Effects of a sexual and reproductive health intervention on adolescents' service usage in northern Ghana: results of a community-randomised trial

Gifty Apiung Aninanya[1*], Cornelius Y. Debpuur[1], Timothy Awine[1], John E. Williams[1], Abraham Hodgson[2], Natasha Howard[3]

[*]For correspondence: Gifty.Apiung@navrongo-hrc.org

Abstract

Background: Many adolescents are at risk of sexually transmitted infections (STIs) including HIV/AIDS, unintended pregnancies and unsafe abortions. However, uptake of reproductive health services to mitigate these effects is low. The objective of this community-randomised trial was to assess if exposure to a community intervention increased adolescent sexual and reproductive health service usage in the Kassena Nankana Districts of Northern Ghana.

Methods: Twenty-six communities were randomly allocated to the intervention consisting of a school-based curriculum, out-of-school youth activities, and health worker outreach, (n=13), or comparison consisting of youth-friendly health service provision only (n=13). Health workers from the intervention arm were trained in the provision of youth-friendly health services, as part of a package of interventions. The main outcome measure was usage of services for pregnancy or sexually-transmitted infections (STIs) and HIV in the past year. Service usage data was collected at baseline and three years after intervention start from 2, 664 adolescents aged 15-17 years in the trial cohort.

Results: The results showed that SRH interventions have significantly improved health service usage among adolescents in the intervention arm than in the control arm. Participants in the intervention arm were more than two times more likely to use STI/HIV/AIDS services (OR 2.40), 91% greater odds of utilising delivery services (OR 1.91) and 58% greater odds of using antenatal services (OR 1.58) than those in the control group. Participants in the intervention arm reported a greater overall service satisfaction, but were about 17% more likely to use HIV counseling and testing services (OR: 1.17).

Conclusion: The SRH interventions substantially improved adolescents' usage of STI/HIV/AIDS, delivery and antenatal care services, but had no significant effect on adolescents' use of CT services within the three-year trial period. The study informs policy makers about comprehensive interventions more likely to encourage greater SRH service utilisation among adolescents in Ghana and other developing countries.

Key words

Community randomised trial, sexual and reproductive health, health service usage, adolescents, Ghana

Background

Encouraging adolescent sexual and reproductive health (ASRH) service usage is a public health challenge globally. Many governments have pursued strategies to address the specific sexual and reproductive health needs of adolescents since the 1994 International Conference on Population and Development placed ASRH on the global policy agenda (Mbizvo and Zaidi, 2010). However, ASRH statistics remain poor. Approximately 2.1 million adolescents are living with HIV globally with 280,000 dying from AIDS in 2008 (Mbizvo and Zaidi, 2010, Gray, 2010). Nearly 16 million adolescent girls give birth annually, those in developing countries accounting for more than 10% of global births, while adolescent girls remain twice as likely to die in childbirth than women in their twenties (Samandari and Speizer, 2010, Omar et al., 2010, Laski and Wong, 2010). The large relative proportion of adolescents in low and middle-income countries and related high rates of HIV, unwanted pregnancy, maternal mortality and unsafe abortion indicate a need for improved service usage (Bearinger et al., 2007, Secor-Turner et al., 2009).

Adolescent morbidity and mortality are particularly high in sub-Saharan Africa (Singh et al., 2010). However, evidence indicates that many adolescents in sub-Saharan African countries underuse sexual and reproductive health (SRH) services (Biddlecom et al., 2007, Gray, 2010, Bankole et al., 2007). Ahmed and colleagues found many adolescents encountered significant barriers to accessing SRH services (Ahmed et al., 2005). Reported barriers include health service costs and distance, lack of awareness of sexually transmitted infections (STIs), lack of knowledge about where to get contraceptives and STI treatment, and psychosocial constraints including embarrassment, fear, lack of confidentiality and privacy, negative provider attitudes (Biddlecom et al., 2007, Hock-Long et al., 2003, Meekers and Klein, 2002). Biddlecom and colleagues found a substantial fraction of adolescents reporting STI symptoms did not seek care (e.g. 40% in Malawi, 60% in Uganda) and no more than one in ten sexually experienced adolescents had been tested for HIV (Biddlecom et al., 2006). The International Planned Parenthood Foundation (IPPF) recently reported that 67% of married adolescent women in sub-Saharan Africa who wanted to avoid pregnancy for at least two years were not using any contraceptive method (IPPF, 2010).

Findings in Ghana are similar to those regionally. Ghanaian health services (GHS) promote ‘adolescent friendly’ policies (National Population Council, 2000). However, evidence suggests that Ghanaian adolescents may avoid SRH treatment due to stigma associated with premarital sex (National Population Council, 2000). Awusabo-Asare and colleagues found that 2 in 3

females and 4 in 5 males with STI symptoms did not seek treatment, while about half of unmarried sexually-active female adolescents and over one-third of all sexually-active male adolescents did not use contraceptives (Awusabo-Asare and Annim, 2008). In 2008, HIV and syphilis prevalence among Ghanaian adolescents was 1.9% and 5.5% respectively (NACP/GHS, 2009). Government surveys found 5.2% female and 3.4% male adolescents reported having experienced STIs, 8% of female adolescents reported using contraceptives, while 13% of female adolescents had already given birth or were pregnant with their first child (GSS et al., 2009). Research in Bolgatanga showed 32% of out-of-school adolescents experienced difficulties accessing HIV testing services (Saaka, 2005). A qualitative study found adolescents were particularly deterred from accessing health services by costs and negative provider attitudes (Koster et al., 2001). While Karim and others advocated increased adolescent SRH service usage in Ghana's Upper East Region (Karim et al., 2003, Rondini and Krugu, 2009), a review found no literature on associations between ASRH interventions and increased adolescent service usage in the region.

