Predictors of Early Alcohol Use Initiation and Recent Adolescent Alcohol Use Among Orphaned and Separated Children in 5 Low- and Middle-income Countries

by

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Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
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2023

ABSTRACT

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Abstract

Background: Alcohol use accounts for over 3 million deaths each year and causes negative mental and physical health outcomes. Both adolescent use and early use initiation are associated with future dependence and alcohol-related harm. Orphaned and separated children (OSC) in low- and middle-income countries (LMICs) are particularly vulnerable to alcohol use. Methods: A cross-sectional analysis was used to explore predictors of adolescent alcohol use and early alcohol initiation among a sample of OSC in 5 LMICs. Bivariable logistic regression models were used to evaluate associations between age, gender, education, care setting, OSC status (single orphan, double orphan, neither), behavior and emotional health, the experience of potentially traumatic events (PTEs), social support, and participation in chores or work and the outcomes of early initiation and recent alcohol use. Variables with p-value <0.15 were included in a multivariable model for that respective outcome and evaluated through multivariable logistic regressions. Results: In multivariable regressions, age [OR 1.28 (1.11-1.48)], community-based setting [OR 2.74 (1.57-5.02)], non-abuse trauma [OR 5.23 (2.51-12.10)], and physical or sexual abuse [OR 1.27 (0.75-2.11)] were associated with recent use. Non-abuse trauma [OR 12.86 (3.83-80.12)] and work [OR 1.72 (0.91-3.12)] were associated with early use. Conclusions: Interventions targeting alcohol use among

OSC may be more effective if they target predictors identified in this study, such as a community care setting.

Dedication

This thesis is dedicated to those who are struggling with alcohol use disorders and related mental health disorders.

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1. Introduction

Alcohol use is responsible for 3 million deaths each year and accounts for 5.1% of the global burden of disease.[1] Orphaned and separated children (OSC) are defined as children who have experienced the death of a parent or who have been separated from and are no longer living with one of their parents. OSC living in low- and middle-income countries (LMICs)- have a disproportionate risk of adolescent alcohol use, which predisposes drinkers to negative health outcomes.[2,3]

Alcohol use at a young age can have various negative impacts on health. Early alcohol use initiation increases the risk of alcohol dependence and heavy alcohol use later in life.[4] Those who initiate alcohol use between 11 and 14 years of age are most at risk of developing alcohol use disorders.[4] The brain continues to develop through an individual's early twenties.[5] During this adolescent developmental stage, the brain is particularly vulnerable to the effects of alcohol use, predisposing the drinker for mental health, neuro-cognitive, and substance use disorders that may persist over a lifetime.[2,6–9] Additionally, major negative health outcomes such as heart disease, cancer, liver diseases, STIs, HIV/AIDS, tuberculosis, mental health disorders, and unintentional and intentional injuries are associated with alcohol use.[2] Alcohol use may also increase health risk behaviors and impact determinants such as education, criminal involvement,

violence, early pregnancy, and unemployment.[2] Each of these determinants may exacerbate the risk of alcohol use among OSC.

Alcohol use has been directly linked to gender-based violence (GBV), including intimate partner violence (IPV).[10] Partner alcohol use is associated with a 3.2-fold increase in the risk of IPV.[11] Alcohol can reduce cognitive and physical functions, which narrow attention and impair information processing and impulse control, reducing the ability to resolve conflicts nonviolently.[12] Additionally, experiencing IPV is associated with an increased risk of substance use.[13] OSC are already heavily impacted by determinants related to an increased risk of IPV such as physical or emotional abuse, reduced behavior control, a young age, or low self-esteem.[14] Alcohol use and partner alcohol use further exacerbate the risk of OSC experiencing IPV, which may potentially lead to increased negative physical and mental health outcomes among the OSC population. Targeted interventions are needed to prevent and reduce the burden of adolescent alcohol use.

OSC living in LMICs experience high treatment gaps for alcohol use and related mental health disorders. Low- and middle-income countries (LMICs), classified based on the World Bank definition, are disproportionately impacted by alcohol use.[15,16] An estimated 25% of adolescents living in LMICs have participated in alcohol use.[17] Alcohol use is increasing in LMICs. This trend is

expected to continue rising with increased availability of alcoholic beverages, alcohol promotions, and purchasing power, highlighting an urgency to address alcohol use in LMICs.[2,18–20] LMICs may often lack financial resources, trained professional mental health workers, and access to evidence-based treatment, causing them to be disproportionately affected by alcohol use and related mental health disorders.[21] A treatment gap refers to "the absolute difference between the true prevalence of a disorder and the treated proportion of individuals affected by the disorder."[22] The treatment gap for substance use (including alcohol use) in LMICs is between 76% and 85%.[23] While little has been studied about the treatment gap for alcohol use among children and adolescents in LMICs, a community-based sample in Brazil identified a high mental health treatment gap (88%) among children and adolescents with mental health disorders in an urban setting.[24] Consequently, OSC living in LMICs are likely to experience difficulties accessing treatment, highlighting an increasing need to implement more effective, targeted interventions for this population.

