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The Impacts of Two Gender-Transformative Interventions on Early Adolescent Gender Norms Perceptions: A Difference-in-Difference Analysis

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A B S T R A C T

Purpose: Inequitable gender norms are widespread and can be harmful to the wellbeing of adolescents. This study estimates the effects of two gender-transformative interventions, Semangat Dunia Remaja or Teen Aspirations (SETARA) and Growing Up Great! (GUG!), on gender norms perceptions and attitudes among very young adolescents in poor urban settings in Bandar Lampung, Semarang, Denpasar (Indonesia), and Kinshasa (Democratic Republic of the Congo).
Methods: The study draws from the longitudinal Global Early Adolescent Study, using a quasi-experimental design to evaluate the interventions. Data collection took place between 2017 and 2020. Our analytical samples included 2,159 adolescents in Kinshasa and 3,335 in Indonesia. We conducted a difference-in-difference analysis using generalized estimation equations and generalized linear models, after stratification by site and sex.
Results: The interventions shifted a range of gender perceptions, although effects varied by program, city, and sex. SETARA shifted gender-normative perceptions related to traits, roles, and relations, while GUG! effects were more concentrated on attitudes toward chore sharing. SETARA was most effective in Semarang and Denpasar, but not in Bandar Lampung. In addition, both interventions were more consistently effective for girls than boys.
Discussion: Gender-transformative interventions can effectively promote gender equality in early adolescence, but effects are program-specific and context-specific. Our findings emphasize the

IMPLICATIONS AND CONTRIBUTION

Gender-transformative interventions can reduce inequitable gender norms perceptions and attitudes among young adolescents. Within programs, effects vary by sex, with girls often benefitting more. Moreover, program-specific and context-specific effects underscore the need for intervention content specific to the targeted outcomes and enabling environments that allow programs to meet their potential.

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importance of defined theories of change and consistent implementation in gender-transformative intervention.

During early adolescence—the period from age 10–14 years—young people undergo significant and rapid physical, cognitive, and social change. Very young adolescents (VYAs; those aged 10–14 years) enter this life stage having already internalized unequal gender norms, particularly from parents and other family members [1,2]. Such norms reflect a larger gender system that divides power, roles, and expectations between men and women, contributing along with other intersecting social hierarchies (social class, race/ethnicity, stability, etc.) to differing exposures to harmful and beneficial experiences, health behaviors, and inequities in healthcare including gender disparities [3]. While this process unfolds throughout the life course, gender socialization intensifies during critical periods of development, such as early adolescence, when social, cognitive, and physical functions expand rapidly [4]. At that early stage, VYAs around the world express attitudes about gender that is inequitable or stereotypical; for example, emphasizing physical toughness for boys and the importance of beauty for girls [5]. This has important implications for health over the life course, as scholars have identified "gendered pathways to health," in which gender norms incentivize (or disincentivize) health behaviors, promote power disparities, and create inequitable access to services, ultimately resulting in harms to wellbeing [6].

Challenging gender inequalities and inequitable gender norms would create opportunities for better health not only for people experiencing gender-based marginalization (e.g., girls, women, and gender minorities) but also boys and men, who may gain social power but also suffer the health consequences of harmful masculinity norms [7]. Inequitable gender norms are often self-reinforcing; adolescents face sanctions from peers and others for challenging them [5] but they are malleable to change in these formative years [8]. Recent research among young adolescents suggests that gender-normative perceptions are neither static nor simplistic; they evolve over time [9] and are nuanced, as many young people hold both equitable and inequitable beliefs about gender at the same time, depending on the specific attitudes being assessed [10].

However, the fluidity of gender norms in early adolescence represents a window of opportunity to promote gender-equitable attitudes before such attitudes solidify, in turn contributing to greater gender equality. "Gender-transformative" interventions [11], which seek to transform harmful gender norms and power imbalances to promote more gender-equitable relationships [12], have shown notable successes [13]. A recent global systematic review highlights the success of these programs in shifting adolescent gender attitudes and behaviors [14], with benefits for a range of health outcomes, including reductions in gender-based violence [15], and improvement in sexual and reproductive health (SRH) outcomes such as family planning use and contraceptive self-efficacy [16,17].

While programmatic efforts are growing, there is a lack of understanding of when best to intervene and how these interventions work across a diversity of social contexts and populations. To address these gaps, the Global Early Adolescent Study (GEAS; https://geastudy.org) was designed to provide longitudinal evidence on gender socialization and health among VYA boys and girls. The study was also used to evaluate the impact of gender-transformative interventions conducted in urban centers of Indonesia and the Democratic Republic of the Congo (DRC). The impacts of each intervention across a holistic set of outcomes are discussed in studies by Pinandari, Kågesten et al., and Gayles et al. in this supplement. In complement, the present study offers a unique opportunity for cross-cultural and cross-intervention comparisons using common measures to identify commonalities and differences between interventions. Results can shed light on the conditions favoring equal gender-normative perceptions in early adolescence.

Methods

The present study used a quasi-experimental design to compare the effects of the Semangat Dunia Remaja or Teen Aspirations (SETARA) intervention in three sites in Indonesia and the Growing Up Great! (GUG!) intervention in Kinshasa, DRC on adolescents' gender-normative perceptions. These were the two GEAS countries that were implementing gender-transformative interventions with longitudinal data available to evaluate their impact. We first describe study sites and intervention approaches and subsequently describe the GEAS study.

