

## An Unintended Epidemic- Community Outreach Paper: Yela Carey

Beginning in the 1990s, our nation would start to see three waves of overdose-related deaths wash over the country for the next 30 years. These waves began with an unforeseen player who would become responsible for causing the deaths of many loved ones. Over twenty years (1999-2019), nearly 500,000 people would have their lives cut short because of opioids- in prescription, illicit, or synthetic forms.<sup>1</sup> Perhaps this was an unexpected problem considering the very substance itself was often coming from those who were thought to be trusted the most- medical providers. Addiction and associated drug overdose still wreak havoc in the US today. Opioid-based overdose deaths rose 29.4% in 2020 from the year prior.<sup>2,3</sup> Addiction-related objectives have been a Healthy People 2030 goal for an extended time due to the increasing, long-standing impact addiction has on the US population.

The number of opioid prescriptions prescribed in the US started trending down in 2011. In 2015, it was at 640 morphine milligram equivalents (MME); it remains more than three times as high as in 1999 when it was previously 180 MME.<sup>4</sup> For perspective, morphine milligram equivalent values represent the potency of an opioid dose relative to morphine.<sup>5</sup> The core objectives of Healthy People 2030 are measurable and associated with targets for the decade. These objectives reflect high-priority public health issues and are associated with evidence-based interventions. These criteria are a key reason why opioid addiction is a focus of Healthy People 2030.<sup>6</sup>

Data highlights that populations impacted stretch far and wide across the span of life, from teenagers to the elderly, illuminating that no one is exempt from being impacted by opioid addiction and potential subsequent negative consequences. In 2016, one out of every three beneficiaries of Medicare Part D received an opioid prescription.<sup>7</sup> In order to typically qualify

for Medicare Part D, one must be 65 or older. Although opioids are not on the Beers criteria, the side effects and adverse effects of opioids could be more impactful and detrimental to an older population due to respiratory depression and fall risk.<sup>8</sup> Unfortunately, almost 90,000 of these beneficiaries were at risk for misuse/ overdose and received more than two and a half times the level that the CDC recommended for the entire year.<sup>7</sup>

On the other end of the life span impacted by addiction, adolescents have not been spared. If anything, they are the population group to focus upon when considering the big picture of the opioid epidemic slowing down. According to one national survey, opioid-related emergency department visits, ICU admissions, and deaths have accounted for over 12% of total deaths in 2016 in the 15-24 age group.<sup>9</sup> This percentage is a fourfold increase since 2001. The CDC's 2018 National Vital Statistics report re-ranked the leading cause of death among adolescents and young adults as “unintentional injuries”, with poisonings being the most common.<sup>9</sup> In one national survey sample group of adolescents and young adults, 27.5% reported using a prescription opioid in the past year, with 3.8% adolescents and 7.8% of young adults reporting engaging in opioid misuse or having a disorder.<sup>9</sup>

The discussion of addiction education, awareness, and prevention from opioid-based substances is crucial to any audience, however, particularly to adolescent/ young populations. Results show in this population, opioids are most likely obtained from friends, relatives, or a single provider, and less likely from a drug dealer or multiple providers.<sup>9</sup> This fact proposes the conclusion that the source of substance will most likely be obtained from someone they already know and trust. Instead of being concerned that young people will engage in drug-seeking actions, the facts pointing to obtaining opioids from a known and trusted person in their life are why education on this topic is essential. Studies show any young person with a form of opioid

use disorder was significantly more likely to use other substances of abuse, with one-third or more reporting prior use of cocaine, hallucinogens, and inhalants and one-half reporting past-month use of tobacco, alcohol, or cannabis.<sup>9</sup> In this age category, the introduction of opioid addiction increases the lifetime risk of subsequent addictions and escalates substances. Therefore, early prevention and education is a feasible tool to help slow the public health crisis of this epidemic.

The neurobiology of opioid addiction is a crucial step in approaching the education behind addiction. One of the brain circuits activated by opioids is the mesolimbic (midbrain), the reward system. In this system, a signal is generated in a particular part called the ventral tegmental area (VTA), which then releases the chemical dopamine (DA) into another portion of the brain, the nucleus accumbens (NAc). The release of DA into NAc is responsible for the feelings of pleasure. Other vital portions of the brain create a lasting connection or memory to this feeling of pleasure related to the circumstance or environment in which it occurs. The result of this connection is called "conditioned associations," and this occurrence is responsible for the feelings of "cravings," which can be influenced further by persons, place, and things associated with the reward center and memory.<sup>10</sup> The locus ceruleus (LC) is another portion significant in the addiction cycle and withdrawal, found at the base of the brain. Neurons in the LC produce a neurotransmitter, noradrenaline (NA), and subsequently distribute this neurotransmitter to other parts of the brain, which stimulate wakefulness, breathing, blood pressure, alertness, and more.<sup>10</sup> When opioids are taken, the opioid molecules link to mu receptors on cells found in the LC and therefore suppress the release of NA, resulting in the intoxication signs and symptoms found under the influence such as drowsiness, slowed breathing, and lowered blood pressure.<sup>10</sup>

One of the theories of drug addiction is the "changed set point," which holds several variants based on differences of DA neurotransmitters in the VTA and NA neurons in the LC during phases of withdrawal/ abstinence. One variation of this model is described by Koob and LeMoal (2001) and is founded on the concept that drug abuse alters a neuron's biological or physiological baseline or set point.<sup>10</sup> More specifically, the theory by Koob and LeMoal proposes that neurons of the midbrain are designed and programmed to naturally release enough DA into the NAc to elicit a normal level of pleasure. The model suggests that opioids can influence and elicit addiction by initiating a cycle of changing the set point, which reduces the release of DA when normally pleasurable activities or experiences occur when an opioid is not present in the system.<sup>10</sup>

