Drug and Alcohol Dependence 247 (2023) 109866

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

# Predictors of substance use disorder symptoms among women in Katsina State, Nigeria

Martin Osayande Agwogie [a,1], Wendy Kliewer [b,*,2], Muhammed Bashir Ibrahim [c]

[a] Global Initiative on Substance Abuse (GISA), Lagos, Nigeria
[b] Department of Psychology, Virginia Commonwealth University, Richmond, VA, United States
[c] National Drug Law Enforcement Agency (NDLEA), Nigeria

ARTICLE INFO

*Keywords:*
Nigeria
Women
Substance use disorder
Adverse childhood experiences
Risk factors
Protective factors

ABSTRACT

*Background:* Problems associated with substance use are on the rise among women in northern Nigeria, creating a need to understand factors contributing to this trend.
*Method:* Data on substance use, symptoms of substance use disorder (SUD) using DSM-5 criteria, and risk and protective factors associated with SUD symptoms, including adverse childhood experiences (ACE), were collected in a community-based study of young adult women ($M$ age = 25.76, $SD$ = 4.71 years) from Katsina State.
*Results:* The analytic sample included 360 women with valid SUD symptom data. SUD symptoms were correlated in expected directions with the majority of risk and protective factors, including ACE. A hierarchical linear regression analysis predicting SUD symptoms revealed that age, ACE, and peer drug use were uniquely associated with higher levels of SUD symptoms; more education and endorsing a positive relationship with parents was associated with fewer SUD symptoms. Notably, ACE remained a unique contributor to SUD symptom totals in the context of protective factors and additional risk factors, although the association of ACE and SUD symptoms was attenuated.
*Conclusions:* These data illustrate the enduring impact of ACE on risk for SUD symptoms in women, and the protective role that a positive relationship with parents may play in reducing this risk. Further, these patterns of findings reveal the utility of assessing risk and protective factors across multiple life domains to gain a comprehensive picture of risk for SUD symptoms in women.

## 1. Introduction

Recent data from the first comprehensive drug use survey conducted in Nigeria indicate that 14.3 million adults aged 15–64, representing 14.4% of the national population, used at least one psychoactive substance other than tobacco or alcohol in the prior year (United Nations Office on Drugs and Crime, 2019). One in five of these individuals has a substance use disorder (SUD), a rate more than twice the global average (United Nations Office on Drugs and Crime, 2019, 2020), with one in four persons who use drugs in Nigeria being a woman, which is a growing concern among government officials (United Nations Office on Drugs and Crime, 2019; World Health Organization, 2019).

Consistent with worldwide trends, more men than women in Nigeria use drugs. However, the gender gap in the non-medical use of prescription opioids, tranquilizers, and cough syrup containing codeine is less pronounced (United Nations Office on Drugs and Crime, 2019). The narrowing of this gender gap and the overall increase in drug use among women in Nigeria are particularly concerning, given the unique consequences of drug use for women and limited utilization of drug treatment facilities due to social and structural barriers (Ebigbo et al., 2012; Nelson, Abikoye, 2019). For example, while one of every four persons who use drugs in Nigeria is a woman, only one out of twenty persons in treatment for drug use is a woman (United Nations Office on Drugs and Crime, 2019, 2022). Further, while substance misuse is harmful for everyone, relative to men, women who misuse alcohol and other drugs progress more rapidly than men from substance use to dependence to

*Abbreviations:* ACE, Adverse childhood experiences; SUD, Substance use disorder; DSM, Diagnostic and Statistical Manual of Mental Disorders.

* Correspondence to:Department of Psychology, Virginia Commonwealth University, P.O. Box 842018, Richmond, VA23284-2018, United States
*E-mail address:* wkliewer@vcu.edu (W. Kliewer).
[1] 0000-0003-0132-6195
[2] 0000-0003-0046-203x

https://doi.org/10.1016/j.drugalcdep.2023.109866
Received 17 September 2022; Received in revised form 12 March 2023; Accepted 3 April 2023
Available online 5 April 2023

first treatment episode, and are at greater risk for developing medical and psychological problems (Polak et al., 2015; United Nations Office on Drugs and Crime, 2021).

There is strong evidence linking a range of risk and protective factors to substance misuse and SUDs in early adulthood (Substance Abuse and Mental Health Services Administration, 2019). For example, antisocial behavior, family conflict, substance use by friends, availability of substances, and laws and norms favorable to substance use are all specific risk factors that are linked to substance misuse in the period of young adulthood. However, few of these studies have examined adverse childhood experiences (ACE) in concert with other known risk factors in the individual, peer, family, and community domains. This is despite the fact that there is a growing literature linking ACE and health behaviors, including substance misuse (Zarse et al., 2019). Further, relative to studies worldwide, research examining the associations of ACE and health outcomes have been carried out less frequently in sub-Saharan Africa (Amone-P'Olak and Letswai, 2020; Manyema and Richter, 2019; Naicker et al., 2022). Reviews of prevalence rates of ACE across countries have reported fewer ACE on average in high-income compared to low- and middle-income countries (Hughes et al., 2017). ACE are important to investigate because they reflect exposure to stressors in childhood and adolescence that may have enduring consequences on health and health behaviors beyond contemporary risk and protective factors. It also is important to understand whether the presence of risk and protective factors accounts for associations between ACE and health behaviors, such as substance misuse, or contributes additional information about risk factors.

The present study was located in Katsina State, Nigeria. Katsina State is comprised of urban-rural communities in the North-West geo-political zone of Nigeria with a population of over 5.8 million, predominantly Muslim Hausa and Fulani inhabitants (Katsina State, 2022). Katsina State is one of the seven states in the North-West of Nigeria with high prevalence (estimated at 12%) of cannabis and non-medical use of tramadol and cough syrup containing codeine (United Nations Office on Drugs and Crime, 2019) – a rate more than twice that observed worldwide. Access to drug use treatment services is difficult (United Nations Office on Drugs and Crime, 2019). Despite the high prevalence of substance use in Katsina State, preventive interventions in Nigeria are still limited to conveying knowledge about risks associated with substance use and one-off activities, with no particular attention to the risk and protective factors for drug use (Agwogie and Bryant, 2021; Chinelo, 2021). Even though evidence-based programs such as the school-based prevention program "Unplugged" (Vigna-Taglianti et al., 2021) have been approved in Nigeria, only three of the 36 states and the federal capital territory have implemented Unplugged (Ibanga, 2022); Katsina State is one of the states that has yet to adopt the program. Thus, government officials are particularly concerned about substance use and misuse patterns in this region, and the risk and protective factors associated with use.

