The association between individual and village level demographic characteristics and age at first marriage among married adolescents in rural Niger: a spatial analysis.

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Introduction

Niger has the highest prevalence of child marriage in the world, with 76% of women aged 20-24 married by the age of 18; nearly 40% of these marriages occur before the girl reaches 15 years of age.(1) These child brides quickly become child mothers, with 74% of women aged 20-24 years having given birth as adolescents. As a result, Niger has the highest adolescent fertility rate in the world with 201 births per 1000 adolescents aged 15-19. Early childbearing in Niger leads to high levels of overall fertility: Niger also has the highest fertility in the world, with an average of 7.6 children born to each woman, a level of childbearing which has remained largely unchanged for the last 40 years.(2, 3). Unsurprisingly in this context of high fertility, contraceptive use is extremely low, with only one in eight married women reporting modern contraceptive use.(1)

Research documents substantial linkages between early marriage, early childbearing, and adverse health consequences for both the mother and her children.(4, 5) To compound these vulnerabilities, the high levels of early marriage and fertility in Niger exist in a context of an extremely understaffed health system; the density of doctors, nurses and midwives serving its population of 21.5 million is among the lowest in the world.(2, 6) These factors all contribute to some of the most sobering health statics of any country. Niger ranks 17th globally in terms of maternal mortality ratio, at 553 maternal deaths/100,000 live births, and has the 10th highest under-five mortality rate, at 96 deaths/1,000 live births.(7, 8)

Gender equity is extremely compromised in Niger, above and beyond elevated levels of early marriage and fertility. While education and literacy are low overall, they are substantially more depressed in women than men. Only 9% of women receive at least secondary education (compared with 20% of men), and only 14% of women are literate (compared with 42% of men).(1) 60% of women believe that wife-beating is justified (more than twice the number of men who report this belief). The demand for family planning satisfied by modern contraceptive methods is only 41% .(1)

Lower levels of education are associated with child marriage both within Niger and across the region.(1, 9-11) A similar relationship is seen with household wealth. Over the last twenty-five years, West Africa has seen a decrease in child marriage among the wealthiest 20% of women, while levels of child marriage in the poorest 20% are actually increasing over time.(9) Residence is also strongly associated with child marriage in West Africa, where child marriage tends to be concentrated in rural, rather than urban, areas.(9-11) Child marriage also varies by ethnic group, with the highest prevalence in Niger seen among the Hausa.(11) These geographic and economic factors influence decisions on marriage via the tradition of grooms' families offering a "bride price", thus creating direct economic incentive to girls' families for early marriage, in addition to the indirect benefits of one less family member to feed and care for, and the elimination of risk of social stigma associated with premarital sex or pregnancy (CITE HERE FOR W.A). Finally, migration experiences influence child marriage, as younger generations migrate away from their natal communities, especially toward urban areas in search of employment, in the process lessening their exposure to traditional norms regarding social rules and expectations (12).

It is critical to recognize, however, that these statistics are not uniform throughout the country. Median age at marriage ranges from 15.4 to 19.5 across Niger's ten regions, and similar variations are seen in other key

health and equity measures.(1) Not only are child marriage and fertility influenced by myriad social and structural factors, these factors, and their relationships with one another, vary across social and geographic contexts suggesting social normative influences that transcend simple demographic associations.(13-16) Spatial demographers assume that place is an important determinant of attitudes and behaviors, both because geographic features can inhibit or facilitate behaviors (for instance distance to a health clinic) and perhaps, more importantly, because it is through spatial clustering of people that clustering of norms typically occurs. (17, 18) While people with similar characteristics typically choose to interact with each other, a concept known as homophily (19), people who are geographically proximal to each other can also become more alike due to shared exposures or direct social influence. From a spatial analytic perspective, an outcome of interest is *spatially dependent* when people in close proximity to each other are more likely to share certain characteristics in common with each other than with people who live at a greater distance.(17) *Spatial heterogeneity (also known as spatially varying relationships)*, on the other hand, refers to situations in which relationships among variables differ according to place.(17) Both spatial dependence and spatial heterogeneity can be important markers for social norms.

In norms theory, we understand individual behavior as being determined by the attitudes, expectations, and behaviors of important others, or those within a person's *reference group*. Ideally, in norms research, reference groups would be identified through the use of discrete social network ties (20, 21), but in much health and development research such data are lacking. Instead, researchers looking for evidence of norms generate data with measures across more crude social units, in which social ties are inferred, such as residents of the same village or neighborhood (the concept behind DHS clusters) to determine whether there is inter-cluster variation. High levels of variation across these spatial units are viewed as evidence of variability in norms (22). This is also true of spatial heterogeneity. If the impact of education on fertility levels, for example, varies by geographic area, this suggests that there may be geographic-specific social effects that are driving the behavior beyond the expected association of, for example, educational levels and fertility (23). These sorts of insights have important implications for policy applications, as varying levels of social reinforcement and expectations around behaviors of interest can mean very different strategies for engaging with behavioral change.

