Attention Deficit Hyperactivity Disorder (ADHD) and Impaired Driving: Results from the Ontario Student Drug and Health Survey (OSDUHS)

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Background

- Attention Deficit Hyperactivity Disorder (ADHD): neurodevelopmental disorder that can persist into adolescence and adulthood.

- ADHD found to co-occur with
  - anxiety disorders in 25-35% of cases,
  - mood disorders in 20% of cases, and
  - oppositional defiant disorder (ODD) and conduct disorder (CD) in 25-50% of cases.

(Steele, Jensen & Quinn, 2006).

Other problems

- Higher crash rates (Barkley et al., 2006).
- CD, ODD or antisocial personality disorder, partially or fully explained driving-related outcomes (Vaa 2014).
- Mixed results drinking driving behaviours of ADHD adults.
- Some evidence for improved driving with ADHD meds, but simulator study found no differences among placebo, low or high dosed drivers on 15 out of 18 measures (Barkley et al., 2005).

Purpose

To examine the relationships among self-reported screening measures of ADHD, other mental health problems, and impaired driving-related outcomes in a provincially representative sample of high school students living in Ontario.

Caveats

We are using a screener, not comprehensive clinical examination.

Interpretation of findings needs to be mindful of this.

Ontario Student Drug Use and Health Survey (OSDUHS)

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Ontario Student Drug Use and Health Survey (OSDUHS)

- A cross-sectional, anonymous in-class survey.
- Conducted every 2 years since 1977 with 20 cycles available.
- Institutional research ethics committees at CAMH, York University, as well as at 18 district school boards approved this study.

Further details are available at: https://www.camh.ca/en/science-and-research/institutes-and-centres/institute-for-mental-health-policy-research/ontario-student-drug-use-and-health-survey---osduhs/

Ontario Student Drug use and Health Survey (OSDUHS)

- Sample design is based on a probability stratified cluster design with post stratification weights.

- Preliminary analyses (only includes 2015 cycle): 10,426 students surveyed in grades 7 through 12 from 43 school boards, 220 schools, and 750 classes.

Sample

- Youth who have @ least a G2 driver's licence
- Minimum of 16 years of age (16-19 years of age)
- Limited to Form A of Secondary Students Survey, as some questions are only on this form. (Grades 9-12)

Impaired Driving Measures

- **Alcohol and Driving**: In the last 12 months have you driven a vehicle within an hour of drinking 2 or more drinks of alcohol?
- **Cannabis and Driving:** In the last 12 months have you driven a vehicle within an hour of using marijuana or hashish?

Mental Health Measures

Adult ADHD Self-Report Scale (ASRS) Screener

- 6-item checklist to assess ADHD symptoms based on DSM-IV criteria for ADHD, developed by WHO.
- 6 items scored 0-4, summed scores > 14 considered ADHD positive (α=.885)[1]

[1] Kessler RC, Adler L, Ames M, Demler O, Faraone S, Hiripi E, … Walters EE. (2005). The World Health Organization adult ADHD self-report scale (ASRS): A short screening scale for use in the general population. *Psychological Medicine, 35*(2), 245-256. doi:10.1017/S0033291704002892.

Mental Health Measures

Psychological Distress (K6) Screener

- 6-items assessing nonspecific psychological distress (i.e., symptoms of anxiety and/or depression)
- Scoring @ least 8 of 24 scores indicates a moderate or serious level of distress experienced in the past 4 weeks (α=.89)[1].

[1] Kessler RC, Barker PR, Colpe LJ, Epstein JF, Gfroerer JC, Hiripi E, . . Zaslavsky AM. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry, 60*(2), 184-189. doi:10.1001/archpsyc.60.2.184

Mental Health Measures

- **Mental Health Care Utilization:** In the last 12 months, how many times did you see a doctor/nurse/counsellor about your mental health?
- **Suicide:** In the last 12 months, have you ever seriously considered attempting suicide?

