The role of time spent in unpaid domestic work on educational outcomes among adolescents and young adults: Quantitative evidence from India

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Abstract

Higher education among youth is crucial for India's socio-economic development. Despite policy efforts, challenges persist in retaining students beyond elementary school and improving inclusivity and education quality. Using the UDAYA dataset from Uttar Pradesh and Bihar, we examined how unpaid domestic work affects educational outcomes. Findings from survey-adjusted logistic regression models showed that more time spent on unpaid domestic work was associated with greater likelihood of discontinuing education, absenteeism, and lesser likelihood of reading and arithmetic abilities among 12–23 years old, with some evidence of greater burden among girls. This relationship was attenuated by investing more time in academically productive work. There is need for targeted educational interventions for disadvantaged youth and emphasize the importance of expanding quality public services to reduce the burden of unpaid domestic work on young people.

Introduction

Background

Youths' education is one of the most crucial drivers of socio-economic development of a nation [1].The extent and quality of education of youth is of immediate relevance in seizing demographic dividend [2, 3] for countries experiencing first demographic transition such as India. India had nearly 50% of its population below age of 25 years in 2011, and the same is expected to fall to 35% in 2036 during which more than 80% increase in share of workers aged 15–59 is expected.

A range of policy interventions in India had aimed at education expansion which have shown to bring about improvement in school enrollment at every level for both girls and boys, as well as in literacy rates in India [4]. However, substantial challenges persist in retaining children in school beyond elementary level [5], improving inclusivity in education for socio-economically marginalized communities [6], and enhancing quality of education [4]. Specifically, India has near universal enrollment in primary schooling, however, age-specific enrollment rate in the age-group of 14–15 years drops to 72.8%, which further goes down in the age-group of 16–17 years to 42.4 (please see the UDISE + 2021-22 report accessed through [5]. Gross enrollment ratio in higher education beyond grade 12 (age 18 to 23 years) was 28.4% in 2021-22 [7]. While learning outcomes are improving, still 25% school enrolled 14–18 years children could not read a second-grade level text fluently in their regional language, whereas more than 50% could not perform division problems [8].

A range of demand-side individual-level social [gender, birth order], biological [nutritional status], and cognitive [pre-schooling, self-efficacy, reading and writing ability] factors; parental factors [education, aspiration, occupation]; household characteristics [wealth, size, type, location]; socio-economic factors [religion-, caste-, and gender-based discrimination, child labor] and supply side structural and policy-level factors [availability and access to school and colleges, infrastructure of education facilities, quality of education at school and colleges, type of educational institutes] have been studied in the extant scholarship explaining variation in educational attainment across various socio-economic groups in

India [9–11]. Further, relationship of time spent by adolescents and youth in educational activities outside school [12], recreational/extra-curricular activities [13, 14], screen-time [15], and engagement in paid work on educational attainment and academic performance has also been explored [11].

Notably, adolescents and youth in a developing country such as India, devote a significant amount of time and energy to unpaid domestic work, with this burden growing as they get older [16]. Unlike paid employment, adolescent and youth's engagement with domestic work often remains invisible and its influence on educational attainments remains empirically underexplored [17], despite being theoretically conceptualized. Among the few studies investigating the potential relationship between domestic work engagement and educational attainment among adolescents and youth, one study in Côte d'Ivoire found that girls aged 6–11 who were involved in domestic work had a higher likelihood of repeating a school year [17]. Another study from India, utilizing data from the Young Lives longitudinal study, found that children who spent more than three hours on domestic work at age 12 were 70% less likely to complete secondary education compared to those who worked less than three hours in Andhra Pradesh. The NSSO 75th round report also suggested a potential link between domestic work and educational attainment. It highlighted that among individuals aged 3 to 35 who had ever been enrolled in education, 4% of boys and 30% of girls cited housework as the reason for not currently attending school [18].

Conceptualizing unpaid domestic work and its influence on educational outcomes

Unpaid domestic work involves performing routine household activities such as cooking, cleaning, fetching food, collecting water, collecting firewood, routine do it yourself household decoration, repair and maintenance, shopping for daily needs, and caring for children and household members among others [19]. But such division of labor for unpaid domestic work is highly gendered, globally, and more so in developing economies including in India [20]. This translates into women carrying exceptionally greater burden of performing these duties in comparison to men in India [20]. A significant portion of unpaid domestic work is also carried out by adolescents and youth in India [20], which again follows gendered division of labor, placing its disproportionate burden on girls compared to boys [20]. Cultural factors and gender stereotypes are deeply entrenched in the way how parents, families and society at large normalize unpaid housework for girls and women, expecting them to devote greater time for household work regardless of socio-economic background of the household [16]. On the other hand, the need for longer hours of unpaid domestic work increases with insufficient level and quality of basic public provisioning especially water, sanitation, electricity, fuel, transport, food security and childcare [19], disproportionately affecting adolescents in socio-economically disadvantaged households as compared to their wealthier counterparts, again girls being at a greater disadvantage in comparison to boys.

Thus, unpaid housework engagement by adolescents and youth signifies an interplay of material household factors and gender-based division of labor within household. This is different from engagement in paid or economically productive household work, as by the very nature, engagement in

unpaid work within household represents an indirect, non-monetary way of underinvestment in child's education, rooted in household's material circumstances and subscribing to societal norms on value assigned to girls' education [16].

With this theoretical conceptualization, we set out to explore relationship of engagement in unpaid housework as measured by time spent by adolescents and youth between age of 12 to 23 years in doing unpaid housework with educational outcomes operationalized as (i) continuing education as measured by current enrollment status and dropout from school or college between two survey rounds (ii) school/college absenteeism (iii) learning outcomes as measured by arithmetic and Hindi reading proficiency.

