Title: Prevalence and risk factors for sexual assault among class 6 students in unplanned settlements of Nairobi, Kenya: Baseline analysis from the IMPower & Sources of Strength cluster randomized controlled trial

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Authors (in no particular order): Michael Baiocchi, Mary Amuyunzu-Nyamongo, Gabriel Oguda, Dorothy Otieno, Rina Friedberg, Evan Rosenman, Benjamin Omondi, and Clea Sarnquist

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Abstract

Background: Gender-based violence is a crucial global health problem. Sexual violence against children and adolescents occurs at high rates in the informal settlements around Nairobi. This paper contains baseline results from a study evaluating the impact of an empowerment intervention for reducing sexual assault among adolescents.

Methods: Study participants responded to survey questions with in-person interviewers, and the resulting data was de-identified and prepared for analysis. Summary statistics and clustered bootstrap confidence intervals were calculated for social behaviors and rates of violence at baseline. Variables associated with a girl's experience of rape were found via stepwise multiple logistic regression, and evaluated by clustered bootstrap confidence intervals and clustered permutation tests.

Results: The study shows that 10.7% of adolescent girls in this population have been raped, with 12.9% of rape victims experiencing chronically repeated assaults (over five times). We find that among the 21.3% who have had a boyfriend, 38.1% report experiencing intimate partner violence (emotional, physical, and/or sexual). Boyfriends account for 42.9% of reported rapes, and relatives are the perpetrators who repeat most frequently. Prior experience of IPV and violence at home are strong predictors of experiencing sexual assault.

Conclusions: Sexual assault and intimate partner violence are crucial problems for this population and require early prevention.

Background

Sexual assault has been studied in many different settings globally, with most research on intimate partner violence (IPV) and adult or older adolescent populations (see for example Cook et. al. (11), Fisher et. al. (12), and Davis et. al. (13)). Research on particularly vulnerable groups, such as economically and socially disadvantaged adolescents and children, is particularly limited. Reliable prevalence information on sexual assault in these vulnerable subgroups, and associated correlates of the violence, are required to better inform development and evaluation of interventions in this area.

One promising class of intervention for adolescents is those with an empowerment self-defense approach. Several studies in widely different populations, ranging from upper primary and secondary school students in Kenya and New Zealand, to University students in the U.S. and Canada, have shown highly promising effects on rape reduction (1-5). However, few of these studies, and none of those done with young adolescents, have included longitudinal follow-up or follow-up periods beyond 11 months. Therefore, there is a need to improve the quality of follow-up as well as establish the durability of the findings beyond one year.

As empowerment self-defense programs are increasingly being used in settings around the globe, it will be important to tease out causal pathways that help explain how these interventions work. Understanding these pathways will allow revisions of the intervention to focus more resources towards the more effective components of the intervention, and also clearly defines core components that must be retained as the intervention is adapted to new settings. Previous studies have begun to tease out pathways for risk of sexual assault, such as a study of grade 8 students in South Africa (6), which identified gender attitudes, bullying, and alcohol use as candidate pathways from childhood trauma to experiencing IPV.

This paper reports on the baseline data obtained from a stratified sample of student participants in a cluster-randomized trial in five informal settlements around Nairobi, Kenya. This paper focuses specifically on (i) the prevalence rates for rape and other characteristics of girls attending school in Class 6, and (ii) an exploratory analysis of modifiable causal pathways (or “mediating variables”) for reported rape in this population.

Methods

Study Design and Population

This is an analysis of baseline data for a previously-described cluster-randomized trial (CRT) evaluating the impact of an empowerment self-defense based sexual assault prevention program with students in grade 6 (7). Data for this analysis was collected from January 2016 through October 2016 in five informal settlements of Nairobi, Kenya, namely Dandora, Huruma, Kibera, Korogocho, and Mukuru. Partners in Nairobi include No Means No Worldwide (NMNW), who created the intervention; Ujamaa Africa, who implement the program in Nairobi; and the African Institute for Health and Development (AIHD), a research firm in Nairobi.

As part of the larger CRT, 98 schools across the six settlements were matched on pre-trial information, and then one school in each pair was randomly assigned to the standard of care (SOC) or treatment group. Within schools, students were randomly sampled to participate in the surveys (all students in the intervention schools received the intervention) using different colored beads in an opaque bag. Potential participants lined-up and drew beads, and those who received the "participant beads", up to 40 per school, were invited to participate, beginning with an informed assent and parental consent process.

