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The Mental Health Dividend of Secondary Education for Ghanaian Women

Evidence from the Ghana Socioeconomic Panel Survey

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ABSTRACT

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Removing Across sub-Saharan Africa, widening access to and completion of secondary education – especially for women – has become a central development priority. More schooling is associated with improved psychological wellbeing, but whether completing secondary school in particular is linked to better mental health among women in sub-Saharan Africa is not well understood. Using four waves of the Ghana Socioeconomic Panel Survey (2009/10–2022/23), we estimate the relationship between lower- and upper-secondary credentials and women's Kessler-10 (K10) distress scores, over and above a linear relationship with years of education. We find that an upper-secondary credential is associated with lower distress net of years of education: about 1.19 K10 points, or a 7.8-percentage-point lower probability of being at risk (K10 ≥ 20). This association is not concentrated among the tertiary-educated in that group. A lower-secondary credential is also associated with a 4.3-percentage-point lower probability of being at risk, net of years of education. The credential gradient is attenuated, but remains, after adjustment for observed economic security, household circumstances, physical health and care burden; economic security produces the largest attenuation. The panel allows us to track the same women between waves. Among women not at risk at one interview, secondary credentials are associated with a lower probability of being at risk at the next; among women already at risk, there is little evidence of a credential gradient in recovery. However, educational attainment is not randomly assigned and the current circumstance measures are observed contemporaneously with distress, so the estimates are conditional associations and the sequential adjustment is an accounting exercise rather than a causal mediation analysis. The findings nevertheless point to psychological wellbeing as a potentially important non-market return associated with secondary education.

JEL Classification:
I12, I21, I26, O15, O55

Keywords:
secondary education; credential completion; women's mental health; psychological distress; Kessler-10; Ghana; sub-Saharan Africa

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1 Introduction

Mental health is increasingly recognised as a fundamental component of human capital and wellbeing. Psychological distress is associated with poorer physical health, reduced labour-market participation and productivity, lower earnings, and greater vulnerability to poverty (Patel et al., 2010; Canavan et al., 2013; Alloush, 2023). These consequences are particularly important in low- and middle-income countries, where mental-health conditions frequently remain under-recognised and untreated because of stigma, limited service provision and acute shortages of trained personnel (Ofori-Atta et al., 2010; Patel et al., 2010; Rehm and Shield, 2019). Women are consistently over-represented among those affected (Sipsma et al., 2013; Menil et al., 2012), and, for women in particular, psychological distress has been linked to poorer outcomes not only for themselves but for their children and households (Gelaye et al., 2016). Improving psychological wellbeing is therefore important not only as a health objective in its own right, but also because of its implications for economic development, household functioning and intergenerational welfare.

Education has long been viewed as one of the fundamental determinants of health (Grossman, 1972; Ross and Wu, 1995; Cutler and Lleras-Muney, 2006). Beyond increasing labour-market opportunities and earnings, schooling may improve psychological well-being by enhancing health knowledge, strengthening cognitive and non-cognitive skills, improving access to information and services, increasing women's autonomy and bargaining power, reducing exposure to poverty and economic insecurity, and changing marriage and fertility trajectories (Grossman, 1972; Cutler and Lleras-Muney, 2006; Cutler and Lleras-Muney, 2010; Kate et al., 2017; Galama et al., 2018). At the same time, education may alter women's economic and household roles in ways that generate new demands. More educated women may combine paid work with childcare and unpaid domestic work, experience role conflict, or face a gap between educational expectations and available employment opportunities (Nwosu, 2021; Smith-Greenaway and Yeatman, 2020; Potarca and Rossier, 2022).

This paper uses four waves of the Ghana Socioeconomic Panel Survey, collected between 2009/10 and 2022/23 and responses to the Kessler Psychological Distress Scale (K10) to examine the relationship between education and psychological distress among women aged 20 to 49. Understanding this relationship has particular policy relevance in Ghana and on the African continent more broadly. Across sub-Saharan Africa, widening access to and completion of secondary education has become a central development priority (UNESCO, 2016; Mastercard Foundation, 2020). In Ghana, the expansion of secondary education, including the introduction of free senior high school (SHS) in 2017, has made progression beyond basic education a central policy objective and has widened access, especially for girls (Stenzel et al., 2024). Although the women analysed in this study largely completed their schooling before Free SHS, and the study does not estimate the causal effect of the reform, the reform motivates a broader question about the potential benefits of secondary education that extend beyond attainment, employment and earnings to women's psychological well-being. Evidence on such broader, non-market returns is important for assessing the full social value of investments in secondary education.

The literature on the relationship between education and mental health is mixed and remains concentrated in higher-income settings (Wang, 2022; Li and Sunder, 2024; Courtin et al., 2019; Avendano et al., 2020). A particularly relevant African contribution is Kondirolli and Sunder's

(2022) study of Zimbabwe. Exploiting age-specific exposure to a post-independence education reform as an instrument for years of schooling, they find that additional education reduced the likelihood and severity of depression- and anxiety-related symptoms more than two decades later. Their estimates are larger among women and rural residents, and their pathway analysis points to physical health, health knowledge and behaviour, and women's empowerment as possible mechanisms.

Research from Ghana has established that psychological distress[1] is strongly socially patterned. Using the first wave of the Ghana Socioeconomic Panel Survey (GSPS), Sipsma et al. (2013) show that distress varies by gender, education, wealth, region, health, and marital status. Among women in relationships, physical abuse, partner control and attitudes reflecting women's disempowerment are strongly associated with poorer mental health. This evidence highlights both an education gradient and the importance of relational and household circumstances, but it is cross-sectional and education enters their analysis largely as one socioeconomic correlate among several, rather than the focal point.

Subsequent Ghanaian studies have used the panel structure of the GSPS to focus more directly on women's unpaid work and mental well-being. Owoo and Lambon-Quayefio (2021) combine the first two waves of the GSPS with qualitative interviews to examine domestic work, childcare and women's mental health. Their analysis indicates that heavier domestic and childcare demands are associated with poorer mental-health outcomes, while the qualitative evidence emphasises persistent gender norms and the limited redistribution of unpaid work within households. Vitellozzi et al. (2024) extend this literature using the second and third GSPS waves. They shift attention from a focus on time to the number and composition of domestic and care activities, finding that greater task multiplicity is associated with higher psychological distress.

Together, these studies contribute an understanding of the immediate household and socioeconomic circumstances associated with women's psychological distress in Ghana. They leave three related questions open, where this study makes its primary contributions. First, little is known about whether completing a schooling credential itself, particularly upper secondary (or senior high school; SHS), carries a mental-health advantage over and above the broader per-year gradient in schooling. Secondary credentials may be specifically important for the incidence of distress over and above a general years of education attainment gradient for several reasons. A recognised qualification is a labour-market signal that partial attendance is not (Spence, 1973): economists have long documented "sheepskin" effects (discrete jumps in earnings at the point of certification rather than smoothly with each additional year of attendance; Hungerford and Solon, 1987), and studies that use actual credentials rather than years of schooling find such completion premia at multiple levels, including secondary-school graduation (Jaeger and Page, 1996). Furthermore, in the Ghanaian setting the senior-secondary certificate is a gateway to tertiary study and formal-sector employment, and signals status in the marriage market, in ways that additional years of education without the certificate do not. Completion may therefore reshape the very circumstances (economic security, household formation) through which schooling is linked to mental health more than an uncertified extra year of education

[1]For analyses using GSPS data, psychological distress and mental health refer to K10 scores.

would.

Second, while existing work identifies economic insecurity, physical health, empowerment, intimate partner violence, and unpaid work as correlates of distress, it has not specifically addressed how much of the credential gradient is accounted for by these observed circumstances. We use sequential adjustment to examine how the gradient changes as current-circumstance domains are added. Third, previous Ghanaian studies have focused mainly on contemporaneous distress, rather than repeated distress over time. We use repeated observations of the same women to distinguish associations with onset, recovery and repeated distress across survey waves.

Our findings point to a secondary-credential gradient in psychological distress in Ghana, over and above the linear gradient in years of education. The gradient is attenuated but remains after adjustment for four domains of women's current circumstances, with economic security producing the largest attenuation. In the longitudinal analysis, the clearest credential association is at the onset margin: among women not at risk at one interview, secondary credentials are associated with a lower probability of being at risk at the next. There is little evidence of a credential gradient in conditional recovery, while the significant chronic-distress association is with years of schooling rather than the credential indicators. Because educational attainment is not randomly assigned and many current circumstances are measured contemporaneously with distress, we interpret these findings as conditional associations rather than causal effects.

The remainder of the paper is organised as follows. Section 2 reviews the literature linking education to health and well-being and develops a conceptual framework for how schooling might shape women's psychological distress. Section 3 describes the setting, the GSPS data, and our sample of women aged 20 to 49; the measures of educational attainment; the two distress outcomes; and the pathway domains. Section 4 sets out the empirical strategy. Section 5 presents the results, which are then discussed in Section 6. Section 7 concludes.

2 Literature and conceptual framework

2.1 The relationship between education and mental health

Education may influence mental health through several interrelated pathways. The human-capital perspective emphasises that schooling builds skills and knowledge that raise productivity, earnings and the capacity to produce health (Grossman, 1972). Higher earnings and more stable employment can reduce exposure to material deprivation, food insecurity, and debt and economic shocks, each of which is associated with poorer mental health (Alloush, 2023; Smith et al., 2021). Education may also improve the ability to obtain, understand and act on health information, facilitate access to formal services, and strengthen problem-solving and coping resources (Ross and Wu, 1995; Cutler and Lleras-Muney, 2006; Adu et al., 2021). Sociological accounts add that the less educated tend to report more distress partly because they command less cultural capital and a weaker sense of personal control (Ross and Wu, 1995; Kate et al., 2017).

Education may be particularly consequential for women because it can alter bargaining power and life-course choices. More schooling is associated with delayed marriage and first birth, lower completed fertility, a greater likelihood of partnering with a more educated spouse, and a stronger say in decisions over household purchases, health care, fertility and the use of one's own

income (Kabeer, 1999; Sen, 1999; Duflo, 2012; Osili and Long, 2008). Partner "matching" itself carries mental-health implications: comparative evidence on highly educated women shows that those in hypogamous unions, that is, partnering with a less-educated spouse, report significantly more depression, partly through financial strain and household economic insecurity (Potarca and Rossier, 2022). Education may also lower tolerance of controlling behaviour and violence (Stromquist, 2015). Through these channels, schooling could improve mental wellbeing both directly and indirectly, by reducing women's exposure to adverse relational circumstances.

Causal evidence on education and mental health in African settings remains scarce. Kondirolli and Sunder (2022) provide a key benchmark by exploiting the post-1980 dismantling of colonial-era restrictions on Black Zimbabweans' schooling as an instrument for years of education. Treated cohorts gained substantially more schooling, and the instrumental-variable estimates indicate lower levels of depression and anxiety more than two decades later, with effects concentrated among women and rural residents. The authors point to better physical health, improved health behaviour, and greater female empowerment as plausible pathways. Their study shows that schooling reforms may have effects extending well beyond labour-market and physical-health outcomes. Quasi-experimental evidence from China points in the same direction: compulsory-schooling reforms improve mental health, with effects largest in the worse-off tail of the distribution and operating partly through income, social status, and cognition (Wang, 2022; Li and Sunder, 2024).

The relationship between education and distress is, however, not necessarily uniformly protective. Where labour markets offer educated women only limited opportunities, schooling may raise aspirations without delivering commensurate employment or earnings, which can itself be a source of distress (Smith-Greenaway and Yeatman, 2020), and paid work may itself be insecure or demanding (Sackey and Sanda, 2009). Crucially, entry into employment need not be accompanied by any redistribution of household work: educated women may face a "double burden" of paid work alongside persistent unpaid domestic and care responsibilities (Avotri and Walters, 1999; Seedat and Rondon, 2021; Ervin et al., 2022). The net association between secondary education and psychological distress, therefore, depends on the balance between these protective and potentially stressful channels, a balance that is ultimately an empirical question and may differ across settings.

