Screening Brief Intervention and Referral to Treatment

Opioid and Other Substance Use Disorders Interim Study Committee

Elizabeth Pace, Peer Assistance Services, Inc.
Carolyn Swenson, Peer Assistance Services, Inc.
Cyrille Adam, Senior Director of Health Programs, Kognito Solutions, LLC

August 22, 2017
Peer Assistance Services, Inc.

Prevention and Early Intervention Programming

- Workplace Prevention Services
- Parents & Caregivers
- Peer Health Assistance
  - Nurses, Pharmacists, Dentists, Veterinarians, Mental Health Professionals
- Prescription Drug Abuse Prevention
- Screening, Brief Intervention and Referral to Treatment
Carolyn Swenson, MSPH, MSN, RN
Manager of Training and Consultation
SBIRT in Colorado
Peer Assistance Services, Inc.

Peer Assistance Services
Since 1984
Packet of materials

- SAMHSA SBIRT Grant End Report
- JAMA Psychiatry article and editorial: Increased alcohol use in the US
- OMNI Report: Opioids
- OMNI Report: Women of Childbearing Age
- Pocket Cards: Adult, Adolescent, Older Adult, and Women
- Online Training Postcard for health and mental health providers
- SBIRT in Colorado Training and TA flyer
- APNA article: Using Virtual Patient Simulations
- Mhealth article: Harnessing the power of conversations
The Role of Health Professionals

- Address the full continuum of prevention
- Introduce the topic to open the door to conversation
- Become adequately trained to address substance use
- Initiate and coordinate care for alcohol and drug use problems
Screening-Brief Intervention-Referral to Treatment: SBIRT

**Screening:** Using validated questions.

**Brief Intervention:** A brief conversation to enhance motivation to change.

**Referral to Treatment:** Assessment and services for the person with a more severe alcohol or drug use problem

*Early intervention improves health outcomes*
The goal

Universal screening and conversations about alcohol and drug use in health care setting for adults and adolescents
SBIRT in Colorado
2006-2016

Legend
Grant Sites
- 2006-2011
- 2011-2016
- Interstates
- CoCounties

Grand Junction
Colorado Springs
Denver
SBIRT Colorado Primary Care Screening Results

1% Opioids, 99%

10% Cannabis, 90%

2% 11% Alcohol, 87%

- Moderate-High and High Risk
- Moderate Risk
- No/Low Risk
SBIRT Colorado follow-up results

MEASURED AT INTAKE AND FOLLOW UP
MEAN NUMBER OF DAYS OF USE IN PAST 30 DAYS

Alcohol
- Pre: 12.6
- Post: 5.1

Cannabis
- Pre: 19.3
- Post: 10.2
Cyrille Adam
Senior Director of Health Programs
Kognito Solutions, LLC
Conversations can improve social, emotional, and physical health.

Conversations are central to SBIRT.
Kognito simulations prepare people to effectively lead real-life conversations that drive measurable improvements in health behaviors.

Users engage in role-play conversations with emotionally-responsive virtual humans.
A unique approach to changing attitudes and behaviors that resonates:

- Serving **governments, healthcare, education, and non-profits** for professional development or public education

- **Over 1 million users to date:** 300,000+ educators in 11,000 schools; 10,000 health professionals in 70+ universities and healthcare settings; over two dozen state agencies & statewide nonprofits. 400+ institutions of higher education.

- **Only developer with health simulations** in SAMHSA’s National Registry of Evidence-Based Programs and Practices (NREPP)
Colorado’s statewide campaign to reduce substance use by promoting more effective conversations with healthcare professionals and among the public.

Targeted Messages by Area and Audience

- Radio PSAs and News - Bus Ads and Events – Online Advertising
- Simulations for Public and Clinicians
- More Frequent and Effective Real Life Conversations
- Harm Reduction
Education for Health Professionals

The One Degree campaign provides access to interactive learning experiences where professionals practice talking with virtual patients about substance use before they lead those conversations in real life.

Talking with Adolescent Patients
Alcohol, Marijuana

Talking with Adult Patients
Alcohol, FASD

Standardized assessment of SBIRT competency can be tied to certification or reimbursement.
Public Awareness & Education

The One Degree app allows anyone to practice conversations with virtual peers who use substances in unhealthy ways, moving from awareness to action.

Hi, I'm Jordan!
I enjoy partying, but my drinking and smoking weed have been getting in the way of keeping my job.

Hi, I'm Donna!
I'm dealing with a lot these days, and I use alcohol to cope with stress.

www.shifttheinfluence.org
Recommendations

1. Support efforts to require substance use education for health and mental health professionals; facilitate student loan forgiveness

2. Capitalize on and expand existing prevention expertise to enhance the continuum of care

3. Fund expansion of Screening, Brief Intervention, and Referral to Treatment
Thank you

- Peer Assistance Services, Inc.
  - Elizabeth M. Pace, MSM, RN, CEAP, FAAN
  - Carolyn Swenson, MSPH, MSN, RN

- Kognito Solutions
  - Cyrille Adam, Senior Director of Health Programs
Remarkable Increases in Alcohol Use Disorders

Marc A. Schuckit, MD

This issue of JAMA Psychiatry includes a timely article by Grant et al that makes a compelling case that the United States is facing a crisis with alcohol use, one that is currently costly and about to get worse. The article reminds us that the chilling increases in opioid-related deaths reflect a broader issue regarding additional substance-related problems.

The article by Grant et al describes substantial increases in alcohol use and related problematic behaviors that occurred between the National Epidemiologic Survey on Alcohol and Related Conditions evaluations in 2001-2002 and in 2012-2013. The validity of the results is underscored by the impressive methodology, which at each time applied virtually identical well-validated face-to-face interviews and analytic approaches to about 40,000 nationally representative participants 18 years and older. The concept of high-risk drinking demanded 5 drinks per occasion for men (4 for women) at least weekly, with a standard drink defined as 14 g of ethanol, and alcohol use disorders (AUDs) were defined by the DSM-IV.

The results documented substantial increases in prevalence of past 12-month drinking, high-risk drinking, and AUDs. The largest increase related to the rate of the most serious problems, AUDs overall, which shot up by 49.4%, from 8.5% in 2001-2002 to 12.7% about a decade later. These figures are limited to the past 12-month, or current, diagnoses and do not include individuals who are in potentially temporary remissions. Respondents with lifetime but not current AUDs are also likely to carry future health care costs through enhanced vulnerabilities for cancers, cardiac disease, and other serious disorders associated with histories of heavy drinking.

The overall changes in prevalence over the decade were even greater for several population subgroups including women (an 83.7% increase in AUDs over the 11 years), African American individuals (a 92.8% increase in AUDs), individuals aged 45 years to 64 years and 65 years and older (with 81.5% and 106.7% increases in AUDs, respectively), those with only high school educations (a 57.8% increase in AUDs), and individuals with incomes less than $20,000 (a 65.9% increase in AUDs). During that same period, high-risk drinking, described using the previously mentioned criteria, increased from 9.7% to 12.6% (a change of 29.9%), with similar subgroups as reported for AUDs demonstrating the greatest increases. The proportion of drinkers increased from 65.4% to 72.7% (an enhancement of 11.2%). Similar results have been reported in other national surveys, indicating that the National Epidemiologic Survey on Alcohol and Related Conditions findings are not anomalies.

As noted by the authors, in 2010, the cost to society for alcohol-related problems was estimated at $250 billion per year. It may be too early to precisely identify future costs associated with the higher rates of problematic drinking and AUDs because most do not become apparent for years after heavier drinking begins. However, there are already signs that the changes in drinking observed since 2001-2002 may be associated with increases in alcohol-related health consequences. As highlighted by Grant et al, data already indicate increases in alcohol-related cirrhosis and in hypertension as well as a levelling off of previous decreases in cardiovascular and stroke-related deaths.

The higher rate of increase in high-risk drinking and AUDs in groups less likely to have adequate health coverage is particularly alarming. I am especially concerned about the 105% increase in AUDs for older individuals because they are likely to carry multiple preexisting medical disorders that can be exacerbated by heavier drinking. These older drinkers are also likely to be taking multiple medications that can interact adversely with alcohol, with resulting significant and costly health consequences. It is worth noting the greater-than-average increases in AUDs and related conditions in individuals with less education and lower incomes because these individuals who drink often cannot afford insurance or might have policies that severely limit or do not cover alcohol-related treatments. The 169% increase in the proportion of women who drink alcohol, 58% increase in their high-risk drinking, and the 84% higher 12-month prevalence of AUDs among women are likely to foreshadow future increases in lost time at work, suboptimal child-rearing practices, and children with fetal alcohol spectrum disorders, with potential lifelong impairments in functioning. The higher rate of alcohol problems in subgroups with lower financial resources are cause for concern for humanitarian reasons alone. But even if those are set aside, the absence of easier access to medical care for individuals with long-term, often severe medical problems associated with heavier drinking is likely to result in these individuals turning to emergency departments for their treatment. That will produce subsequent increased costs to taxpayers both directly and through higher insurance rates.

This brings us to the $54-billion question of what can be done to mitigate the problems and costs in the future. First, some good news. Several studies have demonstrated that it is possible to decrease the risk for future alcohol-related problems in 18-year-old students by focusing on risk factors for heavy drinking. Our group delivered an intervention to 500 university freshmen through four 50-minute internet-based videos that helped students recognize their vulnerability toward heavy drinking related to a low level of response to al-
cohol and taught them how to change environmental and attitudinal mediators of how a low level of response affects future drinking quantities. The effects on drinking quantities were still significant 6 and 12 months after students viewed the last video. Other studies have identified programs that help diminish drinking during pregnancy, and others have documented significant reductions in alcohol consumption after treatments. These are only a few examples of ongoing hopeful developments.

There is also some disturbing news. For all the reasons stated previously, the proposed cuts to the National Institutes of Health budget being considered in Washington in 2017 are potentially disastrous for future efforts to decrease alcohol problems and are likely to result in higher costs for us all. Efforts to identify risk factors for substance-related problems and to test prevention approaches take time and money and are less likely to be funded in the current financial atmosphere. If the proposed budget prevails, the National Institutes of Health will have serious problems keeping current research going, and it will be difficult or even impossible to fund new research. In addition, most of the problems raised here will escalate further if as many as 23 million people lose health care benefits under a plan passed by the House of Representatives.

Because this is an editorial, I will close by editorializing. I feel a personal responsibility to do what I can to support politicians, regardless of whether they are Democrats, Republicans, or Independents, who recognize the benefits of research, understand the health care crises we face, and are willing to do something about it. I believe there are people in the United States who are in situations where it is hard for them to mobilize themselves to work toward avoiding future health-related problems and who do not have the financial resources to pay for their care when they need it. My view is that if we ignore these problems, they will come back to us at much higher costs through emergency department visits, impaired children who are likely to need care for many years for preventable problems, and higher costs for jails and prisons that are the last resort for help for many.

REFERENCES
Prevalence of 12-Month Alcohol Use, High-Risk Drinking, and DSM-IV Alcohol Use Disorder in the United States, 2001-2002 to 2012-2013

Results From the National Epidemiologic Survey on Alcohol and Related Conditions

Bridget F. Grant, PhD; S. Patricia Chou, PhD; Tushli D. Saha, PhD; Roger P. Pickering, MS; Bradley T. Kerridge, PhD; W. June Ruan, MS; Boji Huang, MD, PhD; Jeesun Jung, PhD; Haitao Zhang, PhD; Amy Fan, PhD; Deborah S. Hasin, PhD

IMPORTANCE Lack of current and comprehensive trend data derived from a uniform, reliable, and valid source on alcohol use, high-risk drinking, and DSM-IV alcohol use disorder (AUD) represents a major gap in public health information.


DESIGN, SETTING, AND PARTICIPANTS The study data were derived from face-to-face interviews conducted in 2 nationally representative surveys of US adults: the National Epidemiologic Survey on Alcohol and Related Conditions, with data collected from April 2001 to June 2002, and the National Epidemiologic Survey on Alcohol and Related Conditions III, with data collected from April 2012 to June 2013. Data were analyzed in November and December 2015.

MAIN OUTCOMES AND MEASURES Twelve-month alcohol use, high-risk drinking, and DSM-IV AUD.

RESULTS The study sample included 43,093 participants in the National Epidemiologic Survey on Alcohol and Related Conditions and 36,309 participants in the National Epidemiologic Survey on Alcohol and Related Conditions III. Between 2001-2002 and 2012-2013, 12-month alcohol use, high-risk drinking, and DSM-IV AUD increased by 11.2%, 29.9%, and 49.4%, respectively, with alcohol use increasing from 65.4% (95% CI 64.3%-66.6%) to 72.7% (95% CI 71.4%-73.9%), high-risk drinking increasing from 9.7% (95% CI 9.3%-10.2%) to 12.6% (95% CI 12.0%-13.2%), and DSM-IV AUD increasing from 8.5% (95% CI 8.0%-8.9%) to 12.7% (95% CI 12.1%-13.3%). With few exceptions, increases in alcohol use, high-risk drinking, and DSM-IV AUD between 2001-2002 and 2012-2013 were also statistically significant across sociodemographic subgroups. Increases in all of these outcomes were greatest among women, older adults, racial/ethnic minorities, and individuals with lower educational level and family income. Increases were also seen for the total sample and most sociodemographic subgroups for the prevalences of 12-month DSM-IV AUD among 12-month alcohol users from 12.9% (95% CI 12.3%-13.5%) to 17.5% (95% CI 16.7%-18.3%) and 12-month DSM-IV AUD among 12-month high-risk drinkers from 46.5% (95% CI 44.3%-48.7%) to 54.5% (95% CI 52.7%-56.4%).

CONCLUSIONS AND RELEVANCE Increases in alcohol use, high-risk drinking, and DSM-IV AUD in the US population and among subgroups, especially women, older adults, racial/ethnic minorities, and the socioeconomically disadvantaged, constitute a public health crisis. Taken together, these findings portend increases in many chronic comorbidities in which alcohol use has a substantial role.

Published online August 9, 2017.
Alcohol use and specifically high-risk drinking, which often leads to alcohol use disorder (AUD), are significant contributors to the burden of disease in the United States and worldwide. High-risk drinking and AUD are important risk factors for morbidity and mortality from fetal alcohol spectrum disorders, hypertension, cardiovascular diseases, stroke, liver cirrhosis, several types of cancer, infections, pancreatitis, type 2 diabetes, and various injuries. High-risk drinking and AUD are associated with numerous psychiatric comorbidities and impaired productivity and interpersonal functioning, and place psychological and financial burdens on society as a whole and on those who misuse alcohol, their families, friends, and coworkers as well as through motor vehicle crashes, violence, and property crime.

In view of the seriousness of the numerous physical and psychiatric harms of high-risk drinking and AUD, regular and detailed monitoring of their trends over time is imperative for the health of the nation. Historically, reliable national survey data on alcohol use, high-risk drinking, and AUD were not available before the early 1970s. The few national trend surveys conducted between the early 1970s to the early 1990s showed stability or decreases in trends for 12-month alcohol use, various measures of high-risk drinking, and social consequence and alcohol dependence symptoms. Between the early 1990s and the early 2000s, 12-month alcohol consumption increased from 44.0% to 65.4%, 12-month high-risk drinking increased from approximately 8.0% to 9.7%, and DSM-IV AUD increased from 7.4% to 8.5%.

Lack of current and comprehensive trend data derived from a uniform source on alcohol use, high-risk drinking, and DSM-IV AUD since the early 2000s represents a major gap in public health information. Tracking patterns of alcohol consumption and AUD is essential to test temporal models of alcohol consumption behaviors and alcohol-related morbidity and mortality and to estimate the effectiveness of policy changes related to alcohol use (eg, taxes and treatment entitlements). Furthermore, monitoring of alcohol consumption patterns and AUD over time within important sociodemographic subgroups of the US population is critical for planning and targeting prevention and intervention programs.

Accordingly, this study presents data for 2001-2002 and 2012-2013 on the prevalences of 12-month alcohol use, high-risk drinking (defined as exceeding the daily drinking guidelines at least weekly in the past 12 months), and 12-month DSM-IV AUD overall and among important sociodemographic subgroups of the US population. We used data from the National Institute on Alcohol Abuse and Alcoholism’s 2001-2002 Wave I National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) and 2012-2013 NESARC-III.

Methods

Sample

The 2012-2013 NESARC-III is a nationally representative, face-to-face interview survey of 36,309 US adults 18 years and older residing in households and selected group quarters, with respondents selected through multistage probability sampling. The data were collected from April 2012 to June 2013. Primary sampling units were counties or groups of contiguous counties, secondary sampling units were groups of US Census-defined blocks, and tertiary sampling units were households within sampled secondary sampling units within which eligible adult respondents were selected, with black, Asian, or Pacific Islander, and Hispanic individuals oversampled. The household response rate was 72.0%, the person-level response rate was 84.0%, and the overall response rate was 60.0%, which were comparable with other current US national surveys. Data were adjusted for oversampling and nonresponse and were weighted to represent the US civilian population based on the 2012 American Community Survey. Weighting adjustment compensated for nonresponse. Informed consent was electronically recorded, and respondents received $90 for participation. The Combined Neuroscience Institutional Review Board of the National Institutes of Health and Westat Institutional Review Board approved the protocol and informed consent procedures.

The 2001-2002 NESARC was a nationally representative, face-to-face interview survey of 43,093 US adults, described elsewhere in detail. The data were collected from April 2001 to June 2002. The target population was the US adult population 18 years and older residing in households and selected group quarters. Primary sampling units consisted of counties or county equivalents from which eligible adults were selected, with black and Hispanic individuals, and young adults oversampled. The sampling frame response rate was 98.5%, the household response rate was 88.5%, and the person response rate was 93.0%, yielding an overall survey response rate of 81.0%. Data were adjusted for oversampling and nonresponse and were weighted to represent the civilian US population based on the 2000 Decennial Census. The survey protocol, including written informed consent procedures, received full ethical review and approval from the US Census Bureau and the US Office of Management and Budget.
Assessments
The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV) was used in NESARC and the AUDADIS Fifth Edition Version was used in NESARC-III. The 12-month alcohol use with identical questions, consistent with the US dietary guidelines, high-risk drinking was defined as drinking 4 or more standard drinks (a drink equals 14 g of pure alcohol) on any day for women and as drinking 5 or more standard drinks on any day for men. In this study, high-risk drinking was defined as exceeding the daily drinking limits at least weekly during the prior 12 months.

An individual was considered to have a DSM-IV AUD diagnosis if the respondent met criteria for alcohol dependence or abuse in the past 12 months. A diagnosis of dependence required 3 or more of the 7 DSM-IV dependence criteria, and a diagnosis of abuse required 1 or more of the 4 abuse criteria. Respondents with a 12-month abuse or dependence diagnosis were classified as having 12-month AUD.

Symptom items that assessed DSM-IV AUD diagnoses in NESARC and NESARC-III were virtually identical. However, 3 items were slightly reworded, and 3 additional abuse questions appeared in NESARC-III. Comparisons between DSM-IV AUD diagnoses with and without the additional questions yielded almost identical prevalences (8.5% and 8.2%, respectively, for NESARC and 12.7% and 12.2%, respectively, for NESARC-III), with near-perfect concordance (κ = 0.97 for NESARC and κ = 0.98 for NESARC-III), which suggested that trivial differences between AUD operationalizations were not responsible for the changes reported herein.

The test-retest reliability and validity of AUDADIS alcohol use, high-risk drinking, and DSM-IV AUD diagnoses are documented in clinical and general population national and international studies. The reliability and validity of alcohol use, high-risk drinking, and DSM-IV AUD and their associated criteria scales were fair to excellent.

Statistical Analysis
Data were analyzed in November and December 2016. Weighted cross-tabulations estimated the prevalence of alcohol use, high-risk drinking, and DSM-IV AUD in the total sample and in subgroups. For 2001-2002 and 2012-2013, the prevalences of 12-month DSM-IV AUD among 12-month alcohol users and 12-month DSM-IV AUD among 12-month high-risk drinkers were also examined. To account for the complex sample design of NESARC and NESARC-III, a software program (SUDAAN, version 11.0; Research Triangle Institute) was used to produce standard errors of the prevalence estimates for each survey. These data were used to test differences in prevalences between the surveys using 2-sided t tests for independent samples. P < .05 indicated significant differences in the estimates between surveys.

Results
12-Month Alcohol Use
Twelve-month alcohol use significantly increased from 55.4% in 2001-2002 to 72.7% in 2012-2013, a relative percentage increase of 11.2% (Table 1). Significant increases, seen across all sociodemographic subgroups, were particularly notable among women (15.8%), racial/ethnic minorities (from 17.2% among Hispanic to 29.1% among Asian or Pacific Islander individuals), adults 65 years and older (22.4%), and respondents with lower educational level and family income (range, 11.7%-22.3%).