Measures

Individual-level measures

This study drew on several validated scales, including the "Self-Efficacy Questionnaire for Children," for self-efficacy, or one's belief in his or her ability to succeed in a specific task or situation (8). However, for both the primary outcomes and several secondary outcomes, validated scales for this age group and literacy level were not available. In these situations, the research team relied on a variety of existing survey tools, including the Kenya Violence Against Children Survey and the Stepping Stones surveys, as described in more detail elsewhere (7).

School-level measures

In order to design the randomization process, information about the schools was obtained prior to the start of the individual level surveys. The study used a covariate balanced restricted randomization. Variables chosen to be collected were those that could be obtained relatively easily from administrative records and observation of the schools' material environment. These pre-baseline, school-level variables include: physical location information, number of girls enrolled by grade, number of boys enrolled by grade, teachers per capita, Class 8 standardized test scores, number of toilets by sex, school funding source (e.g., governmental, private, religious, other), and school building materials (e.g., flooring, ceiling, walls).

Data Analysis

Several distinct data analyses were performed on this data at baseline. This paper contains (i) demographic information of study participants, (ii) baseline rates of intimate partnerships and intimate partner violence (rape and non-rape), (iii) baseline rates of rape (IPV and non-IPV) and discussion of corresponding count distributions, and (iv) summaries of baseline self-efficacy and attitudes about gender norms. Additional analyses include (a) an exploration of theorized modifiable causal variables which may change the probability of the outcome and (b) the relative utility of features of the schools to predict the school-level prevalence of rape. These results and detailed discussions of the statistical methodology are available in (9).

Data about sexual assault is necessarily highly protected and self-reported, which can cause missing or conflicting reports. To address this, we aggregate information from many different questions about sexual assault and validate this method with an

Adjudication Model. Full details of the model and our evaluation of it can again be found in (9).

Standard confidence intervals, for example the familiar Wald interval, fail to account for the structure of this study's sampling procedure, and are thus unlikely to produce accurate measurements of sampling error (see (9) for further detail). There is a straightforward and intuitive statistical fix in the clustered bootstrap. In the example at hand, we sample individuals within schools with replacement. The number of students from a given school stays the same, but within in a school it may be that a student is replicated a few times or not at all. Observing the proportion of girls who have been raped in each of these bootstrapped, pseudo-datasets yields a sampling distribution for the observed proportion. In a formula-driven estimate of sampling variance, such as a Wald confidence interval, this sampling distribution is assumed to be generated from a Normal or Binomial distribution; here, we generate the sampling distribution using information from our data, and use this to estimate standard errors.

Results

A total of 4117 sixth-grade female participants from 96 schools completed the baseline survey. Table 1 displays baseline demographic information. Note that in Table 1 and in subsequent tables, we report the denominator n at each step due to missing data.

About half of study participants live in homes of 3-5 people (2304, 56.6%), with another third of participants reporting 6-8 person homes (1337, 32.8%). Small numbers live in very small homes of 0-2 people (151, 3.70%) or very large homes of over 9 people (287, 7.02%). Table 1 also gives a breakdown of the mother's education level and of how many parents are still alive. Slightly fewer than one in five girls (672, 16.5%) have either one or both parents deceased or missing. As a general measure of socioeconomic status, the survey asks how easy it would be for an adolescent to get 1000 shillings for medical attention or a hospital visit. Half of the girls (49.8%) rate it difficult or very difficult to get this money, while a quarter (24.7%) report that they have medical insurance.

Table 1. Baseline Demographics

	Count (n = 4117)	Percent
Home size	n = 4079	
0-2	151	3.70%
3-5	2304	56.5%
6-8	1337	32.8%
9-12	233	5.71%
13+	54	1.31%
Mother's education level	n = 4100	
None	40	0.976%
Primary incomplete	229	5.59%
Primary school	363	8.85%
High school incomplete	249	6.07%
High school	723	17.6%

Post-high school	1180	28.8%
Do not know	1316	32.1%
Parental status	n = 4071	
Both alive	3399	83.5%
Mother dead	104	2.55%
Father dead	315	7.74%
Orphaned	60	1.47%
Do not know	193	4.74%
Ability to get 1000 shillings for hospital or medicine	n = 4116	
Very difficult	775	18.8%
Difficult	1251	31.0%
Easy	850	20.7%
Very easy	245	5.95%
Have medical insurance	995	24.2%

One in ten girls (442, 10.74%) reported sexual assault. We also examine how many assaults each girl reported. The numbers range from one to forty assaults, with about half of the girls (234, 52.9%) who were assaulted reporting one assault. On the other hand, 57 individuals (12.9%) reported over five sexual assaults. Reported confidence intervals are over 1000 bootstrap runs as described earlier. Figure 1 shows a histogram of how many rapes each girl has experienced over the course of her life, in total, for all girls who have been raped at least once. The vast majority are close to zero, but there is a long right tail of extreme counts.