We hypothesize at least two potential underlying pathways that link longer time spent on unpaid domestic work with educational outcomes. First, spending longer time in unpaid domestic work is shown to be associated with higher risks of anxiety and depression among adolescents [21] and likely leave them with lesser time for recreational and social activities, thereby likely affecting their mental health and cognitive functioning which in turn affect their learning outcomes. Second, time and energy spent in unpaid domestic work could leave adolescents with lesser time and energy for doing other educational activities such as doing homework or exploring educational information through various resources, likely impacting their learning outcomes. We also argue that this relationship is moderated by gender, where educational outcomes are expected to be poorer for girls engaged in household work at the same level as that of a boy from similar socio-economic background. This difference might result from boys being able to leverage greater advantages available to them in a patriarchal social context in comparison to girls (for instance son preference in the household [22]), which help them offset the adverse effect of engagement in unpaid domestic work. Further, we posit that relationship of time spent in unpaid domestic work with educational outcomes is moderated by time spent at home in educationally productive activities, where longer time spent on doing homework, for instance, will be able to attenuate the adverse effect of time spent in unpaid work on educational outcomes. In such instances, engagement in academic activities seldom get compromised because of time and energy spent on unpaid work, averting potential loss in educational performance.

In this line, we investigate the following three hypotheses:

Hypothesis 1

Greater time spent on unpaid domestic work by the adolescents and youth is related to a lower likelihood of continuing education, greater likelihood of absenteeism and lower levels of learning outcomes adjusted for covariates.

Hypothesis 2

Gender moderates the relationship in hypothesis 1 in a way that for the same level of engagement in unpaid domestic work, girls will have lower likelihood of continuing education, greater likelihood of

absenteeism and lower levels of learning outcomes as compared to boys, adjusted for covariates.

Hypothesis 3

Time spent in academically productive activities outside school moderates the relationship in hypothesis 1 (*except school/college absenteeism, explained in methods*) in a way that for the same level of engagement in unpaid domestic work, adolescents and youth spending greater time in academically productive activities outside school will have greater likelihood of continuing education, and higher levels of learning outcomes as compared to adolescents and youth spending lesser time doing academically productive activities outside school, adjusted for covariates.

Methods

Data source

We drew our cross-sectional data from the wave 2 (2018-19) of the "*Understanding the Lives of Adolescents and Young Adults (UDAYA)*" survey conducted by the Population Council [23]. This final analytical data from the wave two of the longitudinal data comprised 4,428 boys and 11,864 girls (aged 10–19 years) across Bihar and Uttar Pradesh. The comprehensive survey had laid its focus on various aspects of an adolescent's life (and their transitioning to adulthood) including their education, economic activities, sexual and reproductive health awareness and behaviors, exposure to social media, job aspirations, gender role attitudes, romantic and parental relationships, and health-seeking behavior. The survey utilized a multi-stage systematic sampling design comprising both urban and rural areas. The 150 primary sampling units (PSUs) in the survey were villages (rural) and census wards (urban). More details on the sampling and the selection of individuals can be found elsewhere [23]. It is noteworthy to acknowledge that we relied only on the wave 2 cross-sectional data, since a few indicators that were key to our analyses (such as the time-use indicators), were only available at the latest time point (wave 2).

Ethical considerations

Our research used the publicly available UDAYA wave 2 dataset [23], and therefore, it did not require the approval from any institutional review board. However, the survey received its IRB approval from the ethical review board of Population Council, New Delhi. During the data collection, informed consent was sought and obtained from the adult respondents. In case of minors (10–17 years), consent was obtained from either a parent or guardian of the respondents.

Measures

Final outcome variables

Reading proficiency: To assess reading proficiency, we utilized the Annual Status of Education Report (ASER) tools [24] that was used by UDAYA survey team among the respondents who ever attended school. It recorded a four-level assessment of proficiency in the Hindi language: ability to recognize

letters, read words, read a short paragraph. We further categorized these in our analyses as a binary outcome with individuals who could read both at paragraph and story level as “1”, “0” otherwise. In our sample, 71.9% of the respondents could read at both the paragraph and story levels.

Arithmetic proficiency: Similar to the reading tools, the arithmetic component had four levels of assessments of proficiency: the individuals’ ability to recognize single-digit numbers, double-digit numbers, solve subtraction and division problems. We categorized these as a binary outcome with individuals who could subtract and were capable of solving division problems as “1”, “0” otherwise. In our sample, 48.4%% of the respondents could solve both subtraction and division problems.

School/college enrolment status: One of our outcome variables was the status of school attendance during wave 2 (2018-19). The survey captured a question on the school enrolment status (currently attending school/college) which we categorized as binary (yes/no). We have categorized correspondence school as “no”, since we were focused on regular school enrolment. About 39.7% of our sample were attending school during the survey.

School/college dropout: We defined school dropout as a binary variable (yes/no) categorized on the basis of the individuals dropping out of school between the two waves of the UDAYA survey. We defined adolescents who were attending school during wave-1 but not during wave-2 as school dropouts (“1”) and those attending school at both the waves as non-school dropouts (“0”). In our sample, 40.2% were school/college dropouts.

School/college attendance: The UDAYA survey also captured data on frequency of absent days from school/college among the respondents who reported to be attending school/college. We operationalized regular attendance as “1” to categorize those respondents who reported attending school/college on all days or missed a day, and “0” otherwise. Only about 21.6% of our school/college going respondents reported attending school/college regularly.

Independent variables

Time use variables: UDAYA survey asked the respondents to detail their activities throughout the previous day, from waking up to going to bed (5 AM to 1 AM), in 15-minute intervals (quarters). It included 14 activities including being at school, domestic duties in home, and spending time with friends and family members, among many (see supplementary file 1 for detailed sample characteristics on these variables). We operationalized *time spent in unpaid domestic work* which included time spent throughout the day the respondent spent in domestic duties at home and for the care of children, sick, elderly. This time ranged from about 0-18.5 hours (mean = 4.74, SD = 4.00). We also utilized the time use data to create another variable: *time spent in productive academic work* by the respondents. For this, we clubbed the total reported time spent by the respondent on doing their homework and time spent on vocational training and skill development. The time for this varied from 0–16 hours with a mean of 1.08 hours in our sample.

