Predisposing, enabling and reinforcing factors associated with opioid addiction helping behaviour in tri-state Appalachian counties: application of the PRECEDE–PROCEED model–cross-sectional analysis

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ABSTRACT

Objectives The overdose epidemic was designated a 'Public Health Emergency' in the USA on 26 October 2017, bringing attention to the severity of this public health problem. The Appalachian region remains substantially impacted by the effects from years of overprescription of opioids, and subsequently opioid non-medical use and addiction. This study aims to examine the utility of the PRECEDE–PROCEED model constructs (ie, predisposing, reinforcing and enabling factors) to explain opioid addiction helping behaviour (ie, helping someone who has an opioid addiction) among members of the public living in tri-state Appalachian counties.

Design Cross-sectional study.

Setting Rural county in the Appalachian region of the USA.

Participants A total of 213 participants from a retail mall in a rural Appalachian Kentucky county completed the survey. Most participants were between the ages of 18 and 30 years (n=68; 31.9%) and identified as men (n=139; 65.3%).

Primary outcome measure Opioid addiction helping behaviour.

Results The regression model was significant ($F_{(6, 180)}$=26.191, p<0.001) and explained 44.8% of the variance in opioid addiction helping behaviour (R^2=0.448). Attitude towards helping someone with opioid addiction (B=0.335; p<0.001), behavioural skills (B=0.208; p=0.003), reinforcing factors (B=0.190; p=0.015) and enabling factors (B=0.195; p=0.009) were all significantly associated with opioid addiction helping behaviour.

Conclusions PRECEDE–PROCEED model constructs have utility to explain opioid addiction helping behaviour among individuals in a region greatly impacted by the overdose epidemic. This study provides an empirically tested framework for future programmes addressing helping behaviour related to opioid non-medical use.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study assessed the utility of PRECEDE–PROCEED model constructs in explaining opioid addiction helping behaviour.

⇒ Data were collected from the rural Appalachian region of the USA, where the overdose epidemic has had some of its worst effects.

⇒ The knowledge gained from this study may be used to design future educational intervention programmes to encourage opioid addiction helping behaviour.

⇒ Since the study was cross-sectional, no inferences about causality or directionality between the variables could be drawn.

⇒ Results are based on self-reported data, which may be impacted by social desirability and recall bias.

the USA, which brought renewed focus to this dangerous and pervasive problem. Since 1999, nearly 841 000 people have died in the USA due to a drug overdose, where 72.9% of those deaths involved an opioid.[1] In 2019 alone, opioids were involved in 49 860 overdose deaths in the USA.[1] In 2019, it is estimated that about 10.1 million people in the USA aged 12 years or older had non-medically used opioids in the last year, with 9.7 million of those non-medically using prescription pain relievers and 745 000 people using heroin.[2] An estimated 21%–29% of patients who were prescribed opioids for chronic pain end up non-medically using the prescription medications, and another 8%–12% develop an opioid use disorder.[3] Furthermore, the Centers for Disease Control and Prevention (CDC) estimates a $78.5 billion/year total economic burden of prescription opioid non-medical use in the USA.[4]

INTRODUCTION

On 26 October 2017, the overdose epidemic was declared a 'Public Health Emergency' in

Major efforts have been made to curb this crisis; however, age-adjusted overdose death rates increased by 4% from 2018 to 2019 (20.7–21.6 per 100 000, respectively), illustrating that there is still much work to be done to curb the overdose epidemic.[1] National public health initiatives, including the United States Department of Health and Human Services' 2017 *5-Point Strategy to Combat the Opioid Epidemic* and the CDC's *Overdose Data to Action* 3-year cooperative agreement, initiated in September 2019, are ongoing and outline the importance of gathering more specific public health data, providing innovative prevention approaches and expanding research on addiction.[5 6]

The Appalachian region of the USA, including Kentucky, Tennessee and Virginia, experiences some of the most detrimental impacts from the overdose epidemic. Tennessee prescribes the third most opioids in the country at 68.5 prescriptions per 100 people, with Kentucky in fifth at 68.2 and Virginia with 37.6 in 2020.[7] Although the number of opioid prescriptions has decreased in recent years, overdose deaths increased to 60% in Tennessee from 2013 to 2017, which can mostly be attributed to a nearly 10-fold increase in illicit fentanyl-related deaths during this time.[8] Kentucky, Tennessee and Virginia rank 13th, 14th and 16th, respectively, for illicit fentanyl overdose with Virginia at 11th and Tennessee at 13th for heroin overdoses.[8] The costs of lost tax revenue due to opioid non-medical use are $48 million in Tennessee, $344 million in Kentucky and $495 million in Virginia.[9] Further action will continue to be necessary in the Appalachian region as the fentanyl problem continues to evolve.

