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# Geographical location as a determinant of caregiver burden: a rural-urban analysis of the informal caregiving, health, and healthcare survey in Ghana

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## Abstract

**Background** The caregiving scholarship widely acknowledges informal caregivers' contributions to maintaining older adults' health and well-being. However, informal caregivers encounter economic, physical, social, financial and psychological challenges when caring for older adults. The caregiving literature has shown variations in caregiving intensity and motivation between rural and urban informal caregivers of older adults. This situation is likely to result in rural-urban disparities in caregiver burden. However, the literature on predictors of caregiver burden is more focused on demographic, socio-economic, caregiving and health-related factors with very little attention to geographical dynamics. For this reason, the effects of demographic, socio-economic, caregiving, and health-related factors on the variations in caregiver burden between rural and urban informal caregivers of older adults are yet to be known in the sub-Saharan African context, including Ghana. Notably, the impact of geographical location on caregiver burden is mainly missing in the informal caregiving literature in Ghana. Situated within the stress process model, we determine the association between geographical location and caregiver burden among informal caregivers of older adults in Ghana.

**Methods** This study employed data from a large cross-sectional survey on informal caregiving, health, and healthcare among caregivers of older adults aged 50 years or above ( $N=1,853$ ) in Ghana. We selected the World Health Organization Impact of Caregiving Scale to measure caregiver burden. Generalized multivariable linear regression models were employed to determine the association between geographical location and caregiver burden among informal caregivers of older adults. We reported beta values and standard errors with significance levels of 0.05 or less.

**Results** The results showed that rural informal caregivers of older adults significantly have a decreased caregiver burden compared to urban informal caregivers ( $\beta = -1.64$ ;  $SE = 0.41$ ). Also, participants across all the self-rated health categories (poor/very poor:  $\beta = 12.63$ ;  $SE = 1.65$ ; fair:  $\beta = 9.56$ ;  $SE = 1.07$ ; good:  $\beta = 11.00$ ;  $SE = 0.61$ , very good:  $\beta = 7.03$ ;  $SE = 0.49$ ) have a significantly increased caregiver burden for the full sample and for both rural (poor/very poor:  $\beta = 13.88$ ;  $SE = 2.4$ ; fair:  $\beta = 6.11$ ;  $SE = 1.62$ ; good:  $\beta = 9.97$ ;  $SE = 0.96$ , very good:  $\beta = 6.06$ ;  $SE = 0.71$ ) and urban (poor/very poor:  $\beta = 11.86$ ;  $SE = 2.25$ ; fair:  $\beta = 12.33$ ;  $SE = 1.42$ ; good:  $\beta = 11.80$ ;  $SE = 0.79$ , very good:  $\beta = 7.90$ ;  $SE = 0.67$ ) participants.

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This study further revealed that participants with no financial support needs reported a decreased caregiver burden compared to those with financial support needs for the full sample ( $\beta = -2.92$ ,  $p$ -value  $< 0.01$ ) and for both rural ( $\beta = -3.20$ ;  $p$ -value  $< 0.01$ ) and urban ( $\beta = -2.70$ ;  $p$ -value  $< 0.01$ ) participants.

**Conclusion** The findings from this study underscore geographical location differences in caregiver burden among informal caregivers of older adults in Ghana. Given these findings, the need to consider geographical location variations in providing welfare and health support programs to lessen caregiver burden among informal caregivers of older adults is welcomed. In line with the stress process model, such welfare and health programs should consider background, context, and stressor factors that contribute to variations in caregiver burden between rural and urban informal caregivers of older adults in Ghana and other sub-Saharan African countries.

**Keywords** Geographical location, Caregiver burden, Informal caregivers, Older persons, Ghana

## Introduction

The rationale for understanding the caregiver burden among informal caregivers of older adults in low - and middle - income countries (LMICs) is anchored in global ageing and health frameworks- the Ageing in Place agenda, global strategy and action plan on ageing and health framework, the United Nations Decade of Healthy Ageing (2021–2030) agenda and the United Nations health-related Sustainable Development Goals. These global ageing and health frameworks serve as a guide in promoting the health of older adults. More importantly, in meeting the goals of these global ageing and health frameworks, health stakeholders should concurrently consider the health-related quality of life of older adults and their informal caregivers. Clearly, in most LMICs like Ghana, it has increasingly been recognized that the tasks of providing care for the growing older population fall mostly on informal caregivers (i.e., family members, friends, and neighbours) who deliver care to older adults who are unable to provide care for themselves [1–7]. Notably, the caregiving scholarship widely acknowledges the contributions of informal caregivers in maintaining the health, functional status, and quality of life of older adults [8–10].

Importantly, in performing their caregiving roles, which mostly take the form of domestic, economic, religious, and healthcare support, informal caregivers encounter physical, mental, social, and financial stresses, known as caregiver burden [11–14]. Regarding the rates of caregiver burden, de Almeida Mello et al. [8] have estimated a 57% prevalence of caregiver burden among informal caregivers of frail older adults in Belgium. In Singapore, Ding et al. [15] found that the prevalence of caregiver burden is 71.8%. In a systematic review, Addo et al. [16] indicated that 71% of informal caregivers face economic burdens of caregiving in sub-Saharan Africa (SSA). In Nigeria, research has shown that 96.7% of informal caregivers experience caregiver burden [17]. More specifically, 74.6% of caregivers of stroke patients report financial burden, 66.9% experience physical burden, 63.6% report psychological burden and 51.7% face

social burden in Ghana [13]. The relatively high level of caregiver burden in SSA can be attributed to the predominantly unpaid nature of caregiving and the lack of opportunity to engage in other viable economic activities [16]. Therefore, these dynamics result in caregivers' poor physical and psychological health and lower health-related quality of life [18–22], which are likely to adversely affect informal caregivers' ability to provide successful and sustainable care. Therefore, this underscores the need to determine the factors associated with caregiver burden in developed and developing countries to inform health policy development.

In a sample of 180 old-age caregivers in Jamaica, James et al. [23] established that socio-economic factors such as age and relationship with care recipients are associated with caregiver burden. In a prospective observational study in an Asian setting, Wang et al. [24] estimated that female, full-time employees and caring for care recipients with higher functional needs are associated with a higher caregiver burden. In their study on caregiver burden and associated factors for respite care needs among family caregivers of community-dwelling older adults in Thailand, Aung et al. [11] reported that age, gender, health status and current smoking patterns predict caregiver burden. In a cross-sectional study on caregiver burden among 150 older adults with chronic illnesses, Limpawattana et al. [25] found that the age of caregivers, self-reported health status and caregiving duration are positively associated with caregiver burden. In a recent study of a sample of 168 caregivers of frail older adults with multimorbidity in Singapore, Ding et al. [15] identified the ethnicity of the caregiver and the increase in time spent providing care in a week as factors positively associated with caregiver burden. In a cross-sectional study with a sample of 610 informal caregivers in Spain, García-Mochón et al. [26] established that having secondary education, performing ungratifying tasks, negative coping with caregiving, and more years of delivering care explain an increased caregiver burden. In South Africa, socio-economic and demographic factors such as gender, age, education, income, and physical health status are

associated with caregiver burden [27]. A systematic study in sub-Saharan Africa (SSA) showed that the level of income, employment status, condition of care recipients and duration of mental illness are negatively associated with the economic burden of caregiving [16]. In Ghana, Okai [13] indicated that caregiver characteristics such as gender, income, employment status, number of tasks performed and other factors such as the presence of comorbidities are associated with caregiver burden. These findings emphasize that demographic, socio-economic, caregiving and health-related factors contribute to caregiver burden in both developed and developing countries [see 8, 13, 15, 16, 24, 27, 28, 29].

