has long been supportive of international business and trade. The negative economic expectancies are more common among the younger generation, contributing to their unfavorable attitudes toward alcohol policies. In contrast to most developed Western countries, in Hong Kong, as in some other regions of Asia, the collective economic prosperity is often prioritized over public health interests when devising public policies, including alcohol policies (9, 56). Past research has suggested that East Asians tend to adopt a more collectivistic perspective than individualistic compared to norms in Western cultures (57–59). Hence, under such culture norm, the economic

benefits of policies must be counterbalanced by pervasive social harms in order for a policy to be acceptable. Due to the low levels of automobile ownership and strictly restricted firearms, serious alcohol-related harms including interpersonal violence and traffic fatalities in Hong Kong are much more uncommon than in countries such as the US and UK (60–62). This could partially explain why there has not been strong advocacy for greater alcohol regulation. Although data on perceived consequences of implementing various alcohol policies are very scarce in East Asian region, it is likely that the acceptability of policy recommendations in other Asian cities rests in the perceived trade-off of benefits to the local economy vs. the pervasiveness of societal harms.

In addition to economic externalities, our findings suggest that beliefs of drinking's social benefits lowered support for greater regulation. Over the past two decades, the Hong Kong alcohol industry has strategically used mass media to shape the public perception that alcohol regulation would deprive ordinary drinkers of their enjoyment; health benefits of moderate drinking has also been strongly promoted (63). Until recently, there has been relatively less public health information on alcohol. Therefore, misconceptions about health effects of drinking are likely to be pervasive in the general public. In our sample, concerns about alcohol-related health harms generally predicted higher endorsement of WHO-recommended strategies, as noted elsewhere (23, 64). A media campaign that aims to promote public awareness of alcohol-related health and social harms and public health significance of effective countermeasures may be effective in shifting public opinion. It is critical to reinforce the belief on the effectiveness of strategies and dispel common misconceptions among the general public prior to the introduction of any new alcohol policy, particularly among men and young people.

There are limitations to this study. First, the study instrument was developed for assessment purposes and needs future validation. The findings are prone to information bias from self-reported data, but this is minimized by assuring anonymity in telephone interviews. Second, despite the high fixed landline penetration of Hong Kong (93%) (65), certain population subgroups such as individuals living in elderly homes, prisons, dorms, and vessels could not be reached by landlines. Although the response rate of our survey (62.5%) was typical as a telephone survey conducted in this region (37, 66), the overrepresentation of Non-working and higher educated population might reduce the generalisability of results. Nonetheless, a study from New Zealand concluded that public attitudes surveys may not be subject to strong Non-response biases (67). Third, only four attitudinal questions were included, and the mediating effects of perceived consequences have not been fully explored, which warrants further studies. Additionally, while we acknowledge that the assumption of PCA may not be met fully and the loading estimates may be biased upward compared to common factor analysis approaches, the findings are supported by consistent results from maximum likelihood factor analysis. PCA was chosen as the preferred method of data reduction because the identified components

largely replicate the clustering of alcohol strategies that are put forth in alcohol action plans and the PCA did not eliminate key WHO “Best Buys” strategies. Lastly, the cross-sectional study design precludes any conclusions of causality between attitudes toward alcohol and policy endorsement. To better inform policy making, future research is needed to acquire more knowledge on the complex association between alcohol policy, perceived effectiveness, and policy acceptability, and to increase the understanding of how these attitudes are formed.

In conclusion, this study demonstrates that public acceptability of alcohol regulation is strongly influenced by the local social context, as well as the perceptions of consequences vs. benefits of the various policies (68). Specifically, the main barriers to higher public support for increased alcohol regulation in Hong Kong are skepticism of alcohol policy effectiveness and the negative expectancies on the local economy rather than infringements on personal civil liberties. Further, in-depth investigation of these factors would, therefore, be highly informative in understanding public opinion before introducing a policy. To reduce potential barriers to implementing alcohol control strategies in a low alcohol consumption region, it is thereby important to educate the general public of alcohol-related harms and to strengthen their belief in the effectiveness of drinking countermeasures.

DATA AVAILABILITY STATEMENT

Data is available upon reasonable request by the author.

ETHICS STATEMENT

Ethical approval was obtained from Ethics Committee of The Chinese University of Hong Kong. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

The initial concept for this paper was developed by JK. Statistical analysis was completed by JY, TS, WG, and QF. The manuscript was written by JY, TS, JK, and DD. The editing process included JY, WG, DD, JK, and QF, and other authors approved the final manuscript. The overall process was led by JK. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2022.855416/full#supplementary-material>

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