12-Month High-Risk Drinking
The prevalence of 12-month high-risk drinking increased significantly between 2001-2002 and 2012-2013 from 9.7% to 12.6% (change, 29.9%) in the total population (Table 2). Significant increases in high-risk drinking were also seen for all sociodemographic subgroups except Native Americans and respondents residing in rural areas. Increases were most notable among women (57.9%), other racial/ethnic minorities (from 40.6% among Hispanic to 62.4% among black individuals), adults 65 years and older (65.2%), persons previously married (widowed, divorced, or separated) (31.9%) and married or cohabiting respondents (34.2%), as those with a high school education (42.3%) and less than a high school education (34.7%), those earning incomes of $19,999 or less (35.1%), and those residing in urban areas (35.1%).

12-Month DSM-IV AUD
The prevalence of 12-month DSM-IV AUD increased significantly from 8.5% to 12.7% (change, 49.4%) in the total population (Table 3). Significant increases in AUD were seen in all subgroups except Native Americans and those residing in rural areas. Notable increases were found among women (83.7%), racial/ethnic minorities (51.9% for Hispanic and 92.8% for black individuals), adults 65 years and older (106.7%), those with a high school education (57.8%) and less than a high school education (48.6%), those earning incomes of $20,000 or less (65.9%), those living within 200% of the poverty threshold (range, 47.1%-55.8%), and those residing in urban areas (59.5%).

12-Month DSM-IV AUD Among 12-Month Alcohol Users
Twelve-month DSM-IV AUD among 12-month alcohol users significantly increased from 12.9% to 17.5% (change, 35.7%) in the total population (Table 4). Increases were significant during this time for all subgroups except Native Americans, respondents who were previously married, and those residing in rural areas. Notable increases were found among women (59.8%), those who were black (55.8%), Asian or Pacific Islander (36.2%), or Hispanic (25.9%), adults aged 45 to 64 years (61.9%) and 65 years and older (75.0%), those who were married or cohabiting (45.1%), those who had a high school education (41.2%), and those who resided in urban areas (44.8%).

12-Month DSM-IV AUD Among 12-Month High-Risk Drinkers
Twelve-month DSM-IV AUD among 12-month high-risk drinkers increased 17.2% from 46.5% in 2001-2002 to 54.5% in 2012-2013 (Table 5). Increases were significant for all sociodemographic subgroups except Native American, Asian or Pacific Islander, previously married respondents, those with less than a high school education, and those residing in rural areas, the Northeast, and the Midwest. Notable increases were seen for...
women (34.7%), those who were black (25.7%) or Hispanic (16.8%), respondents aged 45 to 64 years (34.8%) and 65 years and older (58.1%), and those residing in urban areas (21.1%).

## Discussion

Between 2001-2002 and 2012-2013, the 12-month prevalence of alcohol use increased 11.2% in the United States from 65.4% to 72.7%. High-risk drinking increased almost 30% from 9.7% to 12.6%, representing approximately 20.2 million and 29.6 million Americans, respectively. There was a 49.4% increase in 12-month DSM-IV AUD during this time from 8.5% to 12.7% (representing approximately 17.6 million and 29.9 million Americans, respectively), much greater than the corresponding 14.8% increase in DSM-IV AUD observed between 1991-1992 (7.4%) and 2001-2002 (8.5%). While the prevalences of AUD among both 12-month alcohol users and 12-month high-risk drinkers increased, the prevalence of AUD among high-risk drinkers (46.5% in 2001-2002 and 54.5% in 2012-2013)
Table 2. Prevalence of and Percentage Change in 12-Month High-Risk Drinking by Sociodemographic Characteristics, 2001-2002 and 2012-2013

<table>
<thead>
<tr>
<th>Sociodemographic Characteristic</th>
<th>% (95% CI)</th>
<th>NESARC-III 2012-2013</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>9.7 (9.3-10.2)</td>
<td>12.6 (12.0-13.2)§</td>
<td>-29.9%</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>14.2 (13.4-14.9)</td>
<td>16.4 (15.7-17.3)§</td>
<td>15.5%</td>
</tr>
<tr>
<td>Women</td>
<td>5.7 (5.3-6.1)</td>
<td>9.0 (8.4-9.7)§</td>
<td>57.5%</td>
</tr>
<tr>
<td><strong>Racial/ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>10.0 (9.5-10.5)</td>
<td>12.3 (11.6-13.0)§</td>
<td>23.0%</td>
</tr>
<tr>
<td>Black</td>
<td>9.3 (8.4-10.4)</td>
<td>15.1 (14.0-16.2)§</td>
<td>62.4%</td>
</tr>
<tr>
<td>Native American</td>
<td>12.4 (9.5-15.8)</td>
<td>17.4 (13.6-22.1)</td>
<td>40.3%</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>4.6 (3.5-6.0)</td>
<td>7.2 (6.0-8.8)§</td>
<td>56.5%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9.6 (8.8-10.6)</td>
<td>13.5 (12.5-14.6)§</td>
<td>40.6%</td>
</tr>
<tr>
<td><strong>Age, y</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>16.9 (15.7-18.2)</td>
<td>19.3 (18.0-20.6)§</td>
<td>14.2%</td>
</tr>
<tr>
<td>30-44</td>
<td>10.8 (10.1-11.5)</td>
<td>14.8 (14.0-15.7)§</td>
<td>37.0%</td>
</tr>
<tr>
<td>45-64</td>
<td>7.5 (6.9-8.2)</td>
<td>11.2 (10.5-12.1)§</td>
<td>49.3%</td>
</tr>
<tr>
<td>≥65</td>
<td>2.3 (1.9-2.8)</td>
<td>3.8 (3.2-4.4)§</td>
<td>65.2%</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>7.3 (6.9-7.6)</td>
<td>9.8 (9.2-10.5)§</td>
<td>34.2%</td>
</tr>
<tr>
<td>Widowed, divorced, or separated</td>
<td>9.1 (8.3-9.9)</td>
<td>12.9 (11.3-13.5)§</td>
<td>31.9%</td>
</tr>
<tr>
<td>Never married</td>
<td>17.4 (16.3-18.6)</td>
<td>20.3 (19.1-21.5)§</td>
<td>17.6%</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>9.5 (8.5-10.6)</td>
<td>12.8 (11.6-14.0)§</td>
<td>34.7%</td>
</tr>
<tr>
<td>High school</td>
<td>10.4 (9.6-11.1)</td>
<td>14.8 (13.9-15.9)§</td>
<td>42.3%</td>
</tr>
<tr>
<td>Some college or higher</td>
<td>9.5 (9.0-10.0)</td>
<td>11.6 (10.9-12.4)</td>
<td>22.1%</td>
</tr>
<tr>
<td><strong>Family income, $</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-19,999</td>
<td>11.1 (10.1-12.0)</td>
<td>15.0 (13.9-16.3)§</td>
<td>35.1%</td>
</tr>
<tr>
<td>&gt;20,000-34,999</td>
<td>10.3 (9.5-11.2)</td>
<td>12.6 (11.7-13.7)§</td>
<td>22.3%</td>
</tr>
<tr>
<td>&gt;35,000-69,999</td>
<td>9.3 (8.7-10.1)</td>
<td>12.9 (12.1-13.7)§</td>
<td>38.7%</td>
</tr>
<tr>
<td>≥70,000</td>
<td>8.4 (7.9-9.2)</td>
<td>10.5 (9.7-11.4)§</td>
<td>25.0%</td>
</tr>
<tr>
<td><strong>Poverty threshold, %</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;100</td>
<td>11.8 (10.8-13.0)</td>
<td>14.2 (12.9-15.5)§</td>
<td>29.3%</td>
</tr>
<tr>
<td>100-200</td>
<td>9.7 (8.9-10.7)</td>
<td>12.7 (11.7-13.7)§</td>
<td>30.9%</td>
</tr>
<tr>
<td>&gt;200</td>
<td>9.3 (8.8-9.8)</td>
<td>12.1 (11.4-12.7)§</td>
<td>30.1%</td>
</tr>
<tr>
<td><strong>Urbanicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>9.7 (9.2-10.3)</td>
<td>13.1 (12.5-13.7)§</td>
<td>35.1%</td>
</tr>
<tr>
<td>Rural</td>
<td>9.6 (8.9-10.5)</td>
<td>10.8 (9.9-11.8)</td>
<td>12.5%</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>9.3 (8.1-10.7)</td>
<td>12.2 (11.5-12.9)§</td>
<td>31.2%</td>
</tr>
<tr>
<td>Midwest</td>
<td>11.2 (10.3-12.1)</td>
<td>14.7 (12.9-16.6)§</td>
<td>31.3%</td>
</tr>
<tr>
<td>South</td>
<td>9.0 (8.4-9.7)</td>
<td>12.1 (11.3-13.1)§</td>
<td>34.4%</td>
</tr>
<tr>
<td>West</td>
<td>9.7 (8.9-10.5)</td>
<td>11.8 (11.0-12.7)§</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

Abbreviation. NESARC, National Epidemiologic Survey on Alcohol and Related Conditions.

* P < .05 for 2001-2002 compared with 2012-2013.

2012-2013) was much greater than the prevalence of AUD among 12-month users (12.9% in 2001-2002 and 17.5% in 2012-2013), highlighting the critical role of high-risk drinking in the increase in AUD between 2001-2002 and 2012-2013, which was 49.4%. The smaller increase in 12-month high-risk drinking (21.3%) and the larger increase in 12-month alcohol use (48.6%) seen between the early 1990s and the early 2000s were associated with a much lower increase in AUD (14.9%), again underscoring the more important influence of increases in high-risk drinking relative to alcohol use on increases in AUD. Increases shown in 12-month alcohol use and high-risk drinking are consistent with other surveys during the same period. The National Health Interview Survey showed a 6.0% increase in 12-month alcohol use, while the National Survey on Drug Use and Health showed a 3.1% increase in 12-month alcohol use. Trends in drinking 5 or more drinks at least once in the past year increased 17.8% in the National Health Interview Survey. Parallel increases were also seen in per capita alcohol consumption based on alcohol sales data, which rose 6.4%. The marked increases in high-risk drinking and DSM-IV AUD between 2001-
Table 3. Prevalence of and Percentage Change in 12-Month DSM-IV Alcohol Use Disorder by Sociodemographic Characteristics, 2001-2002 and 2012-2013

<table>
<thead>
<tr>
<th>Sociodemographic Characteristic</th>
<th>NESARC-IV 2001-2002 (n = 43,039)</th>
<th>NESARC-IV 2012-2013 (n = 35,395)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>8.5 (8.0-9.0)</td>
<td>12.7 (12.1-13.3)*</td>
<td>49.4</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>12.4 (11.7-13.1)</td>
<td>16.7 (15.8-17.6)*</td>
<td>34.7</td>
</tr>
<tr>
<td>Women</td>
<td>4.9 (4.5-5.3)</td>
<td>9.0 (8.5-9.6)*</td>
<td>83.7</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>8.9 (8.4-9.5)</td>
<td>13.1 (12.3-13.9)*</td>
<td>47.2</td>
</tr>
<tr>
<td>Black</td>
<td>6.9 (6.1-7.7)</td>
<td>13.3 (11.9-14.8)*</td>
<td>92.5</td>
</tr>
<tr>
<td>Native American</td>
<td>12.1 (9.3-15.0)</td>
<td>16.6 (12.7-21.5)</td>
<td>37.2</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>4.5 (3.5-5.9)</td>
<td>8.0 (6.7-9.5)*</td>
<td>77.8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>7.9 (6.8-9.2)</td>
<td>12.0 (11.1-12.9)*</td>
<td>51.9</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>15.2 (15.1-17.4)</td>
<td>23.4 (21.9-24.9)*</td>
<td>44.4</td>
</tr>
<tr>
<td>30-44</td>
<td>9.7 (9.0-10.5)</td>
<td>14.3 (13.3-15.3)*</td>
<td>47.4</td>
</tr>
<tr>
<td>45-64</td>
<td>5.4 (4.9-6.0)</td>
<td>9.8 (9.3-10.5)*</td>
<td>81.3</td>
</tr>
<tr>
<td>&gt;65</td>
<td>1.5 (1.2-1.8)</td>
<td>3.1 (2.6-3.7)*</td>
<td>106.7</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>6.0 (5.6-6.5)</td>
<td>9.7 (9.0-10.3)*</td>
<td>51.7</td>
</tr>
<tr>
<td>Widowed, divorced, or separated</td>
<td>8.1 (7.3-9.0)</td>
<td>10.6 (9.8-11.5)*</td>
<td>30.9</td>
</tr>
<tr>
<td>Never married</td>
<td>15.9 (14.7-17.1)</td>
<td>22.4 (20.9-23.9)*</td>
<td>40.9</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>7.0 (6.2-8.0)</td>
<td>10.4 (9.3-11.7)*</td>
<td>48.6</td>
</tr>
<tr>
<td>High school</td>
<td>8.3 (7.6-9.0)</td>
<td>13.1 (12.2-14.0)*</td>
<td>57.8</td>
</tr>
<tr>
<td>Some college or higher</td>
<td>9.0 (8.4-9.6)</td>
<td>13.0 (12.3-13.8)*</td>
<td>44.4</td>
</tr>
<tr>
<td>Family income, $</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1999</td>
<td>8.8 (7.9-9.7)</td>
<td>14.6 (13.4-15.9)*</td>
<td>65.9</td>
</tr>
<tr>
<td>20000-24999</td>
<td>8.0 (8.2-9.7)</td>
<td>3.2 (13.3-13.4)*</td>
<td>28.2</td>
</tr>
<tr>
<td>35000-69999</td>
<td>8.1 (7.4-8.8)</td>
<td>12.7 (11.5-13.1)*</td>
<td>51.9</td>
</tr>
<tr>
<td>&gt;70000</td>
<td>8.3 (7.6-9.1)</td>
<td>12.8 (11.1-12.8)*</td>
<td>44.6</td>
</tr>
<tr>
<td>Poverty threshold, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;100</td>
<td>9.4 (8.8-10.5)</td>
<td>14.3 (13.0-15.5)*</td>
<td>52.1</td>
</tr>
<tr>
<td>100-200</td>
<td>7.7 (6.9-8.5)</td>
<td>12.0 (11.1-12.9)*</td>
<td>55.8</td>
</tr>
<tr>
<td>&gt;200</td>
<td>8.5 (8.0-9.0)</td>
<td>12.5 (11.8-12.2)*</td>
<td>47.1</td>
</tr>
<tr>
<td>Urbanicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>8.4 (7.8-8.9)</td>
<td>13.4 (12.8-14.0)*</td>
<td>59.5</td>
</tr>
<tr>
<td>Rural</td>
<td>8.6 (8.0-9.7)</td>
<td>10.2 (9.0-11.5)</td>
<td>15.9</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>7.8 (6.7-9.0)</td>
<td>11.9 (10.9-12.9)*</td>
<td>52.6</td>
</tr>
<tr>
<td>Midwest</td>
<td>10.6 (9.3-11.9)</td>
<td>14.8 (13.2-16.5)*</td>
<td>39.6</td>
</tr>
<tr>
<td>South</td>
<td>7.3 (6.6-8.0)</td>
<td>11.5 (10.5-12.7)*</td>
<td>57.5</td>
</tr>
<tr>
<td>West</td>
<td>8.8 (7.9-9.7)</td>
<td>13.3 (12.2-14.5)*</td>
<td>51.1</td>
</tr>
</tbody>
</table>


2002 and 2012-2013 also reveal recent sharp increases in morbidity and mortality from diseases and injuries in which alcohol use has a substantial role or deceleration of previously seen declines. Most important, mortality rates of all cardiovascular diseases and stroke decelerated between 2000-2001 and 2011-2014 after 3 decades of decline.68,86 Morbidity and mortality rates of hypertension increased,82,83 as did hypertensive emergencies seen in emergency departments (EDs).84 Age-specific death rates of liver cirrhosis, especially alcohol-related liver cirrhosis, rose dramatically between 2009 and 2013 for the first time since the early 1970s.85 Although increases in age-adjusted rates of type 2 diabetes56,87 since 2000 have largely been attributed to more overweight and obesity,80,89 increases in high-risk drinking during this time may have contributed, an issue that merits further investigation. During the same period, alcohol-related ED visits associated with falls increased, and the total number of care hours doubled, along with the intensity of care (eg, advanced imaging) received.80 Mortality among alcohol-affected drivers who were simultaneously distracted also increased between 2005 and 2009 by 63%.81
<table>
<thead>
<tr>
<th>Seclodemographic Characteristic</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NESARC 2001-2002 (n = 43,093)</td>
</tr>
<tr>
<td>Total</td>
<td>12.9 (12.3-17.5)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>17.2 (16.3-18.2)</td>
</tr>
<tr>
<td>Women</td>
<td>8.2 (7.5-8.9)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>12.8 (12.3-13.6)</td>
</tr>
<tr>
<td>Black</td>
<td>12.9 (11.6-14.3)</td>
</tr>
<tr>
<td>Native American</td>
<td>26.8 (16.3-26.0)</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>9.4 (7.3-11.9)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>13.2 (11.4-15.2)</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>22.2 (20.7-22.7)</td>
</tr>
<tr>
<td>30-44</td>
<td>13.5 (12.5-14.6)</td>
</tr>
<tr>
<td>45-64</td>
<td>8.4 (7.6-9.3)</td>
</tr>
<tr>
<td>≥65</td>
<td>1.2 (2.6-4.0)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>9.1 (8.5-9.8)</td>
</tr>
<tr>
<td>Widowed, divorced, or separated</td>
<td>14.2 (12.9-15.7)</td>
</tr>
<tr>
<td>Never married</td>
<td>22.6 (20.9-24.4)</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>15.2 (13.4-17.2)</td>
</tr>
<tr>
<td>High school</td>
<td>13.6 (12.4-14.8)</td>
</tr>
<tr>
<td>Some college or higher</td>
<td>12.2 (11.5-13.0)</td>
</tr>
<tr>
<td>Family income, $</td>
<td></td>
</tr>
<tr>
<td>0-19,999</td>
<td>16.7 (15.2-18.3)</td>
</tr>
<tr>
<td>20,000-34,999</td>
<td>14.7 (13.5-15.9)</td>
</tr>
<tr>
<td>35,000-69,999</td>
<td>11.8 (11.0-12.8)</td>
</tr>
<tr>
<td>≥70,000</td>
<td>10.6 (9.7-11.5)</td>
</tr>
<tr>
<td>Poverty threshold, %</td>
<td></td>
</tr>
<tr>
<td>&lt;100</td>
<td>17.9 (16.1-20.0)</td>
</tr>
<tr>
<td>100-200</td>
<td>13.9 (12.6-15.4)</td>
</tr>
<tr>
<td>&gt;200</td>
<td>11.9 (11.3-12.6)</td>
</tr>
<tr>
<td>Urbanicity</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>12.5 (11.7-13.2)</td>
</tr>
<tr>
<td>Rural</td>
<td>15.1 (13.7-16.5)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>11.0 (9.7-12.4)</td>
</tr>
<tr>
<td>Midwest</td>
<td>13.1 (13.4-17.0)</td>
</tr>
<tr>
<td>South</td>
<td>12.3 (11.3-13.4)</td>
</tr>
<tr>
<td>West</td>
<td>13.2 (12.0-14.6)</td>
</tr>
</tbody>
</table>

Abbreviation: NESARC, National Epidemiologic Survey on Alcohol and Related Conditions.

*p < .05 for 2001-2002 compared with 2012-2013.

Increases in high-risk drinking and AUD among women (57.9% and 83.7%, respectively) relative to men (15.5% and 34.7%, respectively) were alarming, consistent with earlier studies demonstrating a narrowing of the gender gap in these drinking patterns and AUD between 1991-1992 and 2001-2002. Greater sensitivity to adverse health effects of heavy drinking among women are potential biological factors influencing the convergence of rates between the sexes within the context of increasing rates of high-risk drinking and AUD. Drinking norms and values have become more permissive among women, along with increases in educational and occupational opportunities and rising numbers of women in the workforce, all of which may have contributed to increased high-risk drinking and AUD in women during the past decade. Stress associated with pursuing a career and raising a family may lead to increases in high-risk drinking and AUD among women, results that were consistent with substantial increases in these patterns of alcohol use among married individuals and those residing in urban areas found in this study. A narrowing of...
the gender gap in high-risk drinking and AUD may portend substantial future increases in the types of alcohol-related morbidity and mortality to which women are more vulnerable, especially breast cancer and liver cirrhosis, as well as increases in fetal alcohol spectrum disorder and exposure to violence. Women are also more likely than men to take prescription drugs that can increase the risk of severe adverse reactions when combined with alcohol.

Older adults have had consistently lower rates than others of alcohol use, high-risk drinking, and AUD over the past 40 years. However, between 2001-2002 and 2012-2013, increases in alcohol use (22.4%), high-risk drinking (65.2%), and AUD (106.7%) among older adults were substantial and unprecedented relative to earlier surveys. Older adults are at higher risk for disability, morbidity, and mortality from many alcohol-related chronic diseases that have increased over the past 15 years. Older adults are at particular risk for falls and injuries, and the unintentional injury death rate. ED-treated falls, hospitalized fall rates, and fall-related traumatic brain injury deaths have risen significantly over the past 15 years.