Indonesia

Indonesia is the fourth most populated country in the world and is majority (87%) Muslim [18]. The cities of Bandar Lampung, Semarang, and Denpasar, in which this study took place, are located on the islands of Sumatra, Java, and Bali, respectively, with distinct cultural and ethnic makeups. A GEAS synthesis of gender equality metrics found that education disparities are major contributors to gender inequality in Indonesia, although there are significant variations by province [19]. For example, Bandar Lampung is in a province where older adolescent girls have higher school enrollment than boys, while Denpasar is in an area where girls have about 10% lower school enrollment than boys [20]. Previous research found that both male and female VYAs in the Indonesian cities agree with gender stereotypes about boys being tough and women being vulnerable, although less than one in five believed there should be sanctions for challenging such norms [21].

The SETARA intervention was conducted in 18 schools between 2018 and 2021 in each of the three sites. SETARA was a two-year, rights-based comprehensive sexuality education program for junior high-school students (aged 12–15 years), covering 23 themes such as "Gender" and "Rights and decision-making". The primary aim of SETARA was to promote healthy sexual wellbeing, which includes building knowledge about SRH and more gender-equal attitudes [22], with content aligned to UNESCO guidelines for comprehensive sexuality education. The program was delivered by trained teachers in classrooms or

"school clubs" in grades 7 and 8. The theory of change for SETARA's impact on gender norms was as follows: by building critical awareness of harmful and inequitable gender norms, encouraging VYAs to question them, and identifying positive existing norms, SETARA will replace inequitable gender norms with equitable and inclusive ones.

Kinshasa, Democratic Republic of the Congo

In DRC, the study took place in Kinshasa, located on the western border of the country. Kinshasa is the second most populous city in sub-Saharan Africa [23]. Kinshasa has endured decades of civil conflict, resulting in ongoing violence and instability and high poverty [24]. Gender inequalities are prevalent, as girls have less educational and employment opportunities and suffer high levels of gender-based violence [25]. These inequalities are internalized at a young age, as boys and girls aged 10–14 years in Kinshasa endorse highly unequal gender norms related to roles, traits, and relationships [10].

The GUG! intervention, presented in more detail by Gayles et al. in the present supplement, was implemented in schools and community-based settings over nine months in 2017–2018. The intervention took place in Masina and Kimbanseke, two of Kinshasa's poorest communes. GUG! took a norms-focused social and behavior change approach with intervention at multiple levels: the individual, family, school, and community [26] to increase SRH knowledge, build personal assets (communication skills and agency), and promote gender-equitable attitudes and behaviors. The intervention included 26 youth-led, teacher-led, and educator-led sessions using a flexible, modular toolkit (rather than set curriculum) in which gender was a cross-cutting theme, with an emphasis on pubertal development, SRH knowledge, and age-appropriate gender-equal behaviors (such as girls' education, chore-sharing, and accepting peers' gender-atypical behavior). The theory of change for GUG!'s impact on gender norms was as follows: using a multilevel intervention that includes critical reflection on inequitable norms, role-modeling of positive behaviors, and reinforcement of gender-equitable attitudes, GUG! will foster more equitable gender norms in VYAs and their communities.

SETARA and GUG! addressed gender inequalities in distinct ways. While GUG! aimed to shift gender norms through a multilevel intervention, SETARA aimed to promote more equitable gender attitudes as an intermediate outcome toward improving sexual wellbeing among VYAs. Across both interventions, having facilitators who promoted gender-equitable attitudes, and gaining social and structural support for such attitudes, were seen as key conditions for success (Mmari et al. in the present supplement).

GEAS impact study

The impact studies of both GUG! and SETARA were embedded within the larger GEAS, a multicountry study examining gender norms perceptions and their relation to health and wellbeing, with a specific focus on young adolescents living in low-income urban centers. For the evaluation studies in Kinshasa and Indonesia, longitudinal surveys were used to determine the impact of the interventions in changing outcomes among VYAS. Specifically, baseline data from Kinshasa and the Indonesian sites (Bandar Lampung, Denpasar, and Semarang) were collected in 2017 and 2018, respectively. In Kinshasa, follow-up (Wave 2) data were collected the year following intervention completion. In Indonesia, follow-up data were gathered in 2021 due to COVID-19–related delays. The impact studies were implemented by researchers from the Kinshasa School of Public Health in DRC and the Center for Reproductive Health at Gadjah Mada University in Indonesia.

A two-stage sampling procedure was used to obtain the study samples in both countries, starting with the selection of schools and followed by the selection of adolescents in each school. Parental consent and adolescent assent were provided for adolescent participation in both sites. Each study city in Indonesia included three intervention schools and three control schools with similar profiles from the same districts. Sample size was powered to show a one-standard deviation shift in gender-normative perceptions and 40% reduction in the 6-month incidence of peer violence victimization in the intervention relative to controls. In Kinshasa, the sample was divided into in-school and out-of-school adolescents. In-school adolescents were sampled from 80 schools (40 intervention and 40 matched controls). The out-of-school sample was drawn from the same neighborhoods and included adolescents participating in GUG! and control adolescents randomly selected from a list of households in the same neighborhoods. Sample size was powered to show a doubling of contraceptive use among girls aged 15–17 years in the intervention relative to the control group, assuming a prevalence of 13% based on PMA2020 estimates in Kinshasa.