In Ghana, a small body of work using the GSPS and the Kessler K10 scale has established the inverse relationship between educational attainment and mental health. Sipsma et al. (2013) provide the first nationally representative estimates, documenting a prevalence of moderate-to-severe distress of 18.7% and a strong cross-sectional social gradient. They further show that women's relationship context matters, with physical abuse, partner control and disempowering attitudes associated with poorer mental health. Canavan et al. (2013) link distress to unemployment and lost productivity in the same panel, and Amenah et al. (2025), using three GSPS waves, report that post-secondary education reduces the odds of depression, while Northern-region residence and older age increase them.

Two further studies focus specifically on the unpaid-work channel. Owoo and Lambon-Quayefio (2021) examine time devoted to domestic work and childcare; their use of individual fixed effects strengthens the evidence that changes in unpaid workload are associated with

changes in women's mental health, although reverse causality and time-varying confounding remain possible. Notably, they find the adverse association is strongest among women in wealthier households, cautioning against a simple "material security is always protective" reading. Vitellozzi et al. (2024) introduce a complementary measure (the number of distinct domestic and care activities performed) and argue that task multiplicity may create strain independently of total hours, with women's distress driven mainly by care activities.

The contribution of the present paper is thus not to establish, for the first time, that economic conditions, empowerment, violence, or care burdens are related to mental health in Ghana. Instead, it addresses the extent to which these correlates work to lower the observed gradient between credentials and distress.

2.2 Conceptual framework

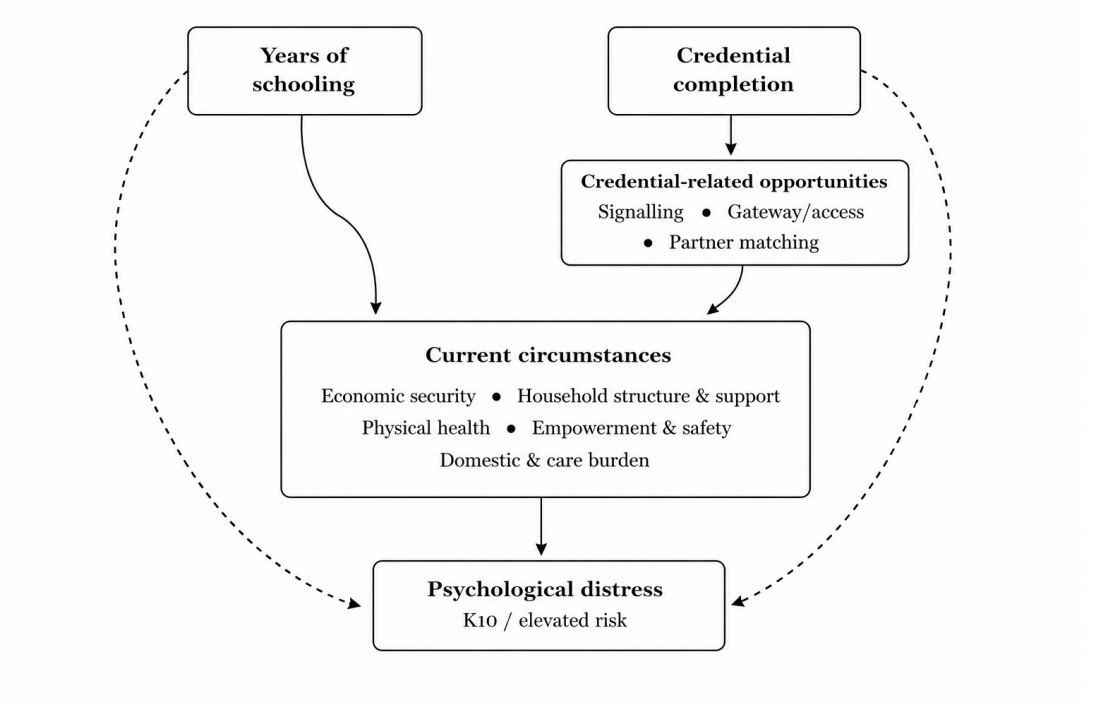
Our starting point is that years of schooling and credential completion may capture distinct dimensions of educational attainment. Years of schooling measure accumulated exposure to education, while a recognised credential may carry additional value at the point of completion. A qualification can provide a labour-market signal that partial attendance does not (Spence, 1973), consistent with evidence of "sheepskin" effects in which returns increase discontinuously at certification rather than smoothly with each additional year of schooling (Hungerford and Solon, 1987; Jaeger and Page, 1996). In Ghana, the senior-secondary credential is also a gateway to tertiary study and may facilitate access to particular forms of employment. Certification may additionally convey status in the marriage market and be associated with partner matching. These distinctions motivate our empirical specification in which years of schooling and secondary credentials enter simultaneously: the credential coefficients capture differences associated with completion over and above the linear gradient in years of schooling.

Figure 1 summarises the framework. Both years of schooling and credential completion may be associated with psychological distress directly or through differences in women's subsequent circumstances. We group the observed circumstances into economic security, household structure and support, physical health, empowerment and safety, and domestic and care burden (see Table 1). These domains are conceptual groupings rather than mutually exclusive mechanisms. For example, employment may capture economic security while also being related to women's autonomy, and household structure may shape both material resources and care responsibilities.

The credential distinction gives particular content to the link between education and circumstances. If certification changes access to opportunities in ways that an additional year of attendance without completion does not, credentials may be associated with discrete differences in employment, household resources, further study or partner characteristics even conditional on years of schooling. We therefore examine whether secondary credentials are associated with selected economic and household circumstances after controlling for years of schooling and predetermined background characteristics. These comparisons provide a descriptive test of whether credential completion is associated with the kinds of opportunities motivating the credential specification; they do not distinguish, for example, labour-market signalling from gateway or selection processes.

We then ask how far observed current circumstances account for the credential gradient

Figure 1. Conceptual Framework



Notes: Years of schooling and credential completion enter the empirical models simultaneously. Credential completion may be associated with discrete differences in opportunities through signalling, gateway/access and partner matching. Current-circumstance domains are overlapping conceptual groupings rather than mutually exclusive mechanisms. Solid arrows represent the associations examined through observed circumstances; dashed arrows indicate that education and credentials may also be associated with distress through other measured or unmeasured factors. Arrows are conceptual and do not denote identified causal effects.

in psychological distress. If credentialed women are exposed to different economic, household, health or care circumstances, and those circumstances are themselves associated with distress, adjusting for them may attenuate the credential coefficient. We compare specifications with and without these domains, using sequential adjustment in the main analysis and separate-domain specifications as a check on the ordering of the domains in the appendix. The resulting attenuation provides an accounting of how much of the observed credential gradient is associated with measured differences in current circumstances.

This framework does not identify causal mediation. Educational attainment is not randomly assigned, and employment, marriage, fertility, household resources and health may be jointly determined with psychological distress or respond to prior mental health. Unobserved characteristics may also jointly predict credential completion, subsequent circumstances and distress. We therefore interpret both the associations between credentials and circumstances and the attenuation of the credential coefficient after adjustment as descriptive conditional relationships rather than causal pathways.

Table 1. Education, current circumstances and women's psychological distress

Domain	Why education or credentials may be associated with the domain	Expected association with distress	Illustrative GSPS measures
Economic security	Credential completion may facilitate access to wage employment and further study; schooling may also be associated with earnings, assets and resilience to economic shocks.	Greater economic security is expected to be associated with lower distress; precarious employment may not be protective.	Employment status; wage/self-employment; household assets.
Household structure & support	Education and credentials may be associated with marriage timing, partner matching, fertility and access to other adult support.	Supportive household structures may reduce burdens, while separation, widowhood or high dependency may be associated with greater distress.	Marital status; spouse education; household size; other adult women; number and ages of children.
Physical health	Education may improve health knowledge, behaviours and access to care and may be associated with lower exposure to poor health.	Illness, injury and poor physical health are expected to be associated with higher distress.	Recent illness or injury.
Empowerment & safety	Education may be associated with decision-making power, control over resources, attitudes toward gender roles and exposure to partner control or violence.	Greater autonomy may be associated with lower distress, while partner control and IPV are expected to be associated with higher distress.	Decision-making autonomy; acceptance of IPV norms; partner control; physical IPV.
Domestic & care burden	Education may be associated with fertility and unpaid workload, while more educated women may also combine paid employment with persistent domestic and care responsibilities.	Long unpaid-work hours and intensive care responsibilities may be associated with greater distress.	Unpaid-work hours; number of domestic/care activities; childcare; care for sick or elderly household members.

Notes: Domains are conceptual groupings and are not mutually exclusive. Variables may reflect more than one dimension of women's circumstances. The expected relationships summarise the conceptual motivation for examining each domain and should not be interpreted as causal assumptions.

3 Data, sample and measures

3.1 Ghana Socioeconomic Panel Survey

The analysis uses four waves of the Ghana Socioeconomic Panel Survey (Osei et al., 2022, GSPS)[2], conducted in 2009/10, 2013/14, 2018/19 and 2022/23, designed to follow individuals and their households over time. The baseline used a stratified, nationally representative household sample and collected extensive information on education, employment, household resources, health, time use, family relationships and individual well-being.

The panel structure permits two complementary forms of analysis. First, all valid person-wave

[2]The GSPS is a collaboration of the Economic Growth Center at Yale University, the Institute of Statistical, Social and Economic Research at the University of Ghana, and Northwestern University

observations are pooled to estimate the conditional association between educational attainment and current psychological distress. Second, observations of women interviewed in consecutive waves are organised into transition pairs to distinguish onset, recovery, and repeated incidence. The resulting dataset is an unbalanced panel: women need not be observed in all four waves to contribute to the pooled analysis, and need only be observed in two adjacent waves to contribute to a transition pair. Standard errors are clustered at the individual level in all pooled and transition models. A woman contributes on average about 1.9 person-waves.

3.2 Analysis sample

The primary sample comprises women aged 20–49 who completed the K10 module in at least one wave and have valid information on age and education. The lower age bound retains younger adult women while excluding most respondents still progressing through basic schooling[3]. The upper bound aligns the analysis with women's prime working and reproductive ages.

The K10 module forms part of Section 10 (Psychology) of the GSPS individual questionnaire, which is administered to a selected subset of each household's members: the household head, the (first) spouse, and one further household member aged over 12 chosen at random; where there is no spouse, the head and two other randomly chosen members over 12 are interviewed. Women who are household heads or spouses therefore enter by design, whereas other adult women (for example adult daughters or other female relatives) enter only through the random draw, so the sample somewhat over-represents women in head or spouse roles. Among selected respondents, K10-item coverage is near-complete (about 99% of the analytic sample).

The sample of women 20–49 with valid K10 values across any wave contains 11,654 person-wave observations from 5,826 women, who are on average 34.3 years old. After coding explicit missing categories for background controls (parental education and birth zone), the estimation sample for the main **current distress** models is 11,612 person-waves from 5,817 women; the difference reflects missing education measures. The four-domain pathway variables are jointly observed for 9,359 person-waves (4,605 women), of which 9,333 person-waves (4,596 women) enter the pathway regressions after education and control-variable missingness. A full accounting of each available and regression-ready sample is given in Appendix Table A4.

For the **transition analysis sample**, observations are organised into the adjacent pairs 2009/10–2013/14, 2013/14–2018/19 and 2018/19–2022/23. A woman can contribute more than one pair. Women without a valid K10 score at either end of a pair are excluded (but remain in the pooled analysis). There are 6,549 valid K10 wave-pairs; 6,523 also have the education measures required by the transition regressions.

