Sex, gender and cannabis

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Key messages

- Research evidence on sex, gender and cannabis is scant
- Limited information about sex differences
- Gender related factors matter for policy and programming
- Applying learnings from tobacco, vaping, and other substance use important
- Knowledge translation is challenging
Outline

- Sex and gender definitions
- Two projects underway
- Scoping review findings
  - Human sex differences
    - Physical & mental health consequences
  - Gender related factors:
    - Patterns of use & prevalence
    - Factors associated with initiation & use
    - Access & methods of use
    - Perceptions of peer use, risk, benefit
- Policy, Research and Practice Implications
Components of sex affecting substance use

- **HORMONES**
  - levels, age

- **GENES**
  - Disease, addiction

- **PHYSIOLOGY & ANATOMY**
  - Body size, fat content, organ Fx

- **NEURO BIOLOGY**
  - Pain, memory..

Sex exists on a continuum and components may change (or be changed) over time.
Components of gender influencing substance use

Gender has several components intersecting and interacting with; sexual orientation, race, ethnicity, culture, SES… and changing over time.
Objective: to develop and test sex and gender-informed approaches to alcohol, nicotine, opioids and cannabis

3 year project
- Scoping & systematic reviews
- Intervention development in 3 Canadian sites
- Baseline and follow-up measures of integration of sex, gender in substance use responses

Funded by Canadian Institutes of Health Research: Institute of Gender & Health
2. Developing sex and gender informed public health policy

- Partnership project goals:
  - to support the analysis of available data regarding cannabis use patterns among gender groups
  - to provide expertise and capacity building on sex and gender-based analysis (SGBA+)
  - to support the development of responsive and effective public education and awareness products

- Policy-research partnership project funded by Health Canada and the CIHR-Institute of Gender and Health: SGBA policy partnership
Scoping review informs both

Scoping review question:

- How do sex and gender related factors impact:
  a) patterns of use
  b) health effects
  c) and prevention/ treatment/ or harm reduction outcomes for opioid, alcohol, tobacco and cannabis use?
Important research limitations

- Self reporting of use
- Illegal status to date in most jurisdictions
- Correlational/ cross-sectional data
- Lack of generalizability
- Contradictory, limited evidence
- Overall lack of sex and gender in research
- Rapidly evolving literature
Prevalence Trends
Greater prevalence among boys & men

- Cross-sectional [1-3] and cohort [4,5] studies reveal higher prevalence of cannabis use among boys and men compared to girls and women.

- Analysis of US cannabis use trends from 2007 to 2014—greater increase in the prevalence of cannabis use for men [3]

- In the USA, Germany, and France [6], experimentation with cannabis higher among men
Males use more cannabis more frequently


- Factors associated with greater cannabis use frequency in cross-sectional studies:
  - greater reward dependence (increased sensitivity to social situations and reinforcement) in women but not men [9]
  - expectation of relaxation and tension reduction with cannabis use in women [10]
  - depressive symptoms for boys [11]
Gender gap narrowing?

- Cross sectional study, gender & trends in cannabis use in USA, Germany, France [6]:
  - Narrowing of the gender gap in the USA and Germany
  - Gender gap is greater and more stable over time in France
  - Similar to tobacco epidemic: beginning among men and spreading to women?

- Cross-sectional study on US trends in adolescent cannabis use 1999 to 2009 [12]:
  - higher prevalence of lifetime use for boys in all years
  - in 1999, 51% of boys and 43.4% of girls
  - in 2013, 42.1% of boys and 39.2% of girls
Human Sex Differences
Limited evidence on sex differences: hard to interpret