---

### Table 5. Prevalence of and Percent Change in 12-Month DSM-IV Alcohol Use Disorder Among 12-Month High-Risk Drinkers by Sociodemographic Characteristics, 2001-2002 and 2012-2013

<table>
<thead>
<tr>
<th>Sociodemographic Characteristic</th>
<th>NESARC 2001-2002 (n = 43,083)</th>
<th>NESARC-III 2012-2013 (n = 36,309)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>46.5 (44.3-48.7)</td>
<td>54.5 (52.7-56.4)</td>
<td>17.2</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>50.7 (47.9-53.4)</td>
<td>57.4 (55.0-59.8)</td>
<td>13.2</td>
</tr>
<tr>
<td>Women</td>
<td>36.9 (33.4-40.5)</td>
<td>49.7 (46.8-52.6)</td>
<td>34.7</td>
</tr>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>47.3 (44.3-50.0)</td>
<td>56.8 (54.1-59.0)</td>
<td>19.7</td>
</tr>
<tr>
<td>Black</td>
<td>40.4 (35.8-45.2)</td>
<td>50.8 (45.9-54.6)</td>
<td>25.7</td>
</tr>
<tr>
<td>Native American</td>
<td>63.1 (51.0-75.8)</td>
<td>55.2 (41.8-67.9)</td>
<td>-12.5</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>52.5 (38.5-66.2)</td>
<td>55.0 (45.8-64.0)</td>
<td>-4.8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>42.3 (37.4-47.4)</td>
<td>49.4 (46.0-52.9)</td>
<td>16.8</td>
</tr>
<tr>
<td><strong>Age, y</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-19</td>
<td>56.6 (53.0-60.2)</td>
<td>64.6 (61.0-68.0)</td>
<td>14.1</td>
</tr>
<tr>
<td>30-44</td>
<td>45.0 (41.6-48.4)</td>
<td>52.3 (49.2-55.4)</td>
<td>16.2</td>
</tr>
<tr>
<td>45-64</td>
<td>37.1 (33.0-41.3)</td>
<td>50.0 (47.0-53.0)</td>
<td>34.8</td>
</tr>
<tr>
<td>65+</td>
<td>19.8 (13.7-27.8)</td>
<td>21.3 (24.8-28.7)</td>
<td>8.1</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>38.1 (35.1-41.2)</td>
<td>48.6 (45.7-51.3)</td>
<td>27.5</td>
</tr>
<tr>
<td>Widowed, divorced, or separated</td>
<td>50.8 (46.0-55.6)</td>
<td>53.4 (50.0-56.8)</td>
<td>5.1</td>
</tr>
<tr>
<td>Never married</td>
<td>55.0 (51.4-58.5)</td>
<td>62.5 (58.9-66.0)</td>
<td>13.6</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>47.2 (42.0-52.4)</td>
<td>51.4 (46.7-55.1)</td>
<td>8.5</td>
</tr>
<tr>
<td>High school</td>
<td>46.6 (42.7-50.5)</td>
<td>55.7 (52.6-58.4)</td>
<td>19.5</td>
</tr>
<tr>
<td>Some college or higher</td>
<td>46.3 (43.7-48.9)</td>
<td>54.0 (52.0-57.3)</td>
<td>17.9</td>
</tr>
<tr>
<td><strong>Family Income, $</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-19,999</td>
<td>49.3 (45.4-53.1)</td>
<td>58.8 (55.7-62.4)</td>
<td>19.3</td>
</tr>
<tr>
<td>20,000-34,999</td>
<td>49.6 (45.2-53.9)</td>
<td>55.7 (51.9-58.4)</td>
<td>12.3</td>
</tr>
<tr>
<td>35,000-59,999</td>
<td>43.4 (39.7-47.1)</td>
<td>52.7 (48.4-56.0)</td>
<td>21.4</td>
</tr>
<tr>
<td>&gt;70,000</td>
<td>44.4 (40.0-48.9)</td>
<td>51.2 (47.3-55.1)</td>
<td>15.3</td>
</tr>
<tr>
<td><strong>Poverty threshold, %</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;100</td>
<td>48.7 (43.4-54.0)</td>
<td>58.2 (54.3-62.0)</td>
<td>19.5</td>
</tr>
<tr>
<td>100-200</td>
<td>46.2 (41.7-50.8)</td>
<td>55.2 (51.4-59.0)</td>
<td>19.5</td>
</tr>
<tr>
<td>&gt;200</td>
<td>46.0 (43.5-48.6)</td>
<td>52.9 (50.4-55.4)</td>
<td>15.0</td>
</tr>
<tr>
<td><strong>Urbanicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>45.5 (43.0-48.0)</td>
<td>55.1 (53.0-57.1)</td>
<td>21.1</td>
</tr>
<tr>
<td>Rural</td>
<td>50.7 (46.2-55.1)</td>
<td>52.2 (47.0-57.4)</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>46.4 (42.2-50.6)</td>
<td>51.7 (47.6-55.8)</td>
<td>11.4</td>
</tr>
<tr>
<td>Midwest</td>
<td>48.6 (43.3-53.9)</td>
<td>54.4 (49.9-58.3)</td>
<td>11.5</td>
</tr>
<tr>
<td>South</td>
<td>44.9 (41.3-48.6)</td>
<td>53.8 (50.0-56.7)</td>
<td>16.7</td>
</tr>
<tr>
<td>West</td>
<td>46.4 (41.8-51.2)</td>
<td>56.1 (51.4-61.8)</td>
<td>25.2</td>
</tr>
</tbody>
</table>

Abbreviation: NESARC, National Epidemiologic Survey on Alcohol and Related Conditions.
* P < .05 for 2001-2002 compared with 2012-2013.
decade. Alcohol-related prescription medication use is highly prevalent among older adults, especially among current drinkers, and recent trend data suggest that ED visits for adverse drug reactions involving alcohol use are on the rise. Even if the rates among older adults remain stable, the projected increase in the size of this segment of the population (from 40 million in 2010 to 80 million in 2030) could produce a substantial increase in the absolute number of older adults with high-risk drinking and AUD, with concomitant increases in alcohol-related multimorbidities.

Between 2001-2002 and 2012-2013, increases in alcohol use, high-risk drinking, and AUD were generally much greater among minorities than among white individuals, results that are consistent with substantial increases among individuals with the lowest educational levels and family incomes seen in this study. Wealth inequality between minorities and whites has widened during and after the 2008 recession, possibly leading to increased stress and demoralization. Adversities that disproportionately affect racial/ethnic minorities include family income and educational disparities, unemployment, residential segregation, discrimination, decreased access to health care, and increased stigma associated with drinking. These disparities may have accumulated over recent years, leading to increased negative coping behaviors, such as high-risk drinking and the development of AUD. Reasons for the widening of the racial/ethnic gap in alcohol use, high-risk drinking, and AUD are complex, historically rooted in racial/ethnic discrimination and persistent socioeconomic disadvantage both at the individual and community levels. Future research is warranted to understand the interplay of socioeconomic, psychosocial, cultural, and biological factors that have contributed to the widening of the racial/ethnic gap in alcohol use, high-risk drinking, and AUD in recent years, with particular attention to the development of subracial/subethnic prevention and intervention strategies.

Limitations and Strengths
Limitations of this study are noted. NESARC and NESARC-III lacked biological testing for substance use. Like other national surveys, some population segments were not covered in either survey (eg, the homeless and those who are incarcerated), potentially leading to underestimation of alcohol use, high-risk drinking, and DSM-IV AUD. AUDADIS interviewers were not clinicians, but a NESARC-III validation sub study comparing AUDADIS and clinician diagnoses of 12-month AUD showed similar prevalence and good concordance. The NESARC-III response rate was acceptable (90%) but was lower than that of NESARC (85%). Weighting that compensated for nonresponse facilitated comparisons between the surveys. The validity of increases shown between NESARC and NESARC-III is supported by their coherence with the other studies noted above showing increases in alcohol-related indicators over the same period.

Conclusions
Between 2001-2002 and 2012-2013, an increase in alcohol use, high-risk drinking, and AUD occurred in the total US population and across almost all sociodemographic subgroups, especially women, older adults, racial/ethnic minorities, and the socioeconomically disadvantaged. These increases constitute a public health crisis that may have been overshadowed by increases in much less prevalent substance use (marijuana, opiates, and heroin) during the same period. Treatment rates for AUD remain low (<10%) despite the significant rise in high-risk drinking and AUD and the existence of a broad spectrum of evidence-based and effective behavioral and pharmacological approaches. The results of this study call for a broader effort to address the individual, biological, environmental, and societal factors that influence high-risk drinking and AUD and their considerable consequences and economic costs to society ($250 billion) to improve the health, safety, and well-being of the nation. The development of prevention and intervention strategies both at the population level and those targeted at high-risk subgroups of the population identified in this study will be paramount to achieving this goal. Most important, the findings herein highlight the urgency of educating the public, policymakers, and health care professionals about high-risk drinking and AUD, designating these conditions and encouraging those who cannot reduce their alcohol consumption on their own, despite substantial harm to themselves and others, to seek treatment.
301-304.
49. National Institute on Alcohol Abuse and Alcoholism. Unpublished Data on Excessive Drinking
From the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions, Rockville, MD: National Institute on Alcohol Abuse and Alcoholism; 2014.
51. Grant BF, Moore TC, Sheapiro J, Kaplan K, Sorenz, and Accuracy Statement: Wave I National
54. Substance Abuse and Mental Health Services Administration. Results From the 2012 National
57. Grant BF, Dawson DA, Hash S. The Alcohol Use Disorder and Associated Disabilities Interview
58. Grant BF, Goldstein RB, Chou SP, et al. The Alcohol Use Disorder and Associated Disabilities
Interview Schedule-Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition Version
65. Grant BF, Dawson DA, Stinson FS, Chou PS, Kay W, Pickering R. The Alcohol Use Disorder and
66. Grant BF, Goldstein RB, Smith SM, et al. The Alcohol Use Disorder and Associated Disabilities
Interview Schedule-IV (AUDADIS-IV): reliability of substance use and psychiatric disorders in a
71. Vrasti R, Grant BF, Chatterji S, et al. Reliability of the Romanian version of the alcohol module of the WHO Alcohol Use Disorder and Associated Disabilities Interview Schedule-Alcohol/Drug
73. Grant BF, Dawson DA, Stinson FS, Chou SP, Dufour MC, Pickering RP. The 12-month prevalence and
76. Substance Abuse and Mental Health Services Administration. National Survey on Drug Use and
84. Janke AT, McNaughton CD, Broady AM, Welch RD, Levy PD. Trends in the incidence of
119-192.


Screening for Heroin and Use of Prescription Pain Medication in Primary and Emergency Care

A brief report prepared by OMNI Institute for SBIRT Colorado, November 2016

On an average day, 3,900 people initiate nonmedical use of prescription opioids and 580 initiate heroin use, with the numbers growing at an alarming rate. In 2014, more people died from drug overdoses than in any other year on record. More than six out of 10 of these overdoses involved an opioid. Relatedly, the Center for Behavioral Health Statistics and Quality found that approximately three out of four new heroin users report prior abuse of prescription opioids. The overall rate of opioid overdose has almost quadrupled since 1999, reflecting what many are calling an opioid epidemic.

Since 2006, Colorado has been actively working to disseminate screening and brief intervention (SBI) in health care settings across the state through a SAMHSA-funded screening, brief intervention, and referral to treatment (SBIRT) grant. Utilizing data collected from the SBIRT Colorado initiative between 2013 and 2016, this report examines the following questions:

- What proportion of adult patients screened through SBIRT Colorado screened positive for heroin or misuse of prescription pain medication? What proportion screened positive for both types of opioids?
- What are the characteristics of patients who screen positive for heroin or misuse of prescription pain medication?
- Were there increases in the proportion of patients who screened positive for opioids (prescription or heroin) over the past four years?

METHODS

Through the SAMHSA-funded SBIRT Colorado initiative, health educators in grant-partner primary and emergency care sites across Colorado screened patients for risky alcohol and other substance use. Patients were screened about their substance use using the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). The ASSIST assesses patients on various substance use categories, including opioids. Because Colorado was interested in distinguishing heroin use and the misuse of prescription pain medications, in August 2013, the ASSIST was adapted to track patient misuse of prescription pain medications separately from heroin, using the same ASSIST questions and scoring guidelines that are used for opioid use more generally. Specifically, patients were asked the ASSIST questions about misuse of prescription pain medications (e.g., fentanyl, oxycodone, OxyContin, Percocet) and then asked questions about use of heroin (e.g., opium, smack, H). Revisions to the ASSIST were based on work by the National Institute on Drug Abuse
(NIDA) and the Connecticut SBIRT program. Per ASSIST guidelines, scores of four or higher were coded as a positive screen. Throughout this brief report we refer to screening for heroin use rather than screening for risky use. However, per ASSIST guidelines, individuals who have used heroin may screen in the low risk range depending on the pattern of use. The data presented in this report are from August 2013, when the ASSIST opioid categories began being tracked separately, through August 2016, the end of the grant-funded period.

RESULTS
In emergency care, of the 18,068 patients screened, 1,073 (5.9%) screened positive for opioid misuse:

- 1.5% (n=270) screened positive for prescription pain medication misuse.
- 5.0% (n=900) screened positive for heroin use.
- 0.5% (n=99) screened positive for both prescription pain medication and heroin.

In primary care, of the 27,705 patients screened, 223 (0.8%) screened positive for opioid misuse:

- 0.6% (n=162) screened positive for prescription pain medication misuse.
- 0.3% (n=78) screened positive for heroin use.
- 0.1% (n=18) screened positive for both prescription pain medication and heroin use.

Overall, the proportion of patients who screened positive for opioid misuse was higher in emergency than in primary care. In emergency care, the proportion of patients who screened positive for heroin use was much higher than the proportion who screened positive for prescription pain medication. The converse was true in primary care -- although a smaller overall proportion screened positive for opioid misuse than in emergency care, in primary care, almost twice as many patients screened positive for misuse of prescription pain medications than for heroin.

Finally, of the subset of patients who screened positive in either setting, less than 10% screened positive for both prescription medication misuse and heroin use:

- In emergency care, 99 of 1,073 positive screens (9.2%) were positive for misuse of both prescription pain medication and heroin.
- In primary care, 18 of 223 positive screens (8.1%) were positive for misuse of both prescription pain medication and heroin.
PATIENT CHARACTERISTICS

In the figures below, we examine the characteristics of patients who screened positive for misuse of prescription pain medication or heroin in emergency and primary care settings. When comparing across settings, it is important to note that each setting may serve different populations; thus, comparisons across type of opioid within settings are more appropriate than comparisons across settings.

PATIENT GENDER

Overall, 60% of patients screened in emergency care were male and 41% of patients screened in primary care were male. Figure 1 shows the gender of patients who screened positive for prescription pain medications and heroin in both settings. Within both settings, males were overrepresented among patients screening positive for both types of opioid misuse.

Figure 1: Gender of Patients who Screen Positive for Opioid Misuse

<table>
<thead>
<tr>
<th>Emergency Care</th>
<th>Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescription (n=270)</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>Heroin (n=900)</td>
<td>68%</td>
</tr>
<tr>
<td></td>
<td>32%</td>
</tr>
<tr>
<td>Prescription (n=162)</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>53%</td>
</tr>
<tr>
<td>Heroin (n=78)</td>
<td>55%</td>
</tr>
<tr>
<td></td>
<td>45%</td>
</tr>
</tbody>
</table>

PATIENT AGE

Patients screened in emergency care had a slightly lower average age than patients screened in primary care (43 versus 45 years, respectively). In emergency care, the average ages of patients who screened positive for misuse of prescription opioids and heroin were 37 and 36 years, respectively. In primary care, the average ages of patients who screened positive for misuse of prescription opioids and heroin were 43 and 40, respectively. Figure 2 provides the percentage of patients who screened positive for misuse of opioids by age categories. For example, 5% of the 269 patients who screened positive for prescription pain medication misuse in emergency care were between the ages of 18 and 20.
Figure 2: Age of Patients who Screened Positive for Opioid Misuse

Emergency Care

- Prescription (n=269)
  - 5% 18-20
  - 39% 21-24
  - 15% 25-34
  - 11% 35-44
  - 16% 45-54
  - 16% 55-64
  - 7% 65-74
  - 1% 75+

- Heroin (n=600)
  - 4% 18-20
  - 38% 21-24
  - 17% 25-34
  - 15% 35-44
  - 9% 45-54
  - 2% 55-64
  - 1% 65-74
  - 2% 75+

Primary Care

- Prescription (n=162)
  - 6% 18-20
  - 6% 21-24
  - 27% 25-34
  - 23% 35-44
  - 19% 45-54
  - 19% 55-64
  - 3% 65-74
  - 3% 75+

- Heroin (n=78)
  - 6% 18-20
  - 19% 21-24
  - 31% 25-34
  - 12% 35-44
  - 18% 45-54
  - 22% 55-64
  - 9% 65-74
  - 3% 75+

PATIENT RACE/ETHNICITY

Patients could select more than one racial category and also selected whether or not they were of Hispanic or Latino ethnicity. Very few individuals identified a race/ethnicity other than White, Black or African American, or Hispanic/Latino. Thus, we restrict our examination of race/ethnicity to these three categories. In emergency care, overall, 51% identified as White, 16% identified as Black or African American, and 33% identified as Hispanic/Latino. In primary care, 46% identified as White, 8% identified as Black or African American, and 42% identified as Hispanic/Latino. Figure 3 shows the race/ethnicity proportions for patients who screened positive for opioid misuse in each setting. In both settings, a higher proportion of patients who screened positive for heroin use were white than who screened positive for prescription pain medication.
Figure 3: Race/Ethnicity of Patients who Screened Positive for Opioid Misuse

Emergency Care
- % White
- % Black or African American
- % Hispanic or Latino

Prescription (N=270) 60% 10%
Heroin (N=900) 70% 6%

Primary Care
- % White
- % Black or African American
- % Hispanic or Latino

Prescription (N=161) 34%
Heroin (N=78) 49%

Patterns of Use Over Time

Figure 4 shows the percentage of patients who screened positive for misuse of prescription pain medication or heroin use by setting and year (only partial data are available for 2013 and 2016). In emergency care, rates of detection of prescription pain medication misuse are roughly between 1 and 2% of all patients screened each year. However, in emergency care, we see a general increase each year in the percentage of patients screening positive for heroin use, with 3.5% screening positive in 2013 and 6.7% screening positive in 2016. In general, in primary care, rates of positive screens for both types of opioids are less than 1%, with one exception – in 2013, 2% of patients screened positive for misuse of pain medications. It is unclear why this rate would have been higher in 2013.

Figure 4: Percentage of Positive Screens by Year, Type, and Setting

% Positive for Misuse of Pain Medication
Emergency Care

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.4%</td>
<td>2.0%</td>
<td>1.0%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

% Positive for Heroin
Emergency Care

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.5%</td>
<td>4.4%</td>
<td>5.7%</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

% Positive for Misuse of Pain Medication
Primary Care

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.0%</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

% Positive for Heroin
Primary Care

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>
CONCLUSIONS

Patients screened in emergency care were more likely than those screened in primary care to screen positive for opioids, a finding that is consistent with SBIRT Colorado data on other substances – patients screened in SBIRT Colorado emergency care sites, most of whom are seeking care from a large urban safety net emergency department, tend to have higher rates of positive screens for alcohol and other substances than patients screened in SBIRT Colorado primary care sites, and this pattern held for detection of opioids.

Among those who screened positive for opioids, heroin use was more common in emergency care whereas prescription opioid misuse was relatively more common in primary care. Furthermore, men were more likely than women to screen positive for either substance; and men were relatively more likely to screen positive for heroin than for prescription pain medications whereas women were somewhat more likely to screen positive for prescription pain medications than heroin, particularly when screened in primary care. Younger patients tended to be overrepresented among positive screens in emergency care. Patients identifying as White tended to be overrepresented among those screening positive for either substance, with the exception of being underrepresented (and Hispanics overrepresented) among those in primary care settings screening positive for prescription pain medication misuse.

In both settings, concurrent risk for both substances was fairly low – because assessments are designed to capture current risk, this does not mean that users of one substance would not have a history of use of the other. In order to better understand histories/trajectories of use, future analyses should examine, for example, the proportion of those screening positive for heroin use who have a history of misusing prescription pain medications.

Overall, these results underscore the importance of substance use screening as an effective way to initiate conversations regarding alcohol and other substance use between a health care provider and a patient to better identify problematic substance use that would otherwise go undetected. SBIRT may be a useful strategy to not only identify and intervene with current problematic opioid use but also to provide healthcare professionals with information regarding patients’ substance use before prescribing pain medications. Specifically, individuals with a history of substance use disorders (including abuse of alcohol, nicotine, and illicit drugs) are at increased risk of an opioid use disorder and identification of risky tobacco, alcohol and other drug use can help guide providers’ prescribing practices, such as looking for potential alternatives to opioid prescriptions or close monitoring of patients’ use of the prescriptions. Furthermore, screening can help detect when patients are using substances, such as alcohol, that may dangerously interact with opioids.