A total of 2,174 adolescents in Kinshasa and 3,827 in Indonesia (1,215 in Bandar Lampung, 1,304 in Denpasar, and 1,308 in Semarang) had baseline and follow-up data (follow-up rates were 89.1% in Kinshasa and 81.7% in Indonesia). Fifteen (0.69%) adolescents in Kinshasa and 492 (12.9%) in Indonesia were dropped due to excessive missing data (15% for Kinshasa surveys and Indonesia baseline, 30% for Indonesia follow-up conducted online). The final analytic samples included 2,159 adolescents in Kinshasa and 3,335 in Indonesia (948 in Bandar Lampung, 1,156 in Denpasar, and 1,231 in Semarang).

Ethics

Ethical approval for the study was provided by the Johns Hopkins School of Public Health Institutional Review Board (Kinshasa: #7510, Indonesia: #8549) and by in-country review board at Gadjah Mada University and the Kinshasa School of Public Health.

Survey instrument

The GEAS survey was completed using computer-assisted self-interviewing in Indonesia and face-to-face in Kinshasa (due to low literacy rates) and took on average 90 minutes. The survey collected information about adolescents' social environments, normative perceptions, and health and wellbeing (https://www.geastudy.org).

Outcome measures

In this study, we examined several gender norms perceptions outcomes, some of which were specifically targeted by the two interventions. Specifically, we used three gender norms perceptions scales related to traits, roles, and relationships, developed and validated in cross-cultural mixed-method GEAS formative research [10,27]. The sexual double standard (SDS) scale

measures young people's differential expectations for engaging in heterosexual relationships, rewarding boys but sanctioning girls; the gender-stereotypical traits (GST) scale contrasts male toughness to female need for protection while the gender-stereotypical roles (GSR) scale measures power imbalance in household decision-making. These scales were aligned with SETARA's theory of change. Scale scores could range from 1 to 5, with 5 indicating the highest degree of inequitable gender norms perceptions. We also used three binary gender attitudes indicators, aligned with GUG!'s theory of change. These were in agreement with gender equality in household chores and in agreement with gender-atypical teasing (*It is okay to tease a boy who acts like a girl* and *It is okay to tease a girl who acts like a boy*). A full description of the outcome measures is provided in Table 1.

In this article, we use the term "sex" rather than "gender" to qualify respondent boys and girls because they responded to the question "Are you a boy or a girl?", which in these contexts, is traditionally understood as sex in the absence of a specific reference to gender identity. In addition, the question provides no opportunity to capture more nuanced gender identities such as nonbinary or fluid gender identities. Nonetheless, we assume observed differences between boys and girls reflect social processes (gender) rather than biological processes (sex).

Analysis

This study used a difference-in-difference approach to estimate the effect of SETARA and GUG! on gender norms perceptions. The use of difference-in-difference analyses in public health evaluations is well documented and can limit unobserved confounding from group-invariant and time-invariant factors [28]. We used generalized linear regression models (continuous variables) or generalized estimating equations regression models (binary variables), interacting study group and survey time to evaluate differential trends in the outcomes between intervention and controls. All analyses were stratified by site. Moderation effects by sex and age were also investigated.

Across the sites, we compared demographic characteristics between adolescents who were included versus excluded from the final analysis (due to loss to follow-up, poor data quality, or missing outcome measures). Characteristics with significant differences at baseline (age, sex, household composition, sibling sex composition, family wealth, caregiver closeness, peer socialization, and neighborhood safety) were incorporated into inverse probability weights to reduce attrition bias [29]. Weighted regressions used a robust variance estimator. Analyses of continuous variables were completed using data in a wide format; the article by Pinandari, Kågesten et al. in this supplement used a long-formatted database, resulting in slight differences in standard errors across the two articles. All analyses were conducted with Stata SE 15.1 [30].

Results

Baseline levels of sociodemographic factors, by site and study group, are presented in Table 2. Samples were equally divided by sex and adolescents were on average aged 12 years at the time of the survey. Across sites, more than eight in 10 VYAs felt close to their caregiver. By design, 27.9% of VYAs were out of school in Kinshasa. Half (50%) of those in Kinshasa saw their peers every day, while this proportion ranged from 29% to 42% in Indonesia. Almost eight of 10 adolescents in Kinshasa felt safe in their