Countries with low resources and economic status have higher rates of OSC.[25,26] The increasing number of OSC in LMICs may be the result of high mortality among young parents from conditions such as malaria, tuberculosis, HIV/AIDS, pregnancy and childbirth complications, accidents and natural disasters.[25–27] Short and long term separation between children and their parents

may occur because biological parents are: (a) unable to provide food, shelter, and safety; (b) forced to leave their children to seek employment elsewhere; or (c) physically or mentally unable to care for their children.[28] The separation from or loss of a parent can impact emotional, mental, and physical health and the availability of resources. Consequently, OSC may have a unique risk of alcohol use. Individual, family, and community, and cultural domains may contribute to this risk.[2] Each of these domains is impacted by the children's orphan status, highlighting key a population in need of intervention.

While being orphaned or separated from parents is associated with various determinants that may lead to alcohol use, little is known about the risk factors for adolescent alcohol use and early alcohol use in this population and their level of impact. While the current literature identifies predictors of alcohol use among children, little relates to OSC in LMICs specifically. OSC have a unique experience that may differ from children living with their biological parents. Previous studies have identified that OSC are more likely to exhibit common emotional and behavioral problems, which is associated with an increased risk of alcohol use.[3] However, there is a need to identify predictors of early alcohol use initiation and recent adolescent alcohol use specific to OSC. Additionally, in LMICs, there is an increased urgency to identify these predictors, as high treatment gaps prevent OSC from receiving care for alcohol

use and mental health disorders. The identification of predictors may lead to the implementation of more effective targeted interventions.

This study is an exploratory analysis of to identify potential predictors of recent adolescent alcohol use and early alcohol use initiation to be further investigated in future research. This study was designed to evaluate: (1) the individual and social predictors of recent adolescent alcohol use among OSC in 5 LMICs, and (2) the individual and social predictors of early initiation of alcohol use among OSC in 5 LMICs. The overall goal of this study is to gain more knowledge about predictors of alcohol use among OSC in LMICs. This aligns with the World Health Organization's Mental Health Action Plan and Sustainable Development Goal (SDG) 3, of ensuring healthy lives and promoting well-being for all at all ages.[29,30] The predictors of alcohol use among OSC in LMICs identified through these aims can be used to identify potential areas of intervention to prevent and reduce alcohol use among this population. These predictors will help to gain an understanding of individual and care-related factors contributing to early and adolescent alcohol use and can be used to inform future health interventions that can ultimately reduce the burden of alcohol use among an at-risk population, improving other physical and mental health outcomes related to alcohol use.

2. Methods

This study consists of a cross-sectional secondary data analysis of a longitudinal cohort study. The secondary data analysis will identify predictors of recent adolescent alcohol use and early alcohol use initiation among OSC in LMICs. All methods and procedures were approved by the Duke University Institutional Review Board.

2.1 Parent Study

2.1.1 Design and Setting

Positive Outcomes for Orphans (POFO) is a longitudinal cohort study designed to identify characteristics of care across diverse care structures and cultures. The study was conducted across 6 regions in 5 LMICs: Kenya, Ethiopia, Tanzania, Cambodia, and India (Nagaland and Hyderabad). The regions were defined by political boundaries and selected based on where the research team had existing relationships with community organizations with an interest in the proposed research and the diversity of the locations.[31] The study aimed to select countries that were culturally, historically, ethnically, politically, and geographically diverse from each other.[31] Each region contained 50 randomly sampled clusters. Ethical approval for the parent study was provided by Duke University IRB, IRBs of Meahto Phum Ko'mah (Battambang, Cambodia), SaveLives Ethiopia (Addis Ababa, Ethiopia), Sharan (Delhi, India), ACE Africa

(Bungoma, Kenya), and Kilimanjaro Christian Medical Centre (Moshi, Tanzania), and regulatory agencies in all participating countries: National Ethic Committee for Health Research (Cambodia), Ministry of Science and Technology (Ethiopia), Indian Council of Medical Research (India), Kenya Medical Research Institute (KEMRI), and the National Institute for Medical Research (Tanzania).[31]

2.1.2 Participants

Participants in the parent study consisted of 1,357 residential-living OSC, 1,480 community-living OSC, and 301 non-orphans. At baseline enrollment, which took place between May 2006 and February 2008, participants were between the ages of 6 and 12. Residential care facilities were defined as structures with at least five orphaned children from at least two different families not biologically related to the caregiver(s).[31] A comprehensive list of eligible facilities for each cluster were collected from government officials and organizations working with OSC, the list was then randomized and approached sequentially.[31] To identify participants in residential care, each residential care facility provided a list of children ages 6-12 in their care. Up to 20 children were randomly selected per facility.[31] A community-living OSC was defined as an orphan who is not living in an institution or a separated child living with up to 1 of their parents.[31] Community-living OSC were selected in two ways. Community-living OSC were selected randomly using lists provided by host organizations, which were

governmental and community-based organizations working with OSC in the selected regions. Additionally, a house-to-house census was conducted to identify 5 households with eligible children in each cluster within a given region. Only one child was selected from households with multiple eligible children. The child whose first name started with the earliest letter in the alphabet was selected from the household.

2.1.3 Data Collection

One male interviewer, 1 female interviewer, and a lead investigator were selected from each region and trained on study protocol and procedures. All interviewers and primary investigators attended a weeklong training at a central location. Following training, interviewers practiced and underwent repeated direct and video-taped observation with local children not participating in the study before becoming certified.[31]

Data was collected at baseline, every 6 months for the first 3 years, and then annually, for a total of 11 rounds of data collection to date. Initial data collection took place between May 2006 and February 2008.[31] Information was collected from children aged 6-12 residing in the community who experienced the death of a parent or who had a parent who was missing, children residing in residential facilities, the children's primary caregivers, and staff who could answer administrative questions about the facility.[31] Gender-matched

interviewers conducted interviews with OSC and their caregivers in community- and residential-based settings. Follow-up interviews were performed by the same interviewer to build rapport, encouraging more honest answers from participants, especially considering the sensitive nature of the questions. Written informed consent was obtained from participating caregivers and heads of participating residential facilities. Assent was obtained from all participating children.