While trends observed in this SBIRT Colorado sample should be viewed with caution as they may or may not generalize to different populations of patients, the data suggest that screening will identify a small but important number of patients misusing prescription pain medications, and in emergency care settings, identification of heroin use through screening may be increasing.
SBIRT Colorado is funded by the Substance Abuse and Mental Health Services Administration (SAMHSA) and is an initiative of the State of Colorado, Office of the Governor. It is implemented and managed by Peer Assistance Services, Inc., and administered by the Colorado Department of Human Services, Office of Behavioral Health. For more information, see www.improvinghealthcolorado.org.

END NOTES

2 Muhuri PK, Groer JC, Davies C. Associations of nonmedical pain reliever use and initiation of heroin use in the United States. CBHSQ Data Review, 2013.
3 Centers for Disease Control and Prevention. Increases in Drug and Opioid Overdose Deaths — United States, 2000–2014. MMWR 2015; 64;1-5
4 Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) developed for the World Health Organization (WHO) - http://www.who.int/substance_abuse/activities/assist/en/
Women of Childbearing Age: 
Screening and Brief Intervention for Alcohol and Cannabis Use

A BRIEF REPORT PREPARED BY OMNI INSTITUTE FOR SBIRT COLORADO, SEPTEMBER 2016

More than 3.3 million women of childbearing age (18-44) in the United States are considered at risk for alcohol-exposed pregnancies. According to national surveys, 50% of women of childbearing age use alcohol, 15% binge drink, and 7.6% report having consumed alcohol while pregnant.\textsuperscript{1} There is no known safe drinking level during pregnancy and women who are pregnant or want to become pregnant are generally advised not to drink alcohol.\textsuperscript{2} Binge drinking has been shown to increase the chance of miscarriage, unintended pregnancy, sudden infant death syndrome, and fetal alcohol spectrum disorders.\textsuperscript{3} In addition, there is no known safe level of marijuana use during pregnancy, despite evidence that the number of pregnant women using marijuana is increasing.\textsuperscript{4} Some studies have linked premature birth, low birthweight, stillbirth, and slow brain development to mothers' marijuana consumption.\textsuperscript{5,6} Due to the potential negative consequences of substance use during pregnancy, there is a strong need for effective prevention methods for women of childbearing age to reduce the risk of substance-exposed pregnancies.

Since 2006, Colorado has been actively working to disseminate screening and brief intervention (SBI) in health care settings across the state through a SAMHSA-funded screening, brief intervention, and referral to treatment (SBIRT) grant. The grant is administered by the Colorado Department of Human Services, Office of Behavioral Health (OBH), and managed and implemented by Peer Assistance Services, Inc. (PAS). OMNI Institute (OMNI) conducts the evaluation. Utilizing data collected from the SBIRT Colorado initiative, this report examines the following questions concerning screening and intervention for substance use with women of childbearing age:

- Are women who indicate risky substance use using reliable forms of contraception to avoid a substance-exposed pregnancy?
- For which substances are women reporting risky use?
- Do women who screened at-risk for a substance-exposed pregnancy, and contacted six-months after screening, report reduced use of alcohol and/or cannabis use?

SBIRT COLORADO

Between June 25, 2012 and July 31, 2016, 59,558 patients were screened in primary and emergency care sites across five Colorado healthcare networks. One of these networks is an urban safety net system with a Level I Trauma Center and high patient volume. The primary care sites were located in urban and rural regions throughout Colorado.

In most locations, nurses or medical assistants collected patient responses to five brief screen questions based on the Colorado clinical guidelines for alcohol and substance use screening.\textsuperscript{9} If a patient provided a positive response to any brief screen question, a grant-funded health educator administered the World Health Organization's Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST), an eight-item
tool that has been validated in primary care settings and in multiple languages and cultures. Patients were assigned a risk level based on self-reported patterns of substance use detected on the ASSIST. Brief Screen and ASSIST data were entered into an online database, along with data gathered from the federally required Government Performance and Results Act (GPRA) data collection tool.

Because alcohol and other substances can have harmful effects during pregnancy and approximately 50% of pregnancies are unplanned, SBIRT Colorado implemented a protocol to identify and intervene with women who were at risk for a substance-exposed pregnancy. Specifically, women who screened positive on the ASSIST were asked whether they were pregnant or able to become pregnant, whether they had sex with a male in the last year, and what method of contraception they used, if any (type of contraception was then coded as effective or not effective based on the CDC's efficacy information). Health educators were instructed to provide brief interventions to women at risk of a substance-exposed pregnancy and to encourage women who were sexually active and not using effective contraception to discuss contraceptive options with their healthcare providers.

WOMEN INCLUDED IN THIS STUDY

2,373 women of childbearing age (18-44), with an average age of 28, who also met the following criteria were identified as being at-risk for a substance-exposed pregnancy within our SBIRT Colorado sample: screened positive for substance use; indicated they were sexually active with a male; and, to their knowledge, physically able to get pregnant. Most of the women identified as White (46.6%) or Hispanic or Latina of any race (19.9%). A little more than half of the women (53.3%, n=1,265) were screened in an emergency care setting while the rest were screened in a primary care setting.

At intake, a random selection of patients screening positive for substance use were invited to participate in a six-month follow-up interview. Thirty-nine (1.6%) of the women included in this study participated in the six-month follow-up study. The women at risk of a substance-exposed pregnancy that completed a follow-up interview were reflective of the 2,373 women included in this sample with the exception of screening location, with 79.5% of women who completed a follow-up interview having been screened in primary care.

CONTRACEPTION

Women who indicated they had been sexually active with a male in the past twelve months were asked about what form of contraception, if any, they used. Women who reported not consistently using a reliable form of contraception were encouraged by the health educator to discuss contraception options with their healthcare provider. Of the 2,373 women included in this study, 976 (41.1%) reported not using any form or a non-reliable form of contraception. This subset of women is the most at risk for a substance-exposed pregnancy.

41.1% of sexually active women who were screened and identified as at risk for a substance-exposed pregnancy, reported using no form of reliable contraception.
RISKY SUBSTANCE USE

Of the 976 women that were identified at greatest risk for a substance-exposed pregnancy, 57% were specifically at risk for an alcohol-exposed pregnancy and reported using alcohol an average of 9.37 days in the past 30 days; 48% were at risk for a cannabis-exposed pregnancy and reported using cannabis an average of 18.34 days in the past 30 days; and 12.3% were at risk for another substance-exposed pregnancy such as cocaine, methamphetamine, heroin, etc. and on average reported using these other substances 0.29 days in the past 30 days.

<table>
<thead>
<tr>
<th>Substance</th>
<th>At-Risk Women (n)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>557</td>
<td>57.0%</td>
</tr>
<tr>
<td>Cannabis</td>
<td>409</td>
<td>48.0%</td>
</tr>
<tr>
<td>Other</td>
<td>120</td>
<td>12.3%</td>
</tr>
</tbody>
</table>

SIX MONTH FOLLOW-UP

Women at risk for a substance-exposed pregnancy that participated in the six-month follow-up study reported a decrease in the average number of days alcohol was used in the past 30 days from 7.4 to 4.8. Similarly, women reported a decrease in the average number of days marijuana was used in the past 30 days between intake and six months after screening from 16.7 to 14.3. Although in the expected direction, change in the average number of days used at intake and follow-up, for both substances, was not statistically significant.
CONCLUSION

These results highlight the risk of a substance-exposed pregnancy for women of childbearing age engaged in risky alcohol and cannabis use. In this sample, nearly half of sexually active women using substances did not consistently use a reliable form of contraception. Furthermore, women using cannabis tended to use it frequently (average of 18 days in the past 30). One recommendation to reduce this risk is to encourage women of childbearing age that are sexually active to use reliable forms of contraception if they drink alcohol, use cannabis, or use other substances.

Very few women in the study had follow-up data. Thus, our ability to examine outcomes after brief interventions for this population was limited. Nonetheless, SBIRT provides an important avenue to prevent substance-exposed pregnancies by reaching a large population of women seeking health care who may be at risk for a substance-exposed pregnancy. SBI has been shown to be effective at reducing risky alcohol use, but more studies are needed on which components of the SBIRT program are most effective for this population of users. Efforts should then be implemented to ensure that these components are delivered to all women of childbearing age who use substances.

REFERENCES

1. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6128a4.htm?s_cld=mm6128a4_w
10. The clinical guidelines were developed by HealthTeamWorks. For information about HealthTeamWorks please visit: http://www.healthteamworks.org/index.aspx. To view the full clinical guideline for alcohol and other substance use screening please visit: http://healthteamworks.ebizcdn.com/f8da71e562ff44a2bc7edf3578c593da
10. Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) developed for the World Health Organization (WHO) - http://www.who.int/substance_abuse/activities/assist/en/
INTRODUCTION

SBIRT Colorado uses a short brief screen and the ASSIST screening tool, developed by the World Health Organization. Screening, Brief Intervention and Referral to Treatment (SBIRT) is an evidence-based approach to identifying patients who use alcohol and other drugs at risky levels, with the goal of reducing and preventing related health consequences, disease, accidents and injuries. SBIRT provides the tools, counseling and coaching that healthcare providers and patients need to understand the potential negative health consequences of substance use. SBIRT targets the large population who uses alcohol or drugs at risky levels before they become dependent.

SBIRT Colorado, an initiative of the Office of the Governor, began in 2006 with federal grant assistance from the Substance Abuse and Mental Health Services Administration (SAMHSA). A second round of funding provided for expansion of services in 2011 through 2016. The Colorado Office of Behavioral Health administers the funding, Peer Assistance Services implements and manages the grant, and OMNI Institute (OMNI) serves as the evaluator.

During the 2011-16 grant period, screening and intervention for substance use was implemented in five grant-funded health systems in 11 locations in urban and rural Colorado. Participating health systems include:

Denver Health
- Adult Urgent Care Center
- Emergency Department
- La Casa/Quigg Newton Community Health Center
- Park Hill Community Health Center

Peak Vista Community Health Centers
- Myron Stratton

Salud Family Health Centers
- Commerce City
- Fort Morgan
- Fort Lupton
- Sterling

San Luis Valley Health

Vail Valley Medical Center

During 2011-16, SBIRT-funded health educators provided substance use screening services to 59,711 individuals.
SBIRT Colorado Follow-Up Study

The SBIRT Colorado follow-up study collected data on a random sample of patients who screened positive for at-risk alcohol or illegal substance use at intake. Participants were contacted six months after screening and asked a series of questions about their experiences with SBIRT and their patterns of use in the past 30 days. On average, patients in the follow-up study reduced past 30-day use of alcohol and cannabis.

MEASURED AT INTAKE AND FOLLOW-UP
MEAN NUMBER OF DAYS OF USE IN PAST 30 DAYS

Patient Satisfaction

OVERALL, HOW SATISFIED WERE YOU WITH YOUR EXPERIENCE WITH THE HEALTH EDUCATOR?

- Extremely - 52%
- Very - 35%
- Moderately - 12%
- Slightly - 1%
- Not at all - 1%

HOW RESPECTFUL WAS THE HEALTH EDUCATOR?

- Extremely - 61%
- Very - 36%
- Moderately - 3%
- Slightly - 1%
- Not at all - 0%

HOW COMFORTABLE DID THE HEALTH EDUCATOR MAKE YOU FEEL TALKING ABOUT YOUR USE OF ALCOHOL, TOBACCO AND OTHER DRUGS?

- Extremely - 46%
- Very - 41%
- Moderately - 10%
- Slightly - 1%
- Not at all - 1%
"After learning about the bad stuff that happens to your body I thought about it subconsciously while using [substances/drugs] and eventually stopped."

The health educator “made me feel comfortable to talk about something that most people are ashamed of. I was at a point in my recovery where I was ready to talk about it.”

“I think it was influential. You don’t expect to get that kind of information at the doctor’s office and it makes you think about it.”

“I enjoyed the discussion I was able to have with [the health educator] and it should be available more with all people. I’ve been dealing with the same issues for a long time and it felt that the doctor didn’t listen or care about me, but she did.”

“I found it helpful that they were concerned about my disease and I found it helpful they cared and they didn’t even know me.”

Demographics of Patients Screened at Grant-Funded Sites

<table>
<thead>
<tr>
<th>GENDER</th>
<th>Age</th>
<th>Race/Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>18-20</td>
<td>White – 50%</td>
</tr>
<tr>
<td></td>
<td>21-23</td>
<td>Hispanic – 39%</td>
</tr>
<tr>
<td></td>
<td>24-34</td>
<td>Black – 11%</td>
</tr>
<tr>
<td></td>
<td>35-44</td>
<td>Asian – 1%</td>
</tr>
<tr>
<td></td>
<td>45-54</td>
<td>Other – &lt;1%</td>
</tr>
<tr>
<td></td>
<td>55-64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>65-74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75+</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18-20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21-23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24-34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35-44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-54</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55-64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>65-74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75+</td>
<td></td>
</tr>
</tbody>
</table>
Patients Who Screened Positive for Harmful Substance Use

SBIRT Colorado uses a short brief screen and the ASSIST screening tool, developed by the World Health Organization. For each substance, individuals are assigned a level of risk (low/no, moderate, moderate-high, or high).

The recommended service for moderate-risk use is a brief intervention—the recommended service for moderate-high or high-risk use is a brief intervention paired with a referral for additional services.
• Conducted 59,711 screens at 11 sites in five health systems.
• Reached more than 11,600 people through trainings, presentations and exhibits.
• Provided expert input to health professions training programs in Colorado and nationally—especially nursing.
• Provided training, consultation and expert input on youth substance use prevention/early intervention—with a focus on marijuana.
• Responded to increased requests for training mental health professionals on SBIRT.
• Offered SBIRT training to clinics, hospital emergency departments and trauma services, and health professions training programs throughout Colorado.
• Marijuana clinical guideline developed and widely disseminated throughout Colorado and nationally.
• Contributed to the development of the Colorado Department of Public Health and Environment’s new marijuana clinical guideline.
• Monthly SBIRT implementation training offered starting spring 2015 and well attended.
• Offered regular SBIRT Train-the-Trainer classes.
• Provided expert consultation and presentations to health care providers and stakeholders nationwide upon request.

• Presented SBIRT data at national and international conferences.
• Pilot tested the “Essential Steps” approach to alcohol SBI (single-item alcohol screening in primary care).
• Developed HeartSmartKids electronic screening and guided brief intervention tool for primary care SBI in adults and adolescents.
• Participated on the Colorado Suicide Prevention Commission Training and Development workgroup to provide input on substance use early intervention as part of suicide prevention.
• Participated on the Colorado Consortium for Prescription Drug Abuse Treatment workgroup to provide SBIRT perspective.
• Contributed to the creation and dissemination of www.LinkingCare.org, a Colorado referral resource with statewide access to information and services for prevention, treatment, and recovery from substance use and mental health conditions.
• Developed interactive public and secured site-specific data dashboards documenting screening and outcome data.
• Authored papers in peer-reviewed journals to report on SBIRT evaluation findings.
• Developed an online searchable database for quick identification of SBIRT-related research studies.
• Developed a short demonstration video of a brief intervention for alcohol.

SBIRT COLORADO MISSION
To motivate Coloradans to make changes to improve their health and life through universal screening and early substance use intervention.

GRANT-END EVALUATION
The evaluation was conducted by OMNI Institute, a non-profit social science research firm that specializes in a variety of research areas including substance use prevention and treatment, and community health. For additional information on SBIRT Colorado and links to full evaluation reports, please visit the SBIRT Colorado website: www.improvinghealthcolorado.org.
How many times in the past year have you had x or more drinks in one day?  
Men x = 5  
Women x = 4  
Positive = 1 or more times

Tips for Giving Feedback

A Standard Drink

Any Drink Containing About 14 Grams Of Alcohol
NIAAA (www.RethinkingDrinking.NIAAA.nih.gov)

12 fl oz beer = 5 fl oz 18% wine = 1.5 fl oz liquor  
(whisky, vodka, etc)

12% alcohol 15% alcohol 21% alcohol

Craft beers often contain a higher % alcohol.

See Lower Risk Drink Limits chart to know your limit.

Lower Risk Drink Limits

Per Day Per Week

<table>
<thead>
<tr>
<th></th>
<th>Per Day</th>
<th>Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOMEN</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>MEN</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>OVER 65</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

LESS IS BETTER

AVOID ALCOHOL IF YOU
- take medications that interact with alcohol
- have a health condition made worse by drinking
- are under 21 years of age
- plan to drive a vehicle or operate machinery
- are pregnant or trying to become pregnant

How important is it to you?  | 0 1 2 3 4 5 6 7 8 9 10  | How ready are you?  | How confident are you?  | Extremely

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
01 RAISE THE SUBJECT
   Ask permission: "Would you mind taking a few minutes to discuss your screening results?"
   • Review reported alcohol use and refer to lower risk alcohol guidelines.
   • Discuss possible health and other consequences of use; link to purpose of visit, if applicable.
   • Express concern.
   • Elicit the person’s response: “What do you think about this information?”

02 PROVIDE FEEDBACK
   • “On a scale of 0-10, how important is it to you to decrease (or quit) your drinking?”
   • “On a scale of 0-10, how confident are you that you will be able to make this change?”
   • “How does your current level of drinking fit with what matters most to you?”
   • When readiness is low, ask, “What do you enjoy about drinking? What do you not enjoy about drinking?” Then summarize both sides.

03 ENHANCE MOTIVATION
   • Elicit response: “What are your thoughts about our conversation?”
   • Negotiate a goal: “What steps are you interested in taking to make a change?”
   • Assist in developing a plan: “What could help you accomplish your goal? What will be challenging?”
   • Summarize the conversation. Arrange follow-up.
   • Thank the person for having the conversation.

This guide can be used for other risky behavior, such as tobacco or illicit drug use. 5/2016

OPTIONS FOR MORE HELP
Medication • Referral • www.LinkingCare.org

SBIRT Colorado | 303.369.0939 ext. 245 | www.ImprovingHealthColorado.org
Substance misuse among older adults is often missed, attributed to normal aging or to chronic disease.

**Key points**
- Older adult: 65+ years
- Of older adults who drink, almost 1 in 4 exceed lower risk limits and/or may be affected by combined use of alcohol and medications or alcohol and comorbid conditions
- Screening tools: AUDIT validated in older adults; cut-off score for low-risk alcohol use = 5

**Considerations for clinicians**
- Physiologic
  - Distribution
  - Metabolism
  - CNS effects
- Social factors
  - Loss and Grief
  - Social Isolation
  - Retirement

**Health conditions**
- Medication Interactions
- Chronic Diseases
- Functional Impairment
- Cognitive Impairment
- History of substance use disorder or psychiatric dx

**Brief interventions with older adults**
- Have been shown to be effective
- Linking to chief concern(s), signs or symptoms may increase effectiveness

**Key points for giving feedback**
- Sleep
- CI Symptoms
- Memory
- AFib
- Cardiac
- Depression
- Falls
- Hypertension
- Medication Interactions
- Driving

**How important is it to you?** | **How ready are you?** | **How confident are you?**
---|---|---
NOT AT ALL | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | EXTREMELY
Lower Risk Drink Limits for Men and Women Over 65

- Per Week: No more than 7 drinks
- On any single day: No more than 3 drinks

Why lower limits?
- Increased blood alcohol level per amount consumed
- Psychomotor, cognitive and GI symptoms increase with age
- Alcohol may worsen common co-occurring health problems
- Potential medication interactions, especially:
  - Medications with increased risk for bleeding e.g. NSAIDs, anticoagulants
  - Medications that increase risk for sedation e.g. opioids, sedatives
  - Medications with decreased efficacy due to alcohol e.g. ulcer medications, antidepressants

Marijuana and Older Adults

Cannabis and cannabinoids may result in clinically significant pain reduction -- however:
- Smoking associated with chronic cough/phlegm
- Heavier use may result in panic or anxiety attacks and increase suicidal thoughts
- May result in medication interactions
- Temporarily increases heart rate and BP

MARIJUANA GUIDELINE
www.improvinghealthcolorado.org/Resources

Substance Use Disorder Treatment

- Long-term outcomes equivalent or better than those in younger adults
- Possible barriers: transportation, mobility and/or hearing impairment, being homebound

Find Services: www.LinkingCare.org

Opioids and Sedative-Hypnotic Medications

- ~49% of older adults used prescription psychoactive medications in the past year; 2-5% misused them
- In older adults: decreased lean body mass, body water, renal and hepatic clearance and increased body fat → increased drug effects
- Use increases risk of falls, fractures, cognitive impairment, delirium, motor vehicle accidents
- Non-drug therapies are more effective for long-term management of insomnia and back pain

More Information
www.improvinghealthcolorado.org
How many times in the past year have you used tobacco, alcohol or marijuana?