Table 1
Outcome measures of gender norms perceptions and attitudes

Measure	Description	Notes
Gender norms perceptions scales (aligned with SETARA's theory of change)		
Sexual double standard (SDS)	Perceptions of different standard for boys and girls related to romance/sexuality. • *Girls are the victims of rumors if they have boyfriends.* • *Boys tell girls they love them when they do not.* • *Adolescent girls should avoid boys because they trick them into having sex.* • *Boys have girlfriends to show off to their friends.* • *Adolescent boys lose interest in a girl after they have sex with her.* • *Adolescent boys fool girls into having sex.*	Response options from "agree a lot" to "disagree a lot." Cronbach's alpha: 0.78 (Indonesia), 0.74 (Kinshasa)
Gender stereotypical traits (GST)	Perceptions of gendered expectations for boys' toughness and girls' vulnerability. • *Boys should be raised tough so they can overcome any difficulty in life.* • *Girls should avoid raising their voice to be ladylike.* • *Boys should always defend themselves even if it means fighting.* • *Girls are expected to be humble.* • *Girls need their parents' protection more than boys.* • *Boys who behave like girls are considered weak.* • *It's important for boys to show they are tough even if they are nervous inside.*	Response options from "agree a lot" to "disagree a lot." Cronbach's alpha: 0.70 (Indonesia), 0.62 (Kinshasa)
Gender stereotypical roles (GSR)	Perceptions of gender role expectations for men and women. • *A woman's role is taking care of her home and family.* • *A man should have the final word about decisions in the home.* • *A woman should obey her husband in all matters.* • *Men should be the ones who bring money home for the family.*	Response options from "agree a lot" to "disagree a lot." Cronbach's alpha: 0.80 (Indonesia), 0.46 (Kinshasa)
Binary attitudes outcomes (aligned with GUG!'s theory of change)		
Gender equality in chores	*Boys and girls should be equally responsible for household chores.*	Response options from "agree a lot" to "disagree a lot." Agreeing "a lot" or "a little" was considered endorsement.
Gender-atypical teasing items	*It is okay to tease a girl who acts like a boy.* *It is okay to tease a boy who acts like a girl.*	

neighborhood, while this proportion ranged from 64% to 75% in Indonesia. There were several significant differences between intervention and control groups at baseline including household composition, family wealth, and feeling of safety. Specifically, VYAs in the intervention groups in Kinshasa and Bandar Lampung lived in wealthier families than the controls, and in Bandar Lampung they were also more likely to live with both of their parents. In Bandar Lampung and Semarang, a higher proportion of VYAs felt safe in their neighborhood in the intervention group relative to the controls.

At baseline, mean gender norms perceptions and attitudes varied by site and outcome (Figure 1). VYAs in Kinshasa consistently scored higher than those in Indonesia, indicative of more unequal norm perceptions (higher scores indicate greater inequality). Across sites, VYAs endorsed greater GST and GSR compared to SDS, especially in Indonesia. An agreement that it was okay to tease boys/girls acting a gender-atypical way was also descriptively higher in Kinshasa than in the Indonesian cities. Most VYAs endorsed gender-equal views about household chore-sharing, with the exception of control group boys in Bandar Lampung (47%) and control group girls in Denpasar (48%).

Estimated intervention effects

Table 3 shows the estimated effect of SETARA and GUG!, by site, on selected gender norms perceptions and attitudes. The interventions shifted a range of gender normative perceptions, although effects were program and context specific. SETARA was associated with more egalitarian gender outlooks across a range of normative perceptions, while GUG!'s effect was more concentrated on gender attitudes that it specifically targeted. As a result, SETARA led to significant reductions in stereotypical perceptions about traits and roles relative to controls (0.12-point greater average score reduction in GST and 0.13-point greater score reduction in GSR, on a scale from 1 to 5). SETARA was also associated with a greater decline in SDS scores than controls, although differences were not significant (−0.07; $p = .09$). On the other hand, SETARA had no effect on specific gender attitudes related to household chore-sharing and gender-atypical behaviors. The opposite was true in Kinshasa, where GUG! was mostly effective in shifting specific attitudes, with greater improvement in the odds of equitable chore-sharing attitudes in the intervention group relative to the controls (Odds Ratio [OR] = 2.28), but had no effect on SDS, GST, and GSR scores nor on attitudes toward atypical gender behaviors.

Subgroup analyses

Beyond program differences, intervention effects varied notably by site, reflecting cultural influences and differential implementation disruptions related to the COVID-19 pandemic (Table 3). Specifically, SETARA was most effective in Semarang and Denpasar but had no effect in Bandar Lampung, which experienced the greatest implementation challenges related to teacher opposition and the need to shift to online delivery during COVID-19. In both Denpasar and Semarang, SETARA shifted GSR with 0.26-point and 0.14-point greater reductions in stereotypical gender normative scores relative to controls. The intervention also reduced perceptions of GST in Denpasar (0.17-point reduction in the GST score relative to controls), while challenging perceptions of a sexual double standard in Semarang (0.20-point reduction in the SDS score relative to controls). Across sites, no effect was found on attitudes related to atypical gender