Studies in other parts of the world have investigated gender-specific risk and protective factors associated with drug use among women (Cheong et al., 2022; Stevens et al., 2009; Stevens-Watkins et al., 2012). Similar studies, particularly in Katsina State and the northern parts of Nigeria, are lacking despite the growing prevalence of drug use and barriers to treatment. In order to better understand the context of substance misuse and SUDs among young women in northern Nigeria, we investigated protective factors and risk factors, including ACE, in a community sample of young women. Risk and protective factors were included due to known associations with substance misuse in prior studies both inside and outside of the United States (Kliewer et al., 2019; Ocaña-Gordillo and Kliewer, 2022; Razali and Kliewer, 2015; Substance Abuse and Mental Health Services Administration, 2019; Wan et al., 2019). Based on prior research linking a range of risk and protective factors to substance misuse and SUDs (McGue et al., 2014; Substance Abuse and Mental Health Services Administration, 2019), we anticipated that higher levels of antisocial behavior, easier perceived access to substances, more peer substance use, greater family disharmony, and higher levels of ACE would be positively associated with SUD symptoms, while higher levels of morality and religiosity and strong positive bonds with parents, other family members, and the community would be negatively associated with SUD symptoms.

## 2. Methods

### 2.1. Participants

All procedures were approved by the Katsina State Health Research Ethics Committee, and were carried out in accordance with the Code of Ethics of the World Medical Association. Women aged 18–35 who had valid outcome data ($N = 360$) comprised the analytic sample. The African Youth Charter, adopted in 2006, defines youth or young people as individuals between the ages of 15 and 35 (African Union, 2006). Study participation was voluntary, and no compensation was provided.

### 2.2. Procedures

In order to gain an understanding of the epidemiology surrounding substance use and misuse by women in Katsina State, Nigeria, multiple sampling strategies were used to recruit participants. Females ages 15–35 who resided in Katsina State and who could read and write English were eligible. (Subsequently women under age 18 were excluded from the analytic sample.) Participants were recruited by survey administrators with experience in drug use counseling. All staff were trained prior to participant recruitment to identify circumstances that could compromise the survey responses, such as intoxication or incoherent communication. Potential participants who were incoherent or intoxicated were excluded from the study. Snowball sampling (Goodman, 1961) was used to recruit women who use drugs. Under this procedure, women who use drugs were first approached by the survey administrators at drug using joints. After explaining the objectives of the survey, those women who agreed to participate were handed the survey instructions and a consent form to sign. Each respondent was asked if she were willing to invite friends who use drugs to participate in the survey. Door knocking (Edwards et al., 2022; Qadir et al., 2005; Zhou et al., 2015) and availability (Frey, 2018) were used to recruit additional participants who were not known drug users. Potential participants were approached in their homes, work settings, social gatherings, and service centers. To minimize bias, only one participant per family was admitted into the study. Once an eligible woman was identified, the survey was explained and the consent form signed. After being enrolled in the study, survey administrators identified 5% of the sample who could not read English. Given difficulties in recruitment, in order to retain these participants, the survey administrators, who were fluent in the Hausa language, read the questions to them. Survey administrators collected the surveys upon completion. Across all recruitment methods, 94% of women approached agreed to participate.

### 2.3. Measures

All measures were in printed English and were self-reported.

#### 2.3.1. Substance use and substance use disorder (SUD) symptoms

Participants answered questions about lifetime, past year, and past month use of cigarettes, shisha, alcohol, cannabis, methamphetamine, cocaine, heroin, khat, solvents or inhalants, and the following substances without a doctor's prescription: amphetamines, tramadol, diazepam, rohypnol, cough syrup containing codeine, Librium, morphine, and pentazocine. Responses options were 0 (*never*), 1 (*1 or 2 times*), 2 (*3–5 times*), 3 (*6–9 times*), 4 (*10–19 times*), 5 (*20–30 times*), and 6 (*40 or more times*). Age at which substances were first used, and the first substance tried, also were reported.

Questions corresponding to the 11 symptoms of SUD from the

*Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) were asked using a yes-no response format. For each symptom, a positive response to a question was coded 1. The DSM-5 includes four questions on impaired control over substance use, three questions on social impairment, two questions on risky use, and two questions on tolerance and withdrawal, for a possible range of 0–11.

#### 2.3.2. Risk and protective factors

Risk and protective factors were assessed with an adaptation of the *Communities That Care* (CTC; Arthur et al., 2007) measure that previously had been used in Nigeria and several other low- and middle-income countries. The measure was adapted slightly for the sample. Risk and protective factors were assessed across multiple domains, including individual, peer, parenting/family, and community contexts. In the northern Nigerian context, which is largely Muslim, parental and familial influence extends well into adulthood, and often persists even if a woman is married with children (Alabi et al., 2020; Heaton and Hirschl, 1999). Thus, special consideration was paid to the questions on parenting and family influences on substance use.

The World Health Organization (WHO) *Adverse Childhood Experiences International Questionnaire* (ACE-IQ; World Health Organization, 2018) was used to measure ACEs. The ACE-IQ consists of questions covering 13 domains, including family dysfunction; physical, sexual and emotional abuse and neglect by parents or caregivers; peer violence; witnessing community violence, and exposure to collective violence. Designed for people ages 18 and older through input from a task force, the ACE-IQ is intended to measure ACEs in all countries. Available data from low- or middle-income countries indicate the ACE-IQ is reliable and valid (cf. Kidman et al., 2019). In the present study 12 of the 13 domains were assessed and the binary coding method was used, with participants receiving a score of 1 for each ACE they endorsed, for a possible range of 0–12.

#### 2.3.3. Demographics

Participants' age, marital status, religious affiliation, and educational and employment histories were collected.

### 2.4. Data analysis

Analyses were conducted using SPSS version 27. Descriptive information on the sample is presented first, followed by information on lifetime, past year, and past month substance use; prevalence of SUD symptoms; and risk and protective factors. Bivariate correlations among the study constructs is presented next, followed by a stepwise hierarchical linear regression predicting SUD symptom scores. Only risk and protective factors that were significantly associated with SUD symptoms in the bivariate analyses were included in the regression analysis. The regression model was evaluated for tolerance and Variance Inflation Factor (VIF). Two predictors with unacceptable tolerance and VIF values were excluded from the final model. Variables were added to the model in a stepwise fashion. Demographic variables were entered on step 1; ACE was entered on step 2 to evaluate the unique contribution of ACE prior to considering other risk factors. The remaining risk factors were entered on step 3, and protective factors were entered on the final step.