Never, Once or twice, Monthly, Weekly or more

Potential consequences of alcohol and drug use:
- Brain
- Injury
- Legal issues
- Violence
- Pregnancy
- Sexually transmitted infections

Any Drink Containing About 14 Grams Of Alcohol

Risk Levels:
- Never/No use = No risk.
- Once or twice in past year = Low risk.
- Monthly use = Moderate risk.
- Weekly or more = High risk.

What is binge drinking?

<table>
<thead>
<tr>
<th>YEARS</th>
<th>DRINKS IN A SITTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEMALES 9-17</td>
<td>3</td>
</tr>
<tr>
<td>MALES 8-13</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>14-15</td>
</tr>
<tr>
<td></td>
<td>16-17</td>
</tr>
</tbody>
</table>

How important is it to you? | How ready are you? | How confident are you?

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | EXTREMELY
**RAISE THE SUBJECT**

- Build rapport: Explore how things are going. Ask permission: "Would it be ok to discuss your answers to the alcohol and drug questions?"

**02 PROVIDE FEEDBACK**

- Review reported responses. Reinforce positive choices: "It's great that you've chosen not to use alcohol or drugs at this stage of your life. What made you make that decision?"
- Provide feedback: "Alcohol/marijuana use can be especially harmful at this stage of your life when your brain is still developing..."
- Recommend abstinence: "Because I care about your well-being, the best choice is to completely avoid alcohol and drugs at this time in your life."
- Elicit response: "What do you think about this information?"

**03 ENHANCE MOTIVATION**

- Explore pros and cons: "What do you like about drinking/smoking marijuana?" "What are some of the not so good things about drinking/smoking marijuana?" Summarize both sides.
- Explore readiness to change: "On a scale where 0 is not at all ready and 10 is very ready, how ready are you to stop drinking/smoking marijuana?"
  Respond: "What made you choose x and not a lower number?"
- Reasons to change: "What are some of the best reasons you can think of to avoid alcohol/marijuana?"

**04 NEGOTIATE AND ADVISE**

- Reinforce autonomy: "What you choose to do is up to you." Elicit input from adolescent: "What next steps would you like to take?"
- Negotiate a goal.
- Harm reduction: Contract for Life (if "yes" to care question). Ask: "What steps could you take to reduce harms from alcohol or drug use?"
- Assist with developing a plan. Address co-occurring mental health and other issues.
- Arrange follow-up depends on level of risk.
- Thank them.

This guide can be used for other risky behaviors, such as tobacco or illicit drug use.
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>01 RAISE THE SUBJECT</strong></td>
<td>Ask permission: “Would you mind taking a few minutes to discuss your screening results?”</td>
</tr>
</tbody>
</table>
| **02 PROVIDE FEEDBACK** | - Review reported alcohol use and refer to lower risk alcohol guidelines.  
- Discuss possible health and other consequences of use; link to purpose of visit, if applicable.  
- Express concern.  
- Elicit the person’s response: “What do you think about this information?” |
| **03 ENHANCE MOTIVATION** | - “On a scale of 0-10, how important is it to you to decrease (or quit) your drinking?”  
- “On a scale of 0-10, how confident are you that you will be able to make this change?”  
- “How does your current level of drinking fit with what matters most to you?”  
- When readiness is low, ask, “What do you enjoy about drinking? What do you not enjoy about drinking?” Then summarize both sides. |
| **04 NEGOTIATE AND ADVISE** | - Elicit response: “What are your thoughts about our conversation?”  
- Negotiate a goal: “What steps are you interested in taking to make a change?”  
- Assist in developing a plan: “What could help you accomplish your goal? What will be challenging?”  
- Summarize the conversation. Arrange follow-up.  
- Thank the person for having the conversation. |

This guide can be used for other risky behaviors, such as tobacco or illicit drug use. ©2016

OPTIONS FOR MORE HELP
Medication • Referral • www.LinkingCare.org

SBIRT Colorado • 303.369.0039 ext. 245 • www.improvingHealthColorado.org
SBIRT in Colorado
No-Cost Training and Technical Assistance

SBIRT: SCREENING, BRIEF INTERVENTION, AND REFERRAL TO TREATMENT IS AN EVIDENCE-BASED EARLY INTERVENTION TO PREVENT ALCOHOL AND DRUG USE PROBLEMS IN ADULTS AND ADOLESCENTS.

Online Training

♦ Short overview of SBIRT, plus interactive simulations to practice SBIRT in adults and adolescents
♦ Certificate upon completion
♦ Continuing education credits for physicians, nurses, and social workers
♦ Available on demand
♦ Total time to complete: 1-2 hours
♦ Access the training here: pas.kognito.com
♦ Access our public awareness campaign, One Degree, here: www.shifttheinfluence.org

In-Person Skills-Based

♦ Two training sessions per RCCO region each year
♦ In various locations in each RCCO region
♦ For all types of professionals and staff from health care and community-based organizations
♦ Training covers:
  ◆ Overview of alcohol and drug use and health
  ◆ Prevention using SBIRT
  ◆ Motivational interviewing skills

Technical Assistance (TA)

For clinics, hospitals, and other organizations. TA can be provided by phone, email, or in-person.

♦ Workflow
♦ Reimbursement for SBIRT
♦ SBIRT in specific populations: women, adolescents, and older adults
♦ SBIRT for marijuana use
♦ SBIRT for safe medication prescribing
♦ Tobacco cessation
♦ Staff coaching on motivational interviewing
♦ Treatment of alcohol and drug use disorders
♦ Using technology to support implementation
♦ Developing SBIRT champions and trainers for your organization

FIND SCHEDULED SBIRT TRAININGS, RESOURCES, CLINICAL TOOLS, AND MORE:
www.SBIRTcolorado.org

7/10/2017

CONTACT US
Peer Assistance Services, Inc.
2170 S Parker Rd, Suite 229
Denver, CO 80231
SBIRTinfo@peerassist.org
303-369-0039
www.peerassistanceservices.org
READY FOR THE CONVERSATION?

Making it easier to discuss substance use. Here is an opportunity to build skills and confidence.
ALCOHOL AND DRUG USE MODULE
This program offers a no-cost opportunity to learn the basics of Screening, Brief Intervention, and Referral to Treatment (SBIRT) to prevent alcohol and drug misuse in adults or adolescents. The module begins with engaging videos, before starting virtual patient simulations to practice conversations with realistic patient characters.

SBI WITH ADOLESCENTS
Learn to conduct substance use screening, brief intervention and referrals to treatment.

ROLE-PLAY SIMULATIONS INCLUDE:
Alcohol/Marijuana Use, Scoring Dashboard
CE CREDITS:
2.0 AMA CME, 2.0 ANCC CNE, 2.0 NASW contact hours

SBI SKILLS ASSESSMENT
Learn to practice and assess your skills in substance use screening and motivational interviewing.

ROLE-PLAY SIMULATIONS INCLUDE:
Screening with Validated Tools, Conducting Brief Interventions for Alcohol Use, Scoring Dashboard
CE CREDITS:
0.75 AMA CME, 0.75 ANCC CNE, 1.0 NASW contact hour

TO ACCESS THESE SBIRT SIMULATIONS:
1. Visit https://nas.kognito.com/
2. Log in or create a new free account
3. Watch "A ReThink of the Way We Drink"
4. Watch "Addressing Alcohol and Drug Use in Healthcare"
5. Take SBI Skills Assessment and/or SBI With Adolescents

As part of the upcoming One Degree campaign, Peer Assistance Services, Inc. is offering free access to these SBIRT simulations to Colorado health professionals.

# ONE DEGREE.
Changing the conversation about alcohol and marijuana

Each of us can empower others to make small changes that can have a big impact on their lives. Be the influence, with help from One Degree, for those you care about. By practicing talking with our virtual humans, Donna and Jordan, you’ll learn how to navigate these conversations in real life.

Hi, I'm Donna!
I'm dealing with a lot these days, and I use alcohol to cope with stress. Practice talking with me before you talk with someone that you care about. Read more.

Hi, I'm Jordan!
I enjoy partying, but my drinking and smoking weed have been getting in the way of keeping my job. Practice talking with me before you talk with someone that you care about. Read more.

25% of Americans drink at levels that could lead to health or other problems – yet, most people who drink too much do not have a serious alcohol use disorder – or what we used to call “alcoholics.” Talking with those around us about alcohol and other substances can help prevent those disorders, avoid diseases and injuries, improve family and work life, and promote overall well-being. One Degree empowers each of us to be the influence and change the lives of those we care about. Download the One Degree app to practice conversations and transform the way we talk about alcohol and other drugs.

A One Degree shift is all it takes.
Using Virtual Patient Simulations to Prepare Primary Health Care Professionals to Conduct Substance Use and Mental Health Screening and Brief Intervention

Glenn Albright¹, Craig Bryan², Cyrille Adam³, Jeremiah McMillan⁴, and Kristen Shockley⁵

Abstract

BACKGROUND: Primary health care professionals are in an excellent position to identify, screen, and conduct brief interventions for patients with mental health and substance use disorders. However, discomfort in initiating conversations about behavioral health, time concerns, lack of knowledge about screening tools, and treatment resources are barriers. OBJECTIVE: This study examines the impact of an online simulation where users practice role-playing with emotionally responsive virtual patients to learn motivational interviewing strategies to better manage screening, brief interventions, and referral conversations. DESIGN: Baseline data were collected from 227 participants who were then randomly assigned into the treatment or wait-list control groups. Treatment group participants then completed the simulation, post-simulation survey, and 3-month follow-up survey. RESULTS: Results showed significant increases in knowledge/skill to identify and engage in collaborative decision making with patients. CONCLUSIONS: Results strongly suggest that role-play simulation experiences can be an effective means of teaching screening and brief intervention.

Keywords

substance use, mental health, primary care, screening, simulations

Introduction

Nearly half of the people living in the United States will be diagnosed with one or more mental health disorders at some point in their lives, with the first signs typically arising in their childhood or adolescence (Kessler, Berglund, et al., 2005). During any given year, 26% of the U.S. population will receive a psychiatric diagnosis, of which the most common are mood, substance use, anxiety, and impulse control disorders (Kessler, Chiu, Demler, & Walters, 2005). Primary care settings account for almost half of all ambulatory care visits in the United States (National Center for Health Statistics, 2010; Schapport & Rechtsteiner, 2008) and is the most frequently visited clinic for mental health-related concerns (Kessler et al., 1994; Regier et al., 1993; Wang et al., 2005).

In terms of substance use disorders, the Substance Abuse and Mental Health Services Administration's (2014) National Survey on Drug Use and Health showed that 27 million people from age 12 years on were known to have used an illicit drug during the past 30 days (10.2%). The survey also showed that “20.2 million adults (8.4%) had a substance use disorder, and of these, nearly 8 million had co-occurring mental and substance use disorders” (“Sovereign Health’s CEO,” 2016, p. 1). Additionally, less than half of these people with a readily diagnosable mental health disorder will receive appropriate services of any kind, and of those who do receive mental health care, the most common source is primary care (Wang et al., 2005). The relatively low rates of mental health service delivery may be due in part to limitations in screening and

¹Glenn Albright, PhD, Baruch College, City University of New York, One Bernard Baruch Way, New York, NY, USA
²Craig Bryan, PsyD, University of Utah, Salt Lake City, UT, USA
³Cyrille Adam, EdM, Teachers College, Columbia University, New York, NY, USA
⁴Jeremiah McMillan, BA, University of Georgia, Athens, GA, USA
⁵Kristen Shockley, PhD, University of Georgia, Athens, GA, USA

Corresponding Author:
Glenn Albright, Baruch College, City University of New York, One Bernard Baruch Way, New York, NY 10010, USA.
Email: Glenn.Albright@baruch.cuny.edu
diagnosis of psychiatric conditions by primary health care professionals (PHPs) and the accuracy and efficacy of diagnoses that have been called into question (Mitchell, Vaze, & Rao, 2009; Tyrer, 2009).

Inadequate treatment of mental health conditions has considerable public health implications in light of evidence indicating that, relative to physical illness and injury, psychiatric conditions show stronger relationships with functional impairment, disability, and mortality (Chang et al., 2010; Ormel et al., 1994; Strine et al., 2015). Although identification of psychiatric conditions and diagnostic accuracy among PHPs can be remarkably improved through training (Wintersteen, 2010; Zuckerbrodt & Jensen, 2006), barriers do exist that include perceived time demands and increased patient volume. In addition, many PHPs do not view mental health as a component of the services they provide, and most have received limited training in recognizing risk factors and symptoms and developing treatment options in their pre-licensure or continuing education. Furthermore, although administering a depression screening tool such as the nine-item Patient Health Questionnaire (Kroenke, Spitzer, & Williams, 2001) requires little training, discussing the result of the screening, conducting a brief intervention, collaboratively creating a treatment plan that integrates behavioral health, and building the intrinsic motivation in the patient to follow that plan require training that includes how to effectively manage these challenging conversations with patients.

Currently, mental health parity legislation is providing growing momentum to expand the provision of behavioral health services and PHP training and incentives to integrate mental health and substance use screening and counseling in primary care. Also, the U.S. Preventive Services Task Force (2015) and other government agencies have issued recommendations for screening protocol in primary care settings, and the Centers for Medicare & Medicaid Services (2011) have created new Health Care Procedure Coding System codes to reimburse screening and behavioral assessments for alcohol misuse, depression, and obesity. The White House Office of National Drug Control & Policy (2013) has also called for the expansion of Screening, Brief Intervention, and Referral to Treatment (SBIRT) in integrated care settings. SBIRT is an evidence-based approach to screening and early intervention that seeks not only to address alcohol and drug use but also to detect those who are at risk of such behaviors (The White House Office of National Drug Control & Policy, 2013).

However, education on substance use and mental health for PHPs remains scarce: It is often taught as an optional or specialized area, and it competes for time and resources with other subjects taught. Clinical barriers for screening and brief intervention include a lack of awareness, skills, and knowledge of screening tools; discomfort initiating conversations about behavioral health; time concerns; and a lack of treatment resources and simple guidelines for conducting brief interventions (McPherson, Goplerud, & Adam, 2015; Van Hook et al., 2007). PHPs are sometimes provided the opportunity to develop their skills in these areas by role-playing with standardized patients, who are actors hired and trained to behave as real patients. While these experiences offer some measure of deliberate practice in realistic conditions, they are often logistically difficult and expensive to organize and maintain and can leave learners feeling uncomfortable about having to perform with the standardized patient in front of their instructor and/or class. Virtual experiences have been shown to provide learners with a more comfortable space to experiment with a variety of techniques to engage patients on matters related to behavioral health (Lowes, Hamilton, Hochstedler, & Pack, 2013).

**Background**

The main objective of this study is to evaluate the effects of a computer-based role-play simulation on PHPs’ attitudes, motivation, and behaviors related to mental health screening and collaborative care of patients who may be experiencing mental health disorders defined as alcohol and substance abuse, generalized anxiety disorder, depression, and posttraumatic stress disorder. Kirkpatrick’s (1996) training evaluation model was used in assessing the impact of the simulation. This model comprises four levels: reaction, learning, behavior, and results. Reaction is the level of satisfaction; learning is the impact on attitudes, knowledge, and/or skills; behavior represents the change in behavior; and results are the final outcomes such as overall long-term health benefits as the result of screening and brief intervention (Kirkpatrick & Kirkpatrick, 2006). The learning stage is important to evaluate because behavior will not change if the desired knowledge, skills, and attitudes are not acquired. The fourth level was not assessed.

For the reaction level, we used measures of satisfaction and means efficacy. Means efficacy is defined as the “individual’s belief in the utility of the tools available for performing the job” (Eden, Ganzach, Flumin-Granat, & Zigman, 2010, p. 688) and has been correlated with changes in behavior. The learning level included assessing self-reported knowledge and skill on recognizing and screening patients with mental health disorders as well as discussing treatment options, engaging in collaborative decision making, and building intrinsic motivation to adhere to treatment plans. This level also involved accessing the behavioral intent or likelihood to engage in screening and management of treatment of those patients exhibiting signs of a mental health disorder. The construct of likelihood is drawn from reasoned action theory (Fishbein & Ajzen, 1975),
which posits that behavioral beliefs and subjective norms are the antecedents to behavioral intention which is the direct precedent to behavior. . . . An individual's self-reported likelihood about a behavior acts as a measure of their intentions to engage in the behavior or the probability of taking action. (Albright, Davidson, Goldman, Shockley, & Timmons-Mitchell, 2016, p. 272)

Thus, the likelihood increases his or her probability of actually engaging in the behavior. The behavioral level was measured as self-reported changes in patient screening and intervention.

**At-Risk in Primary Care**

*At-Risk in Primary Care* is an online professional development role-play simulation designed to provide PHPs with simulated conversation experiences where they can learn to identify and assess patients with mental health disorders, complete brief behavioral interventions using motivational interviewing (MI), and refer patients through collaborative decision making. The simulation also aims to help PHPs integrate behavioral health into their treatment and build patients’ intrinsic motivation so they can better adhere to it. The role-play conversations were designed to comply with the SBIRT training protocol. SBIRT itself relies on the use of MI to foster a collaborative relationship between PHPs and patients to resolve patients’ ambivalence about changing their behavior and bring positive changes for their own health by highlighting cognitive dissonance between unhealthy behaviors and healthy goals (Lundahl & Burke, 2009).

The simulation takes between 1 and 1.5 hours to complete and is self-paced (users can complete the simulation in multiple sittings), available to each user online 24/7, and approved for 1.50 CME AMA PRA Category 1 Credits™ and 1.50 American Nurses Credentialing Center Continuing Nursing Education contact hours.

**Motivational Interviewing**

Cate and Albright (2015) summarized MI as a goal-oriented, client-centered counseling line of action designed to engage clients to identify their problems and to increase their intrinsic motivation to change their behavior (Miller & Rollnick, 2012). The MI strategies were originally designed by clinical psychologists to use in counseling sessions with problem drinkers (Miller, 1983). Since 1983, numerous meta-analytic studies have shown its efficacy in a wide variety of other clinical contexts, such as weight loss, smoking cessation, adolescent substance abuse, and primary care (Armstrong et al., 2011; Burke, Arkowitz, & Menchola, 2003; Heckman, Egleston, & Hofmann, 2010; Jensen et al., 2011; Lai, Cahill, Qin, & Tang, 2010; Lundahl & Burke, 2009; Rubak, Sandbaek, Lauritzen, & Christensen, 2005; VanBuskirk & Wetherell, 2013; Vasilaki, Hosier, & Cox, 2006). The *At-Risk in Primary Care* simulation integrates the four core MI skills, which include (1) asking open-ended questions, (2) providing affirmation, (3) reflective listening (listening closely and periodically confirming comprehension), and (4) summarizing client self-assessments. These techniques are associated with effective therapy and are thought to encourage strong rapport and to support behavioral change (Miller & Rollnick, 2012). (Cate & Albright, 2015, p. 6)

Last, because it is quick and conversational in nature, MI can be integrated in most routine health practices.

Finally, the simulated role-plays in *At-Risk in Primary Care* allow learners to engage in sustained and deliberate practice opportunities in an environment that is visually and mechanically congruous with the setting in which learners will apply their skills in real settings (situated learning). Deliberate practice intends to improve real-world performance (Ericsson, Prietula, & Cokely, 2007) by offering the following: a challenge to learners’ existing skills; a simulated risk-free environment that allows users to experiment with various techniques with no fear of being judged by observers, patients, or peers (as opposed to live role-plays with peers or standardized patients); time for users to reflect on their skills and adjust their strategies; and continuous analysis of performance through simulation features (e.g., a meter representing patients’ current level of trust) and through individualized and immediate feedback from a virtual coach throughout the simulation. Evidence shows that practitioners' communication skills improve and endure when training incorporates deliberate practice, ongoing tailored feedback, and role-plays and establishes a connection between new skills learned such as those used in MI and their application in live settings (van de Wiel, Van den Bosch, Janssen, & Jossberger, 2011). To the authors' knowledge, there are no other conversation simulations within the field of medical education that integrate virtual human role-plays, game mechanics, and MI strategies to teach communication skills.

**Hypotheses and Measures**

Based on Kirkpatrick's (1996) model, the hypotheses for this study are as follows:

**Hypothesis 1:** Means efficacy will be associated with increased gains in (a) knowledge and skills, (b) likelihood to engage in screening behaviors, and (c) behavior changes as a result of the simulation. The means efficacy items are designed to assess the simulation's (1) usefulness; (2) construction; (3) ease of use; (4) relevancy to patient population; (5) helpfulness in identifying and managing the care of patients with
trauma-related mental health disorders; (6) helpfulness in increasing patient engagement, trust, and adherence to treatment plans by employing efficacious conversation tactics; and (7) realistic representations of conversations with patients.

