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Research Article

Contemporary female migration in Ghana: Analyses of the 2000 and 2010 Censuses

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Abstract

BACKGROUND
Knowledge of female migration patterns is scant despite increased recognition and reporting of the feminization of migration. Recent data on female internal migration in Ghana challenges historical assumptions that underestimated female migration.

OBJECTIVE
This study presents the first detailed comparative analyses of female migration using microdata from Ghana's censuses (2000 and 2010) and exploits this national data to understand the gendered dimensions of migration.

METHODS
Secondary analyses use direct and indirect methods to describe the scale, type, and demographic structure of contemporary female migration; assess the distribution of female migrants across age and geography; and estimate net internal female migration.

RESULTS
Excluding international migrants, census microdata identified 31.1% of females as internal migrants in 2000 and 37.4% of females as internal migrants in 2010. Working-age migration was particularly pronounced in 2010, reinforcing economic opportunity as a likely driver of migration for both sexes. Female migrants were significantly more likely than female nonmigrants to reside in urban areas and work for pay, profit, or family gain. By 2010, married women were less likely to migrate than peers who had

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never married. Net out-migration exceeded net in-migration in eight of Ghana's ten regions.

CONTRIBUTION

Our analyses expand the evidence base on contemporary female migration and refute the outdated stereotype that girls and women do not participate in migration. The prominence of the Greater Accra and Ashanti Regions as destinations for female migrants suggests that interventions are needed in Ghana's more rural regions to reduce poverty and develop greater economic opportunities for girls and women.

1. Introduction

Due to population growth and urbanization, projections suggest that two-thirds of the world's population will reside in urban areas by 2050, with most of this increase occurring in Asia and Africa (UNDESA 2014). Planning for and managing this changing population distribution will require better understanding of new migration patterns and the impacts of internal migration. This includes a better understanding of female migration, which has been historically underestimated, with analyses focused on male migrants or assumptions that migrants were male (Caldwell 1969; Zlotnik 1995).

Knowledge of female migration patterns is scant despite increased recognition and reporting of the feminization of internal migration (Hofmann and Buckley 2012; Beegle and Poulin 2013). Research from South Africa challenges the assumption that females represent the residentially stable population, finding women in rural areas to be highly mobile (Camlin, Snow, and Hosegood 2014). In Malawi, where young women now migrate more than young men, assumptions of traditional patterns of matrilocal residence following marriage no longer hold (Beegle and Poulin 2013). As evidence reveals changes in the sex composition of migrants, it also reveals changes in the reasons for migrating.

While both sexes may attribute their migration decisions to factors such as the need to seek employment or a lack of independence at the place of origin, gender-specific factors emerge. In South Africa, girls experience an increased risk of moving out of the household following a parent's AIDS-related death compared to boys; families experiencing a death may expect girls to perform caring duties elsewhere or may prefer to keep boys (Ford and Hosegood 2005). In Ghana, girls and women attribute their migrations to the need to accumulate property for marriage; to avoid harm, including female genital mutilation; and to avoid forced or arranged marriages

that may be polygamous (Anarfi and Agyei 2009).[5] These factors influence both the decision to migrate and the choice of destination.

Data from Ghana's two most recent Population and Housing Censuses (2000 and 2010) indicates that there are more female than male internal migrants, particularly at younger ages (GSS 2013c). The growing number of younger migrants puts increasing pressure on social services and employment opportunities in urban areas. Some migrants move to Ghana's urban areas independent of available resources or employment opportunities (Agyei and Ofosu-Mensah Ababio 2009).

This study analyses Ghana's 2000 and 2010 Censuses using census microdata disaggregated by sex to provide a comprehensive picture of internal female migration at all ages. We use direct and indirect techniques to analyse the patterns, trends, and determinants of contemporary female migration. Our comparative analyses are the first to exploit national data from the 2000 and 2010 Censuses with a view to understanding the gendered dimensions of migration in Ghana.

2. Background

2.1 Migration in Ghana

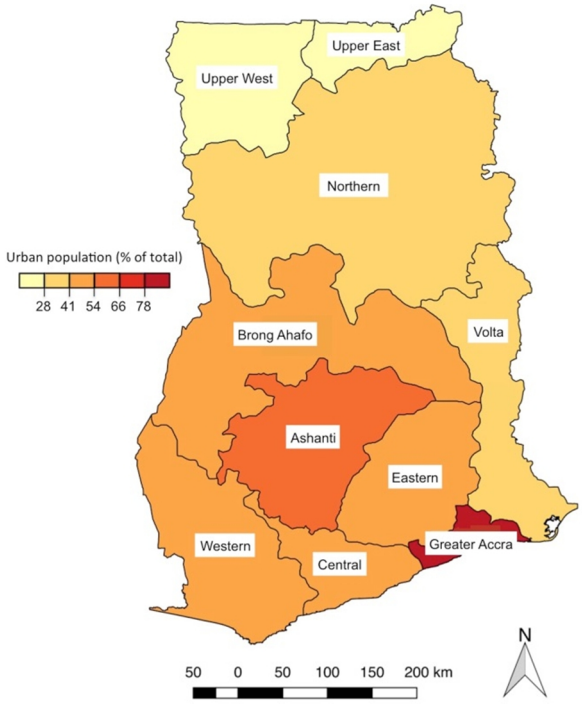
Migration has historically been a way of life in West Africa and migration within Ghana is no exception. Ghana's internal migration is primarily a north–south phenomenon established well before the census started officially recording migration data in 1960 (Agyei and Ofosu-Mensah Ababio 2009). Since 1960, each census has recorded large out-migration streams from Ghana's northern regions and significant in-migration streams into the Greater Accra Region, with Ghana's 2010 Census recording an intercensal in-migration rate of 40.72% for Greater Accra (GSS 2013c). Nearly one-third (32.2%) of the Greater Accra Region's population is between the ages of 15 and 29 years, due to a high rate of age-selective in-migration and rapid natural increase (GSS 2013b). Migrants residing in Accra also tend to be long-term migrants, with only about one in ten having moved in the 12 months prior to the 2010 Census (GSS 2013b). As a result, Ghana's urban centres (Figure 1) are facing growing challenges brought on by unemployment, inadequate sanitation, and the development of shanty towns. Of the 1.6 million migrants residing in the Greater Accra Region during the 2010 Census, about 10% originated from Ghana's three northern regions (GSS 2013b).

With growing social acceptance of female independence and mobility, girls and women are now the majority of Ghana's internal migrants. Among adolescents, females

[5] Polygamy is illegal under Ghanaian civil law, but it is common in northern Ghana.

migrate from Ghana's rural areas to the country's urban areas at greater rates than males (GSS 2013a). The same pattern exists among youth aged 25 years and younger, with girls and young women comprising 60.5% of migrant youth (Anarfi and Appiah 2009). Girls frequently migrate before completing their education. Depending on the estimates, between 50% and 80% of female migrants have no formal education (Agyei and Ofosu-Mensah Ababio 2009; Frempong-Ainguah, Badasu, and Codjoe 2009; Quartey and Yambilla 2009).

Figure 1: Map of Ghana by region with differentiated urbanization levels (2010)



Note: Map created by the authors.

There is debate about whether independent child migrants decide to migrate primarily as a result of poverty or for economic reasons (Anarfi and Agyei 2009). Commonly cited causes of child migration include deteriorating agricultural land, drought, poor market facilities, poor transport networks, lack of employment

opportunities, and lack of desire to participate in the agricultural industry (Frempong-Ainguah, Badasu, and Codjoe 2009). Urban-pull factors and rural-push factors also influence children's migration decisions. Push factors for child migration include parental inability to cater for their children's needs, ethnic conflicts, lack of privacy and money, lack of interest in schooling from parents and/or children, maltreatment by family members, desire to prevent being given away in marriage, and lack of independence (Frempong-Ainguah, Badasu, and Codjoe 2009). Pull factors for child migration include assisting a sibling with work, schooling, learning a trade, working for money, experiencing city life, and staying with a relative (Frempong-Ainguah, Badasu, and Codjoe 2009).

Child migrants experience a number of problems related to either their work or their young age: for instance, a decline in business, cheap prices for migrant services, harassment from city guards, financial problems, physically demanding work, work that is too difficult, no/insufficient work, no place to sleep, and high taxes (Kwankye and Addoquaye Tagoe 2009). Given these challenges, child migrants frequently return to their place of origin (Addoquaye Tagoe and Kwankye 2009). A survey conducted in northern Ghana among returned child migrants found that other reasons for children's return included continuing their education, changed marital status, and being needed at home (Addoquaye Tagoe and Kwankye 2009). As children (and their families) appear to constantly weigh the costs and benefits of migrating to and from their place of origin, repeated migrations may occur (Anarfi and Kwankye 2009).

2.2 Gender and migration

Defining the roles of girls and women as daughters, wives, and mothers has failed to recognize women's work beyond reproductive labour (e.g., caregiving, household labour, unpaid work). This narrow view of female roles is present in the literature on migration. Migrant girls and women may be classified as 'dependent' or 'independent' based on whether they migrate as daughters and wives or as members of the workforce (Llácer et al. 2007: ii4). Similarly, the migration literature has referred to girls and women who migrate with fathers and husbands as "passive" rather than "active" migrants (Findley 1989). These labels are absent from the literature on migrant boys and men. Male migrants are not classified according to their relationship to their mothers and wives.

In addition to using different language to describe the migration of girls and women, the migration literature has historically overlooked the roles of female migrants. Girls' and women's forms of migration and their migration-related employment have often been invisible and unrecognised, especially with regards to

migrant domestic work (Elias 2010). This invisibility stems from research in the 1960s and 1970s in which researchers often assumed migrants were male, focusing analyses on male migrants and historically underestimating female migration (Caldwell 1969; Zlotnik 1995). Sex-disaggregated census data increasingly shows growing mobility among girls and women, with migration rates frequently balanced between the sexes (Beegle and Poulin 2013; GSS 2013c; Camlin, Snow, and Hosegood 2014). While census data is limited to sex-disaggregated analyses, examining differences between the migration patterns of women and men is the first step in advancing our understanding of gender and migration.

Migration increasingly allows girls and women to challenge traditional social roles in rural societies (Guo, Chow, and Palinkas 2011). In Ghana, girls challenge these roles by independently deciding to migrate (70% of girls vs. 54% of boys) and by personally financing their migrations (57.6% of girls vs. 34.9% of boys) (Anarfi and Agyei 2009). Research from the Democratic Republic of Congo and Senegal finds that, in patriarchal settings, women's access to and support from migrant networks is crucial in order for women to migrate (Toma and Vause 2014). Upon migrating, migrant women develop and strengthen community ties by strategically giving gifts, sharing food, caring for children, and participating in reciprocal labour (Tufuor et al. 2015).