2.2 Current Study

2.2.1 Population

For this analysis, all participants are from round 11 of data collection. This round was chosen as it was the most recent round of data collection, which took place in 2015. This round of data collection provides the most complete set of data as it captures more participants who have initiated alcohol use. At round 11, participants were aged 12-21 years old. Additionally, non-orphans were excluded from the analysis, as this study focuses on OSC.

2.2.2 Outcomes

Adolescent Alcohol Use

An 'adolescent' is a person who is in the "period of human development that starts with puberty and ends with physiological and neurobiological maturity."[32] While the World Health Organization

defines adolescents as ages 10-19 years, adolescence is defined by culture, which may vary in each of the study areas.[33] This study defines all of the sample as adolescents (ages 12-21). This definition is supported by the fact that the brain is still developing in an individual's early twenties, indicating a vulnerable transitional phase in development of the brain.[5] Participants were asked how many days in the past week they had a drink containing alcohol. Drinking 0 days in the past week was labelled as no recent adolescent alcohol use (0). Any days drinking in the past week was defined as recent adolescent alcohol use (1).

Early Alcohol Use

For this study early alcohol use is defined as an age of alcohol use initiation of 14 years and younger. Participants were asked how old they were when they had their first drink other than a few sips. Participants who responded as having their first drink at age 14 years and younger were considered to participate in early alcohol use (1). Those who have never had a drink, or who reported having their first drink at age 15 or older are identified as not participating in early alcohol use. This outcome was coded as binary, with 1 representing early alcohol use initiation and 0 representing not participating in early alcohol use.

2.2.3 Potential Predictors

Child Characteristics

Child characteristics measured include study site, care setting, OSC status, gender, age, and education. Study site may refer to any of the 6 regions included in this study: Cambodia, Ethiopia, Hyderabad, Kenya, Nagaland, and Tanzania. Study site was coded categorical and used for descriptive statistics of the study population. Care setting may be residential or community based. Care setting was coded as a binary 1/0 variable with residential as the referent. OSC status refers to whether the participant is a single orphan (one parent is deceased), a double orphan (both parents are deceased), or neither parent is deceased (child is permanently separated with no expectation of reunification). OSC statuses are nominal variables evaluated as dummy variable indicators coded as 1/0 for each of the OSC statuses. For this study, gender is coded as a binary 1/0 variable with females coded as 1 and male as the referent. Education was measured using the number of years as assigned to the highest grade completed. These were classified as having completed 6 years or less, 7-12 years, and 13 years or more. Education was also examined using dummy variable indicators coded as 1/0 for each of these categories.

Behavior and Emotional Health

There is a positive correlation between mental health disorders and alcohol use disorders, indicating that behavior and emotional health may be an important predictor of alcohol use among OSC.[34] Behavioral and emotional health were measured using the Strengths and Difficulties Questionnaire (SDQ) self-report, a brief screening tool.[35] Clinically significant SDQ scores have been associated with past month alcohol use.[36] The SDQ is used to assess emotional and behavioral difficulties and pro-social behavior.[35] The SDQ has five scales, with 4 of those scales relating to difficulties (emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship).[35] There are 5 items per scale that are all scored from 0-2.[35] For this study, the first four scales were added to obtain the summary score of Total Difficulties (ranging 0-40), where a higher summary score is associated with more difficulties.[35] SDQ total difficulties scores of 17 and higher are considered abnormal.[37] The SDQ was selected for "dimensions of behavior assessed, brevity, high correlations with well accepted but much longer behavior measures, and its wide use in both LMICs and high-income countries (HICs)."[31,37–40] While there is no published data around the psychometric properties or standardization in the 5 LMICs for this study, the validity of the SDQ is supported by its translation and use in over 80 languages and the high

level of attention given by native language speakers to translating the SDQ for the study sites.[28] In this study, the total difficulties scores were evaluated as a continuous variable in models. SDQ total difficulties scores were assessed for the outcome of recent adolescent alcohol use. This variable was not assessed for the outcome of early alcohol use initiation, as responses for the SDQ referred to the previous 6 months.

Potentially Traumatic Events

The high association between posttraumatic stress disorder (PTSD) and alcohol misuse and the high rates of trauma among OSC, suggests the experience of potentially traumatic events (PTEs) may be a predictor of alcohol use among OSC.[41,42] Additionally, the PTEs of physical and sexual abuse have been associated with adolescent alcohol use and heavy alcohol use.[43,44] Potentially traumatic events (PTEs) were measured through the Life Events Checklist (LEC), which was created by the National Center for Posttraumatic Stress Disorder (PTSD) to assist in PTSD diagnoses.[45] The events on the checklist are predictive of PTSD, anxiety, and depression diagnoses.[46] The LEC has been validated in various settings and used cross-culturally.[47] Participants shared whether they experienced the event never, once, or more than once. Additionally, if participants had experienced an event, they were asked if the event

happened more than a year ago, within the past year, or both.[46] As the OSC population is defined by parental death or permanent separation, these events were not considered a PTE, unless the participant was present for the death.[47] 'Non-abuse trauma' was defined as endorsement of one or more of any PTE on the LEC that was not related to physical or sexual abuse (1), while having never experienced non-abuse trauma was coded as 0. For this study, 'physical or sexual abuse' was defined as an endorsement of any item under the physical or sexual abuse category (1), while no endorsement for any item in this category was coded as 0.