- Research on anxiety, subjective effects and dependence is mixed, in multiple study designs
- **May** be more anxiety in females
- **May** be more subjective feelings of “high” in females
<table>
<thead>
<tr>
<th>Effects</th>
<th>Sex differences</th>
<th>No Sex differences</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependence</td>
<td>- decrease in cannabis smoking compulsivity in women who received THC [13,14]</td>
<td>- medium effect size between dependence and sensation seeking, lack of planning, positive urgency [16]</td>
<td>Meta-analysis</td>
</tr>
<tr>
<td>Subjective Effects</td>
<td>Greater subjective effects for females:</td>
<td>- no sex differences in subjective ratings of cannabis [22]</td>
<td>double-blind placebo-controlled RTs</td>
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<tr>
<td></td>
<td>- women rated themselves &quot;higher&quot; than men [18]; and women greater subjective effects than men at low dose; men greater subjective effects at high dose [19]</td>
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<td></td>
<td>- women higher ratings for ‘Good’ and ‘Take Again’ [20]</td>
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<tr>
<td></td>
<td>Greater subjective effects for males:</td>
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<tr>
<td></td>
<td>- men felt more &quot;down&quot; during cue exposure [14]; and more likely to rate themselves as ‘high’ over time [21]</td>
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</tbody>
</table>

Note: RT = Reaction Time, DB = Double-Blind, DB placebo controlled RTs = Double-Blind placebo-controlled Reaction Times
Effects on cognition, sleep and memory?

- **May** be reduced pain sensitivity in men
- **May** be different kinds of impaired cognition in men and women
<table>
<thead>
<tr>
<th>Effects</th>
<th>Sex Differences</th>
<th>No Sex Differences</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiological</td>
<td>- men trended to exhibiting greater increases in heart rate after smoking [20]</td>
<td>- increased heart rate in females and males [14, 17, 18, 21]</td>
<td></td>
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<tr>
<td>Effects</td>
<td>- Greater heart rate increase in females [19]</td>
<td>placebo controlled RTs</td>
<td></td>
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<tr>
<td></td>
<td>- decreased cortical thickness - males [25]; lateral orbitofrontal cortex-females [26]; different neural activation response to cues [27]</td>
<td>cross-sectional observational studies</td>
<td></td>
</tr>
<tr>
<td>Cognition &amp;</td>
<td>- impaired delayed recall in women; impaired decision making in men [29]; impaired total verbal learning, visual memory scores, and delayed free recall in men [30]</td>
<td>- no effects visuospatial processing or cognitive flexibility [31]; no effect on task performance [21]</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>cross-sectional observational studies</td>
<td>- frequent users worse executive control, occasional users better executive control vs. non-users [32]</td>
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<tr>
<td>Pain &amp; Attention</td>
<td>- reduced pain sensitivity in men [22]</td>
<td>- reduced attention [17, 31]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>within-subject, double blind placebo controlled RT</td>
<td>Between-subject placebo controlled RT</td>
<td></td>
</tr>
<tr>
<td>Sleep</td>
<td></td>
<td>- increased sleepiness after THC [31]</td>
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<tr>
<td></td>
<td></td>
<td>Within &amp; between subject placebo controlled RCTs</td>
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</table>
Physical & Mental Health Consequences
Mental health impacts?

- Contradictory evidence on sex/gender differences in impact of cannabis on onset of mental illness
- Similarly on onset of suicidal ideation among young people
<table>
<thead>
<tr>
<th>Health effect</th>
<th>Sex/Gender differences in physical/mental health consequences</th>
<th>No sex/gender differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk behaviours</td>
<td>“risky partying” men more fighting injuries; women: blackouts &amp; accident injuries [33]</td>
<td>Cross-sectional</td>
</tr>
<tr>
<td>Depression</td>
<td>more emotional/physical problems that interfered with social activities in women, not in men [34]</td>
<td>Cross-sectional:</td>
</tr>
<tr>
<td>Other mental health diagnoses</td>
<td>psychiatric illness during late adolescence in males [35]</td>
<td>[Cross-sectional]</td>
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<tr>
<td></td>
<td>bipolar patients lower total remission in females; lower manic symptoms in males [36]</td>
<td>Before &amp; after study</td>
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<tr>
<td></td>
<td>men and women with schizophrenia, earlier age of symptom onset [37]</td>
<td>Cross-sectional</td>
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<tr>
<td></td>
<td>earlier onset first psychosis for males &amp; females with a psychotic illness [38]</td>
<td>Cross-sectional</td>
</tr>
<tr>
<td>Suicidal ideation</td>
<td>early initiation associated with suicide ideation/attempts with girls only in USA [39]</td>
<td>Cross-sectional studies</td>
</tr>
<tr>
<td></td>
<td>suicidal ideation/attempts for American Indian males only [40]</td>
<td>early initiation associated with suicide ideation/attempts for girls &amp; boys in France [39]</td>
</tr>
<tr>
<td>Cognition</td>
<td>problems with cognition related to daily time spent smoking cannabis [41]</td>
<td>Correlational</td>
</tr>
</tbody>
</table>
Girls & depression