Evidence suggests that rural informal caregivers are more motivated to provide care than urban residents [30, 31]. Given this, geographical location is likely to explain caregiver burden among informal caregivers of older adults. Despite this, few studies exist on the association between geographical location and caregiver burden in developed and developing countries (including SSA). For example, in developed countries, Cohen et al. [32] have highlighted that rural informal caregivers are more likely to report an increased caregiver burden due to the COVID-19 pandemic in the United States. Again, Kim et al. [19] on caregiving outcomes sub/urban and rural caregivers in the United States highlighted more significant changes in caregiving outcomes of rural caregivers than urban caregivers. In the developing countries, Sanuade and Boatemaa [5] found that place of residence, provision, and receipt of support services (financial, health and physical support) are associated with caregiver burden in Ghana. Specifically, their study identified that urban informal caregivers have a reduced caregiver burden compared to rural informal caregivers [5], which remains relevant to the literature on geographical location and caregiver burden among informal caregivers of older adults.

Despite the scant information on rural-urban gaps in caregiver burden, previous studies [5, 19, 32] have been silent on the specific factors that separately predict caregiver burden for rural informal caregivers of older adults and urban informal caregivers of older adults. Therefore, literature on how demographic, socio-economic, caregiving and health-related factors contribute to the variations in the determinants of caregiver burden between rural and urban informal caregivers of older adults is missing in SSA, including Ghana. Moreover, to our knowledge, a study that utilizes a large sample size to determine the association between geographical location and caregiver burden among informal caregivers of older adults has yet to be carried out in Ghana [see 5]. Knowing these dynamics may offer valuable information to assist in designing a geographically driven supportive program to

lessen caregiver burden and also improve informal caregivers' health-related quality of life [5, 15, 33].

Building on the published work of Sanuade and Boatemaa [5], we employ the stress process model to (1) examine the association between geographical location (rural-urban divide) and caregiver burden among informal caregivers of older adults, (2) determine if the association between geographical location and caregiver burden among informal caregivers of older adults persists after controlling for potential confounders such as employment status of caregivers, income level of caregivers and self-rated health of caregivers etc., and (3) examine if disparities in background and context (demographic and socio-economic factors) as well as stressor factors (caregiving and health-related factors) explain rural-urban variations in the determinants of caregiver burden among informal caregivers of older adults.

### Theoretical model

Built from the theory of role strain, the stress process model is a theoretical model guiding this study [34, 35]. The stress process model depends on the notion that caregiving is a stressful activity [34]. The stress process model is grouped into four main domains- background and context, stressors (primary and secondary), mediators of stress and the outcomes of stress [34], which help to measure caregiver burden in its totality [5, 34, 36]. First, background and context factors are place of residence, age, gender, ethnicity, educational level, and economic status, which are the characteristics of caregivers that predict caregiver burden [34]. Second, classified as primary and secondary stress, stressors are conditions, experiences and activities described as challenging for caregivers in their quest to provide (informal) care. These stressors threaten, frustrate, and weaken them, hindering effective and efficient care provision [34]. More importantly, caregivers are likely to develop secondary strains where caregiving roles intersect with other family responsibilities [8, 34, 37]. As Pearlin et al. [34] and Raina et al. [38] have argued, the stress process model suggests that primary strains correlate with the characteristics of the care receiver and the level of disability of the care receiver.

In contrast, secondary strains evolve out of caregiving responsibilities. Third, mediators are interventions that affect primary and secondary stressors on caregiver burden [34, 36]. For instance, social support as a mediator variable buffers the effect of primary and secondary strains on the outcomes of stress [34]. Given the purpose of this study, which has already been described, we are not interested in how mediator variables (such as social support and coping strategies) buffer the effects of background characteristics and stressor variables on caregiver burden. Such an analysis is ultimately essential in

creating a complete picture of caregiver burden; however, it is beyond the scope of this study. The fourth domain of the stress process model is the outcome of stress, conceptualized as caregiver burden in this study.

Previous studies have applied the stress process model to study caregiver burden in developed and developing countries. In the United States, for instance, Wang and Nguyen [39] applied the stress process model to understand the correlates of physical and emotional strain among older adults' caregivers. In China, for instance, Yu et al. [40] employed the stress process model to understand the experiences of family caregivers of people living with schizophrenia. In their cross-sectional study in Belgium, de Almeida Mello et al. [8] also employed the stress process model to understand the determinants of informal caregivers' burden in the care of frail older persons. Further, in South Africa, Yabubu and Schutte [27] applied the stress process model to study the association between caregiver attributes and sociodemographic determinants of caregiver burden in low-income communities. Again, Lindt et al. [41] employed the stress process model in a systematic review of overburdening determinants in informal care. In Ghana, Sanuade and Boatemaa [5] employed the stress process model to understand caregiver profiles and determinants of caregiver burden. These published empirical and review works highlight the applicability of the stress process model to study caregiver burden.

In this study, we consider background and context factors to include place of residence, employment, monthly income, etc. We also consider primary stressors to include mobility limitations of care recipients, memory problems of care recipients and self-rated health of caregivers. Secondary stressors comprise caregivers' economic, domestic, healthcare, and emotional roles in care provision, as well as psychological and financial support needs of caregivers. These are our predictor and control variables, whereas caregiver burden is our outcome variable. Our selection of the dependent, independent and control variables in this study was thus informed by the domains of the stress process model [5, 8]. Using the stress process model, therefore, our hypotheses are as follows: (1) Rural informal caregivers will significantly report an increased caregiver burden compared to urban informal caregivers; (2) Rural-urban gaps in caregiver burden will still exist after controlling for theoretically relevant variables; (3) There will be marked demographic, socio-economic, caregiving and health-related factors (in this study, demographic and socio-economic factors are termed as background and context factors whereas caregiving and health-related factors are described as stressor factors) that explain variations in the determinants of caregiver burden between rural and urban informal caregivers of older adults.

