UNRAVELING THE RELATIONSHIP BETWEEN SMOKING AND DRINKING IN YOUNG ADULTS

Why do they go together like drinking milk with cookies?
Why do drinking and smoking go together like………..

- “drinking milk with cookies”
- “eating peanut butter with jelly”

Nichter et al., 2006; Stromberg et al., 2007
Why do drinking and smoking go together like milk & cookies?

Levels of Interaction

- Co-morbidity
- Cross-tolerance
- Cross-cue reactivity
- Pharmacological
- Social
- Psychological

- Conditioning
- Neurochemical
- Electrophysiological
- Molecular
- Genetic
- Environmental

Dani & Harris, 2005
Davis & de Fiebre, 2006
Larsson & Engel, 2004
Li et al., 2007
Schlaepfer et al., 2008
Söderpalm et al., 2000
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Why do drinking and smoking go together like milk & cookies?

**SECTION I**

- Alcohol & tobacco co-use
  - Part I: Prevalence
  - Part II: Does tobacco use increase risk for alcohol misuse?
  - Part III: Does alcohol use increase the risk for daily smoking?

**SECTION II**

- How can knowledge of alcohol-tobacco interactions be utilized to reduce alcohol & tobacco use?
  - Part I: Screening
  - Part II: Policy
  - Part III: Treatment
Funding & Disclosures

- National Institute on Alcohol Abuse and Alcoholism
- Alcoholic Beverage Medical Research Foundation
- National Institute of Drug Abuse
- National Cancer Institute
- Robert Wood Johnson Foundation
- NIH Common Fund
- Pfizer
Alcohol & Tobacco Use: Prevalence

Cigarette Use by Drinking Status: Age 18+

Current Cigarette Use In Past Year Drinkers
n=27,935

Current Cigarette Use In Past Year Abstainers
n=14,620

NESARC WAVE I (2001-2002), unpublished data
Alcohol & Tobacco Use: Prevalence

Cigarette Use by Drinking Status: Age 18-25

Current Cigarette Use
In Past Year Drinkers n=3,977

- 58%
- 29%
- 9%
- 4%

Current Cigarette Use
In Past Year Abstainers n=1,768

- 87%
- 9%
- 2%
- 3%

NESARC WAVE I (2001-2002), unpublished data

Section I: Part I
Alcohol & Tobacco Use: Prevalence

Cigarette Use by Drinking Status: Age 18-25

Current Cigarette Use In Past Year Drinkers

- 56%
- 27%
- 11%
- 7%

DC/MARYLAND/VIRGINIA

Current Cigarette Use In Past Year Abstainers

- 94%
- 5%
- 1%

NESARC WAVE I (2001-2002), unpublished data
Alcohol & Tobacco Use: Prevalence

Alcohol Use by Smoking Status: Age 18+

Past Year Alcohol Use
In Smokers n=10,444

- Current Drinker: 78%
- Former Drinker: 16%
- Abstainer: 6%

Past Year Alcohol Use
In Non-Smokers n=32,112

- Current Drinker: 62%
- Former Drinker: 21%
- Abstainer: 18%

NESARC WAVE I (2001-2002), unpublished data
Alcohol & Tobacco Use: Prevalence

Alcohol Use by Smoking Status: Age 18-25

Past Year Alcohol Use
In Smokers n=1,703

- 90% Current Drinker
- 6% Former Drinker
- 5% Abstainer

Past Year Alcohol Use
In Non-Smokers n=4,069

- 61% Current Drinker
- 30% Former Drinker
- 10% Abstainer

NESARC WAVE I (2001-2002), unpublished data
Alcohol & Tobacco Use: Prevalence

Alcohol Use by Smoking Status: Age 18-25

Past Year Alcohol Use In Smokers
- 6%
- 1%
- 93%

Past Year Alcohol Use In Non-Smokers
- 8%
- 32%
- 60%

DC/MARYLAND/VIRGINIA

NESARC WAVE I (2001-2002), unpublished data
Alcohol & Tobacco Use: Prevalence

Alcohol & Tobacco

USE OF BOTH or USE OF NEITHER GO TOGETHER
Does tobacco use increase risk for alcohol misuse?
Does tobacco use increase risk for alcohol misuse?

- **Binge Drinking (5+ males, 4+ females)**

- **Hazardous Drinking – NIAAA definition**
  - **Males:** more than 14 drinks weekly and at least one episode of heavy drinking per year (5+ drinks)
  - **Females:** more than 7 drinks weekly and at least one episode of heavy drinking per year (4+ drinks)

- **Alcohol Use Diagnosis (abuse or dependence)**
Does tobacco use increase risk for alcohol misuse?