At the epicentre of the national overdose epidemic, the tri-state rural Appalachian communities of Kentucky, Tennessee and Virginia have experienced this public health crisis firsthand. Claiborne County, Tennessee was recently listed as the seventh highest morphine equivalents per capita annually, quadrupling the national average.[10] During 2018, the tri-state region saw a startling rate of opioid prescriptions per 100 residents at 140.9 in Wise County, Virginia; 148.2 in Claiborne County, Tennessee; and 197.9 in Bell County, Kentucky with a national average of 51.4.[11] As of 2018, the drug overdose rate per 100 000 residents was 38 in Bell County, Kentucky; 40 in Wise County, Virginia; and 41 in Claiborne County, Tennessee compared with the national average of 21.7.[8 11 12] Dramatically elevated rates of prescribed opioids and drug overdoses when compared with national trends highlight this area of the country and its residents as a focal population of concern when considering opioid-related harms, inclusive of overdose.

As early research identified associations between opioid prescribing and non-medical use as well as opioid-related harms,[13] initial efforts to address opioid-related harms focused largely on controlling supply, primarily by reducing prescribing rates through strategies where more rigorous prescribing guidelines, prescription monitoring programmes and drug tapering, were advocated and applied.[14–16] Unfortunately, these and other preventative activities led to the evolution of opioid-related problems such as the increased propensity to use alternative drugs, inclusive of illicitly manufactured fentanyl. Though prescribing rates have reduced of late resulting from the aforementioned prevention strategies, overdose deaths have continued to rise,[8] and localised prescribing rates continue to serve as an indicator of opioid-related harms.[17] Recent US data suggest a 28.5% increase in opioid-related overdose deaths from 2020 to 2021.[18 19] Data from the Canadian government indicate similar increases and further suggest there to be no evidence that increases in overdose are related to prescribed opioids.[20] Over the past decade, overdose deaths due to prescription opioids have remained relatively stable; at the same time, inconceivable increases in synthetic opioid-related overdose have been observed.[21] Furthermore, laboratory tests conducted by the Drug Enforcement Agency found that 6 of 10 fentanyl-laced pills confiscated in 2022 contained a lethal dosage,[22] an increase from 4 of 10 in 2021. This radical short-term increase highlights the concern over illicitly manufactured and dispensed fentanyl, as well as other drugs contaminated with this fentanyl. Control of illicit fentanyl should be viewed as the highest priority related to the current overdose epidemic.

Emergent research highlights newer concerns related to reduction of opioid prescribing, specifically in the form of 'deprescribing' (ie, tapering and/or complete removal) once opioid-based chronic pain management therapy has been initiated.[16] A recent cohort study among those who underwent opioid dose tapering between 2008 and 2017, inclusive of nearly 20 000 participants, found that opioid tapering was associated with increased risk of withdrawal, drug overdose and mental health crisis.[16] Those with higher initial dose were at greater risk of these deleterious outcomes. Of critical limitation to this study is the temporality of the study period, as guidelines for appropriate tapering of opioids were not published until 2019.[23] Thus, the tapering process may have lacked certain safeguards which would now guide a more appropriate tapering process. As prescription opioid use has been shown to precede non-medical use and illicit opioid use,[24–26] there is a critical need for drastic measures to be taken at both national, state and county levels to reduce opioid-related harms, extending far beyond prescribing-related interventions.

One strategy to address the overdose epidemic is to encourage helping behaviour among individuals in the public through the development of peer-to-peer interventions. Helping behaviour may include strategies such as administration of naloxone[27] and social support from families, peers and healthcare providers.[28] Multiple factors have been identified in previous research to be associated with greater likelihood to exhibit helping behaviour relevant to opioid non-medical use. Individuals who had more positive attitude toward and reduced stigma towards helping someone with an opioid addiction and skills to help someone with an opioid addiction were more likely to exhibit greater helping behaviour.[29 30]

In addition to attitude and skills, research has shown that support from healthcare providers and family is associated with increased likelihood of helping someone with opioid addiction.[31 32] Outside of individual and interpersonal factors, environmental factors, such as community, faith-based and healthcare organisations, that support helping behaviour have also been shown as important factors to address opioid non-medical use.[33] To date, little research has explored factors associated with helping behaviour among people living in the Appalachian region using a theoretical framework.

Therefore, the objective of the current study was to examine the utility of the PRECEDE–PROCEED model[34–36] constructs (ie, predisposing, reinforcing and enabling factors) in measuring and explaining opioid addiction helping behaviour among members of the public living in tri-state Appalachian counties. By determining the level of opioid addiction knowledge, attitudes, beliefs and helping behaviours among members of the public in a region greatly impacted by the overdose epidemic, public health education and promotion professionals will gain valuable insight to inform the development, implementation and evaluation of programmes to address helping behaviour related to opioid addiction in populations with a high prevalence of opioid-related morbidity and mortality. Furthermore, the information gleaned from the PRECEDE–PROCEED model constructs in this study will provide a deeper understanding of how to design and modify customised opioid addiction educational intervention strategies that align with the specific needs of the population of interest.

