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An assets-based approach to promoting girls' financial literacy, savings, and education

Shelley Clark[a,*], Marianne Paul[a], Richmond Aryeetey[b], Grace Marquis[c]

[a] Department of Sociology, McGill University, Peterson Hall, 3460 McTavish, Montreal, QC, H3A 0E6, Canada
[b] School of Public Health, University of Ghana, Akilagpa Sawyer Rd, Legon, Accra, Ghana
[c] School of Human Nutrition, McGill University CINE Bldg, Macdonald Campus, 21,111 Lakeshore Rd, Ste-Anne-de-Bellevue, QC, H9X 3V9, Canada

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ABSTRACT

Purpose: This study examined whether micro-savings programs can improve young adolescent girls' financial knowledge, savings behaviors, and schooling outcomes in Ghana.
Methods: We evaluated the short- and medium-term effects of a randomized control trial in which a sub-sample of over 1400 girls living in the Eastern Region of Ghana received financial literacy training and a micro-savings account.
Results: Girls in the intervention arm of the study initially exhibited higher levels of financial knowledge, planning, and savings, but some of these effects disappeared within two years. Nonetheless, girls with micro-savings retained their greater knowledge of interest rates, had higher levels of savings, and were more likely to save for school. The effects on girls' educational enrollment was strongest in the second year.
Conclusions: Our results suggest that even relatively young girls can manage micro-savings accounts and that such programs, if sustained, can effectively build girls' financial and educational assets.

1. Introduction

Across the globe, education is increasingly regarded as an indispensable tool to reach adolescents' full potential. Through the acquisition of human capital, education promotes successful transitions into adulthood including finding a well-paid job, creating a stable union, and bearing and raising healthy children. In the past several decades, some of the greatest educational gains have been made in sub-Saharan Africa (World Health Organization, 2015). Yet, despite concerted efforts to enroll an equal number of girls and boys, there remains a gender gap in most countries. This gender gap tends to increase as children become adolescents (World Health Organization, 2015).

School-girl pregnancies and early marriage are often identified as the primary reason for girls' higher attrition rates (Clark & Mathur, 2012; Eloundou-Enyegue, 2004). However, studies show that insufficient funding is the most common reason parents' give for removing their children from school (Lloyd & Mensch, 2008). Although most primary and secondary schools are ostensibly free, parents are responsible for paying a host of ancillary costs including school uniforms, exam fees, and school supplies. These cumulative costs can be prohibitive, particularly for families living in poverty (Cameron & Ananga, 2015). Some parents in sub-Saharan Africa also report being more reluctant to cover these schooling expenses for their daughters than their sons (Tanye, 2008).

* Corresponding author. Department of Sociology, McGill University, Peterson Hall, 3460 McTavish, Montreal, QC, H3A 0E6, Canada.
E-mail addresses: shelley.clark@mcgill.ca (S. Clark), marianne.paul2@mail.mcgill.ca (M. Paul), raryeetey@ug.edu.gh (R. Aryeetey), grace.marquis@mcgill.ca (G. Marquis).

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Intervention studies have aimed to reduce financial barriers to schooling by providing direct cash transfers, which are often conditional on children or adolescents remaining in school (for overviews see Baird, Ferreira, Özler, & Woolcock, 2014; Bastagli et al., 2016; Chaffin & Ellis, 2015; García & Saavedra, 2017). Most of these programs provide cash to the child's mother or guardian. Nonetheless, a handful of studies find positive outcomes when youth are the direct beneficiaries (Baird; Chirwa; McIntosh, & Özler, 2010; Chaffin & Ellis, 2015; Ssewamala, Sperber, Zimmerman, & Karimli, 2010). At the same time, there has been mounting interest in expanding the financial inclusion of youth in developing countries. These programs typically offer financial literacy training and enhanced access to financial services (such as savings accounts) tailored to the needs of adolescents and children (Deshpande & Zimmerman, 2010; Meyer, Zimmerman, & Boshara, 2008). Drawing on concepts from asset theory, researchers contend that early training in financial literacy and access to micro-savings accounts are valuable assets that can foster a life-time habit of savings, improve financial security, and engender a more future-oriented perspective (Austrian & Anderson, 2015; Austrian & Muthengi, 2013, 2014; Johnson & Sherraden, 2007; Sherraden, 1990, 1991). In addition, these financial skills, knowledge, and resources may promote adolescents' educational achievements, although evidence directly linking financial inclusion and education is sparse (Curley, Ssewamala, Nabunya, Ilic, & Keun, 2016; Ssewamala & Ismayilova, 2009).

Building on the literature, our project combines financial literacy training with small cash transfers into local bank savings accounts. This micro-savings intervention was offered to a randomly selected sub-sample of about 1400 girls aged 9–13 years living in the Upper Manya Krobo District of Ghana. The goal of our study was to assess both transient and enduring effects by examining differences in girls' financial knowledge, savings behaviors, and educational outcomes one, two, and three years after our baseline survey.