Social support

As social support is negatively associated with frequency of alcohol use in adults, lower social support may be associated with increased adolescent and early alcohol use among OSC.[48] Social support was measured using the MOS social support survey, a brief survey instrument initially developed for patients with chronic conditions.[49] The survey is comprised of four subscales (emotional/informational support, tangible support, affectionate support, and positive social interaction) and an overall functional support index that are intended to measure perceived social support.[49] A higher score for either a subscale or the overall functional support index would imply a higher level of support.[49]

Each subscale is scored by calculating the mean average scores for each item in the subscale.[49] The overall support index is calculated by taking the average of the scores for the 18 items included in the subscales and the score for one additional question, for a total of 19 questions.[49] The adapted version of the MOS social support survey for this study excludes two items that are on the original survey (someone to love and make you feel wanted, someone who hugs you). The excluded items were decided to be not culturally relevant following pretests in each country.[50] Consequently, for this study, the survey will be scored by taking the average score of the 17 questions included, and used as a continuous variable in models. While the MOS social support survey has not been validated in these settings and translations, it has been validated in seven languages and has been widely used in diverse populations.[51] This study evaluated MOS overall support index as a continuous variable in models.

Child work

Long working hours have been associated with increased alcohol use.[52] However, performing household chores are associated with the development of self-competence, prosocial behavior, and self-efficacy, which could lead to reduced alcohol use.[53] Therefore, child work and a lack of performing household chores, may be predictive of alcohol use

among OSC. Children were asked about their participation in household work and chores and income-generating or trade work. A participant who did not perform chores in the home was classified as performing 'no chores' (1) or any chores (0). A participant who received payment for their work outside of the home or participated in trade work is considered to participate in 'work' (1), while not participating in work was coded as 0.

2.2.4 Data Analysis

A predictive model approach was used to estimate the association between child characteristics, SDQ total difficulties scores, PTEs, MOS social support indexes, chores, work and the outcomes of adolescent alcohol use and early alcohol use. For this study, the term predictor does not indicate a causal setting. Rather, a predictor refers to variables that correlate with the study outcomes and may warrant consideration in future analyses or interventions. Bivariable logistic regression modeling was used to evaluate associations of each variable with the outcomes of recent adolescent alcohol use and early alcohol use initiation. Odds ratios, 95% confidence intervals (CIs), and confidence limit ratios (CLRs) were reported for each model. CLRs, which are calculated by dividing the upper CI by the lower CI, are a measure of precision, with ratios closer to 1 indicating a higher level of precision.[54] The variables that resulted in a p-value of

less than 0.15 from the bivariable regression, were selected for inclusion in a larger predictive model. This p-value was chosen to be more inclusive in the initial screening to minimize the risk of missing an important variable given the wide range of variation in the data. Two predictive models were created to estimate the predictors of each of the outcomes of interest: recent adolescent alcohol use and early alcohol use initiation. Both the adolescent and early alcohol use models were evaluated through multivariable logistic regressions. Odds ratios, 95% CIs, and CLRs were reported for each model. All statistical analyses were performed on R (4.1.3).

3. Results

3.1 Population Characteristics

Characteristics of the study population are described in Table 1. Values were reported as n (%) or as a mean (sd) where otherwise indicated by an asterisk. There were a total of 1978 participants included in the study sample. In round 11 of data collection, the average age of participants was 17.1 years old (range 12-21 years). There were more males [n=1058 (53.5%)] than females [n=920 (46.5%)] in the sample. Most of the participants completed between 7 and 12 years of education [n=1565 (82.6%)], with the remaining participants nearly equally split between having completed 6 years or less [n=160 (8.4%)] or 13 years or more [n=169 (8.9%)] of education. More participants resided in the community [n=1144 (57.8%)] than residential care settings [n=834 (42.2%)]. While double orphans were most prevalent among the study sample [n=1191 (60.2%)], 14.1% were single orphans (n=278) and 25.7% were neither (n=509) (i.e. permanently separated). The most participants resided in Kenya [n=393 (19.9%)] and Hyderabad [n=392 (19.8%)]. Cambodia accounted for the least number of participants [n=256 (12.9%)].

The study sample had an average SDQ total difficulties score of 7.4 (sd 6.0) and average MOS total support index of 3.0 (sd 0.8). Most participants endorsed at least one potentially traumatic event for non-abuse trauma [n=1498

(75.7%)] and slightly over one third of participants reported physical or sexual abuse [n=713 (36.0%)]. While nearly all participants reported to perform chores [n=1769 (90.5%)], few participated in income-generating or trade work [n=279 (14.3%)]. A total of 88 participants (5.4%) participated in recent adolescent alcohol use (i.e. alcohol use in the past week). A large majority of participants initiated alcohol use at age 15 or later [n=1915 (96.8%)], with 3.2% (n=63) participating in early alcohol use initiation.