## 3. Results

### 3.1. Descriptive and bivariate analyses

Descriptive information on the sample is seen in Table 1. The majority of the sample was Muslim (89%), single (57%), and many women had education beyond secondary school (45%). Table 2 presents descriptive information on lifetime, past year, and past month substance use. As seen in the table, substances with the most frequently reported use were tobacco, shisha (which can include tobacco and other substances), and cough syrup with codeine. Regarding SUD symptoms, approximately one-fourth of the sample endorsed each SUD symptom. Overall, out of a possible range of 0–11, the SUD symptom mean was 2.86 ($SD = 4.17$). Overall SUD symptom scores were correlated with age ($r = 0.20$, $p < 0.001$) and education ($r = -0.30$, $p < 0.001$), and differed by religious affiliation, $t(358) = 4.55$, $p < 0.001$. Women endorsing the Islamic faith had higher SUD symptom scores ($M = 3.09$, $SD = 4.26$) than women endorsing the Christian faith ($M = 0.92$, $SD = 2.58$). However, there were no SUD symptom differences between women who were married versus not married, $t(358) = 1.59$, $p = .11$. Table 3 presents information on ACE and the risk and protective factor subscales. Sample items, number of items in each measure, Cronbach alphas, the possible range of scores, and means and standard deviations are presented. With the exception of mobility (alpha =0.68), all scales had internal

**Table 1**
Demographic information on the analytic sample ($N = 360$).

| | *M* | *SD* |
|---|---|---|
| Age | 25.76 | 4.71 |
| | *n* | Valid % |
| Marital status | | |
| Single | 204 | 56.8 |
| Married | 112 | 31.2 |
| Divorced | 30 | 8.4 |
| Separated | 5 | 1.4 |
| Widowed | 8 | 2.2 |
| Education – highest level | | |
| No formal education or schooling | 21 | 5.8 |
| Completed primary school | 13 | 3.6 |
| Some secondary school | 54 | 15.0 |
| Completed secondary school | 109 | 30.3 |
| Some higher education, vocational, or trade school | 74 | 20.6 |
| Completed University | 89 | 24.7 |
| Employment | | |
| Work with the government | 33 | 9.2 |
| Work in a private organization or NGO | 43 | 12.0 |
| Self-employed | 69 | 19.2 |
| Apprentice or learning a trade | 10 | 2.8 |
| Housewife | 35 | 9.7 |
| Student | 102 | 28.4 |
| Not employed | 67 | 18.7 |
| Religious Affiliation | | |
| Islam | 321 | 89.2 |
| Christianity | 39 | 10.8 |

*Note.* $M$ = Mean; $SD$ = Standard Deviation; $n$ = Sample Size.

**Table 2**
Descriptive information on lifetime, past year, and past month substance use.

| | Lifetime *M* (*SD*) | Past Year *M* (*SD*) | Past Month *M* (*SD*) |
|---|---|---|---|
| **Tobacco (Cigarettes)** | 1.66 (2.58) | 1.43 (2.25) | 1.21 (2.08) |
| **Shisha** | 1.15 (2.16) | 1.12 (2.11) | 0.85 (1.74) |
| **Alcohol** | 0.81 (1.91) | 0.65 (1.60) | 0.49 (1.27) |
| **Cannabis** | 0.68 (1.69) | 0.59 (1.61) | 0.54 (1.45) |
| **Solvents/Inhalants** | 0.45 (1.29) | 0.37 (1.15) | 0.19 (0.86) |
| **Methamphetamine** | 0.32 (1.02) | 0.21 (0.82) | 0.15 (0.70) |
| **Cocaine** | 0.34 (1.03) | 0.24 (0.80) | 0.16 (0.77) |
| **Heroin** | 0.31 (0.90) | 0.21 (0.72) | 0.12 (0.60) |
| **Khat** | 0.31 (0.90) | 0.25 (0.82) | 0.12 (0.61) |
| **Without a prescription:** | | | |
| **Cough Syrup with Codeine** | 1.16 (2.14) | 1.14 (2.10) | 0.95 (1.97) |
| **Tramadol** | 0.50 (1.34) | 0.40 (1.28) | 0.32 (1.15) |
| **Amphetamines** | 0.30 (0.96) | 0.20 (0.86) | 0.13 (0.68) |
| **Diazepam** | 0.33 (0.96) | 0.30 (0.97) | 0.19 (0.83) |
| **Rohypnol** | 0.41 (1.15) | 0.33 (1.00) | 0.23 (0.90) |
| **Librium** | 0.25 (0.85) | 0.22 (0.78) | 0.10 (0.56) |
| **Morphine** | 0.28 (0.83) | 0.21 (0.74) | 0.13 (0.65) |
| **Pentazocine** | 0.30 (0.88) | 0.27 (0.82) | 0.14 (0.70) |

*Note.* Response options were: 0 (never), 1 (1 or 2 times), 2 (3–5 times), 3 (6–9 times), 4 (10–19 times), 5 (20–30 times), and 6 (40 or more times). *N*s ranged from 313 to 358 due to missing data.