A second model is the "cognitive deficit" model, which proposes that individuals who develop addictive disorders have an abnormality in the prefrontal cortex (PFC). The PFC regulates judgment, planning, and executive functions. Inhibitory signals are sent from the PFC to the VTA DA neurons in the midbrain when we need to override the impulse for instant pleasure gratification for more long-term important rewards.<sup>10</sup> If the PFC is anatomically or physiologically altered in a person, it supports the theory that this person would have a reduced ability to utilize judgment and withhold impulses, placing them at a higher risk for compulsive drug-taking behaviors.<sup>10</sup>

When focusing specifically on the adolescent population and addiction, research suggests that identifying potential addiction risk and early intervention performed through the primary care provider or a pediatrician is beneficial.<sup>9,11</sup> Substance use accounts for most life- years lost in the 15-24 age population and is considered one of the most modifiable health risk behaviors.<sup>11</sup> The American Academy of Pediatrics has called upon pediatricians to be diligent in screening all

youth for substance use, and conduct management of the spectrum of this disorder, from preinitiation to substance use disorder (SUD).<sup>11</sup> Beginning SUD treatment inside the pediatric primary care setting walls and involving these providers in the care of these disorders can revise and increase access to SUD treatment for youth at risk or in need.<sup>11</sup> Additionally, there is a potential benefit that increasing SUD treatment in primary care could help extend access to alcohol, marijuana, and tobacco treatments.

Connecting lines between prescriber, prescription, and addiction, high school seniors who receive a first-time medical prescription for opioids research has shown a 33% increased risk of future opioid misuse post high school.<sup>9</sup> This lends to the previous statement above that a common source of opioids for adolescents could be from a single prescriber. This bolsters another reason that frequent screening and close awareness in primary care or pediatrician settings could be very beneficial to control these unnecessary exposures to opioids, or be aware that abuse and/or addiction was forming. The risk only continues to climb for adolescents who engage in nonmedical use of prescription opioids. In one survey study, 50% of adolescents who participated in occasional, 3-9 lifetime doses of nonmedical prescription opioid use met the criteria for substance use disorder by the age of 35.<sup>9</sup> A connection between heroin use and prescription opioid use has also been made. An analysis of NSDUH data from 2004-2011 revealed heroin initiation was 13 times higher in adolescents aged 12-21 with a history of nonmedical prescription opioid use than the same age group without use.<sup>9,12</sup>

Harm reduction education utilizing practical and evidence-based strategies focused in the primary care setting is essential and favorable. Youth misusing opioids tend to have riskier use and injection practices than older or adult populations. Younger population also remain less aware of the dangers of injections and how to reduce the risk of infection.<sup>13</sup> Fatal opioid

overdose is still a significant cause of mortality. The journal of the American Academy of Pediatrics stressed that youth are generally uninformed about overdose.<sup>13</sup> The recommended education should include strategies for reducing overdose risk, recognizing signs of overdose, and responding to an overdose. Curriculums that have been taught and focused on these three areas of education have allowed nonmedical participants to administer naloxone for overdose reversal successfully.<sup>13</sup> A meta-analysis evaluating bystander naloxone administration conducted did not provide quantitative statistical data, but concluded in favor of naloxone administration education for the treatment of opioid overdose for nonmedical persons associated with the increased odds of recovery.<sup>14</sup> In addition to overdose prevention education, it is recommended that pediatricians prescribe naloxone to youth receiving/ taking opioids and their families, partnered with training on administration.<sup>13</sup>

A web-based program for opioid abuse prevention and education (Pop4Teens) was studied as a science-based interactive program for adolescents 12-17 years old. Six focus groups were designed with 30 youths participating along a continuum of exposure to prescription opioids. The research aimed to develop a formative evaluation of the program's eight comprised modules addressing concepts such as, misconceptions about prescriptions, risks and misuse, nonmedication alternatives to pain, and how to know if someone is addicted. The study of the program concluded that the technology-based tool could be applied to multiple different settings including, school, home, and primary care. In the primary care setting, it was proposed to be a part of a universal, targeted care approach or part of behavioral health recommendations during an annual visit. In a school setting, Pop4Teens could be adopted as a stand-alone program or used in conjunction with other interventions to expand current drug prevention education.<sup>15</sup> Ultimately, the process of exposure and addiction is complicated and will most likely require a

multi-prong approach to help adolescents continue to move away from the trajectory of opioid addiction.<sup>15</sup> Although considering the power and influence of technology in 2021, a web-based approach aligns with an appealing and familiar form of communication and education for youth today.

The opioid epidemic is not close to being over, but hope and focus on education to adolescents will hopefully cause a down-trending curve of addiction and deaths. Youth are vulnerable to the onset of addiction. A longitudinal study highlighted that from ages 13-25, a new diagnosis of opioid use disorder increased six-fold from 2001-2014.<sup>9</sup> These rising rates have been related to poisonings and overdoses among this population. Moreover, for adolescents 15-19 years old, the rate of hospitalizations and poisonings have increased > 170%. And opioid deaths have increased by approximately 250% since the 1990s.<sup>9</sup> Although these numbers are startling percentages, adolescents and young adults also have another very protective factor on their side- the brain's plasticity. In this time frame of life, they can absorb, learn, and form healthy coping mechanisms and habits far beyond older populations. By bringing education to schools, primary care clinics, and home settings, this number could be progressively reduced and impact the next generation, which has not been seen in decades.

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