Table 1: Characteristics of POFO participants selected for the current study

Domain and Variable		n (%) or *mean (sd) N= 1978
Demographics		
Age	years	*17.09 (1.87)
	Missing	1
Gender	Male	1058 (53.5%)
	Female	920 (46.5%)
	Missing	0
Education	6 years or less	160 (8.4%)
	7-12 years	1565 (82.6%)
	13 or more	169 (8.9%)
	Missing	84
Care Setting	Residential	834 (42.2%)
	Community	1144 (57.8%)
	Missing	0
OSC Status	Single Orphan	278 (14.1%)
	Double Orphan	1191 (60.2%)
	Neither	509 (25.7%)
	Missing	0
Site	Cambodia	256 (12.9%)
	Ethiopia	319 (16.1%)
	Hyderabad	392 (19.8%)
	Kenya	393 (19.9%)
	Nagaland	295 (14.9%)
	Tanzania	323 (16.3%)
	Missing	0
Behavior and Emotional Health		
SDQ	Total Difficulties Score	*7.37 (6.04)
	Missing	9
Potentially Traumatic Events		
Non-abuse Trama	No	480 (24.3%)
	Yes	1498 (75.7%)
	Missing	0
Physical or Sexual Abuse	No	1265 (64%)
	Yes	713 (36%)
	Missing	0
Social Support		
MOS Social Support Survey	Overall Support Index	*3.04 (0.78)
	Missing	76
Child Work		
No Chores	No	1769 (90.5%)
	Yes	185 (9.5%)
	Missing	24
Work	No	1672 (85.7%)
	Yes	279 (14.3%)
	Missing	27
Outcomes		
Adolescent Alcohol Use	No	1529 (94.6%)
	Yes	88 (5.4%)
	Missing	361
Early Alcohol Use	No	1915 (96.8%)
	Yes	63 (3.2%)
	Missing	0

3.2 Bivariable Regressions

Table 2 shows the results of bivariable regressions for the outcomes of adolescent alcohol use and early alcohol use. Coefficients, 95% CIs, CLRs, and p-values are reported from models of each variable with the associated outcomes.

3.2.1 Adolescent Alcohol Use

Bivariable linear regressions for the potential predictors identified associations of adolescent alcohol use in the past week. Bivariable logistic regressions identified significant associations between recent adolescent alcohol use and age [OR 1.27 (1.13-1.43), p-value <0.001], female gender [OR 0.17 (0.09-0.30), p-value <0.001], completing six years or less of education [OR 2.09 (1.08-3.79), p-value <0.02], and neither parent deceased (i.e. permanently separated) [OR 0.58 (0.27-1.13), p-value 0.137]. Associations were also found between SDQ total difficulties score [OR 1.12 (1.09-1.16), p-value <0.001],having experienced non-abuse trauma [OR 3.84 (2.02-8.27), p-value <0.001], experiencing physical or sexual abuse [OR 1.90 (1.22-2.93), p-value <0.005], MOS overall support index [OR 0.53 (0.25-0.45), p-value <0.001], performing income-generating or trade work [OR 1.80 (0.99-3.10), p-value <0.04], and the outcome of recent adolescent alcohol use.

3.2.2 Early Alcohol Use

Associates of early alcohol use initiation were identified through bivariable logistic regressions. The bivariable logistic regressions found a significant association between early alcohol use initiation and the female gender [OR 0.23 (0.12-0.43), p-value <0.001] and having experienced non-abuse trauma [OR 10.15 (3.16-62.00), p-value <0.002]. Additionally, MOS overall support index [OR 0.55 (0.43-0.73), p-value <0.001] and performing income-generating or trade work [OR 3.00 (1.70-5.12), p-value <0.001] were associated with early alcohol use initiation.

Table 2: Bivariable regression models for adolescent alcohol use and early alcohol use

		Adolescent Alcohol Use			Early Alcohol Use		
Domain and Variable		OR (CI)	CLR	p-value	OR (CI)	CLR	p-value
Demographics							
Age		1.267 (1.125-1.432)	1.27	<0.001	1.030 (0.901-1.179)	1.31	0.662
Gender	Female	0.166 (0.085-0.296)	3.48	<0.001	0.234 (0.115-0.434)	3.77	<0.001
Education	6 years or less	2.091 (1.075-3.786)	3.52	<0.021	1.595 (0.689-3.244)	4.78	0.232
	13 years or more	0.708 (0.271-1.533)	5.66	0.427	0.548 (0.132-1.511)	11.45	0.315
Care Setting	Community	2.391 (1.475-4.035)	2.74	<0.001	1.112 (0.670-1.878)	2.8	0.685
OSC Status	Neither	0.581 (0.265-1.131)	4.27	0.137	1.265 (0.629-2.367)	1.87	0.483
	Double Orphan	0.745 (0.437-1.223)	2.8	0.259	0.562 (0.264-1.086)	4.11	0.106
Behavior and Emotional Health							
SDQ Total Difficulties Score		1.123 (1.089-1.159)	1.06	<0.001	_		
Potentially Traumatic Events							
Non-abuse Trauma		3.836 (2.015-8.274)	4.11	<0.001	10.145 (3.159-62.007)	19.63	<0.002
Physical or Sexual Abuse		1.897 (1.217-2.930)	2.41	<0.005	1.436 (0.860-2.377)	2.76	0.16
Social Support							
MOS Overall Support Index		0.529 (0.250-0.449)	1.8	<0.001	0.553 (0.426-0.726)	1.7	<0.001
Child Work							
No Chores		1.311 (0.666-2.375)	3.57	0.339	1.624 (0.738-3.186)	4.32	0.188
Work		1.803 (0.992-3.096)	3.12	<0.042	2.997 (1.699-5.120)	3.01	<0.001

3.3 Multivariable Regressions

Table 3 presents the results of multivariable regressions for the outcomes of recent adolescent alcohol use and early alcohol use initiation. Odds ratios (OR), 95% CIs, and CLRs are reported for each variable included in the model for the respective outcome.