Table 2
Baseline sociodemographic characteristics by intervention group and city

Factor	Indonesia						Kinshasa, DRC	
	Bandar Lampung		Denpasar		Semarang			
	Control (n = 663)	Intervention (n = 751)	Control (n = 761)	Intervention (n = 992)	Control (n = 757)	Intervention (n = 760)	Control (n = 1,383)	Intervention (n = 1,459)
Age, mean (SD)	**12.3 (0.6)**	**12.1 (0.6)**	**12.2 (0.5)**	**12.1 (0.5)**	12.2 (0.5)	12.2 (0.6)	**12.0 (1.4)**	**11.9 (1.4)**
Female sex, n (%)	332 (50.1)	412 (54.9)	401 (52.7)	498 (50.2)	421 (55.6)	413 (54.3)	697 (50.4)	722 (49.5)
Household composition, n (%)								
No parents	**91 (13.7)**	**64 (8.5)**	39 (5.1)	43 (4.3)	35 (4.6)	32 (4.2)	193 (14.0)	235 (16.1)
One parent	**48 (7.2)**	**67 (8.9)**	43 (5.7)	55 (5.5)	66 (8.7)	61 (8.0)	437 (31.6)	440 (30.2)
Two parents	**524 (79.0)**	**620 (82.6)**	679 (89.2)	894 (90.1)	656 (86.7)	667 (87.8)	753 (54.4)	784 (53.7)
Sibling sex composition, n (%)								
No siblings	31 (4.7)	43 (5.7)	71 (9.3)	70 (7.1)	75 (9.9)	61 (8.0)	26 (1.9)	33 (2.3)
Same sex sibling only	105 (15.8)	127 (16.9)	154 (20.2)	223 (22.5)	190 (25.1)	182 (23.9)	119 (8.6)	153 (10.5)
Different or mixed sex siblings	527 (79.5)	581 (77.4)	536 (70.4)	699 (70.5)	492 (65.0)	517 (68.0)	1,238 (89.5)	1,273 (87.3)
Family wealth tertile, n (%)								
Low	**363 (54.8)**	**265 (35.3)**	164 (21.6)	189 (19.1)	231 (30.5)	230 (30.3)	**492 (35.6)**	**481 (33.0)**
Medium	**202 (30.5)**	**193 (25.7)**	245 (31.9)	316 (31.9)	247 (32.6)	254 (33.4)	**483 (34.9)**	**458 (31.4)**
High	**98 (14.8)**	**293 (39.0)**	354 (46.5)	487 (49.1)	279 (36.9)	276 (36.3)	**408 (29.5)**	**520 (35.6)**
Feels close to caregivers, n (%)	577 (87.0)	661 (88.0)	685 (90.0)	902 (90.9)	652 (86.1)	644 (84.7)	1,204 (87.1)	1,251 (85.7)
Time spent with friends, n (%)								
No friends or does not spend time with friends	76 (11.5)	73 (9.7)	107 (14.1)	131 (13.2)	68 (9.0)	53 (7.0)	87 (6.3)	92 (6.3)
1–4 times per week	305 (46.0)	390 (51.9)	392 (51.5)	560 (56.5)	465 (61.4)	451 (59.3)	589 (42.6)	661 (45.3)
Nearly every day	282 (42.5)	288 (38.3)	262 (34.4)	301 (30.3)	224 (29.6)	256 (33.7)	707 (51.1)	706 (48.4)
Has started puberty, n (%)	614 (92.6)	683 (90.9)	701 (92.1)	917 (92.4)	723 (95.5)	720 (94.7)	857 (62.0)	933 (63.9)
Feels neighborhood is safe, n (%)	**422 (63.7)**	**570 (75.9)**	564 (74.1)	714 (72.0)	**520 (68.7)**	**559 (73.6)**	1,099 (79.5)	1,146 (78.5)

Significant differences ($p < .05$) between study groups at baseline were identified using Chi-squared test (categorical variables) and Student's *t*-test (continuous variables) and are denoted with bolding.