3.3 Key variables: Psychological distress and educational attainment

Psychological distress is measured using the Kessler Psychological Distress Scale (K10), which asks how frequently respondents experienced ten symptoms of non-specific distress during the preceding four weeks. The K10 is a validated screen for non-specific distress rather than a clinical diagnosis (Furukawa et al., 2003). Consistent with this, we refer throughout to psychological

[3]Because some women aged 20–24 may still be enrolled, we report the proportion currently enrolled and check robustness to restricting the sample to ages 25–49.

distress and elevated risk rather than diagnosing respondents as depressed. Each of the ten questions is scored one to five such that the ranges between 10–50[4]

We consider three outcome measures based on the K10 score. First, the **continuous K10 score** itself is used over its full 10–50 score distribution. Second, an **indicator for elevated risk** (K10 $\geq$ 20) following the categorisation used in the Ghanaian literature (Sipsma et al., 2013). In our sample, 36.8% score at or above this threshold (mean K10 = 18.0).[5]At-risk prevalence (i.e. K10 $\geq$ 20) was highest in Wave 1 (2009/10, 50.8%) and lower and broadly stable afterwards (29.5% in 2013/14, 34.3% in 2018/19 and 30.9% in 2022/23), so the pooled at-risk rate of 36.8% is pulled upward by the elevated first wave (see Figure A1 in the appendix). These patterns are broadly consistent with the by-wave movements reported by Amenah et al. (2025).

Our third measure captures **consecutive wave-on-wave transitions**. We define four mutually exclusive next-wave states: remained below risk (0→0), onset (0→1), recovery (1→0) and repeated distress (1→1). Across the 6,549 valid K10 wave-pairs, 41.2% remained below risk, 19.0% experienced onset, 24.7% recovered and 15.1% remained at risk (see Appendix Table A1). Inter-wave intervals are long (about 4–5 years), so transitions do not map continuous histories.

Our main **educational attainment** measure is credential completion, a three-level measure distinguishing (i) no secondary credential, (ii) completed junior secondary (BECE, or the older MSLC) referred to hereafter as JHS, and (iii) completed senior secondary or higher (SSCE/WASSCE, O/A-levels, vocational/commercial, or any post-secondary or tertiary qualification referred to as SHS). It is constructed from each woman's reported highest qualification.

Education is largely time-invariant in this age group, but reported attainment can change across waves if respondents continue studying or as a result of measurement error. Among women observed in consecutive waves, the credential measure shows 359 implausible within-woman declines (about 3% of person-waves), while years of schooling shows none. We use the wave-specific, years-filled credential as our main measure, and construct a harmonised highest-ever credential (the running maximum within each woman) as a robustness check that removes these declines; the gradient is essentially unchanged under it.

Figures 2 and 3 illustrate the three distress measures by education credential status. The raw education gradient is pronounced and monotonic. Mean K10 falls from 18.9 among women with no secondary credential, to 17.3 among those who completed lower secondary (or junior high school; JHS), to 16.0 among those who completed senior secondary or above (SHS). The share at risk falls in step: from 43.8% to 30.9% to 22.8% at the K10 $\geq$ 20 threshold, and from about 20% to 12% to 7% at the stricter K10 $\geq$ 25 threshold (Figure 2). The gradient is therefore at least as steep for moderate-or-severe distress as for the milder threshold.

The four-state transition picture, among women observed in consecutive waves, already hints at dynamic differences across credential groups (Figure 3). More-educated women are far more likely to have stayed well across a wave-pair transition (33%, 50%, 58% across the three education groups) and far less likely to have remained chronically distressed (18%, 11%, 8%).

[4]In our data an exploratory factor analysis confirms the scale is essentially unidimensional (first eigenvalue 3.5, second 0.33; Cronbach's $\alpha \approx 0.82$), so we treat it as a single distress construct. Higher scores indicating greater distress (Kessler et al., 2002).

[5]We use higher K10 $\geq$ 25 and $\geq$ 30 thresholds in the a sensitivity analysis, to check that the findings do not depend on grouping milder distress with more severe symptoms.

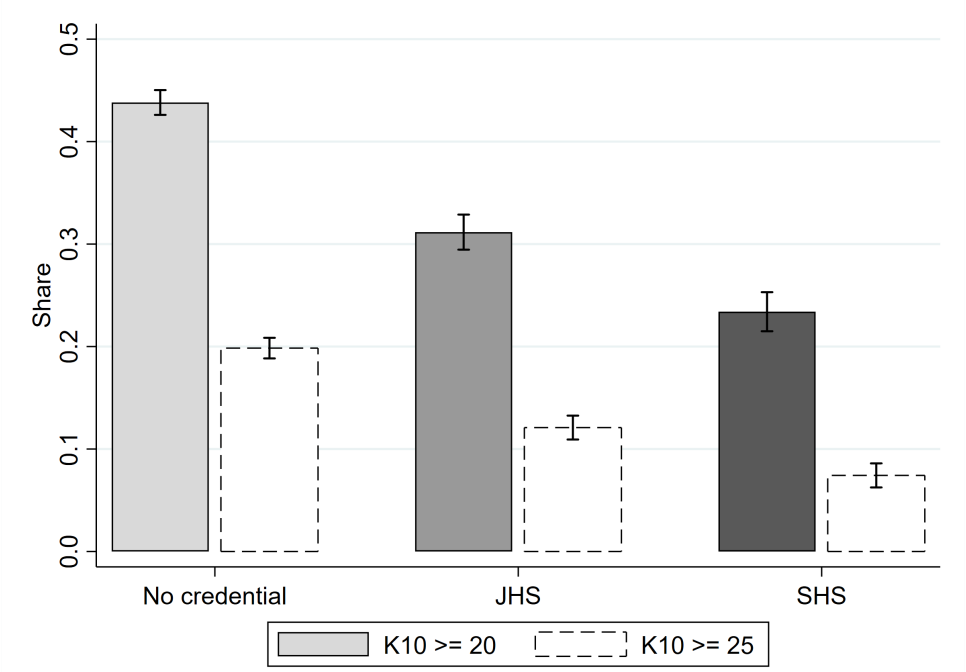


Figure 2. Share at risk by education, at two thresholds.

Dark bars: K10 $\geq$ 20 (at risk); light bars: K10 $\geq$ 25 (moderate or severe), by education credential, with 95% confidence intervals.

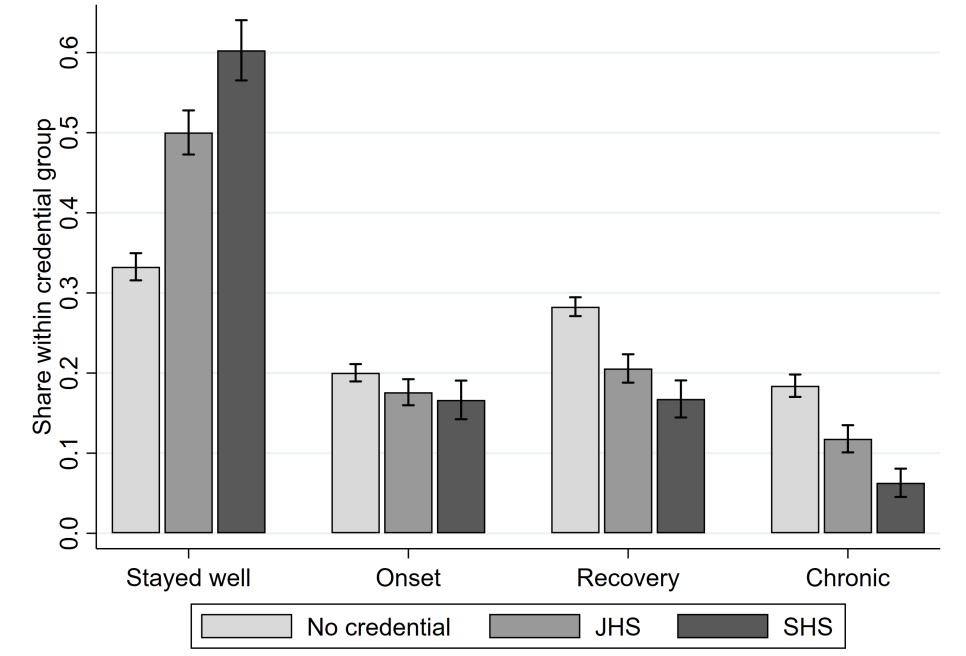


Figure 3. Wave-to-wave transitions by education.

Share of women in each education group falling into each transition state (95% CIs).

On the other hand, onset share is broadly flat across credential groups and the recovery shares actually falls. This latter point could be a function of composition as fewer credentialed women are at risk at baseline, therefore those available to recover are a select group. What is clear

from Figure 3, is that women with secondary education credentials are differently distributed across the four states, with a much higher likelihood of being interviewed in good mental health – either in one or both waves (71.1% for JHS, 75.4% for SHS versus 62.5% for no credential).

Table 2 provides the values underlying Figures 2 and 3, plus addition sample information, and the mean values for the continuous K10 and for each of the individual questions underlying the Kessler measure. Using our credential-based measure, 56.1% of women in our sample hold no secondary credential, 27.5% have completed lower secondary (BECE/MSLC), and 16.4% have completed SHS or higher (SSCE/WASSCE+). The mean K10 score ranges from 18.9 among those with no credential to 16.03 for those with SHS, with values also more dispersed for the no credential group.

Table 2. Distress outcomes by education

	No credential	**JHS**	**SHS**	**Total**
Sample (person-waves)	56.2% (6,550)	27.0% (3,151)	16.8% (1,953)	100% (11,654)
Mean K10 score (SD)	18.97 (6.32)	17.29 (5.78)	16.06 (5.21)	18.03 (6.11)
At risk, K10 $\geq$ 20 (%)	43.8	31.2	23.4	37.0
Moderate+, K10 $\geq$ 25 (%)	19.8	12.1	7.4	15.7
Individual K10 items: (%)				
K10 item means (1–5)				
Hopeless	1.83	1.58	1.41	1.69
Worthless	1.64	1.41	1.29	1.52
Depressed	1.99	1.80	1.62	1.88
So sad, nothing could cheer	1.79	1.65	1.54	1.71
Tired for no reason	2.18	2.03	1.82	2.08
Everything an effort	2.80	2.74	2.53	2.74
Nervous	1.89	1.71	1.65	1.80
So nervous, nothing calming	1.49	1.33	1.31	1.42
Restless/fidgety	1.79	1.62	1.53	1.70
So restless, could not sit	1.52	1.38	1.31	1.45
Next-wave transitions: (%)				
Sample				
Stayed well (0→0)	33.3	50.0	60.3	41.2
Onset (0→1)	20.0	17.6	16.6	19.0
Recovery (1→0)	28.3	20.6	16.8	24.7
Chronic (1→1)	18.4	11.8	6.3	15.1

Distress outcomes by education group (person-wave means or shares; companion to the covariates in Table 3). At-risk, moderate-plus and transition shares all differ across education groups at $p<0.001$. Transition shares are within education, among women observed in consecutive waves. K10 item means run from 1 (none of the time) to 5 (all of the time). Table A1 in the appendix shows summary statistics by transition state.

3.4 Background characteristics and potential pathways

Covariates are divided into predetermined background characteristics and current circumstances that may lie on the pathways from education to distress. Table 3 summarises these.