3.3.1 Adolescent Alcohol Use

Predictors of recent adolescent alcohol use were identified through a multivariable logistic regression. The female gender [OR 0.16 (0.08-0.30)], neither parent deceased [OR 0.57 (0.24-1.21)] , MOS overall support index [OR 0.45 (0.31-0.65)], and performing income-generating or trade work [OR 0.69 (0.32-1.39)] were associated with decreased odds of recent adolescent alcohol use. Non-abuse trauma had the strongest association with recent adolescent alcohol use [OR 5.23 (2.52-12.10)], but there is lower precision in this estimation (CLR 4.81). Additionally, increased odds of adolescent alcohol use were associated with age [OR 1.28 (1.11-1.48)], a community-based care setting [OR 2.74 (1.57-5.02)], and having experienced physical or sexual abuse [OR 1.27 (0.75-2.11)]. Both completing 6 years or less of education [OR 0.96 (0.43-1.96)] and SDQ total difficulties score {OR 1.11 (1.06-1.15)] did not have a meaningfully large impact on recent adolescent alcohol use.

3.3.2 Early Alcohol Use

A multivariable logistic regression identified predictors of early alcohol use initiation. The female gender [OR 0.23 (0.11-0.45)] and a double orphan status (i.e. both parents deceased) [OR 0.57 (0.26-1.10)] were associated with decreased odds of early alcohol use initiation. While experiencing non-abuse trauma [OR 12.86 (3.82-80.12)] had the highest association with early alcohol use initiation,

this estimate is highly imprecise [CLR 20.9]. Performing income-generating or trade work [OR 1.72 (0.91-3.12)] was also associated with increased odds of early alcohol use. However, MOS overall support index [OR 1.05 (0.75-1.47)] did not have a meaningful large impact on early alcohol use initiation.

Table 3: Multivariable logistic regression models for adolescent alcohol use and early alcohol use

		Adolescent Alcohol Use		**Early Alcohol Use**	
Domain and Variable		OR (CI)	CLR	OR (CI)	CLR
Demographics					
Age		1.280 (1.111-1.480)	1.33	_	
Gender	Female	0.164 (0.082-0.304)	3.71	0.231 (0.108-0.447)	4.14
Education	6 years or less	0.957 (0.433-1.963)	4.53	_	
Care Setting	Community	2.744 (1.569-5.016)	3.2	_	
OSC Status	Neither	0.572 (0.241-1.210)	5.02	_	
	Double Orphan	_		0.565 (0.264-1.096)	4.15
Behavior and Emotional Health					
SDQ Total Difficulties Score		1.106 (1.062-1.153)	1.09	_	
Potentially Traumatic Events					
Non-abuse Trauma		5.231 (2.515-12.095)	4.81	12.857 (3.831-80.120)	20.91
Physical or Sexual Abuse		1.267 (0.752-2.111)	2.81	_	
Social Support					
MOS Overall Support Index		0.453 (0.314-0.647)	2.06	1.047 (0.751-1.471)	1.99
Child Work					
Work		0.691 (0.321-1.389)	4.33	1.719 (0.914-3.117)	3.41

4. Discussion

In a sample of nearly 2000 OSC living in diverse regions of LMICs, 5.4% of respondents participated in recent adolescent alcohol use. Additionally, 3.2% of participants were identified as positive for early alcohol use initiation. The female gender, neither parent deceased (i.e. child is permanently separated from parent), social support, and performing income-generating or trade work were associated with decreased odds of recent adolescent alcohol use. Increased odds of recent adolescent alcohol use were associated with age, a community-based care setting, experiencing non-abuse trauma, and experiencing physical or sexual abuse. The female gender and both parents deceased (i.e. double orphan) were associated with decreased odds of early alcohol use initiation, while experiencing non-abuse trauma and participating in income-generating or trade work were associated with increased odds of early alcohol use initiation.

The demographics of age and a community-based care setting were associated with recent adolescent alcohol use. As age increases, the odds of recent adolescent alcohol use increase by 28%. While there is limited data in LMICs, this finding is consistent with literature in the U.S., as rates of alcohol use are highest at ages 21-25 years.[55] A community-based care setting had a high association with recent adolescent alcohol use. Caregivers may serve as a potential mediator in this relationship. Adolescent alcohol use is associated with parental moderate to high-risk alcohol

consumption.[56] If there are higher rates of alcohol use among caregivers in a community-based care setting compared to residential care settings, this may explain the association between community care settings and recent adolescent alcohol use.

The female gender was associated with decreased odds of both recent adolescent alcohol use and early alcohol use initiation. The literature supports this finding, as women drink less and are less likely to engage in problematic drinking than men.[57] Despite being less likely to drink and develop alcohol dependence, women are still widely impacted by alcohol use. Women are more vulnerable than men to the effects of alcohol and alcohol-related harm.[57–59] Women report more severe psychiatric, medical, and employment complications from alcohol use.[60] Therefore, the amounts that women do drink have a greater effect on them than they would on men. Additionally, partner alcohol use is associated with an increased risk of IPV.[11] Even if a woman does not use alcohol, their partner may, which would place the woman at a higher risk of experiencing IPV-related harm. Despite women's decreased odds of recent adolescent alcohol use and early alcohol use initiation, they still experience significant alcohol-related harm that should be targeted in future health interventions.