Evidence suggests that gender-specific factors may influence girls' and women's choice of destination. Based on a survey of 450 child migrants residing in Accra and Kumasi in 2005, researchers found that migrant girls were occasionally pursued and recaptured by their families; this finding may illustrate one of the reasons why many females decide to move to Accra, the urban centre that is furthest from the northern regions (Anarfi and Agyei 2009). In addition to choice of destination, gender may influence where migrants work. In Accra, public spaces have historically been gendered: markets are associated with female entrepreneurship, whereas bus stations are associated with male entrepreneurship (Thiel and Stasik 2016).

When mothers migrate, it can lead to restructuring of the parent–child relationship as well as paradoxes pertaining to mothers' caregiving role (Resurreccion 2009; Contreras and Griffith 2012). With economic support now a key component of 'superior motherhood,' this type of support comes at a cost for migrant mothers: mothers may be absent from their children's lives and unable to provide their children with emotional support and care from afar (Contreras and Griffith 2012: 62). Migration can enhance the value of motherhood, as mothers provide increased resources and improved material conditions for their children; however, migration can also diminish motherhood, as other family members are called upon to provide childcare responsibilities in the mother's absence (Contreras and Griffith 2012). In this regard, mothers migrating independently without their children are in fact dependent upon family members' ability to fulfil the daily caregiving role.

2.3 Data sources for analysing migration in Ghana

Ghana's internal migration data comes primarily from the decennial censuses and ad hoc population surveys, as Ghana has no population register or administrative data suitable for migration analyses. While census data provides limited depth of information on female migration, it provides the most comprehensive source of evidence on female migration at all ages that can be exploited using demographic techniques. Ad hoc subnational surveys and research on female migration in Ghana are localized and small-scale, precluding national-level analyses (Awumbila and Ardayfio-Schandorf 2008; Anarfi and Kwankye 2009). These studies address important aspects of migration, such as push- and pull-factors underlying independent child migration, childcare practices among young migrants, and migrants' livelihood strategies. National migration data comes from the Ghana Migration Study (1991–1992), "Development on the Move" migration study (2008–2009), Ghana Demographic and Health Surveys (conducted in 1988, 1993, 1998, 2003, 2008, and 2014), Ghana Living Standards Survey (conducted in 1987, 1988, 1991–1992, 1998–1999, 2005–2006, and 2013), and post-independence censuses (1960, 1970, 1984, 2000 and 2010). Each of these data sources has strengths and limitations for national-level analyses of migration.

The 1991–1992 Ghana Migration Study (GMS), developed in response to inadequate migration data in prior censuses, provided a depth of migration data unparalleled by more recent surveys. It collected evidence on the processes, mechanisms, and effects of internal migration; however, this survey has not been repeated (Twum-Baah, Nabila, and Aryee 1995). Despite its relative depth of migration data, the 1991–1992 GMS has significant limitations: exclusion of child migrants younger than 15 years of age; documented implementation challenges, such as inaccessible enumeration areas (i.e., resulting from floods, ethnic conflicts, and broken transportation); and lack of technical assistance required to implement the survey (Twum-Baah, Nabila, and Aryee 1995).

To fill evidence gaps in migration's developmental impacts and policy that were unaddressed in the GMS, the Regional Institute for Population Studies at the University of Ghana and the Global Development Network collaborated in 2008–2009 on a nationally representative survey entitled "Development on the Move: Measuring and Optimising Migration's Economic and Social Impacts" (Yeboah et al. 2010). This study focused on international migration and its socioeconomic impacts on households and individuals remaining in Ghana.

Ghana's Demographic and Health Surveys (GDHS) (1988, 1998, 2003, and 2008) have each asked the same single question about migration – "How long have you been living continuously in (NAME OF CURRENT PLACE OF RESIDENCE)?" – and defined migrants based on how long they have lived in the enumeration area (GSS and IRD 1989; GSS and Macro International 1999; GSS, NMIMR, and ICF Macro 2004

2009). This question has several drawbacks for measuring migration. It precludes identification of types of migrants (e.g., internal, international) and calculation of subnational interregional migration flows. The 1993 GDHS included a five-question migration module that went beyond birthplace to include whether or not the respondent had lived elsewhere for at least six months, age at first migration, and reason for first migration (GSS, GHS, and ICF Macro 1994). Most recently, the 2014 GDHS asked respondents how many times in the last 12 months they had been away from home for one or more nights and whether they had been away from home for more than one month at a time (GSS, GHS, and DHS Program 2015). These questions have not been repeated, preventing comparative analyses across GDHS. Furthermore, GDHS sampling in Ghana excludes girls and women outside 15–49 years of age.

The Ghana Living Standards Survey (GLSS) assesses living conditions in Ghanaian households using a nationally representative sample. In the household roster, the 2012–2013 GLSS6 captures region/country of birth (question 11) and how many months during the past 12 months the person (aged six months and older) has been away from this household (question 22). The survey also contains a ten-question module on migration (Section 5A) that collects data such as timing of move/return, intentions to stay, occupation and industry of migrant labour, and reason for migrating. The GLSS6 is a valuable source of migration data since this migration data is linked to detailed individual- and household-level sociodemographic data; however, the ten-question module is asked only of household members aged seven years or older.

3. Data and methods

3.1 Data

Through the Ghana Statistical Service (GSS), we obtained a 10% random sample for both the 2000 and 2010 Censuses along with all available questionnaires, manuals, codebooks, and reports. To assess data quality, we reviewed the post-enumeration surveys conducted to assess coverage and content errors (GSS 2003, 2012). Three months after the 2000 Census, the post-enumeration survey sampled 200 out of 26,716 enumeration areas to collect data on eight selected census questions, including place of usual residence (GSS 2003). The post-enumeration survey data was matched to the census data and reconciled where necessary. Unfortunately, planning for the 2000 post-enumeration survey was more effective than its data management; the 2000 post-enumeration survey data is physically missing, preventing analysis of whether or not the final census results required adjustment.

Implementation was greatly improved for the 2010 Census post-enumeration survey, which sampled 250 out of 37,488 enumeration areas seven months after the census (GSS 2012). The post-enumeration survey found an omission rate of 3%, the erroneous inclusion of 1.3% of the population in the census, and a greater chance of males (3.3%) being omitted from the census than females (2.8%) (GSS 2012). Based on the low net coverage error of 1.8% at the national level, it was unnecessary to adjust the 2010 Census results for our analyses. However, some populations, such as migrant *kayayei* (female porters who carry loads on their heads at markets and transportation centres), proved challenging to enumerate in the 2010 Census since they are highly mobile and occasionally homeless; this population reportedly exceeded estimates and required additional time to enumerate in Accra (*Daily Express* 2010). Comparing key variables between the microdata and censuses reveals that the microdata sample from the 2010 Census more accurately reflects the complete census than the microdata sample from 2000, in which the age structure differs slightly (Table 1).

Table 1: Comparison of microdata samples to the 2000 and 2010 Censuses

	2000		2010	
	Census	**Sample (10.0%)**	**Census**	**Sample (10.0%)**
Total population	18,912,079	1,891,158	24,658,823	2,466,289
Sex				
Female	9,554,697 (50.5%)	955,504 (50.5%)	12,633,978 (51.2%)	1,262,598 (51.2%)
Male	9,357,382 (49.5%)	935,654 (49.5%)	12,024,845 (48.8%)	1,203,691 (48.8%)
Enumeration locality				
Rural	10,637,809 (56.2%)	1,063,732 (56.2%)	49.1%	49.1%
Urban	8,274,270 (43.8%)	827,426 (43.8%)	50.9%	50.9%
Age structure				
Median age	19.4	19.0	20.0	20.0
Dependent population†	8,965,233 (47.4%)	880,031 (46.6%)	10,617,930 (43.1%)	1,060,608 (43.0%)
Regional population distribution				
Highest share	Ashanti (19.1%)	Ashanti (19.1%)	Ashanti (19.4%)	Ashanti (19.3%)
Lowest share	Upper West (3.0%)	Upper West (3.0%)	Upper West (2.8%)	Upper West (2.9%)

Note: † Respondents aged <15 and >64 years.

The 2000 and 2010 Censuses both included four questions to measure migration. However, the phrasing of these questions differed (Table 2), affecting cross-census comparability. Given these changes to the phrasing of migration questions between the 2000 and 2010 Censuses, the 2010 Census National Analytical Report acknowledges that the census data underestimates people's actual mobility and does "not provide enough and adequate information on patterns and differentials of migration in a country" (GSS 2013c: 205). Several response categories also changed between the 2000

and 2010 Censuses. Changes to response categories between censuses (e.g., additions, removals, or changes in definitions), and their analytic implications, are explored in the results.

Table 2: Criteria for classifying migrants and nonmigrants by Ghana census questions on migration

2000 Census			2010 Census		
Census question	**Migrant determination**	**Nonmigrant**	**Census question**	**Migrant determination**	**Nonmigrant**
P06a BORN IN THIS TOWN/VILLAGE: Was (NAME) born in this town or village? If Yes go to P07. [Note: Only asked of respondents who were Ghanaian by birth.]	Person who is Ghanaian by birth and enumerated in a place different from the place where s/he was born *A NO answer is a lifetime migrant.* International migrant = person for whom this answer is missing (implying that they are a foreign citizen)	Person who is Ghanaian by birth and enumerated in the place where s/he was born *A YES answer is a nonmigrant.*	P05 BIRTHPLACE: Was (NAME) born in this town/village? If Yes, go to P07.	Person enumerated in a place different from the place where s/he was born *A NO answer is a migrant.*	Person enumerated in the place where s/he was born *A YES answer is a nonmigrant.*
P06b BIRTHPLACE OUTSIDE THIS TOWN/VILLAGE: In what region or country was (NAME) born? [Note: Only asked of respondents who were Ghanaian by birth.]	Person who is Ghanaian by birth and enumerated in a place different from the place where s/he was born Internal migrant = person who is Ghanaian by birth and born in one of Ghana's nine regions outside the region of enumeration International migrant = person who is Ghanaian by birth and born outside Ghana *All respondents answering are lifetime migrants.*	–	P06 BIRTHPLACE: In what region or country was (NAME) born?	Person enumerated in a place different from the place where s/he was born Internal migrant = person born in Ghana outside the place of enumeration International migrant = person born outside Ghana *All respondents are migrants.*	–
P07 USUAL PLACE OF RESIDENCE: In what district is (NAME'S) usual residence?	Person enumerated in a place different from her/his usual place of residence Internal migrant = person who usually resides in one of Ghana's districts outside the district of enumeration International migrant = person who usually resides outside Ghana	Person enumerated in her/his usual district of residence	P07 LIVING IN THIS TOWN/VILLAGE: Has (NAME) been living in this town or village since birth? If Yes, go to P09.	Person who has not lived in the place of enumeration for her/his entire life *A NO answer is a migrant.*	Person who has lived in the place of enumeration for her/his entire life *A YES answer is a nonmigrant.*
P08 PLACE OF RESIDENCE FIVE YEARS AGO IF (NAME) IS FIVE YEARS OR OLDER: In what district was (NAME'S) usual place of residence five years ago?	Person whose place of residence at the 2000 Census differs from her/his place of residence in 1995 Internal migrant = person who usually resided in 1995 in one of districts outside the district of enumeration International migrant = person who usually resided outside Ghana in 1995	Person whose district of residence at the 2000 Census is the same as that in 1995	P08 NUMBER OF YEARS LIVED IN THIS TOWN/VILLAGE: For how long has (NAME) been living in this town or village?	Person who has lived in the place of enumeration for a period less than her/his age	Person who has lived in the place of enumeration for her/his entire life

Definitions in this paper are consistent with those used by the GSS. "Lifetime migrants" are people whose residence at the census differs from their birthplace (GSS 2013c), with "birthplace" defined as "the town or village (locality) of usual residence of the [infant's] mother at the time of birth" (GSS 1999: 37). "District of usual residence" refers to the district in which the respondent usually resides and may be the place where s/he was enumerated; however, in cases where respondents maintain multiple residences (e.g., students, military personnel), "usual residence" refers to "where the person spends most of his/her days or time" (GSS 1999: 38). A respondent may also be considered a "usual resident" if s/he has "lived there for at least six months or has the intention of staying for the next six months" (GSS 1999: 38).