Several studies document associations between ASRH interventions and adolescent service usage in Worldwide and in sub-Saharan Africa (Van Belle et al., 2010, Renju et al., 2010b, Renju et al., 2010a, Larke et al., 2010, Wolf and Bond, 2002, Brieger et al., 2001, Wolf et al., 2000, Debpuur et al., 2002, Fullerton et al., 2003, Speizer et al., 2003, Erulkar et al., 2004, Erulkar et al., 2005, Plummer et al., 2007). A study conducted by UNESCO revealed that more than a third of sexuality education programmes increased condom use and contraceptive use (UNESCO, 2009). Also, a study carried out in Bangladesh revealed that SRH interventions led to a major improvement in attitudes towards health facility-based services for contraceptive information and services among adolescents (Bhuiya et al., 2004). A review of ASRH interventions in developing countries, by Speizer and colleagues, found most positively affected adolescent knowledge and attitudes, increasing their health service attendance and contraceptive usage (Speizer et al., 2003). For example, a Ugandan study found significantly more adolescents used reproductive health services in intervention than control health facilities (Mbonye, 2003). A quasi experimental study done in Kenya also revealed that participants in the intervention group showed increased condom use than those in the non-intervention area (Erulker et al., 2004). A study in Tanzania on the effects of SRH interventions in Mwanza among adolescents identified that the interventions largely improved knowledge, attitudes and condom use (Plummer et al. 2007). Two studies also revealed that adolescents in the intervention groups reported great improvement s in the use of condoms, STIs partner notification and treatment seeking behaviour as compared to the control groups (Akpabio, Asuzu & Boluwam, 2009 & Oknofua et al., 2003). The first study used quasi experimental design and post intervention data collection was only done 3 months after the interventions.

The study done in Nigeria employed a randomized controlled design but it focused was on adolescents between 14-20 year olds. Some of these studies though effective employed small sample sizes and only short term impacts of ASRH interventions could be reliably evaluated. In this light, large-scale innovative, integrated, multifaceted adolescent sexual and reproductive health (ASRH) interventions are urgently needed in sub-Saharan Africa in particular. The only large-scale multifaceted ASRH intervention, which was developed and evaluated over a three year period, was done in rural communities in Mwanza Region, North West Tanzania (Obasi et al., 2006).

Currently in Ghana, there are only two well documented evaluation studies of adolescent sexual and reproductive health interventions. These include an evaluation of a three month intervention study on a peer education activity that was initiated by the Association for Reproductive and Family Health (ARFH) among Ghanaian and Nigerian youth, which reported that there were significant changes among the intervention group after the period of intervention. Also, a study conducted in Ghana by the African Youth Alliance (AYA) identified that females who were exposed to the SRH interventions were more likely to use modern contraceptives and condoms than those who were not exposed to the interventions (AYA/GHANA/JSI Evaluation Survey, 2007). However, currently there is no evidence as to whether a community randomized control trial on ASRH interventions are associated with increased adolescent usage of reproductive health services such as STI/HIV/AIDS, CT, and pregnancy related issues and ANC in the KND and Ghana as a whole is rare. Against this background, this study seeks to assess if a community ASRH intervention is associated with increased adolescent usage of services for pregnancy and STI diagnosis and treatment. It also aimed at determining the association between intervention exposure and adolescents' reported satisfaction with health services.

Methods

Study Design

The study is a community randomized controlled trial where thirteen out of twenty-six communities in the KND were randomly selected to receive the intervention package. A baseline survey was carried out before randomization of communities. These thirteen intervention communities received the intervention package, while those in the thirteen communities served as a control group. The original project's primary target was adolescents between the ages of 10-24 years, but to ease measurement of the impact of the interventions, a cohort of adolescents aged 15-17 years from both intervention and control communities were randomly recruited for follow up. Baseline and follow up surveys were conducted in this cohort

to measure the impact of the interventions on adolescents' sexual and RH knowledge, attitudes and practices.

Study site and Population

KND is located in the Upper East Region of north-eastern Ghana (Figure 1). The 1,675 square kilometre district, split administratively into Kassena-Nankana East and West, has a population of approximately 151,000, 84% rural (NHRC/NDSS, 2008). The main ethnic groups are Kassena (54%) and Nankam (42%), with the remaining 4% predominantly Buili (Nyarko et al., 2001). A hospital, five health centres, and 27 community health compounds provide health services. Adolescents aged 10-19 years are 24.4% of the district population, 80% of them enrolled in school (NHRC/NDSS, 2008). A 2003 survey indicated 50% of all first sexual encounters among KND adolescents were unprotected (NHRC/ASRH, 2004). Health facility attendance records from 2006 indicated 32% of adolescent visits were STI-related, while 2007 data indicated that adolescent HIV prevalence was 2.7% (NACP/GHS, 2009, NHRC/ASRH, 2006).

ASRH Interventions

Investigators aimed to compare the effectiveness of community-level sexual health education and outreach for improving adolescent SRH service usage additional to YFHS and community awareness. The programme, based on social learning theory principles (McCullough Chavis, 2011), consisted of: (1) community mobilisation to create a supportive environment, (2) health worker training to make services more effective and appealing, (3) sexual health education to enhance knowledge and attitudes about healthy sexuality, and (4) skills-building to improve self-efficacy (NHRC/ASRH, 2004). To increase sustainability, the programme was delivered and supervised through existing systems by government workers trained and supported by five NHRC staff members.

Community mobilisation aimed to develop a supportive environment for ASRH principles and services in all study communities. At least fifty consultations and seminars were organised per community with community stakeholders and partners including community chiefs and elders, district assembly, district health personnel, Ghana Education Service (GES) officials, the National Youth Council and non-governmental organizations (e.g. Ghana Red Cross, Catholic Relief Services).

Youth-friendly health services (*YFHS*) aimed to improve adolescent usage by increasing access to appropriate services in all study communities, specifically: at least 2 health personnel per facility trained in (i) syndromic management of STIs and adequately supplied with STI drugs and contraceptives; (ii) friendly and responsive approaches to adolescents, and (iii) ASRH

counselling. Additionally, trained health workers and peer educators in intervention communities organised outreach activities to inform adolescents about SRH issues and encourage health-service usage.

School-based SRH education aimed to build adolescent knowledge, attitudes and skills for responsible and healthy behaviour, including SRH service usage. Approximately 75 teachers were trained to teach a standard SRH curriculum in all intervention-area Junior High Schools (JHS) and promote extracurricular activities on selected SRH themes (e.g. inter-school competitions and debates, video performances, dramas, and role plays).