We measure household economic resources using the survey's harmonised nominal value of household durable assets. Because the distribution is highly skewed and nominal values are not directly comparable across survey rounds, we transform the measure as $\ln(\text{asset value} + 1)$ and standardise it to mean zero and standard deviation one, separately within each wave. Higher values indicate a higher relative durable-asset position within the same wave. The care-burden measures follow the two competing operationalisations in the literature, hours (Owoo and

Table 3. Key covariates by dimension

Dimension	Variables used
Predetermined background (core controls)	Age and age^2; survey-wave fixed effects; parental education; zone of birth (coastal, middle/forest, northern), with an explicit missing category to avoid loss of sample
Economic security	Employment status (not employed / self-employed / wage); household durable-asset index and wealth quintiles; urban residence
Household structure & support	Marital status; spouse's years of schooling (partnered subsample); household size; number of other adult women; number of living children; child under five
Physical health	Recent illness/injury (main measure)
Domestic & care burden	Housework hours; indicator for 6+ hours of chores; number of domestic/care activities (activity count); childcare hours; care for elderly/sick
Empowerment & violence (partnered subsample)	Accepts-IPV attitudes; partner control; decision-making autonomy; experienced physical IPV

Lambon-Quayefio, 2021) and activity counts (Vitellozzi et al., 2024).

Note that all empowerment and violence items (accepts-IPV attitudes, decision-making autonomy, experienced IPV, and partner control) are only asked of partnered women. We therefore exclude empowerment from the main accounting exercise and assess it separately in a sub analysis. The empowerment and violence measures follow Sipsma et al. (2013).

Table 4 summarises the analytic sample and pathway variables by education category. Education is bundled with almost every material advantage. Moving from no credential to completed senior secondary, the mean standardised durable-asset value rises from −0.17 to 0.61, the share in the richest wealth quintile rises from 13% to 42%, and the share in paid or wage employment rises from 4% to 30%. More-educated women also report fewer unpaid-work hours (9.4 to 7.8 per day), fewer domestic and care activities, fewer living children (3.9 to 2.2), and lower acceptance of intimate-partner-violence norms (0.29 to 0.12). They are younger and more urban. This clustering motivates adjustment for background and the subsequent sequential accounting exercise.

3.5 Panel attrition

Attrition is potentially important for the longitudinal analysis because the distress-transition models require women to be observed in two consecutive survey waves. We therefore assess attrition in terms of next-wave retention. For each adjacent wave pair, we compare the baseline characteristics of women who are and are not observed in the following wave.

Across 8,838 eligible origin-wave transition opportunities, 6,523 (73.8%) are retained with a valid K10 score in the immediately following wave. Retention declines from 75.7% for 2009/10–2013/14 and 74.8% for 2013/14–2018/19 to 70.8% for 2018/19–2022/23 (Appendix Table A5). Unadjusted comparisons show that retained women generally have fewer years of schooling and are less likely to hold an SHS credential, but neither years nor the JHS or SHS indicators predicts

Table 4. Sample characteristics by credential group

	No secondary credential	**JHS**	**SHS**	**Total**
Person-waves	6,550	3,151	1,953	11,654
K10 distress score	18.97 (6.32)	17.29 (5.78)	16.06 (5.21)	18.03 (6.11)
At risk, K10 $\geq$ 20 (%)	43.8	31.2	23.4	37.0
Moderate/severe, K10 $\geq$ 25 (%)	19.8	12.1	7.4	15.7
Years of schooling	2.43 (3.08)	9.07 (0.77)	12.57 (1.68)	5.91 (4.78)
Age (years)	35.76 (8.13)	34.06 (8.44)	30.02 (7.66)	34.34 (8.40)
Household asset index	−0.17 (0.89)	0.16 (0.92)	0.61 (0.97)	0.05 (0.96)
Illness/injury, past 2 weeks (%)	16.4	16.4	12.9	15.8
Domestic/care activities (count)	7.06 (2.48)	6.87 (2.49)	6.44 (2.42)	6.91 (2.48)
Unpaid-work hours/day	9.45 (5.29)	8.05 (4.66)	7.78 (4.65)	8.79 (5.08)
Living children	3.94 (2.04)	3.01 (1.65)	2.20 (1.26)	3.50 (1.96)
Household size	5.11 (2.59)	4.16 (1.97)	3.63 (1.94)	4.61 (2.41)

Note: Person-wave means with standard deviations in parentheses; binary indicators are shown as percentages. Counts vary where values are missing: years of schooling N=11,612, illness N=11,652, unpaid-work hours N=11,647, and living children N=9,438. Table A2 in the appendix provides a similar summary by at risk status. Table A3 shows additional characteristics by education.

retention after adjustment for the other origin characteristics (Appendix Table A6). Baseline at-risk status is also not predictive in any pair. Age, marital status–especially being never married–and selected household and employment characteristics are more consistent predictors.

We then estimate separate retention models for each wave pair using characteristics observed at the baseline of the transition. The predicted probabilities of next-wave observation are used to construct inverse-probability-of-retention weights, which give greater weight to retained women whose baseline characteristics are associated with a lower probability of being re-observed. We use these weights to re-estimate the distress-transition models and compare the results with the main unweighted estimates (Appendix Tables A10-A12). Pair-specific inverse-probability weights are winsorised at the 1st and 99th percentiles among retained women and normalised to mean one within pair.

These retention weights are distinct from the GSPS survey weights. The available survey weights reflect the original Wave 1 sampling design and do not provide compatible longitudinal weights that account for subsequent attrition and sample evolution. We therefore retain the unweighted models as our main specifications and use the retention-weighted estimates as a robustness check. This approach addresses attrition associated with observed baseline characteristics, but cannot correct for selection on unobserved characteristics.

4 Empirical strategy

4.1 Current psychological distress

To answer whether completing a schooling credential, and in particular upper secondary level, carries a mental-health advantage over and above the linear per-year gradient in schooling, our first specification is a pooled ordinary least squares (OLS) regression of distress on educational attainment:

$$Y_{it} = \alpha + \beta_1 edyrs + \beta_2 \,\mathrm{JHS}_{it} + \beta_3 \,\mathrm{SHS}_{it} + f(\mathrm{Age}_{it}) + \lambda_t + X_{it}\gamma + \varepsilon_{it} \tag{1}$$

where Y_{it} is either the continuous K10 score or the elevated-risk indicator (K10 $\geq$ 20) for woman i in wave t; JHS and SHS are indicators for the two higher education categories (lower secondary, and upper secondary or above credential) relative to the omitted category of no secondary credential. Years of schooling ($edyrs$) enter the main specification alongside these credential indicators, so that JHS and SHS capture the additional step at credential completion, net of a linear per-year gradient in schooling;[6] $f(Age)$ is a quadratic in age; λ_t are wave fixed effects; and X_{it} contains predetermined background controls. Standard errors are clustered at the woman level throughout, because the same women are repeatedly observed.

For the continuous K10 score we obtain an estimate directly in K10 points. For the elevated-risk indicator, the linear probability model (LPM) coefficients are directly interpretable as changes in the probability of being at risk. We report the gradient with only the baseline demographics (age and survey wave) before adding the background controls (parental education and birth zone), so that the contribution of background can be separated from that of the current-circumstance pathways examined later.

4.2 Credentials and current circumstances

To examine whether credential completion is associated with the kinds of opportunities and circumstances highlighted in the conceptual framework, we estimate:

$$C^k_{it} = \alpha + \beta_1 edyrs_{it} + \beta_2 JHS_{it} + \beta_3 SHS_{it} + f(Age_{it}) + \lambda_t + X_{it}\gamma + \varepsilon_{it}, \tag{2}$$

where C^k_{it} denotes circumstance k for woman i in wave t. As in Equation (1), years of schooling and the two credential indicators enter simultaneously, and X_{it} contains the predetermined background controls (parental education and birth zone). The credential coefficients therefore capture differences in each circumstance associated with credential completion over and above the linear gradient in years of schooling. Standard errors are clustered at the woman level.

We focus on outcomes that map directly onto the credential-specific hypotheses in Section 2.2: paid or wage employment and household assets capture economic circumstances; spouse's years of schooling captures educational matching among partnered women; and ever having attended tertiary education captures the gateway to further study. We also examine any employment to distinguish differences in employment type from labour-force attachment more generally. Binary outcomes are estimated using linear probability models and continuous outcomes using OLS.

For tertiary attendance, we exclude women who have completed a post-secondary or tertiary credential, since the main SHS category includes women with higher qualifications. This avoids a mechanical association between the credential indicator and tertiary attainment.

As elsewhere, these estimates are descriptive rather than causal. The purpose is to assess whether credentials are associated, conditional on years of schooling, with the economic and household circumstances through which certification was hypothesised to matter, rather than to identify the effect of credential completion on those circumstances.

[6] A credential-only version, in which the categories absorb the full gradient, is reported as a robustness.

4.3 Pathway analysis

To examine the extent to which women's current circumstances account for the education gradient in psychological distress, we sequentially add four pathway domains to the K10 and at-risk models: economic security, physical health, domestic and care burden, and household structure and support. We assess how the education coefficients change as each domain is added, and also assess each domain separately to identify which accounts for the largest share of the observed gradient (in the appendix).

We interpret this as an accounting exercise rather than a causal mediation analysis. The pathway measures may themselves be jointly determined with mental health, and changes in the education coefficients may also reflect confounding, measurement error or reverse causality.

First, each domain is added to the baseline (includes background controls). For the OLS models, the share of the credential gradient accounted for by a block is summarised as $100 \times (\beta_{\text{baseline}} - \beta_{\text{adjusted}})/\beta_{\text{baseline}}$, interpreted with caution where coefficients are small. Because such sequential shares depend on the order in which blocks enter, we also add each domain to the baseline on its own (a non-cumulative check), so that the leading domains can be identified without relying on a particular entry order. Second, we enter all pathway variables together to see which remain associated with distress once the others are held constant.

4.4 Distress transitions

For consecutive-wave observations we model movements between distress states. The first specification is a four-outcome multinomial logit:

$$\Pr(T_{i,\,t\to t+1} = j) = g_j(\text{edyrs}_{it},\ \text{JHS}_{it},\ \text{SHS}_{it},\ f(\text{Age}_{it}),\ \lambda_t,\ X_{it}) \tag{3}$$

where j indexes the four states (remained below risk [well $\to$ well], onset [well $\to$ at risk], recovery [at risk $\to$ well], and chronic distress [at risk $\to$ at risk]) with at risk defined based on the K10 ≥ 20 threshold. Because multinomial coefficients are not interpretable directly, we report predicted probabilities and average marginal effects. Standard errors are clustered at the woman-level.

To distinguish between the onset and recovery dimensions of distress, we estimate two conditional models. Among women who are not at risk at baseline, we use a linear probability model (LPM) to estimate the probability of becoming distressed by the next wave. Among women who are at risk at baseline, we estimate the probability of recovering by the next wave. This allows us to assess whether the education gradient in distress operates primarily through a lower likelihood of becoming distressed or a greater likelihood of recovering once distressed.

Education and time-varying covariates are measured at baseline. The long intervals between waves mean that episodes beginning and ending between waves are unobserved, so these models describe differences in status across observation points rather than the duration or recurrence of episodes.

5 Results

5.1 Education and current distress

Table 5 reports the secondary-credential gradients for the pooled sample. Each specification includes linear years of schooling alongside indicators for JHS and SHS credentials, so the credential coefficients describe differences associated with credential completion over and above the per-year schooling gradient. We first adjust for age, age squared and survey wave, and then add parental education and birth zone. With the full background controls, a SHS credential is associated with a K10 score 1.19 points lower than no secondary credential (1.00 point with demographic controls only), while a JHS credential is associated with a 0.62-point lower score. Separately, each additional year of schooling is associated with a 0.10-point reduction. For the binary outcome, the corresponding net-of-years associations are -7.8 percentage points for SHS and -4.3 percentage points for JHS at K10 $\geq$ 20. Formal SHS–JHS coefficient equality tests reject equality in both fully adjusted models (Table 5).