3.2 Methods

Secondary analyses of the 2000 and 2010 Census microdata were conducted using SPSS Statistics 22.0 and Microsoft Excel 2011 software. We used direct and indirect demographic techniques (UNDESA 1970; Moultrie et al. 2013) to describe the scale, type, and demographic structure (e.g., age, religion, marital status) of contemporary female migration in Ghana and to assess the distribution of female migrants across age and geography. We detail these methods and their assumptions in a technical appendix (Appendix 1).

In order to represent typical age patterns of migration, we fitted a Rogers–Castro multiexponential model migration schedule to observed female migration data (Rogers and Castro 1981; Little and Dorrington 2013) (Appendix 1, Section A-1.1). These schedules, which range from 7 to 13 parameters depending on the model's complexity, depict the dependency between age and migration for use in population projections and in understanding migration dynamics (Little and Dorrington 2013). While not all data will produce a shape compatible with the multiexponential model migration schedule, researchers have successfully fitted the schedule to migration flows in North America, Europe, Asia, and Africa (Little and Dorrington 2013). To examine the effects of demographic indicators on the likelihood of a girl or woman migrating internally in 2000 and 2010, we conducted logistic regression analyses (Appendix 1, Section A-1.2). Binary logistic regression modelled the effects of selected independent variables on whether or not a girl or woman was identified in the census as ever having migrated internally. Selection of the independent variables was based on a literature review of push- and pull-factors of migration. Finally, we generated estimates of net internal female migration between subnational regions from place of birth data (Dorrington 2013) (Appendix 1, Section A-1.3). While we considered estimates produced using the

cohort component method (Spoorenberg 2015), our estimates of net internal migration from place of birth data appear more robust (Appendix 1, Section A-1.4).

4. Results

After first identifying all migrants in the census data, we present analyses of the demographic structure of internal migrants. We then explore the demographic characteristics of female migrants, using regression analyses to explain internal migration status, with "internal migrant" as the dependent variable (yes/no). After examining who migrates, we analyse their migration destinations. The results conclude with analyses of interregional migration, including patterns and trends in the geographic distribution of internal migrants and estimates of interregional female migration between 2000 and 2010.

4.1 Identification of migrants

Migrants in the 2000 and 2010 Censuses were identified and classified according to the criteria in Table 2. The 2000 Census microdata identified a total of 359,960 female internal and international migrants (37.7% of the female population) and 371,577 male internal and international migrants (39.7% of the male population) (Appendix 2, Table A-7). In the 2010 microdata, the questions identified 487,376 female internal and international migrants (38.6% of the female population) and 447,485 male internal and international migrants (37.2% of the male population).

Of the female migrants identified in the 2010 microdata, international migrants comprised 3.1% of the sample (15,123). The 2000 Census permitted more refined identification of international migrants, since it collected data on place of usual residence at the time of the census and place of usual residence five years prior to the census. In the 2000 microdata, female migrants can be split into 62,929 international migrants (13.5%) and 402,146 internal migrants (86.5%). Between 2000 and 2010, the proportion of lifetime internal migrants increased for both females and males (28.7% to 35.6% and 28.1% to 34.2% respectively). The relative increase in lifetime migration was greater for females during this period.

At the subnational level, we identified interregional lifetime migration for both sexes using region of birth and region of residence at enumeration (Tables 3 and 4). This identification ignores any interim migration and captures only migration between region of birth and region of residence at enumeration.

Table 3: Female population classified by region of birth and region of enumeration, Ghana, 2000 and 2010

Region of birth	Region of enumeration										Total
	Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West	
a) Region of birth by region of enumeration at 2000 Census											
Western	642,460	16,760	28,380	2,920	8,000	21,060	5,560	1,880	1,600	1,410	730,030
Central	62,770	676,570	89,760	3,260	29,500	42,480	7,160	2,840	1,000	740	916,080
Greater Accra	11,700	15,640	809,900	13,850	27,230	17,310	6,220	3,420	2,230	1,420	908,920
Volta	22,260	13,250	125,930	725,740	54,130	23,840	13,520	8,610	780	810	988,870
Eastern	29,300	21,540	162,960	11,400	858,730	37,760	8,970	2,120	1,420	930	1,135,130
Ashanti	44,500	15,970	78,680	5,070	19,850	1,304,400	36,120	7,360	8,830	5,340	1,526,120
Brong Ahafo	28,420	3,300	16,980	2,130	5,150	35,620	683,910	5,640	2,310	3,390	786,850
Northern	8,870	3,020	23,010	14,910	5,600	31,620	27,290	821,860	4,020	2,660	942,860
Upper East	19,410	2,550	12,680	960	4,480	42,890	23,720	10,410	422,900	1,440	541,440
Upper West	12,370	1,890	9,710	810	3,860	22,890	40,210	12,700	2,200	264,120	370,760
Total	882,060	770,490	1,357,990	781,050	1,016,530	1,579,870	852,680	876,840	447,290	282,260	8,847,060
b) Region of birth by region of enumeration at 2010 Census											
Western	909,160	30,970	43,610	3,640	11,730	40,980	10,090	1,210	1,600	1,540	1,054,530
Central	71,810	945,810	136,770	4,840	35,330	58,510	8,150	1,880	590	650	1,264,340
Greater Accra	15,150	43,100	1,188,210	19,930	37,770	25,650	7,480	3,620	2,510	1,480	1,344,900
Volta	23,340	22,980	180,300	1,000,130	63,580	26,720	15,900	8,660	880	710	1,343,200
Eastern	28,610	38,450	245,430	15,380	1,123,500	46,750	10,290	1,830	1,030	1,000	1,512,270
Ashanti	41,350	29,580	125,150	7,230	28,910	2,011,670	44,260	7,620	12,740	5,230	2,313,740
Brong Ahafo	27,870	7,730	32,930	3,850	8,780	77,220	943,410	6,700	2,550	5,170	1,116,210
Northern	18,190	6,950	49,480	17,280	10,890	61,570	40,740	1,190,720	5,970	3,620	1,405,410
Upper East	21,250	3,850	20,530	910	6,610	66,430	29,680	9,560	500,400	2,230	661,450
Upper West	13,370	2,050	9,910	610	4,170	28,600	50,520	11,820	2,770	334,880	458,700
Total	1,170,100	1,131,470	2,032,320	1,073,800	1,331,270	2,444,100	1,160,520	1,243,620	531,040	356,510	12,474,750

Table 4: Male population classified by region of birth and region of enumeration, Ghana, 2000 and 2010

Region of birth	Region of enumeration										Total
	Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West	
a) Region of birth by region of enumeration at 2000 Census											
Western	613,470	14,430	26,760	2,620	7,390	19,710	5,580	1,750	1,870	1,440	695,020
Central	62,760	593,640	85,470	3,460	25,960	43,890	8,380	3,470	910	520	828,460
Greater Accra	13,890	15,600	769,250	14,930	27,750	19,980	7,480	3,620	2,480	1,200	876,180
Volta	25,450	13,360	122,100	665,010	52,970	26,210	14,590	9,030	1,090	780	930,590
Eastern	33,250	21,020	151,680	10,780	804,890	39,620	9,700	2,330	1,540	790	1,075,600
Ashanti	48,040	15,600	80,840	4,170	18,940	1,222,970	34,200	7,190	8,850	4,610	1,445,410
Brong Ahafo	30,760	3,690	17,350	2,210	5,170	35,070	647,860	5,340	2,530	2,600	752,580
Northern	10,710	3,630	23,200	14,170	7,260	35,630	32,400	796,510	3,680	2,510	929,700
Upper East	23,880	2,890	14,600	1,070	6,230	49,060	29,090	8,390	372,130	1,040	508,380
Upper West	13,780	1,940	8,700	1,060	5,310	27,470	49,760	12,530	2,090	242,230	364,870
Total	875,990	685,800	1,299,950	719,480	961,870	1,519,610	839,040	850,160	397,170	257,720	8,406,790
b) Region of birth by region of enumeration at 2010 Census											
Western	874,870	25,780	38,060	2,790	10,360	37,300	11,550	1,070	1,730	1,640	1,005,150
Central	72,240	850,070	117,280	4,790	31,750	54,310	9,030	1,880	800	810	1,142,960
Greater Accra	20,080	41,520	1,137,810	20,680	36,550	27,510	9,220	3,800	3,370	1,700	1,302,240
Volta	27,770	25,350	164,370	922,570	63,920	31,140	18,380	8,050	1,240	700	1,263,490
Eastern	34,700	37,390	211,150	14,320	1,071,690	46,210	11,210	2,130	1,600	910	1,431,310
Ashanti	50,080	31,680	123,980	6,700	27,270	1,868,170	47,390	7,400	12,710	5,840	2,181,220
Brong Ahafo	32,480	9,420	29,570	3,330	9,300	66,940	895,440	6,250	2,480	4,430	1,059,640
Northern	21,890	7,840	45,020	16,990	13,680	61,050	47,070	1,172,660	5,250	4,200	1,395,650
Upper East	26,540	5,250	20,180	910	7,460	65,630	33,050	7,150	471,290	1,610	639,070
Upper West	14,880	2,650	7,240	680	6,190	27,940	55,620	10,430	1,820	315,410	442,860
Total	1,175,530	1,036,950	1,894,660	993,760	1,278,170	2,286,200	1,137,960	1,220,820	502,290	337,250	11,863,590

Figures 2 and 3 condense these migration streams by sex into noncumulative, stacked column charts that compare the totals (i.e., net lifetime migration) and their shares (i.e., lifetime out-migrants, lifetime in-migrants) (Appendix 2, Tables A-8 and A-9). Four regions experienced population gains in net lifetime migration streams by

both sexes in 2000 and 2010: Greater Accra, Western, Ashanti, and Brong Ahafo. The remaining six regions experienced net losses by both sexes in 2000 and 2010.

