

# BIG dreams... setting our sights HIGH!

page 1



## Research News

The instructor began, “Is this post-test on the Dashboard the same one you use for Prime For Life Evaluations?”. The short answer was, “No.” ...

page 6

## Alcohol Research

Several research articles published in the past few years, including two published last month, provide additional support for and more details about the importance of biological responses to alcohol as a risk factor for serious alcohol problems...

page 3

## Drug Research

With greater availability, Colorado has seen increased medical and recreational cannabis use since 2009 and increased hospital emergency department (ED) visits over the same time period...

page 10

## Solutions News

You may now earn CE hours while preparing or when deepening your understanding in the session topics—gaining credit for the work you already do...

page 5

# Growing into a State of Possibility

**Okay, let's begin with a basic truth. Change is hard. If it weren't, there would be no need for what it is we do. People would simply identify an area of their life that needed fixing or changing, and they would do it. No muss, no fuss. Done. But, it doesn't work that way, and hence we have jobs.**



**W**hy is change so hard? That is an interesting and nettlesome question. Of course, it depends on the behavior and circumstances, but our experiences with high-risk alcohol and drug choices provide some insights. Our brain changes when we develop a well-engrained behavior (or characteristic response). Indeed, those neurons that fire together also “wire” together so that our brains aid us in performing the well-engrained behavior. The brain doesn’t evaluate, at this neurobiological level, whether the behavior is constructive or destructive. It just helps us be efficient in our actions.

Our characteristic ways of seeing and doing things also served a function for us when the behavior began. Since they served this purpose, and since they worked, we did it again and again. This way of seeing or doing things might have only been intermittently reinforced and may have sometimes been punished in the face of performing the behavior. Interestingly, this pattern of intermittent rein-

forcement in the face of punishment made it even more resistant to change. Behaviorists call this “resistance to extinction.”

This process of learning also means the behavior became associated with things. Those things became cues for the behavior, which not only caused our brain to begin firing us down the path to the response, but also caused the cues themselves to become rewarding. We start to experience some of the same pleasurable responses just by experiencing the cues. That is, the cues become reinforcers.

Then the social context can begin to shift. More and more cues can become associated with the behavior and we may gravitate to situations where the behavior has an opportunity to be expressed. Other social and psychological influences can come into play.

Of course, this all makes sense in the context

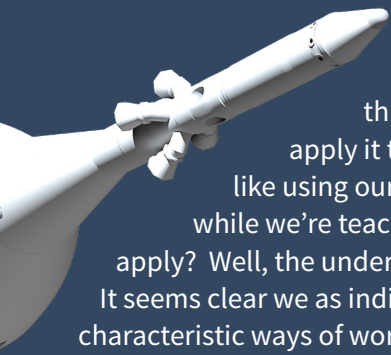


David Rosengren, President PRI



**In our case, we have targeted a metaphorical moon – the people we serve. The specific goal is just as audacious as the original moon shot -- we intend to serve a million new people over the next five years, beyond the people we currently serve. These are big dreams.**





of high-risk alcohol and drug use behaviors. But what if we take this behavior out of that context and apply it to something entirely different, like using our instructor manual as a reference while we're teaching Prime For Life? Does it still apply? Well, the underlying principles look comparable. It seems clear we as individual workers can engage in characteristic ways of working that become habitual.

What about our organizations? Organizations can start doing things in a particular way and continue to do things in a particular manner well after the original reason or people who started that method have departed. This is not to say that these behaviors or habits are bad. Indeed, we can develop habits of excellence. The question is how do we change when we need to? This is the question I've been posing to myself and our staff for the last few years.

Well, it seems the next step is to figure out if this is a technical change or an adaptive change. A technical change is the type that allows organizations to make shifts in the way they do things - the addition of products or opening of new markets - but the fundamental nature of the organization does not shift. This is Boeing building new airplane lines, shifting plants to states with lower labor costs, and using new materials and technologies in building their planes.

Conversely, adaptive changes are ones that fundamentally change the nature of the organization. These changes require organizations to make not just small shifts in how they function, but instead make transformative changes. This is Apple, a computer maker, creating the iPhone and then selling apps and individual songs. It disrupted the organization, as well as the industry. Now, that sort of change is REALLY hard.

Not surprisingly, most organizations apply technical solutions when challenges first emerge. It makes sense. We just need to make a few small tweaks, or maybe bring in a consultant or lobbyist. Then our business model will go back to how things were, before the challenge emerged. Sometimes that works beautifully. But sometimes, something more fundamental and transformative is needed. That is where we are at PRI and we're embracing it.