1.1. Financial literacy and savings accounts for children and youths in Sub-Saharan Africa

A growing body of research, policies, and programs are aimed at building assets and increasing the financial inclusion of youth in low and middle income countries (Austrian & Anderson, 2015; Austrian & Muthengi, 2013, 2014; Child & Youth Finance International, 2012; Deshpande & Zimmerman, 2010; Meyer et al., 2008; Sebstad, 2011; Ssewamala et al., 2010; United Nations Capital Development Fund, 2011). Nearly all projects offer some form of financial literacy training or education that vary in length from a couple of days to a few months. Several projects combine financial education with increased access to formal savings accounts. Most savings are held in local banks offering important advantages over keeping savings at home. First, they provide greater security, thereby mitigating theft or loss which can be especially pertinent for young girls (Austrian, 2011; Johnson et al., 2015). Second, establishing a formal savings account creates ties to a local bank, which may not only facilitate the development of life-long savings habits, but also increase access to credit and other banking services (Meyer et al., 2008). Third, savings held in commercial banks have the potential to earn interest which is particularly important in countries with high inflation to maintain the value of the savings.

However, there is substantial variation in the arrangements and regulations for these savings accounts across projects. Some programs simply help set up the savings accounts for youth or children (Austrian, 2011; Jamison, Karlan, & Zinman, 2014; Johnson et al., 2015), while others also provide either matching funds or seed funds as an incentive to save (Ansong & Chowa, 2009; Curley et al., 2016; Meyer, Masa, & Zimmerman, 2010). There are also important differences concerning ownership of accounts and the restrictions on the use of funds. Typically, minors (below the age of 18 years) cannot establish independent savings accounts and are either held by or co-signed with a parent or guardian (Johnson et al., 2015).

One of the earliest studies in sub-Saharan Africa offered out-of-school adolescent girls (aged 16–22 years) living in an informal settlement in Nairobi, Kenya, access to microfinance services including both savings accounts and microcredit. They found that girls with access to these financial services were not only saving more, but were also protected from the potential risk of theft (Erulkar & Chong, 2005). Subsequent work in this area found that the combined provision of financial education, safe spaces, and savings accounts increased young women's financial knowledge and savings (Austrian & Anderson, 2015; Austrian, 2011). The SUUBI project conducted in Uganda, provided financial literacy training and matched funds for a joint-savings account between orphans (aged 11–17 years) and their caregivers (Ssewamala & Ismayilova, 2009). Orphans enrolled in this program demonstrated more positive attitudes toward saving as well as greater amounts of savings (Ssewamala & Ismayilova, 2009). In Uganda, Jamison et al. (2014) found the provision of an intensive financial education program and access to savings accounts generated increased savings among young adult participants. Lastly, a study targeting low-income households in Uganda, found financial literacy training coupled with a 1:1 matched savings account roughly doubled the amount of savings (Ansong & Chowa, 2009).

However, most of these programs have targeted adolescents above the age of 15 years (Ansong & Chowa, 2009). In the Jamison study (2014), the mean age of the youth was 24.5 years old. Engaging younger adolescents in savings can pose additional regulatory and logistical challenges. A project in Kenya and Uganda, for example, required that all girls younger than age 18 had an adult co-signer on their accounts who was present with the girl when the account was opened and for any subsequent withdrawals (Austrian & Muthengi, 2013). Another study in Ghana attempted to reach primary and junior high students in 4th and 8th grade (roughly 10–14 years old) through voluntary after-school clubs. Although participants were given some financial information and offered a safety-box in which to store their savings at school, they found these interventions had limited effect on either financial knowledge or savings (Berry, Karlan, & Pradhan, 2018).

Although the ultimate objective of several of these savings programs is to further children's and youth's education, only a few explicitly evaluate this outcome. Previous research suggests that the creation of guardian-owned child savings accounts are usually, although not always, positively associated with higher levels of schooling for younger children (Cameron & Ananga, 2015; Chowa, Ansong, & Masa, 2010; Karlan & Linden, 2014; Karlan et al., 2012). However, the potential impact of financial education or youth

savings accounts on adolescents' education has been comparatively understudied. Neither the study by Jamison et al. (2014) nor the SUUBI study (Ssewamala & Ismayilova, 2009) found any statistically significant differences in educational enrollment between participants and non-participants in their programs. The SUUBI study did, however, report that orphaned youth with savings accounts were more likely to plan to attend secondary school (Curley et al., 2016; Ssewamala & Ismayilova, 2009).

1.2. Conceptual framework

Like many of these previous studies, our project draws on asset theory. Assets are stocks of resources that may be tangible such as ownership of financial wealth or intangible such as knowledge, skills, or social capital. Assets have a greater influence than income on individuals' wellbeing because they facilitate the acquisition of other assets and foster a more future-looking orientation, thereby helping individuals exit from poverty (Beverly et al., 2008; Deshpande & Zimmerman, 2010; Karimli & Ssewamala, 2015; Sherraden, 1990, 1991).