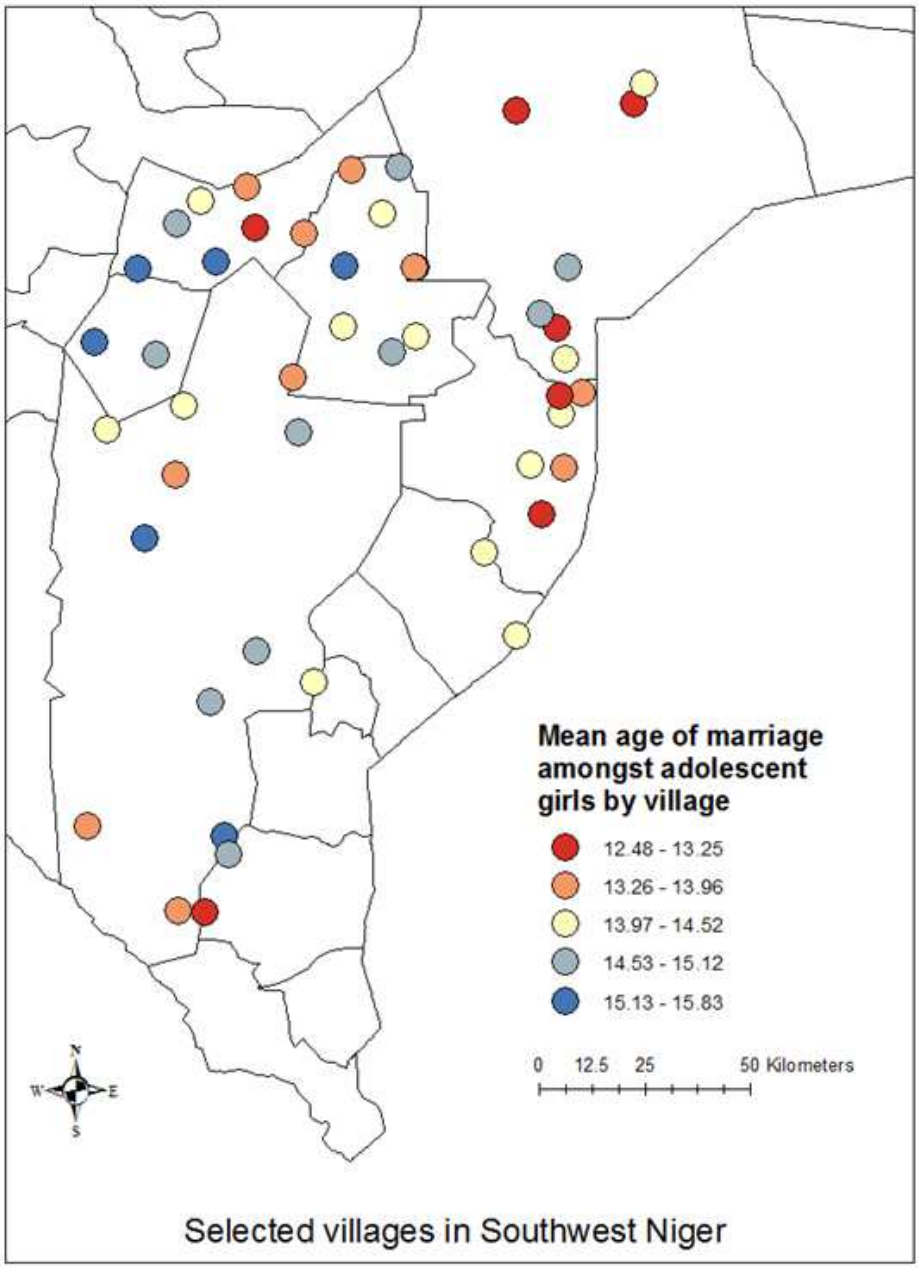
Understanding these potential normative influences across geographic areas within a country is not only a critical next step in dissecting coverage of essential health services and determinants of health outcomes, but allows for a more nuanced and informed means of addressing those inequitable gaps.(24) The goal of this paper, therefore, is to test whether village level factors predict age of marriage for a group of married adolescent girls in rural Niger, accounting for her own demographics, and to then test whether the association of those village level factors varies geographically. We first consider the individual level demographic predictors of younger age of marriage. We then aggregate those significant factors at the village level to determine whether independent of a girl's own demographic measure, the impact of that factor is strongly associated at the village level. Finally, we test for spatial heterogeneity. Do the village level associations we find differ geographically?

Methods

Study Setting

Niger – a land-locked country in Francophone West Africa – is the second most gender inequitable country in the world according to the UN's Gender Inequality Index (ranked 154 out of 155 countries) (25, 26). While comprehensive data on Niger is limited, the Demographic and Health Survey is one of the main sources of information on socio-demographics, health, fertility, and gender equity (Institut National de la Statistique & ICF International Enquête, 2013). With the DHS data as a background, in this research we analyze data that

were collected across 48 villages clustered within the Dosso, Doutchi, and Loga districts in the Dosso region of Niger as part of the baseline data collection (i.e., no intervention activities had been implemented at the time of data collection) for a cluster randomized control trial evaluating a family planning intervention (see Figure 1). Villages were randomly selected based on the following inclusion criteria: 1) having at least 1000 permanent inhabitants; 2) primarily Hausa or Zarma-speaking (the two major languages of Niger); and 3) no known recent intervention specifically around family planning or female empowerment with married adolescent wives or their husbands. Both intervention and control villages from the RCT are included in this analysis.



Selected villages in Southwest Niger

Participants

Twenty-five married female adolescents ages 13-19 years old from each of the 48 villages (N=1200) and their husbands (N=1200) were randomly selected from a list of all eligible married female adolescents provided by each village chief. Eligibility criteria for the married female adolescents include: 1) ages 13-19 years old; 2) married; 3) fluent in Hausa or Zarma; 4) residing in the village where recruitment was taking place with no plans to move away in next 18 months or plan to travel for more than 6 months during that period; 5) not currently sterilized; and 6) providing informed consent to participate in the study. Of those who were randomly selected, 81.6% participated in the baseline survey. No significant differences in wife age, husband age, or time spent away from the village were observed across those who did and did not participate. An equal number of respondents was chosen from each of the three districts.

Data Collection

Separate surveys with the young women and their husbands were conducted by sex-matched trained research assistants from the Dosso region who could fluently read and speak French and fluently speak Hausa and/or Zarma. Research assistants visited the randomly selected households and conducted a Household Recruitment Screener to confirm eligibility. If the household was found not to include an eligible wife and husband, a randomly selected replacement was recruited in their place. Up to three visits were made to each of the selected participants; if they could not be reached after three attempts, no additional efforts were made.