You might wonder how we've embraced this type of transformative change. It began by recognizing we had been caught in a spiral of needs and challenges, which kept us focused on the nearby and the immediate. We needed to change our focal length, just as we've talked about in our

*Zoom In, Zoom Out* continuing education session this year. So, back in January of this year I proposed to our staff and Board that we look beyond these things and set our horizons much higher. We set a PRI "moon shot."

It's no accident that I chose this language in the time of the 50-year anniversary for the original moon shot. In talking about this seemingly impossible goal in 1962, President Kennedy asserted, "We choose to go to the moon, and do the other things, not because they are easy, but because they are hard; because that goal will serve to organize and measure the best of our energies and skills; because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one we intend to win."

In our case, we have targeted a metaphorical moon – the people we serve. The specific goal is just as audacious as the original moon shot -- we intend to serve a million new people over the next five years, beyond the people we currently serve. These are big dreams.

We've spent 2019 working, as an organization, to shake off all those reasons for inertia described earlier and build the systems that are necessary for us to get there. We've been reviewing, rethinking, and redesigning how we do things to provide the infrastructure to get to our goal, just as NASA had to design rockets and systems to go to the moon, land successfully, leave the moon, and return to earth successfully. Of course, we want you to be a part of this process, after all it took more than 400,000 people and 20 organizations and universities to get to the moon.

We started with "change is hard" and noted many of the reasons why that is so. Adaptive change can be especially hard, though it can also be re-invigorating. It creates uncertainty and possibility. While we embrace this adaptive change, we will not waiver in our core values, which include commitment to excellence in our programs and in our relationships with our partners. Expect to hear more over the next year as we set our sights high. 🌱



# More on the Importance of Biological Response to Alcohol



Mark Nason, Research Analyst PRI



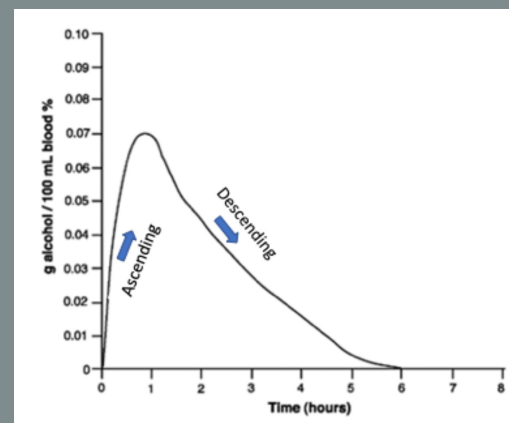
**...while genetic factors are important because they set our level of risk and some even influence our choices, social factors (such as heavy drinking peers) and psychological factors (like impulsiveness and beliefs about alcohol's effects) are also important influences on our choices.**



Several research articles published in the past few years, including two published last month, provide additional support for and more details about the importance of biological responses to alcohol as a risk factor for serious alcohol problems. This article will focus primarily on two of the biological responses mentioned in Prime For Life®: high tolerance and greater reward (often accompanied with greater stimulant-like effects).

First, some background information. For several years research seemed to conflict as to how responses to alcohol differ between people who have a parent with alcoholism and people who do not. Some studies found people with a biological parent with alcoholism to have more intense responses and other studies found them to have less intense responses. Morean and Corbin (2010) sought to discover why these apparent discrepancies existed. They concluded that the seemingly conflicting findings were largely due to differences in the type of responses being measured, the blood alcohol level (BAL) at time of the measurement, and at what point the BAL was being measured — ascending or descending limb of the BAL curve. The diagram below shows a sample BAL curve. The stronger stimulant-like effects were found on the ascending limb

of the BAL curve and the lesser sedative and impairing effects of alcohol were found on the descending limb of the BAL curve. This suggests that children of biological parents with alcoholism might get more rewarding responses



from drinking as their BAL rises and have lesser negative effects as their BAL begins to drop. Both responses could reinforce drinking.

The idea that some people have “stimulant-like” effects when drinking can be confusing since alcohol is classified as a central nervous system depressant. Nevertheless, on self-report scales, like the Biphasic Alcohol Effect Scale (BAES), some people report experiencing stimulant-like effects when their BAL is rising. These include feeling elated, energized, excited, stimulated, talkative, up, and vigorous (DOC. 170). In other words, many people talk louder and become





more active and outgoing when they start drinking. If they drink more, the depressant effect of alcohol will begin to affect other brain systems, causing the typical sedating effects such as impairment and drowsiness. People vary in the degree to which they experience these stimulant-like effects (DOC. 171).