In our study, we offer two specific assets essential to adolescent development. First, financial literacy training programs provide information about financial planning (i.e., how to make a budget), financial concepts (such as interest rates), and banking services (including how to access loans and set up savings accounts), increasing girls' financial and money management skills. Second, more recent work in asset theory draws on Sen's (1999) capacities approach to development by promoting adolescents' *financial capacities* (Johnson & Sherraden, 2007). This approach requires not only financial knowledge and skills, but also access to and experience with financial services. For example, creating a saving account offers both the tangible benefit of the money held in the bank, but also affords girls first-hand experience with directly managing their accounts. This combination of both knowledge and experience can generate a synergistic effect that fosters the accumulation of additional assets (Johnson & Sherraden, 2007). To test this theoretical assumption, we examine whether increased financial capacities facilitate the acquisition of other assets, specifically greater savings for school and higher levels of school enrollment.

1.3. Study site

This study was conducted in the Upper Manya Krobo District (UMKD), located in the Eastern Region of Ghana. We selected this district as it is representative of poorly resourced districts in southern Ghana with limited access to government resources and few services from NGOs. Most of the girls in the district live in rural villages away from major highways. However, about a third of the girls live in Asesewa, a small town with numerous commercial establishments, an active market, a large secondary school, and the Upper Manya Krobo Rural Bank (where the girls' savings accounts are held). As a poorly developed district, this area has particularly sub-optimal indicators for adolescent girls' educational attainment, health outcomes, and sexual and reproductive health risks.

Ghana, like many countries in sub-Saharan Africa, has invested heavily over the last decade in expanding universal access to education. The standard programme consist of six years of primary education, three years of junior high school (JHS), and an additional three years of senior high school (SHS). Children who are “on-track” are expected to enter SHS around age 15, but enrollment rates decline precipitously during SHS. Only about 15% of girls in the Eastern region have completed SHS (GSS, GHS, and ICF International, 2015). The most common reason given for dropping out (45%) was the lack of funding (GSS, GHS; ICF International, 2015). Although education is officially free, most government schools regularly charge small fees of around $6–9 USD for primary schools and about $15 USD for students in JHS. Parents frequently incur additional expenses to cover books, uniforms, and other school supplies (Cameron & Ananga, 2015).

2. Data and methods

2.1. Longitudinal samples

Our initial sample of adolescent girls was drawn from a full enumeration of all households in three randomly selected sub-districts (Asesewa, Otrokper, and Sekesua) of UMKD.[1] During the first wave of our longitudinal survey, conducted between July 2014 and March 2015, we interviewed 1419 girls aged 9–13 years and their parents or guardians. Participation rates were high, less than 1% of eligible girls refused to be interviewed. Approximately one year later (between August 2015 and January 2016), a total of 1256 girls were re-interviewed, representing an attrition rate of 11.4%. The third wave of the survey, began in August 2016 and ended in October 2016, with 80.6% retention rate (n = 1145). During the fourth and final wave of the survey (August 2017 and January 2018), we were able to re-interview 1046 girls (73.7% of the original sample). At the time of the last survey these girls were between eleven and 16 years old.

In all waves, efforts were made to interview girls who were temporarily away and to locate those girls who moved to other locations within the study area. In addition, data were gathered on girls who permanently left the study area, by contacting their primary guardians and asking them to provide information about the girls' current residence, marital status, and educational outcomes, if known. Through this method of proxy reporting, we were able to obtain information about school enrollment for most of the absentee girls, yielding educational data on a total of 97.7% of girls in Wave 2, 96.6% in Wave 3, and 95.2% in Wave 4. However, data on girls' financial knowledge and savings behaviors are missing for all girls who left the study area, raising concerns about

[1] The six sub-districts of UMKD were stratified by level of urbanization before the three sub-districts were drawn.

attrition bias. Analyses of predictors of attrition in Wave 4 show that there are no significant differences with respect to study arm assignment, key outcome measures, or any differences by most adolescent and guardian characteristics (see Appendix A). However, girls whose primary guardian was someone other than their mother or father were less likely to remain in their initial household, reflecting the higher residential mobility of fostered children. The practice of fostering, whereby a child is cared for by another relative or close family friend, is widespread in Ghana and many other parts of sub-Saharan Africa. Fostering may be permanent, as is often the case with orphans, or temporary with the expectation that children will return to their parents' care. Similarly, girls who resided in Asesewa are less likely to have left the study area than girls in more rural areas. This finding may be driven by differences in educational opportunities, as Asesewa has more JHS-level schools and the only senior high school in the district.