Hypothesis 2: Participants in the simulation group will display higher levels of self-reported knowledge and skills (a) in comparison with presimulation levels and (b) in comparison with an independent control group. All knowledge and skill items addressed trauma-related mental health disorders that were defined as alcohol and substance abuse, depression, generalized anxiety disorder, and posttraumatic stress disorder. The measures were identified by Albright and Adam (2016) in a pilot study and included knowledge and skill to

(1) identify risk factors and warning signs of trauma-related mental health disorders; (2) recognize when a patient is exhibiting signs and symptoms of trauma-related mental health disorders; (3) screen patients for trauma-related mental health disorders; (4) discuss treatment options with patients exhibiting signs and symptoms of trauma-related mental health disorders; (5) engage in collaborative decision-making about treatment plans with patients exhibiting signs and symptoms of trauma-related mental health disorders; and (6) build intrinsic motivation in patients with trauma-related mental health disorders to adhere to suggested treatment plans. (p. 2)

Hypothesis 3: Participants in the simulation group will display higher likelihood to engage in mental health screening behaviors (a) in comparison with presimulation levels and (b) in comparison with an independent control group. The measure included a question that addressed the likelihood of participants screening and managing treatment of patients exhibiting symptoms and signs of trauma-related mental health disorders when visiting their PHP.

Hypothesis 4: Self-reported screening behaviors will be higher at the 3-month follow-up than prior to the simulation. The behavior measure used in this study included self-reported measures in the number of patients with possible trauma-related mental health disorders that were identified, screened, discussed treatment options with, and collaboratively engaged in decision-making treatment plans. We also measured the number of patients that participants reported screening before the simulation and at follow-up.

### Table 1. Participant Demographic Information.

<table>
<thead>
<tr>
<th>Demographic Items</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>41</td>
<td>18.1</td>
</tr>
<tr>
<td>Female</td>
<td>186</td>
<td>81.9</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>184</td>
<td>81.1</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>12</td>
<td>5.3</td>
</tr>
<tr>
<td>Hispanic</td>
<td>12</td>
<td>5.3</td>
</tr>
<tr>
<td>Asian, non-Hispanic</td>
<td>12</td>
<td>5.3</td>
</tr>
<tr>
<td>Multiple ethnicities</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td>Work role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>149</td>
<td>65.6</td>
</tr>
<tr>
<td>Doctor</td>
<td>47</td>
<td>20.7</td>
</tr>
<tr>
<td>Nurse practitioner</td>
<td>31</td>
<td>13.7</td>
</tr>
<tr>
<td>Years of experience in primary care setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>89</td>
<td>39.2</td>
</tr>
<tr>
<td>5-9</td>
<td>40</td>
<td>17.6</td>
</tr>
<tr>
<td>10-14</td>
<td>29</td>
<td>12.8</td>
</tr>
<tr>
<td>15-19</td>
<td>17</td>
<td>7.5</td>
</tr>
<tr>
<td>20-29</td>
<td>28</td>
<td>12.3</td>
</tr>
<tr>
<td>30-39</td>
<td>19</td>
<td>8.4</td>
</tr>
<tr>
<td>≥40</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Previously received training for screening trauma-related mental health disorders?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>113</td>
<td>49.8</td>
</tr>
<tr>
<td>No</td>
<td>114</td>
<td>50.2</td>
</tr>
</tbody>
</table>

Previously received training for screening trauma-related mental health disorders?

E-mail from local and state departments of health or health and mental health, hospital administrators, and word of mouth. Participants were 81.9% female and primarily White (81.1%). Most participants had moderate industry experience ($M = 10.89$ years, $SD = 11.01$) and came from a spectrum of work roles. Complete demographic information is available in Table 1.

### Materials

Unless otherwise noted, all measures were created specifically for the present study.

**Means Efficacy.** Means efficacy was measured immediately after completing the simulation (postsimulation) and included seven items that were rated on a 5-point Likert-type response scale ranging from not at all to a very little extent to a very great extent (Cronbach’s $\alpha = .91$; see Results section).

**Knowledge and Skills.** The Knowledge and Skills scale was assessed at presimulation and postsimulation using six items based upon the Gatekeeper Behavior Scale (Albright, Davidson, et al., 2016), and it was tailored for the present study to measure general abilities and preparedness to deal with mental health issues within the
patient population (Cronbach's $\alpha = .96$; see Results section). A composite score was created by averaging the six items in this scale.

Likelihood to Screen and Manage Mental Health Issues. Likelihood to engage in screening behavior was assessed using the single item: "How likely are you to screen and manage the treatment of patients that exhibit signs of trauma-related mental health disorders when visiting your primary care practice?" at both presimulation and postsimulation, using a 4-point Likert-type scale.

Behavioral Data. Participants responded to a single question at presimulation and at the 3-month follow-up regarding their current frequency of mental health screenings on a 5-point Likert-type scale. At follow-up, participants were also asked to indicate if there was an increase in the identification and screening of mental health disorders and if they had increased discussions and collaborative decision making surrounding patients' mental health conditions.

The Simulation

At-Risk in Primary Care was developed by Kognito (www.kognito.com) with input from subject matter experts and end users. The subject matter experts were nationally recognized scholars and professionals in mental health, public health, social work, and health education. Based in part on gaming technology, the simulation provides learners opportunities to practice role-playing with emotionally responsive virtual patients that have memory and personality and are experiencing mental health disorders. These virtual patients model human behavior and realistically react (e.g., becoming defensive or opening up) to the user's conversation strategies. In the simulation, the learner assumes the role of a PHP and engages in three role-play conversations with virtual patients. The learner must use MI conversation skills to gain patients' trust so that they will open up and provide more information.

Learners communicate with virtual patients by selecting from a dynamic menu of dialogue options. The dialogue options represent a variety of effective, neutral, and ineffective conversation tactics (see Figure 1). In some cases, a tactic that is ineffective at one point in the conversation may be effective elsewhere. Once learners choose a dialogue option, they observe their PHP avatar verbalizing the dialog and the ensuing reaction of the virtual patient including their verbal and nonverbal responses. A new set of dialogue options then appears, based on which tactic was selected. A Trust Meter provides continual feedback based on the choices made by the learner as he or she progresses through the simulation. If the learner selects choices that include being critical, judgmental, and/or labeling, the Trust Meter will decrease, and learners will find it harder to complete the simulation within an allotted time frame. Throughout the simulation learners are able to occasionally view the patients' inner thoughts; this is designed to provide greater insight, understanding, and empathic communication skills. Additionally,

A virtual coach provides personalized feedback and gives users an opportunity to revise their conversation tactic choice. Lastly, the relationship between the user's dialogue
decision and the response of the emotionally responsive virtual humans are controlled by a set of mathematical behavioral models and algorithms specifically designed to simulate real interactions with patient types that represent particular personality traits or conditions. These algorithms ensure that users are repeatedly exposed to target conversation and behavior patterns as a way to develop skills and knowledge. To successfully complete the conversation, users must apply effective conversation tactics and adapt their decisions based on the virtual human’s behavior. (Albright, Adam, Serri, Bleeker, & Goldman, 2016, p. 3)

Finally, the learning experience was designed to have high fidelity, which refers to the standardization in the learning experience over multiple deliveries. This includes accurate content, engaging delivery style, realism, role-plays that reflect real-world scenarios, and ongoing real-time feedback that reinforces correct conversational tactics and suggestions to correct ineffective tactics. The high fidelity is in part due to the simulation being computer-delivered, and as it is not possible to modify its content and delivery. Decision trees are incorporated such that selecting a particular conversation tactic to discuss with the virtual patient results in a particular follow-up, and the content available is uniform across participants and administrations.

Research Design and Procedure

The Baruch College (City University of New York) Human Protections Program Office determined that At-Risk in Primary Care is a professional development program and did not meet the definition of human subjects research as defined by the federal regulations 45 CFR 46.102.

The research design involved a control group and a treatment group created after data collection. All participants agreed to an informed consent and followed the same path through the study: presimulation survey, completion of the At-Risk in Primary Care simulation, postsimulation survey, and 3-month follow-up survey. For the purposes of the primary data analyses in the study, participants were randomly assigned to two groups in a post hoc manner—those considered in the treatment group (N = 117) and those considered in the control group (N = 110). Where appropriate, comparison of variables of interest were assessed using the control group’s presimulation scores and the treatment group’s postsimulation scores (see Figure 2).

As would be expected from the random assignment design, the control group and treatment group did not differ appreciably on gender, race, work role, years of experience, or previous training for mental health screening (all χ² test significance values were greater than ρ = .05), nor did they differ on initial knowledge and skills or likelihood (both t test significance values were greater than ρ = .05). Note that the sample size varies for some analyses below due to individual missing data.

Planned Analyses

The impact of the simulation on Knowledge and Skills and likelihood to engage in screening behavior (Hypotheses 2 and 3) were assessed in a two-pronged approach to provide complementary results: (1) comparison between the wait-list control group and treatment group was conducted using an independent-samples t test, and (2) comparison within the treatment group from presimulation to postsimulation was conducted using a paired-samples t test. For Knowledge and Skills, items were assessed individually and as a composite score.

For Hypothesis 4, behavioral data were assessed with descriptive statistics and a paired-samples t test for screening behaviors at presimulation and at the 3-month follow-up. Means efficacy was analyzed using descriptive statistics on treatment group responses. In addition, Hypothesis 1 was tested by separately regressing each postsimulation measure onto means efficacy scores while controlling for the respective presimulation measure. This provided an index of the degree to which means efficacy affects changes in key outcome variables, regardless of initial participant scores.
Table 2. Participant Attitudes Toward Simulation.

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found this activity useful for my professional practice.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Neutral</td>
<td>5</td>
<td>7.4</td>
</tr>
<tr>
<td>Agree</td>
<td>40</td>
<td>58.8</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>21</td>
<td>30.9</td>
</tr>
<tr>
<td>This activity will enhance my knowledge/skills as a health care provider.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Neutral</td>
<td>4</td>
<td>5.9</td>
</tr>
<tr>
<td>Agree</td>
<td>47</td>
<td>69.1</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>16</td>
<td>23.5</td>
</tr>
<tr>
<td>Would you recommend this course to your colleagues?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>114</td>
<td>97.4</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>How would you rate this course in terms of your skill level?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below my skill level</td>
<td>8</td>
<td>6.8</td>
</tr>
<tr>
<td>At my skill level</td>
<td>98</td>
<td>83.8</td>
</tr>
<tr>
<td>Above my skill level</td>
<td>11</td>
<td>9.4</td>
</tr>
</tbody>
</table>

Note. The first two items were presented only to a subset of the entire treatment group.

Results

Satisfaction and Means Efficacy

When asked for a global rating of the simulation, participants provided an average rating of 3.12 on a 4-point scale (31.6% of participants rated the simulation "excellent," the top point on the scale, and 48.7% rated it as "very good"). Additionally, 89.7% either agreed or strongly agreed that the activity was useful in their professional practice, and 92.6% agreed or strongly agreed that the activity will enhance their knowledge/skills as a health care provider. Information regarding general attitudes about the utility of the simulation can be seen in Table 2, and detailed responses to specific means efficacy items can be seen in Table 3.

Evaluation of At-Risk in Primary Care

Within Treatment Group. The composite score for Knowledge and Skills of the treatment group measured in the postsimulation survey (M = 3.40, SD = 0.89) was significantly higher than in the presimulation survey (M = 2.82, SD = 0.79), paired-samples t(116) = 8.34, p < .001, Cohen’s d = 0.77, power (1 − β) > .99. Further analysis for each individual item from the Knowledge and Skills scale can be seen in Table 4. Likelihood of engaging in screening behavior of the treatment group at postsimulation (M = 3.27, SD = 0.74) was also notably higher than at presimulation (M = 2.91, SD = 0.83), paired-samples t(110) = 5.34, p < .001, Cohen’s d = 0.51, power (1 − β) > .99. Hypotheses 2a and 3a are supported.

Between Wait-List Control and Treatment Group. The composite score for Knowledge and Skills of the treatment group measured in the postsimulation survey (M = 3.40, SD = 0.89) was markedly higher than the control group at presimulation (M = 2.91, SD = 0.69), independent-samples t(224) = 4.55, p < .001, Cohen’s d = 0.61, power (1 − β) > .99. Note that there was no significant difference when comparing the treatment group presimulation (M = 2.82, SD = 0.79) to the control group, t(224) = 93, p > .05. Further analysis for each individual item from the Knowledge and Skills scale can be seen in Table 5. Likelihood of engaging in screening behavior for the treatment group (M = 3.27, SD = 0.74) was also significantly higher than the control group (M = 2.90, SD = 0.87), independent-samples t(215) = 3.32, p < .01, Cohen’s d = 0.45, power (1 − β) = .91. Here too the treatment group at presimulation (M = 2.92, SD = 0.83) was not different than the control group, t(216) = .14, p > .05. Hypotheses 2b and 3b are supported.

Assessment of Behaviors at Follow-Up

To assess actual change in behaviors over time, we examined the responses of 38 participants who participated in the 3-month follow-up survey. These particular analyses were conducted across both the treatment and wait-list control group to maximize power (see Figure 2). When asked in general if they had changed anything in the way they practice medicine as a result of the course, 52.6% answered in the affirmative, while 47.4% indicated that they did not. Information about additional specific behavioral items can be seen in Table 6.

Regarding the frequency of screening behaviors, responses at the 3-month follow-up (M = 3.24, SD = 1.12) were significantly higher than responses at presimulation (M = 2.88, SD = 1.19), t(49) = 2.24, p < .05, Cohen’s d = 0.32, power (1 − β) = .59. Hypothesis 4 is thus supported based on two types of self-reported data.

Means Efficacy as a Predictor

The impact of means efficacy on knowledge and skills and likelihood to engage in screening behavior, and self-reported frequency of screening behaviors at follow-up can be seen in Tables 7, 8, and 9, respectively. Controlling for pretest scores, means efficacy was a significant
Table 3. Means Efficacy Items Percentage of Participants Who Endorsed Each Option.

<table>
<thead>
<tr>
<th>Item: Please indicate to what extent you think that the course is . . .</th>
<th>Not at all/very little, %</th>
<th>A little, %</th>
<th>Some, %</th>
<th>Greatly, %</th>
<th>Very greatly, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A useful tool</td>
<td>0.0</td>
<td>1.7</td>
<td>13.7</td>
<td>54.7</td>
<td>29.9</td>
</tr>
<tr>
<td>Well constructed</td>
<td>0.0</td>
<td>0.9</td>
<td>9.5</td>
<td>56.0</td>
<td>33.6</td>
</tr>
<tr>
<td>Easy to use</td>
<td>0.0</td>
<td>0.9</td>
<td>10.3</td>
<td>50.9</td>
<td>37.9</td>
</tr>
<tr>
<td>Relevant to your patient population</td>
<td>0.9</td>
<td>4.3</td>
<td>17.2</td>
<td>50.9</td>
<td>26.7</td>
</tr>
<tr>
<td>Helpful in learning how to identify and manage the care of patients with trauma-related mental health disorders</td>
<td>0.0</td>
<td>1.7</td>
<td>25.6</td>
<td>50.4</td>
<td>22.2</td>
</tr>
<tr>
<td>Helpful in learning effective conversation tactics to increase patient engagement, trust, and adherence to treatment plans</td>
<td>0.0</td>
<td>2.6</td>
<td>23.9</td>
<td>51.3</td>
<td>22.2</td>
</tr>
<tr>
<td>Realistic representations of conversations you have or may have with your patients</td>
<td>0.0</td>
<td>3.4</td>
<td>24.8</td>
<td>50.4</td>
<td>21.4</td>
</tr>
</tbody>
</table>

Table 4. Means and Significance Testing for Individual Knowledge and Skills Items: Within Treatment.

<table>
<thead>
<tr>
<th>Item: Please rate your knowledge and skills to . . .</th>
<th>Prestimulation, M (SD)</th>
<th>Poststimulation, M (SD)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify risk factors and warning signs of trauma-related mental health disorders</td>
<td>2.96 (0.83)</td>
<td>3.48 (0.90)</td>
<td>7.76</td>
</tr>
<tr>
<td>Recognize when a patient is exhibiting signs and symptoms of trauma-related mental health disorders</td>
<td>2.96 (0.80)</td>
<td>3.51 (0.90)</td>
<td>8.04</td>
</tr>
<tr>
<td>Screen patients for trauma-related mental health disorders</td>
<td>2.82 (0.85)</td>
<td>3.43 (0.96)</td>
<td>7.81</td>
</tr>
<tr>
<td>Discuss treatment options with patients exhibiting signs and symptoms of trauma-related mental health disorders</td>
<td>2.79 (0.70)</td>
<td>3.33 (0.95)</td>
<td>7.60</td>
</tr>
<tr>
<td>Engage in collaborative decision making about treatment plans with patients exhibiting signs and symptoms of trauma-related mental health disorders</td>
<td>2.79 (0.92)</td>
<td>3.37 (0.99)</td>
<td>7.55</td>
</tr>
<tr>
<td>Build intrinsic motivation in patients with trauma-related mental health disorder to adhere to your suggested treatment plan</td>
<td>2.62 (0.89)</td>
<td>3.25 (1.01)</td>
<td>8.18</td>
</tr>
</tbody>
</table>

Note. All tests significant at p < .001.

Table 5. Means and Significance Testing for Individual Knowledge and Skills Items: Between Treatment and Control.

<table>
<thead>
<tr>
<th>Item: Please rate your knowledge and skills to . . .</th>
<th>Control, M (SD)</th>
<th>Poststimulation treatment, M (SD)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify risk factors and warning signs of trauma-related mental health disorders</td>
<td>3.15 (.74)</td>
<td>3.48 (0.90)</td>
<td>3.02</td>
</tr>
<tr>
<td>Recognize when a patient is exhibiting signs and symptoms of trauma-related mental health disorders</td>
<td>3.20 (.72)</td>
<td>3.51 (0.90)</td>
<td>2.87</td>
</tr>
<tr>
<td>Screen patients for trauma-related mental health disorders</td>
<td>2.96 (.79)</td>
<td>3.43 (0.96)</td>
<td>3.95</td>
</tr>
<tr>
<td>Discuss treatment options with patients exhibiting signs and symptoms of trauma-related mental health disorders</td>
<td>2.76 (.87)</td>
<td>3.35 (0.95)</td>
<td>4.85</td>
</tr>
<tr>
<td>Engage in collaborative decision making about treatment plans with patients exhibiting signs and symptoms of trauma-related mental health disorders</td>
<td>2.81 (.89)</td>
<td>3.37 (0.99)</td>
<td>4.40</td>
</tr>
<tr>
<td>Build intrinsic motivation in patients with trauma-related mental health disorder to adhere to your suggested treatment plan</td>
<td>2.60 (.82)</td>
<td>3.25 (1.01)</td>
<td>5.25</td>
</tr>
</tbody>
</table>

Note. All tests significant at p < .01.

The Role of Completion Time

Completion time from beginning of the pretest to end of the posttest differed widely among participants. Median completion time was 155 minutes, while mean completion

predictor for knowledge and skills and likelihood to engage in screening behavior (p < .05) but not for self-reported frequency of screening behavior (p > .05). Hypothesis 1 is partially supported.
Table 6. Behavioral Item Responses at Follow-Up.

<table>
<thead>
<tr>
<th>Item: As a result of taking this course, there has been an increase in the number of patients that I have . . .</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Undecided (%)</th>
<th>N/A (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>identified at risk for trauma-related mental health disorders</td>
<td>31.6</td>
<td>31.6</td>
<td>19.3</td>
<td>17.5</td>
</tr>
<tr>
<td>Screened for trauma-related mental health disorders</td>
<td>49.1</td>
<td>22.8</td>
<td>10.5</td>
<td>17.5</td>
</tr>
<tr>
<td>Discussed treatment options with</td>
<td>40.4</td>
<td>35.1</td>
<td>5.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Engaged in collaborative decision making about treatment plans</td>
<td>35.1</td>
<td>35.1</td>
<td>10.5</td>
<td>19.3</td>
</tr>
</tbody>
</table>

Table 7. Multiple Regression for Postsimulation Knowledge and Skills.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presimulation knowledge and skills</td>
<td>.69</td>
<td>.08</td>
<td>.61***</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presimulation knowledge and skills</td>
<td>.69</td>
<td>.08</td>
<td>.61***</td>
</tr>
<tr>
<td>Means efficacy</td>
<td>.27</td>
<td>.10</td>
<td>.19*</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall $R^2$</td>
<td>.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall F</td>
<td>39.38***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 117.

***p < .001. *p < .05.

time was 4,998 minutes. There were no restrictions placed on the time frame within which the online training simulation must be taken after the pretest survey, nor were any restrictions placed on when the posttest must be completed after the training simulation. Therefore, the majority of participants completed all three steps in succession, but many participants took several days to complete the entire process, indicating that they did not complete it in a single sitting. Thus, it was important to evaluate if this variable might be associated with the impact of the simulation. Treatment group participants were grouped into two categories: (1) those who completed the entire study in less than 4 hours—considered to be the upper limit of a reasonable completion time “short-completers” ($n = 68$) and (2) those who completed it in greater than 4 hours, “long-completers” ($n = 49$). Independent-samples $t$ tests for both Likelihood of Helping Behaviors and Knowledge and Skills (composite score and all individual items) indicated no significant differences between short-completers and long-completers at postsimulation (all $p s > .5$). Additionally, there were no significant interactions between measurement time point and completion time status (all $p s > .05$). Thus, evidence suggests that the simulation is equally effective regardless of the time to complete the pretest—simulation—posttest process.