We refer to the lower level of response to the impairing (depressant) effects of alcohol some people experience on the descending limb of the BAL curve as “high tolerance.” The identification of high tolerance as a biological risk factor for serious alcohol problems in humans comes largely from the study referred to as the “25-Year Study.” This study is ongoing and has now spanned 35 years for the original study participants, and over the years has added their spouses and children. In comparing the data collected when each generation was about age 30, Schuckit et al. (2019) found that the second generation’s rate of alcohol-related problems and alcohol use disorders was nearly twice that of the first generation. In both generations, having heavy drinking friends was one of the significant factors affecting rates of problems. Unlike the first generation, the rate of problems among the second generation did not seem to be related to measures of drinking to cope with stress (which included drinking to

combat boredom). Factors identified which help to explain this increase in problems among the second generation include an even greater influence of high tolerance on drinking, higher levels of impulsivity (particularly in males), and a higher level of positive beliefs about how alcohol will affect them (positive alcohol expectancies) Consequently, now there is data from two generations indicating high tolerance as a risk factor for experiencing serious alcohol-related problems.

Research has also identified gene variants which seem to be related to the rewarding, stimulant-like effects or to high tolerance. In a review of the gene literature, Schuckit (2018) examined studies on gene variants related to each of the brain systems affected by alcohol as well as other gene variants of potential interest. To varying degrees, there is evidence for certain gene variants which differentially affect the activity level in the brain, the stress response system, pain experience, reward responses, mood regulation, memory and learning, muscle activation, and alcohol tolerance and withdrawal being more prevalent in heavier drinkers than in light drinkers. It is the net effect of all these different actions which produce a person’s responses to alcohol. In humans, the evidence for the potential importance of

gene variants is just one of association. Nevertheless, some of these variants are also found in animals, and studies in which these variants have been altered (knockout studies), have resulted in significant effects on alcohol responses. All in all, it appears many genes have small effects on alcohol response. An exception is gene variants related to alcohol metabolism. Some of these variants can deter drinking, and thus greatly reduce risk for alcohol problems. They deter drinking by causing a metabolite of alcohol, acetaldehyde, to accumulate in larger amounts than normal. This results in headaches, skin “flushing,” and nausea after consuming even small amounts of alcohol (DOC 19).


In conclusion, research continues to support the importance of greater reward, which commonly includes a stronger stimulant-like effect from drinking, and of high tolerance as being risk factors for the development of serious alcohol-related problems. The genetic factors affecting these responses continue to be studied. Since there are many gene variants which seem to be related to increased risk for alcohol problems, it is highly unlikely that people could be genetically tested to determine their level of risk any time soon. Also, while genetic factors are important because they set our level of risk and some even

influence our choices, social factors (such as heavy drinking peers) and psychological factors (like impulsiveness and beliefs about alcohol's effects) are also important influences on our choices. The research referenced above reinforces the importance of these factors as well.

References [The following references are in addition to those listed as “DOC” numbers, which are part of the Prime For Life program documentation (located at [https://www.primefor-life.org/Dashboard?OpenLink=/Research/PRIME\\_For\\_Life\\_Program\\_Documentation](https://www.primefor-life.org/Dashboard?OpenLink=/Research/PRIME_For_Life_Program_Documentation)).]

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# CE hours: earn while you learn!

**We all need those CE hours, and now your Prime Solutions Online Computer Application includes the e-Manual and has been updated and equipped to help you gain hours!**



Michelle Stephen Seigel  
Director of Training, PRI

**A win-win! Providers can now learn evidence-based methods for influencing substance use behaviors and earn CE hours at the same time. Well done, PRI, well done....**

Theresa B. Moyers Ph.D.

**T**hat's right! You may now earn CE hours while preparing or when deepening your understanding in the session topics—gaining credit for the work you already do.

To access this new feature, email [ejna.mitchell@primeforlife.org](mailto:ejna.mitchell@primeforlife.org) or [michelle.stephen@primeforlife.org](mailto:michelle.stephen@primeforlife.org). They will provide access to the Prime Solutions Online Application's online learning portal. It's now located on the Dashboard's home page on the lower left in the orange Prime Solutions

shaded area. This feature is only available in the streaming version.

Melanie Snyder was integral in testing this new feature. She summarized her takeaway from the testing process like this. “The Prime Solutions Online Manual is a one-stop shop for all things implementation, training, and skill building. Being able to see Prime Solutions in action and get tips and tools from PRI staff and other leading experts in the field at your fingertips helps deepen

understanding of not only the what, but the why, and how to put all the pieces together. Earning hours in the process is an added bonus!”