Peer outreach aimed to build SRH knowledge and skills among out-of-school adolescents. Approximately twelve adolescent peer workers were recruited in each intervention community. Strategies included dramas, games, sporting events, film nights, community meetings, quiz competitions, home visits, one-to-one discussions, health facility tours, and referral to health facilities.

Data Collection

Outcomes measured were reported health service usage within the past 12 months for STI management (i.e. diagnosis and treatment, HIV counseling and testing) or maternal care (i.e. antenatal, perinatal, postnatal) –as these were deemed by service providers as highest need, and reported satisfaction with services received.

Outcome data was collected at baseline in 2005 and endline in 2008 via surveying a sample of the trial cohort. Trained interviewers, the same gender as participants, visited each sampled compound, identified eligible adolescents, obtained parental and participant consent, and interviewed in one of three local languages (i.e. Kasem, Nankam, Buili) at convenient locations for participants. Questionnaires, developed for male and female participants based on study objectives and similar research, were piloted in two non-survey communities. Data was collected on socio-demographic characteristics, and SRH knowledge, attitudes, and reported practices during the past year (e.g. sexual norms, contraceptive usage, health service usage).

Sampling

Kassena Nankana District (KND) was divided into 26 communities for study purposes (average population 4,500 each; range 861-12,392). After a ten-month intervention pilot in two communities, remaining communities were assigned by simple random allocation using sealed envelopes. First, communities were identified by zone and size. Second, names were sealed in opaque envelopes. Third, representatives from Ghana Education Service and the District Health

Management Team drew envelopes for intervention or comparison alternately. Thus, 11 communities were randomly allocated to receive the intervention (i.e. programme components 3-4), covering a population of 36,840 adolescents (NHRC/ASRH, 2004), while 12 served as comparison sites (i.e. receiving components 1-2 only).

While communities served as clusters randomly allocated as intervention or comparison, analysis subjects were adolescents aged 15-17 living in study communities (Campbell et al., 2001). All residents aged 15-17 in 2005 were potentially eligible for cohort inclusion. Survey participants were selected through random sampling of district compounds from the Navrongo Demographic Surveillance System (NDSS) database in 2005 and retargeted for interview in 2008. Sample size was calculated assuming an intracluster correlation coefficient of 0.10, to account for a 33% difference in between-group outcomes with a response rate of 60% at follow-up, a 1.4% design effect, 95% significance, and 90% power (NHRC/ASRH, 2009).

Data Analysis

Analysis was conducted based on participant's residence during initial community allocation in 2005. Data was entered, cleaned and checked for inconsistencies using Microsoft FoxPro 6.0 and analyzed using Stata® 10.0. Participant responses were used to calculate proportions reporting health service usage in intervention and comparison communities. A pre and post analysis was considered (% change from baseline).We analysed the change between the study groups at end line taking baseline differences into account by fitting a logistic regression with the end line and baseline as a dependent and independent variables respectively and adjusting for intervention group.

Reporting was guided by the CONSORT extension recommended by Campbell *et al* (Campbell et al., 2004, Campbell et al., 2012).

Ethical Considerations

Ethics approval was provided by the Navrongo Health Research Centre Institutional Review Board and ethics committees of the Ghana Health Services and London School of Hygiene & Tropical Medicine in the United Kingdom. Written informed consent was obtained from guardians and participants. Anonymity and confidentiality were safeguarded (e.g. using identification numbers for names and locations, storing questionnaires in locked files, conducting interviews in locations requested by participants).

Results

Demographics

A total of 2,664 adolescents were interviewed in 2008, 1,288 in intervention (520 females and 768 males) and 1,376 in comparison sites (576 females and 800 males). This represented a 26.1% loss-to-follow up from the 2005 survey, 24% in intervention and 28% in comparison sites. Table 1 shows frequencies of demographic characteristics, comparing adolescents in intervention and comparison sites, disaggregated by gender. At baseline, average age for participants in the intervention and non-intervention areas was the same (16%). Significant demographic differences found between intervention and comparison participants at baseline were a higher percentage of comparison participants attending primary school (38.5 % versus 35.8%). About half of adolescents in the comparison group were Catholic (49.3%), this was lower in the intervention group (44%). 11% and 6.3% were Muslim in intervention and comparison communities respectively. No significant differences were found between intervention and comparison site participants in sexual experience among either boys or girls and pregnancy experience or parity among girls.

Service usage

Table 2a shows reported usage of STI and maternity services among participants in the past twelve months at baseline and end line. Usage increased among intervention adolescents for three of the four SRH services assessed, most noticeably STI services (Figure 1, standard error bars depicting percentage change in health service utilization). Reported usage of STI services increased from 2.5% to 16.6% among adolescents in intervention communities, versus 4.5% to 7.9% among comparison adolescents. Thus, adolescents in intervention areas had more than double the odds of using STI services than comparison adolescents at end line (16.6% versus 7.9%; OR 2.40, adjusted baseline STI services intake).

Adolescent usage of CT services increased from 3.3% to 13.0% versus 3.8% to 11.4% among intervention and comparison adolescents respectively. Thus, usage was lower among intervention adolescents at baseline and reached equivalence at end line (13.0% versus 11.4%; OR 1.17, adjusted baseline CT services intake).

Adolescent usage of antenatal services also increased from a lower baseline frequency (i.e. from 3.1% to 12.3% versus 3.0% to 8.2% among intervention and comparison adolescents respectively). Thus, intervention adolescents had 58% higher odds of using antenatal services than comparison adolescents at end line (12.3% versus 8.2%; OR 1.58; adjusted baseline ANC attendance).

Adolescent usage of delivery services increased from 3.1% to 15.2% versus 3.3% to 8.7% among intervention and comparison adolescents respectively. End line usage was significantly higher among exposed adolescents, who had 91% higher odds of attending delivery and postnatal services compared to their unexposed counterparts (15.2% versus 8.7%; OR 1.91; adjusted baseline delivery services intake).