## Methods

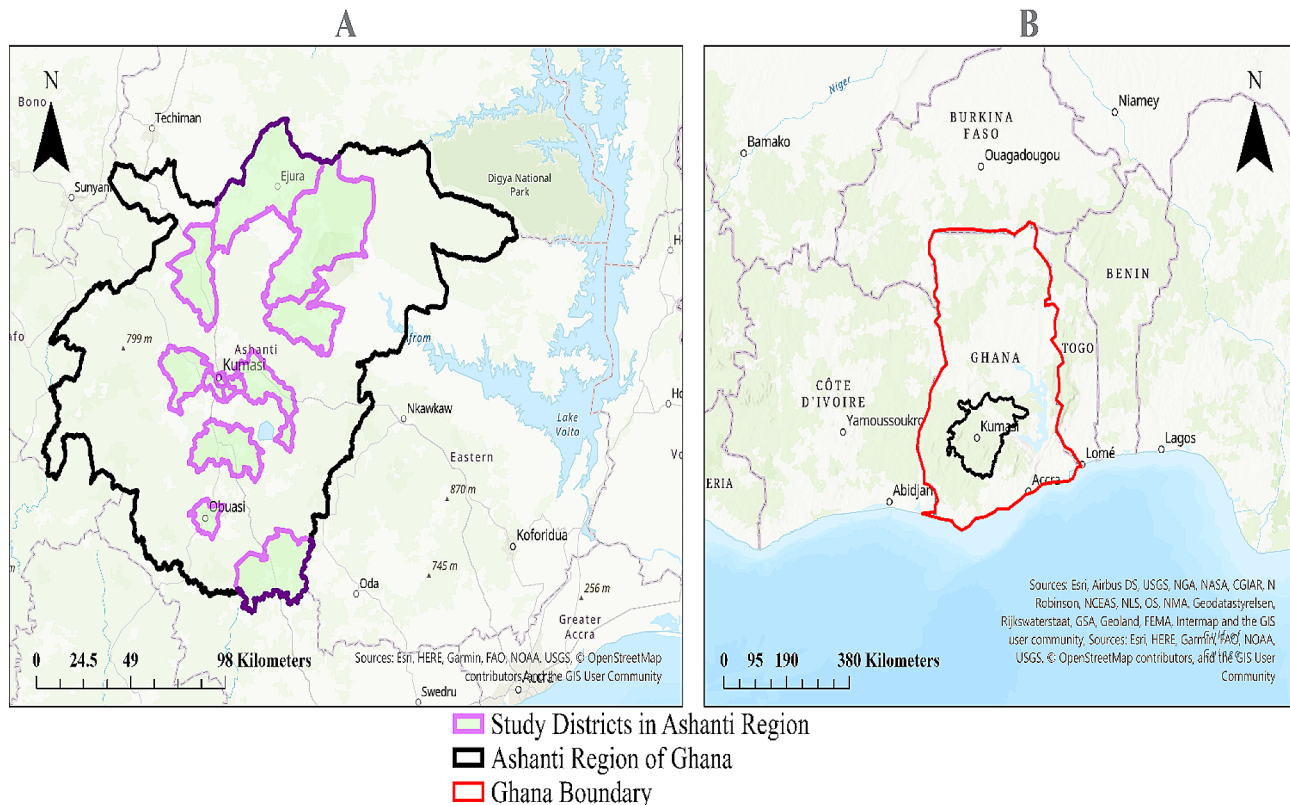
### Data and sample

Data for this study were obtained from a large cross-sectional survey on informal caregiving, health, and health-care among caregivers of older adults aged 50 years or above. This study focused on an aspect of the survey, which looked at caregiver burden. The survey was carried out between July and September 2022 in the Ashanti region of Ghana (see Fig. 1 for the study area location). We conducted the study in the Ashanti region of Ghana because it is centrally situated in the middle belt of Ghana, making it a nodal region. Hence, many people (including informal caregivers) are attracted to reside in the region [42]. Other justifications for conducting the study in the Ashanti region and conceptualizing older adults as 50 years or above have been reported elsewhere [30]. Cluster sampling was employed to demarcate the study area into three geographical regions: northern, middle, and southern. We then used a simple random sampling technique to select three districts each from the northern and southern zones and seven from the middle zone because the middle zone has more districts than the other two zones. We selected three communities from each district, yielding 39 communities-18 rural and 21 urban. Following a more rigorous sample size estimation procedure, 1,900 informal caregivers of older adults were recruited to participate in this study. Notably, 36 (1.89%) of the participants, however, declined to participate in the study, 7 (0.37%) of them provided incomplete responses, and 4 (0.21%) of their responses contained missing data, yielding a response rate of 97.52%. Our analytic sample was thus 1853 participants.

Given that we did not have records of the number of informal caregivers of older adults in Ghana and the Ashanti region, we used a snowball sampling technique to recruit the participants. Interview-administered questionnaires constituted the main data collection instrument used. We clarify that the questionnaire used in this study was developed for this study (see Supplementary file 1- a portion of the questionnaire related to this study). More detailed information on inclusion and exclusion criteria, sample size calculation, sampling process and data collection procedure have been reported elsewhere [43].

### Ethics

Following the Helsinki Declaration, ethical approval was sought from relevant institutions and committees. First, we sought ethical approval from the Queen's University General Research Ethics Board (GREB), Kingston, Canada (Ref: GGEOPL-344-22). Second, we further sought approval from the Committee on Human Research Publication and Ethics (CHRPE), School of Medical Sciences, College of Health Sciences, KNUST, Kumasi, Ghana (Ref:



**Fig. 1** Study area location. (A) shows the study area covered by the selected districts, and (B) shows the study area in the context of Ghana and neighbouring countries in sub-Saharan Africa

CHRPE/AP/182/22). Third, before the start of the fieldwork, the Ashanti Regional Health Directorate under the Ghana Health Service approved the study region (Ref: GHS/ASH/RES/V.2). Informed consent comprising oral and written consent was obtained from the study participants. The procedure for obtaining verbal informed consent was approved by the ethics committee/institutional review board. We further confirm that for illiterate participants, informed consent to participate in the study was obtained from their legal guardians/parents. Apart from informing the participants that their participation in the study was voluntary, we further assured them of strict confidentiality and anonymity of the data they proffered.

#### Measurement of outcome, predictor, and control variables

Following the stress process model, our outcome variable was caregiver burden. We employed the World Health Organization Impact of Caregiving Scale to measure caregiver burden [World Health Organization in 2007, as cited in Sanuade and Boatemaa [5]. This scale has been used in a previous Ghanaian study [5]. The scale contains 10 items with a 5-point Likert scale ranging from: 1=None, 2=Mild, 3=Moderate, 4=Severe, 5=Extreme. From informal caregivers who have provided care for at least a year [5], the 10 items scale seeks to find out if

caregiving results in the following: 1= “difficulty getting enough sleep,” 2= “problem getting enough food to eat,” 3= “not enough energy for extra work,” 4= “do not know the correct care to provide for health problems of care recipients,” 5= “cannot take care of health, ailment/chronic condition,” 6= “unable to pay for medication/treatment for ailment/chronic condition alone,” 7= “cannot visit friends and relatives as much as before,” 8= “cannot share feelings about caregiving responsibility with others,” 9= “experienced financial problems due to loss of income,” and 10= “experienced stigma or problems as a result of the care recipient’s illness or death.” Based on this, we developed a composite score ranging from 10 to 50, with a higher score indicating a higher caregiver burden. We found strong internal consistency in responses. The Cronbach’s alpha value was 0.881.

In this study, the primary predictor variable was geographical location. Therefore, as a background and context variable based on the stress process model, we measured geographical location using a rural-urban divide (0=rural, 1=urban). A rural caregiver is any individual who provides care to an older family member, friend or neighbour in villages or rural communities. Also, an urban caregiver is a person who renders care to an older family member, friend or neighbour in cities or urban communities. Based on a simple linear regression

analysis, other background and context variables (such as employment of caregivers, and income level of caregivers), primary and secondary stressor factors (such as mobility problems of care recipients, memory problems of care recipients, self-rated health of caregivers, economic roles in care provision, domestic roles in care provision, healthcare roles in care provision, emotional roles in care provision, psychological support needs of care recipients and financial support needs of care recipients) were controlled for. We measured employment of caregivers (0=unemployed, 1=employed), mobility problems of care recipients (0=no, 1=yes), memory problems of care recipients (0=no, 1=yes), economic roles in care provision (such as working daily to generate money to cater for the care recipients etc.) (0=no, 1=yes), domestic roles in care provision (such as performing activities including cooking, feeding, washing, and cleaning etc.) (0=no, 1=yes), healthcare roles in care provision (such as booking medical appointments, accompanying the care recipients to health facilities, assisting or helping care recipients comply with medical practitioners' prescriptions etc.), (0=no, 1=yes), emotional roles in care provision (such as offering counselling services for care recipients etc.) (0=no, 1=yes), psychological support needs (such as whether a caregiver needs psychological support services, including counselling to improve their psychological wellbeing etc.) (0=no, 1=yes), and financial support needs (such as whether a caregiver needs a financial assistance etc.) (0=no, 1=yes) were measured as dichotomous variables. The caregivers' income was measured as a continuous variable but was categorized as an ordinal variable (0=less than GH¢1000, 1=GH¢1000–1999, 2=GH¢2000 or above). The self-rated health of caregivers (0=very poor/poor, 1=fair, 2=good, 3=very good, 4=excellent) was also measured as an ordinal variable.

### Analytical framework

Using SPSS version 28 (IBM Armonk, NY), we employed descriptive and inferential techniques to analyze our data. Specifically, we used descriptive statistics such as mean, standard deviations, percentages, and frequencies to describe the background characteristics of the study participants. We also used descriptive statistics to analyze the prevalence of caregiver burden among the participants. The inferential statistics used in this study were chi-square tests and linear regression models. For instance, chi-squared analysis was performed to establish disparities between the prevalence of caregiver burden among the study participants by geographical location. Also, generalized simple linear regression models analysis was conducted to determine the background and context factors as well as stressor (primary and secondary strains) variables associated with caregiver burden. The

significant variables associated with caregiver burden in the generalized simple linear regression model analysis were selected for the generalized multivariable linear regression model analysis. The Variance Inflation Factor (VIF) calculation for all the independent and control variables yielded a value of less than 1.3 (mean=1.008, minimum=1.008 and maximum=1.227), suggesting no strong multicollinearity.