Control variables: In our statistical analyses, we controlled for a host of variables— current age (in years), religion (Hindus and non-Hindus), wealth quintiles based on household asset index, caste categories (General, Scheduled Tribes (ST), Scheduled Castes (SC), and Other Backward Classes(OBC)), mother's education (none, 1–7 years, 8–9 years, and 10 years and above), gender (male and female), place of residence (rural and urban), state of residence (Bihar and Uttar Pradesh), current marital status (married and unmarried), and ever engaged in paid work in the last 12 months (yes and no).

Statistical analysis

First, we performed descriptive statistics analysis of the outcome variables and assessed the differences across the host of sociodemographic characteristics of the sample. Then, we ran a series of survey adjusted logistic regression models to assess the relationship of time spent in unpaid domestic work with the outcomes. For each binary outcome, the first set of models included the primary independent variable (*time spent in unpaid domestic work*) along with the host of covariates. The second set of models then further included the interaction of the primary independent variable with the gender of the respondent. This allowed us to assess if there was a statistically different effect of time spent in household chores on the outcomes, by gender of the respondent. Our final set of models included the interaction of the primary independent variable with the gender of the respondent with the continuous variable indicating the *time spent by the respondent on productive academic work*. This allowed us to assess if the effect of the time spent in household work on the outcomes get moderated by the time the respondent spent in productive work at home. It is worthwhile to note that we excluded the predictor "*time spent on productive academic work*" as a covariate for the outcome of school/college absenteeism. We also did not perform interaction analysis for this absenteeism. We argue that while time spent on productive academic work is a direct predictor of dropouts and learning outcomes, it might hold lesser importance in the context of absenteeism as an outcome.

Alpha was set at 0.05 in all our models. All our statistical analyses were carried out in STATA version 18.

Results

Descriptive statistics

Our sample consisted of 16,292 respondents, with 72.82% girls and 27.18% boys (Table 1). The majority were from Other Backward Classes (58.76%). Most respondents identified as Hindu (79.97%), with a significant portion from rural areas (57.51%). Notably, 63.43% were unmarried, and only a small portion of the respondents (29%) reported paid work in the last 12 months. The distribution of educational outcomes revealed disparities across sociodemographic characteristics of the respondents. Boys had higher school/college enrollment (59.6%), and academic abilities compared to girls, who exhibited higher dropouts (46.63%). Hindu students had lower Hindi reading ability (71.04%) than non-Hindus, however had better arithmetic problem-solving skills (50.69%). General category students performed better than others, particularly in Hindi reading (84.81%) and arithmetic (58.51%). Wealthier students consistently performed better, with the richest quintile having the highest academic outcomes. Those with educated

mothers showed significantly better academic performance, particularly when maternal education exceeded 10 years (Table 1).

Table 1
Distribution of the outcomes across the sociodemographic characteristics of the respondents (N = 16,292)

Characteristic	Percentage (%)	Dropout	Current enrolment (Yes)	Absenteeism (Regular)	Hindi reading ability (Yes)	Arithmetic problem solving ability (Yes)
Gender						
Male	27.18	30.12	59.6	31.75	76.92	65
Female	72.82	46.63	31.35	25.88	69.71	41.04
Religion						
Hindu	79.97	39.45	41.11	28.43	71.04	50.69
Non-Hindu	20.03	43.7	33.67	28.8	75.5	38.51
Caste						
Scheduled Caste (SC)	22.83	43.64	34.28	25.09	59.72	35.85
Scheduled Tribe (ST)	0.77	53.12	26.79	40	72.12	42.86
Other Backward Classes (OBC)	58.76	41.07	38.5	28.12	72.18	49.73
General	17.64	34.09	50.44	31.85	84.81	58.51
Wealth quintiles						
Poorest	11.47	49.64	26.24	30.89	49	27.41
Poorer	16.14	45.75	31.86	26.59	57.83	35.13
Middle	20.86	45.55	33.29	27.53	64.57	41.16
Richer	26.79	40.82	39.9	26.01	75.99	50.3
Richest	24.74	31.68	53.68	31.06	88.09	65.11
Marital status						
Married	36.57	82.5	5.96	6.47	59.17	29.64
Unmarried	63.43	33.3	55.58	29.6	77.47	56.27
Place of residence						
Rural	42.49	43.85	35.46	27.58	66.06	42.66

Characteristic	Percentage (%)	Dropout	Current enrolment (Yes)	Absenteeism (Regular)	Hindi reading ability (Yes)	Arithmetic problem solving ability (Yes)
Gender						
Urban	57.51	35.77	45.34	29.43	79.41	55.6
State						
Uttar Pradesh	48.03	37.58	39.94	39.29	71.9	38.3
Bihar	51.97	42.58	39.49	17.73	71.86	58.07
Paid work in last 12 months						
Yes	26.92	52.46	31.1	17.05	69.66	45.79
No	73.08	35.86	42.88	31.54	72.69	49.36
Mother's education						
None	70.27	45.96	32.28	27.69	64.81	39.6
1–7 years	10.37	39.12	42.69	24.51	76.66	51.96
8–9 years	7.81	30.91	54.58	31.69	85.14	62.18
10 years and above	11.54	26.23	65.85	31.04	94.1	77.95

Role of time spent in unpaid domestic work on continuing education

We had two outcomes that indicated status of continuing education, namely current school enrolment status (wave 2) and school/college dropout status between wave 1 and wave 2 of UDAYA data. The results from our fully adjusted logistic regression models (Table 2) indicate that one hour of unpaid domestic work was associated with 10.1% greater dropouts (AOR: 1.101 [1.067,1.136]), accounting for all covariates. Similarly, one hour of unpaid domestic work was associated with about 10% lower odds of being currently enrolled in any formal education (AOR: 0.900 [[0.878,0.924]), controlling for all factors in the model.