Neither parent deceased (i.e. permanently separated) was associated with decreased odds of recent adolescent alcohol use, while both parents deceased (i.e. double orphan) was associated with decreased odds of early alcohol use initiation. Neither parent deceased was associated with a 42.8% reduction in the odds of recent

adolescent alcohol use compared to single orphans. Overall, there is a lack of literature comparing separated children to orphaned children. However, this finding is consistent with literature demonstrating that parental death is associated with alcohol use.[61] A double orphan status was associated with a 43.5% reduction in the odds of early alcohol use initiation compared to single orphans. Given that parental death is associated with alcohol use, this finding is unexpected. However, this result may potentially be explained by a reminder of trauma that is for single orphans. As single orphans experienced the death of one parent, they may have still had a living parent. This parent may serve as a reminder of the loss of their other parent. However, double orphans experienced the loss of both parents, and may have been seamlessly placed into residential or community-based care settings at a very young age. Consequently, double orphans may have had an easier time adjusting to their situations and experience a reduced risk compared to single orphans, as they do not have a constant reminder of their loss-related trauma.

The SDQ total difficulties score did not have a meaningfully large association with recent adolescent alcohol use. However, there was a slight association between higher SDQ total difficulties scores and increased odds of recent adolescent alcohol use. This association was expected to have a higher magnitude given the positive correlation between mental health disorders and alcohol use disorders and the association between clinically significant SDQ scores and alcohol use.[34,36] This relationship is potentially

modified by resilience. Resilience is "the process and outcome of successfully adapting to difficult or challenging life experiences."[32] Higher resilience is associated with lower levels of depression and anxiety among adolescents.[62] Therefore, despite experiencing increased difficulties, those who have higher resiliency may be able to overcome these difficulties and do not experience as much mental health-related harm. The environment, social support, and caregivers may all impact resiliency.[63]

PTEs were found to be associated with increased odds of both recent adolescent alcohol use and early alcohol use initiation. Having experienced physical or sexual abuse was predictive of recent adolescent alcohol use. These results are consistent with the literature, as future alcohol abuse is associated with childhood physical and sexual abuse.[64–66] The experience of non-abuse trauma was highly associated with both recent adolescent alcohol use and early alcohol use initiation. This is consistent with the literature, as experiencing stressful life events is associated with early onset of problem drinking and alcohol dependence later in life.[67] However, the estimates for the associations of non-abuse trauma with early alcohol use initiation (CLR 20.9) and recent adolescent alcohol use (CLR 4.8) are imprecise. While there is clearly an association between non-abuse trauma and recent adolescent alcohol use and early alcohol use initiation, the magnitude of this association may differ from the results reported due to this imprecision.

Social support was associated with decreased odds of adolescent alcohol use but did not significantly impact the odds of early alcohol use. For every one unit increase in the MOS overall support index, there is a 54.7% decrease in odds of adolescent alcohol use. Early alcohol use initiation and recent adolescent alcohol use are expected to both decrease as the social index score increases, as social support is associated with reduced alcohol use.[68,69] It is unexpected for the MOS overall support index to not have a significant effect on the odds of early alcohol use initiation. This result may be partially impacted by peers. While peers may offer support to children and adolescents, association with 'deviant peers' is associated with alcohol abuse.[70] Peers may socially encourage OSC to participate in alcohol use and increase their access to alcohol. Adolescent alcohol use is mediated by a change in descriptive norms, indicating an important influence from peers and other social supports.[71] However, the not meaningfully large study result may also indicate that there is a stronger relationship between trauma and early alcohol use initiation than social support at ages 14 and younger.

Participating in income-generating or trade work was associated with increased odds of early alcohol use initiation and decreased odds of recent adolescent alcohol use. Income-generating or trade work was associated with a 71.9% increase in the odds of early alcohol use initiation. This is consistent with the literature, as long working hours have been associated with increased alcohol use among adults.[52] Given this information,

the result of an association between income-generating or trade work and 30.9% decreased odds of recent adolescent alcohol use was unexpected. This result may be confounded by leisure time. Adolescent alcohol use is more common among those with more unstructured leisure time.[72] Work as an adolescent increases structured time, providing less leisure time to potentially participate in alcohol use.

4.1 Study strengths and limitations

This parent study for this analysis has several key methods that strengthen the validity of the results. The parent study performed robust random sampling and included both residential and community based OSC. This allows for greater generalizability to the OSC population in LMICs. Additionally, the diversity between the study regions allows for greater generalizability to other LMICs. High retention rates of study participants also improve the validity of this study. Interviewers were highly trained and built rapport over time with gender-matched participants. This assisted in eliciting honest responses from participants on topics that may be sensitive.