Rates of Problem Alcohol Use by Smoking Status

Adults aged 18+, n=43,093

Daily smokers and chippers have increased risk of meeting criteria for hazardous drinking and alcohol use disorders.

NESARC WAVE I (2001-2002) *p<.001 McKee et al., 2007, Arch of Int Med
Does tobacco use increase risk for alcohol misuse?

Rates of Problem Alcohol Use by Smoking Status

Young adults who smoke (daily or non-daily) are at greatest risk for meeting criteria for hazardous drinking and alcohol use disorders.

Young Adults aged 18-25, n=5,838

- Non-Smokers
- Daily Smokers
- Chippers

ODDS RATIOS

Hazardous Drinking

Alcohol Use Diagnoses

NESARC WAVE I (2001-2002) *p<.001

Harrison…McKee, 2008, ACER
Does tobacco use increase risk for alcohol misuse?

Longitudinal Prediction of Problem Alcohol Use by Smoking Status

Young Adults aged 18-25, n=4,468

Smoking status at Wave I, predicted drinking behavior across a 3-yr span in young adults, while controlling for Wave 1 drinking behavior.

Harrison…McKee, under review

Does tobacco use increase risk for alcohol misuse?

Smoking increases the amount consumed per episode and likelihood of frequent binge drinking.

**% Binge Drinking at Least 1x per Week in Young Adults**

- Non-Smoker
- Daily Smoker
- Chipper

*Smoking increases the amount consumed per episode and likelihood of frequent binge drinking.*

*p<.05*

*McKee et al., 2004, Nic Tob Res; Harrison, Hinson, McKee, 2009, Addict Behav*
Does tobacco use increase risk for alcohol misuse?

% Consuming Alcohol by Hour During a Drinking Episode

Smoking increases the length of a drinking episode

* p<.05

Harrison & McKee, 2009, SRNT
Does tobacco use increase risk for alcohol misuse?

- Smoking increases alcohol-related reinforcement
  - Increases reported pleasure and desire for alcohol
  - “brings on the buzz”
  - “get drunk quicker”

McKee et al., 2004, Nic Tob Res; Harrison.. McKee, 2009, Addict Behav
Does tobacco use increase risk for alcohol misuse?

YES, daily and non-daily smokers

- drink more
- drink for longer periods of time
- find alcohol more reinforcing
Does alcohol use increase risk for daily tobacco use?
Does alcohol use increase risk for daily tobacco use?

Does alcohol facilitate the transition from non-daily to daily smoking?
Does alcohol use increase risk for daily tobacco use?

- In young adult non-daily smokers, 75% to 90% of all smoking occurs during alcohol consumption (McKee et al., 2004)
Does alcohol use increase risk for daily tobacco use?

Probability of Smoking in Freshman (Colder, 2006)
Does alcohol use increase risk for daily tobacco use?

**Probability of Smoking in Freshman (Colder, 2006)**
Does alcohol use increase risk for daily tobacco use?

Self-Reported Pleasure and Desire from Smoking In Young Adult Non-Daily Smokers

Drinking increases pleasure and desire for cigarettes

Harrison, McKee et al, 2009
Does alcohol use increase risk for daily tobacco use?

“When I smoke cigarettes while drinking, I expect to…..

<table>
<thead>
<tr>
<th></th>
<th>Non-Daily Smokers (n=101)</th>
<th>Regular Smokers (n=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Reinforcement</td>
<td>65%</td>
<td>58%</td>
</tr>
<tr>
<td>Negative Reinforcement</td>
<td>23%</td>
<td>34%</td>
</tr>
<tr>
<td>Negative Consequences</td>
<td>12%</td>
<td>8%</td>
</tr>
</tbody>
</table>

McKee et al, 2004
Does alcohol use increase risk for daily tobacco use?

Hour by Hour Timeline of Smoking in Young Adult Non-Daily Smokers

Harrison et al, 2009
Does alcohol use increase risk for daily tobacco use?

- Young adult non-daily smokers report that smoking, while under the influence of alcohol, is a positive experience even for relatively inexperienced smokers.
- Does alcohol facilitate the transition from non-daily to daily smoking?
Does alcohol use increase risk for daily tobacco use?

A large proportion of smokers consolidate their smoking behavior in young adulthood

Chassin et al, 2000
Does alcohol use increase risk for daily tobacco use?

A large proportion of smokers consolidate their smoking behavior in young adulthood

Chassin et al, 2000
Does alcohol use increase risk for daily tobacco use?

- Does alcohol alter reactivity to tobacco in relatively inexperienced smokers who are heavy drinkers?
  - Alcohol (.08 g/dl)
  - Placebo (told alcohol)
  - Mixer (told no-alcohol)

- Subjective reactivity to a single cigarette
- Ad-lib smoking – 60 min

McKee et al, 2010
Does alcohol alter reactivity to tobacco?