Figure 2: Lifetime female migration streams, Ghana, 2000 (blue) and 2010 (red)

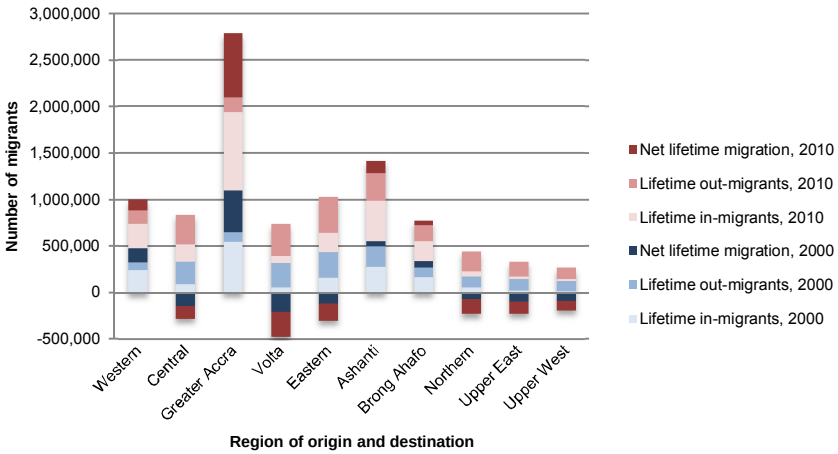
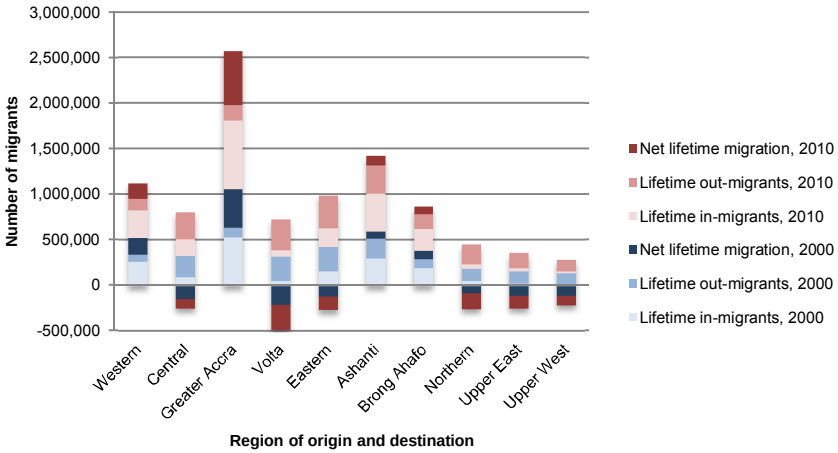


Figure 3: Lifetime male migration streams, Ghana, 2000 (blue) and 2010 (red)



4.2 Demographic structure of internal migrants

Disaggregating internal migrants by age and sex highlights changes between groups and over time. Though Ghanaians migrate at all ages, the mean age of internal migrants increased over time. From 2000 to 2010, the mean age of female internal migrants rose from 27.39 years (s.d. 18.86) to 29.71 years (s.d. 18.69). Males showed a similar trend, with the mean age of internal migrants increasing from 28.48 years (s.d. 19.57) to 29.71 years (s.d. 18.62) between 2000 and 2010.

Examining the distribution of migrants and nonmigrants by five-year age groups indicates growing relative migration between 2000 and 2010. In 2000, female nonmigrants outweighed female migrants in each five-year age group (Figure 4, top). By 2010, the percentage of female migrants overtook female nonmigrants among women aged between 25 and 49 years (Figure 4, bottom). For males in 2000, nonmigrants comprised a greater percentage of each age group than migrants, with the exception of the age group 45–49 years (Figure 5, top). By 2010, male migrants outweighed male nonmigrants among men aged between 30 and 59 years (Figure 5, bottom). Working-age migration was particularly pronounced in 2010 for both men and women.

The age-related distribution of female and male regional out-migrants was assessed in greater detail using multiexponential model migration schedules (Figure 6) for age cohorts x–5 to x over the period 1995–2000. Since retirement was not concentrated among specific ages in this data and the data may exaggerate older ages (Little and Dorrington 2013), the standard 7-parameter model fitted the observed data better than the more complex 9-, 11-, or 13-parameter models, which account for more complex components such as retirement peaks and post-retirement up-slopes. The mean absolute percentage error statistic, 7% for both sexes, is within the boundaries for achieving a reasonable fit. The R-squared values for males (92%) and females (89%) are acceptable compared to the established threshold of 90%, indicating that the models reasonably fit the data (Little and Dorrington 2013). T-statistics are significant at the 0.05 level for all coefficients. For both sexes, the rate of ascent of the labour force component is greater than the rate of this component's descent. Female migration propensity rises sharply from the age of 10, peaking at 0.09097 at the age of 23 years. Male migration propensity peaks several years later at 0.10204 at the age of 27 years.

Figure 4: Female population pyramid by migrant status, 2000 Census (top) and 2010 Census (bottom)

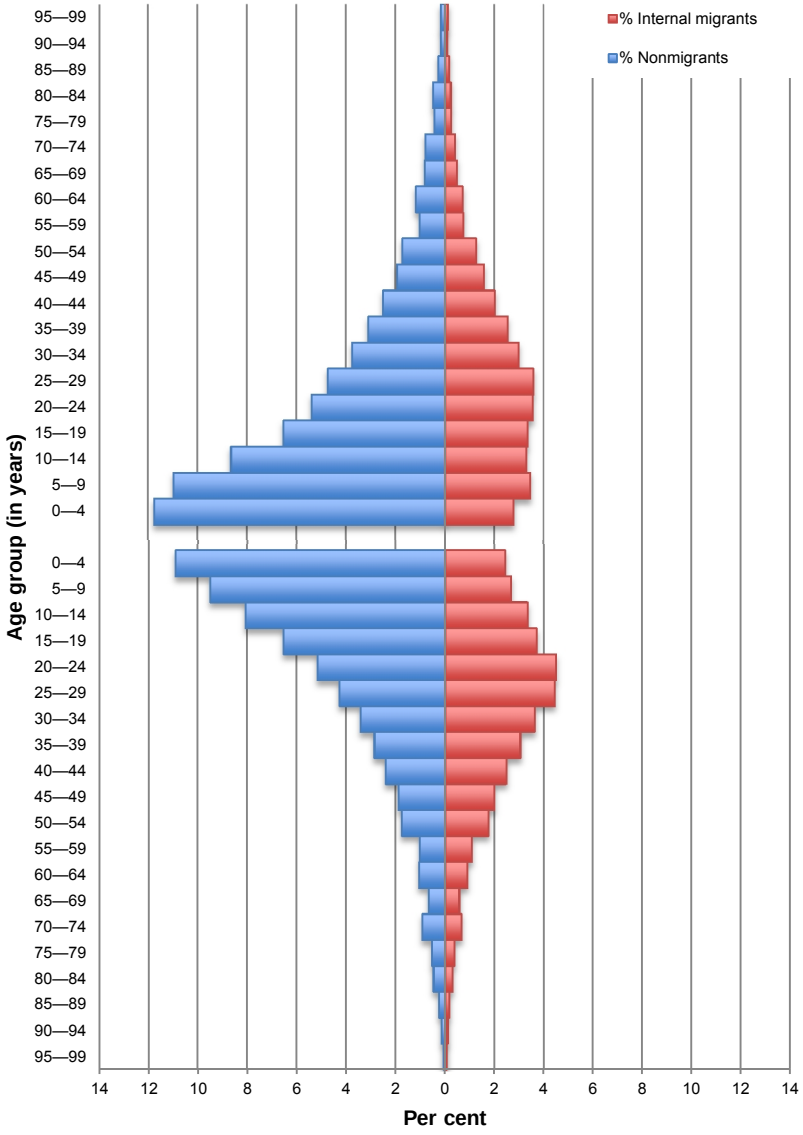


Figure 5: Male population pyramid by migrant status, 2000 Census (top) and 2010 Census (bottom)