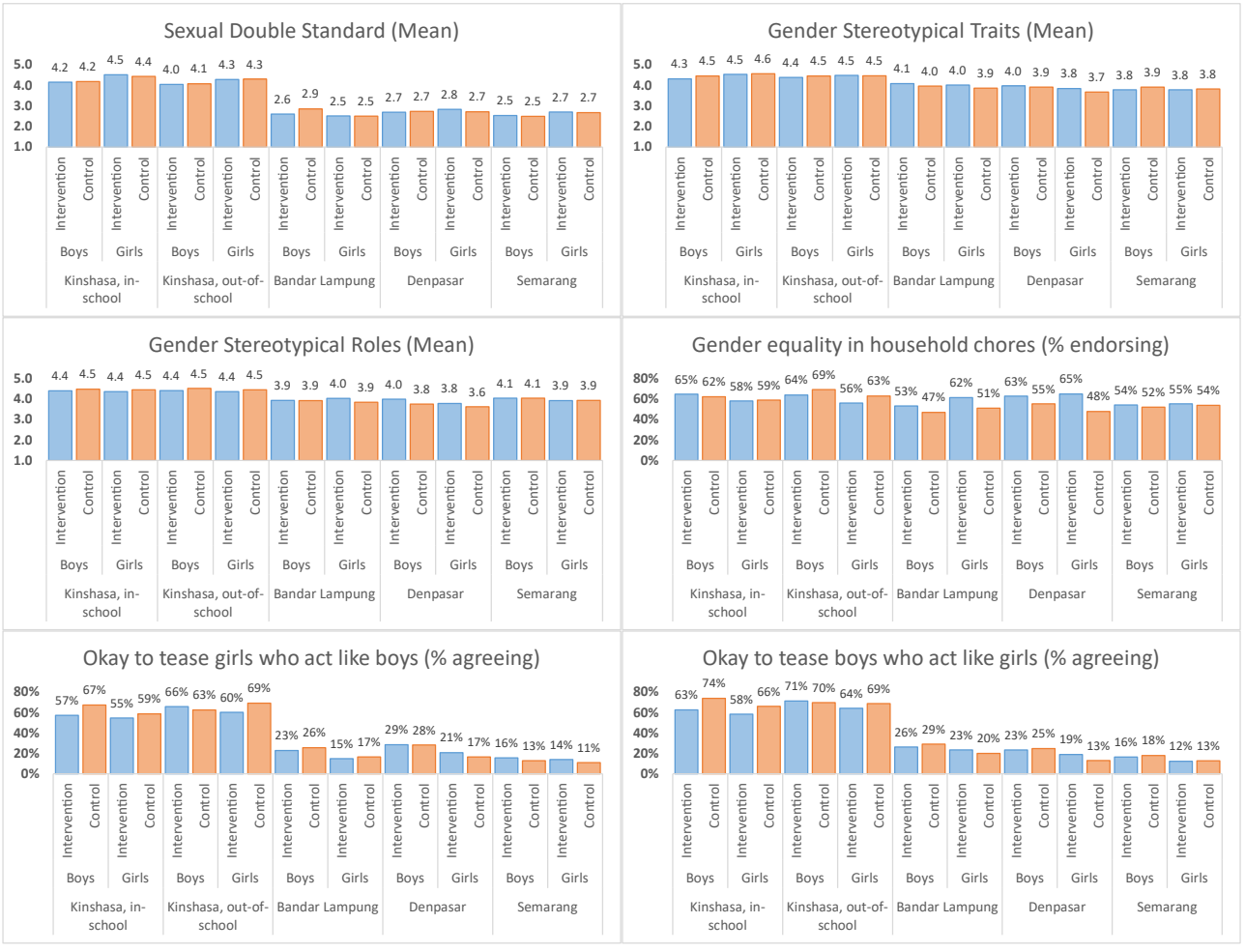

Figure 1. Gender norms perceptions and attitudes, at baseline, by site, sex, and study group.

behaviors or chore-sharing, which were not directly addressed by the SETARA curriculum.

The interventions had similar effects by age and sex (Table 4), with one notable difference. In Bandar Lampung, SETARA was associated with a significant reinforcement of gender-stereotypical roles for boys (0.35-point increase in GST score relative to controls), while shifts in GST scores by study group for girls trended in the opposite direction (0.17-point greater

Table 3
GEAS intervention effects on gender norms perceptions and attitudes, by site

Measure	Overall	Indonesia (SETARA)			Kinshasa, DRC (*Growing Up Great!*)
		Bandar Lampung	Denpasar	Semarang	
Gender norms perceptions scales[a]					
Sexual double standard (SDS)	0.07 (−0.15, 0.01)	0.09 (−0.09, 0.27)	−0.06 (−0.19, 0.08)	**−0.20**** **(−0.32, −0.08)**	0.04 (−0.04, 0.13)
Gender stereotypical traits (GST)	**−0.12***** **(−0.18, −0.06)**	−0.13 (−0.27, 0.01)	**−0.17**** **(−0.27, −0.07)**	−0.08 (−0.17, 0.01)	0.07 (−0.00, 0.13)
Gender stereotypical roles (GSR)	**−0.13**** **(−0.22, −0.05)**	0.09 (−0.10, 0.27)	**−0.26***** **(−0.40, −0.13)**	**−0.14*** **(−0.27, −0.01)**	−0.04 (−0.11, 0.04)
Binary attitudes outcomes[b]					
Gender equality in chores	0.94 (0.78, 1.14)	0.98 (0.66, 1.44)	0.78 (0.56, 1.08)	1.15 (0.85, 1.57)	**2.28***** **(1.81, 2.87)**
It is okay to tease a girl who acts like a boy	0.98 (0.71, 1.35)	1.22 (0.67, 2.22)	0.81 (0.48, 1.36)	0.97 (0.53, 1.76)	1.15 (0.93, 1.43)
It is okay to tease a boy who acts like a girl	0.96 (0.72, 1.27)	1.27 (0.77, 2.09)	0.69 (0.42, 1.13)	0.97 (0.57, 1.67)	1.09 (0.83, 1.44)

Bold values indicates significant intervention effect.
*$p < .05$, **$p < .01$, ***$p < .001$.
[a] Difference in means (linear regression).
[b] Odds ratio (logistic regression).

Table 4
GEAS intervention effects on gender norms perceptions and attitudes, by site and sex

Measure	Indonesia (*SETARA*)						Kinshasa, DRC (*Growing Up Great!*)	
	Bandar Lampung		Denpasar		Semarang			
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Gender norms perceptions scales[a]								
Sexual double standard (SDS)	0.18 (−0.09, 0.45)	−0.02 (−0.25, 0.20)	0.04 (−0.18, 0.25)	−0.13 (−0.30, 0.04)	−0.08 (−0.26, 0.10)	**−0.29***** **(−0.45, −0.13)**	0.07 (−0.05, 0.20)	0.01 (−0.10, 0.12)
Gender stereotypical traits (GST)	−0.07 (−0.31, 0.16)	**−0.18*** **(−0.34, −0.02)**	−0.15 (−0.30, 0.01)	**−0.21**** **(−0.34, −0.08)**	0.01 (−0.14, 0.15)	**−0.15**** **(−0.26, −0.04)**	**0.10*** **(0.00, 0.20)**	0.03 (-0.06, 0.11)
Gender stereotypical roles (GSR)	***0.35*** **(0.07, 0.64)***	*−0.17 (−0.42, 0.08)*	**−0.28**** **(−0.47, −0.07)**	**−0.28**** **(−0.45, −0.11)**	−0.05 (−0.26, 0.15)	**−0.21*** **(−0.37, −0.05)**	−0.03 (−0.14, 0.07)	−0.05 (−0.16, 0.06)
Binary attitudes outcomes[b]								
Gender equality in chores	1.29 (0.72, 2.31)	0.74 (0.43, 1.26)	0.94 (0.57, 1.53)	0.69 (0.45, 1.06)	1.12 (0.70, 1.80)	1.20 (0.79, 1.80)	**2.14***** **(1.54, 2.97)**	**2.43***** **(1.75, 3.38)**
It is okay to tease a girl who acts like a boy	1.01 (0.46, 2.21)	1.81 (0.71, 4.60)	1.06 (0.53, 2.14)	0.50 (0.23, 1.09)	1.40 (0.60, 3.26)	0.63 (0.26, 1.49)	1.08 (0.80, 1.45)	1.24 (0.91, 1.69)
It is okay to tease a boy who acts like a girl	1.97 (0.98, 3.97)	0.72 (0.35, 1.49)	0.88 (0.47, 1.64)	0.43 (0.18, 1.03)	1.42 (0.68, 2.97)	0.49 (0.21, 1.16)	0.95 (0.64, 1.42)	1.25 (0.85, 1.84)