If you have not logged in recently you might also want to check out the newly added “Show Me” and “Coach Me” segments we captured working with an intensive outpatient group of clients.

The “Show Me” sessions feature our training team leading session topics with

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# Prime Research

**What's the difference:  
The question, or the  
questions we're trying  
to answer?**



The instructor began, “Is this post-test on the Dashboard the same one you use for Prime For Life Evaluations?”. The short answer was, “No.” While the follow-up query seemed innocuous enough on the surface, below it was a great deal of complexity: “How’s it different?”. That good question spawned a whole series of additional questions for us and eventually led to this long answer.

Let’s begin at the beginning: At Prevention Research Institute (PRI) we value research. No surprises there. Not only are our programs (Prime for Life and Prime Solutions) built on empirical evidence, but we seek to continually evaluate the effectiveness of our programs. Evaluation can happen at many levels—from assessing whether participants are learning what we want them to learn to whether this increased knowledge translates to intended or actual behavioral change. Let’s take a look at these

levels because they address our instructor’s question.

Returning to the instructor’s question – “Is this post-test on the Dashboard the same one you use for Prime For Life Evaluations?” – our answer is no, we don’t typically use this post-test for our evaluations. Instead, instructors use this questionnaire for knowledge evaluation; that is, did participants in the Prime For Life (PFL) class learn the concepts being taught? These pre- and post-tests assess the degree to which knowledge changes as a result of going through the program. Typically, these assessments are very short, and the questions have high “face” validity. Face validity, sometimes also referred to as ecological validity, refers to the extent to which the questions appear to assess what they are supposed to - in this case, knowledge about alcohol-related high-risk behaviors. We say “appear to measure,” because, while



Rita Dykstra  
Research Director, PRI

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**There is a higher  
bar for research.  
It is more  
rigorous. There is  
a preference for  
questionnaires  
that are  
well-researched.**

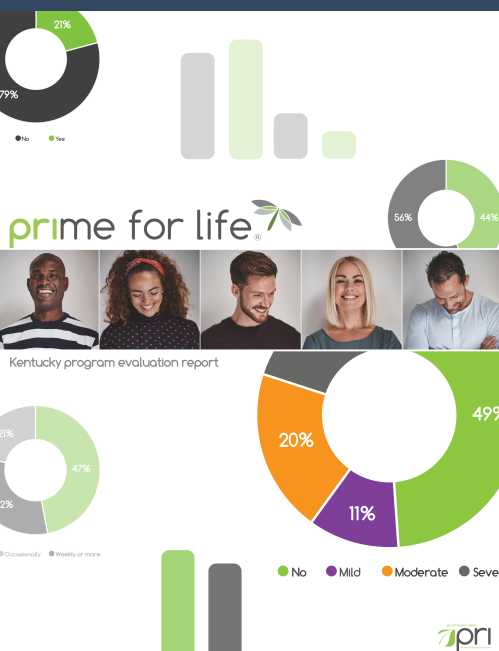
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there is great thought and care given to item construction (i.e., test questions), these types of questionnaires do not undergo the sort of rigorous testing that accompanies other forms of validity.

In terms of usage, this type of assessment can be scored on the spot with participants and provide instant feedback to the instructor. For example, if a specific question is consistently answered incorrectly or if participants show little to no change in knowledge from pre- to post-program delivery, it suggests that adjustments may need to be made to what information we present and how we present it.

Now, PRI also uses these types of evaluations. When you became a Prime For Life instructor you completed a knowledge test assessing the degree to which you learned the information your trainer presented. Just as for your Prime For Life participants, this evaluation provided information not only about your learning, but also to the trainer about what needed to be changed or emphasized in that training. Implementation Science suggests that knowledge tests are an important part of the training sequence to assess adequacy of training. PRI also asks these types of questions as part of its evaluations.

The second type of evaluation, program evaluation, is historically where PRI's focus as an organization has been.



This type of evaluation seeks to determine if there is change beyond knowledge acquisition (e.g., intentions, behavioral changes) that occurs as a result of going through PFL. This type of evaluation is typically longer and asks more in-depth questions. The questions are not only high in face validity, but also content validity. Content validity is the degree to which questions measure a specific construct, or concept, of interest; and the

testing of this form of validity is much more rigorous. For example, on a knowledge test, everyone answering a question correctly can mean the content is being well-taught. On a program evaluation, an item where everyone scores the same is a problem, because it doesn't differentiate between people, so that question would be eliminated.