**Table 3**
Risk and protective factor constructs: descriptive information.

| Construct | Sample Item | # items | Cronbach Alpha | Possible range | *M* | *SD* |
|---|---|---|---|---|---|---|
| **Risk Factors** | | | | | | |
| Adverse Childhood Experiences (ACE) | Before the age of 18, did a parent, guardian or other household member spank, slap, kick, punch or beat you up? | 12 | n/a | 0–12 | 3.43 | 2.72 |
| Acceptance of antisocial behavior | How wrong is it for women to smoke shisha? | 20 | 0.96 | 1 – 4 | 1.23 | 0.38 |
| Easy access to substances | How difficult do you think it would be for you to get tramadol, if you wanted? | 18 | 0.96 | 1 – 5 | 2.47 | 0.95 |
| Depressed affect | All in all, I am inclined to think that I am a failure. | 4 | 0.83 | 1 – 5 | 3.06 | 1.10 |
| Peer substance use: Average # of 4 best friends who use drugs or alcohol | In the past year, how many of your four best friends have used solvents or inhalants? | 16 | 0.94 | 0 – 4 | 0.34 | 0.61 |
| Peer antisocial behavior: Average # of 4 best friends who engaged in antisocial behavior | In the past year, how many of your four best friends have stolen money, jewelry, etc.? | 3 | 0.72 | 0 – 4 | 0.27 | 0.57 |
| Mobility: Frequency of changing homes and schools since age 5 and in the past year | How many times have you changed homes since you were 5 years old? | 3 | 0.68 | 0–4 | 0.45 | 0.58 |
| Negative relationship with parents prior to age 18 | During your first 18 years of life, how often did your parents or guardians not respect you as a person (for example, not let you talk or favor someone else more than you)? | 7 | 0.84 | 1 – 5 | 2.10 | 0.84 |
| **Protective Factors** | | | | | | |
| Perceived harm associated with substance use | How much do you think ladies/women risk harming themselves (physically or in other ways) if they smoke or take cannabis? | 17 | 0.97 | 1 – 4 | 3.69 | 0.64 |
| Morality: Disapproval of aggression, theft, cheating | I think it is okay to take something without asking if you can get away with it. (reverse coded) | 3 | 0.81 | 1 – 5 | 3.55 | 1.18 |
| Personal religiosity | My faith in God helps me through hard times. | 5 | 0.93 | 1 – 4 | 3.78 | 0.43 |
| Positive peer behavior: Average # of 4 best friends who engaged in positive behavior | In the past year, how many of your four best friends have attended religious services? | 3 | 0.78 | 0 – 4 | 0.76 | 1.09 |
| Positive relationship with parents prior to age 18 | During your first 18 years of life, how often did your parents or guardians support and encourage you? | 13 | 0.97 | 1 – 5 | 3.62 | 1.06 |
| Parental solicitation of information prior to age 18 | During your first 18 years of life, how often did your parents or guardians try to know where you went at night? | 4 | 0.92 | 1 – 5 | 3.41 | 1.30 |
| Actual parental knowledge of activities prior to age 18 | During your first 18 years of life, how often did your parents or guardians really know who your friends were? | 6 | 0.93 | 1 – 5 | 3.41 | 1.29 |
| Parental disapproval of alcohol, tobacco, or other drug use | How wrong do your parents/guardians think it would be for you to use medicines like tramadol, rohypnol, codeine in cough sirup, etc. without a doctor's prescription? | 4 | 0.94 | 1 – 4 | 3.78 | 0.48 |
| Sense of connection to and cohesion within the community | I feel close to people in my community. | 6 | 0.93 | 1 – 5 | 4.02 | 0.74 |
| Community disapproval of drug use | How wrong do people in your community/ neighborhood think it would be for ladies/women to smoke cigarettes or shisha? | 4 | 0.88 | 1–4 | 3.74 | 0.43 |

*Note.* $M$ = Mean; $SD$ = Standard Deviation. Mean item scores are presented in the table.

reliabilities above.70.

Bivariate correlations between SUD symptoms, risk factors, and protective factors are displayed in Table 4. SUD symptoms were correlated weakly to moderately in expected directions with most of the risk and protective factors. SUD symptoms were not correlated with mobility, a negative relationship with parents, perceived harm from substance use, or positive peer behavior. Likewise, ACE were correlated in expected directions with most of the risk and protective factors except positive peer behavior and community cohesion. In general, community factors were less strongly associated with either SUD symptoms or ACE relative to factors in the individual, peer, and family domains.

### 3.2. Multivariate analyses

Finally, Table 5 presents results from the stepwise hierarchical regression analysis predicting variation in SUD symptom scores. As seen in Table 5, the final model explained 47% of the variation in SUD symptoms, $F(15, 359) = 22.25$, $p < 0.001$. Age was positively associated with SUD symptoms and education was negatively associated with SUD symptoms in every step of the model ($b = 0.13$, $p = .002$ for age at step 4; $b = -0.14$, $p = .001$ for education at step 4). ACE was likewise positively associated with SUD symptoms when it was initially entered into the model and in every subsequent step, although the association between ACE and SUD symptoms weakened as additional risk and protective factors were added to the model ($b = 0.47$, $p < 0.001$ at step 2; $b = 0.29$, $p = .001$ at step 3; $b = 0.20$, $p = .001$ at step 4). Peer substance use was associated positively with SUD symptoms at both the third and final step of the regression ($b = 0.41$, $p < 0.001$ at step 4), and a positive relationship with parents was significantly negatively associated with SUD symptoms ($b = -0.18$, $p = .002$ at step 4).

## 4. Discussion

This community-based study of women in northern Nigeria revealed significant levels of SUD symptoms, with use of tobacco, shisha, cough syrup with codeine, alcohol, and tramadol reported most often. The use and misuse of cough syrup with codeine, along with misuse of shisha and tramadol is consistent with national data from Nigeria (United Nations Office on Drugs and Crime, 2019). Shisha use is a growing epidemic, and scholars have called for public health interventions, including legislation, to combat it (Kanmodi and Kanmodi. 2020).

A key finding to emerge from the study was that in the context of other risk and protective factors in the individual, family, peer, and community domains, ACE were uniquely associated with higher levels of SUD symptoms in this sample of young Nigerian women. This data is consistent with other research linking ACEs to substance misuse (Hughes et al., 2017; Zarse et al., 2019), but extends research findings by demonstrating that even in the context of other risk factors and protective factors, ACE are a powerful contributor to SUD symptoms.