2.2. Randomization and intervention

To implementation our randomized control study design, all 1419 girls interviewed in Wave 1 were first organized into 72 clusters (or "villages") according to the geographic location of their households. These clusters were then randomly assigned to either the control (n = 35) or intervention (n = 37) arm of the study.[2] Less than half of the girls (n = 643 or 45.3%) lived in villages assigned to the control arm and 776 girls resided in intervention villages.[3]

All girls assigned to the intervention arm were given the opportunity to receive financial literacy training and a savings account at a local bank. The financial literacy training course provided 10 hours of instruction over three days and consisted of activities and instructions about how to make and keep a budget, the importance of banking and basics of savings as well as common terms and concepts such as withdrawals, deposits, and interest rates. Girls were exposed to this financial literacy training only once in the first year.

In addition, each girl in the intervention arm was given $15 USD (equivalent to 45 Ghanaian Cedis (GHS)). To facilitate the monitoring of these funds, one group savings account per village (or cluster) was opened in the Upper Manya Kro Rural Bank between January and February of 2015 into which these funds were deposited. Each girl was given an individual passbook in which deposits and withdrawals were recorded. Girls were informed that this money was their own and they were given no restrictions on the time or reason for withdrawing funds. However, each savings group established their own written by-laws which often included guidelines on withdrawing funds. Each savings group was visited by project staff at a regular scheduled time every other week to enable girls to make deposits and withdrawals.

All girls in the intervention arm were informed during the baseline survey that if they enrolled or continued in school the following year, they would receive a second deposit of $15 USD in their savings accounts. Girls' reports on school attendance were collected during the second wave of interviews and subsequently verified with school records during the start of the next school year (October to November 2015). Those who met the criteria (as defined as having no more than 3 unexcused absences in the previous 3 weeks) received a second deposit in January and February of 2016, shortly after the second round of interviews.

2.3. Ethical approvals and informed consent

Three institutional review boards at McGill University in Canada, the Population Council in the U.S., and the Noguchi Memorial Institute for Medical Research at the University of Ghana, approved the protocols for the longitudinal survey and intervention. Because our study focused on minors (specifically girls aged 9–13 years at baseline), parents or guardians were first informed about the study and provided their consent. Adolescent girls were then contacted and asked to give their assent to be interviewed and, if selected, to participate in the intervention.

2.4. Analysis plan

Our analyses focus on testing differences in outcomes pertaining to financial knowledge, savings behaviors, and education between girls in the intervention and control arms of our study. Measures of financial knowledge include the total number of bank services girls can name (e.g., loans, savings accounts, bank cheques), whether girls know what an interest rate is, and whether girls' can correctly count a combination of coins. Girls' savings behaviors are measured by whether they have a budget for how they intend to manage their money, whether they have a specific financial goal, and their total amount of reported savings, which includes both informal and formal savings. Girl's educational outcomes measure whether they are deliberately saving for school and whether they are currently enrolled in school.

After checking for balance in baseline characteristics of adolescents between our two study groups, we present simple bivariate differences in our main outcomes in Waves 2, 3, and 4 using Student's t-test and chi-squared statistics. To adjust for observed baseline differences, we then use multivariate regression to control for the characteristics of girls (age and level of schooling), guardians (type of guardian and highest level of education), and households (wealth and residence in Asesewa) and the value of the dependent

[2] After randomization, due to the geographic distance between some households and the relatively small sample sizes in other clusters, we split five clusters and combined four sets of clusters within the same study arm, yielding a final number of 73 administrative clusters.

[3] Twenty-eight of the girls or their guardians assigned to the intervention arm declined to participate in the intervention. They are retained in our analyses of the intervention on the intent to treat groups. Exclusion of these girls slightly strengthens our findings, particularly with respect to educational outcomes, but does not substantively alter our conclusions.

Table 1
Descriptive characteristics at baseline by study arm.

	Total	C	I	Sig.
n	*1419*	*643*	*776*	
Dependent Variables				
Financial Knowledge				
Bank services (mean)	1.4	1.4	1.3	
Knows interest rate (%)	6.4	5.9	6.7	
Can count money (%)	80.4	84.3	77.2	**
Savings Behaviors				
Has a budget (%)	46.1	45.1	46.9	
Has a financial goal (%)	69.0	68.0	70.3	
Amount of savings (mean)	2.7	2.4	3.0	
Educational Outcomes				
Saving for school (%)	12.3	13.5	11.3	
Not in school (%)	3.0	3.1	2.8	
Independent Variables				
Age of adolescent (mean)	10.9	11.0	10.9	
Adolescent's current education level (%)				
Not in School	3.0	3.1	2.8	
Primary	90.4	88.8	91.7	
Middle or higher	6.6	8.1	5.4	
Type of guardian (%)				
Biological mother	48.0	45.1	50.4	
Biological father	17.3	19.1	15.7	
Someone else	34.7	35.8	33.9	
Guardian's highest education level (%)				
None	30.8	29.1	32.2	
Primary	33.1	34.7	31.8	
Middle	30.9	31.3	30.5	
Secondary or higher	5.2	4.9	5.3	
Wealth quintiles (%)				***
1 (lowest)	20.0	14.5	24.6	
2	20.0	19.5	20.5	
3	20.0	20.9	19.3	
4	20.0	21.4	18.9	
5 (highest)	19.9	23.6	16.9	
Lives in Asesewa (%)	27.9	32.5	24.1	***