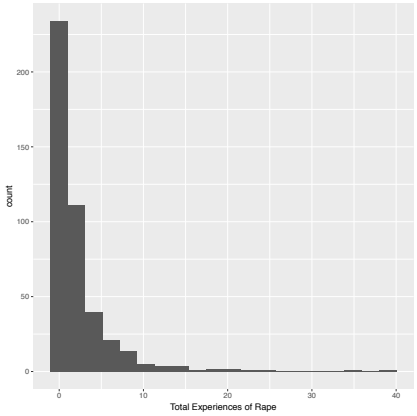

Figure 1. Histogram showing reported total counts of rape.

Of the girls who responded to questions about experiencing violence (Table 2), 858 (21.34%) have had a boyfriend at some point in their lives. Of those who have had a boyfriend, about one in three (266, 31.00%) reported experiencing emotional intimate partner violence (IPV), while about one in five (182, 21.21%) experienced physical IPV and 143 (16.67%) reported sexual IPV. A little over one in five (941, 23.0%) reported violence at home, which encompasses any individual (father or other) hitting their mother.

Table 2. Baseline Violence Statistics.			
	Count (n = 4117)	*Percent*	*95% Confidence Interval*
Have had a boyfriend	858 (n = 4020)	21.3%	(19.8%, 23.7%)
Violence at home	941 (n = 4097)	23.0%	(21.6%, 24.1%)
Sexual assault	442 (n = 4117)	10.7%	(9.76%, 11.9%)
Once*	234 (n = 442)	52.9%	(47.8%, 58.0%)
2-5 times*	151 (n = 442)	34.2%	(30.3%, 38.6%)
5+ times*	57 (n = 442)	12.9%	(9.70%, 15.6%)
Sexual IPV**	143 (n = 858)	16.7%	(14.9%, 19.1%)
Physical IPV**	182 (n = 858)	21.2%	(18.6%, 23.4%)
Emotional IPV**	266 (n = 858)	31.0%	(28.8%, 33.9%)

* The denominator for how many times a girl reported sexual assault is the number of total girls who reported a sexual assault, here 442.
** The denominator for IPV questions is the number of girls who have had a boyfriend, here 858.

Behavior and social characteristics of the study participants are presented in Table 3. Alcohol use is binned into categories of never, infrequent (once ever to a few times per month), high (a few times per week to daily), and unknown. Note that the unknown category is difficult to interpret, as it could contain girls who drink very frequently and girls who do not know how to recognize an alcoholic beverage. Almost nine in ten participants (3625, 88.8%) said they have never consumed an alcoholic beverage, and about one in ten (417, 10.2%) use alcohol infrequently. The vast majority of girls who answered the question about drug use (3255, 99.1%) reported that they have never used drugs. Note that the responses for some questions (drug use stands out with only 3284 responses) are relatively low. We have higher numbers for IPV responses because we can aggregate across questions.

Table 3 also contains a self-efficacy score. Individuals were given a set of questions designed to assess their self-efficacy, on a scale of 1 to 5. We average their answers to see an overall self-efficacy agreement of 3.84/5.

Table 3. Behavior and Social Characteristics.			
	Count (n = 4117)	*Percent*	*95% Confidence Interval*
Alcohol use	n = 4080		
None	3625	88.8%	(87.95%, 89.8%)
Infrequent	417	10.2%	(9.56%, 10.9%)
High	7	0.172%	(0.0490%, 0.320%)
Do not know	31	0.760%	(0.515%, 1.04%)
Drug use	n = 3284		
None	3255	99.1%	(98.9%, 99.4%)
Infrequent	25	0.768%	(0.514%, 1.03%)
High	4	0.122%	(0.024%, 0.183%)
Intercourse	n = 4045		
No	3804	94.0%	(91.9%, 96.26%)
Yes	207	5.12%	(4.41%, 5.70%)

Do not know	34	0.841%	(0.547%, 1.11%)
	Average		*95% Confidence Interval*
Self-efficacy score	3.84/5.00		(3.82, 3.85)

Table 3a summarizes the attitudes expressed about gender norms, such as "a woman should listen to her husband" and "a man cannot control himself when he wants sex." Students were given each statement and then asked to respond either strongly agree, agree, disagree, or strongly disagree. Counts of these responses and corresponding percentages are given.