In addition to ACE, other unique contributors to SUD symptoms included age, educational attainment, peer substance use, and a positive relationship with parents. These results are consistent with several studies assessing risk substance misuse or SUD (Ocaña-Gordillo and Kliewer, 2022; Razali and Kliewer, 2015; Wan et al., 2019). For example, in a nationally representative study of Ecuadorian girls, some of these same factors – specifically age and friends' drug use – were unique predictors of problematic marijuana use (Ocaña-Gordillo and Kliewer, 2022). Collectively, the findings on risk factors in this study

**Table 4**
Correlations among the risk factors, protective factors, and SUD symptoms assessed in the study.

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 1 SUD symptoms | 0.55*** | 0.24*** | 0.15** | 0.29*** | 0.56*** | 0.32*** | 0.10 | 0.01 | -.01 |
| 2 ACE | – | .28*** | 0.15** | 0.46*** | 0.48*** | 0.29*** | 0.13* | 0.13* | -.23*** |
| 3 Acceptance of antisocial behavior | | – | .06 | 0.16** | 0.31*** | 0.26*** | 0.03 | 0.09 | -.25*** |
| 4 Easy access to substances | | | – | .09 | 0.11* | 0.02 | -.01 | 0.22*** | -.11* |
| 5 Depressive affect | | | | – | .32*** | 0.22*** | -.06 | 0.12* | -.28*** |
| 6 Peer substance use | | | | | – | .64*** | 0.12* | 0.17*** | -.14** |
| 7 Peer antisocial behavior | | | | | | – | .17*** | 0.13* | -.10 |
| 8 Mobility | | | | | | | – | .23*** | 0.05 |
| 9 Negative relationship with parents | | | | | | | | – | -.01 |
| 10 Perceived harm | | | | | | | | | – |
| 11 Morality | | | | | | | | | |
| 12 Personal religiosity | | | | | | | | | |
| 13 Positive peer behavior | | | | | | | | | |
| 14 Positive relationship with parents | | | | | | | | | |
| 15 Parental solicitation | | | | | | | | | |
| 16 Parental knowledge | | | | | | | | | |
| 17 Parental disapproval of drug use | | | | | | | | | |
| 18 Community cohesion | | | | | | | | | |
| 19 Community disapproval of drug use | | | | | | | | | |

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|
| 1 SUD symptoms | -0.37*** | -0.18*** | -.02 | -0.54*** | -.58*** | -.57*** | -0.15** | -.11* | -0.15** |
| 2 ACE | -0.54*** | -0.20*** | -.04 | -0.66*** | -.54*** | -.53*** | -0.12* | -.03 | -0.15** |
| 3 Acceptance of antisocial behavior | -0.20*** | -0.25*** | -.02 | -0.26*** | -.20*** | -.18*** | -0.18*** | -.07 | -0.26*** |
| 4 Easy access to substances | -0.06 | -0.07 | -.14** | -0.16** | -.09 | -.14** | -0.10 | -.12* | -0.13* |
| 5 Depressive affect | -0.64*** | -0.12* | -.05 | -0.35*** | -.28*** | -.24*** | -0.10 | 0.12* | -0.10* |
| 6 Peer substance use | -0.44*** | -0.08 | -22*** | -0.40*** | -.42*** | -.38*** | -0.22*** | -.06 | -0.21*** |
| 7 Peer antisocial behavior | -0.27*** | -0.01 | 0.31*** | -0.24*** | -.18*** | -.18*** | -0.11* | -.10 | -0.14** |
| 8 Mobility | 0.02 | 0 | 0 | -0.14** | 0 | -.02 | 0.03 | -.18*** | 0.05 |
| 9 Negative relationship with parents | -0.22*** | 0.12* | -.03 | 0 | 0.01 | 0.08 | -0.01 | 0.13* | -0.03 |
| 10 Perceived harm | 0.33*** | 0.29*** | 0.01 | 0.26*** | 0.17*** | 0.19*** | 0.09 | -.04 | -0.13* |
| 11 Morality | – | 0.20*** | 0.07 | 0.43*** | 0.37*** | 0.37*** | 0.07 | -.13* | 0.09 |
| 12 Personal religiosity | | – | 0.14** | 0.34*** | 0.27*** | 0.31*** | 0.19*** | 0.11* | 0.21*** |
| 13 Positive peer behavior | | | – | .06 | 0.06 | 0.09 | 0.05 | -.05 | -0.07 |
| 14 Positive relationship with parents | | | | – | .69*** | 0.71*** | 0.09 | 0.12* | 0.09 |
| 15 Parental solicitation | | | | | – | .93*** | 0.14** | 0.08 | 0.20*** |
| 16 Parental knowledge | | | | | | – | .15** | 0.09 | 0.18*** |
| 17 Parental disapproval of drug use | | | | | | | – | .21*** | 0.53*** |
| 18 Community cohesion | | | | | | | | – | .23*** |
| 19 Community disapproval of drug use | | | | | | | | | – |

Note. SUD = Substance Use Disorder. *$p$ <0.05' **$p$ <0.01; ***$p$ <0.001.

**Table 5**
Hierarchical regression results predicting SUD symptom scores.

| | Step 1 | | Step 2 | | Step 3 | | Step 4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | *b* | *p* | *b* | *p* | *b* | *p* | *b* | *p* | Tolerance | VIF |
| Age | **0.23** | **<0.001** | **0.15** | **0.001** | **0.14** | **0.004** | **0.13** | **0.002** | 0.89 | 1.13 |
| Islamic faith | **0.11** | **0.03** | 0.09 | 0.05 | 0.07 | 0.07 | 0.08 | 0.06 | 0.91 | 1.11 |
| Education | **-.30** | **<0.001** | **-.17** | **<0.001** | **-.18** | **<0.001** | **-.14** | **0.001** | 0.77 | 1.31 |
| Adverse childhood experiences | | | **0.47** | **<0.001** | **0.29** | **<0.001** | **0.20** | **0.001** | 0.44 | 2.27 |
| Acceptance of antisocial behavior | | | | | 0.02 | 0.64 | -0.01 | 0.88 | 0.79 | 1.26 |
| Easy access to substances | | | | | 0.05 | 0.18 | 0.04 | 0.33 | 0.94 | 1.07 |
| Depressive affect | | | | | -0.03 | 0.53 | -0.02 | 0.69 | 0.56 | 1.80 |
| Peer substance use | | | | | **0.42** | **<0.001** | **0.41** | **<0.001** | 0.45 | 2.24 |
| Peer antisocial behavior | | | | | -0.06 | 0.24 | -0.07 | 0.19 | 0.56 | 1.78 |
| Personal religiosity | | | | | | | 0 | 0.96 | 0.79 | 1.27 |
| Morality | | | | | | | -0.01 | 0.92 | 0.46 | 2.18 |
| Positive relationship with parents | | | | | | | **-.18** | **0.002** | 0.45 | 2.22 |
| Parental disapproval of substance use | | | | | | | 0.01 | 0.83 | 0.68 | 1.47 |
| Community cohesion and connection | | | | | | | -0.06 | 0.19 | 0.85 | 1.18 |
| Community disapproval of drug use | | | | | | | 0 | 0.97 | 0.65 | 1.53 |

*Note*. SUD = Substance Use Disorder. b = Standardized beta weight. VIF = Variance Inflation Factor. Only predictor variables that were correlated significantly with SUD total symptoms in bivariate correlational analyses were included in the model. Two predictor variables with unacceptable tolerance and VIF values were removed from the model. Final model: $F(15, 359) = 22.25$, $p$ <0.001. Adjusted $R^2$ =.47.

spanned individual, family, and peer domains, highlighting the importance of a comprehensive assessment of risk.