When we assessed the interaction of time spent on unpaid domestic work with gender of the respondent, we could find statistically significant differences between girls and boys (Table 3) only for current school enrolment status. For girls, each additional hour of home care is associated with an 11.4% reduction in the odds of being enrolled in school, while the effect for boys was almost neutral. For other outcomes, we could not find any statistical significance of the interaction term, suggesting no

evidence to support any gendered differences in the effect. However, the effect sizes and the direction of the interaction effect highlight the greater burden of time spent on unpaid domestic work among girls, compared to boys.

We further assessed if time spent on academic productive work mitigated the relationship of time spent on unpaid domestic work with the outcomes. Our results showed that (Table 4), with greater time spent on academic productive work, the effect of time spent on unpaid domestic work on dropouts (positive effect) and current school/college enrolment (negative effect) is mitigated. Specifically, we found that each additional hour spent on academic productive work mitigates the negative effect of time spent on unpaid domestic work on dropout by about 13% and on current enrolment status by 35.5%.

Table 2
The associations of time spent in unpaid domestic work with educational outcomes (adjusted odds ratios (AORs and 95% CIs) among Indian adolescents and young adults from survey adjusted logistic regression models.

	Dropout	Enrolment	Absenteeism	Reading ability	Arithmetic problem solving ability
Time in unpaid domestic work	1.101***	0.900***	0.882***	0.953***	0.948***
	[1.067,1.136]	[0.878,0.924]	[0.847,0.920]	[0.933,0.974]	[0.927,0.969]
Gender					
Male (ref)					
Female	0.915	1.038	1.460**	1.091	0.429***
	[0.753,1.112]	[0.861,1.252]	[1.122,1.899]	[0.926,1.284]	[0.356,0.516]
Age (in years)	1.290***	0.712***	0.784***	1.174***	1.075***
	[1.240,1.343]	[0.688,0.738]	[0.754,0.815]	[1.142,1.206]	[1.043,1.109]
Religion					
Hindu (ref)					
Non-Hindu	1.430***	0.531***	0.898	0.977	0.505***
	[1.160,1.763]	[0.436,0.647]	[0.678,1.190]	[0.789,1.210]	[0.415,0.613]
Household wealth					
Poorest (ref)					
Poorer	0.789	1.427**	0.968	1.321**	1.393**
	[0.593,1.050]	[1.116,1.825]	[0.672,1.396]	[1.091,1.601]	[1.092,1.777]
Middle	0.806	1.503**	1.085	1.535***	1.911***
	[0.614,1.059]	[1.177,1.920]	[0.755,1.559]	[1.264,1.863]	[1.509,2.421]
Richer	0.664**	1.953***	0.957	2.090***	2.426***
	[0.505,0.872]	[1.545,2.468]	[0.687,1.333]	[1.726,2.532]	[1.978,2.977]
Richest	0.577***	2.579***	1.053	3.035***	3.579***
	[0.425,0.785]	[1.994,3.335]	[0.731,1.515]	[2.501,3.683]	[2.810,4.557]
Caste Category					
SC (ref)					

	Dropout	Enrolment	Absenteeism	Reading ability	Arithmetic problem solving ability
ST	1.855	0.615	2.235	1.787	0.773
	[0.591,5.823]	[0.217,1.742]	[0.947,5.275]	[0.982,3.252]	[0.429,1.393]
OBC	0.93	1.126	1.594***	1.360***	1.428***
	[0.765,1.131]	[0.948,1.338]	[1.280,1.985]	[1.148,1.611]	[1.198,1.701]
General	1.094	0.984	1.551**	1.684***	1.415**
	[0.856,1.398]	[0.783,1.237]	[1.157,2.078]	[1.303,2.177]	[1.126,1.778]
Marital Status					
Unmarried (ref)					
Married	3.583***	0.159***	0.497*	0.528***	0.464***
	[2.772,4.632]	[0.127,0.197]	[0.258,0.959]	[0.455,0.611]	[0.393,0.549]
Place of residence					
Urban (ref)					
Rural	1.116	0.95	0.921	0.988	0.984
	[0.939,1.327]	[0.805,1.120]	[0.733,1.157]	[0.831,1.175]	[0.824,1.175]
State					
Uttar Pradesh					
Bihar	1.302**	0.993	0.229***	1.109	3.390***
	[1.092,1.553]	[0.831,1.186]	[0.185,0.284]	[0.959,1.281]	[2.885,3.983]
Paid work in last 12 months					
Yes (ref)					
No	0.441***	2.284***	1.588***	1.304***	1.210**
	[0.370,0.524]	[1.953,2.671]	[1.210,2.084]	[1.139,1.493]	[1.050,1.395]
Mother's education					
None (ref)					
1-7yrs	0.768*	1.384**	0.804	1.307**	1.387**

	Dropout	Enrolment	Absenteeism	Reading ability	Arithmetic problem solving ability
	[0.616,0.959]	[1.127,1.699]	[0.584,1.106]	[1.072,1.592]	[1.111,1.733]
8-9yrs	0.917	1.283	1.077	1.837***	1.749***
	[0.691,1.218]	[0.988,1.667]	[0.785,1.478]	[1.428,2.364]	[1.382,2.213]
10and above	0.605***	2.060***	0.908	2.762***	2.319***
	[0.486,0.753]	[1.675,2.533]	[0.691,1.192]	[1.885,4.048]	[1.831,2.937]
Time in academic productive work	0.725***	1.479***		1.409***	1.306***
	[0.687,0.765]	[1.400,1.564]		[1.327,1.496]	[1.252,1.362]
Observations	**9196**	**14593**	**5795**	**13831**	**12382**

95% confidence intervals in brackets

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

Table 3
The associations of time spent in unpaid domestic work and its interaction with gender with educational outcomes (adjusted odds ratios (AORs and 95% CIs) among Indian adolescents and young adults from survey adjusted logistic regression models.