METHODS
Theoretical framework

Using a planning model like PRECEDE–PROCEED, an intervention can be directed based on identified needs. The PRECEDE–PROCEED model uses four assessment phases, one implementation phase and three evaluation phases, to produce change within a population at risk. Assessment phases first include a review of social, epidemiological, behavioural, environmental, educational and ecological factors that together provide a clear picture of the target population in relation to the health issue. The programme development is then based on data ascertained from the assessment categories and milestones are created in the form of measurable objectives.[34] The PRECEDE–PROCEED model has utility to address the overdose epidemic as a health promotion practice framework and to make recommendations for social, epidemiological, behavioural, environmental, educational and ecological targets for future programming.

The PRECEDE–PROCEED model helps individuals to better grasp the issues facing them and their respective span of control. To achieve success in the fight against opioid drug overdoses, it is critical to comprehend the PRECEDE–PROCEED model's educational and ecological evaluation phases. Predisposing, reinforcing and enabling elements are classed as predisposing, reinforcing and enabling factors in this phase. Predisposing variables are elements that influence the incentive to modify one's conduct (ie, knowledge, beliefs, attitudes, values, perceptions, existing skills). Enabling variables are precursors to behavioural and environmental change that enable the realisation of a motive or environmental policy that supports the behaviour (ie, availability of resources, accessibility, laws, legislation, new skills). Reinforcing factors (ie, family, classmates, teachers, employers, health providers, community leaders or decision-makers) follow a behaviour and give ongoing incentive for maintaining the behaviour.[35] Ecological assessment is particularly important as the opioid crisis is worse in some regions of the country including rural Appalachia. Educational strategies will aid in the empowerment of those affected by this issue and promote improved quality of life for their communities.

The PRECEDE–PROCEED model has been widely validated with a wide range of populations in cross-cultural contexts over the previous decades of research.[34–36] The PRECEDE–PROCEED model has been used to conceptualise a wide range of preventive health behaviours, including HIV prevention, breast self-examination, diabetic self-care and physical activity.[35 37] To our knowledge, however, the PRECEDE–PROCEED model constructs have yet to be explored in behavioural research on opioid addiction helping behaviour.

Participant recruitment

Participants for this cross-sectional study were recruited using an intercept survey sampling strategy in a community in rural Appalachian Kentucky. Public intercept surveys aim to recruit people from the public from widely used, public locations, such as malls and parks, and have been supported as an effective recruitment strategy in rural populations.[38] In this study, participants were recruited from a large shopping mall in a community in rural Kentucky in Spring 2019. Researchers intercepted mall patrons to ask for their willingness to participate in the study and complete a survey regarding opioid addiction knowledge, attitudes, beliefs and helping behaviour. Community members who agreed to participate in the study were asked to complete a paper-and-pencil survey on-site at the shopping mall. Participants were informed by members of the research team that their participation in the study was completely voluntary and that they could discontinue participation in the study at any time. Informed consent was obtained verbally following review of the consent information with the participant. Participants were given a water bottle for their participation in this study. Participants were also required to indicate 'yes' to an item stating, 'I am aware that this survey is completely voluntary. I am aware my responses including any identifying information will be kept confidential and will be destroyed' before continuing with the survey. Survey completion took approximately 10–15 min.

Patient and public involvement
None.

Measures
Using the PRECEDE–PROCEED framework,[34–36] a 40-item survey instrument was developed for the present study to assess sociodemographic information, opioid use/non-medical use history, knowledge about opioid addiction, attitude about opioid addiction, attitude about helping people with opioid addiction, behavioural skills to help people with an opioid addiction, reinforcing factors, enabling factors and opioid helping behaviours. To assess the content validity of the items, a panel of six content, instrumentation and theory experts were consulted and asked to provide feedback about the instrument. The instrument was assessed for readability and the use of clear and appropriate language and was considered acceptable with a Flesch reading ease score of 56.2 and Flesch-Kincaid Grade Level of seventh grade. Following data collection in the present study, all scales were assessed to determine internal consistency reliability using Cronbach's alpha for scales including three or more response options or Kuder-Richardson 20 for scales including two response options (ie, knowledge).[39]

Sociodemographic factors and opioid use behaviour
Seven variables were used to assess sociodemographic information, including gender identity, age, highest level of education attained, employment status, average hours worked per week and yearly household income. Participants were able to select 'prefer not to answer' for all sociodemographic variables. All participants were provided with the following definition of opioids at the beginning of the survey instrument to increase accuracy of self-reported responses, 'Opioids are a group of drugs that include the illegal drug heroin as well as the legal prescription pain relievers such as codeine, oxycodone, hydrocodone, morphine, fentanyl and others'. Three items were used to determine opioid use/non-medical use both for participants and referent others. Two items assessed personal opioid use. One item asked, 'Have you ever used an opioid drug?' (1=yes; 2=no; 3=I don't know) and a second item asked, 'Do you think you have a problem with opioid misuse/abuse?' (1=yes; 2=no). A third item, 'Do you know someone who has a problem with opioid misuse/abuse?' (1=yes; 2=no), was used to assess if participants knew someone else who non-medically used opioids.