Bold values indicates significant intervention effect.
Italic values indicates significant interaction term.
*$p < .05$, **$p < .01$, ***$p < .001$.
[a] Difference in means (linear regression).
[b] Odds ratio (logistic regression).

reduction in GST scores relative to controls). While most sex differences were not significant, we noted more SETARA benefits for girls than boys, including greater reductions in GST scores in all three sites for girls and greater reductions in GSR and SDS scores for girls in Semarang (none of which were the case for boys).

At the intersection of implementation challenges and sex, we also found differences in GUG! effects between in-school boys and out-of-school boys, who were instructed by different facilitators (trained peers vs. trained adults from local community-based organizations). For example, the odds of agreeing with teasing gender nonconforming peers increased marginally among GUG! adolescent boys who attended school relative to their control counterparts (OR = 1.41), while the opposite was true among out-of-school boys (OR = 0.55) (Table 5). Likewise, significantly greater increases in stereotypical traits perceptions were noted among in-school boys in the intervention group relative to the controls (0.12-point greater increase in GST scores).

Discussion

This cross-site, cross-program analysis shows that gender transformative interventions in early adolescence can successfully shift gender norms perceptions among VYAs, with GUG! and SETARA both showing targeted effects. Comparison across programs, sites, and populations provides additional insights into opportunities and challenges of gender-transformative interventions for VYAs that can guide future programing.

Results indicate that shifts in gender norms perceptions and attitudes were program-specific, reflecting the different approaches between GUG! and SETARA in promoting gender equality; SETARA is a two-year school-based comprehensive sex education curriculum, while GUG! is a modular, game-based package of materials used over nine months. Although GUG!'s content included a specific focus on norms, it is possible that its lighter-touch approach resulted in less meaningful opportunities for reflective discussion than SETARA enabled, which may be the primary driver of shifts in high-level gender norms perceptions. Results also suggest that promoting gender equality in one area (such as household chore-sharing) does not translate into greater equality in other life domains, as people hold a constellation of gender perspectives that are simultaneously egalitarian and less egalitarian depending on the area of life [10]. These results are critical in informing theories of change [22,26], by underscoring the need for specificity when assessing and addressing gender inequalities and related health outcomes.

In line with the description by Mmari et al. of "conditions of success" for gender-transformative programming with VYAs, our results suggest that GUG! and SETARA effects are related not only to intervention content but also additionally reflect the local implementation context. Consistent with the ranking of the global gender equality index, adolescents in Kinshasa perceived greater gender stereotypes than in Indonesia at baseline, suggestive of a less conducive environment for adolescents to challenge unequal gender norms. In Indonesia, we also found greater SETARA effects in Semarang and Denpasar compared to the more conservative Bandar Lampung, where implementation data indicate greater resistance from teachers and community leaders in delivering the intervention than in the other sites.

Implementation challenges not only reflect cultural acceptability but also facilitation quality and environmental disruptions. In Kinshasa, the differential GUG! effects between in-school and out-of-school groups likely depended on the type of facilitator (trained peer [VYA] leaders or trained community organization facilitator) and their competing responsibilities. More generally, the political unrest in DRC accompanying the 2018 elections disrupted GUG! implementation across groups. In Indonesia, the implementation of the SETARA was disrupted by the COVID-19 pandemic, leading to a shift to an online interface in Bandar Lampung with little time for in-person implementation (Pinandari, Kågesten et al., and van Reeuwijk et al. in this supplement). Accordingly, SETARA was most successful in Semarang where the program was fully implemented but least successful in Bandar Lampung. Current efforts to address facilitator-implementation barriers involve digitized programs, but such avenues need careful adaptation and evaluation to understand their full potential, as suggested by the Bandar Lampung online experience (van Reeuwijk et al. in this supplement).