Medications Measures

- **ADHD**: In last 12 months used
  - ADHD drug NON-medically
  - ADHD drug for MEDICAL purposes

- **Anxiety/Depression:** In last 12 months, prescribed medicine to treat anxiety or depression

Alcohol

- **Alcohol use**: Drank alcohol past 12 months (excludes sips)
- **Binge Drinking**: Had 5+ drinks at least once past 4 weeks
- **Hazardous drinking:** Alcohol Use Disorders Identification Test (AUDIT): 10 items, 8+ cut-off, α=. 86.[1]

[1]Saunders JB, Asland OG, Babor TF, De La Fuente JR, Grant M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction, 88*(6), 791-804. doi:10.1111/j.1360-0443.1993.tb02093.x

Cannabis

- **Cannabis Use:** Used cannabis in the past 12 months
- **Drug Use Problem Screener** (**CRAFFT):** Measures a drug use problem that may require intervention in past 12 months: 6 items, cut-off 2+, α = .79.[1]

[1]Knight JR, Shrier LA, Bravender TD, Farrell M, Vander Bilt J, Shaffer HJ. (1999). A new brief screen for adolescent substance abuse. *Archives of Pediatrics & Adolescent Medicine, 153*(6), 591-596. doi:10.1001/archpedi.153.6.591.

Statistical Analysis

Complex Sampling Adjustments

- Weighted to adjust for the probability of selection, stratification, and clustering.
- A final post-stratification adjustment was provided to restore the population gender distribution according to grade.

Statistical Analysis

- Crosstabs reported with an adjusted Rao-Scott F-statistic with a Coefficient of Variation (CV) not exceeding 33.3 (as suggested by Statistics Canada).
- Logistic Regression is employed to assess the impact of risk factors on the likelihood that respondents would report driving impaired.
- Analyses were conducted in SPSS 25 Complex Samples.

Results

Impaired Driving

- **Rates are high as they include Grade 9 students and students with a G1 or 2 licence.**
- **Driving after recent cannabis use is 2 times that of alcohol.**

		Alcohol Driving		Cannabis Driving	
	N	1+ times %	95% CI	1+ times %	95% CI
Total	**534**	**9.50**	**6.13-14.37**	**19.27**	**14.16-25.66**

Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals

Age/Sex

- Males reported a higher rate of impaired driving.
- More females reported cannabis driving and males who reported alcohol driving.

			Alcohol Driving		Cannabis Driving		
		N (534)	1+ times (%)	95% CI	N (534)	1+ times (%)	95% CI
Age	16	43	*unstable*		43	*unstable*	
	17	343	10.38	6.27-16.69	343	19.71	13.74-27.47
	18	141	*unstable*		141	18.23	11.65-27.39
	19	<10	*unstable*		<10	*unstable*	
Sex	Male	265	12.10	7.30-19.4	265	22.64	15.75-31.42
	Female	269	*unstable*		269	14.75	8.49-24.41

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

ADHD Screener

		Alcohol Driving		Cannabis Driving		
	N (531)	1+ times (%)	95% CI	**N (531)**	1+ times (%)	95% CI
Yes (14+)	**94**	*unstable*		**95**	**28.58**	**15.74-46.14**
No	**437**	**8.91**	**5.45-14.23**	**436**	**17.42**	**12.39-23.94**

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Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Psychological Distress K6 Screener

		Alcohol Driving		Cannabis Driving		
	N (531)	1+ times (%)	95% CI	**N (531)**	1+ times (%)	95% CI
Yes (8+)	**219**	**11.28**	**5.97-20.32**	219	**20.43**	**13.09-30.45**
No	**312**	**8.37**	**4.69-14.48**	**312**	**18.03**	**11.84-26.49**

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Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Mental Health Care Utilization

		Alcohol Driving		Cannabis Driving		
	N (533)	1+ times (%)	95% CI	**N (533)**	1+ times (%)	95% CI
# times see doctor/nurse/counsellor about your mental health						
1+ times	**138**	*unstable*		**138**	**25.11**	**14.24-40.38**
No	**395**	**8.25**	**5.17-12.91**	**395**	**17.09**	**12.03-23.72**