An important finding that emerged from this study relates to factors that protect against SUD symptoms. As our findings illustrate, having a positive relationship with parents prior to age 18 was associated with a lower levels of SUD symptoms. This finding is consistent with research highlighting the important role of protective factors in drug use prevention (United Nations Office on Drugs and Crime and the World

Health Organization, 2018). The inclusion of protective factors attenuated the association between ACE and SUD symptoms, although ACE were still significantly associated with SUD symptoms with all other risk factors and protective factors in the model. Because the relations between ACE and SUD symptoms are probabilistic, it is important to understand assets that potentially mitigate the association of ACE with SUD symptom risk.

### 4.1. Study strengths and limitations

The study had several strengths including assessment of both protective factors and risk factors, including ACE, and their associations with SUD symptoms, and a focus on young women. Despite these strengths, several limitations should be noted. Only self-report survey data was collected; thus mono-source and mono-method biases are likely. The lack of a clinical assessment of SUD symptoms meant a reliance on participant's interpretation of the SUD symptom questions. Further, in order to reduce participant burden, our SUD symptom questions were not asked separately for each drug a woman reported using, which would have significantly lengthened the survey. Rather, the SUD symptom questions were asked generally (e.g., "In the past 12 months, have you ever taken illegal drugs/substances or controlled medications in a larger amount than what you intended?"). This procedure, while providing data on SUD symptoms overall, amalgamates symptoms across different drugs, effectively weighing each drug the same. This procedure also does not capture the extent to which the same symptom applies to multiple drugs. Thus, in all likelihood, the level of impairment reported by the women who used drugs in our sample was underreported. Inspection of the data revealed that nearly a quarter of the sample (24.3%) reported using three or more different substances in the previous year, supporting this notion. Future research, to the extent possible, should assess SUD symptoms separately for different drugs. Regarding our design, the study was cross-sectional; thus, we are unable to quantify changes in SUD symptoms over time. Additionally, the door knocking sampling procedure was not without challenges. As predominantly Muslim communities with restricted access to family dwellings, establishing contact with the respondents at home was particularly challenging. The use of mostly female survey administrators helped to minimize this challenge. Similarly, there were security concerns in some quarters especially with the palpable security situation in the state. Thus, the sample may not be representative of young women in northern Nigeria. Lastly, the survey included questions on Shisha, but there is a lot of variability among individual who use Shisha in terms of the substance consumed. Originally, shisha was a method of smoking tobacco (Abraham et al., 2019; Kadhum et al., 2015), but this has changed in multiple ways and across societies including Nigeria. The substance smoked has developed from usual tobacco to the addition of flavors with romantic allure and consumption of other psychoactive substances including cannabis (Abraham et al., 2019; Akl et al., 2015). Shisha has gradually become popular and preferred method of drug consumption in Nigeria (Abraham et al., 2019). This is particularly worrisome considering the high level of ingenuity in drug use in Nigeria (Agwogie, 2022).

### 4.2. Implications for research, practice, and policy

Our data suggest several avenues for both research and policy related to the prevention of SUD symptoms. First, given that risk and protective factors differ across cities and communities, it would be beneficial to conduct a similar survey across Katsina State and in other regions in Nigeria. Results might be shared with community stakeholders in order to hear their views and interpretations of the study findings. In terms of practice and policy, given that SUD symptoms were associated with risk and protective factors in differ life domains, a comprehensive substance misuse prevention strategy should be developed that involves families and communities, including faith-based settings. Parents, couples, spiritual leaders, and community leaders should participate in the development of this strategy, given evidence for the effectiveness of community coalition building (Nagorcka-Smith et al., 2022; Siervo, 2019; Yang et al., 2012). One particular strategy that could be employed is to develop the capacity of major stakeholders in the state as Champions of Substance Use Prevention. In doing so, special care should be taken to involve women and to train them as community advocates and influencers for positive parenting. At a broader level, existing policies regarding the sale and consumption of tobacco, shisha, alcohol, and cough syrup in the state should be reviewed and changes suggested that would reduce substance use. In summary, this study of correlates of SUD symptoms in young women living in northern Nigeria revealed that age, educational attainment, ACE, peer substance use, and a positive relationship with parents prior to age 18 were uniquely linked to SUD symptoms. A multi-faceted approach that reduces risk and bolsters protective factors across the domains of women's lives is needed to address the issue of women's substance misuse.

## Funding

Funds for the survey was provided by the Global Initiative on Substance Abuse (GISA) and the National Drug Law Enforcement Agency (NDLEA) Katsina State Command.

## Author contributions

MOA provided background information for the survey, conducted literature searches, wrote portions of the introduction, and supervised data entry and cleaning. WK conducted literature searches, conceptualized the research approach, conducted the analyses, and wrote the first draft of the manuscript. MBI assisted with identifying measures for the project, facilitated the ethical approval process, supervised the data collection process, wrote portions of the manuscript, and edited the manuscript. All authors met criteria for authorship as recommended by ICMJE and approved the final version of the manuscript prior to submission.

## Declaration of Competing Interest

No conflict declared.

## Acknowledgments

We thank the Global Initiative on Substance Abuse (GISA) and the National Drug Law Enforcement Agency (NDLEA) Katsina State Command for funding the survey; the NDLEA staff and volunteers who administered the questionnaires led by Hanatu Mohammed, Nuradeen Salisu, Aishat J. Suleiman, Zainab Isah Ibrahim, Shadrach Haruna, Aliyu Abubakar, Asma'u Almu, Hauwau Abdullahi Yusuf, Vasty Moses, Ataka Elisha, Hassan Dahiru and Safiya Yusuf. We also thank the GISA team, particularly Faith Martin Agwogie, Olatunji Abiola Erinjogunola, and Helen Onyia Nwafor for inputting and cleaning the data and for other administrative support during the survey.

## References

Abraham, E.A., Egbe, C.O., Ayo-Yusuf, O.A., 2019. News media coverage of shisha in Nigeria from 2014 to 2018. Tob. Induc. Dis. 17, 33. https://doi.org/10.18332/tid/106139.