Within PFL, program evaluation often involves asking participants to report on their perception of risk associated with continued use of alcohol and drugs for both themselves and for others, their actual use of alcohol/drugs before and after attending PFL, their intended use of alcohol/drugs going forward, and intention to seek support or treatment, among other things. These assessments tend to be longer, but also answer more substantive questions. For example, beyond knowledge gain, our program evaluations show that after going through PFL participants report shifts in elements linked to the model that underlies Prime For Life (e.g., personal risk perception), and changes in motivation, intention and behavior - they intend to drink less, and they do. This is the type of evaluation PRI does traditionally for State reports. Both types of assessments are essential and provide PRI, as well as our partners, valuable information (e.g., Beadnell, Nason, Stafford, & Rosengren, 2014; Beadnell, Stafford, Schumacher, Dykstra, Allen, 2019; Crisafulli, Beadnell, & Stafford, 2015). However, we also want to engage in research that allows us to generalize beyond one group or study population. Let me give you an example.

It is common practice after someone receives a DUI to do an assessment; then, based upon that assessment, the person is referred to an appropriate level of care. This is how ASAM works. But this approach is built on the idea that we obtain accurate information in this assessment. What if we got better information AFTER they did an intervention like Prime For Life? Interestingly, our initial research indicates participants are more forthcoming about their pre-intervention use after going through PFL. In other words, after going through PFL and thinking back to their alcohol use in the time before PFL, they report engaging in more high-risk behaviors than at the pre-PFL assessment. We cannot say they're more honest, as we do not have an absolute standard to compare their reports to for accuracy. But, they do tell us about more use and more consequences when we wait (Nason & Rosengren, 2010), which suggests that we might be better served by referring everyone to Prime For Life and then doing an assessment afterwards. This, combined with other research about the benefits in treatment readiness that accrue as people complete Prime For Life, suggests that even heavy users might do better by going to Prime For Life before referral to treatment. But to establish that this is the case, we would need to randomly assign half a group to receive assessment and treatment as usual, and another half to receive Prime For Life, then assessment and referral to treatment, if needed. We would need to track outcomes and see how each group does both in treatment and after treatment. This type of evaluation moves us deeper into the complex world of research.



There is a higher bar for research. It is more rigorous. There is a preference for questionnaires that are well-researched. These studies are more difficult to conduct and require considerably more resources, including more complicated analytic techniques to evaluate results. A research study of this kind requires submitting an application to an Institutional Review Board which ensures that we are not taking advantage of or causing harm to study participants. Often, it requires access to a comparison sample, so that we can draw conclusions that cannot be attributed to some other cause and goes beyond simple associations. Comparison groups reduce bias and allow for generalization of study results, but historically are challenging to provide in community settings such as ours. This is why these studies are often done with research grants in university settings. However, over the past 10 years PRI has produced more of these types of evaluations (e.g., Beadnell, Crisafulli, Stafford, & Casey, 2016; Beadnell, Crisafulli, Stafford, Rosengren, & DiClemente, 2015; Beadnell, Nason, Stafford, Rosengren, & Daugherty, 2012; Schumacher, Stafford, Beadnell, & Crisafulli, 2018). By partnering with other organizations and tapping into their resources, we hope to do more of it.

As you can see, with each level of research there is added burden on both the participants (i.e., time) and the organization (i.e., resources) and becomes

more complex and expensive to carry out. Each level also answers different questions. At the first level, we simply want to know, did the participants learn the concepts we wanted them to learn. In the second level, we are asking not only did knowledge change, but do participants change in the expected ways as a result of going through the program? The third level takes it even further to generalize beyond the study population and answer more complicated questions. This long response to our instructor was complex. Let's make it simple again: What's the difference? The question or questions we're trying to answer.

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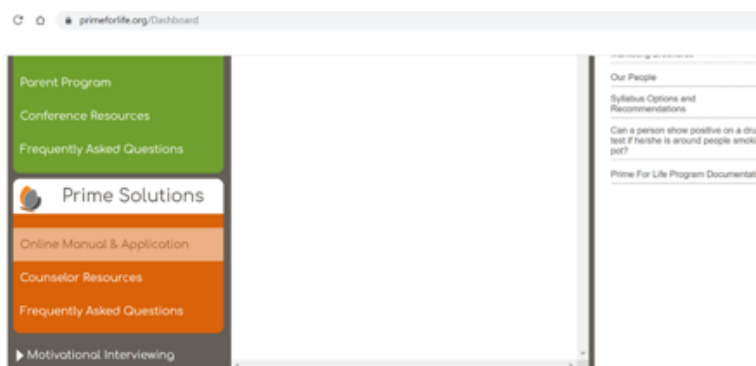
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actual group members. If you are a person who learns best by watching and experiencing these segments (like me) they might be useful for your preparation.