Discussion

Regarding the effectiveness of the At-Risk in Primary Care intervention, participants in the simulation group, when compared to the control group, demonstrated significant increases in all knowledge and skills and likelihood dependent measures from presimulation to postsimulation. These findings are identical to those found by Albright and Adam (2016) in an earlier pilot study and include the following:

1. Identify risk factors and warning signs of mental health disorders,
2. Recognize when a patient is showing signs and symptoms of mental health disorders,
3. Screen patients for mental health disorders,
4. Discussing treatment options with patients showing signs and symptoms of mental health disorders,
5. Engage in collaborative decision-making about treatment plans with patients exhibiting signs and symptoms of mental health disorders,
6. Build intrinsic motivation in patients with mental health disorders to adhere to suggested treatment plans, and
7. Likelihood to screen and manage the treatment of patients who exhibit signs and symptoms of mental health disorders.

Beyond statistical significance, effect sizes were in the moderate to large range, suggesting meaningful changes as a result of the simulation. The same results were discovered when comparing the treatment group’s postsimulation data to an independent control group’s presimulation scores, thus highlighting that the results were not idiosyncratic to one sample.

Participants also reported high means efficacy based on ratings of usefulness, realism, and helpfulness in learning new skills. Furthermore, means efficacy appears to be an important component of simulation success. In the present study, those who rated the simulation as more useful also exhibited higher gains in self-reported knowledge and skills and likelihood to engage in screening.

At the 3-month follow-up survey, there were self-reported increases in the number of patients identified, screened, discussed treatment options with, and engaged in collaborative decision making regarding treatment plans. However, the relative percentages of these reported
A significance test of the reported frequency of patient screenings prior to the intervention and at the follow-up reiterated the above results. Thus, many participants appear to transfer skills to the job and alter their behavior with patients as a result. Referencing Kirkpatrick’s (1996) training evaluation model, there is strong support that the At-Risk in Primary Care simulation is effective on three levels: reaction, learning, and behavior. It is noteworthy, however, that 47.4% indicated they did not change anything in their practice. Because many variables may intervene between the perceived valence or favorability of engaging in helping behaviors and actually instituting such behaviors (e.g., perceived ability to enact behaviors or social norms about doing so; Ajzen & Fishbein, 1977), it is perhaps unsurprising that a high overall likelihood to engage in helping behaviors did not translate perfectly into behavior. Future research is warranted to elucidate practitioners’ perceived barriers to (1) generally engage in mental health screenings and (2) specifically transfer learning from simulations such as the current one.

There are several advantages of using online versus the face-to-face role-play models that were summarized by Cate and Albright (2015) as follows:

The first is that role-playing with virtual humans may reduce situational factors that compromise the effectiveness of face-to-face role-plays, such as performing in front of peers, instructors, and other role-players, which can cause embarrassment or social evaluative threat (Nestel & Tierney, 2007). Both negative emotions in general, and social evaluative threat in particular, are known to impede cognitive performance (Baumeister, Twenge, & Nuss, 2002; Payne et al., 2006). Another advantage is that once a virtual gatekeeper simulation is developed, it is sustainable. There are no costs for training, hiring, and maintaining professional instructors, which is especially onerous if one is scaling up to implement training on a state or national level. Additionally, this online training eliminates the need for travel expenses and the cost of participants being pulled away from their work, especially in rural areas. (pp. 12-13)

Another advantage of using virtual humans is that they increase the willingness of users to disclose (Lucas, Gratch, King & Morency, 2014); thus the learning experience potentially has a deeper and more meaningful impact. Finally, users are able to complete the simulation in private and on their own time. This reduces stress and facilitates a faster and more enjoyable learning experience.

**Limitations**

Despite the above-listed advantages to virtual simulations, there are concomitant disadvantages as well. Namely, despite efforts to maximize psychological fidelity, virtual
humans cannot provide the same degree of nuanced behavior as live human beings, where real-world scenarios involve complex actions and reactions by conversation partners. Although participants reacted very favorably to the simulation, we acknowledge that there may be a trade-off between ease of administration and realism when deciding between a live or simulation-based intervention.

Another potential limitation of the present study design pertains to the general issue of pretest sensitization, in which a pretest/posttest design sensitizes participants to the content of both the simulation and the outcome measures, resulting in artificially inflated gains between the two time points. Although this possibility cannot be ruled out entirely, the two-pronged approach to data analysis provides some reassurance that there is a true effect of the simulation. Specifically, the moderately large observed within-group effect was replicated in the analyses comparing postsimulation scores with a separate sample’s presimulation scores. Still, results must be interpreted cautiously, as the potential for demand characteristics within the treatment group is not fully controlled presently.

Another limitation is that the 3-month behavioral data regarding the perceived impact of the simulation on the increases of the number of patients identified, screened, and engaged were self-reported. Ideally having access to patient records would have allowed us to further ascertain the impact of the intervention. Because follow-up data were not collected for a group who had not undergone the simulation, it would also be beneficial in future research to gather this information in order to make direct comparisons regarding changes in behavior.

Last, the study participants included nurses, nurse practitioners, and doctors who we assumed were providing direct patient services. We have treated these participants as a single sample to maximize statistical power; however, their roles may have varied in terms of interactions with patients. Thus, individual survey items may be slightly more or less pertinent.

**Conclusion**

Integrating behavioral health into primary care is an important initiative that will effect better health outcomes for patients and increased economic efficiency for the nation’s health care system. In a broader sense, digital learning experiences such as *At-Risk in Primary Care* demonstrate a capability to address major health and public health concerns where effective conversations are necessary to bring about changes in attitudes and behaviors. Whether online or mobile, innovative use of simulation technology increases participant engagement so learners not only enjoy the experience but also find themselves transformed from passive receivers to active constructors of the learning experience. In conclusion, the authors are truly excited about the possibilities of reaching large numbers of geographically dispersed PCPs who often serve vulnerable populations to bring about positive changes in people’s lives.

**Author Roles**

The first author designed the study and assessment materials, collected data, and drafted the manuscript with input from coauthors. The second author was involved in writing the literature review, part of the introduction, and critical review of the manuscript. The third author was involved in the intellectual content and critical review of the manuscript. The fourth and fifth authors did the statistical analysis, data interpretation, and manuscript review.

**Declaration of Conflicting Interests**

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: To fully disclose, there are conflicts of interest for five of the five authors. The first author is the Director of Research at Kognito, the company that developed the At-Risk in Primary Care simulation examined in this study. The third author is an SBIRT learning specialist who is employed at Kognito and works collaboratively with national nonprofit organizations such as NORC in developing SBIRT simulation technology to address alcohol and substance use. Finally, the fourth author and the mentor, the fifth author, were paid by Kognito as statistical consultants. The second author has no conflict of interest. The first, third, fourth, and fifth authors are either employees of or received a consultant fee from the company that developed the simulation.

**Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The first and third authors are employees of Kognito, the company that developed the *At-Risk in Primary Care* simulation examined in this study. The fourth and fifth authors were paid by this same company as statistical consultants. No other funding was received.

**References**


Albright, G. L., Adam, C., Serri, D., Bleecker, S., & Goldman, R. (2016). Harnessing the power of conversations with virtual humans to change health behaviors. *mHealth, 2*, 44. doi:10.21037/mhealth.2016.11.02

Cate, C., & Albright, G. (2015). Supporting student veterans:
Utilizing game-based role-plays with virtual humans to build
military cultural competency and helping behaviors in faculty and staff. Online Learning Journal, 19(1).
Retrieved from https://resources.kognito.com/voc/kogni
to_veterans_on_campus_study_2_Jan_2015.pdf

memo for screening and behavioral counseling interventions in
medicare-coverage-database/details-nca-decision-memo.
asp?NCAId=249&ver=5&NcaName=Screening+and+B
ehavioral+Counseling+Interventions+in+Primary+C
are+to+Reduce+Alcohol+Misuse&DocID=CAG-004
27N&bcg=AAAAAGAAAAAA&

Chang, C.-K., Hayes, R., Badbrot, M., Fernandes, A., Lee,
W., Hotopf, M., & Stewart, R. (2010). All-cause mortality among people with serious mental illness (SMI),
substance use disorders, and depressive disorders in southeast
doi:10.1186/1471-244X-10-77

Eden, D., Ganzach, Y., Flumín-Granat, R., & Zigman, T.
(2010). Augmenting means efficacy to boost performance:
Two field experiments. Journal of Management, 36, 687-
713. doi:10.1177/0149206308321553

1). The making of an expert. Harvard Business Review,
ing-of-an-expert

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and
behavior: An introduction to theory and research. Reading,
MA: Addison-Wesley.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas,
K. R., & Walters, E. E. (2005). Lifetime prevalence and age-
of-onset distributions of DM-IV disorders in the national
comorbidity survey replication. Archives of General

Prevalence, severity, and comorbidity of 12-month DSM-IV
disorders in the national comorbidity survey replication.
Archives of General Psychiatry, 62, 617-627. doi:10.1001/
archpsyc.62.6.617

Kessler, R. C., McGonagle, K. A., Zhao, S., Nelson, C. B.,
Hughes, M., Eshleman, S., & Kendler, K. S. (1994). Lifetime
and 12-month prevalence of DSM-III-R psychiatric
disorders in the United States: Results from the National
Comorbidity Survey. Archives of General Psychiatry,

for evaluating training programs. Revisiting Kirkpatrick's
four-level model. Training & Development, 50(1), 54-59.

training programs: The four levels (3rd ed.). San Francisco,
CA: Berrett-Koehler.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-

Teaching communication skills to medical students in a vir-
tual world. Journal of Interactive Technology & Pedagogy,


Harnessing the power of conversations with virtual humans to change health behaviors

Glenn Albright1,2, Cyrille Adam2,3, Deborah Serri2, Seth Blecker2, Ron Goldman2

1Department of Psychology, Baruch College, City University of New York, New York, NY, USA; 2Kognito, New York, NY, USA; 3Department of Communication, Media, and Learning Technologies Design, Teachers College, Columbia University, New York, NY, USA

Correspondence to: Glenn Albright, PhD. Department of Psychology, Baruch College, City University of New York, One Bernard Baruch Way, New York, NY 10010, USA. Email: Glenn.Albright@baruch.cuny.edu.

Abstract: Skillful, collaborative conversations are powerful tools to improve physical and mental health. Whether you are a parent talking with your child about the dangers of substance abuse, an educator concerned about a student’s signs of psychological distress, a veteran worried about a buddy who is contemplating suicide, or a healthcare professional wanting to better engage patients to increase treatment compliance, having the skill, confidence and motivation to engage in conversations can truly transform the health and well-being of those you interact with. Kognito develops role-play simulations that prepare individuals to effectively lead real-life conversations that measurably improve social, emotional, and physical health. The behavior change model that drives the simulations draws upon components of game mechanics, virtual human simulation technology and integrates evidence-based instructional design components as well as principles of social-cognitive theory and neuroscience such as motivational interviewing, emotional regulation, empathy and mindfulness. In the simulations, users or enter a risk-free practice environment and engage in a conversation with intelligent, fully animated, and emotionally responsive virtual characters that model human behavior. It is in practicing these conversations, and receiving feedback from a virtual coach, that users learn to better lead conversations in real life. Numerous longitudinal studies have shown that users who complete Kognito simulations demonstrate statistically significant and sustained increases in attitudinal variables that predict behavior change including preparedness, likelihood, and self-efficacy to better manage conversations. Pending the target population, each online or mobile simulation resulted in desired behavior changes ranging from increased referrals of students, patients or veterans in psychological distress to mental health support services, or increasing physician patient-centered communication or patient self-confidence and active involved in the decision-making processes. These simulations have demonstrated a capability to address major health and public health concerns where effective conversations are necessary to bring about changes in attitudes and behaviors.

Keywords: Simulations; behavior change; virtual humans; motivational interviewing; role play

Received: 27 July 2016; Accepted: 09 November 2016; Published: 28 November 2016.
doi: 10.21037/mhealth.2016.11.02
View this article at: http://dx.doi.org/10.21037/mhealth.2016.11.02

Introduction

The importance of developing conversation skills cannot be understated in terms of their potential to have a positive impact on the health of the world’s population. An article in The Journal of the American Medical Association summarized the importance of communication this way: "Excellent medical care combines sophistication in scientific knowledge with equally sophisticated communication skills to understand the needs of the individual patient, to address his/her feelings and concerns with sensitivity and compassion, and to educate patients about their choices in care.... The benefit of good communication on patient care and outcomes is unequivocal" (1). But health conversations don’t just happen at the doctor’s office. Former California highway patrol officer, Sgt. Kevin Briggs
in the “Guardian of the Golden Gate Bridge”, convinced more than 200 people not to take their lives by jumping from the bridge. He recounted one survivor stating: “He never made me feel guilty for being in the situation I was in. He made me feel like, ‘I understand why you are here, but there are alternatives’.” (2).

Skillful, collaborative conversations are powerful tools to improve physical and mental health. Whether you are a healthcare professional who wants to better engage patients and increase adherence to treatment, a patient who wants to better communicate your goals, preferences, or challenges to your physician, an educator concerned about a student showing signs of psychological distress, a veteran worried about a buddy who is contemplating suicide, or a parent talking with your child about the dangers of substance use, having the skill and motivation to engage in such conversations can truly transform the health and well-being of those you interact with.

Recent developments in technology and research offer new and unique ways for people to learn how to effectively lead health conversations that measurably improve social, emotional, and physical health. The developments span diverse areas, including virtual humans, simulations, social cognitive communication strategies such as motivational interviewing (MI) and shared-decision making, and the increasing adoption of online and mobile instructional technologies within health and behavioral health.

Kognito (www.kognito.com) is a NYC-based developer of research-proven role-play conversations featuring virtual humans that are utilized to prepare individuals, including health professionals, build the skills and knowledge to drive positive change in social, emotional, and physical health through the power of conversations. What follows here discusses: (I) the Kognito Conversation Platform™ that draws upon components of a behavior change model as well as game mechanics and virtual human simulation technology; (II) the advantages of using virtual humans; (III) the behavior change model which underlies Kognito’s conversation simulations; and (IV) research that demonstrates the efficacy of Kognito’s simulations to improve health behaviors in settings such as primary care, schools, and at home.

The Kognito Conversation Platform™

Kognito’s simulations are designed using the proprietary Kognito Conversation Platform™, a ground-breaking group of development, delivery, API, data collection, and analytic technologies integrated with principles of neuroscience, social cognition, adult learning, applied game mechanics, and storytelling (see Figures 1, 2 for sample screenshots).

How a simulation works

In a simulation, the user or “player” enters a risk-free practice environment, assumes a role (e.g., a healthcare professional, patient, or family member) and engages in a conversation with intelligent, fully animated, and emotionally responsive virtual humans that model human behavior. Virtual humans are coded to possess an individual personality and memory and adapt their behaviors to the decisions of the player throughout the conversation. Players communicate with the virtual human by selecting from a dynamic menu of dialogue options. Each option
represents a specific conversation tactic based on social-cognitive and communication skills that may be more or less effective or ineffective in accomplishing the goal. Once the user chooses a dialogue option, they see their virtual human “perform” the dialogue and then observe the verbal and non-verbal response of the non-player virtual human. A virtual coach provides personalized feedback and give users an opportunity to revise their choice. The relationship between the user's dialogue decision and the response of the emotionally responsive virtual humans are controlled by a set of mathematical behavioral models and algorithms specifically designed to simulate real interactions with patient types, for example, that represent particular personality traits or conditions. These algorithms ensure that users are repeatedly exposed to target conversation and behavior patterns as a way to develop skills and knowledge. To successfully complete the conversation, users must apply effective conversation tactics and adapt their decisions based on the virtual human’s behavior. At the end of each conversation, users are provided with summary feedback from the virtual coach and a performance dashboard with detailed feedback on how well they performed on each of the conversation goals (see Figure 3).

**Advantages of virtual humans**

Learning through role-play with trained instructors has been widely used in health and behavioral health education and practice settings. The cost and logistics, however, of organizing live skill practice and assessment sessions with trained actors (or standardized patients), the challenge of standardizing the experience, and the discomfort participants often experience role-playing in a workshop setting are significant barriers to effective adoption. Recent development and research into the efficacy of virtual humans as an alternative to the traditional, live role-play methodology provides an opportunity to eliminate many of these barriers. This alternative also provides a highly effective learning experience—building and assessing communication and conversation competencies in a digital, standardized, and risk-free medium that is available 24/7.

Virtual humans are defined as automated, three-dimensional agents that converse, understand, reason, and exhibit emotions (see Figure 4). Their use has many educational and economic advantages allowing users to practice how to leverage conversations and drive meaningful change in behaviors and attitudes. Role-playing with virtual humans decreases the likelihood of negative transference reactions or the user feeling embarrassed or judged which often happens in live role-plays especially in the presence of peers (3,4). Both negative emotions in general and social evaluative threat in particular are known to impede cognitive performance, learning, and retention (5-11). Another advantage is that virtual humans are coded to support high fidelity of the learning experience. This includes consistent delivery of accurate knowledge, realistic and engaging role-plays, and appropriate feedback. Adding to the fidelity is that virtual humans do not fatigue, have a
neutral appearance, are not subject to trainer bias, and will continually respond in the most efficacious way to promote skill development. Also, users find it easier to talk to and explore different communication strategies with virtual humans as there is little fear of making mistakes or being judged, especially when practicing in the privacy of one’s home or office (12). Lastly, the appearance and voice/language of the virtual human can be customized to each user and conversation setting to provide a high level of personalization, localization, and cultural appropriateness. These factors make digital simulations appropriate alternatives or supplements to traditional workshops and other non-interactive learning experiences.

Kognito Behavior Change Model

The Kognito Behavior Change Model includes two parts: the instructional design component that draws from the science of education and learning theory, and the conversation component that integrates evidence-based communication strategies drawn from models in social cognition and neuroscience.

Instructional design component—simulations rooted in learning theory

There has been widespread agreement based on extensive research that skills are best learned when knowledge is actively constructed, rather than through the traditional didactic model where knowledge is presented and learners passively accept it (13-17). In Kognito simulations, learners are afforded multiple opportunities to actively make decisions, thereby creating unique pathways of experience on an individual level. As learners devise their own experience through the simulation, they actively construct knowledge based on the decisions they make (13-15).

Research has also demonstrated that skills acquisition and mastery is most likely to occur when active learning strategies are used. Situated learning gives learners agency and allows the brain to make meaningful connections through physical, embodied experiences that are as authentic as possible related to the context where the learning will be applied (18-22). By employing this theory in a virtual space, Kognito provides users with an opportunity to both learn and practice in a safe, simulated environment that mimics the authenticity of the same real-world contexts. This allows for experimentation with various communication tactics without fear of consequences or judgement.

According to Cognitive Load Theory, the processing capabilities of the brain’s working memory are limited, and in order to allow for as much processing power as possible, information must be presented in such a way as to reduce extraneous cognitive load (23). Kognito simulations encompass several instructional design strategies to reduce extraneous cognitive load in order to increase encoding capabilities in working memory, therefore resulting in deeper and more meaningful learning. Furthermore, evidence shows that communication skills change and endure when behavior change models incorporate deliberate practice, include personalized attention with ongoing feedback, and self-performance assessment, and also when they utilize role-plays, and provide a connection between the learned content and the current practice (24). Kognito simulations are designed in this way and include:

- Self-pacing so that learners can reflect on their skills and adjust their strategies at their own pace;
- Continuous analysis and feedback on performance via virtual human verbal and nonverbal reactions to conversation tactics, virtual coaches, and feedback meters (e.g., indicating trust built);
- Graphics that cue learners to specific content;
- Dashboards that summarize performance and make recommendations for future practice; and
- Virtual human inner thoughts or thought bubbles that provide users with context around a perspective and understanding outside of their own.

Conversation component

Kognito simulations integrate several interrelated
communication strategies drawn from social/cognitive models and neuroscience (see Figure 5). These include:

(I) MI is a set of communication strategies originally designed by clinical psychologists for use in counseling sessions with problem drinkers (25). MI is a goal-oriented, person-centered counseling approach designed to help people resolve their ambivalence about behavior change. By strategically evoking the person’s own thoughts and feelings, the counselor facilitates the exploration of internal conflicts and amplifies the person’s existing motivation (26). The simulations discussed in this paper integrated the four core MI communication skills and the four elements of the MI spirit. The four core MI communication skills are:

(i) Ask open-ended questions to invite the person to share their thoughts while focusing the conversation in a particular direction.

