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Research Article

A Macrolevel Examination of County-Level Risk Factors for Underage Drinking Prevention: Intervention Opportunities to Protect Youth in the State of Georgia

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Introduction. Underage drinking can have profoundly negative impacts on childhood development. This study compares 4 categories of known underage drinking risk factors with alcohol consumption. The social indicators in these categories will be compared in the 10 most-at-risk (MAR) counties and the 10 least-at-risk (LAR) counties identified in Georgia. *Methods*. Independent 2-tailed *t*-tests were conducted to compare group means among MAR and LAR counties for all identified risk factors. *Results*. Significant differences were observed in all factors included in the poverty and alcohol outlet density categories. *Discussion*. The findings underscore the importance of better understanding youth drinking, poverty, and alcohol outlet density. However, our findings, supported by previous individual and aggregated level research, support strategies for researchers and policy makers to more proactively respond to poverty-stricken and high-density alcohol outlet indicators. The current ecological evaluation of underage drinking risk assessed on a macrolevel offers insights into the demographic features, social structures, and cultural patterns of counties that potentially predispose youth to greater health risks specifically associated with underage drinking.

1. Background

Underage drinking can have a profound impact on childhood development. Research shows that early alcohol use initiation increases risk for heavy alcohol use, alcohol dependence, and alcohol-related harm to others and self [1, 2]. Early underage drinking is also linked to peer and dating violence [3], and other negative outcomes such as problems in school, weapon carrying, or recent marijuana use [4]. Furthermore, alcohol consumption is a significant risk factor for unsafe sexual behaviors, unintentional injuries, physical and sexual assaults, various types of illegal activities, and suicide [3, 5–8]. With all the known negative consequences of early alcohol use, adolescents in the United States [US] still use alcohol more than any other substance, including tobacco and marijuana. By the age of 15, nearly one half of American youth have consumed an entire alcoholic beverage, and 18–20-year olds have a higher prevalence of alcohol dependency than any other age group [8].

Despite the volume of research on underage drinking, there is surprisingly very little information about the range of influences at the macrolevel that may contribute to, or exacerbate risk for, underage drinking. In the state of Georgia, a relatively new initiative to assess social indicators across counties has permitted new and innovative analyses of factors that may impact health, including underage drinking. This study is based on the findings of the 2006 Governor's Cooperative Agreement State Incentive Planning and Development Grant released by the *Social Indicator Study to Assess Substance Use Prevention Needs at the State and County Levels in Georgia* (SIS). One unique feature of the SIS is that it examines multiple sociodemographic and behavior variables on the county level and ranks each county on 29 risk constructs and an overall composite score [9]. The state of Georgia has

159 counties (second to Texas for the most counties within a US state). Georgia counties provide an appealing level of public health analysis because surveillance tends to occur on the county level [10]. The SIS was initiated as a means to inform policy makers, service providers, and public health professionals.

The project presented here focuses on four specific categories identified within the literature: drinking consequences, urbanicity, poverty, and alcohol outlet density. Jones-Webb and colleagues defined drinking consequences as "concrete problems that arise in different areas of an individual's life because of drinking" such as citations for driving under the influence (DUI), alcohol-related arrests, hospitalizations, and treatment admissions [11]. Fourteen percent of adolescents between 17 and 21 presenting in emergency rooms tested positive for alcohol use [12]. As much as 29% of young drivers ages 15–20 that had been killed in motor vehicle accidents had been drinking alcohol [13]. Heavy episodic drinking, drinking in cars, and individual expectations about the negative consequences of DUI all influence an adolescent's decision to drive drunk or ride with someone under the influence [14–16]. Research also suggests that chronically low rates of underage drinking and DUI arrests may lead to decreased awareness of DUI as a drinking consequence among young people [13, 17].

The relationship between urban/rural living and alcohol consumption has been frequently reported in the literature, especially among adults, and with often contradictory results [18, 19]. Youth in rural environments consume more alcohol than their urban counterparts [20–23]. A few studies, however, found either no difference between urban and rural youth or that urban youth have higher rates of alcohol consumption [24, 25].

The association between poverty and alcohol consumption in adults has also been documented, yet few studies attempt to ascertain the relationship between poverty and alcohol consumption in underage drinkers. Poverty, lower household income, and neighborhood deprivations have all been found to be associated with problem drinking, regardless of race/ethnicity or gender [26–29]. In contrast to previously mentioned adult studies, findings from New Zealand show that higher levels of income were associated with increased frequency of underage drinking, but not intensity. Although New Zealand has some similarities to the US, it is difficult to determine the comparability of these results with the US [30].