Table 5. Education and current distress

	(1) K10: demographics	(2) K10: background	(3) At risk: demographics	(4) At risk: background
Years of schooling	-0.145***	-0.103***	-0.012***	-0.008***
	(0.023)	(0.026)	(0.002)	(0.002)
JHS	-0.600***	-0.617***	-0.040**	-0.043***
	(0.201)	(0.201)	(0.016)	(0.016)
SHS	-1.004††***	-1.189†††***	-0.061***	-0.078††***
	(0.278)	(0.283)	(0.022)	(0.022)
Observations	11612	11612	11612	11612
R-squared	0.082	0.093	0.060	0.070

Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).
Stars test whether an individual coefficient differs from zero: * p<0.10, ** p<0.05, *** p<0.01.
Daggers on SHS test H0: β(SHS)=β(JHS), using the regression variance-covariance matrix: † p<0.10, †† p<0.05, ††† p<0.01.

The K10 behaves as a single dimension in these data: a principal-factor analysis returns one dominant factor (first eigenvalue 3.5; second eigenvalue 0.33), and Cronbach's alpha is 0.82. We therefore treat it as a single non-specific-distress scale rather than imposing depression and anxiety subscales. Within that scale, the credential gradient net of years is largest for the mood-centred items (Figure 4). Relative to no credential, the association for hopelessness is -0.27 SD at SHS and -0.16 SD at JHS, followed at SHS by depressed mood (-0.19), tiredness (-0.17) and worthlessness (-0.16). The effort/fatigue item and the arousal items ('so nervous' and 'restless') have the smallest and least precise associations. The ordering is broadly similar across the two credential levels, although the SHS coefficients are larger in magnitude. These are adjusted credential coefficients net of years of schooling, not raw differences between education groups.

This distinction between credentials and years of schooling motivates the question we now turn to address: are credentials associated with the kinds of opportunities and circumstances that motivated treating completion separately from years attended? Table 6 examines this

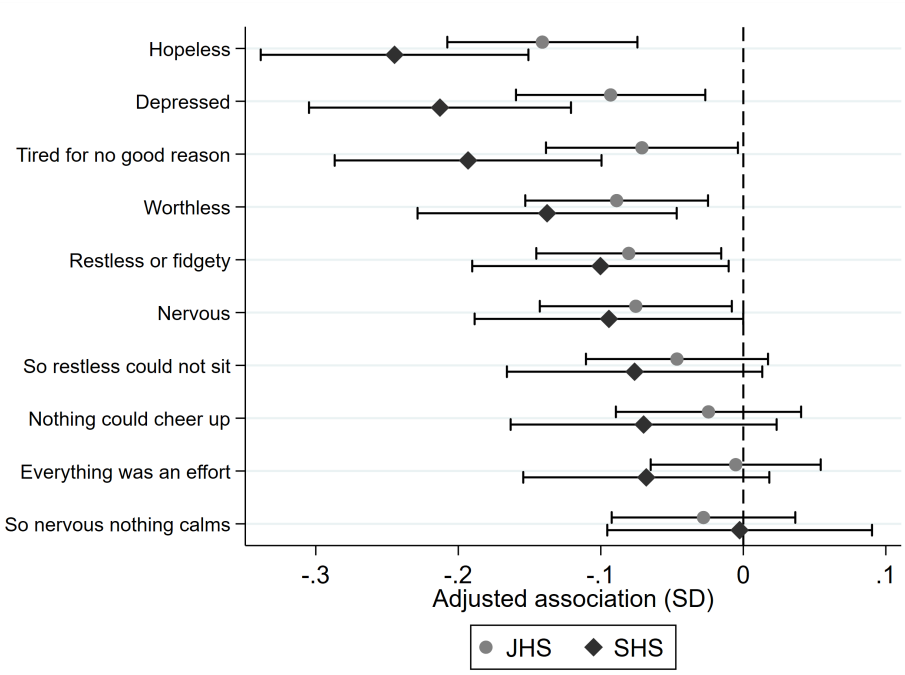


Figure 4. Education gradient by K10 symptom item, by credential level.

Adjusted association of each credential level with each standardised K10 item, relative to no credential (SD units, net of years; JHS in orange, SHS+ in navy)

directly by treating selected current circumstances as outcomes while including credentials and years of schooling simultaneously.

Table 6. Credential completion and selected current circumstances, net of years of schooling

	(1) Paid/wage employment	(2) Household asset index	(3) Spouse schooling	(4) Ever attended tertiary	(5) Any employment
Lower-secondary credential	-0.049***	0.081**	-0.151	-0.037***	-0.007
	(0.010)	(0.036)	(0.298)	(0.005)	(0.016)
Upper-secondary credential	0.200†††***	0.394†††***	1.320†††***	0.078†††***	0.009
	(0.017)	(0.051)	(0.494)	(0.011)	(0.023)
Observations	11,544	11,612	1,896	7,773	11,544

Notes: Years of schooling and the two credential indicators enter together. Controls are age, age squared, survey wave, parental education and birth zone. Standard errors are clustered by woman. Paid/wage employment, tertiary attendance and any employment are estimated using linear probability models; the other outcomes use OLS. The spouse-schooling model is restricted to the resident partnered subsample with spouse education observed. The tertiary-attendance model excludes women with completed post-secondary or tertiary credentials to avoid mechanical overlap with the upper-secondary category. Estimates are descriptive conditional associations, not causal effects. Stars indicate tests against zero: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Daggers on the upper-secondary coefficient indicate tests of $H_0 : \beta_{\text{SHS}} = \beta_{\text{JHS}}$: † $p < 0.10$, †† $p < 0.05$, ††† $p < 0.01$.

The clearest differences occur at SHS. Conditional on years of schooling and predetermined background characteristics, a SHS credential is associated with a 20-percentage-point higher probability of paid or wage employment, a 0.39-standard-deviation higher logged durable-asset value, a 7.8-percentage-point higher probability of ever having attended tertiary education,

and 1.32 additional years of spouse schooling in the partnered subsample. For each of these outcomes, the SHS coefficient is also significantly different from the corresponding JHS coefficient ($p < 0.01$). By contrast, neither credential is meaningfully associated with employment overall, suggesting that the labour-market difference concerns employment type rather than employment participation per se. The JHS associations are mixed.

These patterns provide descriptive support for the premise that credential completion, particularly at SHS, marks differences in educational, economic and household circumstances that are not captured by years of schooling alone. They do not establish that certification causes those differences. We next ask how far adjustment for these and related current circumstances accounts for the credential gradient in distress.

The pathway analysis next asks how much of the observed SHS credential gradient is accounted for by four domains of women's current circumstances: economic security, physical health, care burden, and household structure and support. Figure 5 illustrates that the baseline SHS coefficient is −1.410 K10 points and changes to −1.081 after economic security (23.3% attenuation), −0.914 after physical health, −0.920 after care burden, and −0.798 after household structure and support (full regression results are available in Appendix Table A8. Thus, the four domains together attenuate the baseline coefficient by 43.4%, while a statistically significant association remains. Table 7 displays that the at-risk association similarly changes from −9.5 to −5.5 percentage points (42.1% attenuation), with the largest change when economic security enters, further attenuation with physical health, essentially no change with care burden, and a final smaller change with household structure.

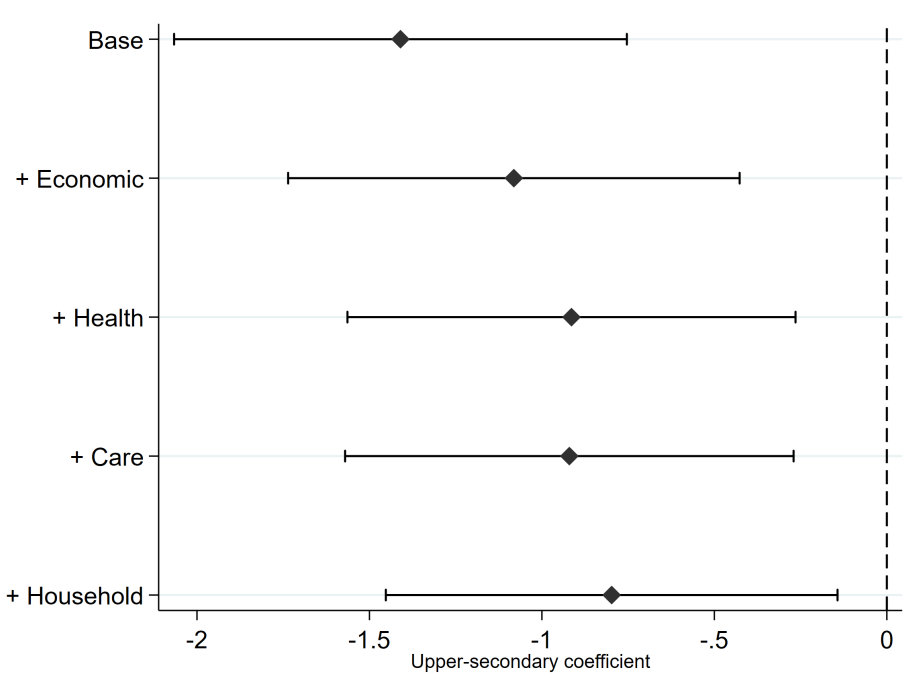


Figure 5. Attenuation of the senior-secondary gradient.

The senior-secondary K10 coefficient (with 95% CI) as each covariate domain is added. The largest drop occurs when economic security enters, with a further drop when physical health is added; care and household structure move it little.

Because attenuation in a sequential specification depends on the order in which domains

Table 7. Credential gradient and current circumstances: at risk (K10 $\geq$ 20)

	(1) Base	(2) + Economic	(3) + Health	(4) + Care	(5) + Household
Years of schooling	-0.006***	-0.005**	-0.005**	-0.005**	-0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
JHS	-0.063***	-0.060***	-0.054***	-0.050***	-0.045***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
SHS	-0.095†***	-0.073***	-0.062**	-0.063**	-0.055**
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Household asset index		-0.038***	-0.037***	-0.040***	-0.031***
		(0.005)	(0.005)	(0.005)	(0.006)
Self-employed		-0.019*	-0.021*	-0.025**	-0.027**
		(0.011)	(0.011)	(0.011)	(0.011)
Paid/wage		-0.027	-0.025	-0.023	-0.029
		(0.019)	(0.019)	(0.019)	(0.019)
Recent illness/injury			0.134***	0.136***	0.131***
			(0.014)	(0.014)	(0.014)
Domestic/care activities				-0.018***	-0.018***
				(0.003)	(0.003)
Unpaid-work hours/day				0.009***	0.009***
				(0.001)	(0.001)
Cohabiting					0.071***
					(0.017)
Separated/divorced/widowed					0.097***
					(0.017)
Never married					0.046**
					(0.021)
Household size					-0.003
					(0.004)
Other adult women in household					0.009
					(0.008)
Number of living children					0.000
					(0.004)
Number of children under 5					0.022***
					(0.007)
Observations	9333	9333	9333	9333	9333
R-squared	0.075	0.080	0.090	0.097	0.103

Linear probability models. Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary). Base category for living arrangments is married. Stars test whether an individual coefficient differs from zero: * p<0.10, ** p<0.05, *** p<0.01. Daggers on SHS test H0: β(SHS)=β(JHS), using the regression variance-covariance matrix: † p<0.10, †† p<0.05, ††† p<0.01.

enter, we also add each domain separately to the common-sample baseline model (Appendix Table A9). Economic security again produces the largest attenuation of the SHS coefficient (23.3%), followed by household structure and support (18.9%) and physical health (13.5%); care burden produces essentially no attenuation. The separate-domain results therefore confirm that

the prominence of economic security is not driven by its position in the sequential specification.

Table 8 reports the separate analysis on the subsample for which the full empowerment and intimate-partner-violence (IPV) battery of questions is observed. The indices are coded so that higher values represent greater acceptance of IPV norms, greater partner control, and greater decision-making autonomy; physical IPV indicates any reported pushing/hitting or kicking/dragging by a partner in the past year. Acceptance of IPV norms, partner control and physical IPV are positively associated with K10 (2.10, 4.70 and 0.95 points in column (3) with the full set of controls). Decision-making autonomy also has a small positive conditional association (0.18), so it should not be read as protective in these data. Adding the full set changes the SHS coefficient from −0.84 to −0.45 on this subsample.