Surveys were administered in a private location (out of earshot of another person, a place the participant indicated as private, typically in an outside area) in the village. Surveys were conducted in either Hausa or Zarma language, depending on participant's language preference. The survey took approximately 40-60 minutes to complete and was administered using pre-programmed tablets. The encrypted, de-identified data were uploaded via secure internet connection on a weekly basis. We compiled the data into dyadic husband/wife observations to be able to include measures from both into our analyses.

Measures

Outcome variable: We asked wives the age they were when they were married.

Sociodemographic predictors: Sociodemographic data were collected from the head of household, most often the husband, but in some cases, this included both husband and wife's reports. As a large age difference between husbands and wives is often associated with gender inequality, we included the difference between husband's and wife's ages in years. We measured education of both husbands and wives as a numeric measure from 0-3, with 0 representing no formal schooling, 1 incomplete primary, 2 completed primary, and 3 as past primary. We also included a binary measure for both husbands and wives of having received Quranic education. We assessed family wealth using the standard household assets list (27) which we summed for each item that was reported in the home: a watch, a mobile phone, a bicycle, a motorbike or scooter, a car or truck, or an animal drawn cart. We included a binary measure of whether or not the wife reported having worked outside of the home in the past 12 months. We also included a measure of food insecurity that asked whether in the last month the respondent or any member of the respondent's family went without eating the whole day because there was not enough food. Finally, we included number of children born to that couple, whether the couple lived with the extended family, the number of wives the husband had, tribe and district.

Village level aggregate measures: for individual demographic variables that were significantly associated with age at marriage at $p<0.10$, we created non-self village level aggregate measures, either means or proportions depending upon the variables. Non-self means and proportions are those in which the village level aggregate value for each individual is calculated minus their own value, divided over N-1 as the denominator.

Statistical approach

We first ran multivariate linear regression analyses looking at the demographic predictors of age at marriage at the individual level. For variables significant at $p<0.10$ at the individual level, we tested between-village variation, using a -2 log likelihood ratio test in which we compared the -2 log likelihood of a null model against a multilevel model clustering on the village. For those variables which showed significant between-village variation, we created village-level aggregate measures. We ran multilevel models looking at the association between village and individual level factors and individual age at marriage, clustering on the village. For those village level factors that were significantly associated with individual level age at marriage, we then tested their significance with village-level mean age at marriage to determine which factors would be appropriate in a spatial model. We used hot spot analysis in ARC GIS to assess whether there were significant spatial hotspots of younger age of marriage. Finally, we ran geographically weighted regression to determine whether the factors we found that were significantly predictive of mean age of marriage at the village level varied geographically.

Results

Descriptive Characteristics

Table 1 shows the descriptive characteristics of the sample population. The mean age of wives within the sample population was 17.32 years (SD 1.54), while the mean age of husbands was 25.25 (SD 5.34). Husbands were on average 8.12 years (SD 5.02) older than their wives. The mean age of marriage for women was 14.20 years of age (SD 1.82), and 13% of marriages were polygamous. Approximately 41% of women reported working outside of the home, almost all of whom reported in a subsequent question that the work they did was agricultural, and not for pay.

Table 1: Descriptive statistics

	Mean	SD	%
Wife's current age	17.32	1.54	
Husband's current age	25.52	5.39	
Wife's education 0-3	0.51	0.79	
Husband's education 0-3	0.74	0.89	
Quranic school Wives			25%
Quranic school Husbands			34%
Wife's age at marriage	14.20	1.82	
Age difference between spouses	8.12	5.02	
Household assets 0-6	2.05	1.16	
Food insecurity			22%
Wife agricultural labor			41%
Number of children	0.91	0.98	
Live with extended family			82%
Polygamous			13%
Tribe Hausa			30%
Tribe Zarma			70%
District Dosso			32%
District Doutchi			33%

District Loga	35%

Sociodemographic associations with wife's age at marriage

We ran a multivariate linear regression model to determine the main sociodemographic predictors of a wife's age at marriage (see Table 2). In our initial exploration of the data, we found evidence of a non-linear relationship between spousal age difference and age at marriage, which led us to include a quadratic term in the model. We found that as the age difference between spouses increases, the age of marriage for an individual wife decreases, however at approximately 15 years of age difference and above (approximately 10% of the population) this trend reverses, and individual age of marriage slightly increases. Consistent with other research, women's education was inversely related to age at marriage, with a small but significant increase in age at marriage (0.14 years 95% CI 0.03-0.25) for each 1 SD increase in education. Women who reported agricultural work were likely to marry almost one year younger (-0.92 years 95% CI -0.70 - -0.94) than those who did not report agricultural work, while women who were in polygamous versus monogamous marriages were likely to marry almost one year older (1.05 years 95% CI 0.68-1.42). Also of note is that there were significant district-level effects: those in Doutchi were likely to marry at a younger age (0.80 years 95% CI 0.13-1.47) than those on Loga or Dosso. We found no significant associations with age at marriage and husband's education, household asset status, or household food security. Using the variance inflation factor test in R, we determined that there was no collinearity between the variables in this model.