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Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Suicide

		Alcohol Driving		Cannabis Driving		
	N (527)	1+ times (%)	95% CI	**N (527)**	1+ times (%)	95% CI
Ever seriously consider attempting suicide						
Yes	**75**	*unstable*		**75**	**30.18**	**15.00-51.44**
No	**451**	**8.57**	**5.48-13.15**	**451**	**16.51**	**12.10-22.12**

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

ADHD Medications

		Alcohol Driving		Cannabis Driving		
	N (534)	1+ times (%)	95% CI	**N (534)**	1+ times (%)	95% CI
Used drug non-medically *				***		
Yes	**26**	*unstable*		**26**	**72.48**	**49.69-87.54**
No	**508**	**8.50**	**5.14-13.75**	**508**	**16.18**	**11.54-22.21**
Used drug medically						
Yes	**10**	*unstable*		**10**	***unstable***	
No	**524**	**9.40**	**6.04-14.35**	**524**	**18.89**	**13.77-25.36**

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Been Prescribed Medicine to Treat Anxiety or Depression

		Alcohol Driving		Cannabis Driving		
	N (533)	1+ times (%)	95% CI	**N (533)**	1+ times (%)	95% CI
Yes	**44**	*unstable*		**44**	**28.55**	**15.91-45.77**
No	**489**	**8.80**	**5.43-13.93**	**489**	**18.16**	**12.95-24.87**

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Alcohol Use

		Alcohol Driving		Cannabis Driving		
	N (534)	1+ times (%)	95% CI	N (534)	1+ times (%)	95% CI
Alcohol Use*				**		
Yes	**461**	**10.64**	**6.89-16.09**	**462**	**21.46**	**15.80-28.47**
No (incl. sips)	**73**	*unstable*		**72**	*unstable*	
Binge Drinking **				***		
Yes (5+)	**243**	**16.06**	**9.67-25.47**	**243**	**30.08**	**22.60-38.80**
No	**291**	*unstable*		**291**	*unstable*	

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Hazardous Drinking

		Alcohol Driving		Cannabis Driving		
	N (527)	1+ times (%)	95% CI	N (527)	1 + times (%)	95% CI
AUDIT* **				***		
Yes (8+)	**204**	**19.75**	**12.18-30.39**	**204**	**34.94**	**25.89-45.23**
No (<8)	**323**	*unstable*		**323**	**7.19**	**4.39-11.56**

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Cannabis/Drug Use

		Alcohol Driving		Cannabis Driving		
	N (534)	1+ times (%)	95% CI	N (534)	1+ times (%)	95% CI
Cannabis Use**				***		
Yes	**259**	**15.29**	**9.31-24.10**	**259**	**38.39**	**28.84-48.94**
No	**275**	*unstable*		**275**	*unstable*	
Drug Use Problem (CRAFFT)**				***		
Yes (2+)	**148**	**18.08**	**10.43-29.48**	**148**	**53.33**	**42.50-63.86**
No (<2)	**386**	*unstable*		**386**	**5.33**	**3.17-8.82**

Some estimates are unstable and cannot be reported > Coefficients of Variation (CV) exceeds the 33.3 standard.
Sample (N) is unweighted, and percentages are based on weighted sample size. CI – Confidence Intervals
Design-based F statistical significant *p<.05; **p<.01; ***p<.001.