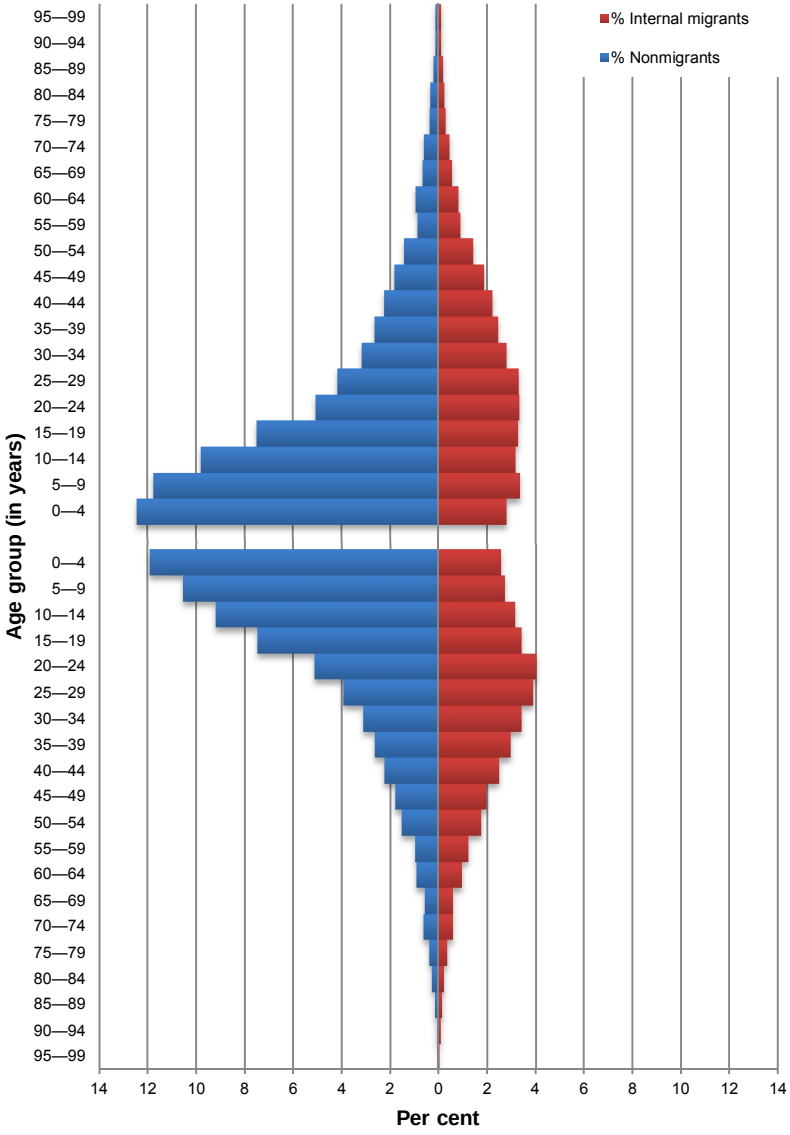
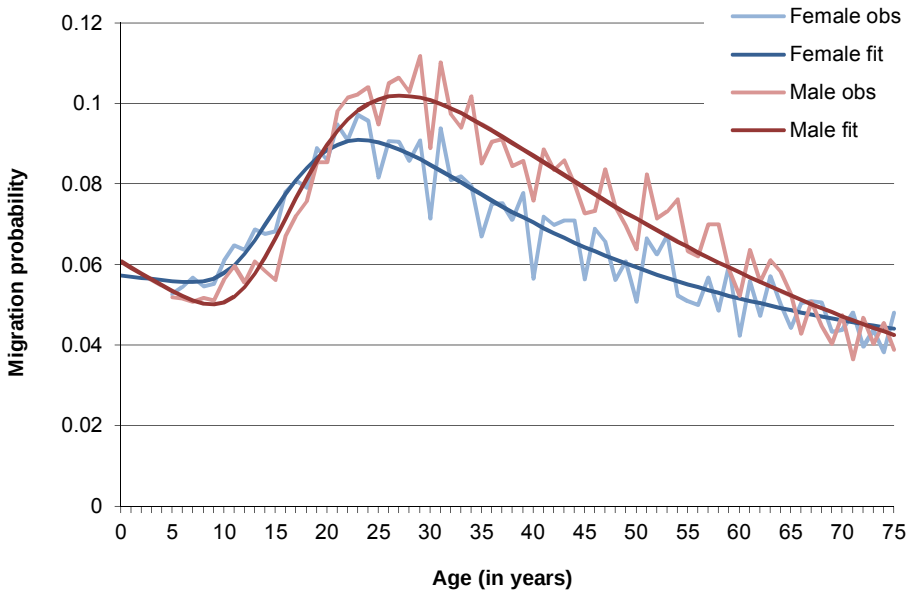


Figure 6: Regional out-migration by sex over the five-year interval, 1995–2000, and fitted with a 7-parameter model schedule, Ghana, 2000 Census 10% microdata



After identifying all female internal migrants in the microdata and examining migrant status by sex and age, we analysed the effects of demographic indicators on the likelihood of a girl or woman being identified as an internal migrant (Table 5). International migrants are excluded from these regression analyses. Age, in five-year age groups, and education status were nonsignificant predictors. These variables are excluded from the final models for 2000 and 2010, as they worsened or did not significantly improve the models' ability to predict internal migrant status. The model for 2000 accurately predicts 63.5% of cases, predicting nonmigrants (85.1%) better than internal migrants (29.7%). The 2010 model improves the accuracy of predicting internal migrants (51.1%). It accurately predicts 65.7% of cases, including 75.5% of nonmigrants. Difficulties in accurately determining migrant status based on census data are likely to affect the models' predictive abilities. Although both models have low R-squared values, they also have statistically significant predictors that can be used to draw conclusions about migrant status.

Table 5: Regression results explaining female internal migration status in Ghana, 2000 and 2010 Census microdata, with internal migrant as the dependent variable

Demographic characteristics (Independent variables)		2000			2010		
		Odds ratio	Std. Error	95% C.I.	Odds ratio	Std. Error	95% C.I.
Residence	Rural	Ref	–	–	Ref	–	–
	Urban	1.377	0.006	1.362–1.393	1.602	0.004	1.589–1.616
Marital status	Never married	Ref	–	–	Ref	–	–
	Married	0.999	0.009	0.982–1.017	0.981	0.007	0.967–0.994
	Consensual union†	0.937	0.013	0.914–0.960	1.000	0.011	0.979–1.022
	Separated	0.902	0.021	0.866–0.940	0.834	0.016	0.809–0.860
	Divorced	0.758	0.014	0.737–0.780	0.827	0.012	0.808–0.847
	Widowed	0.775	0.014	0.755–0.796	0.804	0.010	0.788–0.821
Worked for pay, profit, or family gain	Did not work	Ref	–	–	Ref	–	–
	Worked	1.117	0.006	1.104–1.130	1.097	0.005	1.086–1.107
Relationship to head of household	Head	Ref	–	–	Ref	–	–
	Nonrelative	1.952	0.018	1.886–2.021	2.091	0.009	2.024–2.161
	Temporary head‡	1.355	0.018	1.309–1.403	–	–	–
	Group quarters§	4.468	0.074	3.861–5.169	1.320	0.015	1.283–1.358
	Spouse	1.401	0.010	1.375–1.428	1.271	0.007	1.252–1.289
	Child	0.519	0.011	0.508–0.529	0.356	0.008	0.350–0.361
	Parent or parent-in-law	1.190	0.021	1.142–1.241	1.017	0.016	0.986–1.049
	Daughter-in-law	1.055	0.022	1.010–1.102	0.758	0.020	0.729–0.789
	Grandchild	0.397	0.019	0.382–0.412	0.294	0.012	0.287–0.300
	Sister‡	–	–	–	0.787	0.011	0.769–0.804
	Stepchild‡	–	–	–	0.547	0.025	0.521–0.574
	Adopted/ foster child‡	–	–	–	0.724	0.031	0.681–0.769
	Other relative	1.156	0.010	1.134–1.178	0.914	0.009	0.898–0.930
Religion	No religion	Ref	–	–	Ref	–	–
	Catholic	0.918	0.014	0.893–0.944	1.178	0.012	1.150–1.206
	Protestant	1.019	0.014	0.991–1.046	1.277	0.012	1.248–1.307
	Pentecostal¶	1.154	0.014	1.124–1.185	1.561	0.011	1.527–1.597
	Other Christian	1.033	0.015	1.003–1.063	1.294	0.012	1.263–1.326
	Muslim	0.616	0.015	0.598–0.634	0.758	0.012	0.740–0.776
	Ahmadi‡	–	–	–	1.118	0.029	1.057–1.182
	Traditional	0.397	0.017	0.384–0.410	0.516	0.015	0.501–0.532
	Other	1.158	0.034	1.082–1.239	1.285	0.025	1.223–1.350
Cox & Snell R^2		0.067			0.105		
Nagelkerke R^2		0.090			0.142		

Notes: † In 2010 this category included informal unions and living together. ‡ This response category is included in only one census. § Group quarters included members of nonhousehold populations (e.g., nurses working the night shift) and referred to places such as hotels, orphanages, universities, prisons, and hospitals. ¶ In 2010 the category Pentecostal included respondents who identified as Charismatic.

Being a female migrant is significantly associated with residing in an urban area, indicating the prominence of rural–urban migration. Residing at a residence where relationship to the household head is group quarters, nonrelative, temporary head,

spouse, or parent/parent-in-law also increases a census respondent's odds of being identified as an internal migrant. Female migrants are more likely than nonmigrants to report working for pay, profit, or family gain, suggesting that economic opportunity is a likely driver of migration. By 2010, female migrants are likelier to have never married than be married. Female census respondents are substantially less likely to be identified as internal migrants in 2000 and 2010 if they practise a traditional religion or Islam and if they are the children of the household head.

4.3 Interregional female migration

Key features of Ghanaian female internal migration include the high concentration of intraregional migration within all regions and out-migration from the Upper East, Upper West, Northern, Volta, and Central Regions, with no significant in-migration. The Greater Accra Region exhibited significant in-migration from all but three regions (Upper West, Upper East, and Brong Ahafo).

The importance of the Greater Accra and Ashanti Regions as internal migration destinations is further underscored by examination of interregional female migration streams between 1995 and 2000. Using five-year fixed-interval data from the 2000 Census, we calculated interregional female migration streams between 1995 and 2000 in Ghana in the population aged five years and older. Table 6 depicts destination-specific out-migration rates for each of Ghana's regions, producing a five-year migration rate for females who survived the period 1995–2000. Three of the five highest migration rates are among females migrating to Greater Accra from the Volta (0.0180), Eastern (0.0172), and Central Regions (0.0138). The highest rate is among females in the Western Region migrating to the Central Region (0.0218). The highest rates of migrants to the Ashanti Region are among females migrating from the Upper East (0.0129) and Brong Ahafo (0.0119) Regions.

Regional estimates of the net number of interregional female in-migrants from 2000 to 2010 (Appendix 2, Table A-10) show that Greater Accra received the largest number of female migrants among all age groups. Of Ghana's estimated 804,365 total female in-migrants (Table 7), nearly half (43.56%) migrated into Greater Accra, with the Ashanti Region, home to Ghana's second largest city, receiving 22.47% of female in-migrants. The lowest levels of in-migrants are in northern Ghana, with a net number of 662 girls and women migrating into the Northern Region (0.08%) and 6,823 migrating into the Upper East Region (0.85%). Negative numbers in Table A-10 indicate negative net in-migration. The Upper West is the only region to experience overall net negative in-migration. Net in-migration in the Upper West Region for 2000 and 2010 is positive only among girls aged 0–4 years.

Table 6: Female interregional migration rates in 2000 as proportions of survivors of the 1995 population, female population aged five years and older

Region of residence, 1995	Region of residence at census, 2000										
	Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West	Total
Western	–	**0.0218**	0.0067	0.0025	0.0041	0.0099	0.0037	0.0007	0.0019	0.0023	0.0537
Central	0.0098	–	**0.0138**	0.0016	0.0052	0.0065	0.0012	0.0005	0.0005	0.0002	0.0394
Greater Accra	0.0038	0.0080	–	**0.0170**	0.0086	0.0043	0.0014	0.0009	0.0011	0.0040	0.0490
Volta	0.0032	0.0028	**0.0180**	–	0.0081	0.0029	0.0015	0.0014	0.0006	0.0005	0.0390
Eastern	0.0032	0.0043	**0.0172**	0.0046	–	0.0066	0.0016	0.0005	0.0006	0.0008	0.0394
Ashanti	0.0058	0.0033	0.0072	0.0016	0.0036	–	0.0085	0.0012	0.0017	0.0062	0.0391
Brong Ahafo	0.0053	0.0015	0.0042	0.0016	0.0022	**0.0119**	–	0.0037	0.0023	0.0037	0.0365
Northern	0.0018	0.0007	0.0046	0.0028	0.0017	0.0058	0.0044	–	0.0018	0.0015	0.0251
Upper East	0.0079	0.0020	0.0043	0.0011	0.0021	**0.0129**	0.0055	0.0041	–	0.0008	0.0408
Upper West	0.0077	0.0008	0.0043	0.0008	0.0016	0.0092	**0.0128**	0.0058	0.0010	–	0.0441

Note: Interregional migration rates over 0.0100 are emphasized in **bold**.