Implementation science tells us good coaches are one of the most effective ways of enhancing our skills in any endeavor—sports, music, recovery, or career. The “Coach Me” segments provide one level of coaching within the Prime Solutions Online Computer Application. We offer more personal Prime Solutions Coaching too! Take the next step to enhance your Prime Solutions clinical skills and register for Prime Solutions Coaching with one of our MINT member coaches. <https://www.primeforlife.org/event/solutionscoaching>

Once registered, you will submit an audio tape of you leading a Prime Solutions session topic. Your coach will rate your sample using PRI’s Moving Forward Rating Scale and provide individualized feedback in areas you wish to grow. Once complete, you can add this experience to your list of professional development activities, demonstrating your commitment to becoming an exceptional practitioner.

We hope you enjoy these new features and welcome your feedback about how Prime Solutions is working for you—and

your clients. Special thanks to Ray Daugherty and our media team at PRI—the dynamic duo David Guinnip and Mike O’Byr-an who programmed these new features and coordinated testing with a talented team who piloted these new features and provided feedback. Here’s what Ray had to say about the new developments. “This is such an exciting addition to Prime Solutions, and I think counselors are really going to love it! I cannot think of any other resource for counselors that comes close to providing the rich content and training resources the App now contains. To have one source for state-of-the-art treatment topics, all audio video resources, e-manual, background information and now training to prepare for each session—with NAADAC hours—all in one resource is unprecedented. And, stay tuned, there is more coming. I am so proud of the work the team has done on this!”



Need help logging on or locating resources? Contact Michelle Stephen Seigel—[michelle.stephen@primeforlife.org](mailto:michelle.stephen@primeforlife.org) for a personal tutorial by WebEx! 

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**I am very excited to see PRI has included coaching in their training offerings. Coaching is different from supervision and focuses on continuous skill development. All of us from neophyte to experienced providers could use coaching to grow our skills. Taping a session, listening to yourself, and then getting feedback and guidance from a coach is the most effective way to develop and sharpen skills needed for successful use of PFL and Solutions programs. Hopefully a lot of providers will take advantage of these new features in the Coach Me segments—or via individualized sessions with a Coach!**

**Carlo DiClemente, Ph.D. ABPP**



# Emergency Department Visits Attributable to Cannabis - A Report from Colorado



Alan Barger, Research Analyst PRI



**While many people believe marijuana is harmless, a growing number of emergency department visits in Colorado suggests specific health problems occur from both inhaled and edible cannabis products.**



## Introduction and Purpose:

With greater availability, Colorado has seen increased medical and recreational cannabis use since 2009 and increased hospital emergency department (ED) visits over the same time period. This study reviewed University of Colorado Hospital ED medical records of adults over a 5-year period from Jan. 1, 2012 to Dec. 31, 2016. ED visits noting cannabis condition codes from the International Classification of Diseases versions 9 and 10 (ICD-9, ICD-10) were classified as cannabis-related or cannabis attributable. That is, not all ED visits associated with cannabis are caused by the cannabis use. A subset of those visits met criteria to be identified as “cannabis attributable emergency department” (CAED) visits based on notes in the medical record by the healthcare provider who cared for the patient and reasonable evidence the condition being addressed was due to cannabis use, e.g. acute intoxication, psychosis, or cannabis hyperemesis syndrome. CAED visits were further classified as resulting from either inhaled or edible cannabis. THC is the primary substance in most flower, oil, and edible products sold in dispensaries. This article explores rates of cannabis attributable health problems leading to emergency department visits and explores rates of health problems resulting from inhaled or edible routes of administration.