A final category of risk considers alcohol outlet density related to consumption. Among adults, alcohol outlet density has been found to be associated with increased self-reported drinking and driving [31], automobile crashes [32], and overall alcohol consumption [33]. Another study found that outlet density showed no significant individual-level effects and suggested that neighborhood-level associations were indicative of the clustering of individuals with alcohol problems rather than outlet density influence [34].

Literature reporting the effects of alcohol outlet density on underage drinking is limited. Among the few published studies, varying methodologies, alcohol consumption constructs, and study samples utilized yield extremely limited results. Alcohol outlet density has been positively correlated with decreased parental monitoring, which in turn has been positively correlated with increased youth alcohol consumption [35]. Higher densities of outlets have been associated with both driving under the influence and riding with an intoxicated driver [36], and colleges located in neighborhoods with more alcohol outlets experience more drinking- and driving-related problems [37]. In terms of examining youth drinking in relationship to alcohol outlet density, one study utilizing GIS software found no significant correlations; however the study authors disclosed that only suburban areas were examined which traditionally have restricted access to commercial resources and a lower prevalence of alcohol use in general [38].

Based on these earlier findings, this study sought to examine the potential association between drinking consequences, urbanicity, poverty, and alcohol outlet density on underage alcohol consumption in the 10 healthiest counties and the 10 least healthy counties in the state of Georgia to determine strategies for prevention.

2. Methods

This study examined state and federally collected data from the SIS. Selected study indicators were obtained from standard administrative and reporting databases generated by the source agencies [9].

Ten Georgia counties identified as the most-at-risk (MAR) and the 10 counties that had been identified as least-at-risk (LAR) counties (based on overall SIS ranking) on 15 different variables representing the categories of drinking consequences, urbanicity, poverty, and alcohol outlet density were compared in this study. Variables are presented in Table 1. The risk construct composite scores reflect alcohol-related problems—the higher standardized values, the more vulnerable, more negative consequences of alcohol reported. Due to the fact that there are 159 counties in the state, the top 10 counties have unusually high clusters of risk and therefore, are optimal for intensive intervention/programming opportunity.

Analyses were conducted on the 10 MAR (ranked 150–159), and the 10 LAR (ranked 1–10). The number of counties in each group was chosen arbitrarily, but with the intent of capturing an accurate sample of at-risk counties versus not-at-risk counties. Two-tailed, independent t-test and bivariate correlations were conducted for comparison of the means of two groups for the indicators from all 4 categories. All analyses were performed in SPSS version 17.

3. Results

Comparisons of drinking consequences were not found to be significantly different across high- and low-risk counties. Similarly, the t-test scores for urbanicity did not indicate that population density or percent of the population living in urban areas was significantly different between the high-risk and low-risk counties.

The t-test for the percent of the total population BPL indicated that the mean differences between the top 10 and

Table 1: Risk variables and definitions within each category.

Category	Variable
Drinking consequences	Juvenile arrest rate for liquor violations
	Percent of alcohol-related vehicle crashes; drivers 10–17
	Percent of alcohol-related vehicle crashes; drivers 18–21
	Juvenile alcohol treatment admission rate
Urbanicity	Population density
	Percent of population living in urban areas
Poverty	Percent of residential properties vacant
	Percent of children living below the poverty level (BPL)
	Percent of total population living BPL
	Unemployment rate
	Percent of population receiving temporary assistance to needy families [TANF]
	Percent of population receiving food stamps
	Percent of students receiving free/reduced-price lunches
	Percent of single-parent households
Alcohol outlet density	Number of alcohol licenses per 1,000 persons

Table 2: Poverty group statistics.

Poverty group statistics (10 MAR & 10 LAR)				
Indicator	Group	Mean	Standard deviation	Standard error
% of children below FPL	MAR	8.94	1.59	0.50
	LAR	2.07	.77	0.24
% of total population below FPL	MAR	22.67	3.76	1.19
	LAR	6.12	1.89	0.60
% of residential properties vacant	MAR	13.01	1.34	0.42
	LAR	6.09	3.14	0.99
Unemployment rate	MAR	5.46	1.08	0.34
	LAR	3.11	.389	0.12
% of population receiving TANF	MAR	2.92	0.54	0.17
	LAR	0.50	0.26	0.08
% of population receiving food stamps	MAR	15.00	1.77	0.56
	LAR	2.94	1.47	0.47
% of students receiving free or reduced-price lunches	MAR	69.57	6.52	2.06
	LAR	23.88	8.79	2.78
% of single-parent households	MAR	34.68	6.11	1.93
	LAR	16.05	3.55	1.12