Perceptions of services

Adolescents who visited health facilities were asked whether they were satisfied with services received (Table 2b). Reported satisfaction increased among adolescents in the intervention group, from 18.0% to 43.2% versus 17.3% to 28.3% among intervention and comparison adolescents respectively (43% versus 28.3%; OR 1.92).

Respondents who reported dissatisfaction were asked what could improve health services (Table 2c). At end line, intervention adolescents were 1.64 times more likely to mention drugs availability as compared to their counterparts in the non intervention areas (2.7% versus 1.7%). Also, adolescents in the intervention group were 19% more likely to mention friendly staff as compared to their counterparts in the non-intervention sites (0.8% versus 0.7%, OR 1.19). Other service improvement recommendations made by adolescents in the intervention areas at baseline include short waiting time, confidentiality, privacy and convenient hours.

Availability of same sex providers was the least frequently recommended change. No exposed adolescents requested changes, while 0.2% of unexposed adolescents recommended same sex providers.

Discussion

The SRH interventions substantially improved adolescents' usage of STI/HIV/AIDS services, antenatal care services and delivery services. The findings that SRH interventions improves adolescents SRH usage has been collaborated by evidence available in developing countries (Okonofua et al., 2003; Mantilla & Antezana, 2004; Rani & Lule, 2004; Akpabio, Asuzu & Boluwan, 2009; Teijlingen, Simkada and Acharga, 2012; Kalembo et al., 2013). While it was not possible to determine whether this increase was among those adolescents who most needed services, baseline usage was sufficiently low that any increase is encouraging. Early detection and treatment of STIs and HIV are vital to overall adolescent health, while antenatal and delivery services increase healthy outcomes for adolescent mothers and babies (Tu et al., 2009, Ford et al., 2004).

However, SRH interventions had no significant effect on adolescents' use of counselling and testing (CT) services. The relatively low usage of CT services may be a reflection of the generally low usage of CT in the community, or because adolescents still fear the consequences of knowing their HIV/AIDS status (National Population Council, 2000; Simba and Kakoko, 2009)). Future SRH interventions could still emphasis the benefits of CT and dispel concerns on stigmatization and discrimination of people living with HIV/AIDS.

Exposed adolescents were more satisfied with SRH services. Teijlingen, Simkada and Acharga, 2012 confirmed that majority of adolescents exposed to SRH interventions in Nepal were satisfied with SRH services. Adolescents who are satisfied with health services will continue to use such services which in the long run will reduce their health problems.

Dissatisfied participants wanted improvement in drug availability, staff attitudes, privacy and confidentiality, hours, and waiting times. Findings support previous studies that adolescents may not use health services where confidentiality and privacy are not guaranteed, provider attitudes are perceived as negative, or waiting times considered too long (Bayer et al., 2010). Though total numbers of dissatisfied adolescents were small, it seems important that the major service recommendation in both groups was increased drug availability. This demonstrates that programmes to increase service usage depend on the quality of services available.

To enhance adolescents' uptake of SRH services in Ghana, management of the health system should consider intensifying efforts aimed at developing youth-friendly health services with friendly staff, convenient hours, privacy and confidentiality, and a sufficient drug supply (Bersamin et al., 2010). Policy-makers in Ghana could implement policies aimed at ensuring that health workers, peer educators and teachers are equipped with SRH information to reach adolescents through health talks, facility-based tours, youth forums, school-based programmes, and community sensitization programmes (Goicolea, 2010, Gloppen et al., 2010, Adu-Mireku, 2003). These approaches were positively associated with increased service usage in this study and are supported by the ASRH literature (Doyle et al., 2010, Zabin et al., 2009, Madise et al., 2007).

A few limitations associated with the study include there may be some recall bias as adolescents were asked to recall service usage over a twelve-month period. Some unmeasured confounding is possible, as data was not collected on all potential confounders (Biddlecom et al., 2009, Moore et al., 2007, Kumi-Kyereme et al., 2007). Some unavoidable contamination may have reduced observed differences in service usage between exposed and unexposed

adolescents. For example, some students from unexposed communities attended intervention schools. Despite these limitations, the demonstration of increased service usage by adolescents within a developing country context supports existing literature (Phillips et al., 2006, Debpuur et al., 2002, Larke et al., 2010). Study results help to fill the evidence gap in northern Ghana and inform policy makers.

Conclusion

The findings indicate that the SRH package increased health service utilization for STI/HIV/AIDS, ANC, and pregnancy services. Policy makers in Ghana should implement policies aimed at ensuring that health workers, peer educators and teachers are equipped with SRH information to reach out to adolescents through health talks, facility based tours, youth forums, and school based programmes as well as community sensitization programmes. These approaches were associated with positive service utilisation increases in this study as well as being supported by the literature on adolescent RH (Bhuiya et al. 2004 & AYA/Ghana/JSI Evaluation Survey, 2007).

To enhance adolescents' uptake of sexual and reproductive health services in Ghana, the Ghana Health Service should consider intensifying efforts aimed at developing adolescent friendly health service with the following features: friendly staff, convenient hours, privacy and confidentiality.

Competing Interests

The author(s) declare that they have no competing interests.

Authors' Details

[1]Navrongo Health Research Centre, Navrongo, Ghana. [2]Research and Development Division, Ghana Health Service, Ghana. [3]Department of Global Health and Development, London School of Hygiene and Tropical Medicine, United Kingdom.

Acknowledgements

Authors wish to thank the adolescent participants and their families for their contribution to this study. Authors are indebted to Matilda A. Aberese, Ernest Kanyomse, and Fabian Achana for assistance in validation of instruments. Special thanks to the Rockefeller Foundation for funding the intervention.

References

ADU-MIREKU, S. 2003. Family communication about HIV/AIDS and sexual behaviour among senior secondary school students in Accra, Ghana. *Afr Health Sci,* 3**,** 7-14.

AHMED, F., BANKOLE, A., BIDDLECOM, A., MUNTHALI, A., OUEDRAOGO, C. & WOOG, V. 2005. *Healthcare seeking and utilization by adolescents for reproductive health problems in sub-Saharan Africa*, The Alan Guttmacher Institute, USA.