African Union,2006. African Youth Charter. Accessed August 2022 fromhttp://www.africa-union.org/root/ua/conferences/mai/hrst/charter%20english.pdf.

Agwogie, M.O., 2022. Addressing drug challenges in health and humanitarian crises: Settings in need of care for comprehensive drug use prevention in Nigeria. Paper presented at the Commemoration of the 2022 International Day Against Drug Abuse & Illicit Trafficking, Abuja, Nigeria. https://gisainitiative.org/wp-content/uploads/2022/08/By-Martin-O.-Agwogie-PhD.pdf.

Agwogie, M.O., Bryant, N., 2021. Implementing and evaluating the UPC to promote capacity building among drug demand reduction practitioners in Nigeria: lessons learned and future directions. Adiktologie 21, 219–228. https://doi.org/10.35198/01-2021-004-0003.

Akl, E.A., Ward, K.D., Bteddini, D., Khaliel, R., Alexander, A.C., Lotfi, T., Alaouie, H., Afifi, R.A., 2015. The allure of the waterpipe: a narrative review of factors affecting the epidemic rise in waterpipe smoking among young persons globally. Tob. Control 24 (Suppl 1), i13–i21. https://doi.org/10.1136/tobaccocontrol-2014-051906.

Alabi, O., Shamaki, M.A., Omisakin, O.A., Giro, M., Odusina, E.K., 2020. Family and household issues in northern Nigeria: Change and continuity. In: Odimegwu, C. (Ed.), Family Demography and Post-2015 Development Agenda in Africa. Springer, Cham, https://doi.org/10.1007/978-3-030-14887-4_14.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders, fifth ed. American Psychiatric Association, New York. https://doi.org/10.1176/appi.books.9780890425596.

Amone-P'Olak, K., Letswai, N.K., 2020. The relationship between adverse childhood experiences and depression: a cross-sectional survey with university students in Botswana. S. Afr. J. Psychiatry 26, a1444. https://doi.org/10.4102/sajpsychiatry.v26i0.1444.

Arthur, M.W., Briney, J.S., Hawkins, J.D., Abbott, R.D., Brooke-Weiss, B.L., Catalano, R. F., 2007. Measuring risk and protection in communities using the communities that care youth survey. Eval. Prog. Plan. 30, 197–211. https://doi.org/10.1016/j.evalprogplan.2007.01.009.

Cheong, J., Tucker, J.A., Chandler, S.D., 2022. Time horizons, drug use, and risky sex in young women from poor urban areas. Sucht 68 (2), 75–82 https://doi.org:/10.1024/0939-5911/a000758.

Chinelo, A.O., 2021. Review of Interventions for Reduction of Drug Abuse among Youths in Nigeria. 57th Master of Public Health/International Course in Health Development KIT (Royal Tropical Institute) Vrije Universiteit Amsterdam (VU).https://bibalex.org/baifa/en/Attachment/Documents/aLf3VfQ1Rs_20220125130930653.pdf.

Ebigbo, P.O., Elekwachi, C., Nweze, F., 2012. Challenges in the treatment of drug abuse in a Nigerian female health worker: a case study applying the Wawa technique. J. Contemp. Psychother. 42 (4), 257–264. https://doi.org/10.1007/s10879-012-9213-9.

Edwards, K.M., Herrington, R., Charge, L.L., Charge, D.L., Hopfauf, S., Camp, E.E., Simon, B., Waterman, E.A., Banyard, V.L., 2022. Engaging native American youth and their caregivers in sexual violence research: a case study documenting challenges, opportunities, and lessons learned. J. Interpers. Viol. 37 (23-24) https://doi.org/10.1177/08862605211072158.

Frey, B., 2018. In: The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation. SAGE Publications, Thousand Oaks, CA, USA, 2018. https://doi.org/10.4135/9781506326139.

Goodman, L.A., 1961. Snowball Sampling. Ann. Math. Stat. 32 (1), 148–170. https://doi.org/10.1214/aoms/1177705148.

Heaton, T., Hirschl, T.A., 1999. The trajectory of family change in Nigeria. J. Comp. Fam. Stud. 30 (1), 35–55. ⟨http://www.jstor.org/stable/41603608⟩.

Hughes, K., Bellis, M.A., Hardcastle, K.A., Sethi, D., Butchart, A., Mikton, C., Jones, L., Dunne, M.P., 2017. The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. Lancet Public Health 2, e356–e366. https://doi.org/10.1016/S2468-2667(17)30118-4.

Ibanga, A., 2022. UNODC Innovative Approaches to Drug Demand Reduction in Nigeria Following COVID-19 Pandemic. Available at www.issup.net(Accessed 18 January 2023).

Kadhum, M., Sweidan, A., Jaffery, A.E., Al-Saadi, A., Madden, B., 2015. A review of the health effects of smoking shisha. Clin. Med. 15 (3), 263–266. https://doi.org/10.7861/clinmedicine.15-3-263.

Kanmodi, K.K., Kanmodi, P.A., 2020. Combatting the silent shisha epidemic in Nigeria: the need for public health education. Popul. Med. 2, 18. https://doi.org/10.18332/popmed/120967.

Katsina State, 2022. Katsina State Home of Hospitality.https://www.katsinastate.gov.ng.

Kidman, R., Smith, D., Piccolo, L.R., Kohler, H., 2019. Psychometric evaluation of the adverse childhood experience international questionnaire (ACE-IQ) in Malawian adolescents. Child Abus. Negl. 92, 139–145. https://doi.org/10.1016/j.chiabu.2019.03.015.

Kliewer, W., Wan, N., Parham, B., Ring, Z., 2019. Protective factors and biological sex differentiate profiles of teen substance users in Myanmar. Health Educ. Behav. 46, 853–864. https://doi.org/10.1177/1090198119839106.

Manyema, M., Richter, L.M., 2019. Adverse childhood experiences: prevalence and associated factors among South African young adults. Heliyon 5, e03003. https://doi.org/10.1016/j.heliyon.2019.e03003.

McGue, M., Irons, D., Iacono, W.G., 2014. The adolescent origins of substance use disorders: a behavioral genetic perspective. Neb. Symp. Motiv. 61, 31–50. https://doi.org/10.1007/978-1-4939-0653-6_3.