As part of the generalized multivariable linear regression models analysis, we fitted four different models for the full sample. In Model 1, we executed a bivariate analysis of caregiver burden by geographical location. In Model 2, we added other background and context factors to the variable in Model (1). In Model 3, we included all primary stressor variables to all variables in Model (2). In Model 4 (full model), we added secondary stressor variables to all variables in Model (3). Aside from the above, we further performed a rural-urban stratification multivariable analysis to determine the specific background and context factors as well as stressor variables predicting separately, caregiver burden among rural and urban informal caregivers of older adults. We reported beta values and standard errors with a *p*-value of 0.05 or less as significant.

## Results

### Sample characteristics of the participants by geographical location

Table 1 displays the sample characteristics of the participants by geographical location. Compared to the urban participants, slightly more rural participants were within the age group of 25–34 years (27.9% vs. 27.5%, *p*-value=0.243), had no formal education (35% vs. 23.7%, *p*-value<0.001), received monthly income of below GH¢<1000 (US\$99.50 as at the time of the field survey, 09 September 2022) (79.6% vs.74.6%, *p*-value=0.014), provided care for female care recipients (72.8% vs. 68.2%, *p*-value=0.032), had caregivers with sight problems (5.5% vs. 3.4%, *p*-value=0.031), hearing problems (0.9% vs. 0.3%, *p*-value=0.087), self-rated their (caregivers) health as excellent (31.7% vs. 24.6%, *p*<.001), performed economic roles in the delivery of care (95% vs. 91.1%, *p*-value=0.001), had psychological support needs (23.4% vs. 22.4%, *p*-value=0.583) and financial support needs (90.5% vs. 86.8%, *p*-value=0.013). Conversely, more urban participants than rural participants were females (73.1% vs. 72.7%, *p*-value=0.855), employed (70.5% vs. 61.1%, *p*-value<0.001), married (55.9% vs. 55.7%, *p*-value=0.552), lived with the care recipients (79.5% vs.79.3%, *p*-value=0.944), had care recipients with mobility problems (60.4% vs. 59.4%, *p*=0.216), memory problems (8% vs. 6%, *p*-value=0.096), performed domestic roles in the delivery of care (94.8% vs. 91%, *p*-value=0.002), healthcare roles in the provision of

**Table 1** Sample characteristics of the participants based on the stress process model

Variables	Response	Residence of caregiver		Total Sample	p-value	Mean(SD)
		Rural = 802	Urban = 1051			
		n(%)	n(%)			
<b>BACKGROUND AND CONTEXT</b>						
Age of caregivers (years)	18–24	124 (15.5)	142 (13.5)	266(14.4)	0.243	39.15 (13.28)
	25–34	224(27.9)	289 (27.5)	513 (27.7)		
	35–44	182 (22.7)	257(24.5)	439 (23.7)		
	45–54	152 (19)	217(20.6)	369 (19.9)		
	55–64	70 (8.7)	102(9.7)	172 (9.3)		
	65 or above	50 (6.2)	44(4.2)	94 (5.1)		
Gender of caregivers	Male	219 (27.3)	283 (26.9)	502 (27.1)	0.855	
	Female	583 (72.7)	768 (73.1)	1351(72.9)		
Education level of caregivers	No formal education	281 (35)	249 (23.7)	530 (28.6)	< 0.001	
	Primary	69 (8.6)	83 (7.9)	152 (8.2)		
	Junior High School	206 (25.7)	239 (22.7)	445 (24)		
	Senior high school	163 (20.3)	282 (26.8)	445 (24)		
Employment status of caregivers	Tertiary	83 (10.3)	198 (18.8)	281(15.2)	< 0.001	
	Unemployed	312 (38.9)	310 (29.5)	622 (33.6)		
Marital status of caregivers	Employed	490 (61.1)	741(70.5)	1231 (66.4)	0.552	
	Never married	236 (29.4)	325 (30.9)	561 (30.3)		
Are you living with the care recipient?	Currently Married	447 (55.7)	587 (55.9)	1034 (55.8)	0.552	
	Separated/Widowed/ Divorced	119 (14.8)	139 (13.2)	258 (13.9)		
Income level of caregivers (GHC)	No	163(20.3)	215 (20.5)	378 (20.4)	0.944	
	Yes	639 (79.3)	836 (79.5)	1475 (79.6)		
Gender of the care recipient	< 1000	638 (79.6)	784(74.6)	1422 (76.7)	0.014	683.24 (835.640)
	1000–1999	121 (15.1)	178 (16.9)	299 (16.1)		
	2000 or above	43 (5.4)	89 (8.5)	132 (7.1)		
STRESSORS (PRIMARY AND SECONDARY)	Male	218 (27.2)	334 (31.8)	552 (29.8)	0.032	
	Female	584 (72.8)	717 (68.2)	1301 (70.2)		
Mobility problem of care recipients	No	326(40.6)	416(39.6)	742(40.0)	0.216	
	Yes	476(59.4)	635(60.4)	1111(60)		
Memory problem care recipients	No	754(94)	967(92)	1721(92.9)	0.096	
	Yes	48(6)	84(8)	132(7.1)		
Sight problem care recipients	No	758 (94.5)	1015(96.6)	1773(95.7)	0.031	
	Yes	44(5.5)	36(3.4)	80(4.3)		
Hearing problem care recipients	No	795(99.1)	1048(99.7)	1843(99.5)	0.087	
	Yes	7(0.9)	3(0.3)	10(0.5)		
Self-rated health of caregivers	very poor/poor	13 (1.6)	15 (1.4)	28 (1.5)	< 0.001	
	Fair	30 (3.7)	42 (4)	72 (3.9)		
	Good	123 (15.3)	230 (21.9)	353 (19.1)		
	very good	382 (47.6)	505 (48)	887(47.9)		
	Excellent	254 (31.7)	259 (24.6)	513 (27.7)		
Economic roles	No	40(5)	94(8.9)	134(7.2)	0.001	
	Yes	762(95)	957(91.1)	1719(92.8)		
Domestic roles	No	72(9)	55(5.2)	127(6.9)	0.002	
	Yes	730(91)	996(94.8)	1726(93.1)		
Healthcare roles	No	52(6.5)	32(3)	84(4.5)	< 0.001	
	Yes	750(93.5)	1019(97)	1769(95.5)		
Emotional roles	No	107(13.3)	76(7.2)	183(9.9)	< 0.001	
	Yes	695(86.7)	975(92.8)	1670(90.1)		
Psychological support needs	No	614(76.6)	816(77.6)	1430 (77.2)	0.583	

**Table 1** (continued)

Variables	Residence of caregiver		Total Sample	p-value	Mean(SD)
	Rural = 802	Urban = 1051			
	n(%)	n(%)			
Financial support needs	Yes	188(23.4)	235(22.4)	423(22.8)	0.013
	No	76(9.5)	139(13.2)	215(11.6)	
	Yes	726(90.5)	912(86.8)	1638(88.4)	

care (97% vs. 93.5%,  $p$ -value < 0.001) and emotional roles in the provision of care (92.8% vs. 86.7%,  $p$ -value < 0.001) (see Table 1).

#### Prevalence of caregiver burden by geographical location

The results of the prevalence of caregiver burden by geographical location are reported in Table 2. Compared to the urban participants, the majority of the rural participants reported no difficulty in getting enough sleep (50.4% vs. 45.5%,  $p$ -value = 0.007), indicated getting enough energy for extra work (50.7% vs. 49.1%,  $p$ -value < 0.001), knew the correct care to provide for health problems of the care recipients (55.5% vs. 50.8%,  $p$ -value < 0.001), could take care of health, ailment and chronic conditions (48% vs. 40.6%,  $p$ -value < 0.001), were able to visit friends and relatives as much as before (52.4% vs. 37.2%,  $p$ -value < 0.001), could share feelings about caregiving responsibilities with others (55.5% vs. 45.6%,  $p$ -value < 0.001), did not experience financial problems due to loss of income (30.4% vs. 29.9%,  $p$ -value = 0.460) and stigma because of the care recipients' illness or death (85.3% vs. 83.3%,  $p$ -value = 0.125). Further, compared to the rural participants, most of the urban participants indicated they had no problem getting enough food to eat (56.8% vs. 54.7%,  $p$ -value < 0.001) and were able to pay for the medication/treatment for ailment/chronic conditions alone (30.4% vs. 29.6%,  $p$ -value < 0.001). Given the mean values of all the items, we conclude that there was a moderate prevalence of caregiver burden among informal caregivers of older adults (see Table 2).