AWUSABO-ASARE, K. & ANNIM, S. K. 2008. Wealth status and risky sexual behaviour in Ghana and Kenya. *Appl Health Econ Health Policy,* 6**,** 27-39.

BANKOLE, A., BIDDLECOM, A., GUIELLA, G., SINGH, S. & ZULU, E. 2007. Sexual behavior, knowledge and information sources of very young adolescents in four sub-Saharan African countries. *Afr J Reprod Health,* 11**,** 28-43.

BAYER, A. M., CABRERA, L. Z., GILMAN, R. H., HINDIN, M. J. & TSUI, A. O. 2010. Adolescents can know best: using concept mapping to identify factors and pathways driving adolescent sexuality in Lima, Peru. *Soc Sci Med,* 70**,** 2085-95.

BEARINGER, L. H., SIEVING, R. E., FERGUSON, J. & SHARMA, V. 2007. Global perspectives on the sexual and reproductive health of adolescents: patterns, prevention, and potential. *Lancet,* 369**,** 1220-31.

BERSAMIN, M., TODD, M. & REMER, L. 2010. Does Distance Matter? Access to Family Planning Clinics and Adolescent Sexual Behaviors. *Matern Child Health J*.

BIDDLECOM, A., AWUSABO-ASARE, K. & BANKOLE, A. 2009. Role of parents in adolescent sexual activity and contraceptive use in four African countries. *Int Perspect Sex Reprod Health,* 35**,** 72-81.

BIDDLECOM, A., GREGORY, R., LLOYD, C. B. & MENSCH, B. 2006. Premarital sex and schooling transitions in four sub-Saharan African countries. *IUSSP Seminar on Sexual and Reproductive Transitions of Adolescents in Developing Countries.* Cholula, Mexico.

BIDDLECOM, A. E., MUNTHALI, A., SINGH, S. & WOOG, V. 2007. Adolescents' views of and preferences for sexual and reproductive health services in Burkina Faso, Ghana, Malawi and Uganda. *Afr J Reprod Health,* 11**,** 99-110.

BONGAARTS, J. & COHEN, B. 1998. Adolescent reproductive behavior in the developing world. Introduction and review. *Stud Fam Plann,* 29**,** 99-105.

BRIEGER, W. R., DELANO, G. E., LANE, C. G., OLADEPO, O. & OYEDIRAN, K. A. 2001. West African Youth Initiative: outcome of a reproductive health education program. *J Adolesc Health,* 29**,** 436-46.

CAMPBELL, M. K., ELBOURNE, D. R., ALTMAN, D. G. & GROUP, C. 2004. CONSORT statement: extension to cluster randomised trials. *BMJ,* 328**,** 702-8.

CAMPBELL, M. K., MOLLISON, J. & GRIMSHAW, J. M. 2001. Cluster trials in implementation research: estimation of intracluster correlation coefficients and sample size. *Stat Med,* 20**,** 391-9.

CAMPBELL, M. K., PIAGGIO, G., ELBOURNE, D. R., ALTMAN, D. G. & GROUP, C. 2012. Consort 2010 statement: extension to cluster randomised trials. *BMJ,* 345**,** e5661.

DEBPUUR, C., PHILLIPS, J. F., JACKSON, E. F., NAZZAR, A., NGOM, P. & BINKA, F. N. 2002. The impact of the Navrongo Project on contraceptive knowledge and use, reproductive preferences, and fertility. *Stud Fam Plann,* 33**,** 141-64.

DOYLE, A. M., ROSS, D. A., MAGANJA, K., BAISLEY, K., MASESA, C., ANDREASEN, A., PLUMMER, M. L., OBASI, A. I., WEISS, H. A., KAPIGA, S., WATSON-JONES, D., CHANGALUCHA, J. & HAYES, R. J. 2010. Long-term biological and behavioural impact of an adolescent sexual health intervention in Tanzania: follow-up survey of the community-based MEMA kwa Vijana Trial. *PLoS Med,* 7**,** e1000287.

ERULKAR, A. S., ETTYANG, L. I., ONOKA, C., NYAGAH, F. K. & MUYONGA, A. 2004. Behavior change evaluation of a culturally consistent reproductive health program for young Kenyans. *Int Fam Plan Perspect,* 30**,** 58-67.

ERULKAR, A. S., ONOKA, C. J. & PHIRI, A. 2005. What is youth-friendly? Adolescents' preferences for reproductive health services in Kenya and Zimbabwe. *Afr J Reprod Health,* 9**,** 51-8.

FORD, C., ENGLISH, A. & SIGMAN, G. 2004. Confidential Health Care for Adolescents: position paper for the society for adolescent medicine. *J Adolesc Health,* 35**,** 160-7.

FULLERTON, J., FORT, A. & JOHAL, K. 2003. A case/comparison study in the Eastern Region of Ghana on the effects of incorporating selected reproductive health services on family planning services. *Midwifery,* 19**,** 17-26.

GLOPPEN, K. M., DAVID-FERDON, C. & BATES, J. 2010. Confidence as a predictor of sexual and reproductive health outcomes for youth. *J Adolesc Health,* 46**,** S42-58.

GOICOLEA, I. 2010. Adolescent pregnancies in the Amazon Basin of Ecuador: a rights and gender approach to adolescents' sexual and reproductive health. *Glob Health Action,* 3.

GRAY, G. E. 2010. Adolescent HIV--cause for concern in Southern Africa. *PLoS Med,* 7**,** e1000227.

GSS, GHS & ICF MACRO 2009. Ghana Demographic and Health Survey. Accra: Ghana Statistical Service (GSS), Ghana Health Service (GHS), ICF Macro.

HOCK-LONG, L., HERCEG-BARON, R., CASSIDY, A. M. & WHITTAKER, P. G. 2003. Access to adolescent reproductive health services: financial and structural barriers to care. *Perspect Sex Reprod Health,* 35**,** 144-7.