Table 2: Demographic associations with age at marriage: multivariate linear regression individual level analysis. N=982

	Coef	SE	P
Age difference husband/wife	-0.23	0.03	0.00
Age difference husband/wife quadratic	0.01	0.00	0.00
Education Wife	0.20	0.07	0.01
Wife agricultural work	-0.92	0.12	0.00
Polygamous	1.05	0.19	0.00
Education Husband	-0.03	0.06	0.62
Household assets	0.08	0.05	0.10
Food security	0.05	0.13	0.69
Extended family	0.10	0.14	0.49
Qur'anic education Husband	-0.15	0.13	0.26
Qur'anic education Wife	0.09	0.15	0.52
Tribe Hausa (ref)			
Tribe Zarma	-0.50	0.34	0.14
District			
Doutchi	-0.79	0.34	0.02
Loga	0.25	0.14	0.07

Dependent variable = wife's age at marriage

Between-village variation

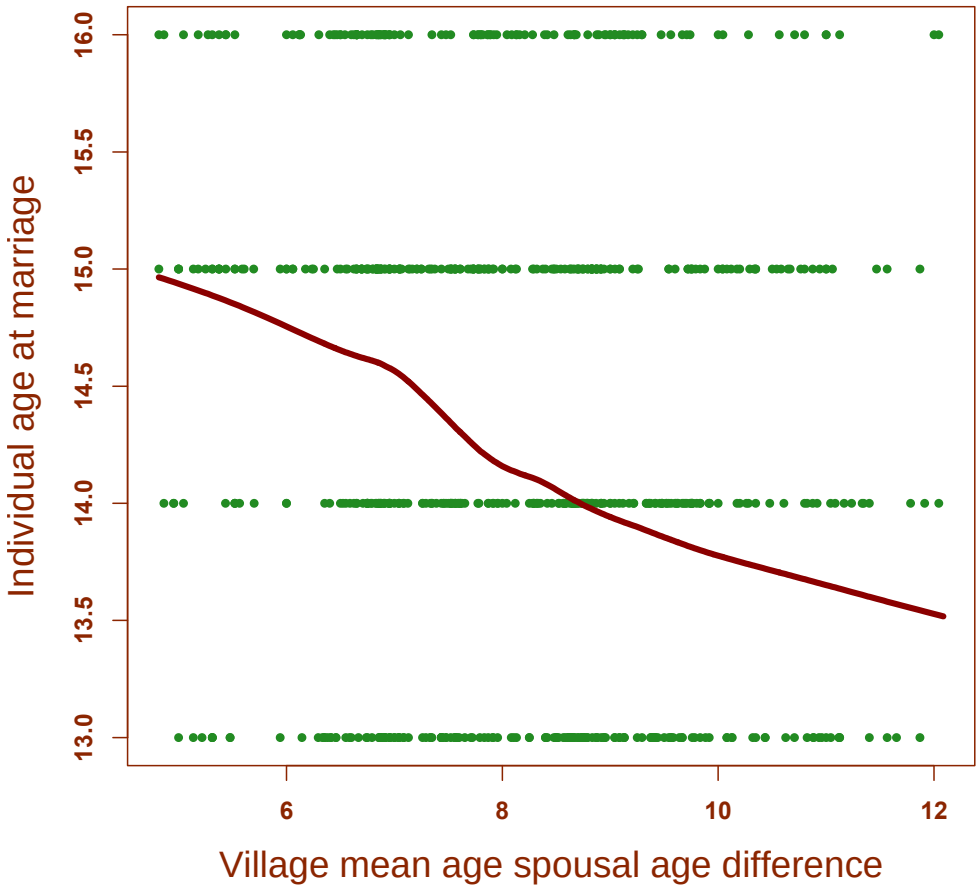
The -2 log likelihood test for between-village variation was significant for wife's age at marriage, as well as for those individual demographic factors predictive of it: age difference between spouses, women's education, women's agricultural work, and polygamous marriage status. Table 3 shows the village-level means and

proportions of these variables as well as their ranges. Mean age of marriage in the population sample as a whole was 14.21, while the mean age at marriage across villages ranged from 12.42-15.93. Similarly, while the average difference in age between spouses was 8.18, the mean across villages ranged from 4.82-12.09. The proportion of women who reported agricultural work varied the most between villages, with some villages having no women who reported agricultural work, while in others all women reported agricultural work. Figure 2 shows the variance in mean age at marriage by village.

Table 3: Village level means and proportions of characteristics associated with marriage at a younger age, 48 villages

	Mean	Range
Age at first marriage	14.21	12.42-15.93
Age difference between spouses	8.18	4.82-12.09
Women agricultural work	0.42	0.00-1.00
Number of wives>1	0.13	0.00-0.38
Women's education	0.51	0.04-1.13

Figure 2 shows village-level residuals depicting the difference in village-level mean age at marriage compared to mean age of marriage across the entire sample. Villages significantly different than the mean have residual lines that do not cross the line at 0.



Village level aggregate measures as predictors of age at marriage

In Table 4 we show the results of our full multi-level model analysis of village and individual level factors as predictors of age at marriage. Model 1 shows the null model, with an intraclass-correlation coefficient of 15%, suggesting that 15% of the variance in an individual girl's age at marriage is accounted for by factors at the village level, or in other words, 15% of the proportion in variance is accounted for by village-level clustering. In Model 2 we include the four village-level variables that we constructed from the significant individual predictors of age at marriage. We find that when included in a model with mean age difference between spouses and village-level proportion of wives who do agricultural work, the proportion of polygamous marriages in the village, and mean level of women's education lose significance. In this model, 6% of the unexplained variation in age at marriage still occurs at the village level, even after inclusion of several village-level factors. In Model 3, we included only individual-level factors. The ICC was 8%, suggesting that some of the variance in age at marriage at the village level can be explained by village-level differences in those individual factors. Finally, Model 4 includes village-level and individual-level factors. Inclusion of proportion of women who work in the village, and village-level mean age difference between spouses in the model with individual characteristics accounts for 40% of the unexplained village level variance from model 3 (a reduction from 8% to 5%). The individual level characteristics identified in the earlier model retain significance while additionally we understand that marriage age differs by village, predicted partially by the proportion of women in that village who do agricultural labor, and the village level average difference in age between spouses. Figures 3 and 4 show the inverse relationship between village-level mean age difference between spouses, and village-level proportion of women who do agricultural work and their relationship with individual age at marriage.