*p < 0.05, **p < 0.01, ***p < 0.001.
C = Control group, I = Intervention group.

variable at baseline. A measure of household wealth was created using principal component analysis of ownership of common household assets (such as radios, televisions, phones, and bicycles) and household amenities (such as household construction materials, source of drinking water, and type of cooking fuel). Following standard practices for evaluations of randomized control trials, we used Ordinary Least Squared regression methods for all multivariate analyses. Sensitivity analyses, which examined the change in the dependent variable between baseline and each wave are presented in Appendix B. All analyses control for clustering at the level of randomization (i.e., the village level).

3. Results

3.1. Baseline characteristics

Table 1 compares baseline characteristics across study groups. Overall, levels of girls' financial knowledge, savings behaviors, and educational outcomes were similar. Most girls could name at least one service provided by a bank but relatively few (6.4%) knew the definition of an interest rate. In contrast, a substantial majority (over 80%) were able to correctly count a handful of coins they were shown. Girls assigned to the control arm of the study (84.3%), however, were significantly more adept at counting money than girls in the intervention arm (77.2%). A similar proportion of girls in both arms reported that they had a budget (about 46%) and a specific savings goal (69%). Girls in both groups had only minimal savings of around 3 GHS ($1 USD). Nearly all girls (97%) were enrolled in school at baseline, but only 12.3% were savings specifically for school.

On average, girls in our sample were 11 years old and only a few (6.6%) had progressed to JHS at baseline. About half of the girls designated their mothers as their primary guardians, while over a third indicated that someone other than their parent was their main guardian, suggesting high levels of child fostering. Despite randomization of clusters (or villages) to study arms, significantly more girls in the control group lived in the urban area of Asesewa, while girls in the intervention group were more likely to live in the more rural sub-districts. These differences in residency may also partially account for differences in girls' skills in counting money as girls living in the urban town may have more occasions to buy or sell goods with cash. Overall, these differences suggest that girls in our

Table 2
Financial knowledge, savings behaviors, and educational outcomes by study arm.

	Wave 2			Wave 3			Wave 4		
	C	I	Sig.	C	I	Sig.	C	I	Sig.
n	*570*	*686*		*523*	*622*		*474*	*572*	
Financial Knowledge									
Bank services (mean)	1.6	1.7	**	1.7	1.7		1.8	1.8	
Knows interest rate (%)	15.8	31.5	***	23.4	44.7	***	34.6	49.5	***
Can count money (%)	90.9	88.3		92.0	86.2	**	90.7	89.5	
Savings Behaviors									
Has a budget (%)	40.4	51.0	***	59.7	62.5		53.8	56.5	
Has a financial goal (%)	70.2	78.3	***	81.8	85.4		67.7	73.6	*
Amount of savings (mean)	4.5	9.3	***	10.4	37.6	***	10.1	21.6	***
Educational Outcomes									
Saving for school fees (%)	14.2	38.5	***	21.0	61.1	***	15.2	28.9	***
Not in school (%)	3.9	2.6		7.7	4.2	*	11.0	10.1	
Not in school-proxy (%)	5.1	3.4		8.8	5.3	*	12.0	10.9	

*p < 0.05, **p < 0.01, ***p < 0.001.
C = Control group, I = Intervention group.

intervention arm are slightly more disadvantaged than those in the control group across several observed and (potentially) unobserved measures.

3.2. Financial knowledge

Table 2 shows that girls' financial knowledge rises across all three measures after the first wave, but then remains relatively constant. Moreover, one year after baseline (Wave 2), girls who received financial literacy training and a micro-savings account could name more bank services. Girls who received the micro-savings intervention were also twice as likely to correctly define an interest rate. In addition, their initial disadvantage with respect to counting money has been nullified. The effects of the intervention, however, appear to wear off over time. Two and three years later, girls who received the intervention are no longer able to name more bank services and their disadvantage with respect to counting money reappears in Wave 3. Nonetheless, they retain their knowledge of interest rates throughout the duration of the study.

Controlling for baseline characteristics does not substantially change the effect of the micro-savings intervention on girls' financial knowledge. The impact on knowledge of banking services appears to be transient, while the effect on knowledge about interest rates endures. In Wave 4, for example, knowledge about interest rates is 17 percentage points higher among girls in the intervention arm than in the control group (Table 3). Similar to our bivariate findings, the multivariate analyses in Table 3 also reveals a deficiency in the counting skills of girls in the intervention arm in Wave 2. This difference, however, is not detected in our model of the change in counting ability between Waves 1 and 2 (shown in Panel A of Appendix B).