- US cohort study with girls with depressive symptoms ages 5-8 [42]
- followed 6 years
  - cannabis use associated with increased depressive symptoms
CUD and quality of life

- Analysis of the US National Epidemiological Survey of Alcohol and Related Conditions (n = 43,093) [43]:
  - male and female cannabis users reported lower quality of life compared to non-users
  - females and males with CUD reported lower quality of life compared to those without CUD
  - effect of cannabis use on mental quality of life scores more pronounced for women
    - Each daily joint smoked associated with a greater decrease in mental quality of life summary scores in females compared to males
Cannabis use dependence - greater in men, but telescoping in women

US cross-sectional studies

- Men report earlier age of CUD onset [7]
- Men report greater rates of cannabis dependence [44, 45, 46]
- Men more likely to report [47]:
  - hazardous use (44.9% vs 19%)
  - social consequences (9.6% vs 3.8%)
  - physiological and psychological consequences (11% vs 5%), tolerance (18.5% vs 10.6%)
  - withdrawal symptoms (10.7% vs 4.6%)
  - inability to stop or reduce use (11.6% vs 4.8%)

- Women – evidence of telescoping [20]
Gender (and intersecting factors)
Associated with Cannabis initiation & use
## Race/ Ethnicity, Income

### Gender differences

| Race | Boys higher prevalence for Black, White, Hispanic, multi-racial adolescents  
Largest gender gap for: American Indian/ Alaskan Native adolescents (41% vs 26.9%) & Black adolescents (27.8% vs 19.9%) [12]  
Indigenous adolescents in USA & Canada: higher female use < age 15; boys> in later adolescence [48]  
| Income | Increase in cannabis use from adolescence to young adulthood among males, not females, living on a low income [49]  
| Cross sectional  
| Cohort  


### Race/ Ethnicity, Income

<table>
<thead>
<tr>
<th>Race</th>
<th>Asian and Native Hawaiian/ Pacific Islander adolescents no gender difference in prevalence [12]</th>
<th>Cross-sectional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>Poverty not significantly associated with initiation among males or females [50]</td>
<td>Cross-sectional</td>
</tr>
</tbody>
</table>
More clear in single gender studies

- Greater past year initiation among Black and Hispanic boys, compared to White boys [51]

- Greater prevalence and intention to use cannabis among Black girls compared to White girls [52]
Risk & Protective Factors and Gender
## Protective Factors

<table>
<thead>
<tr>
<th></th>
<th>Gender differences</th>
<th>No Gender Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team sports</strong></td>
<td>lower use for girls [53]</td>
<td>cross-sectional study</td>
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<tr>
<td></td>
<td></td>
<td><strong>Friendships</strong></td>
</tr>
<tr>
<td></td>
<td>same gender friends, lower use for girls [54]</td>
<td>lower use for girls and boys with schoolmates as friends [55]</td>
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<tr>
<td></td>
<td></td>
<td><strong>Parental monitoring</strong></td>
</tr>
<tr>
<td></td>
<td>lower cannabis use in girls</td>
<td>Meta-analyses [59] cohort &amp; cross-sectional studies</td>
</tr>
<tr>
<td></td>
<td>lower cannabis use in boys [56-58]</td>
<td>cohort &amp; cross-sectional studies</td>
</tr>
<tr>
<td><strong>Religiosity</strong></td>
<td></td>
<td>lower use for girls and boys with: higher religiosity [63]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cross sectional</td>
</tr>
</tbody>
</table>
### Risk Factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Key findings re gender differences</th>
<th>Research Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low academic achievement</td>
<td>greater use in girls [64]</td>
<td>Cohort study</td>
</tr>
<tr>
<td></td>
<td>greater use in boys [65]</td>
<td>Cross sectional</td>
</tr>
<tr>
<td>Public body consciousness</td>
<td>greater public body consciousness associated with cannabis use in boys [66]</td>
<td>Cross sectional</td>
</tr>
</tbody>
</table>
Risk factors—no gender differences