Predisposing factors
Predisposing factors, or necessary antecedents to help someone with an opioid addiction, were operationalised in the present study as knowledge, attitude and existing behavioural skills. Four separate scales were created to assess predisposing factors in the present study.

Knowledge
Eight items were created to assess knowledge about opioid addiction in the USA (Cronbach's alpha=0.62). Response options for the knowledge items included 'true', 'false' and 'don't know'. Responses were coded dichotomously (1=correct; 2=incorrect). After coding responses, the eight knowledge item scores were summated to get a total knowledge score, which ranged from 0 to 8, with a higher score indicating a higher level of knowledge about the overdose epidemic in the USA.

Attitude
Attitude was assessed using two different scales. One six-item scale was created to assess participants' attitudes about opioid addiction (Cronbach's alpha=0.42). Attitude items in both scales were measured on a 5-point Likert scale (1=never; 5=always). A sample item from the attitude about opioid addiction scale states, 'Opioid addiction is a serious problem'. Responses to the six items were summated to generate a total scale score, where scores ranged from 6 to 30. A higher score indicated a more positive attitude about opioid addiction. Another three-item scale was created to assess participants' attitude about helping people with an opioid addiction (Cronbach's alpha=0.79). An example item from the attitude about helping people with opioid addiction scale states, 'I would be willing to talk to someone suffering from opioid addiction about their problem'. Responses to the three items were summated to generate a total score ranging from 3 to 15, with higher scores indicating a more positive attitude towards helping people with an opioid addiction.

Behavioural skills
Participants' existing behavioural skills to help someone with an opioid addiction were assessed using a four-item scale (Cronbach's alpha=0.81). Items were assessed using a 5-point Likert scale (1=not at all sure; 5=completely sure). An item from the behavioural skills scale states, 'How sure are you that you can help someone with an opioid overdose?' To generate a total scale score, responses to the items were summated. Possible scores on the behavioural skills scale ranged from 4 to 20, with higher scores indicating greater skills to help people with an opioid addiction.

Reinforcing factors
Reinforcing factors, or those factors that encourage sustained engagement in a behaviour, were assessed using three items to determine reinforcing factors to help someone with an opioid addiction, including peer, healthcare and familial support (Cronbach's alpha=0.82). Items in the reinforcing factors scale were measured using a 5-point Likert scale (1=not at all sure; 5=completely sure) and summated to generate a total scale score ranging from 3 to 15. A higher score indicated increased reinforcing factors present to help someone with an opioid addiction. An example item from the scale states, 'How sure are you that you would receive support from healthcare professionals to help someone with an opioid addiction?'

Enabling factors

Enabling factors, or factors in the environment that encourage or support engagement in a health behaviour, were assessed using a four-item scale (Cronbach's alpha=0.91). Response options for the items in the enabling factors scale were assessed using a 5-point Likert scale (1=not at all sure; 5=completely sure). An example item from the scale states, 'How sure are you that you would be able to find a community organisation to help someone with an opioid addiction?' Responses were summated to create a total scale score, with scores ranging from 4 to 20. Higher scores indicated a higher presence of enabling factors to help someone with an opioid addiction.

Helping behaviour

Helping behaviour was measured using two items (Cronbach's alpha=0.88). An example item from the helping behaviour states, 'How likely is it that you would help someone with an opioid addiction seek help from a health professional?' Items were measured using a 5-point Likert scale (1=not at all likely; 5=completely likely). Responses to items were summated to create a helping behaviour score, ranging from 2 to 10, where a higher score indicated greater helping behaviour for people with an opioid addiction.

Data analysis

SPSS V.27 was used to analyse all the data (IBM Corp). Internal consistency reliability of the instrument was determined using Cronbach's alpha or Kuder-Richardson 20. For each study variable, descriptive statistics such as mean, SD, normality statistics (such as skewness, kurtosis) and frequencies were determined. Univariate analyses were calculated using independent sample t-tests to determine differences in knowledge, attitude, behavioural skills, reinforcing factors, enabling factors and helping behaviours between participants with previous opioid use and those who did not, as well as participants who knew someone who non-medically used opioids and those who did not. Between-group differences could not be calculated for those reporting opioid non-medical use and those who did not due to only 15 participants reporting current opioid non-medical use at the time of data collection.

Pearson correlation analysis was used to determine the relationship between helping behaviour and the knowledge, attitude, behavioural skills, reinforcing factors and enabling factors prior to multivariable analysis. For multivariable analysis, a multiple linear regression model was created to determine the ability of the knowledge, attitude, behavioural skills, reinforcing factors and enabling factors to explain opioid addiction helping behaviour. Core assumptions of multiple linear regression (ie, multicollinearity, linearity, homoscedasticity, independence of residuals and normality) were not violated. An a priori p value of 0.05 was used for all analyses.