IPPF 2010. Facts on Adolescent women in the developing world. *In brief.*

KARIM, A. M., MAGNANI, R. J., MORGAN, G. T. & BOND, K. C. 2003. Reproductive health risk and protective factors among unmarried youth in Ghana. *Int Fam Plan Perspect,* 29**,** 14-24.

KOSTER, A., KEMP, J. & OFFEI, A. 2001. Utilization of reproductive health services by adolescent boys in the eastern region of Ghana. *Afr J Reprod Health,* 5**,** 40-49.

KUMI-KYEREME, A., AWUSABO-ASARE, K., BIDDLECOM, A. & TANLE, A. 2007. Influence of social connectedness, communication and monitoring on adolescent sexual activity in Ghana. *Afr J Reprod Health,* 11**,** 133-49.

LARKE, N., CLEOPHAS-MAZIGE, B., PLUMMER, M. L., OBASI, A. I., RWAKATARE, M., TODD, J., CHANGALUCHA, J., WEISS, H. A., HAYES, R. J. & ROSS, D. A. 2010. Impact of the MEMA kwa Vijana adolescent sexual and reproductive health interventions on use of health services by young people in rural Mwanza, Tanzania: results of a cluster randomized trial. *J Adolesc Health,* 47**,** 512-22.

LASKI, L. & WONG, S. 2010. Addressing diversity in adolescent sexual and reproductive health services. *Int J Gynaecol Obstet,* 110 Suppl**,** S10-2.

MADISE, N., ZULU, E. & CIERA, J. 2007. Is poverty a driver for risky sexual behaviour? Evidence from national surveys of adolescents in four African countries. *Afr J Reprod Health,* 11**,** 83-98.

MBIZVO, M. T. & ZAIDI, S. 2010. Addressing critical gaps in achieving universal access to sexual and reproductive health (SRH): the case for improving adolescent SRH, preventing unsafe abortion, and enhancing linkages between SRH and HIV interventions. *Int J Gynaecol Obstet,* 110 Suppl**,** S3-6.

MBONYE, A. 2003. Disease and health seeking patterns among adolescents in Uganda. *Inter Journal Adolescence Medical Health,* 15 105-112.

MCCULLOUGH CHAVIS, A. 2011. Social Learning Theory and Behavioral Therapy: Considering Human Behaviors within the Social and Cultural Context of Individuals and Families. *Soc Work Public Health,* 26**,** 471-81.

MEEKERS, D. & KLEIN, M. 2002. Determinants of condom use among young people in urban Cameroon. *Stud Fam Plann,* 33**,** 335-46.

MOORE, A. M., AWUSABO-ASARE, K., MADISE, N., JOHN-LANGBA, J. & KUMI-KYEREME, A. 2007. Coerced first sex among adolescent girls in sub-Saharan Africa: prevalence and context. *Afr J Reprod Health,* 11**,** 62-82.

NACP/GHS 2009. 2008 HIV Sentinel Survey Report: Quarterly Technical Bulletin on HIV/AIDS-STIs in Ghana. National AIDS/STI Control Programme (NACP), National AIDS Commission, Ghana Health Service

NATIONAL POPULATION COUNCIL 2000. Adolescent Reproductive Health Policy (ARHP). Accra: Republic of Ghana.

NHRC/ASRH 2004. Annual Project Progress Report. Navrongo, Ghana: Navrongo Health Research Center /Adolescent Sexual and Reproductive Health.

NHRC/ASRH 2006. Annual Project Progress Report. Navrongo, Ghana: Navrongo Health Research Center /Adolescent Sexual and Reproductive Health.

NHRC/ASRH 2009. Annual Project Progress Report. Navrongo, Ghana: Navrongo Health Research Centre/Adolescent Sexual and Reproductive Health.

NHRC/NDSS 2008. Navrongo Demographic Surveillance System Annual Report 2008. Navrongo, Ghana: Navrongo Health Research Center.

NYARKO, P., WONTUO, P., WAK, G., CHIRAWURAH, D., WELAGA, P., NCHOR, S., HODGSON, A. & BINKA, F. 2001. The Navrongo Demographic Surveillance System. Report to the Rockefeller Foundation. *Community Health and Family Planning Project Documentation.* Navrongo, Ghana: Navrongo Health Research Centre.

OMAR, K., HASIM, S., MUHAMMAD, N. A., JAFFAR, A., HASHIM, S. M. & SIRAJ, H. H. 2010. Adolescent pregnancy outcomes and risk factors in Malaysia. *Int J Gynaecol Obstet,* 111**,** 220-3.

PHILLIPS, J. F., BAWAH, A. A. & BINKA, F. N. 2006. Accelerating reproductive and child health programme impact with community-based services: the Navrongo experiment in Ghana. *Bull World Health Organ,* 84**,** 949-55.

PLUMMER, M. L., WIGHT, D., OBASI, A. I., WAMOYI, J., MSHANA, G., TODD, J., MAZIGE, B. C., MAKOKHA, M., HAYES, R. J. & ROSS, D. A. 2007. A process evaluation of a school-based adolescent sexual health intervention in rural Tanzania: the MEMA kwa Vijana programme. *Health Educ Res,* 22**,** 500-12.

RENJU, J., MAKOKHA, M., KATO, C., MEDARD, L., ANDREW, B., REMES, P., CHANGALUCHA, J. & OBASI, A. 2010a. Partnering to proceed: scaling up adolescent sexual reproductive health programmes in Tanzania. Operational research into the factors that influenced local government uptake and implementation. *Health Res Policy Syst,* 8**,** 12.

RENJU, J., NYALALI, K., ANDREW, B., KISHAMAWE, C., KIMARYO, M., REMES, P., CHANGALUCHA, J. & OBASI, A. 2010b. Scaling up a school-based sexual and reproductive health intervention in rural Tanzania: a process evaluation describing the implementation realities for the teachers. *Health Educ Res,* 25**,** 903-16.

RONDINI, S. & KRUGU, J. K. 2009. Knowledge, attitude and practices study on reproductive health among secondary school students in Bolgatanga, upper east region, Ghana. *Afr J Reprod Health,* 13**,** 51-66.