Table 8. Empowerment and violence in the observed subsample

	(1)	(2)	(3)
Years of schooling	-0.118***	-0.094***	-0.106***
	(0.029)	(0.029)	(0.029)
JHS	-0.461**	-0.453*	-0.295
	(0.234)	(0.234)	(0.229)
SHS	-0.841**	-0.792**	-0.449
	(0.336)	(0.336)	(0.330)
Acceptance of IPV norms (0–1)		2.360***	2.099***
		(0.242)	(0.254)
Partner control (0–1)			4.698***
			(0.359)
Decision-making autonomy (0–4)			0.180***
			(0.067)
Any physical IPV by partner			0.949***
			(0.291)
Observations	8385	8385	8385
R-squared	0.093	0.104	0.136

Standard errors in parentheses. Standard errors are clustered by woman. * $p < .10$, ** $p < .05$, *** $p < .01$ Empowerment subsample. Higher values indicate more acceptance, more partner control, and more decision-making autonomy, respectively; physical IPV is any reported partner pushing/hitting or kicking/dragging in the past year. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).

Among women in the selected resident-partner subsample with spouse schooling observed, adding the spouse's years of schooling changes the woman's SHS coefficient from −1.544 to −1.373 (Table 9). Adding the durable-asset value then changes it to −1.250, where it is no longer statistically significant. Spouse schooling therefore produces slightly more attenuation than the subsequently added durable-asset value in this sequence, although both changes are modest; the estimates do not show that assets account for considerably more than spouse education. Here again, these results are descriptive and cannot identify spousal sorting or household formation as causal pathways.

Table 9. Spouse education and household assets in the partnered subsample

	(1) Base	(2) + Spouse education	(3) + Household assets
Years of schooling	-0.135**	-0.071	-0.068
	(0.059)	(0.063)	(0.063)
JHS	-1.120**	-1.139**	-1.110**
	(0.481)	(0.480)	(0.480)
SHS	-1.544**	-1.373*	-1.250
	(0.780)	(0.781)	(0.783)
Spouse's years of schooling		-0.129***	-0.122***
		(0.036)	(0.037)
Household asset index			-0.182
			(0.163)
Observations	1896	1896	1896
R-squared	0.129	0.135	0.136

Standard errors in parentheses. Standard errors are clustered by woman. * $p < .10$, ** $p < .05$, *** $p < .01$
Partnered subsample. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).

5.2 Distress dynamics: onset, recovery and chronic distress

Table 10 presents the results from the multinomial model across all transition states, moving from demographic controls to predetermined background controls and then to the full set of current-circumstance controls. Net of years of schooling, a SHS credential is associated with an approximately 13-percentage-point higher probability of remaining below the risk threshold and a 5.3-percentage-point lower probability of onset. The multinomial recovery coefficient is negative, but recovery in this model is an unconditional transition-state probability and the composition of the baseline at-risk group differs sharply by education; – only 172 SHS women are ever observed at risk.

At the chronic-distress margin, the distinction between the two education terms is important. Each additional year of schooling is significantly associated with a lower probability of remaining chronically distressed (-0.007), whereas the SHS and JHS credential coefficients, conditional on years, are small and statistically insignificant. The evidence for chronic distress is therefore a linear years-of-schooling association rather than a credential gradient. The average marginal effects are stable across the three control tiers, including the credential associations with remaining below risk and onset.

The conditional models distinguish onset from recovery more directly (Table 11). Among women who were not at risk in the baseline wave, an SHS credential is associated with a 13.1-percentage-point lower probability of being at risk at the next wave, and a JHS credential with a 9.5-percentage-point lower probability, net of years. The coefficient on years of schooling is close to zero in the onset model. Specifically, among women already at risk at baseline, the credential coefficients for recovery are small and statistically insignificant (0.027 for SHS and -0.021 for JHS), while each additional year of schooling is associated with a 1-percentage-point higher recovery probability. The clearest longitudinal credential association is therefore at the

onset margin; there is little evidence of a credential gradient in conditional recovery.

Table 10. Four-state transition probabilities

	(1) Stayed well	(2) Onset	(3) Recovery	(4) Chronic
Years of schooling	0.012***	0.003**	-0.007***	-0.008***
	(0.003)	(0.002)	(0.002)	(0.002)
JHS	0.076***	-0.048***	-0.026	-0.002
	(0.025)	(0.015)	(0.018)	(0.019)
SHS	0.126***	-0.060***	-0.026	-0.041*
	(0.036)	(0.022)	(0.026)	(0.025)
N	6523	6523	6523	6523

Standard errors in parentheses
Average marginal effects from multinomial logit; demographics tier. Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 11. Conditional onset and recovery models

	(1) Onset	(2) Recovery
Years of schooling	-0.001	0.010**
	(0.004)	(0.004)
JHS	-0.095***	-0.021
	(0.027)	(0.036)
SHS	-0.131***	0.027
	(0.040)	(0.055)
Baseline state	Not at risk	At risk
Observations	3923	2600
R-squared	0.031	0.043

Conditional linear probability models. Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).
Stars test whether an individual coefficient differs from zero: * p<0.10, ** p<0.05, *** p<0.01.
Daggers on SHS test H0: β(SHS)=β(JHS), using the regression variance-covariance matrix: † p<0.10, †† p<0.05, ††† p<0.01.

5.3 Robustness checks

We test the robustness of the credential gradient to a number of specification choices. First, we assess the impact of adjusting the sample for attrition. Retention reweighting leaves the conditional results substantively unchanged (Appendix Tables A10-A12). Thus the analysis results are robust to reweighting for observed predictors of next-wave retention; this does not rule out selection on unobserved determinants of subsequent distress.

Next we show that the credential gradient is not driven solely by women who continue beyond secondary school. In a four-level specification that separates post-secondary and tertiary attainment (Table 12), the SHS coefficient is −1.17 K10 points and is −1.21 when post-secondary

women are excluded, while the post-secondary/tertiary coefficient is −1.88. The same ordering appears for the at-risk indicator: SHS completion is associated with a 7.7-percentage-point lower probability of being at risk, compared with 11.3 percentage points for post-secondary/tertiary attainment.

Table 12. Credential levels and the post-secondary/tertiary margin

	(1) K10: all	(2) K10: no tertiary	(3) At risk: all	(4) At risk: no tertiary
Years of schooling	-0.091***	-0.087***	-0.008***	-0.008***
	(0.027)	(0.027)	(0.002)	(0.002)
JHS	-0.682***	-0.708***	-0.047***	-0.048***
	(0.205)	(0.206)	(0.016)	(0.016)
SHS	-1.174***	-1.206***	-0.077***	-0.078***
	(0.283)	(0.285)	(0.022)	(0.022)
Post-secondary/tertiary	-1.877***		-0.113***	
	(0.428)		(0.034)	
Observations	11612	11277	11612	11277
R-squared	0.093	0.089	0.070	0.068

Standard errors in parentheses
Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).
* $p < .10$, ** $p < .05$, *** $p < .01$

A binary threshold can obscure differences elsewhere in the K10 distribution. We therefore present estimates from quantile regressions and a specification using the severe-distress threshold in Appendix Table A14. The SHS credential gradient is −0.58 at the 25th percentile (marginally significant at $p < 0.10$), increases at the median (−0.92) and 75th percentile (−1.20), and is largest at the 90th percentile (−2.86 K10 points). SHS completion is also associated with a 2.3-percentage-point lower probability of severe distress at K10 $\geq$ 30. These estimates indicate that the credential gradient is larger toward the higher-distress end of the K10 distribution.

The net-of-years credential gradient is stable across a wide range of specifications (Appendix Table A13). It remains when the sample is restricted to ages 25–49, when women still enrolled in school are excluded, when urban residence or religion and ethnicity are added, and when the harmonised highest-ever credential is used. Across these specifications, the SHS coefficient ranges from approximately −0.83 to −1.30 K10 points net of years.

6 Discussion

Three findings stand out. First, there is a secondary-credential gradient in psychological distress over and above the linear gradient in years of schooling. Women with upper-secondary credentials have lower K10 scores and a lower probability of crossing the at-risk threshold than women with no secondary credential, even when years of schooling are included in the same model. The estimates are also similar when post-secondary and tertiary attainment are separated or excluded. This distinction matters for policy: analyses based only on years of schooling would

not isolate the additional association at secondary credential completion. While it does not establish that the credential itself causes the difference, it raises the point for further causal analysis.

The distributional results add one qualification to the average association. The upper-secondary credential gradient is small at the lower end of the K10 distribution and larger toward the higher-distress end. This pattern is consistent with quasi-experimental evidence from China that education-related mental-health differences can be larger among those who are worse off (Wang, 2022; Li and Sunder, 2024), although the present quantile estimates remain associational and do not show that credentials are causally more beneficial for the most distressed women.

Second, the four domains of current circumstances account for part, but not all, of the observed upper-secondary credential gradient. Economic security produces the largest attenuation. Physical health and household structure produce further changes in the sequential model. In the separate-domain models, household structure ranks second, physical health third, and care burden produces essentially no attenuation. This pattern aligns with evidence that income, material resources and social standing are important correlates of the education–mental-health gradient in other settings (Wang, 2022; Alloush, 2023; Cutler and Lleras-Muney, 2010).The smaller domains remain substantively relevant even though they account for less of the credential gradient. Unpaid and care work is associated with women's distress, consistent with the Ghanaian evidence (Owoo and Lambon-Quayefio, 2021; Vitellozzi et al., 2024), but the care-burden measures account for essentially none of the upper-secondary credential gradient when entered as a domain on their own. Likewise, acceptance of intimate-partner violence, partner control and recent physical violence are strongly associated with distress, echoing Sipsma et al. (2013); because these measures are available only for a restricted, partnered subsample, their contribution cannot be compared cleanly with the four domains observed for the main sample.

Why might a credential be associated with mental health over and above years of schooling? The upper-secondary associations with paid or wage employment, household assets and tertiary attendance provide descriptive support for the idea that certification distinguishes women with access to different educational and economic opportunities even among those with similar years of schooling. The data cannot distinguish labour-market signalling from gateway or access associations. That economic security produces the largest attenuation of the credential–distress gradient strengthens the consistency of this economic-opportunity interpretation, but does not establish mediation. Upper-secondary completion is also associated with a more educated spouse, consistent with educational matching; however, spouse education itself produces relatively little attenuation of the distress coefficient, so partner matching receives less support as an explanation of the observed mental-health gradient than broader economic security. The lower-secondary results are mixed, and none of these descriptive patterns establishes a mechanism.

The distinction between lower- and upper-secondary completion provides some further insight into this pattern. In the main current-distress models, the upper-secondary credential gradient is significantly larger than the lower-secondary gradient. A similar distinction emerges when we examine women's circumstances: conditional on years of schooling, upper-secondary completion is associated with substantially greater paid or wage employment, household assets, tertiary attendance and spouse education, and these associations are significantly different from those for

lower-secondary completion. Yet in the common-sample pathway models, the initially significant difference between the upper- and lower-secondary distress coefficients is no longer statistically distinguishable once economic security is taken into account. Taken together, these patterns are consistent with the larger upper-secondary gradient being associated in part with the different economic opportunities and material circumstances accompanying upper-secondary completion. They do not establish that these circumstances mediate a causal effect of certification: both credential completion and subsequent circumstances may reflect selection on characteristics that we do not observe.