bottom 10 counties were highly significant [$t = -12.446$] ($P < .001$). t-Tests for the percentage of children BPL [$t = -12.287$] ($P = .001$), the percent of vacant residential properties [$t = -6.408$] ($P < .001$), unemployment rate [$t = -6.472$] ($P = .000$), percent of the population receiving TANF [$t = -12.748$] ($P < .001$), percent of the population receiving food stamps [$t = 16.573$] ($P < .001$), and the percent of children receiving free/reduced lunches [$t = -13.207$] ($P < .001$) were all highly significant. Finally, the percent of single-parent households showed significance [$t = -8.333$] ($P < .001$). Correlations among all poverty indicators were strongly significant. Poverty group statistics can be seen in Table 2, and the results of the significant t-test are presented in Table 4.

Table 3: Alcohol outlook group statistics.

Alcohol outlet density group statistics (10 MAR & 10 LAR)			
Number of alcohol licenses per 1,000 people			
Group	Mean	Standard deviation	Standard error
MAR	2.93	0.43	0.14
LAR	1.26	0.50	0.16

The t-test for the number of alcohol licenses per 1,000 people was also significant [$t = -7.969$] ($P < .001$). Furthermore, alcohol outlet density was highly correlated with: the number of single-parent households (.787), the number of students receiving free/reduced lunch (.878), vacant residential properties (.841), the percentage of children BPL (.868), the percent of the total population BPL (.879), the unemployment rate (.821), the percent of the population receiving TANF (.843), and the percent of the population receiving food stamps (.884). The above correlations were all significant at the ($P < .001$). Urbanicity group statistics can be seen in Table 3, and the results of the significant t-test are presented in Table 4.

4. Discussion

The findings from this study, conducted at the macrolevel, demonstrate that indicators pertaining to poverty and alcohol outlet density appear to be most strongly related to underage alcohol use and that drinking consequences and urbanicity appear less important. Although the significance of underage drinking consequence should not be ignored, the results of this analysis suggest that other indicators are more important.

Similarly, urbanicity was also not important in these analyses, which is inconsistent with previous research. Although a majority of studies indicate that underage drinking is a larger problem in rural areas [18–23], there is a small contingent that maintains that there is either no difference or that urban areas exhibit higher rates of alcohol use [22, 24, 25]. A large part of this controversy could be attributed to nonstandardized underage drinking and urbanicity measures.

In terms of poverty, all individual indicators showed significant differences between the MAR and the LAR groups. The indicators were also highly correlated with one another. Stimpson and colleagues theorized that "a mechanism linking neighborhood deprivation to mortality and morbidity maybe the influence contextual forces have on shaping individual health risk behaviors [29]." Their study identified significant associations between neighbor deprivation, income levels, and excessive alcohol assumption [29]. Chuang and colleagues found that living in lower-socioeconomic status

Table 4: Significant *t*-tests.

Significant *t*-test of social determinants from the 10 MAR and LAR counties									
	Indicator		Levine's test		*t*-test for equality of means				
			F	Sig.	*t*	Df	Sig. (2-tailed)	Mean diff	SE
Poverty	% of children BPL	EVA	4.348	.052	**−12.29**	18	.000	−6.87	.56
		EVNA			**−12.29**	13.010	.000	−6.87	.56
	% of total population BPL	EVA	7.993	.011	**−12.45**	18	.000	−1.66E1	1.33
		EVNA			**−12.45**	13.285	.000	−1.66E1	1.33
	% residential properties vacant	EVA	1.932	.181	**−6.41**	18	.000	−6.92	1.08
		EVNA			**−6.41**	12.182	.000	−6.92	1.08
	Unemployment rate	EVA	10.169	.005	**−6.47**	18	.000	−2.35	.36
		EVNA			**−6.47**	11.304	.000	−2.35	.36
	% of population receiving TANF	EVA	10.766	.004	**−12.75**	18	.000	−2.42	.19
		EVNA			**−12.75**	13.058	.000	−2.42	.19
	% of population receiving food stamps	EVA	.001	.973	**−16.57**	18	.000	−1.21E1	.73
		EVNA			**−16.57**	17.446	.000	−1.21E1	.73
	% of students receiving free/reduced lunches	EVA	2.608	.124	**−13.21**	18	.000	−4.57E1	3.46
		EVNA			**−13.21**	16.611	.000	−4.57E1	3.46
	% of single-parent households	EVA	2.641	.121	**−8.33**	18	.000	−1.86E1	2.24
		EVNA			**−8.33**	14.467	.000	−1.86E1	2.24
Alcohol outlet	Number of alcohol licenses/1,000 people	EVA	.279	.604	**−7.97**	18	.000	−1.66	.21
		EVNA	.088	.771	**−7.97**	17.640	.000	−1.66	.21

neighborhoods was associated with greater amounts of peer drinking which was consequently associated with greater amounts of youth alcohol consumption [39].