Table 7: Estimates of overall net female out-migrants, in-migrants, and migration streams, Ghana, 2000 to 2010

Region of origin and destination	Net in-migrants		Net out-migrants		Overall net migration
	Total	%	Total	%	
Western	42,208	5.25	55,919	6.83	–13,711
Central	91,774	11.41	107,894	13.19	–16,121
Greater Accra	350,391	43.56	50,179	6.13	300,213
Volta	8,186	1.02	109,747	13.41	–101,561
Eastern	70,757	8.80	141,887	17.34	–71,130
Ashanti	180,774	22.47	79,344	9.70	101,431
Brong Ahafo	64,635	8.04	79,573	9.73	–14,939
Northern	662	0.08	109,747	13.41	–109,085
Upper East	6,823	0.85	54,035	6.60	–47,212
Upper West	–11,844	–1.47	29,890	3.65	–41,734
Total	804,365	100	818,215	100	–13,849

Regional estimates of the net number of female out-migrants (Appendix 2, Table A-11) show that the net out-migration was highest in the Eastern Region. Of Ghana's 818,215 total female out-migrants (Table 7), 17.34% migrated from the Eastern Region, followed by the Northern and Volta Regions (13.41% each). Net out-migration was

smallest in the Upper West Region with 29,890 female out-migrants (3.65%), followed by Greater Accra with 50,179 female out-migrants (6.13%).

Negative numbers in Table A-11, such as among girls aged 5–14 years in the Upper West Region, indicate negative net out-migration. Among young girls in the Volta, Upper East, and Upper West Regions, the negative out-migration suggests that these children are likely to be returning home with a mother or father who was working outside the region. Among women aged 55 years and older in the Greater Accra, Western, Northern, Upper East, and Upper West Regions, negative out-migration suggests return migration of retiring workers.

Combining estimates of net in-migration and net out-migration reveals that net out-migration exceeds net in-migration in eight of Ghana's ten regions. Only the Greater Accra and Ashanti Regions have positive net overall migration (Table 7). By contrast, overall net migration is lowest in the Northern and Volta Regions, with more girls and women moving out of the regions than moving into them.

5. Discussion

Our analyses reveal that the overwhelming focus of previous research on male internal migrants is misplaced. Internal migration in Ghana involves both sexes and warrants greater attention to sex-disaggregated analyses. Our analyses reveal that recent migration in Ghana is sex-balanced, according to the 47%–53% typology put forward by Donato and Gabaccia (2015). Ghanaian girls and women migrate at all ages, and approximately 40%–50% of these migrants are within age groups excluded from noncensus sources of national migration data (e.g., GDHS). Working-age migration is a key feature of migration for both sexes, peaking at earlier ages for females than males. Being a female migrant is significantly associated with residing in an urban area and working for pay, profit, or family gain. These findings suggest that economic opportunity is an important driver of female migration.

Advancing our understanding of gender and migration requires paying greater attention to examining differences between the migration patterns of women and men. The historical narrative of the "passive" female migrant has no place in today's evidence. The regression results indicate increased mobility and independence among female migrants, as reflected in their living situations. Female migrants exhibit greater odds of residing in group quarters, in a household where they are the temporary head of household, or in a household with a nonrelative head of the household. Moving with a spouse is no longer a precursor to female migration. By 2010, married women were less likely to migrate than peers who had never married.

Only the Greater Accra and Ashanti Regions, home to Ghana's two largest cities, have positive net overall migration. With net out-migration exceeding net in-migration in eight of Ghana's ten regions, productive female labour losses may have a negative impact on local development efforts and local economies. The prominence of the Greater Accra and Ashanti Regions as destinations for female migrants suggests that interventions are needed in Ghana's more rural regions to reduce poverty and develop greater economic opportunities for girls and women.

Ghana's *kayayei* have become a visible sign of changing internal migration patterns. This growing population represents the face of female north–south, rural–urban migration in Ghana, with most migrant female youth becoming porters on arrival in Accra (Kwankye and Addoquaye Tagoe 2009). Though *kayayei* exist in Ghana's second and third largest cities, Kumasi and Tamale, their presence in the capital has generated particular policy concerns (Parliament 2016). There is no accurate and reliable data on the number of *kayayei*; estimates range from 2,300 to 160,000 in Accra (Kearney 2013; Parliament 2016). Such variation in the estimates reveals a need for improved data on and reporting of female internal migration if policymakers are to address development-related issues in the sending and receiving communities.

Our analyses highlight the valuable information that census data provides on migration's demographic structure, patterns, and trends. Recent collaborations between the GSS and the International Organization for Migration suggest that future data collection activities in Ghana will pay greater attention to migration; however, existing census data presents an incomplete picture of contemporary female migration. Resource constraints in census offices, the expense of implementing a census, the balance of interests among census committee members, and political priorities frequently limit the number of migration questions in census questionnaires. Censuses also fail to capture migrants' underlying motivations and migration experiences.

Census analyses reveal a need for researchers to bring a gendered lens to issues such as drivers of migration, impacts of migration, and links between migration and health. Census data reveals nothing about migrants' and nonmigrants' opportunities or their perceptions of the costs and gains of migration. Breastfeeding infants may migrate with their mothers out of necessity, and girls from large families may be fostered out to aunts or other relatives. Preadolescent girls may independently decide to migrate in search of ways to pay their school fees. Censuses also miss the social and economic contributions that migrants make to their families and communities. Too often the lack of data on female migrants' contributions reinforces the outdated stereotype that girls and women take passive roles in migration. Ad hoc subnational surveys and more detailed interviews can address these aspects of migration in greater depth, complementing national-level census analyses and presenting a completer picture of contemporary migration.

The 2000 and 2010 Censuses have several limitations. Since the post-enumeration survey data collected after the 2000 Census is unavailable, it is impossible to assess the quality of the 2000 Census and whether the results required adjustment. Furthermore, the microdata from the 2000 Census is less representative of the national population than the microdata from the 2010 Census. While the post-enumeration survey conducted after the 2010 Census revealed no need to adjust the final results, the 2010 Census reportedly struggled to enumerate highly mobile populations like the *kayayei* (Daily Express 2010). It is possible that such migrant groups may be underrepresented, particularly if enumerators attempted to enumerate them during working hours or were unprepared to capture mobile populations' large numbers. Additional data limitations include possible reference period error for the question asking about place of residence five years prior, potential uncertainty about exact geographic boundaries, and problems reporting age.

One particular conceptual challenge is that the census questionnaires' understanding and measuring of migration do not capture contemporary migration patterns identified via other sources of migration data. Most movements between place of birth and current residence are missing. The censuses fail to capture cyclical and short-term migrations, which are commonplace in Ghana, as well as seasonal or repeat migrations and migration histories. The censuses also struggle to capture migration duration and meaningful data on intraregional migration, which is more common than interregional migration. These challenges have implications for the types of migrants and migrations that are identified and included in national analyses. Identifying these types of migration patterns in the census would significantly strengthen the predictive ability of regression models examining determinants of migration, as well as sex-specific differences between migrants.

The analyses conducted in this study provide a rich source of information on female migration across the lifespan that complements subnational migration studies and may have relevance in other low- and middle-income countries. Addressing the measurement and impact of female migration is an issue of importance for researchers, policymakers, and nongovernmental organizations working in the development sector. In order to better meet the varied needs of female migrants of all ages and to plan for changing population distribution within Ghana, we would make the following recommendations:

- Data collection and analyses of female migration cannot afford to exclude migrants outside 15–49 years of age. Female migrants have unique age-specific needs, such as integrating into a new school or ensuring that appropriate support systems exist to assist with challenges brought on by

ageing. Data is needed on female migrants of all ages, not just those of reproductive or working age.

- While multiple surveys measure migration at the national level, the questions they use infrequently permit comparative analyses across time or across surveys. Standardizing questions on migration would allow for more comprehensive analyses of national trends.
- Survey questions on migration should expand upon basic demographic data to include migrants' underlying motivations, migration experiences, and economic contributions.
- Net out-migration in the Volta Region and northern Ghana (Upper West, Upper East, and Northern Regions) may negatively affect local economies and local development efforts. Policymakers concerned about the impact of this productive female labour loss should consider focused interventions in these rural regions to reduce poverty and develop greater economic opportunities for girls and women.

Ultimately, female migration is a dynamic process with inextricable links to development, affecting factors such as the development of communities, the delivery of social services, and the impact of remittances. Should current trends continue, female migration within Africa will rise, particularly to regions offering economic opportunities. The planning of development programmes requires far better data sources than those currently existing, as well as greater attention to analyses using a gendered lens.

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Appendix 1: Demographic methods

This technical appendix justifies the methods we used to analyse female migration. It also details the assumptions, applications, and limitations of these methods.

A-1.1 Rogers–Castro multiexponential model migration schedule

Following the instructions detailed in *Tools for Demographic Estimation*, we fitted a Rogers–Castro multiexponential model migration schedule to observed migration data in order to represent typical age patterns of migration (Rogers and Castro 1981; Little and Dorrington 2013). These migration schedules range from 7 to 13 parameters, depending on the model's complexity, and depict the dependency between age and migration (Little and Dorrington 2013). Checking the "shape" or age distribution of migrant flows by fitting a model migration schedule also permitted us to check our estimates of net internal female migration in Section A-3.

Before applying this method, we obtained migration rates for single ages, examined the population's age structure, and examined the relative completeness of the census counts. We assumed that (1) the census accurately counted the population by subnational region and place of birth and (2) the census identified people who moved from one region to another in the time period of interest (1995–2000).

The first step in applying this method is to prepare a schedule of the observed rates. We used census data that gave the numbers of migrants who survived the five-year migration interval 1995–2000. From this data, it is possible to calculate one-year age propensities by backcasting census respondents to the region where they reported living in 1995. The age-specific out-migration propensity is calculated for each one-year age group as the ratio of migrants to the number at risk of migrating over the time period (Little and Dorrington 2013).

The second step is to decide which multiexponential model best fits the data. As noted earlier (Section 4.2, Demographic structure of internal migrants), since retirement is not concentrated among specific ages in this data and the data may exaggerate older ages (Little and Dorrington 2013), we adopted the standard 7-parameter model rather than the more complex 9-, 11-, or 13-parameter models.

For the third step, fitting the model using Solver, we obtained an Excel Workbook for fitting model migration schedules directly from Professor Rob Dorrington at the University of Cape Town. Our calculations for fitting this model appear in a multipage Excel Workbook that is available upon request.