Table 1	Participant characteristics
Characteristic	**n (%)**
Age	
18–30	68 (31.9)
31–40	38 (17.8)
41–50	31 (14.6)
51–60	33 (15.5)
61+	42 (19.7)
Prefer not to say	1 (0.5)
Gender	
Woman	73 (34.3)
Man	139 (65.3)
Education level	
Less than high school	29 (13.6)
High school or GED	73 (34.3)
Some college	55 (25.8)
Bachelor's degree	36 (16.9)
Graduate degree	10 (4.7)
Professional degree	8 (3.8)
Prefer not to say	2 (0.9)
Income	
Less than $15 000	53 (24.9)
$15 000–$30 000	42 (19.7)
$30 001–$45 000	42 (19.7)
$45 001–$60 000	22 (10.3)
Greater than $60 000	32 (15.0)
Prefer not to say	15 (7.0)
Employment	
Employed	119 (55.9)
Non-employed	89 (41.8)
Prefer not to say	3 (1.4)
Opioid history	
Ever used opioids personally for any reason	139 (65.3)
Believe they have a problem with non-medical use or abuse of opioids	15 (7.0)
Know an individual with an opioid non-medical use or abuse problem	133 (62.4)

Percentages may not total 100 due to missing data in the form of participant omission.
GED, General Educational Development.

RESULTS

A total of 213 participants completed the survey (table 1). Most participants were between the ages of 18 and 30 years (n=68; 31.9%), identified as men (n=139; 65.3%), reported a high school diploma or equivalent as their highest level of education (n=73; 34.3%), reported an annual income less than $15 000 (n=53; 24.9%) and were currently employed (n=119; 55.9%). Regarding

prescription opioid use, 65.3% (n=139) of participants reported ever using opioids personally for any reason, and 62.4% (n=133) reported knowing an individual who non-medically used opioids. However, only 7% (n=15) of participants in this study believed that they personally had a problem with non-medically using opioids.

Differences in knowledge, attitude, behavioural skills, reinforcing factors, enabling factors and helping behaviours were explored between those with previous personal opioid use for any reason (ie, prescription or non-prescription) and those who did not report previous personal use (table 2). Attitude toward opioid addiction was significantly higher among those with no personal opioid use (M=15.44) when compared with participants with personal opioid use (M=13.89, $t(183)=2.66$; $p=0.009$), indicating a more positive attitude toward opioid addiction and addressing the overdose epidemic among those with no personal opioid use. There were no

Table 2 Test of group differences in constructs by personal history

	n	Mean	SD	Mean difference	t*	P value
Helping behaviour						
Personal opioid use	134	6.19	1.99	0.19	0.64	0.521
No personal use	65	6.38	1.90			
Know someone who non-medically uses or abuses opioids	133	6.30	1.83	0.12	0.43	0.666
Does not know someone who non-medically uses or abuses opioids	73	6.18	2.16			
Knowledge						
Personal opioid use	139	5.22	1.87	0.01	0.03	0.978
No personal use	65	5.23	1.86			
Know someone who non-medically uses or abuses opioids	133	5.59	1.66	1.04	3.79	<0.001*
Does not know someone who non-medically uses or abuses opioids	78	4.55	2.07			
Attitude toward opioids						
Personal opioid use	123	13.89	3.71	1.55	2.66	0.009*
No personal use	61	15.44	3.72			
Know someone who non-medically uses or abuses opioids	123	14.85	3.32	1.29	2.13	0.035*
Does not know someone who non-medically uses or abuses opioids	68	13.56	4.31			
Attitude toward helping someone with opioid addiction						
Personal opioid use	136	10.50	2.19	0.41	1.45	0.150
No personal use	64	10.91	1.67			
Know someone who non-medically uses or abuses opioids	132	10.81	1.80	0.49	1.54	0.126
Does not know someone who non-medically uses or abuses opioids	75	10.32	2.41			
Behavioural skills						
Personal opioid use	135	8.53	3.99	1.15	1.84	0.067
No personal use	64	9.69	4.40			
Know someone who non-medically uses or abuses opioids	130	9.52	3.81	1.72	2.93	0.004*
Does not know someone who non-medically uses or abuses opioids	76	7.80	4.47			
Reinforcing factors						
Personal opioid use	134	7.14	3.37	0.32	0.65	0.519
No personal use	65	7.46	3.08			
Know someone who non-medically uses or abuses opioids	131	7.12	3.02	0.40	0.80	0.428
Does not know someone who non-medically uses or abuses opioids	75	7.52	3.68			
Enabling factors						
Personal opioid use	133	8.95	4.75	0.44	0.62	0.537
No personal use	65	9.38	4.50			
Know someone who non-medically uses or abuses opioids	132	9.20	4.48	0.04	0.07	0.946
Does not know someone who non-medically uses or abuses opioids	73	9.15	4.96			