(ii) Affirm the person’s strengths, values, or efforts. This builds trust and instills the power to change.

(iii) Listen closely and reflect the person’s statements to selectively emphasize them and confirm understanding.

(iv) Summarize what the person has told you to show that you’re listening, link to related information, or transition to a new topic.

These techniques have been associated with effective therapy and are thought to encourage strong rapport and support behavior change (27). The four elements of the MI spirit are:

(i) Partnership—the counselor respects that the person is the expert on themselves and works with them, not “on” them.

(ii) Acceptance of the person’s perspective, inherent value, and autonomy.

(iii) Compassion for the person’s needs and welfare. The counselor commits to acting in the person’s best interest.

(iv) Evocation of the person’s existing expertise and motivation, rather than installing what the counselor thinks is “missing.”

(II) Mentalizing is the ability to recognize and accept that other people have their own thoughts, beliefs, intentions, and emotions which may be different from one’s own and that this is OK. Mentalizing promotes a non-judgmental or non-critical stance toward the engaged individual and this is crucial for healthy interaction. While all healthy adults understand that other beings have independent
minds, both the inclination to attend to the minds of others and the ability to accurately assess what others think or know varies among individuals. Practicing mindfulness has been shown to increase the frequency and accuracy of mentalizing in clinical populations, leading to better mental health outcomes (28-30).

(III) Empathy is the capacity to feel the emotions of another being (31,32). In most cases, an empathic response is incumbent on mentalizing; a person will be able to feel the emotions of another if they are able to temporarily put aside their own, perhaps different viewpoint (33). In fact, neuroimaging research has shown that mentalizing and empathy rely on overlapping yet distinct brain networks (34). An intact empathic response is important for healthy social and emotional functioning and research has shown that empathic responsiveness can be enhanced through training in a variety of populations and circumstances (35-37).

(IV) Empathic accuracy, also sometimes described as “cognitive empathy”, is the ability to correctly assess or identify the emotions of another (38). This skill may be thought of as the ability to “read people”. Empathic accuracy and empathy are conceptually distinct. Empathy does not necessarily imply the ability to accurately identify a shared emotion, and empathic accuracy does not necessarily require that one feel the emotions of another. However, research has shown a bidirectional relationship between empathy and empathic accuracy, as long as there is sufficient expression (39). Empathic accuracy also varies across individuals, and high empathic accuracy is predictive of healthy interpersonal relationships (40,41). Recent work has shown that it can be improved with training (42).

(V) Situation modification is when one attempts to avoid, leave, or modify circumstances that are likely to elicit unwanted emotions and to enter into situations that are likely to elicit desired emotions (43).

(VI) Reappraisal strategy is when one changes the way they interpret the meaning of a stimulus, for example, seeing eating cake as a hindrance to one’s diet plan rather than a delicious treat (44,45). Reappraisal is an especially important strategy, as it has been shown to have lasting effects on the way in which one responds to an emotional stimulus (46-49). The tendency to reappraise is correlated with improved mental health, social functioning, and well-being.

Research overview

Kognito has partnered with leading academic institutions and non-profits to conduct numerous empirical studies analyzing the impact of Kognito simulations on users’ attitudes, skills, and behaviors. These studies have led three Kognito simulations to be listed in SAMHSA’s National Registry of Evidence-Based Programs and Practices with five currently under review, and they have also inspired journal publications, and dozens of referred conference presentations. Below is a summary of findings based on a sample of studies conducted on Kognito simulations whose users comprise three settings: (I) educators (Tables 1,2); (II) family/caregivers (Table 3); and (III) primary care (Tables 4-6).

Discussion

The summary data of the above six studies show that the Kognito simulations are effective on several levels:

Generalizability

The simulations are effective in driving sustainable changes in skills, self-efficacy, and behavior no matter the target population (e.g., healthcare professionals, patients, educators, students, or military families). This generalizability of impact is due in part to the advantage of providing users with the ability to practice in a risk-free environment, thus reducing the anxiety typically present in face-to-face role-plays, and the neutrality of the virtual humans which makes it easier for the user to open up. This is further supported by a recent study demonstrating a significant impact of four Kognito simulations with Native American and Alaska Native learners (52).

Efficiency

The simulations included in these studies ranged from some with one 10-minute simulated conversation to some with three 10–15-minute simulated conversations. The studies show that a brief 10-minute simulation can result in significant changes which can be further enhanced with additional practice opportunities over time.
### Table 1 Results from At-Risk for High School Educators: a simulation to build mental health awareness, reduce stigma, and increase educators' skill and motivation to recognize when students are exhibiting signs of psychological distress and know how to approach and discuss a referral to support services

<table>
<thead>
<tr>
<th>Simulation goals</th>
<th>Sample size &amp; demographics</th>
<th>Study design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognize when students exhibit signs of psychological distress, including anxiety, depression, and thoughts of suicide</td>
<td>N=31,144</td>
<td>Quasi-experimental design</td>
<td>Statistically significant changes in preparedness, likelihood/behavioral intent, and self-efficacy in ability to identify, talk to, and refer students in psychological distress</td>
</tr>
<tr>
<td>Approach students to discuss their concern</td>
<td>Years of teaching experience (mean, 11.1 years)</td>
<td>Longitudinal group analysis to examine changes in behavior</td>
<td>Behavior changes: 3-month follow-up found statistically significant increases in the number of students who teachers referred to support services</td>
</tr>
<tr>
<td>Make a referral to school support personnel</td>
<td>Age (mean, 42.3 years)</td>
<td>Multivariate analysis, Hotelling's T2</td>
<td>At 3-month follow up point, 57% reported an increase in the number of conversations they had with other adults in their school about students they were concerned about</td>
</tr>
<tr>
<td></td>
<td>Gender: 65.3% female</td>
<td>Independent samples t-tests</td>
<td>Statistically significant increases in the number of educators that felt that part of their role is to help students in psychological distress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paired samples t-tests</td>
<td>Satisfaction data: 95% said they would recommend to colleagues, 80% said it was based on scenarios relevant to their work with students, 79% stated the simulation will aid them in getting timely help to their students, 80% rated the simulation as “excellent” to “very good”</td>
</tr>
</tbody>
</table>

Data used in this table was accepted for review by the National Registry of Evidenced-Based Programs and Practices.

### Table 2 Results from At-Risk for University and College Students: a simulation to build mental health awareness, reduce stigma, increase self-help behaviors, and increase students' skill and motivation to recognize when fellow students are exhibiting signs of psychological distress and know how to approach and discuss a referral to support services

<table>
<thead>
<tr>
<th>Simulation goals</th>
<th>Sample size &amp; demographics</th>
<th>Study design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognize when a fellow student exhibits signs of psychological distress, including anxiety, depression, and thoughts of suicide</td>
<td>N=254</td>
<td>Quasi-experimental design</td>
<td>Statistically significant changes in preparedness, likelihood, and self-efficacy to identify, talk to, and refer a fellow student in psychological distress</td>
</tr>
<tr>
<td>Manage conversations with a fellow student they are concerned about to determine the need for referral</td>
<td>Participants were recruited from 10 academic institutions in the U.S.</td>
<td>Longitudinal within group analysis to examine changes in behavior</td>
<td>Behavior changes: 3-month follow-up found statistically significant increases in the number of fellow students that participants were concerned about, approached to have a discussion with and referred to mental health support services</td>
</tr>
<tr>
<td>If necessary, make a referral to mental health support services</td>
<td>Average age, 19.6 years</td>
<td>ANOVA</td>
<td>Participants reported a statistically significant increase in likelihood that they themselves would seek help when feeling psychologically distressed</td>
</tr>
<tr>
<td></td>
<td>Gender: 52.9% female</td>
<td>Independent samples t-tests</td>
<td>Satisfaction data: 92% said they would recommend the simulation to friends and peers, 95% said it was based on scenarios relevant to them and their fellow students, 85% stated the simulation will aid them in getting timely help to their fellow students, and 78% rated the simulation “excellent” to “very good”</td>
</tr>
<tr>
<td></td>
<td>Year in school: 67% (freshman), 17% (sophomore), 8% (junior), 4% (senior)</td>
<td>Paired samples t-tests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10% resident advisors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data used in this table was accepted for review by the National Registry of Evidenced-Based Programs and Practices.
Table 3 Results from Family of Heroes: a resiliency and PTSD simulation for military families about managing challenging interactions with their veterans while adjusting to post-deployment life. This includes how to identify signs of post-deployment stress and speak with the veteran to motivate them to seek help at the VA (40). Simulation was created in collaboration between Kognito (New York, NY) and the Department of Veterans Affairs of NY/NJ - VISN 3 (50)

<table>
<thead>
<tr>
<th>Simulation goals</th>
<th>Sample size &amp; demographics</th>
<th>Study design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased knowledge of the prevalence of psychological distress among veterans</td>
<td>N=94</td>
<td>Randomized Controlled</td>
<td>Statistically significant changes in preparedness to recognize signs of post-deployment stress, discuss concern with veterans and motivate them to seek help at the VA</td>
</tr>
<tr>
<td>Identify the signs of post deployment stress including PTSD, traumatic brain injury, depression and thoughts of suicide</td>
<td>Average age, 37.5 years</td>
<td>Repeated measures ANOVA</td>
<td>Statistically significant change in self-efficacy to motivate veterans to seek help at the VA</td>
</tr>
<tr>
<td>Talk with their veteran about their concern</td>
<td>Participants were recruited from 27 states</td>
<td></td>
<td>Statistically significant change in likelihood or behavioral intent to approach a veteran and discuss concern and to mention the VA as a helpful resource</td>
</tr>
<tr>
<td>Motivate their veteran to seek help</td>
<td>Relationship to veteran: 37% spouse or partner, 23% son or daughter, 9% mother or father; 22.9% brother or sister; 14% friend</td>
<td></td>
<td>Behavior changes: 1-month follow-up found a 46% increase (statistically significant) in the number of family members who approached their veteran to discuss concerns and identified the need for their veteran to seek help</td>
</tr>
<tr>
<td>Increase the number of veterans experiencing post-deployment stress who seek help</td>
<td>Gender: 72% female</td>
<td>One-month follow-up found that 22% of the veterans approached by their family member decided to seek help for their psychological distress. This is in comparison to 12% at the control group</td>
<td>Satisfaction data: 99% said they would recommend the simulation to family or friends of veterans; 90% said it was based on scenarios relevant to them and their veteran; 98% stated the simulation helped them to be better prepared for similar conversations in real life; 98% rated the simulation &quot;excellent&quot; to &quot;very good&quot;</td>
</tr>
<tr>
<td></td>
<td>Average time veteran home: 11 months</td>
<td></td>
<td>Average experience time was 18 minutes (experience is designed from 7-15 minute modules)</td>
</tr>
<tr>
<td></td>
<td>Veterans previously diagnosed with: 24% (PTSD), 28% (anxiety), 13% (substance use disorder), 3% (traumatic brain injury)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Skill building**

The simulations result in statistically and sustained changes in the level of users' preparedness to effectively manage health conversations. The skills include conversation skills such as those associated with motivational interviewing and shared-decision making covered in the Kognito Behavior Change Model.

**Self-efficacy**

Practicing the simulations yielded an increase in self-efficacy or one's perceived ability to manage conversations in real life. Measures of self-efficacy were based on Bandura's integrative framework of personal efficacy: the level of confidence in ability predicts the level of control of behavior (33). By mastering one's ability, Bandura theorizes...
Table 4 Results from At-Risk in Primary Care: a professional development simulation for primary care professionals on how to conduct screening, brief interventions, and referral to treatment with patients suffering from substance use, depression, anxiety, and PTSD (51)

<table>
<thead>
<tr>
<th>Simulation goals</th>
<th>Sample size &amp; demographics</th>
<th>Study design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognize risk factors, and warning signs of alcohol and substance use, depression, and suicidal thoughts</td>
<td>N=614</td>
<td>Quasi-experimental design</td>
<td>Statistically significant changes in knowledge and skill to: (I) identify risk factors and warning signs of behavioral health disorders, (II) recognize when a patient is exhibiting signs and symptoms, (III) screen patients for behavioral health disorders, (IV) discuss treatment options, (V) engage in collaborative decision-making about treatment plans, and (VI) build intrinsic motivation in patients to adhere to the suggested treatment plan</td>
</tr>
<tr>
<td>Conduct brief interventions using motivational interviewing to build patients' motivation and increase protective behaviors</td>
<td>Participants recruited from six different states in the Midwest, Southwest, and Northeast regions of the U.S.</td>
<td>Longitudinal within group analysis to examine changes in behavior</td>
<td>Behavior change: 3-month self-reported follow-up data revealed that as a result of the simulation there was a: (I) 51% increase in the number of at-risk patients who participants identified; (II) 60% increase in patients screened; (III) 56% increase in patients with which treatment options were discussed; and (IV) 53% increase in patient collaborative decision-making about treatment plans</td>
</tr>
<tr>
<td>Engage in collaborative treatment planning with patients</td>
<td>Work role: 35% nurse, 11% doctor, 17% nursing or medical student, 21% mental health or social worker</td>
<td>ANOVA</td>
<td>Satisfaction data: 94% said they would recommend to colleague; 99% said they would recommend to fellow nursing or medical students; 97% stated the simulation enhanced their skill as a healthcare professional; 86% rated the simulation as “excellent” to “very good”</td>
</tr>
<tr>
<td>Refer patients to treatment services and follow up on referrals</td>
<td>Industry experience, mean –7.4 (9.67)</td>
<td>Independent samples t-tests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gender, 79% female</td>
<td>Paired samples t-tests</td>
<td></td>
</tr>
</tbody>
</table>

that people are more likely to change and improve their behavior in future circumstances (53). Thus, combining user skill acquisition with increased self-efficacy has yielded a host of self-reported, positive behavioral changes pending the simulation and its associated goals.

**Satisfaction with user experience**

Users were highly satisfied with the simulations, reporting that the scenarios with the virtual humans were relevant and similar to situations they face in real life, and more than 90% said they would recommend it to their colleagues.

**Engagement**

Important components of assessing user engagement is the duration of time users spend engaged with the simulation and the frequency of re-playing it. In the two studies that examined these elements, it was shown that users often spent more time in the simulation than required and a significant portion of them decided to play it more than once. When queried why they spent more time, users stated they were curious about different reactions, were having fun, wanted to explore different approaches, and even see the results of instigating a negative response from the virtual humans in the simulation.

**User behavior change**

Another positive effect of the simulations is that users showed statistically significant changes in the frequency they decided to initiate a health conversation which resulted in statistically significant changes in self-reported targeted behavior changes (e.g., number of referrals to mental health services of students by teachers, number of screening and brief interventions conducted by primary care professionals, and communication style of pediatricians when speaking with parents and children about obesity prevention).
<table>
<thead>
<tr>
<th>Simulation goals</th>
<th>Sample size &amp; demographics</th>
<th>Study design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health care professionals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promote effective communication and collaborative decision-making skills in health care professionals</td>
<td>N=35</td>
<td>Within group design</td>
<td>Statistically significant changes at 1-month follow-up in patient-centered communication and focus on patients' psychosocial needs. At the one-month follow-up survey, 77% of physicians reported that the simulation had a positive impact on the way they communicate with patients; 65% indicated that it helped them have a conversation with patients about antibiotics; 84% intend to further invite patients to ask questions and participate; 93% agreed or strongly agreed that as result of the simulation, physicians would be better prepared, confident, and able to effectively engage in a conversation about antibiotics with patients</td>
</tr>
<tr>
<td>To improve patients' understanding and beliefs about the correct usage of antibiotics</td>
<td>Average age, 40.3 years</td>
<td>Repeated measures ANOVA</td>
<td>Satisfaction data: 89% said they would recommend to other physicians; 100% would recommend to medical students or residents; 94% more confident in having an effective conversation about antibiotics with patients; 88% more confident in sharing information in a way patients will understand</td>
</tr>
<tr>
<td></td>
<td>Primary care professionals drawn from NYU Langone Medical Center’s: (i) Bellevue Hospital, Gouverneur Health, (ii) Veteran Affairs NY Harbor Healthcare System’s New York Campus, and (iii) NYU’s Faculty Group Practice</td>
<td>Independent samples t-tests</td>
<td>Physicians also reported that the simulation was a much better learning tool than the standardized patient model as they felt more comfortable and free to make decisions within the virtual space</td>
</tr>
<tr>
<td>Gender: 54% male (74% attending, 26% residents)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Patients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promote effective communication and collaborative decision-making skills in patients</td>
<td>N=34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>To improve patients' understanding and beliefs about the correct usage of antibiotics</td>
<td>Average age, 57.6 years; patients were drawn from New York City's Health + Hospital Bellvue Ambulatory Care Practice; gender (47% male); literacy level (7-8th grade, 32.4%; high school, 67.6%)</td>
<td>-</td>
<td>Statistically significant increase from pre- to post- that remained significant at 1-month follow up point in the accuracy of patients' beliefs about antibiotics, including: (i) that taking antibiotics when they have a cold will not help them get better more quickly; (ii) that their doctor should not prescribe an antibiotic when they experience common cold symptoms; (iii) that they should not stop taking their antibiotics when starting to feel better. Satisfaction data: 87% would recommend simulation to friends and family; 97% rated it as a very useful tool saying that it would help them to be better prepared for a doctor’s appointment, increase their assertiveness when communicating with their physician, and to help them create a treatment plan and learn specific content about antibiotics</td>
</tr>
</tbody>
</table>

Data used in this table was the result of funding by the Robert Wood Johnson Foundation: study PI was Antoinette Schoenthaler, EdD, Population Health and Medicine, NYU School of Medicine, Center for Healthful Behavior Change.
Table 6 Results from Change Talk: A simulation designed for pediatricians and other health professionals to develop motivational interviewing to bring about change in the behaviors of parents and children related to reducing the risk of childhood obesity.

<table>
<thead>
<tr>
<th>Simulation goals</th>
<th>Sample size &amp; demographics</th>
<th>Study design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote the effective use of motivational interviewing to bring about change in patients who are experiencing childhood obesity and gaining buy-in of primary caretakers in support of treatment recommendations</td>
<td>N=26,200</td>
<td>Within group longitudinal study (post simulation survey, 1-month follow up survey)</td>
<td>97% of physicians were “satisfied” with the simulation; 78% said they were “very satisfied” or “extremely satisfied”</td>
</tr>
<tr>
<td>N=307 completed pre-, post- and follow-up surveys for continuing medical education credits</td>
<td>Descriptive and qualitative</td>
<td>In the post-simulation survey, 93% said that as result of participating in the simulation, they intend to make a change in practice to provide better patient care</td>
<td></td>
</tr>
<tr>
<td>In the 1-month follow up survey, 88% said that they did make a change as a result of the simulation. Changes included: (I) asking patients if it is ok to talk about healthy eating, (II) doing more motivational interviewing, (III) placing “more emphasis on meeting patients at their current stage of change instead of moving to action plan, (IV) eliciting “increased buy-in and completion of recommendations made to youth and primary caretaker(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average experience time was 16 minutes (experience is designed to be 10–12 minutes) and about 20% of users visited the app more than once</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data used in this table was from the American Academy of Pediatrics (AAP) Continuing Medical Education serving. The simulation was developed in collaboration with AAP, Institute for Healthy Childhood Weight.

**Users changing the behaviors of others**

The Family of Heroes simulation seeks to better equip military families with the skills and motivation to speak with their veterans about seeking help for post-deployment stress. The results of families practicing this simulation nearly doubled the number of veterans who sought help. With over 62,000 individuals in NY/NJ accessing the simulation, we can project an outcome of thousands of additional veterans deciding to seek help as a result of a family member engaging in a Kognito conversation.

**Conclusions**

In a broader sense, Kognito simulations have demonstrated a capability to address major health and public health concerns where effective conversations are necessary to bring about changes in social, emotional, and physical health. Whether online or mobile, there is a research-proven approach to create realistic and risk-free learning environments that are contextually rich and enable users to harness the power of conversations and positively impact their health and the health of others. Innovative use of these types of simulations increases participant engagement so learners not only enjoy the experience but also find themselves transformed from passive receivers to active constructors of the learning experience.

Additional research is needed to: (I) conduct randomized controlled trials that examine the impact on long term health outcomes of those approached by individuals who completed a Kognito conversation; (II) determine the value of repeated practice opportunities over longer time periods in sustaining motivation and capability to impact health behaviors through conversations; and (III) compare the efficacy of simulated role-plays with face-to-face and
other methods to bring about changes in health behaviors.

In conclusion, the authors are truly excited about the possibilities of reaching large numbers of geographically dispersed and often vulnerable populations to bring about positive changes in people's lives.

Acknowledgements

None.

Footnote

Conflicts of Interest: G Albright and R Goldman are members of Kognito; C Adam, D Serri and S Bleeker are employees of Kognito.

References

4. Stevenson K, Sander P. Medical students are from Mars - business and psychology students are from Venus--- University teachers are from Pluto? Med Teach 2002;24:27-31.
25. Miller WR. Motivational interviewing with problem