Table 4 Multi level model showing individual and village level characteristics predictive of age at marriage, and proportion of variance accounted for.

	Null Model (1)	Village level only (2)			Individual characteristics (3)			Village characteristics (4)		
		Coef	SE	P	Coef	SE	P	Coef	SE	P
Proportion polygamous		0.00	0.09	0.99						
Mean women's education		-0.02	0.09	0.82						
Proportion of women agricultural work		-0.42	0.08	0.00				-0.39	0.09	0.00
Mean age difference between spouses		-0.24	0.09	0.01				-0.15	0.08	0.08
Age difference husband/wife					-0.22	0.03	0.00	-0.22	0.03	0.00
Age difference husband/wife quadratic					0.01	0.00	0.00	0.01	0.00	0.00
Quranic education Husband					-0.07	0.13	0.60	-0.07	0.13	0.60
Quranic education Wife					0.03	0.15	0.84	0.04	0.14	0.77
Education Wife					0.19	0.07	0.01	0.19	0.07	0.01
Education Husband					-0.02	0.06	0.74	0.00	0.06	0.94
Household assets					0.04	0.05	0.39	0.01	0.05	0.81
Food security					0.05	0.13	0.72	0.01	0.13	0.97
Wife agricultural work					-0.66	0.13	0.00	-0.48	0.13	0.00
Extended family					0.13	0.14	0.37	0.13	0.14	0.35
Number of wives					0.86	0.16	0.00	0.90	0.16	0.00
Tribe Hausa (ref)										
Tribe Zarma					-0.42	0.49	0.39	-0.05	0.45	0.91
District										
Doutchi					-0.73	0.50	0.15	-0.18	0.46	0.69
Loga					0.17	0.22	0.43	0.47	0.19	0.02
Group Level Variance	0.50	0.19			0.24			0.13		
Individual Level Variance	2.80	2.82			2.54			2.52		
ICC	15%	6%			9%			5%		
AIC	3878	3861			3789			3772		

Model 1 results suggests that 15% of the variance in individual age at marriage is due to differences between villages. We see that in model 2, 6% of the unexplained variation in age at marriage still occurs at the village level, even after inclusion of several village level factors. In Model 3, we included only individual-level factors. The ICC dropped to 8%, suggesting that some of the variance in age at marriage at the village-level can be explained by village-level differences in those individual factors. Finally, Model 4 includes village-level and individual-level factors. Inclusion of the proportion of women who work in the village, and the village-level mean age difference between spouse's accounts for 40% of the unexplained village-level variance from model 3. The individual-level characteristics identified in model 3 retain significance while additionally we understand that marriage age differs by village, predicted partially by the proportion of women in that village who do outdoor labor, and the village level average difference in age between spouses.

Figure 3: Lowess smoothing plot showing the inverse relationship between spousal age difference and girls age at marriage. Dots represent individual women.