Of the 4 categories examined in this study, the link between poverty and underage drinking has been least studied from a developmental or public health perspective. Poverty, however, seems to have a highly significant connection to underage drinking. This should be highly relevant to researchers, academics, and policymakers concerned with child development and health. The strong associations between the correlates provide a clear contextual landscape of the communities in which children would be most at risk. The cluster of associations supports the *life course perspective*, which posits the cumulative build-up of social determinants of health from birth through death. In turn, research to quantify this relationship further could inform intervention development which could drive policies that target underage drinking risks in low-socioeconomic status neighborhoods.

Finally, the *t*-test conducted to examine differences in alcohol outlet density was also significant. Alcohol outlet density significantly correlated with all poverty indicators. This has a potentially confounding effect since it is impossible to determine if high outlet densities actually affect the risk of underage drinking, or if high outlet densities are a product of poverty. It is possible that it is a combination of the two. Widespread social issues, such as underage drinking, are complex, which makes it extremely difficult to flush out individual causal factors. Whatever the case, the scant literature attempted to analyze the relationship between youth drinking and alcohol outlet density, and this is an area that merits continued research.

5. Limitations

This study and approach have many important limitations that are outlined below and should be considered when interpreting the findings. The construct of "at-risk" versus "not-at-risk" counties was derived from the SIS methodology, whereby all individual indicators were standardized (given an equal weight). In reality, some indicators may be more strongly associated with underage alcohol consumption than others but since that was not a criterion for the development of the index, it was not considered. Moreover, the analyses were based on secondary data. As such, our analyses were limited because the intent of the SIS was not to specifically compare high- and low-risk counties on the factors associated with underage drinking. With that specific goal in mind, the data could have been collected, analyzed, and presented differently. Most specifically, our limitations pertain to the underage drinking consequences analyzed in the study because they largely depend on record keeping and surveillance systems that may or may not be available across counties depending on resources, size of population, and priorities. Moreover, measures like alcohol testing in car crashes is also more likely to be performed when a fatality has occurred and as such may not be equally reflected across counties depending on distribution of highways and other roadway factors. Additionally, other measures may have similar concerns and also reflect availability and levels of police enforcement efforts, or treatment availability which likely vary across counties and jurisdiction based on a number of factors that were not assessed in the SIS. We also relied on a broad age category (ages 10 to 17) that may not adequately reflect

variation within this age group in particularly for driving. However the FBI systematically aggregates the data this way and while it is less useful for driving particularly, it is what we have available. Moreover, many of the social risk factor constructs were originally identified from individual-level data, and directly analogous measures at the county-level may not exist. Research regarding correlations between social indicators and actual amounts of alcohol use within a community is limited. This study only examined the risk of underage drinking in Georgia and therefore may not be illustrative or generalizable to other states [9]. Despite these limitations, the findings from these preliminary analyses can help inform future projects and add to the limited research on these factors and underage drinking at the aggregate level.

6. Conclusions

Underage drinking is a complex issue that spans demographic categories and has many interrelated, contributing factors. If there is to truly be an understanding of the scope and consequence of underage drinking in the US, a more accurate, efficient underage drinking surveillance system is needed with information available at the county level. Underage drinking research that integrates assessment of urbanicity, poverty, and alcohol outlet density risk is an important priority for future research. Research in these areas can inform targeted intervention and prevention efforts including enactment of new policies. Standardization of the urban/rural continuum in research would help clarify the relationship between urbanicity and underage drinking. Because differences were observed between the MAR and the LAR counties in all of the poverty alcohol outlet density indicators, researchers and policy makers should focus on these two areas specifically when designing further research and prevention policies.

This study is important because underage drinking can strongly impact childhood development. Examining county-level data is an innovative approach that complements individual-level research and can aid program planners and professionals from diverse backgrounds gain a better understanding of where risk factors cluster within states. Clearly, despite the many policy-level initiatives and resources directed towards underage drinking, it is apparent that new approaches and strategies are needed to make a significant reduction in the prevalence of underage drinking and its dire consequences. This needs to be an important priority for the safe and healthy development of our youth.

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