## Results:

While cannabis-related visits made up a small percentage of all ED visits (2.2%), there were nearly ten thousand (N = 9,973) ED visits containing an ICD-9 or ICD-10 cannabis-related code over this 5-year period. Of those, 25.7% or 2,567 visits met criteria to be at least partly cannabis attributable. The frequency of ED visits related to both inhaled and edible forms of THC increased annually over the study’s time frame. The most common reason for a cannabis attributable ED visit was 788 cases of gastrointestinal symptoms (nausea and abdominal cramps) of which 440 visits were for cannabinoid hyperemesis syndrome (uncontrolled vomiting). The second most common reason for a CAED

CAED Condition	Numbers
Gastrointestinal Symptoms	788 (30.7% all CAED)
Cannabinoid Hyperemesis Syndrome	440 (17.1% all CAED)
Intoxication	762 (29.7% all CAED)
Psychiatric Symptoms (any)	633 (24.7% all CAED)
Acute psychiatric symptoms	297 (46.9% of psychiatric symptoms)
Worsening of underlying chronic disease	94 (14.1% of psychiatric symptoms)
Chronic psychiatric condition	100 (18.8% of psychiatric symptoms)
Cardiovascular Symptoms*	92 (3.6% all CAED)

\* Severe cardiovascular problems, including myocardial infarction (heart attack) and ventricular dysrhythmia, occurred in those using both inhaled and edible cannabis (N = not stated).

visit was acute intoxication (N=762 cases). Psychiatric symptoms were the third most common reason for a CAED visit (N=633). When grouped by age, there was no difference in CAED visits by edible (N=238) versus inhaled (N=2329) routes of administration. However, investigators did find those using edibles were more likely to be female, more likely to reside outside

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of Colorado, and less likely to be admitted to the hospital. Conversely, inhaled cannabis was associated with longer stays in the ED or hospital with a median of 3 hours (range 0 to 121 hours) versus edibles associated with median stays of 2 hours (range 1 to 54 hours). This chart shows the health problems in those CAED visits and breaks out the numbers

CAED Condition	Numbers* N=2,567 (%)	Edible N=238 (%)	Inhaled N=2329 (%)
Gastrointestinal Symptoms	788 (30.7%)	36 (15.1)	752 (32.3)
Cannabinoid Hyperemesis Syndrome	440 (17.1%)	20 (8.4)	420 (18.0)
Intoxication	762 (29.7%)	115 (48.3)	647 (27.8)
Psychiatric Symptoms (any)	633 (24.7%)	62 (26.1)	571 (24.5)
Acute psychiatric symptoms	297 (46.9%)	43 (18.0)	254 (10.9)
Worsening of underlying chronic disease	94 (14.1%)	1 (0.4)	93 (4.0)
Chronic psychiatric condition	100 (18.8%)	1 (0.4)	99 (4.3)
Cardiovascular Symptoms	92 (3.6%)	19 (8.0)	73 (3.1)

\*Because some patients had more than one diagnosis in a CAED visit (e.g. intoxication + cardiovascular symptoms), the total number of diagnostic cases (3,206) exceeds the total number of visits (2,567).

by route of administration – inhaled or consumed orally. It also shows that all diagnoses were present regardless of route of THC administration.

Inhaled cannabis was the most common form of THC ingestion and therefore accounted for the largest overall numbers (2,329) and largest percentage (90.7%) of diagnoses. However, frequency rates of diagnoses varied depending on the route of ingesting THC. Inhaling THC was more often linked to gastrointestinal symptoms and cannabinoid hyperemesis syndrome. Conversely, psychiatric and cardiovascular problems occurred in a higher percentage of those using edibles. This was particularly true of the CAED visits for acute psychiatric symptoms. While only 10.9% of those using inhaled cannabis had acute psychiatric symptoms, this occurred in 18% of those using edible cannabis. Likewise, 3.1% of those using inhaled cannabis had cardiovascular symptoms, but it happened to 8% of those using edibles. Intoxication requiring emergency department involvement was almost twice as high for edible cannabis compared to inhaled.

Limitations as Noted by the Authors:

1. This is a retrospective study of medical records, not direct interviews of current patients.
2. These data are collected from a single academic hospital in an urban area and may not reflect all urban or smaller hospital experiences.
3. Exposure to cannabis is self-reported except where blood or urine tests were performed in a minority of cases.

4. There was limited data on actual doses or potencies in the medical records.

Authors’ Conclusions:

This study involved 9,973 cannabis-related and 2,567 cannabis-attributable visits with individual determination of the role cannabis played in each visit. It showed that, while edible cannabis product use was less frequent than inhaled cannabis use, edible products nevertheless were linked to more acute psychiatric and cardiovascular symptoms than inhaled exposure. However, the high frequency of visits and the greater likelihood of hospital admission associated with inhaled products, which appear to be driven by a high number of a cannabinoid hyperemesis syndrome, suggest that user education about the adverse effects of inhalable cannabis may have greater effect on public health.