3.3. Savings behaviors

We next assess the impact of the financial intervention on savings behaviors one to three years after baseline. The short-term effects of the intervention on savings behaviors are striking (Table 2). During the second wave of data collection, girls who received the intervention were roughly ten percentage points more likely to report using a budget and having a specific financial goal. They also reported more than twice as much savings, but we note that their reported savings were substantially lower than the official bank

Table 3
Effects of intervention on financial knowledge over waves.

	Bank Services						Knows Interest Rate						Can Count Money					
	Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Intervention (ref = Control)	0.16	***	0.00		0.01		0.16	***	0.23	***	0.17	***	0.01		−0.04	*	0.02	
	(0.04)		(0.03)		(0.04)		(0.03)		(0.04)		(0.04)		(0.01)		(0.02)		(0.03)	
F-stat	14.3	***	11.9	***	5.9	***	17.5	***	24.3	***	13.0	***	15.8	***	8.7	***	7.2	***
n	*1220*		*1116*		*1020*		*1221*		*1116*		*1020*		*1216*		*1116*		*1014*	

All models control for girls' age, educational level, type of guardian, guardian's highest educational level, household wealth, residence in Asesewa and the dependent variable at baseline.
*p < 0.05, **p < 0.01, ***p < 0.001.
Standard errors in parentheses.

Table 4
Effects of intervention on savings behaviors over waves.

	Has a Budget						Has a Financial Goal						Amount of Savings					
	Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Intervention (ref = Control)	0.10	**	0.03		0.04		0.07	*	0.03		0.08	*	4.91	***	27.54	***	12.27	***
	(0.03)		(0.04)		(0.03)		(0.03)		(0.02)		(0.03)		(1.05)		(3.26)		(2.06)	
F-stat	4.2	***	2.7	**	2.8	**	2.0	*	2.2	*	2.0	*	7.7	***	14.7	***	8.2	***
n	*1222*		*1118*		*1021*		*1222*		*1118*		*1021*		*1222*		*1116*		*1021*	

All models control for girls' age, educational level, type of guardian, guardian's highest educational level, household wealth, residence in Asesewa and the dependent variable at baseline.
*p < 0.05, **p < 0.01, ***p < 0.001.
Standard errors in parentheses.

records. When probed, girls in the intervention group seemed largely aware of these savings, yet did not include them potentially because these were held in group accounts. Hence, our estimates of savings likely underestimate the true differences by study arm. These reporting issues appear to diminish by Wave 3, when girls' savings are nearly fourfold greater among girls in the intervention arm. The difference in savings is lower but remains about twice as high in the intervention arm (21.6 GHS) than in the control group (10.1 GHS) in Wave 4.

Further investigation reveals that, as expected, there are striking differences in where girls keep their savings. At baseline, less than 5% of girls in either study arm use formal institutions such as banks and organized savings accounts to save their money, while the large majority store their savings at home in bags or boxes or with their guardians (the difference between study arms is insignificant). By Wave 3, nearly 85% of girls in the intervention arm report keeping at least some of their savings in formal institutions compared to only 5% of girls in the comparison arm. Even after the intervention ended and girls were offered assistance with withdrawing all their money from the bank accounts, almost half (48%) chose to maintain at least some of their money in these formal institutions.

Girls in the intervention arm also remained more likely to use a budget, but these differences become insignificant at the 5% level in Waves 3 and 4. Differences in the likelihood of having a financial goal also become insignificant in Wave 3, but then regain significance in Wave 4 (67.7% of girls in the control group versus 73.6% of girls in the intervention). Controlling for baseline characteristics in Table 4shows similar results to those in our bivariate analyses. The financial intervention had short-term positive effects on girls' budgeting and financial planning and a longer-term impact on their amount of savings, suggesting that girls are retaining a sizeable proportion of their initial savings deposits. Our models of the change in savings behaviors (presented Panel B of Appendix B) are consistent with our bivariate and multivariate analyses, except that some differences become significant only at the 10% level.

3.4. Educational outcomes

Table 5 examines whether girls who received the intervention are more likely to save for school or remain in school. The likelihood that girls in either arm are saving specifically for school changes as girls' age; rising in Wave 3 before declining by Wave 4 (Table 2). Almost three times as many girls in the intervention group than in the control group report saving for school in Wave 3. Furthermore, despite the overall decline in savings towards school in Wave 4, girls in the micro-savings program are nearly twice as likely to be saving specifically for school-related expenses. These findings remain essentially unchanged in both the multivariate model of Table 5 and the change in savings goals model (Panel C of Appendix B).

Table 5
Effects of intervention on educational outcomes over waves.