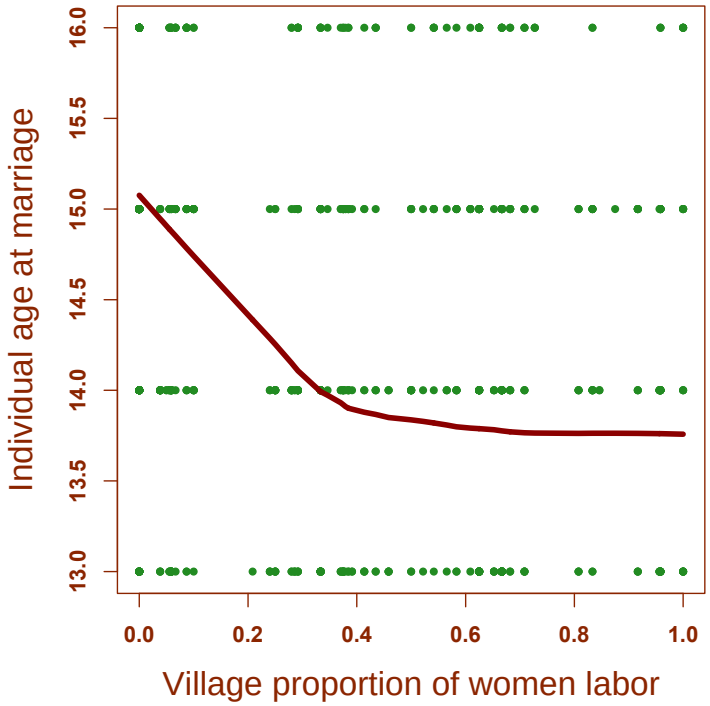
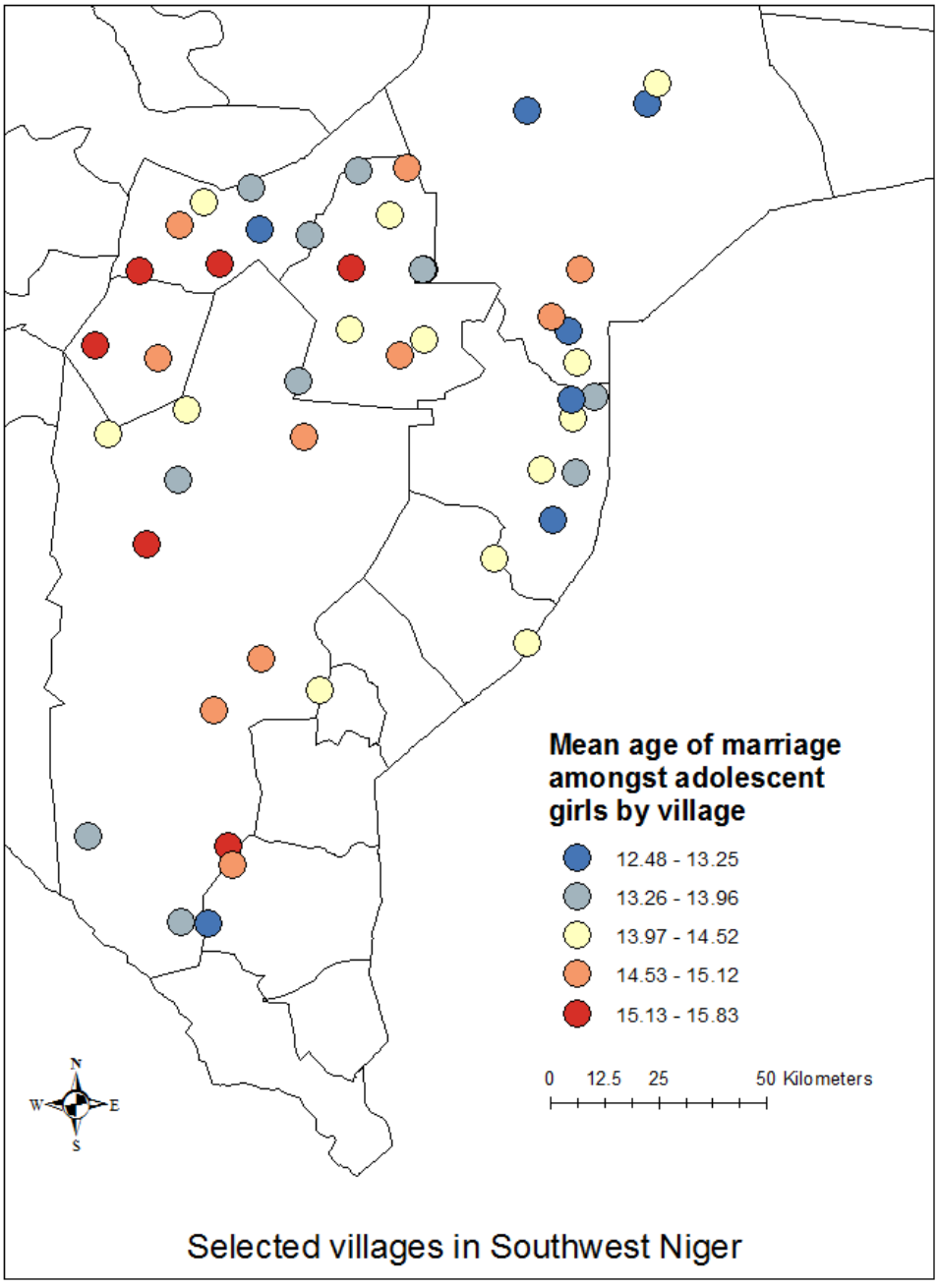


Figure 4: Lowess plot showing the inverse relationship between proportion of village who do outdoor labor and age at marriage. The plot suggests that the mean age of marriage decreases until about 40% of the population engages in agricultural work, then levels off afterwards.



Spatial analysis:

Figure 3 is a map of the study population, depicting the geographic difference in village-level mean age at marriage. To determine whether there is significant spatial clustering of mean age at marriage across villages,

we conducted a hot spot analysis using Getis-Ord Gi Hot Spot Analysis in ArcMap with a fixed distance band determination for clustering. Our results suggest a small cluster of villages in which the age of marriage is higher in the Eastern region, and a small cluster of villages in which the average age of marriage is higher in the Western region.

We then proceeded to run a geographically weighted regression analysis, building upon the results of the OLS model shown in Table 5 in which we identify mean village age difference between spouses and proportion of women who do agricultural work as significant predictors of village level mean age at marriage ($R^2 = 0.52$). Our analysis suggests that the village-level factors do vary geographically in their influence on age at marriage, with the stronger associations taking place in the Western regions, and weaker associations taking place in the Eastern regions. We find that the R^2 for the analysis in the Western regions is greater by a factor of more than 2 compared to the R^2 for the same analysis in the Eastern regions (0.59-0.63 vs 0.25-0.26), suggesting that there are factors in the Eastern region that are associated with age at marriage that are not accounted for in the ordinary linear models.

Table 5 Village level linear regression showing the association between village level aggregate factors and village level mean age of marriage.

Mean village age difference	-0.27	0.06	0.00
Proportion of girls who do agricultural work	-1.43	0.27	0.00
Proportion of village polygamous	1.38	1.06	0.20
Mean village level of education	0.34	0.35	0.34

Figure 5: Mean age at marriage from within a population of married adolescent girls within selected villages in Southwest Niger. Note that mean age at marriage varies significantly by village, although geographically those differences seem somewhat random with possible clustering of higher age at marriage in the Northwest, and younger age of marriage in the Northeast.