	Dropout	Enrolment	Absenteeism	Reading ability	Arithmetic problem solving ability
Time in unpaid domestic work	1.055	0.989	0.865*	1	1.012
	[0.985,1.131]	[0.924,1.059]	[0.773,0.969]	[0.935,1.069]	[0.948,1.079]
Gender					
Male (ref)					
Female	0.846	1.204	1.429*	1.161	0.469***
	[0.671,1.067]	[0.966,1.500]	[1.080,1.890]	[0.954,1.414]	[0.386,0.570]
Interaction of gender and time in unpaid domestic work					
Male # time unpaid domestic work (ref)					
Female # time unpaid domestic work	1.053	0.896**	1.023	0.949	0.928*
	[0.972,1.140]	[0.830,0.968]	[0.904,1.158]	[0.879,1.023]	[0.868,0.993]
Age (in years)	1.290***	0.713***	0.784***	1.174***	1.076***
	[1.239,1.342]	[0.689,0.739]	[0.754,0.815]	[1.143,1.206]	[1.043,1.110]
Religion					
Hindu (ref)					
Non-Hindu	1.426**	0.533***	0.897	0.978	0.505***
	[1.156,1.760]	[0.436,0.650]	[0.677,1.187]	[0.789,1.212]	[0.416,0.615]
Household wealth					
Poorest (ref)					
Poorer	0.788	1.426**	0.97	1.320**	1.390**
	[0.593,1.047]	[1.115,1.823]	[0.673,1.398]	[1.089,1.600]	[1.089,1.773]

	Dropout	Enrolment	Absenteeism	Reading ability	Arithmetic problem solving ability
Middle	0.806	1.503**	1.088	1.534***	1.909***
	[0.613,1.058]	[1.174,1.925]	[0.757,1.564]	[1.263,1.864]	[1.506,2.420]
Richer	0.663**	1.952***	0.959	2.090***	2.426***
	[0.504,0.871]	[1.542,2.471]	[0.689,1.336]	[1.725,2.532]	[1.977,2.976]
Richest	0.578***	2.566***	1.056	3.031***	3.567***
	[0.425,0.787]	[1.983,3.321]	[0.734,1.519]	[2.498,3.677]	[2.804,4.537]
Cate category					
SC (ref)					
ST	1.865	0.61	2.239	1.783	0.759
	[0.597,5.830]	[0.215,1.729]	[0.952,5.265]	[0.980,3.244]	[0.422,1.367]
OBC	0.933	1.12	1.595***	1.359***	1.423***
	[0.767,1.135]	[0.942,1.332]	[1.280,1.987]	[1.147,1.609]	[1.194,1.695]
General	1.105	0.967	1.552**	1.677***	1.402**
	[0.866,1.410]	[0.772,1.213]	[1.158,2.080]	[1.296,2.168]	[1.116,1.761]
Marital status					
Unmarried (ref)					
Married	3.549***	0.162***	0.495*	0.533***	0.474***
	[2.744,4.591]	[0.130,0.202]	[0.256,0.955]	[0.460,0.619]	[0.401,0.561]
Place of residence					
Urban (ref)					
Rural	1.115	0.95	0.92	0.987	0.982
	[0.938,1.325]	[0.806,1.120]	[0.733,1.156]	[0.830,1.172]	[0.822,1.173]
State					
Uttar Pradesh (ref)					
Bihar	1.301**	0.992	0.229***	1.108	3.391***
	[1.090,1.551]	[0.830,1.185]	[0.184,0.284]	[0.959,1.280]	[2.885,3.985]

	Dropout	Enrolment	Absenteeism	Reading ability	Arithmetic problem solving ability
Paid work in the last 12 months					
Yes (ref)					
No	0.440***	2.286***	1.586**	1.305***	1.212**
	[0.369,0.524]	[1.954,2.675]	[1.207,2.085]	[1.139,1.494]	[1.051,1.397]
Mother's education					
None (ref)					
1-7yrs	0.769*	1.386**	0.804	1.305**	1.385**
	[0.617,0.958]	[1.129,1.701]	[0.584,1.107]	[1.071,1.590]	[1.108,1.730]
8-9yrs	0.917	1.284	1.076	1.839***	1.750***
	[0.690,1.218]	[0.989,1.669]	[0.785,1.475]	[1.429,2.366]	[1.383,2.213]
10and above	0.606***	2.056***	0.908	2.763***	2.315***
	[0.486,0.754]	[1.670,2.532]	[0.691,1.193]	[1.885,4.052]	[1.828,2.931]
Time in academic productive work	0.725***	1.477***		1.409***	1.305***
	[0.687,0.765]	[1.398,1.561]		[1.327,1.497]	[1.252,1.361]
Observations	9196	14593	5795	13831	12382

95% confidence intervals in brackets

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

Table 4
The associations of time spent in unpaid domestic work and its interaction with time spent on academic productive work with educational outcomes (adjusted odds ratios (AORs and 95% CIs) among Indian adolescents and young adults from survey adjusted logistic regression models.

	Dropout	Enrolment	Reading ability	Arithmetic problem solving ability
Time in unpaid domestic work	1.118***	0.885***	0.950***	0.948***
	[1.083,1.155]	[0.862,0.909]	[0.929,0.971]	[0.926,0.970]
Time in academic productive work	0.772***	1.355***	1.345***	1.308***
	[0.727,0.820]	[1.276,1.440]	[1.255,1.440]	[1.238,1.383]
Interaction				
Time in unpaid domestic work # Time in academic productive work	0.971**	1.040***	1.025*	0.999
	[0.952,0.991]	[1.019,1.062]	[1.005,1.045]	[0.986,1.013]
Gender				
Male (ref)				
Female	0.949	0.991	1.051	0.429***
	[0.777,1.158]	[0.818,1.201]	[0.892,1.237]	[0.356,0.517]
Age (in years)	1.292***	0.712***	1.174***	1.075***
	[1.241,1.345]	[0.687,0.738]	[1.143,1.206]	[1.043,1.109]
Religion				
Hindu (ref)				
Non-Hindu	1.423**	0.536***	0.981	0.504***
	[1.151,1.760]	[0.439,0.655]	[0.792,1.215]	[0.415,0.613]
Household wealth				
Poorest (ref)				
Poorer	0.793	1.420**	1.317**	1.393**
	[0.595,1.056]	[1.109,1.819]	[1.087,1.596]	[1.092,1.777]
Middle	0.813	1.492**	1.527***	1.912***
	[0.619,1.067]	[1.170,1.902]	[1.258,1.854]	[1.511,2.420]