Then, in step four, we evaluated the model's fit using the mean absolute percentage error statistic. At 7% for both sexes, it is within the boundaries for achieving

a reasonable fit. We also calculated the R-squared values for males (92%) and females (89%). Both values are acceptable compared to the established threshold of 90%, indicating that the models reasonably fit the data (Little and Dorrington 2013). T-statistics are significant at the 0.05 level for all coefficients. We also checked that the age-specific migration rates were visually compatible with the Rogers–Castro model and looked for extreme values that could distort the parameters in our model.

Since we employed census data for these models, they experience the limitations of census data detailed in our article (Section 5, Discussion). Furthermore, a limitation of this method is that without accurate, well-behaved data, it is possible that the model may be overparameterized if it does not produce a close fit (Little and Dorrington 2013). Since the lowest-parameter model best fitted the data, we are not concerned about overparameterization.

A-1.2 Logistic regression analyses

To examine the effects of demographic indicators on the likelihood of a girl or woman migrating internally in 2000 and 2010, we conducted logistic regression analyses using SPSS Statistics 22.0 software. Binary logistic regression modelled the effects of selected independent variables on whether or not a girl or woman was identified in the census as ever having migrated internally (see Table 2 for criteria used to classify migrants). International migrants were excluded. Selection of the independent variables was based on a literature review of push- and pull-factors of migration. We examined the following independent variables: age (in one-year and five-year age groups), education status (ever attended or attending school), marital status, religion, ethnicity, residence (urban, rural), work status (worked for pay, profit, or family gain; did not work), and relationship to household head.

These analyses assume that the census correctly identifies all girls and women who have migrated within Ghana and that our dependent variable (ever having migrated internally) can be measured on a dichotomous scale (yes/no). We know, however, that the census questionnaires' understanding and measuring of migration do not capture contemporary migration patterns identified via other sources of migration data. Most movements between place of birth and current residence are missing, leading to a likely undercount of internal migrants. Improving the census's ability to capture contemporary migration patterns (e.g., cyclical migration, seasonal migration) would significantly strengthen the predictive ability of this regression model.

A-1.3 Estimates of net internal female migration from place of birth data

To generate estimates of net internal female migration from census data, we followed the instructions detailed in *Tools for Demographic Estimation* for estimating subnational regional net in- and out-migration from place of birth data (Dorrington 2013). This estimation required the number of females, in five-year age groups, by subnational region in 2010 and by subnational region at the preceding census in 2000. For estimating deaths in this period, we calculated survival factors using model life tables from GSS (GSS 2013c).

Our assumptions are as follows:

1. Ghana's censuses correctly identify region of birth and accurately count the population by subnational region.
2. We can accurately estimate the mortality of people moving between two regions in Ghana.

Before applying the method, Dorrington (2013) warns demographers to examine the data's age structure of the population and the data's relative completeness. As noted in our article (Section 3.1, Data), we assessed data quality and completeness by (1) reviewing the post-enumeration surveys conducted to assess coverage and content errors (GSS 2003, 2012) and (2) comparing key variables between the microdata and censuses. The microdata sample from the 2010 Census more accurately reflects the complete census than the microdata sample from 2000 in which the age structure differs slightly (Table 1). Unfortunately, the 2000 Census's post-enumeration survey data is physically missing, preventing analysis of whether or not the final census results required adjustment. The 2010 Census required no adjustments based on the low net coverage error of 1.8% at the national level (GSS 2012). While this data is imperfect, it is the best currently available for estimating net internal migration in Ghana.

Dorrington (2013) also warns demographers that the estimations are sensitive to census quality: for example, inaccurately recorded place of birth (e.g., respondent may be unaware of boundary changes or may be unaware of person's place of birth), inability to completely identify all migrants and from where they migrated (i.e., undercount), and net migration's underestimation of migrant flows into and out of a region.

The first step in estimating net internal migration between subnational regions from place of birth data is to decide on survival factors. While we considered survival factors generated by the 2005 life table for Ghana from the World Health Organization's (WHO) Global Health Observatory data repository (WHO 2018) (Table A-1), we ultimately used survival factors derived from the Urban Females and Rural Females model life tables produced by the Ghana Statistical Service (GSS) (2013c).

Since we had reason to believe that mortality differed between regions, using the Urban Females and Rural Females life tables produced by the GSS permitted us to better match the mortality profiles of each region. Ten-year survival factors determined by the Urban Females model life table were used to generate migration estimates for the Greater Accra (see "$_5S_{x+10}$" in the fifth column of Table A-2) and Ashanti Regions, where the majority of girls and women reside in urban areas (90.5% and 59.6% respectively) (Figure 1). We used the GSS's Rural Females model life table to generate ten-year survival factors used in the estimates for the other eight regions, where the rural population exceeded the urban population (see "$_5S_{x+10}$" in the fifth column of Table A-3). The second step is to use these survival factors to estimate the number of deaths that occurred between the 2000 and 2010 Censuses. The third step is to estimate the net number of in-migrants or out-migrants.

Table A-1: Comparison of overall net migration estimates based on changes to survival factors

Region	Overall net migration		
	As estimated with constant survival factors for all regions, based on the WHO 2005 life table for Ghana	As estimated with separate survival factors for predominately rural or urban regions, based on Ghana's 2010 Census life tables	% difference
Western	–13,332	–13,711	–1.40
Central	–18,117	–16,121	5.83
Greater Accra	318,278	300,213	2.92
Volta	–105,237	–101,561	1.78
Eastern	–74,510	–71,130	2.32
Ashanti	106,929	101,431	2.64
Brong Ahafo	–12,627	–14,939	–8.39
Northern	–111,108	–109,085	0.92
Upper East	–47,941	–47,212	0.77
Upper West	–41,916	–41,734	0.22

Table A-2 works through these steps for estimating the net number of female in-migrants. The second and third columns show the number of girls and women living in the Greater Accra Region who were born outside the region, as counted by the 2000 and 2010 Censuses. We calculated the ten-year survival factors ($_5S_{x+10}$) in the fifth column using data from the GSS (2013c) Urban Females model life table. The seventh column (Do) is the number of estimated deaths of in-migrants who were born outside that occurred in the ten years between censuses (n). We estimated deaths of people born outside the region (denoted by the superscript ^{O}) aged between x and $x + 10$ years at the

time of the first census (t), ${}_5D_x^O$, of those aged A–n and older at the first census, ${}_\infty D_{A-n}^O$, and of those born between the censuses, D_B^O, as follows:

For those born between the two censuses

$$D_B^O = \frac{1}{2}\left({}_5N_0^O(2010)\right) \times \left((1/S_{B,10}) - 1\right)$$
$$= \frac{1}{2}\left(34{,}950 \times \left(\left(\frac{1}{0.92534}\right) - 1\right)\right.$$
$$= 1{,}410$$

For those aged 65 years and older at the time of the first census

$${}_\infty D_{65}^O = \frac{1}{2}\left({}_\infty N_{65}^O(2000) \times {}_\infty S_{65,10} + {}_\infty N_{75}^O(2010)\right) \times \left((1/{}_\infty S_{65,10}) - 1\right)$$
$$= \frac{1}{2}\left((6{,}630 + 4{,}260 + 9{,}520) \times 0.62448 + 14{,}730\right) \times \left(\left(\frac{1}{0.62448}\right) - 1\right)$$
$$= 8{,}261$$

For all other age groups, such as those aged 30–34 years at the time of the first census

$${}_5D_{30}^O = \frac{1}{2}\left({}_5N_{30}^O(2000) \times {}_5S_{30,10} + {}_5N_{40}^O(2010)\right) \times \left((1/{}_5S_{30,10}) - 1\right)$$
$$= \frac{1}{2}\left(53{,}230 \times 0.93040 + 57{,}480\right) \times \left(\left(\frac{1}{0.93040}\right) - 1\right)$$
$$= 4{,}002$$

where ${}_5N_x^O(t)$ represents the number of people born outside the region (by age group) according to the census at time t who were aged between x and x + 10 years.

The final column (Net M (born out)) shows the net number of female migrants into the Greater Accra Region who were born in regions other than the Greater Accra Region for each five-year age group. From 2000 to 2010, a total of 371,632 girls and women born outside the Greater Accra Region moved to the Greater Accra Region (after excluding those who moved out).

Table A-2: Estimation of the net number of female in-migrants of those born outside by age group, Greater Accra Region, Ghana, 2000–2010

Age	2000	2010	x	${}_5S_{x+10}$	Age at 2nd census	Do	Net M (born out)
			B	0.92534			
0–4	30,390	34,950	0	0.98072	0–4	1,410	36,360
5–9	38,460	40,280	5	0.98272	5–9	1,625	11,515
10–14	46,270	60,730	10	0.97981	10–14	890	23,160
15–19	63,980	79,870	15	0.97245	15–19	1,034	34,634
20–24	68,690	117,250	20	0.96188	20–24	1,675	54,945
25–29	69,260	119,690	25	0.94706	25–29	2,576	53,576
30–34	53,230	93,920	30	0.93040	30–34	3,170	27,830
35–39	45,660	74,330	35	0.91571	35–39	3,910	25,010
40–44	35,430	57,480	40	0.90525	40–44	4,002	15,822
45–49	26,190	44,490	45	0.89823	45–49	3,972	13,032
50–54	19,130	39,350	50	0.88747	50–54	3,738	16,898
55–59	12,360	25,560	55	0.86645	55–59	2,781	9,211
60–64	9,170	19,100	60	0.83183	60–64	2,287	9,027
65–69	6,630	11,640	65+	0.62448	65–69	1,722	4,192
70–74	4,260	10,740			70–74	1,857	5,967
75+	9,520	14,730			75+	8,261	9,211
Total	538,630	844,110			Total	44,911	350,391

Table A-3 works through the steps for estimating the net number of female out-migrants. The second and third columns show the number of girls and women living in regions other than Ghana's Upper East Region who were born in the Upper East Region, as counted by the 2000 and 2010 Censuses. We calculated the survival factors (${}_5S_{x+10}$) in the fifth column using data from the GSS Rural Females model life table (2013c). The seventh column (Di) is the number of estimated deaths of out-migrants who were born inside that occurred in the ten years between censuses. It is calculated in the same manner as the deaths of in-migrants who were born outside the region (Do). The final column (Net M (born in)) shows the net number of female out-migrants of those born in the Upper East Region (i.e., the number of girls and women born in the Upper East Region who moved out, less those who have returned). From 2000 to 2010, a total of 54,966 girls and women born in the Upper East Region moved out of the Upper East Region (after excluding those who moved in).