SAAKA, S. 2005. HIV/STIs health-seeking behaviour among in- and out-of-school urban male adolescents in the Bolgatanga Municipality of Upper East Region, Ghana. MSc Population and Reproductive Health, Kwame Nkrumah University of Science And Technology.

SAMANDARI, G. & SPEIZER, I. S. 2010. Adolescent sexual behavior and reproductive outcomes in Central America: trends over the past two decades. *Int Perspect Sex Reprod Health,* 36**,** 26-35.

SECOR-TURNER, M., KUGLER, K., BEARINGER, L. H. & SIEVING, R. 2009. A global perspective of adolescent sexual and reproductive health: context matters. *Adolesc Med State Art Rev,* 20**,** 1005-25, xii.

SIMBA, D. O. & KAKOKO, D. C. 2009. Volunteerism among out-of-school adolescent reproductive health peer educators: is it a sustainable strategy in resource constrained countries? *Afr J Reprod Health,* 13**,** 99-110.

SINGH, K., SAMBISA, W., MUNYATI, S., CHANDIWANA, B., CHINGONO, A., MONASH, R. & WEIR, S. 2010. Targeting HIV interventions for adolescent girls and young women in Southern Africa: use of the PLACE methodology in Hwange District, Zimbabwe. *AIDS Behav,* 14**,** 200-8.

SPEIZER, I. S., MAGNANI, R. J. & COLVIN, C. E. 2003. The effectiveness of adolescent reproductive health interventions in developing countries: a review of the evidence. *J Adolesc Health,* 33**,** 324-48.

TU, W., BATTEIGER, B. E., WIEHE, S., OFNER, S., VAN DER POL, B., KATZ, B. P., ORR, D. P. & FORTENBERRY, J. D. 2009. Time from first intercourse to first sexually transmitted infection diagnosis among adolescent women. *Arch Pediatr Adolesc Med,* 163**,** 1106-11.

VAN BELLE, S. B., MARCHAL, B., DUBOURG, D. & KEGELS, G. 2010. How to develop a theory-driven evaluation design - Lessons learned from an adolescent sexual and reproductive health programme in West Africa. *BMC Public Health,* 10**,** 741.

WOLF, R. C. & BOND, K. C. 2002. Exploring similarity between peer educators and their contacts and AIDS-protective behaviours in reproductive health programmes for adolescents and young adults in Ghana. *AIDS Care,* 14**,** 361-73.

WOLF, R. C., TAWFIK, L. A. & BOND, K. C. 2000. Peer promotion programs and social networks in Ghana: methods for monitoring and evaluating AIDS prevention and

reproductive health programs among adolescents and young adults. *J Health Commun*, 5 Suppl**,** 61-80.

ZABIN, L. S., EMERSON, M. R., NAN, L., CHAOHUA, L., ERSHENG, G., MINH, N. H., CHUANG, Y. L., HURNG, B. S., BISHAI, D. & BLUM, R. W. 2009. Levels of change in adolescent sexual behavior in three Asian cities. *Stud Fam Plann*, 40**,** 1-12.

Tables

Table 1 Percentage distribution of demographic characteristics, comparing intervention to comparison area adolescents, disaggregated by gender at baseline

Variables	**Intervention**			**Comparison**		
2005 Baseline survey	**Female** (n=733)	**Male** (n=959)	**All** (n=1692)	**Female** (n=844)	**Male** (n=1068)	**All** (n=1912)
Age (Mean)	16.0	16.0	16.0	16.0	16.0	16.0
Education, n(%)						
Attending Primary	47(6.4)	558(58.2)	605(35.8)	54(6.4)	683(64.0)	737(38.5)
Attending Junior High School	316(43.1)	264(27.5)	580(34.3)	435(51.5)	259(24.3)	694(36.3)
Attending Senior High School	331(45.2)	44(4.6)	375(22.2)	334(39.6)	11(1.0)	*345(18.0)*
None (Reference group)	39(5.3)	93(9.7)	132(7.8)	21(2.5)	115(10.8)	136 (7.1)
Religion, n(%)						
Catholic	386(52.7)	364(38.0)	750 (44.3)	496(58.8)	447(41.9)	943 (49.3)
Other Christian	217(29.6)	165(17.2)	382(22.6)	281(33.3)	217(20.3)	498(26.0)
Muslim	96(13.1)	102(10.6)	198(11.7)	18(2.1)	103(9.6)	121(6.3)
Traditional	24(3.3)	99(10.3)	123 (7.3)	32(3.8)	49(4.6)	81(4.24)
No religion	10(1.4)	229(23.9)	239(6.3)	17(2.0)	252(23.6)	269 (14.1)
Living with mother n(%)	535(72.9)	764(79.7)	1299 (76.8)	687(81.4)	910(85.2)	1597(83.5)
Ever had sexual Intercourse, n(%)	123(16.8)	125(13.0)	248 (14.7)	95(11.3)	106(9.9)	201(10.5)
Ever pregnant/impregnated someone, n(%)	32(4.4)	2(0.2)	34 (2.0)	28(3.3)	1(0.1)	29 (1.5)
Ever given birth, n(%)	18(2.5)	..	9(1.1)	20(2.4)	..	20(1.0)

Table 2 Percentage distribution of Services utilisation, satisfaction and improvement and Odds Ratios (95% CI) comparing intervention group to control at baseline and endline.