#### Generalized simple linear regression models analysis of factors associated with caregiver burden among informal caregivers of older adults

Table 3 shows the generalized simple linear regression models analysis of factors associated with caregiver burden. We found that caregiver burden was positively associated with geographical location of caregivers ( $\beta$  = 2.467), income of caregivers ( $\beta$  = 1.535), economic roles in care provision ( $\beta$  = 2.705), domestic roles in care provision ( $\beta$  = 3.808), healthcare roles in the provision of care ( $\beta$  = 4.903), emotional roles in the delivery of care ( $\beta$  = 4.776), mobility problems in the delivery of care ( $\beta$  = 2.347), memory problems of care recipients ( $\beta$  = 1.803), and financial support needs in care provision ( $\beta$  = 3.827). We reported a negative relationship between

employment status ( $\beta$  = -1.460), psychological support needs ( $\beta$  = -3.992) and self-rated health of caregivers ( $\beta$  = -4.038). However, there was no statistically significant relationship between the age of caregivers, gender of caregivers, education level of caregivers, marital status of caregivers, living arrangement of caregivers with care recipients, sight problems of care recipients and hearing problems of care recipients as regards caregiver burden (see Table 3).

#### Regression analysis

##### Factors associated with informal caregiver burden for the full sample (both rural and urban participants)

The results of the generalized multivariable linear regression models analysis are reported in Table 4. In Model 1, we reported a significant association between geographical location and caregiver burden. For instance, the analysis revealed that rural informal caregivers have a significantly reduced caregiver burden compared to urban informal caregivers ( $\beta$  = -2.47,  $p$ -value < 0.01). In Model 2, after including additional background and context factors, the association between geographical location and caregiver burden still achieved statistical significance. Specifically, the analysis showed that rural informal caregivers have a significantly decreased caregiver burden compared to urban informal caregivers ( $\beta$  = -2.52,  $p$ -value < 0.01). After adjusting for the significant stressor variables (only primary stressors variables), we still found that geographical location significantly predicted caregiver burden. For example, we established that rural informal caregivers have a reduced caregiver burden compared to urban informal caregivers ( $\beta$  = -1.81,  $p$ -value < 0.01). In the full model, when secondary stressor variables were added to all variables in Model 3, the significant association between geographical location and caregiver burden was still present. Rural informal caregivers reported a significantly decreased caregiver burden compared to urban informal caregivers ( $\beta$  = -1.64,  $p$ -value < 0.01).

Beyond geographical location, other background factors, as well as stressor variables, significantly determine caregiver burden. On background and context factors, first, we found that unemployed participants have an increased caregiver burden compared to the employed participants ( $\beta$  = 2.16,  $p$ -value < 0.01), demonstrating an association between employment status and caregiver



**Table 2** Prevalence of caregiver burden by geographical location

Variables	Response	Rural	Urban	Total	p-value	Mean	SD
		%	%	%			
Difficulty getting enough sleep	None	50.4	45.5	47.6	0.007	2.13	1.285
	Mild	17.7	14.8s	16.1			
	Moderate	16.7	18.6	17.8			
	Severe	10.8	14.9	13.2			
	Extreme	4.4	6.2	5.4			
Problem getting enough food to eat	None	54.7	56.8	55.9	<0.001	2.13	1.348
	Mild	15.6	11.0	13.0			
	Moderate	15.6	12.0	13.5			
	Severe	9.4	12.0	10.8			
	Extreme	4.7	8.2	6.7			
Not enough energy for extra work	None	50.7	49.1	49.8	<0.001	2.12	1.380
	Mild	18.1	13.0	15.2			
	Moderate	16.5	14.8	15.5			
	Severe	8.4	13.7	11.4			
	Extreme	6.4	9.3	8.0			
Do not know the correct care to provide for health problems of care recipients	None	55.5	50.8	52.8	<0.001	2.55	1.608
	Mild	16.1	9.3	12.3			
	Moderate	12.0	14.0	13.1			
	Severe	11.0	16.5	14.1			
	Extreme	5.5	9.4	7.7			
Cannot take care of health, ailment/chronic condition	None	48.0	40.6	43.8	<0.001	2.55	1.608
	Mild	14.5	7.9	10.7			
	Moderate	12.8	12.4	12.6			
	Severe	9.9	15.0	12.8			
	Extreme	14.8	24.1	20.1			
Unable to pay for medication/treatment for ailment/chronic condition alone	None	29.6	30.4	30.0	<0.001	2.84	1.520
	Mild	17.3	11.1	13.8			
	Moderate	21.2	17.1	18.9			
	Severe	14.7	17.9	16.5			
	Extreme	17.2	23.5	20.8			
Cannot visit friends and relatives as much as before	None	52.4	37.2	43.8	<0.001	2.48	1.576
	Mild	14.6	12.5	13.4			
	Moderate	11.0	14.2	12.8			
	Severe	8.2	13.4	11.2			
	Extreme	13.8	22.7	18.9			
Cannot share feelings about caregiving responsibility with others	None	55.5	45.6	49.9	<0.001	2.34	1.573
	Mild	12.7	10.8	11.7			
	Moderate	11.3	9.3	10.2			
	Severe	7.2	14.1	11.1			
	Extreme	13.2	20.2	17.2			
Experienced financial problems due to loss of income	None	30.4	29.9	30.1	0.460	2.78	1.441
	Mild	14.0	12.0	12.8			
	Moderate	19.3	21.1	20.3			
	Severe	21.3	23.4	22.5			
	Extreme	15.0	13.6	14.2			
Experienced stigma or problems as a result of the care recipient's illness or death	None	85.3	83.3	84.2	0.125	1.33	0.886
	Mild	6.0	7.3	6.7			
	Moderate	3.4	3.7	3.6			
	Severe	2.0	3.4	2.8			
	Extreme	3.4	2.2	2.7			
Reliability Test		10(0.881)					
Items (Cronbach's alpha based on standardised items)							

**Table 3** Generalized simple linear regression models analysis of factors associated with caregiver burden among informal caregivers of older adults

Variables	B	SE	p-value
Age (years) of caregivers	0.138	0.1672	0.409
Gender of caregivers	-0.675	0.5152	0.190
Place of residence of caregivers	2.467	0.4588	0.000
Education of caregivers	0.006	0.1596	0.970
Employment of caregivers	-1.460	0.4839	0.003
Marital Status of caregivers	-0.162	0.3555	0.649
Living arrangements of caregivers	-0.597	0.5683	0.294
Income (GHS) of caregivers	1.535	0.3834	0.000
Economic roles in the provision of care	2.705	0.8822	0.002
Domestic roles in the delivery of care	3.808	0.9023	0.000
Healthcare roles in the provision of care	4.903	1.0952	0.000
Emotional roles in the provision of care	4.776	0.7598	0.000
Mobility problems of care recipients	2.347	0.4643	0.000
Memory problems of care recipients	1.803	0.8896	0.043
Sight problems of care recipients	1.601	1.1264	0.155
Hearing problems of care recipients	4.041	3.1252	0.196
Psychological support needs of caregivers	-3.992	0.5378	0.000
Financial support needs of caregivers	3.827	0.7097	0.000
Self-rated health of caregivers	-4.038	0.2459	0.000