• One US cohort study reported that experiencing peer pressure, or using alcohol & tobacco risk factor for initiating cannabis use in both girls and boys [64]

• In contrast, another US cohort study reported that peer use *not* linked with cannabis use for Hispanic girls or boys during emerging adulthood [67]
More risk factors: Violence, trauma and ACEs

Evidence from cohort & cross-sectional studies:

- Both women and men who were victims of violence more likely to report use [68]
- Both girls and boys who witnessed a violent death more likely to report use [69]

Girls:
- dating victimization [70, 71] & aggression [71, 72] associated with cannabis use in girls

Boys & Men:
- adolescent dating victimization associated with cannabis use in men in young adulthood [73]
- cannabis use associated with having witnessed mother’s partners incarceration in men [74]
Gender norms & cannabis use

- Men adhering to gender typical behaviors may have greater risk for both alcohol and cannabis use, based on findings from both cross-sectional [75] and cohort [76] studies.

- Qualitative studies:
  - In contrast to alcohol and other substances, cannabis use may represent an alternative and gentler way of “doing masculinity” [77]
  - Similar to tobacco and other substances, young women who use cannabis frame their use as a form of rebellion against traditional gender roles [78]
    - female cannabis users resist dominant feminine ideals, position themselves as “one of the boys” and engaging in “masculine” cannabis use activities: using cannabis habitually, rolling joints, buying cannabis, being able to handle the high
Gender identity affects use

US cross-sectional studies:

- Gender identity status is linked to increased substance use [79, 80]

- Trans/ gender diverse individuals [81]:
  - trans men 12.5% used cannabis
  - trans women using outreach services (with/without HIV): 25.6%

- Gender minority youth (ages 13-18): greater odds of past year use for victims of bullying and harassment [82]

- Gender minority stress associated with cannabis use among transgender women [83]
Sexual orientation linked to use

Sexual minority status associated with increased use of a range of substances [84, 85]

- Patterns of cannabis use reflect these trends
- Consistent across race/ethnic groups and age categories in cohort [86] and cross-sectional studies [87-93]
- In Canadian bisexual women, cannabis use identified as helpful for coping with anxiety, stress, pain and biphobia [94]
Age of Initiation

- Cross-sectional studies report no gender difference in age of initiation [3, 95]

- In a cohort study with US justice involved adolescents on probation, boys reported earlier age of initiation [96]
Access, Methods and Co Use
Gender and Access

- Danish cross-sectional study [97]:
  - no significant gender differences in the number of joints purchased, or in the quantity of cannabis bought in cannabis retail purchases in Christiania, Copenhagen in 2004
  - Normalized cannabis use

- Norwegian cross-sectional study [98]:
  - girls (48%) and boys (52%) reported similar rates of being offered cannabis in the past year
Girls use less often, for sleep and medicinal purposes

- **US cross-sectional survey of students aged 10-19 years (n=20,055 students) [99]:**
  - males more likely to report using cannabis at school and on weeknights
  - girls more likely to report cannabis use on the weekends

- **German cross-sectional study [100]:**
  - male cannabis users more frequently used with friends, strangers or alone
  - female cannabis users more likely to use cannabis before sleep

- **US cross-sectional survey [3]:**
  - prevalence of cannabis use for recreational purposes: 73.4% men; 65.5% women
  - medicinal purposes: 54.3% men; 64.1% women
  - men more likely to report enhanced: memory, appetite, enthusiasm, musicality
  - women more likely to report experiencing loss of appetite, desire to clean
# Medical Cannabis Use: gendered reasons?

<table>
<thead>
<tr>
<th>Study sample</th>
<th>Gender differences</th>
<th>No gender differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>medical cannabis programs in 13 US States [101]</td>
<td>• men more likely to use medical cannabis</td>
<td></td>
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<tr>
<td></td>
<td>• narrowest gender gap: Oregon, Alaska</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• gender gap narrowing in Colorado and Arizona</td>
<td></td>
</tr>
<tr>
<td>US medical cannabis users [3]</td>
<td>• women use cannabis to treat: anxiety, nausea, anorexia, irritable bowel syndrome, and headaches/ migraines</td>
<td></td>
</tr>
<tr>
<td>(cross-sectional)</td>
<td>• men: greater headache/ migraine relief</td>
<td></td>
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<tr>
<td>US women &amp; men using prescription painkillers [102]</td>
<td></td>
<td>female and male medical cannabis users more likely to use cannabis as a substitute for prescription medication vs. non-medical cannabis users</td>
</tr>
<tr>
<td>(cross-sectional)</td>
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</table>
## Gender and ROA (methods of use)