This study is limited due to its cross-sectional design, self-reported measures, and imperfect measures of adolescent and early alcohol use. Cross-sectional studies are unable to examine a change over time, making it difficult to draw causal inference. However, this study utilized a cross-sectional design as round 11 had the most complete set of data, where participants were slightly older and the questions were more relevant to the population. While this study included diverse areas, the sample is not

representative of all LMICs. The sample does not account for all areas and cultures, excluding large areas such as Latin America. Additionally, this study utilizes self-reporting on sensitive topics, which may introduce respondent biases. A recall bias may occur, if a participant does not remember or does not report all relevant information. Additionally, the sensitive nature of the questions may introduce a social desirability bias, especially if the participant is concerned with how they will be perceived. However, the risk of respondent biases is partially mitigated by the rapport building between gender-matched interviewers and participants, which encourages honesty among participants. Adolescent alcohol use and age at first initiation of alcohol use are heavily influenced by culture.[2] As culture plays such a major role, the estimates for recent adolescent alcohol use and early alcohol use initiation are not perfect estimates. These estimates do not account for the cultural differences between the countries within this study. However, the outcomes were defined based on the literature. Early alcohol use is in this study is defined as 14 years or younger, as the literature shows ages 11-14 have been shown to be predictive of alcohol related harm in the future.[4] Ages 12-21 who report any alcohol use in the past week are classified as adolescent alcohol use in this study, as the brain is still developing at these ages and is especially vulnerable to alcohol-related harm. The measure of adolescent alcohol use is also flawed in that the outcome is derived from a question asking how many days participants drank alcohol in the past week. A participant may have not drank alcohol in the past week, despite

drinking alcohol at other times. Furthermore, this number of days drinking alcohol does not capture the number of drinks consumed each day. Higher amounts of alcohol consumption in those days may be associated with further harm that is not accounted for in this measurement.

4.2 Implications for policy and practice

Interventions are needed to address the predictors of recent adolescent alcohol use and early alcohol use initiation among OSC. The interventions should be directed towards preventing alcohol use and reducing the frequency and burden of early alcohol use initiation and recent adolescent alcohol use, preventing future alcohol related harm and dependency.

Future interventions targeting early alcohol use initiation and recent adolescent alcohol use should target key demographics identified in this study. As the female gender is associated with reduced odds of early alcohol use initiation and recent adolescent alcohol use, interventions may have more impact targeting males. However, interventions should also be mindful of the increased alcohol related harm experienced by women. As adolescent alcohol use is highly associated with a community-based care setting, more interventions should be targeted towards OSC in this setting rather than residential care facilities. Furthermore, increased alcohol use prevention strategies should be available to OSC and caregivers in community-based care settings. There is limited literature on early alcohol use initiation prevention in LMICs and interventions

for alcohol use prevention targeted towards OSC. However, a study among 4th grade students in the U.S. demonstrated that an intervention challenging alcohol expectancies reduces the risk for early alcohol use.[73] Similar interventions can be adapted for the LMIC context and delivered to OSC living in community settings by caregivers or community workers.

PTEs should be addressed in early alcohol use initiation and recent adolescent alcohol use interventions and policy to both prevent and reduce the burden of alcohol use. There is a need to connect OSC who have experienced a PTE to mental health care. Policy changes and funding are needed to increase access to mental health care. However, with a lack of resources, interventions are the best solution to reduce the burden of trauma. Task-shifted trauma-focused cognitive behavioral therapy (TF-CBT) delivered by lay counselors has been effective at reducing the symptoms of grief and posttraumatic stress among OSC in Tanzania.[74] Similar interventions may be task shifted to community members, health workers, and teachers and delivered to OSC and their caregivers to reduce the effects of trauma.

4.3 Implications for further research

There is a lack of literature surrounding alcohol use among OSC in LMICs. While a community-based care setting was associated with recent adolescent alcohol use in this study, there is no literature to compare these results to. More research is needed on the prevalence and predictors of recent adolescent alcohol use and early alcohol use

initiation among OSC in LMICs. Future studies of this topic, should have more thorough measurements that fully capture alcohol use among adolescents, including if the participant has ever drank alcohol before and how many standardized drinks are consumed over a period of time. The alcohol use disorders identification test (AUDIT) may be a better measurement for alcohol use in future studies.[75] Predictors identified in this study and future research should be targeted through interventions. More research is needed on interventions that may effectively target alcohol use among OSC in LMICs. Additionally, implementation research is needed to determine the best methods and strategies to implement the interventions in this context.

5. Conclusion

Adolescent and early alcohol use are associated with future alcohol dependence and alcohol related harm.[4] OSC living in LMICs are particularly susceptible to the effects of alcohol use, especially given the lack of access to treatment for alcohol use and related mental health disorders. Interventions are needed to effectively target predictors of early alcohol use initiation and recent adolescent alcohol use among OSC in LMICs. This study identified age, a community-based care setting, non-abuse trauma, and physical or sexual abuse as predictors of recent adolescent alcohol use. The female gender, neither parent deceased, social support, and income-generating or trade work were associated with reduced odds of recent adolescent alcohol use. While the female gender and a double orphan status were associated with decreased odds of early alcohol use initiation, non-abuse trauma and income-generating or trade work were identified as predictors.

This study suggests that interventions may be more effective if they are targeted towards and informed by the predictors identified in this study. In the absence of clinical providers, task-shifted mental health interventions can help provide care to OSC living in LMICs. For example, a TF-CBT intervention delivered by lay counselors, may make mental health care more accessible for OSC living in LMICs. This study serves as a starting point for exploring predictors of early alcohol use initiation and recent adolescent alcohol use. More research is needed to identify the prevalence and

predictors of alcohol use among OSC in LMICs. Additional research is needed to identify effective interventions to address these predictors and how to best implement them in a low-resource setting. Overall, these efforts will help to reduce the prevalence and burden of alcohol use among OSC in LMICs. This will ultimately prevent and reduce the burden of alcohol-related harm.

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