Subjective Reactivity to a Single Cigarette Following Beverage Consumption

Alcohol and placebo beverages increased positive effects of smoking, but only the alcohol beverage decreased negative effects of smoking.

* \( p < .05 \)
Does alcohol alter reactivity to tobacco?

% Smoking Additional Cigarette Following Beverage Consumption

The alcohol beverage increased rates of additional smoking

McKee et al, 2010
Does alcohol alter reactivity to tobacco?

- The expectation of alcohol increased positive reinforcement and actual alcohol decreased negative consequences associated with smoking a cigarette in relatively inexperienced young adult smokers who are heavy drinkers.

- This study has implications for understanding how alcohol may facilitate the development of daily tobacco use.
Alcohol & tobacco co-use

- High-comorbidity
- Tobacco increases risk for hazardous drinking and alcohol use diagnosis, particularly for non-daily smokers
- Smokers are more likely to drink more for longer and find it more reinforcing
- Alcohol may facilitate the transition from non-daily to daily tobacco use
SECTION II

How can knowledge of alcohol-tobacco interactions be utilized to reduce alcohol and tobacco use?

- Screening
- Policy
- Treatment
Screening

- Can knowledge of either alcohol or tobacco use tell you something about the likelihood that the other substance is being used?

- 80% are screening for smoking status (McAvoy et al., 1999; Taira et al., 1997; McBride et al., 1997)

- 30% are typically screened for alcohol or drug use problems during primary care visits (Edlund et al., 2004)
Can smoking status be used as a clinical indicator for alcohol misuse?

- US Preventative Services Task Force recommends screening for hazardous drinking and alcohol use disorders
  - Grade B – screening and brief interventions in primary care settings
Can smoking status be used as a clinical indicator for alcohol misuse?

- John et al., 2003; Kranzler et al., 2002

- **Sensitivity** — rate of true positives
- **Specificity** — rate of true negatives
- **Positive predictive value** — rate of alcohol misuse given smoking behavior
- **Positive likelihood ratio** — odds of alcohol misuse given smoking behavior vs. no alcohol misuse given smoking behavior

- NESARC Wave I (2001-2002) n=43,093
- Daily, chipper, former, or never smoker
Can smoking status be used as a clinical indicator for alcohol misuse?

Current Smoking = Daily Smokers + Chippers

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Positive Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous Drinking</td>
<td>43%</td>
<td>82%</td>
<td>45% vs 26%</td>
<td>2.34</td>
</tr>
<tr>
<td>Alcohol Use Disorders</td>
<td>51%</td>
<td>78%</td>
<td>18% vs 8%</td>
<td>2.33</td>
</tr>
</tbody>
</table>

NESARC WAVE I (2001-2002)

McKee et al., 2007, Arch of Int Med
Policy

- Policies which disaggregate tobacco and alcohol use may serve to reduce the use of both substances.

- Does alcohol policy reduce tobacco use?
  - For example, does increasing alcohol taxes reduce tobacco use?
    - UNKNOWN

- Does tobacco policy reduce alcohol use?
  - Smokefree bans
Do tobacco policies reduce alcohol use?

- Collaboration with Andy Hyland – Roswell Park Cancer Center, Buffalo, NY

- Public health significance of smoke-free policies is clear
  - Second hand smoke exposure is reduced
  - Reduce overall smoking levels

- Does smoke-free legislation produce reductions in drinking behavior?
Do tobacco policies reduce alcohol use?

- International Tobacco Control Policy Evaluation Project  [www.ITCproject.org](http://www.ITCproject.org)

- **Aim:** To conduct a longitudinal examination of the impact of the Scottish smoke-free policy on drinking behavior in smokers and non-smokers, compared to the rest of the United Kingdom, which did not have comprehensive smoke-free policies during the study period.
Do tobacco policies reduce alcohol use?

- Will drinking behavior in pubs decrease among Scottish smokers?
- Will this effect be most pronounced among heavy drinkers?

- Telephone interviews (smoking, drinking, pub attendance)
- Wave I – Feb/March 2006
- Wave II – March 2007
- n=1,059

McKee et al., 2009, Nic Tob Res
Do tobacco policies reduce alcohol use?

Change in Drinks/wk in Pubs 1 yr Following Smoke-Free Legislation in Scotland

Drinking behavior decreased among Scottish smokers, compared to smokers in the rest of the UK, 1-yr following enactment of smoke-free legislation in Scotland.

*p<.05

McKee et al., 2009, Nic Tob Res
Do tobacco policies reduce alcohol use?