	Saving for School						Not in School						Not in School with Proxy Reports					
	Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Intervention	0.24	***	0.40	***	0.14	***	−0.01		−0.03	*	0.00		−0.02		−0.03	*	0.00	
(ref = Control)	(0.03)		(0.03)		(0.03)		(0.01)		(0.02)		(0.02)		(1.01)		(0.02)		(0.02)	
F-stat	7.8	***	13.6	***	4.2	***	4.0	***	4.3	***	6.2	***	3.0	**	4.0	***	8.7	***
n	*1222*		*1118*		*1021*		*1223*		*1118*		*1021*		*1349*		*1334*		*1313*	

All models control for girls' age, educational level, type of guardian, guardian's highest educational level, household wealth, residence in Asesewa and the dependent variable at baseline.
*p < 0.05, **p < 0.01, ***p < 0.001.
Standard errors in parentheses.

The percentage of girls out of school rises from about 3% in Wave 1 to above 10% in Wave 4. Dropout rates remain around 3% in Wave 2, but start rising noticeably in Waves 3 and 4 when many girls would be entering into JHS. Interestingly, there is no significant difference in enrollment between study arms in Wave 2, despite girls in the intervention receiving an additional deposit if they were in school. In contrast, drop-out rates are significantly lower among participants in the intervention group in Wave 3 (4.2% intervention vs. 7.7% control). This difference persists when we include reports from proxy respondents about girls who have moved away from the community. In total, 8.8% of girls in the control group compared to only 5.3% in the intervention arm are reported to be out of school. By the final wave of the survey, however, there is no significant effect of the intervention on educational enrollment rates despite higher overall levels of drop-out. Multivariate analyses (Table 5) and change models (Panel C of Appendix B) yield similar results, except that differences in enrollment in Wave 3 become marginally insignificant ($p = 0.055$). These findings suggest that although girls continue to save for school, these savings and their intentions are not predictive of educational enrollment over the long term.

4. Discussion and conclusions

Local banks in sub-Saharan Africa and other low-income regions are increasingly interested in expanding their scope of services from micro-credit to micro-savings (Karlan, Ratan, & Zinman, 2014). Extending micro-saving services to youth is particularly appealing as it can both enhance corporate social responsibility and foster relations with new life-long clients (Deshpande & Zimmerman, 2010; Meyer et al., 2008). Developing financial capacities and furthering education is especially important for low-income youths facing an increasingly monetarized and global economy. Yet, most of these existing programs are targeted to older youths, many of whom are already out of school. Our study is among the first to suggest that micro-savings programs for youth below the age of 15 may yield important benefits by increasing young girls' financial knowledge, improving their savings habits, and promoting educational achievement.

First, our study provides evidence that even comparatively young girls in both small towns and rural areas can manage micro-savings accounts. Despite initial concerns that young girls' may quickly spend all their money or have their funding commandeered by family members or friends, we found that girls retained a large proportion of their savings. Moreover, when asked about their financial goals, the most common response was for school-related expenses, suggesting that girls are reluctant to spend these funds on less future-oriented items such as cosmetics or sweets. The ability of the girls to successfully manage these accounts may be partly attributed to the creation of “savings clubs”. Although girls did not technically share their savings, the group organization of accounts allowed girls to establish their own rules about withdrawals for use of funds, which may be a key feature to successful future programs. Offering girls direct access to a bank-based saving account appears to enhance their participation compared to home or school-based savings mechanisms (Austrian, 2011; Berry et al., 2018).

Although we find that girls in the intervention arm report more than twice the savings as those in the comparison arm in all waves, our analyses are limited as they rely on girls' self-reports of their combined formal and informal savings. Even though we find no evidence that girls in the intervention arm are over-reporting their savings, discrepancies between girls' reports and bank records of girls' savings in Wave 2 are concerning. Furthermore, although girls in the intervention group are much more likely than girls in the comparison arm to hold at least some of their savings in formal institutions, we do not know the exact percentage of their savings held at home or in savings accounts. Future studies would benefit by tracking the formal savings of all girls over a longer duration of the study. Mobile banking services may assist in improving the accuracy of such savings data.

In addition to differences in savings behaviors, girls in the intervention arm also acquired important intangible financial assets. Although our financial literacy training was relatively short, it appears to have enhanced girls' financial knowledge and savings behaviors. Some of these effects were transient, but others were more enduring. In particular, girls in the intervention retained their knowledge of an interest rate, suggesting that once this concept is grasped it is not readily forgotten. Knowledge of interest rates may be particularly valuable to girls in the future as they apply for micro-credit programs and bank loans. Interest rates also play a vital role in maintaining the value of savings held in bank accounts in countries, such as Ghana, that experience high and unpredictable levels of inflation. Girls were also more likely to have a specific savings goal three years later. This enhanced financial capacity can have important consequences, particularly in contexts with significant credit constraints and market volatility.