	Dropout	Enrolment	Reading ability	Arithmetic problem solving ability
Richer	0.669**	1.933***	2.083***	2.427***
	[0.510,0.878]	[1.530,2.441]	[1.719,2.523]	[1.980,2.975]
Richest	0.576***	2.592***	3.035***	3.578***
	[0.424,0.782]	[2.004,3.353]	[2.502,3.682]	[2.810,4.557]
Caste category				
SC (ref)				
ST	1.842	0.622	1.782	0.773
	[0.599,5.663]	[0.223,1.733]	[0.977,3.249]	[0.429,1.392]
OBC	0.931	1.127	1.360***	1.428***
	[0.764,1.134]	[0.946,1.341]	[1.148,1.612]	[1.198,1.701]
General	1.097	0.983	1.688***	1.415**
	[0.858,1.404]	[0.782,1.235]	[1.306,2.183]	[1.126,1.778]
Marital status				
Unmarried (ref)	1	1	1	1
	[1,1]	[1,1]	[1,1]	[1,1]
Married	3.427***	0.168***	0.542***	0.463***
	[2.639,4.452]	[0.135,0.210]	[0.467,0.629]	[0.392,0.547]
Place of residence				
Urban (ref)				
Rural	1.126	0.945	0.986	0.984
	[0.947,1.339]	[0.802,1.115]	[0.830,1.171]	[0.824,1.175]
State				
Uttar Pradesh (ref)				
Bihar	1.306**	0.984	1.106	3.391***
	[1.097,1.556]	[0.825,1.173]	[0.957,1.277]	[2.886,3.985]
Paid work in the last 12 months				

	Dropout	Enrolment	Reading ability	Arithmetic problem solving ability
Yes (ref)				
No	0.432***	2.342***	1.319***	1.210**
	[0.364,0.514]	[2.007,2.733]	[1.151,1.512]	[1.048,1.396]
Mother's education				
None (ref)				
1-7yrs	0.768*	1.383**	1.307**	1.388**
	[0.616,0.958]	[1.128,1.696]	[1.072,1.594]	[1.111,1.733]
8-9yrs	0.923	1.273	1.838***	1.749***
	[0.695,1.226]	[0.979,1.656]	[1.428,2.365]	[1.383,2.213]
10and above	0.609***	2.029***	2.755***	2.320***
	[0.488,0.761]	[1.647,2.501]	[1.880,4.036]	[1.833,2.936]
Observations	9196	14593	13831	12382

95% confidence intervals in brackets

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

Role of time spent in unpaid domestic work on school/college attendance

We performed another set of survey adjusted logistic regression models to assess the association of time spent on unpaid domestic work with school/college regular attendance (whether the respondent have missed at most a day of school/college). This is a subset of the main sample which comprises respondents ever enrolled in a school/college. Our results in Table 2 show that one hour of greater unpaid domestic work was associated with 11.8% lower odds of having reported regular attendance in school/college, adjusted for the covariates. We could not find any statistically significant evidence of any differences in the effect across gender of the respondent.

Role of time spent in unpaid domestic work on learning outcomes

After assessing the associations of time spent in unpaid domestic work with outcomes of continuous education and attendance, we assessed its association with two learning outcomes: Hindi reading ability at both story and paragraph level; and ability to solve subtraction and division problems. Results presented in Table 2 indicate that one hour of greater hour spent on unpaid domestic work was

associated with 4.7% and 5.2% lower odds of ability to read Hindi and ability to solve arithmetic problems, respectively controlling for the covariates. We could not find substantial statistical evidence for any gendered differences in these effects (Table 3). While we could not find statistical evidence of the moderating role of time spent on productive academic work on the relationship of time spent on unpaid domestic work with the ability to solve arithmetic problems, we found some evidence for Hindi reading ability. Table 4 shows that spending an extra hour of time in academic productive work mitigated the negative effect of time spent on unpaid domestic work on Hindi reading ability by about 2.5%, adjusting for all covariates.

Additional findings from the covariates

We included a host of covariates in our models. The adjusted odds ratios presented in Table 2 allow us to assess the partial effect of each covariate on the different outcomes, conditional on the other covariates in the models. The results show that girls, compared to boys, had greater odds of reporting regular attendance (AOR = 1.460 [1.122, 1.899]) but lower odds of ability to solve arithmetic problems (AOR = 0.429 [0.356, 0.516]). We could not see any statistically significant gendered effect on other outcomes. In our population, older students were more likely to drop out (AOR = 1.290 [1.240, 1.343]), less likely to be currently enrolled (AOR = 0.712 [[0.688,0.738]), more likely to demonstrate better Hindi reading (AOR = 1.174 [1.142,1.206]) and arithmetic-problem-solving skills (AOR = 1.075 [1.043,1.109]). However, older students were less likely to report regular attendance in schools/colleges (AOR = 0.784 [[0.754,0.815]). Household wealth had a significant effect on the outcomes. We found that greater household wealth was consistently associated with better educational outcomes. For instance, respondents from the highest wealth quintile (5th level), versus the lowest (1st level) had significantly lower odds of dropout (AOR = 0.577 [0.425,0.785]), higher odds of current enrollment (AOR = 2.579 [[1.994,3.335]), greater reading ability (AOR = 3.035 [[2.501,3.683]), and arithmetic-problem-solving ability (AOR = 3.579 [[2.810,4.557]). Married respondents reported a much higher likelihood of dropping out (AOR = 3.583 [2.772,4.632]) and were associated with lower odds of current enrollment (AOR = 0.159 [0.127,0.197]), regular attendance (AOR = 0.497 [0.258,0.959]), reading ability (OR = 0.528 [0.455,0.611]), and arithmetic-problem-solving abilities (AOR = 0.464 [[0.393,0.549]), adjusted for other covariates in the model. Not engaging in paid work in the last 12 months was also found to be associated with lower odds of dropout (AOR = 0.441 [0.370,0.524]) and higher odds of regular attendance (AOR = 1.588 [1.210,2.084]), reading ability (AOR = 1.304 [1.139,1.493]), and arithmetic-problem-solving abilities (AOR = 1.210 [1.050,1.395]).