Nagorcka-Smith, P., Bolton, K.A., Dam, J., Nichols, M., Alston, L., Johnstone, M., Allender, S., 2022. The impact of coalition characteristics on outcomes in community-based initiatives targeting the social determinants of health: a systematic review. BMC Public Health 22, 1358. https://doi.org/10.1186/s12889-022-13678-9.

Naicker, S.N., Ahun, M.N., Besharati, S., Norris, S.A., Orri, M., Richter, L.M., 2022. The long-term health and human capital consequences of adverse childhood experiences in the Birth to Thirty cohort: single, cumulative, and clustered adversity. Int. J. Environ. Res. Public Health 19, 1799. https://doi.org/10.3390/ijerph19031799.

Nelson, E.E., Abikoye, G.E., 2019. Multiple barriers to utilization of drug abuse treatment by female street sex workers in Nigeria. J. Psychoact. Drugs 51 (4), 383–390. https://doi.org/10.1080/02791072.2019.1605103.

Ocaña-Gordillo, D., Kliewer, W., 2022. Risk and protective factors for marijuana use and problems with use in a national sample of female Ecuadorian secondary school students. Intern. J. Psychol. https://doi.org/10.1002/ijop.12881.

Polak, K., Haug, N.A., Drachenberg, H.E., Svikis, D.S., 2015. Gender considerations in addiction: implications for treatment. Curr. Treat. Options Psychiatry 2, 326–338. https://doi.org/10.1007/s40501-015-0054-5.

Qadir, F., Stewart, R., Khan, M., Prince, M., 2005. The validity of the parental bonding instrument as a measure of maternal bonding among young Pakistani women. Soc. Psychiatry Psychiatr. Epidemiol. 40 (4), 276–282. https://doi.org/10.1007/s00127-005-0887-0.

Razali, M., Kliewer, W., 2015. Risk and protective factors for recreational and hard drug use among Malaysian adolescents and young adults. Addict. Behav. 50, 149–156. https://doi.org/10.1016/j.addbeh.2015.06.022.

Siervo, E., 2019. The CADCA Model for Strengthening Communities Globally to Prevent and Reduce Illicit Drug Use: Community Coalition in Guatemala. Asia Pacific Forum Against Drugs APFAD – WFAD Singapore 2019. Accessed August 2022 fromhttps://www.ncada.org.sg/docs/default-source/apfad/apfad2019presentations/apfad2019_ericsiervo.pdf.

Stevens, S.J., Andrade, R.A., Ruiz, B.S., 2009. Women and substance abuse: gender, age, and cultural considerations. J. Ethn. Subst. Abus. 8 (3), 341–358. https://doi.org/10.1080/15332640903110542.

Stevens-Watkins, D., Perry, B., Harp, K.L., Oser, C.B., 2012. Racism and illicit drug use among African American women: the protective effects of ethnic identity, affirmation, and behavior. J. Black Psychol. 38 (4), 471–496. https://doi.org/10.1177/0095798412438395.

Substance Abuse and Mental Health Services Administration, 2019. Substance Misuse Prevention for Young Adults. Publication No. PEP19-PL-Guide-1. Substance Abuse and Mental Health Services Administration, Rockville, MD.

United Nations Office on Drugs and Crime, 2019. Drug Use in Nigeria, 2018. United Nations Publication, Vienna. https://www.unodc.org/documents/data-and-analysis/statistics/Drugs/Drug_Use_Survey_Nigeria_2019_Exsum.pdf.

United Nations Office on Drugs and Crime, 2020. World Drug Report 2020. United Nations Publication, Vienna. https://wdr.unodc.org/wdr2020/en/exsum.html.

United Nations Office on Drugs and Crime, 2021. World Drug Report 2021. United Nations Publication, Vienna. ⟨https://www.unodc.org/unodc/en/data-and-analysis/wdr2021.html⟩.

United Nations Office on Drugs and Crime, 2022. UNODC and NDLEA Partner to Sensitize the Nigerian Governors Wives on Drug Use, Treatment, Prevention and Care.https://www.unodc.org/nigeria/en/unodc-and-ndlea-partner-to-sensitize-the-nigerian-governors-wives-on-drug-use–treatment–prevention-and-care.html.

United Nations Office on Drugs and Crime and the World Health Organization, 2018. International Standards on Drug Use Prevention, second updated edition. United Nations Publication, Vienna https://www.unodc.org/documents/prevention/UNODC-WHO_2018_prevention_standards_E.pdf.

Vigna-Taglianti, F., Mehanović, E., Alesina, M., Damjanović, L., Ibanga, A., Pwajok, J., Prichard, G., van der Kreeft, P., Virk, H.K., Unplugged Nigeria Coordination Group, 2021. Effects of the "Unplugged" school-based substance use prevention program in Nigeria: a cluster randomized controlled trial. Drug Alcohol Depend. 228, 108966 https://doi.org/10.1016//j.drugalcdep.2021.108966.

Wan, N., Kliewer, W., Sosnowski, D., 2019. Sex differences in risk for substance use among high school students in Myanmar. Intern. Perspect. Psychol. Res. Pract. Consult. 8, 38–52. https://doi.org/10.1037/ipp0000093.

World Health Organization, 2018. Adverse Childhood Experiences International Questionnaire. World Health Organization. https://www.who.int/publications/m/item/adverse-childhood-experiences-international-questionnaire-(ace-iq).

World Health Organization, 2019. Responding to the Challenge of Drug Use among Women in Nigeria. https://www.afro.who.int/news/responding-challenge-drug-use-among-women-nigeria.

Yang, E., Foster-Fishman, P., Collins, C., Ahn, A., 2012. Testing a comprehensive community problem-solving framework for community coalitions. J. Comm. Psychol. 40, 681–698. https://doi.org/10.1002/jcop.20526.

Zarse, E.M., Neff, M.R., Yoder, R., Hulvershorn, L., Chambers, J.E., Chambers, R.A., 2019. The adverse childhood experiences questionnaire: two decades of research on childhood trauma as a primary cause of adult mental illness, addiction, and medical diseases. Cogent Med. 6, 1581447 https://doi.org/10.1080/2331205X.2019.1581447.

Zhou, S.J., Skeaff, M., Makrides, M., Gibson, R., 2015. Vitamin D status and its predictors among pre-school children in Adelaide. J. Paediatr. Child Health 51 (6), 614–619. https://doi.org/10.1111/jpc.12770.