- NESARC (2000-01 Wave 1; 2004-05 Wave II, n=34,653)

- If smoke-free legislation was enacted between waves
  - Individuals who met hazardous drinking criteria at Wave I were less likely to continue meeting criteria at Wave II (O.R. = 0.87; 95% CI=0.78-0.97)

  - Individuals were less likely to transition to meeting criteria for an alcohol use disorder at Wave II (O.R. = 0.81; 95% CI=0.69-0.94)

McKee et al., under review
Do tobacco policies reduce alcohol use?

- Impact of smokefree policies on drinking appears to be greatest in those with heavy alcohol consumption
- Smoke-free policies have additional alcohol-related public health benefits

Next steps:
- Sub-group analysis
- Influence of tobacco taxation and price on drinking
Treatment

- Does reducing either alcohol or tobacco use, reduce the use of the other substance?
  - SOMEBEFORE
Does quitting smoking reduce drinking?

- Mixed findings
  - Some studies find that quitting smoking leads to reductions in alcohol use (O’Malley et al., 2009)
  - Other studies find that quitting smoking does not lead to meaningful changes in alcohol use (Kahler et al, 2010)

- BUT drinking is a strong risk factor for the failure to quit smoking

- NCI-funded study examining brief alcohol intervention added to the New York Quitline for hazardous drinkers
Treatment

- Does alcohol treatment increase rates of quitting smoking?
  - Mixed findings (concurrent vs sequential treatment)

- Smoking cessation treatment following alcohol treatment (Cooney et al., 2009)
  - Increase rates of smoking cessation
  - Does not increase rates of alcohol relapse
Treatment

Medications

- Alcohol and tobacco share common pathways to produce reinforcement in the brain.

- Can medications designed to reduce alcohol-related reinforcement, also reduce smoking?

- Can medications designed to reduce tobacco-related reinforcement, also reduce alcohol use?
Can medications designed to reduce alcohol-related reinforcement, also reduce smoking?

- Naltrexone (opiate antagonist)
  - Effective for the treatment of alcohol dependence
  - Thought to reduce alcohol-related reinforcement

- Some evidence that naltrexone may increase rates of smoking cessation and reduce weight gain during a quit attempt (O’Malley et al., 2006)
Can medications designed to reduce smoking-related reinforcement, also reduce drinking?

- Varenicline (partial nicotinic agonist)
  - Effective for smoking cessation
  - Increases rates of smoking cessation 2x over zyban and 4x over placebo (Jorenby et al., 2006)
Can medications designed to reduce smoking-related reinforcement, also reduce drinking?

**DRINKS CONSUMED during 2-hr self-administration period**

McKee et al., 2009 Biological Psychiatry

Varenicline reduced ad-lib behavior in non-smokers and chippers

\*p<.05
Can medications designed to reduce smoking-related reinforcement, also reduce drinking?

**Aim:** What happens to drinking behavior in smokers taking smoking cessation medications to quit smoking?

- ITC-Four country data (US, Canada, UK, France)
- Drinking, smoking, medication use assessed across 2 waves, 1 yr apart
- N=4,995
  - Varenicline (n=291)
  - Nicotine replacement (n=751)
  - No medication (n=3,953)
Can medications designed to reduce smoking-related reinforcement, also reduce drinking?

<table>
<thead>
<tr>
<th></th>
<th>Varenicline vs NRT</th>
<th>Varenicline vs No Medication</th>
<th>NRT vs No Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Drinking (yes/no)</td>
<td>O.R. = 0.56*</td>
<td>O.R. = 0.74</td>
<td>O.R. = 1.10</td>
</tr>
<tr>
<td>Drinks 1x month or more (yes/no)</td>
<td>O.R. = 0.43*</td>
<td>O.R. = 0.62*</td>
<td>O.R. = 1.14*</td>
</tr>
</tbody>
</table>

- Adjusted for Wave 1 drinking, sex, race, age, heaviness of smoking, and quitting smoking
- Effects of varenicline on alcohol consumption are independent of effects on quitting smoking

*p<.01

McKee et al., submitted
Why do drinking and smoking go together like milk & cookies?

FINAL WORDS

- Alcohol & nicotine co-use
  - Potentiated reinforcement
  - Tobacco use increases risk for alcohol misuse
  - Alcohol use increases risk to transition from non-daily to daily smoking

- How can knowledge of alcohol-nicotine interactions be utilized to reduce alcohol and tobacco use?
  - Screening, Policy, Treatment & Medications
  - Afternoon session
    - How can this knowledge be applied to young adult populations?
With many thanks......

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Emily Harrison
Nina Hill
Meaghan Lavery
Lauren Panicek
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Kwesi Prempeh
Jesse Wanzer
Andrea Weinberger
Katie Yanagisawa
QUESTIONS?