Category	Services	Group	Baseline (2005)		Endline (2008)		Percent change (%)	OR (95% CI)	p-value
			N	n(%)	N	n(%)			
Service usage	STI/HIV	Comparison	1912	86(4.5)	1376	109(7.9)	3.4	2.40 (1.89,3.07)	<0.001
		Intervention	1692	43(2.5)	1288	214(16.6)	13.9		
	HIV counselling and testing	Comparison	1912	73(3.8)	1376	157(11.4)	7.6	1.17(0.93,1.48)	0.1850
		Intervention	1692	55(3.3)	1288	167(13.0)	9.7		
	Antenatal services	Comparison	1912	57(3.0)	1376	113(8.2)	5.2	1.58 (1.22, 2.03)	0.001
		Intervention	1692	53(3.1)	1288	159(12.3)	9.2		
	Delivery services	Comparison	1912	63(3.3)	1376	120(8.7)	5.4	1.91 (1.50,2.43)	<0.001
		Intervention	1692	52(3.1)	1288	196(15.2)	12.1		
Satisfaction	Satisfaction	Comparison	1912	330(17.3)	1376	390(28.3)	11	1.92 (1.63,2.26)	<0.001
		Intervention	1692	304(18.0)	1288	556(43.2)	25.2		
Service improvement	Friendly staff	Comparison	1912	1(0.1)	1376	9(0.7)	0.6	1.19(0.48,2.94)	0.707
		Intervention	1692	1(0.1)	1288	10(0.8)	0.7		
	Privacy	Comparison	1912	2(0.1)	1376	4(0.3)	0.2	2.41(0.74, 7.86)	0.1430
		Intervention	1692	1(0.1)	1288	9(0.7)	0.6		
	Convenient hours	Comparison	1912	1(0.1)	1376	6(0.4)	0.3	0.53(0.13,2.14)	0.374
		Intervention	1692	1(0.1)	1288	3(0.2)	0.1		
	Same sex providers	Comparison	1912	1(0.1)	1376	2(0.2)	0.1	-	-
		Intervention	1692	0(0)	1288	0(0)	0		
	Drugs Availability	Comparison	1912	4(0.2)	1376	23(1.7)	1.5	1.64(0.97,2.80)	0.067
		Intervention	1692	5(0.3)	1288	35(2.7)	2.4		
	Short waiting time	Comparison	1912	2(0.1)	1376	5(0.4)	0.3	1.92(0.64,5.76)	0.241
		Intervention	1692	0(0)	1288	9(0.7)	0.7		
	Confidentiality	Comparison	1912	0(0)	1376	2(0.2)	0.2	4.30(0.91,20.27)	0.065
		Intervention	1692	1(0.1)	1288	8(0.6)	0.5		

Odds of intervention group compared comparison group at endline adjusting for baseline

Figure 1 Percentage Change in Service Usage

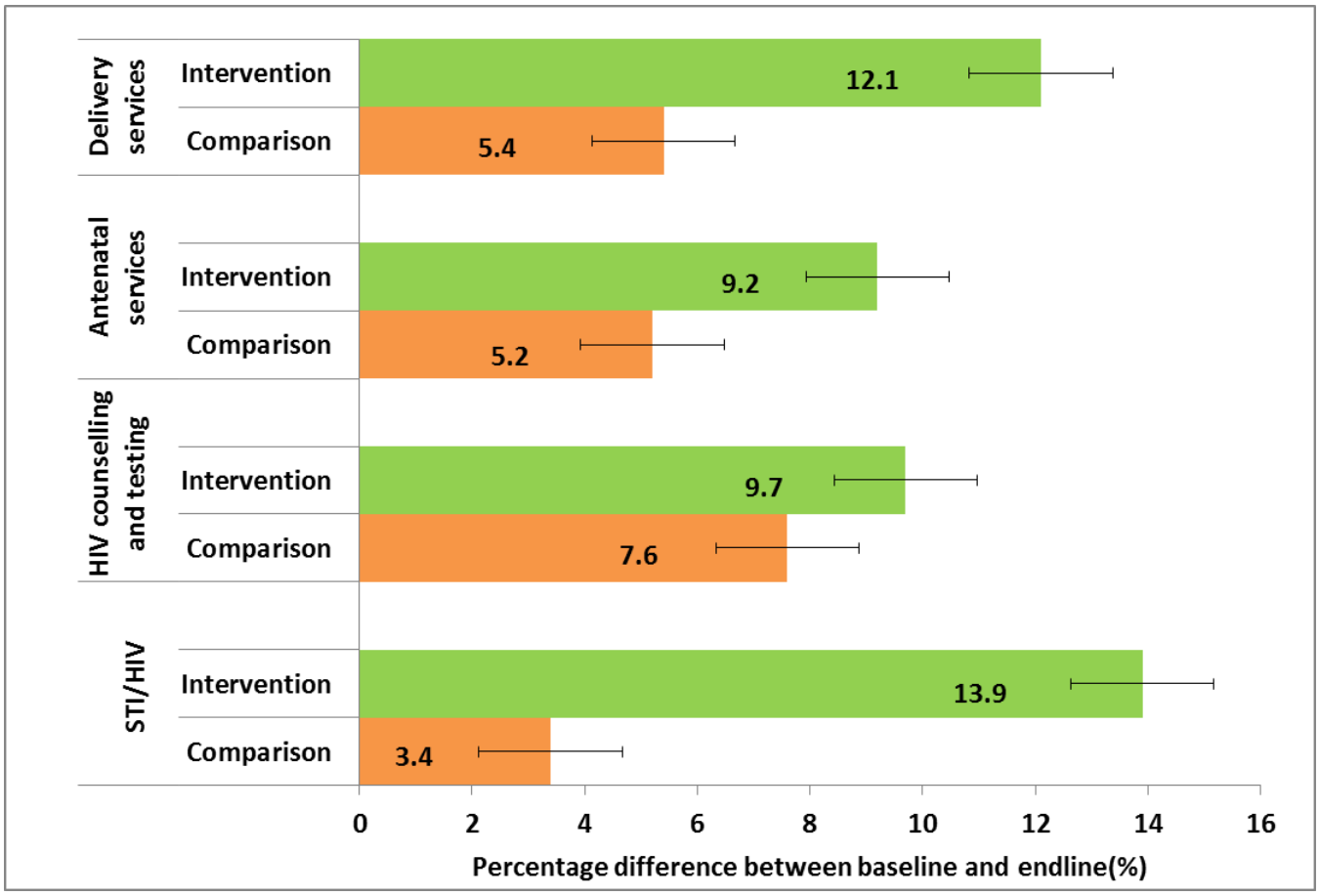

Figure 2 A Map of Ghana indicating the study area

Source: http://openi.nlm.nih.gov/imgs/rescaled512/2935923_GHA-3-5233-g001.png (14/03/2013)

Figure 3 Trial profile