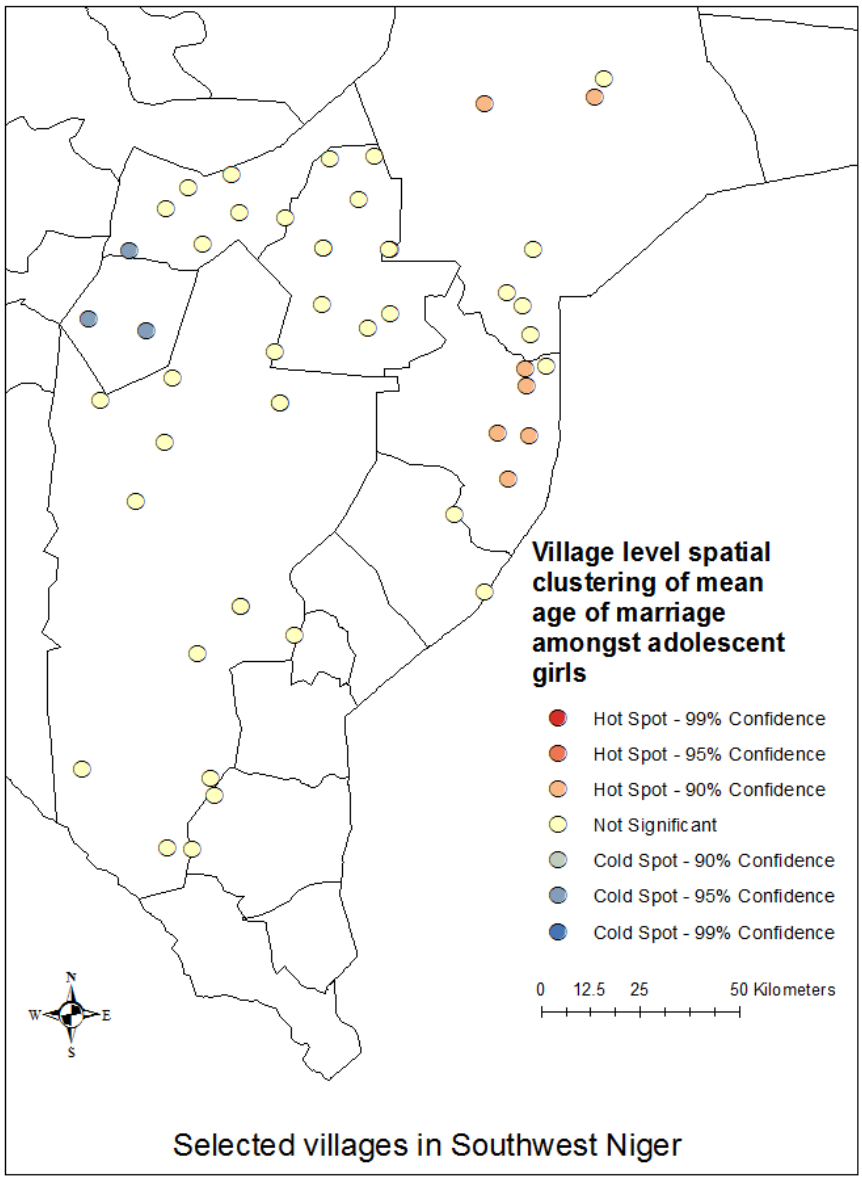
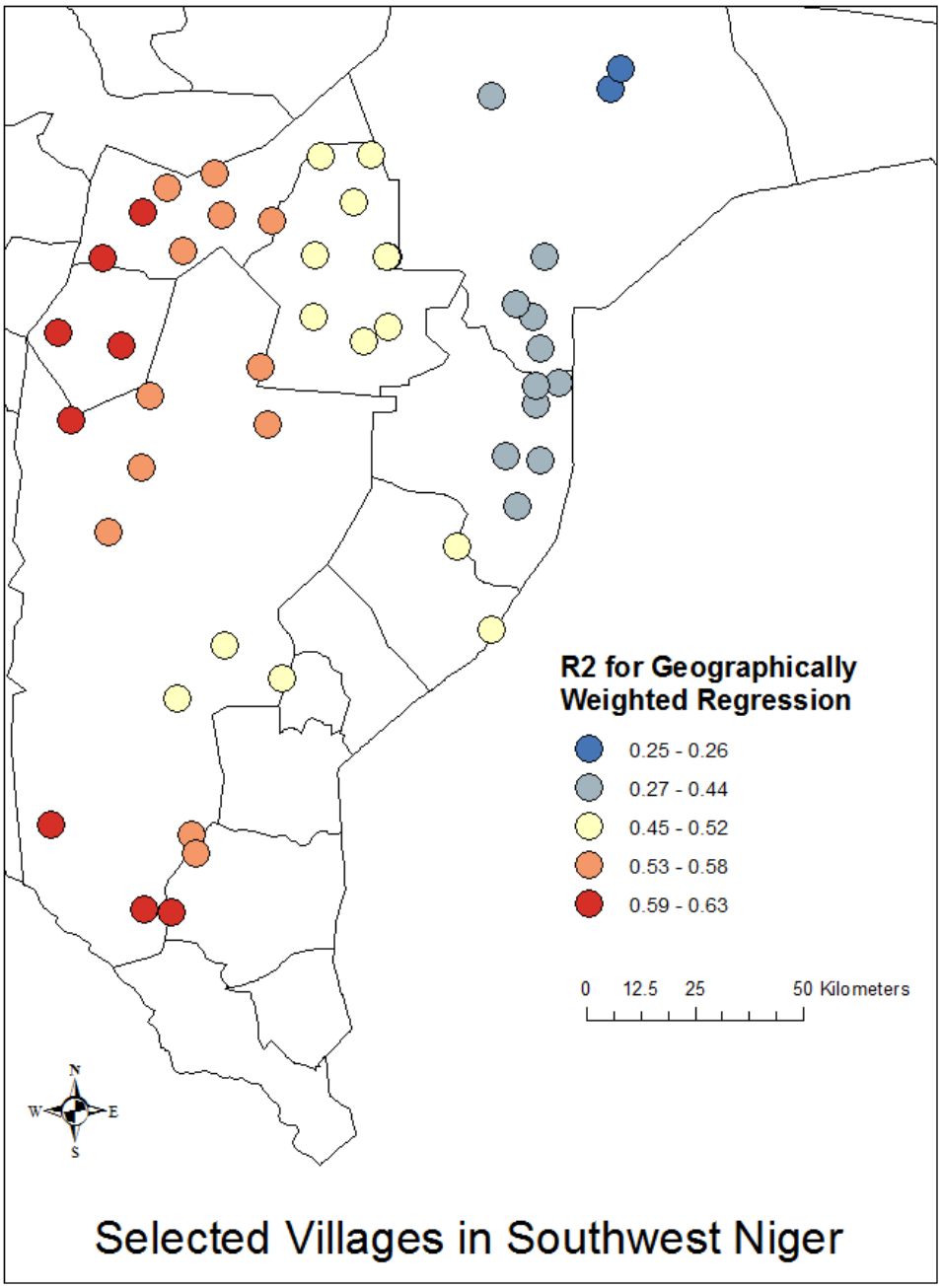