Welch's t-test
*p<0.05

Table 3 Zero-order correlation matrix of study variables

Construct	1	2	3	4	5	6	7
1. Helping behaviour	–	0.033	0.344**	0.527**	0.487**	0.567**	0.522**
2. Knowledge		–	0.185*	0.064	0.263**	0.097	0.120
3. Attitude: opioid addiction			–	0.276**	0.407**	0.350**	0.431**
4. Attitude: helping someone with opioid addiction				–	0.242**	0.361**	0.273*
5. Behavioural skills					–	0.548**	0.495**
6. Reinforcing factors						–	0.631**
7. Enabling factors							–

*p<0.05
**p<0.001

significant differences in helping behaviour, knowledge, attitude towards helping someone with opioid addiction, behavioural skills, reinforcing factors or enabling factors between these two groups (all p>0.05).

Differences in knowledge, attitude, behavioural skills, reinforcing factors, enabling factors and helping behaviours were explored between participants who knew someone who non-medically used opioids and those who did not (table 2). Knowledge about opioid addiction and the overdose epidemic was significantly higher among participants who knew someone who non-medically used opioids (M=5.59) when compared with those who did not (M=4.55, $t(210)=3.79$; p<0.001). Attitude toward opioid addiction was also significantly higher among participants who knew someone who non-medically used opioids (M=14.85) when compared with those who did not (M=13.56, $t(190)=2.13$; p=0.035). Finally, behavioural skills were also significantly higher among participants who knew someone who non-medically used opioids (M=9.52) when compared with those who did not (M=7.80, $t(205)=2.93$; p=0.004). There were no significant differences in helping behaviour, knowledge, attitude towards helping someone with opioid addiction, reinforcing factors or enabling factors between these two groups (p>0.05).

Pearson correlation analyses were calculated to determine the relationship between helping behaviour and knowledge, attitude, behavioural skills, reinforcing factors and enabling factors (table 3). Helping behaviour was found to demonstrate significant, weak to moderate positive correlations with attitude towards opioid addiction (r=0.344; p<0.001), attitude towards helping someone with an opioid addiction (r=0.527; p<0.001), behavioural skills (r=0.487; p<0.001), reinforcing factors (r=0.567; p<0.001) and enabling factors (r=0.522; p<0.001). There was no significant correlation between helping behaviour and knowledge about opioid addiction and the overdose epidemic.

A multivariable linear regression model was created to determine the ability of knowledge, attitude, behavioural skills, reinforcing factors and enabling factors to explain helping behaviour (table 4). The regression model was significant ($F_{(6, 180)}=26.191$, p<0.001) and explained 44.8% of the variance in helping behaviour ($R^2=0.448$). Attitude towards helping someone with opioid addiction (B=0.335; p<0.001), behavioural skills (B=0.208; p=0.003), reinforcing factors (B=0.190; p=0.015) and enabling factors (B=0.195; p=0.009) were all significantly associated with helping behaviour, where increases in all variables were associated with an increase in helping behaviour.

Table 4 Multiple regression models of helping behaviour onto predictor variables

	b	SE	B	P value	LBCI	UBCI
Knowledge	−0.064	0.057	0.064	0.262	−0.176	0.048
Attitudes: toward opioids	0.017	0.032	0.034	0.599	−0.046	0.079
Attitude: toward helping someone with opioid addiction	0.330	0.058	0.335	<0.001*	0.215	0.444
Behavioural skills	0.096	0.032	0.208	0.003*	0.033	0.159
Reinforcing factors	0.111	0.045	0.190	0.015*	0.022	0.200
Enabling factors	0.079	0.030	0.195	0.009*	0.020	0.138
Model statistics: Adjusted $R^2=0.448$, $F_{(6, 180)}=26.191$, p<0.001						

*p<0.05.
LBCI, lower bound of the 95% CI; SE, SE of the estimate; UBCI, upper bound of the 95% CI.

DISCUSSION

The findings from the present study have important implications for understanding helping behaviour related to opioid addiction and the overdose epidemic. In our study, participants who had never used opioids had more positive attitudes about opioid use when compared with those who had previously used opioids, for prescription and non-prescription reasons. Additionally, people who knew someone who non-medically used opioids demonstrated greater knowledge about opioid addiction, attitudes about opioid addiction and greater behavioural skills to help someone with an opioid addiction. In the multivariable regression model, we were able to explain a large proportion of variance in helping behaviour (44.8%), where attitude towards helping someone with an opioid addiction, behavioural skills, reinforcing factors and enabling factors were all significantly associated with helping behaviour. In the multivariable model, predisposing (ie, attitude, skills), enabling and reinforcing factors were all significantly and positively associated with higher helping behaviour scores, supporting the utility of the PRECEDE–PROCEED framework for this analysis and addressing helping behaviour in future health promotion interventions and programmes.