burden. Second, there was an association between caregivers' income and caregiver burden. For instance, informal caregivers who earned between GH¢ 1000–1999 have a decreased caregiver burden compared to those who earned GH¢ 2000 or more in a month ( $\beta = -2.56$ ,  $p$ -value < 0.01). Third, regarding the stressor variables and their association with caregiver burden, we found that participants who did not provide care for care recipients with mobility problems have a decreased caregiver burden compared to those who provide care to care recipients with mobility problems ( $\beta = -1.31$ ,  $p$ -value < 0.01). Fourth, we further reported an association between self-rated health of caregivers and caregiver burden. Specifically, participants across all the self-rated health categories (poor/very poor:  $\beta = 12.63$ ,  $p$ -value < 0.01; fair:  $\beta = 9.56$ ,  $p$ -value < 0.01; good:  $\beta = 11.00$ ,  $p$ -value < 0.01; very good:  $\beta = 7.03$ ,  $p$ -value < 0.01) have a significantly increased caregiver burden. Fifth, the analysis showed that participants who did not perform economic roles in the provision of care have a significantly decreased caregiver burden compared to those who performed economic roles in their quest to provide care ( $\beta = -1.65$ ,  $p$ -value < 0.05). Sixth, our results demonstrated that participants who did not undertake domestic roles in the provision of care reported a decreased caregiver burden compared to those who perform domestic roles in care provision ( $\beta = -2.34$ ,  $p$ -value < 0.01). Seventh, our analysis indicated that participants who did not perform emotional roles in care provision have a decreased caregiver burden compared to those who performed emotional roles ( $\beta = -2.23$ ,  $p$ -value < 0.01). Eighth, our analysis

highlighted that participants with no psychological support needs in care provision have an increased caregiver burden compared to those with psychological support needs ( $\beta = 6.21$ ,  $p$ -value < 0.01). Last, we found that participants with no financial support needs have a decreased caregiver burden compared to those with financial support needs ( $\beta = -2.92$ ,  $p$ -value < 0.01) (see Table 4).

#### **Factors associated with caregiver burden among rural informal caregivers**

Factors associated with caregiver burden among rural informal caregivers are shown in Table 4. In line with the background and context factors, the analysis revealed that unemployed rural informal caregivers have an increased caregiver burden compared to employed rural informal caregivers ( $\beta = 3.13$ ,  $p$ -value < 0.01). We again found that rural informal caregivers who earned less than GH¢ 1000 in a month have an increased caregiver burden compared to those who earn GH¢ 2000 cedis or more ( $\beta = 0.58$ ,  $p$ -value < 0.01).

Also, based on the stressor variables, we found that rural participants across all the self-rated health classifications (poor/very poor:  $\beta = 13.88$ ,  $p$ -value < 0.01; fair:  $\beta = 6.11$ ,  $p$ -value < 0.01; good:  $\beta = 9.97$ ,  $p$ -value < 0.01, very good:  $\beta = 6.06$ ,  $SE = 0.71$ ,  $p$ -value < 0.01) reported an increased caregiver burden. Further, we found that rural participants who did not perform economic roles in the provision of care ( $\beta = -2.84$ ;  $p$ -value < 0.05), domestic roles in the provision of care ( $\beta = -2.34$ ,  $p$ -value < 0.05) and emotional roles in the delivery of care ( $\beta = -1.97$ ,  $p$ -value < 0.05) have a decreased caregiver burden compared to those who performed economic, domestic and emotional roles in care provision, respectively.

Our analysis further showed that rural informal caregivers who did not have psychological support needs have an increased caregiver burden compared to those with psychological support needs ( $\beta = 4.64$ ;  $p$ -value < 0.01). Last, the results showed that rural participants who did not have financial support needs have a decreased caregiver burden compared to those with financial support needs ( $\beta = -3.20$ ;  $p$ -value < 0.01) (see Table 4).

#### **Factors associated with caregiver burden among urban informal caregivers**

Factors predicting caregiver burden among urban informal caregivers are displayed in Table 4. Following the background and context factors as described in the stress process model, we found that unemployed urban participants have an increased caregiver burden compared to those who were employed ( $\beta = 1.22$ ,  $p$ -value < 0.05). Also, we found that urban participants who receive less than GH¢ 1000 in a month ( $\beta = -3.77$ ,  $p$ -value < 0.01) and GH¢ 1000–1999 ( $\beta = -2.91$ ;  $p$ -value < 0.01) have a decreased

**Table 4** Background and context factors as well as stressor variables associated with caregiver burden

Domains of the Stress Process Model	Model 1 β (SE)	Model 2 β (SE)	Model 3 β (SE)	Full Model β (SE)	Rural	Urban	VIF
<b>BACKGROUND AND CONTEXT</b>							
Geographical location							
Rural	-2.47 (0.49)**	-2.52 (0.46)**	-1.81(0.423)**	-1.64 (0.41)**	-	-	1.049
Urban (ref)	0		0	0	-	-	
Employment							
Unemployed		1.96 (0.48)**	1.97 (0.44)**	2.16 (0.44)**	3.13(0.64)**	1.22(0.60)*	1.105
Employed (ref)		0	0	0	0	0	
Income (GH¢)							
Less than 1000		-3.64 (0.89)**	-3.05(0.82)**	-2.35(0.78)**	0.58(1.33)**	-3.77(0.95)**	1.040
1000–1999		-2.54 (1.01)*	-2.30(0.93)*	-2.56(0.88)**	-1.22 (1.48)	-2.91(1.09)**	
2000 or above (ref)		0	0	0	0	0	
<b>STRESSORS</b>							
<i>Primary stressors</i>							
Mobility problems							
No			-1.94 (0.42)**	-1.31(0.41)**	-1.06(0.61)	-1.57(0.54)**	1.028
Yes (ref)			0	0	0	0	
Memory problems							
No			-0.83 (0.81)	-0.69 (0.76)	-0.67(1.25)	-0.68(0.96)	1.008
Yes (ref)			0	0	0	0	
Self-rated health							
very poor/poor			10.55(1.73)**	12.63(1.65)**	13.88(2.40)**	11.86(2.25)**	1.084
Fair			9.07(1.12)**	9.56 (1.07)**	6.11 (1.62)**	12.33(1.42)**	
Good			10.21(0.62)**	11.00(0.61)**	9.97 (0.96)**	11.80(0.79)**	
very good			6.11(0.50)**	7.03(0.49)**	6.06 (0.71)**	7.90(0.67)**	
Excellent (ref)			0	0	0	0	
<i>Secondary Stressors</i>							
Economic role							
No				-1.65 (0.80)*	-2.84(1.40)*	-0.93 (0.99)	1.101
Yes (ref)				0	0	0	
<b>Domestic roles</b>							
No				-2.34 (0.80)**	-2.34(1.06)*	-2.16(1.20)	1.070
Yes (ref)				0	0	0	
<b>Healthcare roles</b>							
No				-1.95 (1.02)	-1.82(1.290)	-2.44(1.64)	1.181
Yes (ref)				0	0	0	
<b>Emotional roles</b>							
No				-2.23(0.73)**	-1.97(0.95)*	-2.38(1.11)*	1.227
Yes (ref)				0 <sup>a</sup>	0 <sup>a</sup>	0 <sup>a</sup>	
Psychological support needs							
No				6.21(0.50)**	4.64(0.76)**	7.32(0.65)**	1.100
Yes (ref)				0	0	0	
Financial support needs							
No				-2.92(0.64)**	-3.20(1.04)**	-2.70(0.80)**	1.091
Yes (ref)				0	0	0	
<b>Model Fitness</b>							
Likelihood Ratio Chi-Square (p-value)	28.69(<0.001)	59.76 (<0.001)	375.58 (0.000)	582.98(0.000)	196.29 (0.000)	392.04(0.000)	
Wald Chi-Square (p-value)	9634.610 (0.000)	4242.530 (0.000)	1868.542 (0.000)	499.529 (0.000)	167.39(0.00)	289.57(0.000)	

\*Test is significant at the 0.05 level

\*\* Test is significant at the 0.01 level

caregiver burden compared to those who earned GH¢ 2000 or more in a month.