Finally, our results suggest more significant effects of gender-transformative interventions for girls than boys in Indonesia and some paradoxical effects among in-school adolescent boys in Kinshasa. As discussed in the article by Gayles et al. in this supplement, the GUG! boys who had increased discriminatory attitudes may have become more aware of the types of gender-atypical behavior described in the outcome measure over time. This, combined with growing peer pressure over the study period (particularly in the school setting), may in part explain the

Table 5
GUG! effect on gender norms perceptions and attitudes in Kinshasa, by school status and sex

Measure	Kinshasa, DRC (*Growing Up Great!*)			
	In-school (n = 1,815)		Out-of-school (n = 704)	
	Boys	Girls	Boys	Girls
Gender norms perceptions scales[a]				
Sexual double standard (SDS)	0.11 (−0.04, 0.25)	−0.06 (−0.18, 0.07)	−0.03 (−0.27, 0.21)	0.21 (−0.02, 0.44)
Gender stereotypical traits (GST)	**0.12*** **(0.00, 0.24)**	0.02 (−0.09, 0.12)	0.06 (−0.12, 0.25)	0.07 (−0.10, 0.24)
Gender stereotypical roles (GSR)	−0.06 (−0.19, 0.07)	−0.07 (−0.19, 0.06)	−0.00 (−0.19, 0.19)	0.02 (−0.19, 0.25)
Binary attitudes outcomes[b]				
Gender equality in chores	**2.11*** (1.41, 3.13)**	**1.82** (1.25, 2.64)**	***2.28** (1.26, 4.14)*	***7.81*** (3.65, 16.74)*
It is okay to tease a girl who acts like a boy	1.41 (1.00, 2.00)	1.17 (0.82, 1.67)	***0.55** (0.31, 0.98)*	*1.49 (0.79, 2.82)*
It is okay to tease a boy who acts like a girl	1.41 (0.97, 2.05)	1.29 (0.91, 1.84)	0.71 (0.39, 1.32)	1.03 (0.52, 2.03)

Bold values indicates significant intervention effect.
Italic values indicates significant interaction term.
*$p < .05$, **$p < .01$, ***$p < .001$.
[a] Difference in means (linear regression).
[b] Odds ratio (logistic regression).

associations found in our analyses. A review of interventions addressing gender norms and attitudes shows girls respond better to educational forms of interventions while boys are more responsive to peer interactions and community mobilization [13]. Despite conferring greater power to boys, there is growing evidence that gender norms are also detrimental to boys, leading to harmful exposures, behaviors, and outcomes. However, evidence regarding gender-transformative programming for boys is lagging, given greater emphasis on girl's empowerment, health, and wellbeing [14]. Thus, including boys in gender-transformative interventions has the potential not only to benefit girls by promoting greater equality but also to benefit boys by challenging gender norms that inform harmful behaviors. While evidence from GUG! and SETARA show some positive outcomes for boys, paradoxical results among boys in Kinshasa point to the need for programs to more carefully consider adolescent boys' specific informational and developmental needs along with those of girls to promote gender-normative shifts and improve the trajectories of all VYAs.

Limitations

Our results should be interpreted with several limitations in mind. First, the focus of this study on VYAs in urban poor settings in Kinshasa and Indonesia, using nonrepresentative samples, limits the generalizability of the study findings. In addition, the nonrandomization of adolescents between intervention and controls introduces potential differences between the two groups, including unobserved confounding. The difference-in-difference approach addresses baseline differences, by focusing on differential trends, but reduces the statistical power of the analysis. Loss to follow-up is also a potential threat to internal validity, especially as adolescents who were excluded hold different normative perceptions. Inverse probability weights partially address differential loss to follow-up but cannot address unobserved differences. Measurement limitations may also affect the internal validity of the study. The internal consistency of the GST and (in particular) GSR scales was lower in Kinshasa than Indonesia, reflecting potential cultural differences in the reliability of these outcome measures. This is addressed by including a suite of outcome measures that included scales and single items, of which several mapped onto each program's content and theory. The use of a binary measure identifying VYAs as "boys" or "girls" is ill suited to define gender, including more fluid gender identities.

Another threat to internal validity relates to implementation, including exposure in the intervention group and contamination in the control group. As previously discussed, COVID-19 was a major barrier in both locations, as was opposition to SETARA content in Bandar Lampung especially, and election-related unrest in Kinshasa. In addition, GUG's norms-shifting approach was designed to reach beyond direct program beneficiaries via social diffusion, a strategy that may have resulted in higher than typical contamination. Such disruptions are likely to affect the impact of interventions, although per-protocol analysis led to similar conclusions. Finally, the standardized measures and VYA focus of the GEAS do not fully capture the specific content of each intervention; for example, GUG! takes a multilevel approach to norms shifting, while this evaluation focuses on the perceptions and attitudes of VYAs only. Each program's effect is discussed in greater detail in articles by Gayles et al., Kågesten et al., and Pinandari, Kågesten et al. in this supplement, presenting a more holistic overview of the interventions within their respective theory of changed frameworks.

Despite these limitations, there are notable strengths to this analysis, including the focus on young adolescents, the inclusion of boys, and the use of common measures to allow for a unique exploration of the similarities and differences in gender-transformative intervention effects across programs, cultures, and populations. The exploration of a constellation of gender norms perceptions also illuminates mechanisms of normative change, which is not unidirectional but rather target-specific.

Conclusion

SETARA and GUG! had notable, but inconsistent, effects on various measures of inequitable gender norms perceptions and attitudes among VYAs. This study offers promising evidence of the impact of gender-transformative interventions in promoting gender equality, while also emphasizing the limits of these programs in achieving specific rather than universal gender norms shift. Our findings reinforce the need for further research that formally tests the conditions for successful program implementation in different contexts, to guide future programmatic efforts. Finally, this study also draws attention to the conditions for success, including facilitation and supportive environments, which inform implementation challenges.

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