In our sample, 65.3% of participants reported ever using an opioid, for both prescription and non-prescription reasons, and 62.4% reported knowing someone who non-medically used opioids. Although national rates of opioid dispensing have decreased in recent years, from 81.3 prescriptions per 100 persons in 2012 to 43.3 per 100 persons in 2020, some states still report higher than average rates of prescription opioid dispensing.[7] For example, in Kentucky where the data for the present study were collected, the dispensing rate in 2020 was 68.2 per 100 persons, mirroring the proportion of participants in the present study who reported ever using an opioid for both prescription and non-prescription reasons.[7] Additionally, over half of the sample reported personally knowing someone who non-medically used opioids, highlighting the magnitude of the overdose epidemic in this region of the country. This demonstrates that there is a continued need for educational programming and health promotion strategies to combat the overdose epidemic in the USA, especially in areas such as Appalachia, which have been hit the hardest and continue to fall behind other regions of the country in reducing opioid non-medical use and dispensing rates.

There were very few differences between participants in this study who reported previous prescription or non-prescription use of opioid medications and those who did not, but there was a higher attitude towards opioid addiction score among participants who reported no previous use when compared with those who had previously used opioid medication. Items in the attitude toward opioid addiction scale assessed factors such as ability to treat addiction, magnitude of the seriousness of the overdose epidemic, and ability to seek help and manage an addiction. Higher scores on this scale were likely reported among those who had no previous opioid use because those participants may not be familiar with the addictive nature of opioid medications and the associated difficulty in overcoming an addiction. It would be important for practitioners and researchers working to address changing attitudes among those who have previous opioid use to increase perceptions of help seeking, management and seriousness of an opioid non-medical use.

Additional differences were found between participants who knew someone who non-medically used opioids when compared with those who did not personally know someone suffering from opioid addiction. Specifically, participants who knew someone who non-medically used opioids had higher knowledge about opioid addiction and the overdose epidemic, more positive attitude about opioid addiction and greater behavioural skills to help someone with an opioid addiction (ie, effective communication, helping with an overdose, referring someone to a health professional). These differences were likely due to their personal experiences or skills they have acquired to potentially assist others with negative outcomes associated with opioid non-medical use, such as an accidental overdose. Additionally, people who did not currently know someone who non-medically used opioids may have been influenced by societal stigma associated with the overdose epidemic, impacting their knowledge and attitude about opioid addiction.[29 40 41] Previous research has linked higher levels of stigma toward people who use prescription opioids to increased support for punitive policies, less support for public health and prevention measures, and a decreased motivation to interact with people who use opioids.[29 31 41] Like the findings in our study, a recent study among US young adults also found that people with less personal experience with opioid use disorder were more likely to exhibit more negative attitudes towards opioid use.[40]

These findings align with current strategies to curb the overdose epidemic in the USA, including the use of naloxone-based interventions to equip bystanders to intervene and administer life-saving medical treatment during an overdose.[27 28] A recent review of naloxone-based interventions showed that these interventions are most effective when framed in a harm reduction context supportive of people who use opioids, in communities where Good Samaritan laws are present, and when societal attitudes towards people who non-medically use opioids are positive.[27] Additionally, aside from encouraging reductions in dispensing of opioid medications, current public health strategies rely on interpersonal relationships and familial influence to help combat the overdose epidemic.[28] This finding is promising but also shows a need to educate people who do not currently know someone who non-medically uses opioids to respond effectively when interacting with individuals with an opioid addiction or in response to an overdose. Future research should continue to explore attitude, knowledge and skills, to develop strategies to increase these important predisposing factors to opioid helping behaviour for the general population.

In the multivariable regression model, we found that predisposing factors, including attitude and behavioural skills to help someone with an opioid addiction, as well as reinforcing and enabling factors, were significantly associated with increased helping behaviour in our sample. The combination of these variables also explained a high proportion of the variance in helping behaviour (44.8%), which is substantial for psychosocial and health behaviour research.[42] This finding is important for two reasons. One, this finding supports the utility of the PRECEDE–PROCEED framework for designing, implementing and evaluating intervention strategies to address opioid addiction in a population with high prevalence of opioid-related morbidity and mortality. Second, these findings provide insight into specific behavioural antecedents that can be incorporated into tailored educational interventions that directly align with the needs of this population of interest.