<table>
<thead>
<tr>
<th>Cross sectional studies with:</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>German cannabis users [100]</td>
<td>Water pipes</td>
<td>Smoking joints</td>
</tr>
<tr>
<td>US medical cannabis users [103]</td>
<td>More likely (41% vs 35%) to vaporize cannabis</td>
<td></td>
</tr>
<tr>
<td>US cannabis users [104]</td>
<td>Higher rates of vaping</td>
<td></td>
</tr>
</tbody>
</table>

2019 North American Cannabis Summit
Cannabis & nicotine and gender?

- US study with adolescent smokers [105]:
  - high frequency cannabis use (more than 6 times in the past month) associated with decreased odds of cigarette quit attempt among boys, but not girls

- US study following adolescents into young adulthood [106]:
  - cannabis use frequency associated with increased cigarette use frequency, particularly among males with depressive symptoms
  - effect not found for females

- Canadian study n=39,837 grade 9-12 students [107]:
  - cannabis users more likely to report using e-cigarettes
  - effect greater for females
Co-use with alcohol especially among men

- Simultaneous use of alcohol and cannabis higher in young men compared to young women [108-110]

- Associated with substantial risks, including:
  - greater impairment
  - heavier alcohol use
  - negative social consequences including driving while impaired
  - greater likelihood of comorbid substance use and mental health issues
Males more prone to impaired driving

- Driving after cannabis use and being a passenger with someone who has used cannabis is higher among men in cross-sectional [108] and cohort [111] studies.

- US cross-sectional study, college students who reported past month cannabis use [108]:
  - 43.9% of males and 8.7% of females reported driving after cannabis use
  - More males reported riding as a passenger with someone who had used cannabis (51.2% vs 34.8%)
Implications for Knowledge Translation, Research and Policy
Important research limitations

- Self reporting of use
- Illegal status to date in most jurisdictions
- Correlational, cross-sectional data
- Lack of generalizability
- Contradictory, limited evidence
- Overall lack of sex and gender in research
Opportunities for research

- Systematic inclusion of sex and gender in research
- Special attention to:
  - Gender and driving, access, peer influences, co-use with tobacco and alcohol
- Basic studies on:
  - Sex specific impacts on use, CUD, impairment, respiratory health
  - Monitor emerging evidence about sex differences in tolerance, brain effects
  - Impact on fertility, reproduction, pregnancy and breastfeeding
  - Develop sex specific low risk guidelines for cannabis
Opportunities for Policy

High priority issues regarding sex, gender and cannabis policy:

- Integrate SGBA+ considerations in all research, policy and communications regarding cannabis
- Generate consistent policies and regulations regarding the impacts of route of administration
- Use existing social and biological research to generate tailored and gendered prevention messaging for all age groups and sub groups
- Respond to the high priority gendered issue of higher male use, higher male DUI, and higher rates of males riding with impaired drivers
- Respond to high risk of misuse among gendered sexual minority populations
Opportunities for messaging & prevention

- Develop critical thinking by girls and boys on gendered influences on use & develop refusal skills regarding usage, driving/riding, multi-substance use
- Align cannabis information, education and policy direction with alcohol, nicotine and vaping policy
- Tailor messaging to:
  - Sexual minority youth
  - Seniors
  - Preconception care
- Highlight the health risks of women’s and men’s co-use of: cannabis & tobacco, cannabis & alcohol
- Address the higher rates of driving and riding while impaired by boys and men and encourage changes in responsibility for DWI to be shared by all


7. Foster, K.T., et al., Gender Differences in Internalizing Symptoms and Suicide Risk Among Men and Women Seeking Treatment for Cannabis Use Disorder from Late Adolescence to Middle Adulthood. Journal of Substance Abuse Treatment, 2016. 66 : p. 16-22.


References