Table 3a. Responses to questions concerning gender norms.

		Count	Percentage
If a woman drinks alcohol and wears miniskirts she is asking for trouble.	Strongly agree	1838	44.8%
	Agree	738	18.0%
	Disagree/strongly disagree	1524	37.2%
A woman should listen to her husband.	Strongly agree	2228	54.3%
	Agree	1490	36.3%
	Disagree/strongly disagree	384	9.4%
A woman has to teach her husband to respect her.	Strongly agree	1639	40.0%
	Agree	1235	30.1%
	Disagree/strongly disagree	1224	29.9%
A woman should choose her own friends even if her boyfriend or husband disagrees.	Strongly agree	1178	28.8%
	Agree	958	23.5%
	Disagree/strongly disagree	1949	47.7%
Men should share the work around the home such as doing the dishes or cleaning or cooking.	Strongly agree	1123	27.6%
	Agree	925	22.7%
	Disagree/strongly disagree	2026	49.7%
Sometimes a man may have a good reason to hit his girlfriend.	Strongly agree	602	14.8%
	Agree	800	19.6%
	Disagree/strongly disagree	2670	65.6%

A woman can refuse to have sex with her husband if she does not want it for any reason.	Strongly agree	1415	34.8%
	Agree	935	23.0%
	Disagree/strongly disagree	1720	42.3%
If a wife does something wrong she should expect her husband to punish her.	Strongly agree	408	10.0%
	Agree	488	12.0%
	Disagree/strongly disagree	3177	78.0%
A woman has to know how to look after herself as she cannot rely on her man to care for her.	Strongly agree	1992	48.9%
	Agree	1086	26.6%
	Disagree/strongly disagree	998	24.5%
A man cannot control himself when he wants sex.	Strongly agree	876	21.5%
	Agree	775	19.0%
	Disagree/strongly disagree	2427	59.5%
A woman should expect to be taught how to behave by her boyfriend.	Strongly agree	686	16.8%
	Agree	690	16.9%
	Disagree/strongly disagree	2708	66.3%
A woman should not expect the fathers of her children to give her money.	Strongly agree	938	22.9%
	Agree	853	20.8%
	Disagree/strongly disagree	2306	56.3%

Table 4 gives the distribution of reported perpetrators, with percentages telling how many of the individuals who reported assaults attributed at least one to a given category of perpetrator. Almost half of the girls declined to answer the question or left it empty, but of the 187 responses received, we can see that almost half of reported perpetrators (95, 42.8%) were boyfriends. Relatives account for one in five (45, 20.4%) assaults, strangers for about one in three (30.2%), and authority figures for 6.76% (15 total). While the survey asks how many times each perpetrator raped each individual, we have some missing and conflicting reports; there are six surveys reporting multiple perpetrators that do not specify how many of the total reported count can be attributed to each perpetrator. These are left out of the full counts in Table 4.

Table 4. Perpetrator Distribution. We show the percentage of reported rapes accounted for by each category of perpetrator, as well as some summary statistics for counts by perpetrator.

	Count (n = 187)	*Percent*	*Mean*	*Median*	*Min*	*Max*
Boyfriend	95	42.8%	4.28	3	1	24
Relative	45	20.4%	5.42	2	1	40
Authority	15	6.76%	5	5	3	8
Stranger	67	30.2%	2.86	2	1	11

Lastly, Table 5 gives the results of a logistic regression predicting whether a girl has experienced sexual assault given the baseline data. Predictors were selected via forward and backward stepwise regression, evaluated by the Akaike Information Criterion (AIC). Confidence intervals are again from a clustered bootstrap over 1000 replicates. Two-sided p-values are computed by a clustered permutation test, analogous to the clustered bootstrap except that instead of re-sampling within clusters, we permute the responses. All predictors were centered and scaled before regression, so as to give meaning to the coefficients. Positive coefficients denote variables that bring up the probability of rape, and negative coefficients vice versa. Physical and emotional IPV are very strong predictors of sexual assault, as is violence at home.