Predisposing factors, specifically attitude and skills to help someone with an opioid addiction, were associated with greater helping behaviour in this sample. These factors could be incorporated into educational programming to increase helping behaviour to address opioid addiction. In addition to addressing changes in knowledge and attitude through educational strategies, public health education professionals should include public training on how to effectively help someone with a drug overdose, such as using take-home naloxone.[27 28] These types of training have been shown to be an effective strategy to increase skills and helping behaviour in other populations, particularly when structured in a harm reduction context and when delivered in a peer-to-peer format.[43] Peer-to-peer interventions are important strategies to address the overdose epidemic, as these programmes help to engage individuals in addressing the overdose epidemic and aid in rebuilding trust in the healthcare system.[30 44] Public health professionals should consider implementing naloxone-based training, an important predisposing skill to address potential opioid-related overdoses, in communities substantially impacted by the overdose epidemic in order to equip all members of the community to intervene with bystander or peer-to-peer intervention.

Reinforcing factors, operationalised in this study as social support from a variety of sources, were also associated with increased helping behaviour in our sample. Reinforcing factors may include improvements in peer, familial and healthcare provider support to help someone with an opioid addiction. Research has shown that familial as well as healthcare provider support can be a promising strategy to increase the likelihood of helping people with an opioid addiction.[45 46] Research on familial support has shown that interventions should use strategies to increase attitude and knowledge toward prescription opioid non-medical use as well as provide resources and develop skills to help facilitate prevention.[45] Findings from a recent comprehensive literature review on the opioid crisis from the perspective of the healthcare system also supported the need for improved education of healthcare providers, including upstream educational programmes that prepare healthcare providers to better combat the opioid crisis.[46] Public health professionals should work to increase these interpersonal relationships to better equip peers, family members and healthcare professionals to provide appropriate support to those impacted by opioid addiction.

Lastly, the presence of enabling factors in the individual's environment, including community organisations, faith-based organisations, healthcare organisations and other resources, was associated with helping behaviour in this sample. This finding emphasises the need to not only address individual-level factors, such as knowledge and attitude, but also to improve the resources available in the communities where people live. Research on contextual factors that may impact the success of community-based interventions to address opioid use disorders has shown that the health services environment, including the availability and access to substance use services, is an important determinant to successfully address the overdose epidemic.[47] In addition to addressing important predisposing and reinforcing factors, public health professionals working in areas heavily impacted by the overdose epidemic should consider improving the community-level resources available to increase helping behaviour among community members.

This study's focus on helping behaviours presents only one facet of opioid-related harm reduction. Illicit fentanyl is the most proximal causal factor for opioid-related overdose.[8 21] The manufacturing and dissemination of illicit fentanyl, as well as other highly toxic and incredibly harmful synthetic drugs such as P2P methamphetamine, are highly profitable.[48] As such, the presence of these drugs and their associated harms will not be eliminated without continued policy change related to how these drugs, those who use these drugs and their treatment are viewed in the USA (ie, legalisation, decriminalisation and medication-assisted treatment).[49–53]

Limitations

The current study is not without limitations. First, using intercept sampling procedures, data were obtained from a sample of mall patrons. Therefore, the participants in the present study may not be representative of the larger population in the surrounding tri-state Appalachian counties, limiting the generalisability of the study findings. Additionally, due to the intercept sampling strategy used in this study, there may be potential bias in the self-reporting of opioid use in a public setting with a researcher who has not built rapport with the participant. Further, findings from this study should be interpreted as relevant to the sample recruited for this study and not the public, which limits the generalisability of the findings to the larger population. The sample was also predominantly composed of men and young adults (18–30 years of age), further limiting the generalisability of the findings to women and older age groups. Second, all data

were collected using self-report measures. This limitation may increase the likelihood of response bias, including social desirability, which may have impacted the findings in the analysis. Specifically, social desirability may have prevented some participants from feeling comfortable answering the items related to their personal non-medical use of opioids. Third, the Cronbach's alpha for the attitudes concerning opioid addiction subscale was low, raising concerns about the subscale's internal consistency reliability. As a result, caution should be used while interpreting the results pertaining to this variable. Last, because the study was cross-sectional, it was impossible to make any conclusions about causation or directionality between the variables. Future studies should employ longitudinal study designs or implement interventions to overcome this limitation.

CONCLUSIONS

The findings from this study provide crucial information about the characteristics that predispose, enable and reinforce helping behaviour among residents in Appalachia, an area that has been severely impacted by the USA overdose epidemic. Our findings highlight important factors, including attitude, skills, reinforcing and enabling factors, that can directly inform the development of intervention strategies to address helping behaviour related to opioid addition. Public health professionals working to address the overdose epidemic should consider all influences on helping behaviour, including individual-level predisposing factors, interpersonal reinforcing factors and community-level enabling factors to develop intervention strategies and programmes that directly reflect the needs of their population of interest. A logical next step in this stream of research is the development and testing of intervention strategies to address the predisposing, enabling and reinforcing factors associated with helping behaviour for opioid non-medical use. Future research should aim to translate these findings to the development of public health programming. Since the findings from this study may only be generalisable to people residing in the tri-county Appalachian region of the USA where the data were obtained, more research is needed to explore characteristics related to helping behaviour in other groups of interest.

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