Third, the clearest longitudinal credential association is at the onset margin. Among women who were not at risk in the baseline wave, secondary credentials are associated with a lower probability of being at risk at the next wave, conditional on years of schooling and the other controls; the JHS and SHS onset coefficients are not statistically distinguishable from one another. Among women already at risk, the credential coefficients for recovery are small, imprecise and statistically insignificant. The chronic-distress association is clearest for the linear years-of-schooling term: JHS is null and SHS is smaller and only marginally significant at the 10% level. Because waves are four to five years apart, these transitions describe status at successive interviews rather than the timing or prevention of clinical episodes.

These findings extend the Ghanaian literature in three respects. Prior GSPS studies establish that distress is socially patterned by education, wealth, employment and relational circumstances (Sipsma et al., 2013; Canavan et al., 2013; Amenah et al., 2025). The present analysis separates the secondary-credential coefficients from the linear years-of-schooling coefficient, uses repeated observations to distinguish onset from recovery and chronic distress, and compares several domains of current circumstances within a common accounting framework. The results therefore sharpen the policy motivation without estimating the effect of Ghana's 2017 Free SHS reform. Most women in the sample completed schooling before the reform, and the estimates may reflect unobserved differences established before or during schooling.

The associational interpretation is central to the policy discussion. The observed secondary-credential gradient suggests that psychological well-being belongs among the potential non-market outcomes considered when motivating investments in girls' secondary-school completion (UNESCO, 2016; Mastercard Foundation, 2020). The especially large attenuation after economic-security controls also points to the importance of the material conditions accompanying educational attainment. Neither result identifies the mental-health consequences of a particular expansion policy, nor does it establish that changing credentials or any measured domain would reproduce the estimated differences. Policy claims should therefore be framed as motivation for further causal evidence, particularly on whether expanded secondary completion is accompanied by economic opportunities and improvements in women's material security.

7 Conclusion

This paper asked whether completing secondary school is associated with psychological distress among Ghanaian women over and above the linear gradient in years of schooling, how that association changes when current circumstances are taken into account, and whether

the longitudinal pattern differs between onset and recovery. Using four waves of the Ghana Socioeconomic Panel Survey, we find a secondary-credential gradient in current distress: lower- and upper-secondary credentials are associated with lower K10 scores and lower probabilities of being at risk, conditional on years of schooling and observed background characteristics.

The sequential-adjustment exercise shows that economic security, physical health, care burden, and household structure and support together account for part, but not all, of the observed credential gradient. Economic security produces the largest attenuation. These comparisons are an accounting exercise: they do not partition a causal effect, identify mediation, or imply that the coefficient remaining after adjustment belongs to the credential itself.

The longitudinal results sharpen the distinction between credentials and years of schooling. Among women not at risk at one interview, secondary credentials are associated with a lower probability of being at risk at the next interview. Among women already at risk, the credential coefficients for recovery are small and statistically insignificant. For chronic distress, the significant association is with years of schooling rather than the credential indicators. The clearest longitudinal credential association is therefore at the onset margin, not in conditional recovery or chronic distress.

The women in our sample largely completed their schooling before Ghana's 2017 Free SHS reform, and educational attainment is not randomly assigned. The estimates therefore describe conditional associations and do not identify the causal effect of completing secondary school or of the reform. Even within those limits, the findings are substantively relevant: psychological wellbeing is a potentially important non-market outcome associated with secondary-school completion, and the comparatively large attenuation after economic-security adjustment highlights the material circumstances accompanying educational attainment. The results motivate further causal evidence on whether expansions in secondary completion, together with economic opportunities, improve women's mental health.

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Data

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Appendix.

Table A1. Summary statistics by wave-to-wave transition state

	Stayed well	Onset	Recovery	Chronic	Total
Person-wave pairs	2,700	1,241	1,620	988	6,549
K10 distress score	14.29 (2.84)	14.71 (2.87)	24.50 (4.05)	24.92 (4.35)	18.50 (6.08)
Age (years)	34.24 (8.07)	35.37 (8.26)	35.16 (7.98)	36.22 (7.84)	34.98 (8.08)
Years of schooling	6.56 (4.68)	5.23 (4.46)	4.45 (4.56)	3.83 (4.29)	5.38 (4.68)
Household asset index	0.19 (0.98)	−0.04 (0.93)	0.01 (0.87)	−0.23 (0.90)	0.04 (0.94)
Illness/injury, past 2 weeks (%)	13.6	15.8	18.1	23.3	16.6
Domestic/care activities (count)	6.91 (2.63)	6.71 (2.66)	7.85 (2.46)	7.48 (2.50)	7.19 (2.61)
Unpaid-work hours/day	8.22 (4.94)	8.09 (4.82)	9.72 (5.46)	9.39 (5.24)	8.74 (5.14)
Living children	3.40 (1.87)	3.59 (1.93)	3.71 (2.04)	3.86 (2.09)	3.59 (1.97)
Household size	4.35 (2.18)	4.40 (2.20)	4.94 (2.53)	4.84 (2.54)	4.58 (2.35)

Note: Person-wave-pair means with standard deviations in parentheses; the illness indicator is shown as a percentage. States are defined from K10 ≥ 20 in origin and destination waves: stayed well (0→0), onset (0→1), recovery (1→0), and chronic (1→1). Counts vary where values are missing, especially living children.

Table A2. Summary statistics by distress status (K10 ≥ 20)

	Not at risk	At risk	Total
Person-waves	7,345	4,309	11,654
K10 distress score	14.18 (2.94)	24.59 (4.23)	18.03 (6.11)
Age (years)	33.99 (8.45)	34.93 (8.27)	34.34 (8.40)
Years of schooling	6.57 (4.76)	4.79 (4.60)	5.91 (4.78)
Household asset index	0.13 (0.98)	−0.09 (0.91)	0.05 (0.96)
Illness/injury, past 2 weeks (%)	13.3	20.1	15.8
Domestic/care activities (count)	6.66 (2.45)	7.33 (2.47)	6.91 (2.48)
Unpaid-work hours/day	8.43 (4.94)	9.41 (5.25)	8.79 (5.08)
Living children	3.40 (1.91)	3.65 (2.03)	3.50 (1.96)
Household size	4.49 (2.34)	4.81 (2.50)	4.61 (2.41)

Note: Person-wave means with standard deviations in parentheses; the illness indicator is shown as a percentage. At risk denotes K10 ≥ 20. Counts vary where values are missing, especially living children.

Table A3. Additional characteristics by education

Variable	No credential	JHS	SHS
Years of schooling (mean)	2.43	9.07	12.57
Moderate+ distress, K10 ≥ 25	0.198	0.121	0.074
Recent illness/injury, past 2 wks	0.164	0.164	0.129
Self-rated health (1–4)	1.33	1.27	1.17
Housework hours/day	8.05	6.66	6.55
No. of children under 5	0.779	0.591	0.472
Household size	5.11	4.16	3.63
Other adult women in household	0.601	0.538	0.688
Partner control (0–1; higher=more)	0.201	0.190	0.159
Decision-making autonomy (0–4)	2.35	2.61	2.76
Physical IPV by partner (past yr)	0.082	0.064	0.044

Appendix Table A3. Person-wave means by education for variables not already shown in Table 4 (age, marital status, urban residence, assets, wealth quintile, employment, unpaid-work hours, care-activity count, living children and IPV attitudes). Self-rated health is Waves 1–3 only; partner control, decision-making autonomy and physical IPV are observed for partnered women.

Table A4. Sample sizes by analysis

Analysis / sample	**Obs.**	**Women**	**Definition**
Base K10 analytic sample	11,654	5,826	Valid K10 among women aged 20–49
Main current-distress regression	11,612	5,817	Education and main controls observed
Pathways: available common sample	9,359	4,605	All four current-circumstance domains observed
Pathways: regression sample	9,333	4,596	Common sample plus education and controls
Valid consecutive K10 pairs	6,549	3,533	Valid K10 at both ends of an adjacent pair
Four-state transition regression	6,523	3,528	Valid pair plus education measures
Onset: available / regression	3,941 / 3,923	2,662 / 2,659	Below risk at origin; latter also has controls
Recovery: available / regression	2,608 / 2,600	1,981 / 1,975	At risk at origin; latter also has controls
Empowerment: available / regression	8,414 / 8,385	4,358 / 4,348	Full routed battery; latter also has controls
Spouse schooling: available / regression	1,903 / 1,896	1,903 / 1,896	Resident-partner link and spouse schooling observed
K10 symptom-item gradients	11,461	5,771	All ten items, education and controls observed
Attrition origin-wave risk set	8,838	4,852	Eligible origin observations with a possible next wave

Note: Observations are person-waves except where consecutive pairs or origin-wave opportunities are specified. Available counts describe observed outcomes or batteries; regression counts additionally require the education measures and relevant controls. A woman may contribute multiple person-waves or pairs.

Table A5. Next-wave retention by survey pair

Survey pair	Eligible at origin	Retained	Not retained	Retention rate (%)
2009/10–2013/14	3107	2351	756	75.7
2013/14–2018/19	2863	2141	722	74.8
2018/19–2022/23	2868	2031	837	70.8
Pooled transition opportunities	8838	6523	2315	73.8

Notes: Eligible observations are women aged 20–49 with valid origin-wave K10, years of schooling and credential status. Retained means observed in the immediately following wave with valid K10. Pooled counts are person-wave transition opportunities; a woman may contribute more than once.

Table A6. Origin-wave characteristics by next-wave retention

Characteristic	Retained	Not retained	Difference	p-value
2009/10–2013/14				
Years of schooling	5.035	6.013	-0.978	0.000
JHS credential	0.270	0.280	-0.010	0.582
SHS credential	0.105	0.161	-0.056	0.000
K10 score	20.335	19.607	0.728	0.006
At risk (K10 >= 20)	0.523	0.456	0.066	0.001
Age	34.202	32.390	1.811	0.000
Parent completed secondary or higher	0.085	0.115	-0.030	0.019
Household asset index	0.039	0.165	-0.125	0.003
Self-employed	0.574	0.519	0.055	0.008
Paid/wage employed	0.090	0.120	-0.030	0.023
Cohabiting	0.108	0.102	0.006	0.627
Separated/divorced/widowed	0.107	0.095	0.012	0.337
Never married	0.114	0.243	-0.129	0.000
Recent illness/injury	0.118	0.128	-0.010	0.468
Unpaid-work hours/day	8.707	7.841	0.866	0.000
Household size	4.827	4.972	-0.145	0.148
Birth zone (joint test)	–	–	–	0.000
2013/14–2018/19				
Years of schooling	5.237	6.222	-0.985	0.000
JHS credential	0.263	0.270	-0.007	0.709
SHS credential	0.117	0.193	-0.076	0.000
K10 score	17.064	16.633	0.431	0.076
At risk (K10 >= 20)	0.302	0.285	0.016	0.401
Age	35.018	31.490	3.528	0.000
Parent completed secondary or higher	0.085	0.129	-0.044	0.001
Household asset index	0.022	0.046	-0.023	0.589
Self-employed	0.489	0.355	0.134	0.000
Paid/wage employed	0.090	0.108	-0.018	0.173
Cohabiting	0.088	0.091	-0.003	0.800
Separated/divorced/widowed	0.135	0.083	0.052	0.000
Never married	0.137	0.313	-0.176	0.000
Recent illness/injury	0.192	0.181	0.011	0.525
Unpaid-work hours/day	8.813	7.858	0.955	0.000
Household size	4.459	4.683	-0.224	0.038
Birth zone (joint test)	–	–	–	0.019
2018/19–2022/23				
Years of schooling	5.915	6.607	-0.692	0.000
JHS credential	0.274	0.238	0.036	0.040
SHS credential	0.160	0.246	-0.086	0.000
K10 score	17.900	17.376	0.525	0.037
At risk (K10 >= 20)	0.357	0.331	0.026	0.181
Age	35.901	32.534	3.366	0.000
Parent completed secondary or higher	0.108	0.123	-0.015	0.268
Household asset index	0.058	0.053	0.004	0.911
Self-employed	0.470	0.320	0.150	0.000
Paid/wage employed	0.105	0.111	-0.006	0.627
Cohabiting	0.101	0.090	0.011	0.342
Separated/divorced/widowed	0.125	0.086	0.039	0.002
Never married	0.177	0.338	-0.161	0.000
Recent illness/injury	0.192	0.167	0.025	0.111
Unpaid-work hours/day	8.711	8.124	0.587	0.004
Household size	4.433	4.369	0.064	0.488
Birth zone (joint test)	–	–	–	0.000

Notes: Characteristics are measured at the origin wave. Differences are retained minus not retained. P-values use heteroskedasticity-robust tests; the birth-zone row reports an omnibus test across origin-region categories. These comparisons are descriptive and not causal.