Table 5. Risk factors for experiencing sexual assault. Reported coefficients are from a multiple logistic regression model on centered and scaled data.

	Coefficient	95% CI	p-value
Physical IPV	0.31	(0.20, 0.46)	<0.001
Emotional IPV	0.20	(0.05, 0.34)	0.046
Violence at home	0.27	(0.10, 0.39)	0.002
Has had intercourse	0.17	(0.06, 0.28)	0.018
Succeeds at staying friends with other children	-0.18	(-0.33, -0.01)	0.022
Pays attention well during class	-0.17	(-0.32, 0.01)	0.064
Can study well when there are other interesting things to do	0.19	(-0.62, 0.32)	0.32
Can control feelings well	-0.13	(-0.29, 0.09)	0.136
Frequent drug use	-0.24	(-0.46, -0.08)	0.028
Frequent alcohol use	0.09	(-0.07, 0.21)	0.296
Has taken No Means No	-0.15	(-0.65, 0.05)	0.064
Agrees with “a woman should choose her own friends even if her boyfriend or husband disagrees.”	-0.11	(-0.31, 0.05)	0.208

Discussion

This study reports baseline findings from a cluster-randomized trial of a sexual assault prevention program. The adolescent girls in the study were class 6 students in schools that serve unplanned settlements of Nairobi, Kenya. Even though these girls are quite

young (mean, 11.7 years, range 10-14 years) 10.8% reported being raped in the prior 12 months, and of the 21.3% who reported having a boyfriend, 21.2% and 31.0% reported experiencing physical or emotional intimate partner violence, respectively. These numbers correspond to many of the same girls; in total, 38.1% of girls who have had a boyfriend report any of the three categories of IPV. A chi-square test for independence between any IPV and any sexual assault gives a p-value less than 0.001, indicating significant overlap between the populations of girls experiencing IPV (physical or emotional) and rape.

About half of the adolescents reporting assault were assaulted once, with another third reporting 2-5 assaults and almost 13% reporting being assault more than five times. Boyfriends committed slightly under half (42.8%) of reported assaults; the most egregious counts (maximum of 50, and mean of over 5 per person) correspond to assaults by family members. Authority figures committed fewer of the assaults, 6.76%, but consistently perpetrated between 3 and 8 assaults each. Overall, prevalence of sexual assault is higher than qualitative interviews would indicate (10). Almost one quarter of the adolescents report violence at home against their mother, whether by their father or by somebody else.

There was relatively minimal drug use (1%) and drinking (11%) reported in this population. Some gender norms (e.g. “a woman should listen to her husband”, “if a woman wears miniskirts and drinks alcohol then she is asking for trouble”) were fairly pervasive, while others (“sometimes a man may have a good reason to hit his girlfriend”) were more soundly rejected. Average self-efficacy was fairly high, at 3.8 out of five.

The reported levels of violence, including sexual, physical, and emotional, are all quite high, and higher than most previous reports of possibly similar populations. For example, a study of grade 8 students in South Africa (6) reported that 40.5% of respondents who have had an intimate partner had experienced emotional IPV, 24.1% physical IPV and 13.8% sexual IPV. With the exception of the higher rate of emotional IPV, these numbers are consistent with the ones reported by the students in Nairobi, notably reported by students two years older.

Prior physical IPV and violence at home were most strongly associated with increasing the probability that a girl experienced rape. Prior emotional IPV and sexual history were also significant factors. A higher level of generalized self-efficacy appears to decrease probability of rape, with success at staying friends with others and ability to pay attention in class correlated to lower probability of rape. Frequent drug use also corresponded to a lower probability of assault, but we note that only 29 girls reported using drugs infrequently or frequently, so this result may not be meaningful. The only statement related to gender norms that was selected for inclusion in the stepwise regression was “a woman should choose her own friends even if her boyfriend or husband disagrees;” agreeing corresponded to a lower probability of rape, but the trend is not statistically significant. This last point, that gender norms appear to not be linked to an individual girl’s probability of rape, is consistent with the observation that shifting gender norms of a group can be beneficial by shifting how people are expected to act in social situations,

whereas shifting an individual's belief in gender norms may have no impact at all if the group's beliefs do not change. These results are suggestive, and will bear more evidentiary weight if similar results are replicated in the study's final analysis – when these baseline measures can be combined with measurements at 12 months and 24 months after the intervention period.

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