Discussion

In this paper, we attempted to unpack the effect of the burden of unpaid domestic work among adolescents and young adults from UP and Bihar and its influence on different educational outcomes. Our series of analyses yielded several key findings. At the foremost, we found that a greater time spent on unpaid domestic duties by the adolescents and young adults was related to a lower likelihood of continuing education (dropout and current enrolment status). This corroborates the findings from

previous research from Andhra Pradesh, which showed that not engaging in more than two hours of domestic work and paid work at age 12 was associated with a greater likelihood of completing secondary education among young adults [25]. A huge amount of time spent in unpaid domestic chores could lower the potential for academic growth through increased stress or lesser availability of time for homework and other academically productive work, likely resulting in poorer educational outcomes.

This supportive finding from our research is critical for a few reasons. The 2020 National Education Policy (NEP) report [26] highlighted that the gross enrolment ratio (GER) for standard 6–8 was about 91%, which dropped subsequently for secondary and higher education. While a few previous research have looked into the determinants of school/college dropouts, acknowledging multiple factors [11], what has been largely missing from the traditional measurement approaches is the adequate decoding of labor-force work, which frequently excluded unpaid domestic work that could have potential effects on schooling outcomes [27]. For instance, we could only locate one study by Singh & Mukherjee [27] in Andhra Pradesh, who used time spent on unpaid domestic work as one of the determinants in assessing continuing education.

Such research is more critical when focused on girls, who the societal norms drive to do domestic chores in the household and are often not captured or measured adequately as “work”. In our research, we also hypothesized that the burden of time spent on unpaid domestic work on school outcomes would be more for girls, compared to boys. Indian boys, could have more privileges, compared to Indian girls which they could leverage to achieve better school outcomes. For instance, recent research from India have shown that educational spending of family members favored boys to girls [28]. This could be due to the evidently strong son preferences within Indian households [29]. We found some evidence of this. An additional hour of time spent on unpaid domestic work had a greater burden for girls, while for boys, the effect was almost neutral. However, we could not find any statistically robust differences in the effect of time spent on unpaid domestic work on the other educational outcomes across gender, while the direction of effect still highlighted the greater burden among girls. One reason for this could be low statistical power in our sample.

We also found strong evidence of time spent in productive academic work to moderate the effect of time spent on unpaid domestic work on the outcomes. We found that with more time spent on academic productive work, the negative effect of time spent on unpaid domestic work on dropouts and current school/college enrolment was mitigated, accounting for the covariates. This suggests that while interventions targeting the reduction of excessive time spent on unpaid domestic work is required, newer interventions could also be (re)formulated around increasing efficient time consumption for academic productive work such as time for homework, tuitions, and vocational trainings. Our descriptive findings also highlight that such time spent on academic productive work was gender-disproportionate with about an average of 1.87 hours being spent by boys compared to only an average of 0.78 hours spent by girls. This translates to the inference that boys had more privilege of spending time in productive academic work to mitigate the effect of time spent in unpaid domestic work on their continuing education, reaffirming the gender norms in the India society.

We not only focused on continuing education outcomes, but also explored the role of time spent in unpaid domestic work with school absenteeism. This was important because according to previous research, there has been a gap in the enrolment of students and regular attendance among students, including chronic absenteeism [30], which could be associated with greater school dropouts [31–33]. We found that greater time spent on unpaid domestic work was associated with greater likelihood of absenteeism. This is important because demands for adolescents' engagement in household work (whether paid or unpaid) is inevitable in the Indian context, especially among households who experience financial constraints or sudden shocks such as death of family members [34]. Previous research has also shown the disproportionate gender effects on school absenteeism, likely driven by the disproportionate time spent by girls (compared to boys) on domestic work such as water fetching [35]. Our findings corroborate this, although this finding was not statistically significant, likely due to statistical power challenges highlighted before.

Our final set of outcomes were on two widely used learning outcomes: proficiency in reading (Hindi) and arithmetic problem-solving ability. This set of analyses was carried out in the sub-sample of respondents who were ever enrolled in a school/college. Similar to the findings discussed above, from our fully adjusted models, we found that one hour of additional time spent by the respondents on unpaid domestic work was associated with about 4–5% lower likelihood of having proficiency in reading and arithmetic problem solving. One pathway to explain this is through the increased psychological health issues of doing unpaid household work, as documented in earlier research that used the same dataset [36]. We argue that excessive time spent on unpaid domestic work could create a stressful environment for the young respondents, which could further affect their cognitive functioning [37], resulting in poorer learning outcomes. Therefore, home becomes a suitable place for restructuring the domestic work for children [38], which when effectively balanced, could result in better cognitive development outcomes for children. It is also worth noting that while we could not find much statistical differences in these effects across gender, we found that an additional time invested by the respondents on academic productive work mitigated the above effect by about 2.5% for the outcome of proficiency in reading Hindi. However, we could not find any evidence for arithmetic problem-solving ability. One reason for this discrepancy could be the relational and differential dynamics between the two outcomes, which have been limitedly studied [39]. Previous study has found that better reading skills could clear the way for "at-risk children" to improving math skills [39]. Therefore, our statistically robust finding for one outcome still holds potential for explaining later effects on the other outcome: arithmetic problem-solving abilities. Further research from India is warranted to comprehensively explain this.