Figure 6: Geographic clustering of mean age at marriage among married adolescent girls in Southwest Niger. Clustering determined using Getis-Ord Gi Hot Spot Analysis in ArcMap with a fixed distance band determination for clustering. Note clusters of very young age at marriage near the eastern border with Nigeria. These results confirm a small cluster of higher age of marriage in the east, and a small cluster of lower age of marriage in the west.



Discussion

The purpose of this paper has been to examine the marriage age patterns of Nigerien women living in the Dosso region. Mapping age of marriage at the village level revealed the following conclusions: (1) There are significant geographical variations at the village level in age at marriage for married adolescents in the Dosso region, identifying hot spots where age at marriage is particularly low, (2) Certain village-level factors significantly influence these variations and their influence is more pronounced in Western Dosso than Eastern Dosso.

Villages with lower ages of marriage are most concentrated in the Eastern and Northern parts of the Dosso region, containing the Doutchi and Loga sub-regions. In recent years, these regions have suffered greater financial distress and food insecurity than the southern sub-region of Dosso, primarily because of limited access to water sources, extreme drought, and the desertification of the plateau regions that make up large swaths of Loga and Doutchi (*30)*. Amid the diminishing employment opportunities and severe inflation, young Nigerien men in these regions have been increasingly unable to afford the expected sadaki, or bride price, to his future wife's family (*Masquelier, 2005)*. In reaction to this, the Islamic reform movement known as Izala has promoted significantly reducing sadaki to a token sum that men are able to easily accrue in a short amount of time; this break from traditional customs has been enthusiastically embraced by many young Nigerien men who otherwise would not have been able to afford to get married (*30)*. Families with no other options than to accept a low bride price payment are primarily those whose daughters have no other suitors and need to alleviate financial stress by having one less family member to provide for. These girls tend to be younger and typically move in with their in-laws and act as an additional labor source to help cultivate their land (*30)*. The need for female participation in agriculture develops strong economic motivations for child marriage (*31).* Because Nigerien families in the lowest wealth quintile have, on average, less people living on their compounds, obtaining additional support with land cultivation is a higher priority, and girls are incorporated into their in-law's compounds at an earlier age (*30)*.

The people of the greater Dosso region are primarily from the Zarma tribe, except for the eastern sub-region of Doutchi, which is majority Hausa (*30)*. Institutions set up by the French during their colonization of Niger created an imbalance of power and economic opportunities between the two tribes, with greater resources, employment opportunities, and political power afforded to the Zarma people. As a result, the Hausa people in Southern Niger remain less economically stable than their Zarma neighbors (32-33). This imbalance could explain the eastern cluster of lower age at marriage, as poverty is a key driver of child marriage. Additionally, the Hausa tribe in Niger reports a higher prevalence of child marriage than the Zarma tribe (30*)*.

The majority of the Dosso region cultivates millet as the main subsistence and income generating crop. However, the Doutchi sub region primarily grows treenuts, which are more labor intensive, less profitable, and more reliant on a consistent water source than millet (28).The decreased outputs of treenut cultivation in comparison to millet farming could explain the clustering of villages with lower age of marriage in Doutchi, as families with less economic resources often need to marry their daughters off earlier to alleviate financial strains *(28)*. The Northernmost portion of the Dosso region has less favorable agricultural conditions than the southern section of Dosso (30). The soil is less fertile and there is limited access to water sources needed for irrigation of cash crops; these factors significantly diminish the economic stability of the area and may be contributing factors to the northern cluster of younger age at marriage shown in the spatial analysis.

Information from ethnographic research conducted six months into the RMA program implementation may also lend possible explanations of the between-village variation and the impact of village level factors in age at marriage. It was observed in this analysis that women in polygamous marriages are, on average, one year

older than women in monogamous marriages. A potential explanation lies in Nigerien customs on how arranging marriages differs depending on the husband's current number of wives. Several transcribed interviews with adolescent wives, their husbands, and members of their social networks, indicated that a man's first marriage is traditionally arranged by his parents; this marriage is intended to find a girl who will live with his parents and help with the household chores (Abdoulaye Ousseni, personal communication, September 15, 2017). In the cases when girls are married before reaching puberty, the bride will stay at her parents' or her in-laws house until she has reached maturity, at which point she moves into her marital home. Sexual relations between husband's and their first wives customarily do not begin until after the wife reaches puberty and living in her marital home; it is frowned upon for men to initiate sexual intercourse with their wives before this transition (28). Second wives, on the other hand, are mostly divorced women or are new to the village and tend to be slightly older (Ousseni, personal communication). Divorce in Nigerien culture is very common, especially in the rural areas of southwestern Niger, where upwards of 50% of marriages end in divorce (28). A husband can divorce his wife simply by repeating a phrase called the *Talaq* three times; after his declaration, the marriage is officially dissolved (29).

Overall, the findings from these analyses provide key insights for identifying key factors associated with age at marriage. These findings can help dissect coverage of essential health services and determinants of health outcomes, and allows for a more nuanced and informed means of addressing these inequitable gaps. Specifically, intervention efforts can be more targeted in addressing this important issue.

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