Sample Design Characteristics

- **Population Size**: 64,123.445
- **Strata** (region by school level)**:** 11
- **Clusters/Primary Sampling Units** (schools): 103
- **Sampling Design Degrees of Freedom:** 100

Alcohol Driving: Adjusted logistic regression among students 16 years old or older with at least a G2 driver's license

	Adjusted Wald Test (t)	Alcohol Driving AOR	95% C.I.
Intercept	*-6.402****	*0.009*	*0.002 – 0.038*
Male	1.326	2.325	0.658 – 8.215
ADHD Screener	-0.281	0.823	0.208 – 3.251
K6 Screener	0.570	1.461	0.391 – 5.456
AUDIT 8+	3.656***	10.102	2.880 – 35.442
CRAFFT 2+	1.302	2.069	0.684 – 6.262

Pseudo R Squares: Cox and Snell = .113; Nagelkerke = .241; McFadden = .190
** p<.05, ** p< .01, *** p < .001*
CI=logit transformed confidence interval; AOR = Adjusted Odds Ratio

Cannabis Driving: Adjusted logistic regression among students 16 years old or older with at least a G2 driver's license

	Adjusted Wald Test (t)	Cannabis Driving AOR	95% C.I.
Intercept	*-7.300****	*0.024*	*0.009 – 0.067*
Male	0.859	1.558	0.559 – 4.341
ADHD Screener	-0.117	0.955	0.438 – 2.084
K6 Screener	-1.256	0.598	0.265 - 1.347
AUDIT 8+	3.689***	4.039	1.906 – 8.556
CRAFFT 2+	8.506***	18.189	9.246 – 35.780

Pseudo R Squares: Cox and Snell = .284; Nagelkerke = .460; McFadden = .348
** p<.05, ** p< .01, *** p < .001*
CI=logit transformed confidence interval; AOR = Adjusted Odds Ratio

Discussion

Cannabis use and driving – problematic

- 1 in 5 students with G1 or G2 licences reported driving within 1 hr of using cannabis at least once in past year.
- 1 in 10 students with G1 or G2 licences reported driving within 1 hr of having 2 or more drinks at least once in past year.
- Driving after cannabis use at twice the rate of driving after drinking.

Mental health and impaired driving

- Driving after alcohol or cannabis use NOT associated with

  – Positive ADHD screener
  – Positive distress screener
  – Suicide ideation
  – Mental health care utilization
  – Medical use of medications for ADHD, anxiety or depression.

Illicit drug use and impaired driving

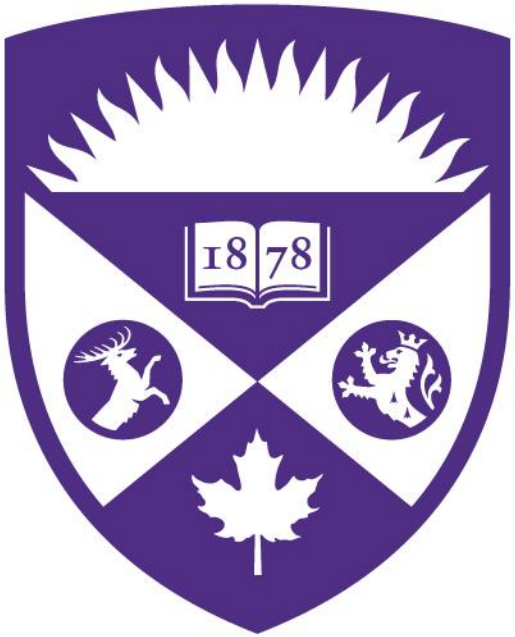
- Driving after alcohol or cannabis use WAS associated with
  - Non-medical use of medications for ADHD
  - Alcohol use
  - Cannabis use
  - Binge drinking
  - Hazardous drinking (AUDIT)
  - Hazardous cannabis use (CRAFFT)

Hazardous drug use and impaired driving

- Logistic regression indicates that only predictors of alcohol and cannabis impaired driving is hazardous alcohol and cannabis use.
- Reflects on the importance of preventing drug use among youth, as drug use can have many negative outcomes for youth, including impaired driving.

Limitations

- The OSDUHS is a self-reported survey. With adolescents under- and over- reporting may exist.
- Small cell sizes did not allow some effects to be found.
- OSDUHS is cross-sectional so no causal inferences can be determined.



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