Based on the stressor variables, we highlighted that urban participants whose care recipients did not have mobility problems have a decreased caregiver burden compared to those who have a care recipient with mobility problems ( $\beta = -1.57$ ,  $p$ -value  $< 0.01$ ). We again reported that urban participants across all the self-rated health categories (poor/very poor:  $\beta = 11.86$ ,  $p$ -value  $< 0.01$ ; fair:  $\beta = 12.33$ ,  $p$ -value  $< 0.01$ ; good:  $\beta = 11.80$ ,  $p$ -value  $< 0.01$ ; very good:  $\beta = 7.90$ ,  $p$ -value  $< 0.01$ ) reported an increased caregiver burden.

Further, we found that urban participants who did not perform emotional roles in the delivery of care ( $\beta = -2.38$ ,  $p$ -value  $< 0.05$ ) have a decreased caregiver burden compared to those who performed emotional roles in care provision. In addition, our analysis demonstrated that urban participants who did not have psychological support needs have an increased caregiver burden compared to those with psychological support needs ( $\beta = 7.32$ ;  $p$ -value  $< 0.01$ ). Last, our results established that urban participants who did not have financial support needs have a decreased caregiver burden compared to those with financial support needs ( $\beta = -2.70$ ;  $p$ -value  $< 0.01$ ) (see Table 4).

## Discussion

Drawing from the stress process model and informal caregiving literature, the primary objective of this study was to examine the association between geographical location and caregiver burden among informal caregivers of older adults in Ghana. The main findings of the study are: (1) rural informal caregivers of older adults report a decreased caregiver burden for the full sample even after adjusting for all theoretically relevant variables; (2) geographical location, employment status of caregivers, income level of caregivers, mobility problems of care recipients, self-rated health of caregivers, economic roles in the delivery of care, domestic roles in care provision, emotional roles in care provision, psychological support needs and financial support needs are associated with caregiver burden for both rural and urban informal caregivers; (3) employment status of caregivers, income level of caregivers, self-rated health of caregivers, economic roles in care provision, domestic roles in the provision of care, emotional roles in the delivery of care, psychological support needs as well as financial support needs in the provision of care predict caregiver burden among rural informal caregivers; (4) employment status of caregivers, income level of caregivers, self-rated health of caregivers, mobility problems of care recipients, emotional roles in the delivery of care, psychological support needs and financial support needs in the delivery of care are associated with caregiver burden among urban

informal caregivers. The findings demonstrate that background and context factors as well as stressor (primary and secondary strains) variables are essential in understanding caregiver burden among informal caregivers of older adults.

Our analysis also highlights factors that might explain why rural informal caregivers have a significantly decreased caregiver burden compared to urban informal caregivers. This finding contradicts our first hypothesis that rural informal caregivers would report an increased caregiver burden compared to urban informal caregivers. As far as we are aware, the result that rural informal caregivers have a decreased caregiver burden has not been reported in previous studies [see 5, 32]. For instance, in a study of rural-urban differences in caregiver burden due to the COVID-19 pandemic among a national sample of informal caregivers in the United States, Cohen et al. [32] reported that rural informal caregivers have a higher likelihood of reporting an increased caregiver burden compared to urban participants. Beyond the noticeable differences in setting, another possible reason why our findings differ from Cohen et al. [32] is the unique challenges that COVID-19 presented to caregivers in contrast to our research, which did not focus on any specific health condition but on the burden of caregiving among informal caregivers of older people regardless of their condition. In Ghana, Sanuade and Boatemaa [5], on caregiver profiles and determinants of caregiver burden, reported that urban informal caregivers have a reduced caregiver burden compared to rural informal caregivers. The differences in these findings might be attributed to disparities in study settings, sample size and geographical coverage. For instance, whereas this current study was conducted in the Ashanti region of Ghana, that of Sanuade and Boatemaa [5] covered all regions of Ghana. Besides, unlike Sanuade and Boatemaa's [5] study, which recruited a small number of informal caregivers ( $N = 238$ ), this current study sampled more significant numbers of informal caregivers ( $N = 1,853$ ). Given the findings of previous studies, our results constitute one of the core contributions of this study to knowledge of geographical location differences in caregiver burden.

The pathways through which rural informal caregivers may have a reduced caregiver burden are further discussed. First, social cohesion and communal supports are more robust in rural areas than in urban areas. Avery et al. [44] state that social cohesion and the willingness of neighbours to offer help are significantly higher in rural communities. Higher social connectedness with others may offer enhanced emotional support for caregivers to manage caregiver burden [20]. Second, compared to rural informal caregivers, more urban informal caregivers provide care for care recipients with mobility problems, increasing their caregiver burden. Third, previous studies

have reported that rural informal caregivers are more willing and motivated to care for older adults than urban informal caregivers [30]. The higher number of informal caregivers in rural areas demonstrating an increased motivation to provide care suggests that more informal caregivers will be available and ready to deliver care in rural areas rather than urban areas. This situation will likely reduce the caregiving tasks of rural informal caregivers, hence decreasing their caregiver burden.

Focusing on employment status, it was revealed that unemployed participants have an increased caregiver burden compared to employed participants. This finding is different from what some previous studies have found elsewhere. For instance, Rodríguez-González et al. [45] established that employed caregivers are more likely to experience a higher caregiver burden. The differences in the study findings might be due to variations in the unit of analysis, sample size and the study settings. Whereas this current research focused on informal caregivers of older adults in general, the Rodríguez-González et al. [45] study was limited to caregivers who provide care for informal caregivers of older recipients with chronic illness. Our findings, however, corroborate those of Schaffler-Schaden et al. [46], who found that working caregivers had less caregiver burden. The possible explanation for why employed caregivers report less caregiver burden is that they may have opportunities to get out and think of other tasks. Work tasks outside the home can be a source of emotional/psychological escape that can alleviate the caregiver's burden. Generally, the association between employment status and caregiver burden suggests the need to encourage work-life balance programs for informal caregivers of older adults [45]. Further, welfare programs and policies to support unemployed informal caregivers are needed to minimize their caregiver burden.

Examining the role of income levels, those whose incomes were low also have lower caregiver burden and vice versa. Previously published work established that low-income informal caregivers have a higher caregiver burden than higher-income caregivers [27, 47, 48]. Differences in findings might be linked to variations in the conceptualization of older adults, units of analysis, settings, and sample sizes. For instance, whereas the present study focused on informal caregivers of older adults in general, the Luo et al. [47] study was limited to family caregivers of elderly patients with spinal tumours. However, consistent with our findings, a published study highlighted that higher-income earners report an increased caregiver burden [26]. Our findings could be attributed to higher-income earners being more likely to engage in other economic activities, increasing their caregiver burden [26]. Another plausible reason for lower caregiver burden perception in low-income caregivers

could be attributed to the less stress associated with lower-paid/less complex jobs with low cognitive demand. Higher-income jobs may be associated with more stressful/demanding work routines, adding to the complexity of managing caregiving responsibilities.

Consistent with other studies, self-rated health and caregiver burden are positively associated [27, 45]. Given the positive association between caregiver burden and self-rated health, the health of informal caregivers is essential in health policy formulation regarding caregiver burden [41, 49]. Many studies, including our study, found an association between mobility problems of care recipients and caregiver burden [24, 29, 41, 48, 50]. Possible explanations are that caregiving roles increase in line with functional limitations, making caregiving responsibility more demanding and challenging to execute. Conversely, the absence of care recipients with mobility problems reduces the care needed.

This study revealed that secondary stressors such as economic, domestic, and emotional roles in care provision predict caregiver burden. We highlight that not performing these caregiving roles was associated with a reduced caregiver burden. The reason may be that those who perform any caregiving role are likely to spend more hours providing care, which has also been associated with a higher caregiver burden [51]. Performing caregiving roles may also interfere with other work activities, affecting emotional health [52]. However, this reason may not be exhaustive as other underlying factors may explain these dynamics. Such underlying factors are likely to be made known in a qualitative study. One exciting finding that needs to be commented on is that whereas economic and domestic roles in care provision were associated with caregiver burden for the full sample and for rural informal caregivers, it was not so for urban informal caregivers. This might be attributed to disparities in caregiving intensity, prevalence of caregiving roles, and overall caregiver burden.