Finally, increased financial capacity can be used to promote the acquisition of additional educational assets. Girls' sustained interest in saving for school-related expenses reflects the high value girls place on schooling in this context. Having greater financial capacity and micro-savings may both make additional schooling more affordable and orient young girls towards higher educational goals (Curley et al., 2016; Ssewamala & Ismayilova, 2009). Similar to other intervention studies, we find that the effect of our micro-savings program on school enrollment was transitory (Bastagli et al., 2016).

Even though some of the financial and educational effects are fleeting, they are not unimportant, as they suggest that the effects could endure if the project were sustained. One of the main drawbacks of our project was the lack of sufficient funds to continue monitoring and replenishing girls' savings accounts each year. Providing girls with small cash transfers (about $15 USD per year) is relatively inexpensive compared to other interventions which offer cash transfers or matched funds to increase youth's schooling (Baird, McIntosh, & Özler, 2011; Ssewamala & Ismayilova, 2009). The greater components of costs stem from setting-up and monitoring small group accounts and providing services that afford rural girls regular access to make deposits and withdrawals. Nonetheless, although girls were entitled to simply withdraw all their remaining funds at the end of the project, only about a third chose to do so. Instead, community leaders, guardians, girls, and bank officials developed a plan to continue these accounts indefinitely. Understanding the full potential of these types of micro-savings programs for adolescent girls' development requires further study, particularly with regard to its cost-effectiveness and long-term effects. Our study, nevertheless, adds to a growing body of literature

that indicates that developing financial capabilities may be an important asset-building strategy for improving the well-being of young girls living in sub-Saharan Africa.

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Appendices

Appendix A. Predictors of attrition in wave 4.

	Coef.	S.E.	Sig.
Intervention (ref = Control)	0.00	0.03	
Outcomes			
Number of bank services	0.00	0.02	
Knows interest rate (ref = does not know)	−0.01	0.05	
Can count money (ref = cannot count)	0.00	0.03	
Has a budget (ref = does not have budget)	−0.03	0.03	
Has a financial goal (ref = does not have goal)	0.04	0.03	
Amount of savings	0.00	0.00	
Saving for school (ref = is not saving for school)	0.07	0.04	
Not in school (ref = in school)	−0.03	0.09	
Baseline Characteristics			
Age of adolescent	0.01	0.01	
Adolescent's current education level (ref = not in school)			
Primary	−0.06	0.07	
Middle or Higher	0.03	0.09	
Type of Guardian (ref = biological mother)			
Biological father	0.00	0.03	
Someone else	0.14	0.03	***
Guardian's highest education level (ref = none)			
Primary	−0.02	0.03	
Middle	−0.01	0.04	
Secondary or Higher	−0.02	0.06	
Wealth quintiles (ref = lowest quintile)			
Second lowest quintile	0.08	0.04	*
Middle quintile	0.02	0.04	
Second highest quintile	−0.07	0.04	
Highest quintile	0.06	0.05	
Lives in Asesewa (ref = lives outside Asesewa)	−0.13	0.04	**
n		*1373*	

*p < 0.05, **p < 0.01, ***p < 0.001.

Appendix B. Effects of intervention on a change in outcomes between baseline and each wave.

	Panel A: Financial Knowledge																	
	Bank Services						Knows Interest Rate						Can Count Money					
Intervention (ref = Control)	Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
	(0.06)		(0.05)		(0.07)		(0.04)		(0.04)		(0.02)		(0.02)		(0.03)		(0.03)	
F-stat	7.1	**	0.3		0.1		16.9	***	22.5	***	13.2	***	3.0		0.1		0.9	
n	*1254*		*1143*		*1045*		*1255*		*1143*		*1045*		*1250*		*1143*		*1039*	
	Panel B: Savings Behaviors																	
	Has a Budget						Has a Financial Goal						Amount of Savings					
Intervention (ref = Control)	Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
	(0.04)		(0.05)		(0.05)		(0.04)		(0.03)		(0.04)		(1.08)		(3.52)		(1.96)	
F-stat	3.2		0.1		0.0		2.5		0.9		2.9		16.1	***	57.3	***	32.9	***
n	*1255*		*1145*		*1046*		*1256*		*1145*		*1046*		*1256*		*1145*		*1046*	
	Panel C: Educational Outcomes																	
	Saving for School						Has a Savings Goal						Amount of Savings					
Intervention (ref = Control)	Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4		Wave 2		Wave 3		Wave 4	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
	(0.03)		(0.04)		(0.04)		(0.01)		(0.02)		(0.02)		(0.01)		(0.02)		(0.02)	
F-stat	59.0	***	118.9	***	22.1	***	0.4		3.8		0.1		1.9		4.8	*	0.2	
n	*1256*		*1145*		*1046*		*1256*		*1145*		*1046*		*1387*		*1371*		*1351*	

*p < 0.05, **p < 0.01, ***p < 0.001.
Standard errors in parentheses.

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