



Development and validation of a Risk Predictive Model of Student Hazardous Drinking

A Longitudinal Data Linkage Study



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Introduction

- Alcohol misuse continues to be a significant health problem among college students
- There is great variability in student alcohol consumption, which is mediated by a range of personal, inter-personal, psychological, and campus-related factors
- Ubiquity and availability of student electronic datasets enable to link data to follow up students for risky drinking behaviors and associated risk markers
- This study aimed to develop and validate a novel risk predictive model to predict absolute risk of student hazardous drinking defined as either acute alcohol intoxication associated with ED visits or alcohol-related incidents recorded in the university incident report system.

Data sources and data analysis

- A retrospective cohort study of students aged 15-49 enrolled in 6 academic years from 2009/10 to 2015/16 academic years
- Student enrollment data were linked to subsequent hazardous drinking events defined as emergency department visits with alcohol intoxication or alcohol-related incidents reported to authorities within 1 year following the first annual (index) enrollment.
- Multivariable logistic regression analysis was used to develop a predictive model based on the first 3 year (2010/11-2012/13) student cohort (n=93,289), which was then validated in the following 3 year (2013/14-2015/16) student cohort (n=85,876)
- Alcohol intoxication was identified using ICD codes
- Alcohol-related incidents were incidents flagged as involving alcohol
- Demographics, academic, campus-related risk markers were ascertained from student enrollment data and clinical risk markers were abstracted from student electronic health records retained at the Student Health Center (SHC)

Results

- The incidence of student first hazardous drinking event was 2.8% in the derivation cohort and 3.1% in the validation cohort, respectively.
- The analysis identified 11 risk markers, including student demographics (gender, age, ethnicity, parental tax dependency), academic level, Greek life member, transfer students, first-time enrolled students, having been diagnosed with depression or injury, and violence involvement
- C-statistics of the model were 0.86 in both cohorts, with excellent calibration and no evidence of over- or under-prediction observed from calibration plots (Calibration slope: 1.070 (95% CI: 1.067, 1.073)).

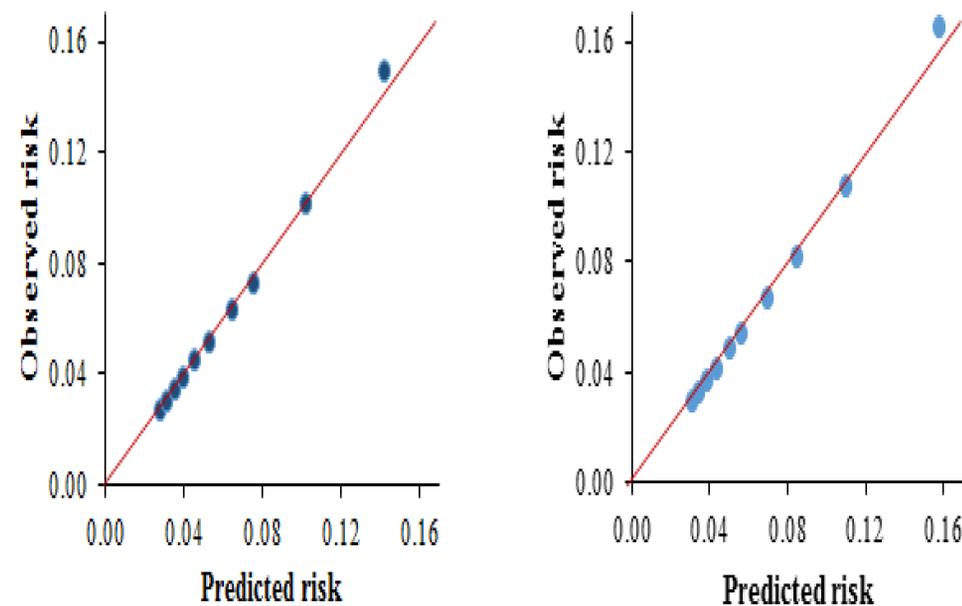


Figure 1. Model calibration in the derivation cohort (Left) and validation cohort (Right)

Sensitivity (SSV) and Specificity (SPV) of the derivation and validation cohorts at different risk cores thresholds were the same or similar. For example, top 5% of students at highest risk (e.g., those with scores of 95 or higher), derivation cohort had 23.7% SSV and 95.9% SVP, and the validation cohort had 23.7% SSV and 96.8% SPV, respectively (Table 1).

Performance of the predictive model (Table 1)

Risk score	Derivation cohort				Validation cohort			
	Total high risk students	SSV	SPV	PPV	Total high risk students	SSV	SPV	PPV
Top 1%	1021	11.8	99.2	30.3	1122	14.2	99.1	33.2
Top 5%	4664	23.7	95.9	20.5	3506	23.7	96.8	23.7
Top 10%	9678	55.6	90.9	15.0	9491	60.0	90.5	16.5
Top 25%	23524	77.7	76.3	8.6	21469	78.4	76.7	9.6
Top 50%	47137	94.9	50.7	5.3	44809	94.0	49.1	5.5

Discussion and Conclusion

- While several well-validated screening tools are available, these tools are typically used to screen student binge drinking, which may not be able to identify students at high risk of hazardous drinking that requires disciplinary infractions or emergency interventions
- Available tools require interview of students, which is not feasible to implement on a population-level scale
- The risk prediction model developed from this study offers a complementary tool to address this gap
- The model can be externally validated and applied in other campuses
- The majority of students seek care at the at the university SHC clinic where information on student demographic, campus-related, and clinical factors is routinely collected and readily available to primary care physicians
- A risk screening tool can easily be developed and adapted in such a setting to facilitate physicians to identify high risk students for better targeting of clinic-based intervention efforts and make expedited referral to available interventions and services.