This study has reported an association between psychological support needs (that is, whether an informal caregiver requires or needs psychological services such as counselling to improve their psychological well-being) and caregiver burden. We found that participants with no psychological support needs (that is, those who indicated they do not need any psychological support services such as counselling) in care provision reported an increased caregiver burden. It is possible to argue that given the geographical context of this study, informal caregivers who indicated that they do not need any psychological support services are likely to perceive to have improved psychological well-being and may tend to use no or minimal psychological services such as counselling even if they are available and easily accessible, which therefore increases their caregiver burden. Further, we

believe that informal caregivers who acknowledge that they need psychological support would be more likely to use any available psychological services, such as counselling, to improve their psychological well-being. Such informal caregivers who use psychological support services are likely to get adequate counselling services integral to managing and dealing with stress, which, therefore, reduces their caregiver burden. Considering the association between psychological support needs and caregiver burden, psychological support training and programs such as counselling should be considered for informal caregivers of older adults. Such programs could be organized by various health institutions (such as Ghana Health Service, Ghana Ministry of Health, etc.) and welfare institutions (such as the Department of Social Welfare and Community Development across all the 261 Metropolitan, Municipal and District Assemblies in Ghana). The design of these programs intended to address the psychological support needs should take into consideration the views of informal caregivers of older adults. In the context of our findings, addressing the psychological support needs of informal caregivers of older adults alone may not necessarily help to lessen caregiver burden without instituting measures that aim at improving the financial situations of informal caregivers. Beyond that, a qualitative study that delves into factors that account for increasing caregiver burden among informal caregivers of older adults with no psychological support needs may contribute to our understanding of this relationship and further guide health policies and programs.

This study demonstrated a relationship between financial support needs and caregiver burden. Specifically, this research revealed that participants with no financial support needs reported a decreased caregiver burden. The relationship between financial support needs and caregiver burden among informal caregivers of older adults calls for health policy and practice measures. First, our findings accentuate the need for family members, friends, and religious organizations to provide adequate and timely financial (social) support for informal caregivers of older adults to reduce their caregiver burden, thereby improving their general quality of life for sustainable care provision. For instance, other research has shown that social support improves caregivers' overall quality of life [52]. Second, health and welfare programs should be designed to assist informal caregivers in receiving social support (including financial support) to care for older adults. For instance, social intervention programs such as the livelihood empowerment against poverty program in Ghana, which partly aims to improve the healthcare utilization of older adults [53, 54], could be streamlined to address the financial needs of informal caregivers of older adults.

### Contributions and limitations of the study

This study offers several theoretical, methodological, and empirical contributions to geographical location differences (and, more broadly, other background and context factors and stressors variables) in caregiver burden among informal caregivers of older adults in Ghana.

Theoretically, our findings point to the relevance of the stress process model in understanding geographical location differences in caregiver burden among informal caregivers of older adults in Ghana. The specific strength is that several independent and control variables emerged as significant factors associated with caregiver burden.

Methodologically, this is the first study in Ghana to have employed a large sample of informal caregivers of older adults across 39 diverse communities with rural and urban characteristics dwelling in 13 districts in Ghana to understand geographical location differences in caregiver burden among informal caregivers of older adults. Another methodological strength of this study is using a standardized scale with a high Cronbach's alpha value ( $\alpha=0.881$ ) to measure caregiver burden.

Contrary to what has been reported, this study's unique empirical contribution is that rural informal caregivers report a decreased caregiver burden compared to urban informal caregivers. Another specific empirical contribution of this study is our ability to investigate the specific factors predicting separately, caregiver burden among rural and urban informal caregivers of older adults.

Despite this study's novel nature, some limitations must be acknowledged. This study employed a cross-sectional design, which may hinder the ability to draw causal inferences [55, 56]. Also, our data were self-rated, which could result in recall bias. Further, the participants were recruited from one region in Ghana, which has the potential to limit the generalization and representativeness of our findings. However, consideration was made to select several rural and urban communities in the study area with the aim of enhancing the generalization and representativeness of our findings.

Given that this cross-sectional study did not determine the mediating role of social support and coping strategies in the association between background and context factors, stressor variables, and caregiver burden among informal caregivers of older adults, a future longitudinal study should investigate these dynamics.

### Conclusion

This study investigated geographical location differences in caregiver burden among informal caregivers of older adults in Ghana. Contrary to our first hypothesis, this study reported that rural informal caregivers of older adults have a decreased caregiver burden compared to urban informal caregivers. Second, our hypothesis that rural-urban gaps in caregiving burden will still exist

after controlling for theoretically relevant variables was confirmed. Last, we reported that differences in background, context, and stressor variables explain variations in the determinants of caregiver burden between rural and urban informal caregivers of older adults, which was consistent with our hypothesis. These findings constitute the core contributions of this current study to knowledge. The results of this study validate two of our hypotheses and the stress process model in explaining caregiver burden among informal caregivers of older adults.

The implications for policy, practice and future research directions have been proposed for the attention of stakeholders in the health sector (such as Ghana Health Service, Ghana Ministry of Health, etc.) and welfare institutions (such as the Department of Social Welfare and Community Development across all Metropolitan, Municipal and District Assemblies in Ghana) as well as researchers in Ghana and other sub-Saharan African countries. For instance, the findings suggest that health and welfare institutions should design specific measures to bridge geographical location differences in caregiver burden. Also, given that significant background, context and stressor factors are associated with caregiver burden, policymakers should try to capture these factors in any health policies and programs that aim to reduce caregiver burden among informal caregivers of older adults.

Our findings also offer opportunities for healthcare providers to understand factors associated with caregiver burden to tailor services necessary to reduce caregiver burden among informal caregivers of older adults. Due to the quantitative nature of this study, which was not able to capture qualitative information to understand the normative views of informal caregivers about underlying mechanisms explaining background and context as well as stressor differences in caregiver burden, our results offer opportunities for future research to employ mixed methods research design to investigate into caregiver burden among informal caregivers of older adults in Ghana.

#### Abbreviations

CHRPE	Committee on Human Research Publication and Ethics
GREB	General Research Ethics Board
KNUST	Kwame Nkrumah University of Science and Technology
LMICs	Low-and Middle-Income Countries
SD	Standard Deviation
SE	Standard Error
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
VIF	Variance Inflation Factor

#### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12875-024-02562-7>.

Supplementary Material 1

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#### Author contributions

Conceptualization, WA-D. and M.W.R.; methodology, WA-D. and M.W.R.; software, WA-D.; formal analysis, WA-D.; data curation, WA-D.; writing—original draft preparation, WA-D.; writing—review and editing, WA-D. and M.W.R.; supervision, M.W.R.; funding acquisition, M.W.R. Both authors have read and agreed to the published version of the manuscript.

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#### Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

#### Declarations

##### Ethics approval and consent to participate

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. For procedural ethics, the General Research Ethics Board (GREB), Queen's University, Kingston, Canada (Ref: GGEOPL-344-22) and the Committee on Human Research Publication and Ethics (CHRPE), School of Medical Sciences, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana (Ref: CHRPE/AP/182/22) approved the study protocol. Further, the Ashanti Regional Health Directorate under the Ghana Health Service approved the study site (Ref: GHS/ASH/RES/V.2) to begin the data collection exercise. Verbal and informed written consent was sought from the participants. The procedure for obtaining verbal informed consent was approved by the ethics committee/institutional review board. We further confirm that informed consent was obtained from their legal guardians for illiterate participants to participate in the study. Participants were assured of strict confidentiality and anonymity of the data they provided. The participation of the respondents in the study was also voluntary.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare no competing interests.

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