Table A7. Predictors of next-wave retention

	(1) 2009/10–2013/14	(2) 2013/14–2018/19	(3) 2018/19–2022/23
Years of schooling	0.002	-0.004	0.003
	(0.003)	(0.004)	(0.004)
JHS	0.031	0.021	0.027
	(0.025)	(0.028)	(0.029)
SHS	-0.006	0.007	-0.022
	(0.041)	(0.042)	(0.044)
Age	0.004***	0.007***	0.006***
	(0.001)	(0.001)	(0.001)
At risk at origin	0.017	0.009	0.006
	(0.016)	(0.018)	(0.018)
Household asset index	-0.016*	0.002	-0.003
	(0.009)	(0.009)	(0.010)
Self-employed	0.037**	0.030	0.074***
	(0.018)	(0.019)	(0.020)
Paid/wage	-0.005	0.020	0.062**
	(0.031)	(0.030)	(0.030)
Cohabiting	0.005	-0.044	0.002
	(0.026)	(0.032)	(0.030)
Separated/divorced/widowed	-0.024	0.004	-0.012
	(0.029)	(0.028)	(0.030)
Never married	-0.085***	-0.094***	-0.085***
	(0.028)	(0.030)	(0.028)
Recent illness/injury	-0.021	-0.004	0.014
	(0.024)	(0.021)	(0.022)
Unpaid-work hours/day	0.002	0.006***	0.003*
	(0.002)	(0.002)	(0.002)
Household size	-0.019***	-0.016***	-0.005
	(0.004)	(0.004)	(0.004)
Model observations	3102	2862	2863
McFadden pseudo R-squared	0.060	0.067	0.053

Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

Average marginal effects from pair-specific logit models; standard errors clustered by woman.
All models include age squared, parental-education categories, birth-zone categories and missing-value indicators for continuous current circumstances.

Table A8. Credential gradient and current circumstances: K10

	(1) Base	(2) + Economic	(3) + Health	(4) + Care	(5) + Household
Years of schooling	-0.087***	-0.060**	-0.068**	-0.061**	-0.083***
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
JHS	-0.753***	-0.698***	-0.602***	-0.573***	-0.497**
	(0.222)	(0.220)	(0.219)	(0.219)	(0.220)
SHS	-1.410†††***	-1.081***	-0.914***	-0.920***	-0.798**
	(0.335)	(0.334)	(0.331)	(0.332)	(0.334)
Household asset index		-0.584***	-0.570***	-0.594***	-0.445***
		(0.072)	(0.071)	(0.071)	(0.074)
Self-employed		-0.386***	-0.412***	-0.453***	-0.497***
		(0.138)	(0.137)	(0.137)	(0.137)
Paid/wage		-0.480**	-0.439*	-0.423*	-0.542**
		(0.244)	(0.242)	(0.241)	(0.241)
Recent illness/injury			2.045***	2.049***	1.978***
			(0.170)	(0.171)	(0.170)
Domestic/care activities				-0.121***	-0.128***
				(0.039)	(0.039)
Unpaid-work hours/day				0.084***	0.092***
				(0.014)	(0.014)
Cohabiting					0.970***
					(0.213)
Separated/divorced/widowed					1.510***
					(0.212)
Never married					0.801***
					(0.278)
Household size					-0.068
					(0.045)
Other adult women in household					0.107
					(0.100)
Number of living children					0.001
					(0.047)
Number of children under 5					0.240**
					(0.094)
Observations	9333	9333	9333	9333	9333
R-squared	0.092	0.100	0.115	0.119	0.127

Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).
Stars test whether an individual coefficient differs from zero: * p<0.10, ** p<0.05, *** p<0.01.
Daggers on SHS test H0: beta(SHS)=beta(JHS), using the regression variance-covariance matrix: † p<0.10, †† p<0.05, ††† p<0.01.

Table A9. Credential gradient with each current-circumstance domain added separately

	(1) Base	(2) + Economic	(3) + Health	(4) + Care	(5) + Household
Years of schooling	-0.087***	-0.060**	-0.094***	-0.081***	-0.106***
	(0.029)	(0.029)	(0.028)	(0.029)	(0.029)
JHS	-0.753***	-0.698***	-0.657***	-0.732***	-0.616***
	(0.222)	(0.220)	(0.221)	(0.222)	(0.222)
SHS	-1.410***	-1.081***	-1.220***	-1.413***	-1.143***
	(0.335)	(0.334)	(0.332)	(0.335)	(0.337)
Observations	9333	9333	9333	9333	9333
R-squared	0.092	0.100	0.107	0.095	0.104

Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$
Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary).

Table A10. Unweighted and retention-weighted current-distress estimates

	(1) K10: unweighted	(2) K10: retention weighted	(3) At risk: unweighted	(4) At risk: retention weighted
Years of schooling	-0.068*	-0.066*	-0.006**	-0.006**
	(0.037)	(0.037)	(0.003)	(0.003)
JHS	-0.511*	-0.510*	-0.031	-0.033
	(0.285)	(0.288)	(0.023)	(0.023)
SHS	-1.143***	-1.174***	-0.063*	-0.069**
	(0.417)	(0.422)	(0.033)	(0.034)
Observations	5495	5495	5495	5495
R-squared	0.044	0.045	0.034	0.035

Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$
Notes: Background-adjusted models estimated on the common retained destination-wave sample (Waves 2–4). Retention weights are predicted at the preceding wave, winsorised at p1/p99 and normalised to mean one within survey pair. Standard errors are clustered by woman.

Table A11. Onset and recovery from distress: linear probability models

	Onset		Recovery	
	(1) Unweighted	(2) Retention weighted	(3) Unweighted	(4) Retention weighted
Years of schooling	-0.001	-0.002	0.010**	0.010**
	(0.004)	(0.004)	(0.004)	(0.005)
JHS	-0.095***	-0.091***	-0.021	-0.021
	(0.027)	(0.027)	(0.036)	(0.037)
SHS	-0.131***	-0.132***	0.027	0.023
	(0.040)	(0.040)	(0.055)	(0.057)
Observations	3923	3923	2600	2600
R-squared	0.031	0.032	0.043	0.043

Notes: Linear probability models with the same controls as the main conditional transition models. Standard errors in parentheses, clustered by woman. Retention weights are pair-specific, winsorised at p1/p99 and normalised to mean one within pair. The onset sample is restricted to women not at risk in the initial wave and the recovery sample to those at risk, hence the differing observation counts. * $p < .10$, ** $p < .05$, *** $p < .01$.

Table A12. Transitions in psychological distress between waves

	Well		Onset		Recovery		Chronic	
	(1) U	(2) W	(3) U	(4) W	(5) U	(6) W	(7) U	(8) W
Years of schooling	0.012***	0.011***	0.003**	0.003*	-0.007***	-0.007***	-0.008***	-0.008***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
JHS	0.076***	0.077***	-0.048***	-0.046***	-0.026	-0.028	-0.002	-0.003
	(0.025)	(0.025)	(0.015)	(0.016)	(0.018)	(0.018)	(0.019)	(0.019)
SHS	0.126***	0.140***	-0.060***	-0.059**	-0.026	-0.035	-0.041*	-0.045*
	(0.036)	(0.036)	(0.022)	(0.023)	(0.026)	(0.026)	(0.025)	(0.024)
Observations	6523	6523	6523	6523	6523	6523	6523	6523

Notes: Average marginal effects from multinomial logit, with standard errors in parentheses clustered by woman. U = unweighted; W = retention weighted. The weighted model uses pair-specific p1/p99-winsorised weights normalised to mean one within pair. * $p < .10$, ** $p < .05$, *** $p < .01$.

Table A13. Robustness of the K10 credential gradient

Specification	SHS coefficient	Standard error	Observations	R-squared
Main specification	-1.189***	(0.283)	11612	0.093
Ever-highest credential	-1.006***	(0.268)	11612	0.093
Age 25–49	-1.226***	(0.322)	9798	0.090
Not currently enrolled	-1.304***	(0.289)	11311	0.093
Additional urban control	-0.828***	(0.317)	9460	0.098
Additional religion/ethnicity controls	-1.138***	(0.284)	11539	0.100

Notes: Outcome is K10. Each row reports the SHS coefficient from a separate model. Standard errors are clustered by woman. JHS denotes junior high school (lower secondary); SHS denotes senior high school (upper secondary). * $p < .10$, ** $p < .05$, *** $p < .01$.

Table A14. Credential gradient across the K10 distribution

	(1) 25th percentile	(2) Median	(3) 75th percentile	(4) 90th percentile	(5) K10 >= 30
Years of schooling	-0.068**	-0.153***	-0.174***	-0.064	-0.002**
	(0.030)	(0.033)	(0.040)	(0.055)	(0.001)
JHS	-0.309	-0.605**	-0.598*	-1.283***	-0.017**
	(0.237)	(0.260)	(0.316)	(0.438)	(0.007)
SHS	-0.580*	-0.921**	-1.197***	-2.864***	-0.023**
	(0.338)	(0.371)	(0.452)	(0.625)	(0.009)
N	11612	11612	11612	11612	11612

Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

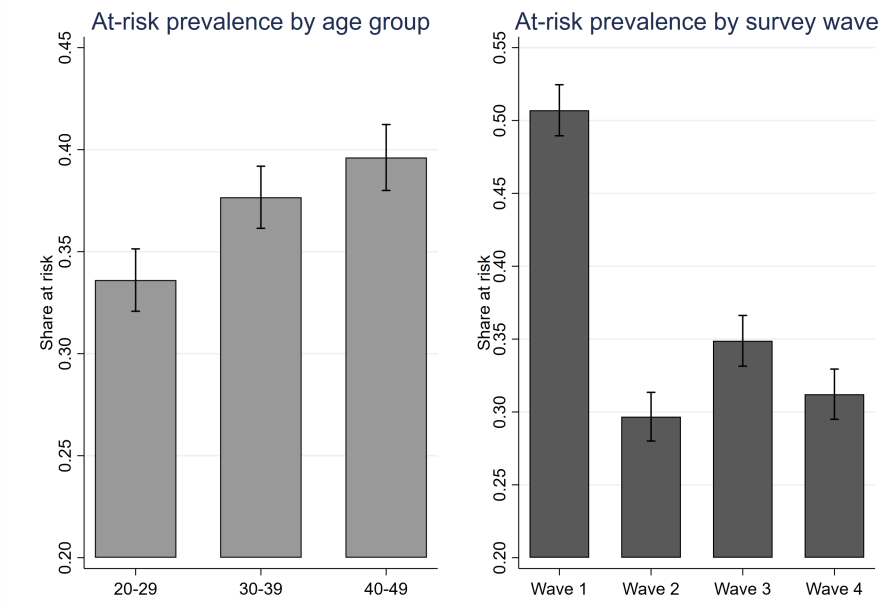

Figure A1. Psychological distress by age group and survey wave.

Share at risk (K10 $\geq$ 20) by age group and by survey wave, with 95% confidence intervals. Distress rises modestly with age (33%, 38%, 39% across 20–29, 30–39, 40–49) and was highest in Wave 1 (51%), lower and broadly stable afterwards (30%, 34%, 31%).