We included a host of covariates in our models which allowed us to also partially assess their relationship with the outcomes, controlling for all other covariates in the models. These findings which largely reconfirm earlier study findings enhance our confidence in our new findings from the study. For instance, corroborating previous research from India, we found that with increasing household wealth status, the likelihood of dropouts among the adolescents and young adults was observed to be lower [11]. Household wealth was also found to be a strong predictor for better learning outcomes in our study, likely suggesting the significance of access to better financial resources in this current context [40]. It is

also likely that constrained financial environment in the household could demand extra investment of the children in the household to engage in paid or unpaid domestic labor [34], which in turn could result in lesser access to school/colleges.

We also found that age was a strong predictor of school dropouts, with older respondents reporting greater dropouts than younger respondents. This also follows earlier research from India [11, 41]. Another study [42] also have shown, using a large sample from a nationally representative survey, that drop-out of students increases sharply after the post-primary level, which could also be inferred from our results. This is worrisome because education has been a crucial factor for individuals to determine the type of work they do [41]. With the growing competitive market in India, it therefore becomes crucial to engage further research to unpack the nuances of the drivers (including motivation) to continue higher education. We also found that older respondents (who were enrolled in schools/colleges) were more likely to absent from their school/colleges compared to their younger counterparts. While age was found to have a negative relationship with the aforementioned outcomes, a greater age was associated with better learning outcomes in our study. This could be likely suggestive of the gradual increase in such competencies over time. We also found the partial effects of caste, maternal education, engaging in paid work in the last 12 months, and place of residence on our study outcomes, which largely corroborated earlier findings from India [4, 11, 25, 42, 43], thereby enhancing our confidence in the newer findings of the study.

Limitations and strengths

Our study had several limitations. First, we relied on the cross-sectional dataset of wave 2 of the UDAYA longitudinal survey because of which causal evidence was limited. This was because the UDAYA dataset at wave 1 one did not capture time-use data. However, our inclusion of the host of covariates increased our confidence in our results. Second, while our study findings are generalizable to the adolescents and young adults of the states UP and Bihar, it is not generalizable to the rest of India. However, given that UP and Bihar are two states which have witnessed poorer educational outcomes [44], our study in these two contexts provide promising findings that need to be further assessed in other contexts. We therefore urge the inclusion of time-use data in larger nationally representative surveys. Third, our time use data captured the time spent on diverse activities by the respondents for the previous day, which might be considerably different from their average days. Therefore, our study findings need to be cautiously viewed with the acknowledgment of this limitation.

Despite these limitations, our study has a few strengths. Our primary predictor time used in unpaid domestic work is a continuous variable captured through time-use data, which allowed us to assess the difference in the outcomes with unit change in time, as opposed to being a categorical variable. We argue that given that at most times in the Indian context, spending time in unpaid domestic work is inevitable, capturing the intensity of the burden of the predictor on the outcomes was a key strength. The second strength of our study lies in its intersectional approach. We did not just conceptualize our primary predictor as a determinant of the outcomes, but also went beyond at looking the differential

effects of the relationship across gender, which was largely missing from previous literature [25]. Additionally, we went a step ahead to show how the time-spent on productive academic work could potentially moderate the relationship, taking a solution-based approach in our research.

Implications and conclusion

Continuing education is potentially one of the most important avenues for enhancing learning outcomes among adolescents and young adults. By unpacking the role of unpaid domestic work on educational outcomes, our findings highlight a novel pathway to ensuring better educational outcomes. While we argue that time spent on unpaid domestic work is at most times inevitable, because of financial constraints in the households or social norms, our findings highlight the importance of creating a balanced time expenditure in the household for the adolescents and young adults that ensures adequate spending of time in academically productive work. For socioeconomically disadvantaged children this becomes more critical, since other resources to achieve educational goals are often limited. We therefore also argue that providing intensified attention to them through arranging remedial classes, or by simply encouraging their participation in the regular class-based activities might stimulate their learning as a short-term measure. Previous research has shown substantial positive of remedial education among Indian students who were poor academic performers [45]. The role of non-governmental organizations can be emphasized here, with more targeted approach to create an enabling learning environment for the underprivileged children in gaining experience with educative sessions, counselling guidance, and engaging them in academic activities, especially in rural areas of India. Our findings also urge for policy-level actions with the aim at ensuring quality basic public infrastructure to all and to minimize the need for extended time doing routine household work.

At the same time, creating economic opportunities for girls' post-education could go a long way in changing the social norms around undervaluing education for women. By providing pathways to employment, initiatives could challenge the entrenched gender roles within households and promote greater gender equality. Additionally, raising awareness about the negative impacts of the gendered division of labor is crucial. It can encourage a cultural shift towards valuing education equally for both genders and expanding the range of choices available to young women for paid employment.

Our findings also highlight the importance of time-use data in making informed policies [46]. Currently, we could locate only a handful of surveys focused on adolescents and young adults in India, that captures time-use data. The understanding of an adolescent's life through time-use has many perks including unpacking the relative importance of time spent on different activities within and outside home, which could allow us to potentially assess many important public health and educational outcomes.

Finally, our study warrants the attention of future researchers in the area of education, public health, and gender to assess causal relationships of the research in context. Robust quantitative research is required to establish causality of the question in context. Further, qualitative studies (or mixed methods studies) could be designed to comprehensively document the effect. Such studies would be helpful in

addressing the challenges and understanding the facilitators of motivation (and acceptability) of efforts to increase productive work time for children and young adults.

In conclusion, our study highlights the influence of unpaid domestic work on educational outcomes among Indian adolescents and young adults. It revealed that time spent on household chores was associated with lower school enrollment, greater dropouts, and poorer learning outcomes. These findings, therefore, underscore the need for targeted interventions to reduce the burden of unpaid work and promote balanced time management, enabling more productive academic engagement within the household. We finally argue that addressing these issues is crucial for enhancing educational achievements and seizing the demographic dividend in India, emphasizing the importance of gender-sensitive policies and support systems for the youth.

Declarations

Author Contribution

Anupam and Ankita wrote the main manuscript text and Anupam analyzed the data and prepared the Tables. All authors reviewed the manuscript.

Data Availability

The dataset used in this study can be freely accessed through https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/RRXQNT

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