Implications for Instructors and Counselors:

There is a long and well-established link between reduced perception of personal risk in using a substance and increased odds that an individual will actually use that substance. Many people believe marijuana—THC in particular—is a harmless substance, and this is quite possibly the reason why it is the most commonly used illicit drug. However, this belief is contradicted by data from the University of Colorado Hospital Emergency Department. From 2012, the year recreational cannabis use was legalized in Colorado, through 2016, the number of cannabis-related emergency department visits increased annually with a significant subset of those being cannabis attributable emergency department (CAED) cases. In this latter category, there is good evidence the condition bringing the patient into the ED was caused at least in part by cannabis consumption. While cannabis-related cases made up a relatively small percent of all emergency department visits—people came into the ED for many reasons—it still totaled in the thousands. If we average the total number of cases across the 1,826 days of that time period it means that daily there were 5.4 cannabis-related cases, and 1.4 cases each day were cannabis attributable. Note that no cases of children or adolescents under the age of 18 were included in this study and therefore the number of actual cannabis-related and cannabis-attributable cases is likely undercounted. These data provide additional research support for cannabis-related health problems in both the Prime For Life® and Prime For Life® 420 programs. Among adults, cannabinoid hyperemesis syndrome cases were the leading causes of inhaled cannabis ED visits and psychiatric symptoms such as anxiety or psychosis, along with cardiovascular symptoms including myocardial infarction (heart attack) and serious heart dysrhythmias, were more associated with edible cannabis. However, all conditions were present with

continued top next page

both routes of THC administration. This suggests that, in terms of health problems, cannabis is not the harmless substance many believe it to be.

Health problems occurring more often with one route of administration versus the other are likely due to the unique ways in which different forms of ingestion alter THC's absorption, distribution, and metabolism. Inhaled THC has clinical effects within 10 minutes, peak blood concentrations in 30 – 90 minutes after using, and typically clears the system within 4 hours. Edible THC typically does not reach clinical effects for at least 30 minutes and may take up to 2 hours. It does not peak until about 3 hours after ingestion and can take 12 hours to clear the system. Thus, intoxication via edibles is less predictable and dosing is harder to control. This may be why 48% of intoxication cases were related to edibles versus 28% being related to inhaled THC.

Prime Solutions Counselors may also find this information useful to help increase their clients' perception of personal risk for health problems with continued cannabis use, or by helping them connect health problems they are currently having to their cannabis use. For example, numerous anecdotal reports suggest that cannabis users struggle to accept that their use is causing nausea or even uncontrolled vomiting. It can be very confusing and can feel counterintuitive to those having heard that cannabis can help stop nausea. In fact, both are true and the reason why some regular cannabis users begin to experience the cannabinoid hyperemesis syndrome is unknown but is clearly linked to their THC use. Likewise, while cannabis may offer an initial calming effect, it may contribute to anxiety and depression over time.

Further information is provided below for those wishing to better understand the study.

### Methods:

The charts of adult patients seen in the University of Colorado Hospital Emergency Department over a five-year period were coded by research assistants blinded to the study hypothesis. Charts containing an ICD-9 or ICD-10 code for a cannabis-related medical condition were included. The charts were further coded according to whether the condition was at least partially attributable to cannabis use, the route of cannabis administration if noted, the dose if available, and both clinical and presenting symptoms present in the examination. A condition was deemed to be at least partially cannabis attributable if it met one or more of the following criteria:

1. The ED provider identified cannabis as likely precipitating or contributing to the condition.
2. The patient was admitted to the hospital and the inpatient provider identified cannabis as likely precipitating or contributing to the condition.
3. The urine toxicologic screening result was positive and there was a documented use of cannabis in the past 24 hours or less and the condition was known to be one linked to cannabis use, e.g. acute panic attack.

When the route of administration was not noted in the records it was presumed to be inhaled as this is the most common form of cannabis consumption in Colorado. However, that may have led to an undercount of edible consumption.

Medical assistants doing the chart reviews were trained to identify ICD-9 and ICD-10 cannabis-related codes and factors suggesting cannabis-accountable health problems. The interrater reliability among those reviewing the medical charts was tested and found to be good ( $\kappa = 0.79$  [CI 0.75 to 0.83]). A medical toxicologist reexamined a random sample of all charts to assure interrater reliability. Any chart with questionable attribution was reviewed and its use determined by the medical toxicologist.

### References:

1Monte, A. A., Shelton, S. K., Mills, E., Saben, J., Hopkinson, A., Sonn, B., ... & Williamson, K. (2019). Acute illness associated with cannabis use, by route of exposure: an observational study. *Annals of Internal Medicine*, 170, pp. 531-537. 