Table A-3: Estimation of the net number of female out-migrants of those born inside by age group, Upper East Region, Ghana, 2000–2010

Age	2000	2010	x	${}_5S_{x+10}$	Age at 2nd census	Di	Net M (born in)
			B	0.92197			
0–4	10,900	8,030	0	0.96465	0–4	340	8,370
5–9	12,660	9,050	5	0.98064	5–9	383	–1,467
10–14	11,270	12,680	10	0.98033	10–14	425	445
15–19	12,240	16,370	15	0.96941	15–19	284	5,384
20–24	14,640	25,790	20	0.95095	20–24	370	13,920
25–29	14,630	23,970	25	0.93235	25–29	565	9,895
30–34	11,390	17,340	30	0.92103	30–34	806	3,516
35–39	9,160	13,470	35	0.91866	35–39	984	3,064
40–44	5,900	9,240	40	0.91618	40–44	846	926
45–49	4,680	6,670	45	0.90422	45–49	668	1,438
50–54	3,330	5,570	50	0.86801	50–54	502	1,392
55–59	2,160	2,560	55	0.78906	55–59	360	–410
60–64	2,050	2,770	60	0.66829	60–64	430	1,040
65–69	1,300	1,880	65+	0.32150	65–69	479	309
70–74	1,100	2,290			70–74	908	1,898
75+	2,110	3,370			75+	5,086	5,246
Total	119,520	161,050			Total	13,436	54,966

After estimating net female in-migration and out-migration for each of Ghana's ten regions, we combined these estimates into Table 7 of our article. While these estimations are currently the most accurate available based on existing data, they have several limitations. As previously mentioned, the quality of census data affects these estimates. Censuses may not identify all migrants and may suffer from an undercount. Additionally, place of birth data and place of residence data are affected by misreporting if boundaries change between rounds or if respondents are ignorant of the boundaries.

A-1.4 Estimates of net female migration using the cohort component method

To strengthen confidence in our estimates of net internal female migration from census data (Section A-1.2), we compared these estimates to those generated by the cohort component method (Spoorenberg 2015). This estimation required us to first forward-

project the female population enumerated in the 2000 Census to 2005, based on estimated levels of age-specific fertility and mortality rates. We then forward-projected the estimated female population in 2005 to compare it with the actual female population enumerated in the 2010 Census. Without accurate vital registration statistics on fertility and mortality during these periods, we relied on estimations. For estimating fertility, we used age-specific fertility rates (ASFRs) for women aged 15–49 years (in five-year age groups) produced by the 2003 Ghana Demographic and Household Survey (GDHS) (GSS, NMIMR, and ICF Macro 2004) and the 2008 GDHS (GSS, GHS, and ICF Macro 2009). We applied the urban ASFRs to the Greater Accra and Ashanti Regions and the rural ASFRs to the eight remaining regions. For estimating deaths in this period, we calculated survival factors using WHO model life tables for Ghana (WHO 2018). For 2000–2005, we used the life table for 2003. For 2005–2010, we used the life table for 2008.

Our assumptions are as follows:

1. Life table survival rates are representative of mortality conditions during the intercensal period, and we can accurately estimate mortality.
2. Fertility rates are representative of fertility during the intercensal period, and we can accurately estimate fertility.
3. Female migrants have the same fertility and mortality levels as the enumerated population.
4. The distribution of net migrants is equal across years during the intercensal period.
5. Differences between our projected population in 2010 and the population enumerated in the 2010 Census result from migration.

The first step in estimating net migration using this method was to forward-project the females enumerated in the 2000 Census five years to 2005 (Table A-4). Next, we estimated the total number of surviving female births from 2000 to 2005 (Table A-5). Then, we repeated the process by forward-projecting the projected female population in 2005 to 2010 and estimating surviving female births from 2005 to 2010. Finally, we compared our estimated female population in 2010 to the actual enumerated female population in 2010. Differences between these figures imply in-migration or out-migration.

Table A-4 works through the steps for forward-projecting the female population in the projection intervals. The first column after age group shows the female population (in five-year age groups) residing in the Upper East Region, as counted by the 2000 Census. The next column lists the five-year survival factors that we derived from the WHO life table for Ghana in 2003. The product of these two columns is the projected

population in 2005; however, there is one exception. The projected population for the age group 0–4 years comes from Table A-5, in which we estimated female births surviving the projection interval 2000–2005. We repeat these steps once more to project the 2005 population forward to 2010. Finally, we estimate net female migration by subtracting the projected population in 2010 from the population enumerated in the 2010 Census. From 2000 to 2010, the Upper East Region experienced negative net migration, with a total of 75,346 girls and women moving out of the region.

Table A-4: Estimating net intercensal female migration by age (birth) cohorts, according to the cohort component method, in the Upper East Region, Ghana, 2000–2010

Age group (in years)	Population, 2000 Census	Five-year life table survival ratio	Projected population, 2005	Five-year life table survival ratio	Projected population, 2010	Population, 2010 Census	Estimated net migrants
	(1)	(2)	(3) = (1) x (2)	(4)	(5) = (3) x (4)	(6)	(7) = (6) – (5)
0–4	66,440	0.93043	**85,338**	0.93923	**96,152**	68,450	–27,702
5–9	75,250	0.97342	61,818	0.97818	80,152	73,600	–6,552
10–14	51,260	0.98795	73,250	0.99020	60,469	64,850	4,381
15–19	40,840	0.99121	50,643	0.99181	72,532	54,020	–18,512
20–24	33,840	0.98779	40,481	0.98901	50,228	42,050	–8,178
25–29	35,770	0.97855	33,427	0.98357	40,036	37,640	–2,396
30–34	29,190	0.96822	35,003	0.97475	32,878	32,840	–38
35–39	26,830	0.96136	28,262	0.96519	34,119	29,180	–4,939
40–44	23,800	0.95851	25,793	0.96027	27,278	26,570	–708
45–49	21,870	0.95902	22,813	0.96067	24,769	20,340	–4,429
50–54	18,020	0.95498	20,974	0.95746	21,915	19,450	–2,465
55–59	11,990	0.94552	17,209	0.94846	20,081	11,510	–8,571
60–64	13,240	0.91340	11,337	0.92161	16,322	14,580	–1,742
65–69	8,980	0.85251	12,093	0.86934	10,448	9,350	–1,098
70+	19,670	0.61137	19,681	0.62723	22,858	30,460	7,602
Total	476,990		538,121		610,236	534,890	–75,346

Notes: Figures in **bold** were produced using the estimation method for female births surviving the projection interval, as shown in Table A-1.5.

Table A-5 works through the steps for estimating female births surviving the projection intervals. The first column shows the female population aged 15–49 years (in five-year age groups) residing in the Upper East Region, as counted by the 2000 Census. The second column shows the projected female population in 2005, based on our calculations in Table A-4. The third column calculates the mid-period female

population as an average of the sum of the populations in the first and second columns. ASFRs in the fourth column come directly from the 2003 GDHS, in this example, and are those used for rural areas. The final column, estimated births (2000–2005), is the product of the female mid-period population and the ASFRs multiplied by five (years) to account for the period 2000–2005. For the first interval (2000–2005), we used a sex ratio of 105 for both urban and rural areas based on the 2000 Census report (GSS 2003). For the second interval (2005–2010), we used rural (103.1) and urban (101.2) sex ratios from the 2010 Census report on fertility (GSS 2014). We generated newborn five-year survival ratios using the WHO 2003 and 2008 life tables for Ghana (WHO 2018). From 2000 to 2005, we estimated 85,338 surviving female births in the Upper East Region. This figure goes into the first row (age group 0–4 years) of the fourth column (Projected population, 2005) in Table A-4.

Table A-5: Estimation of female births surviving the projection interval, Upper East Region, Ghana, 2000–2005

Age group (in years)	Female population, 2000 census	Female population, 2005 projected	Female population, mid-period	Age-specific fertility rates	Estimated births (2000–2005)
	(1)	(2)	(3) = ((1) + (2)) / 2	(4)	(5) = 5 x ((3) x (4))
15–19	40,840	50,643	45,741	0.113	25,844
20–24	33,840	40,481	37,161	0.225	41,806
25–29	35,770	33,427	34,598	0.256	44,286
30–34	29,190	35,003	32,096	0.213	34,183
35–39	26,830	28,262	27,546	0.179	24,654
40–44	23,800	25,793	24,797	0.095	11,778
45–49	21,870	22,813	22,341	0.049	5,474
Total births					188,024
Proportion of female births (sex ratio, rural = 105)					0.488
Total female births (2000–2005)					91,719
Average five-year survival ratio of newborns					0.930
Expected deaths among female births (2000–2005)					6,381
Total surviving female births					85,338

The estimates produced using the cohort component method have several limitations beyond the quality of census data. This method is incredibly sensitive to our estimated fertility and mortality rates. Using ASFRs from the GDHS and censuses produced drastically different estimates (Table A-6). ASFRs from the GDHS produced overall net out-migration in six of Ghana's ten regions, whereas ASFRs from the censuses produced overall net out-migration in only two of Ghana's ten regions. Since

measures between the 2008 GDHS and 2010 Census indicate misreporting of births in the census and census fertility data of questionable reliability, we felt the GDHS ASFRs produced more robust estimates. The mortality rates illustrated less significant swings in the estimates produced using the cohort component method, depending on where we generated the survival rates from. For this reason, we consider our estimations of subnational regional net in- and out-migration from place of birth data (Section A-1.3) to be more robust, as they are affected only by mortality estimates.

Table A-6: Comparison of estimates of net female migration in Ghana produced using different methods

Region	Overall net female migration			
	As estimated with the cohort component method using ASFRs from the 2000 and 2010 Censuses	As estimated with the cohort component method using urban/rural ASFRs from the 2003 and 2008 GDHS	As estimated with the cohort component method using ASFRs from the 2003 and 2008 GDHS with additional modifications*	As estimated with place of birth data (Section A-1.3)
Western	332	–80,102	–80,102	–13,711
Central	118,650	51,291	33,360	–16,121
Greater Accra	367,656	308,633	308,633	300,213
Volta	54,411	–13,143	–13,143	–101,561
Eastern	27,725	–57,576	–57,576	–71,130
Ashanti	456,663	389,721	389,721	101,431
Brong Ahafo	42,939	–33,492	–33,492	–14,939
Northern	132,650	70,086	–44,247	–109,085
Upper East	–40,570	–75,346	–75,346	–47,212
Upper West	–24,367	–47,997	–47,997	–41,734

Notes: * Women in the Northern Region have the highest total fertility rate (TFR) in Ghana, with 7 children per woman in 2003 and 6.8 children per woman in 2008 (GSS, NMIMR, and ICF Macro 2004, GSS, GHS, and ICF Macro 2009). The Central Region also experiences above average fertility with TFRs of 5 children per woman in 2003 and 5.4 children per woman in 2008 (GSS, NMIMR, and ICF Macro 2004, GSS, GHS, and ICF Macro 2009). To improve the accuracy of our migration estimates using the cohort component method, we adjusted the ASFR upwards when estimating births in these two regions. For estimating births from 2005 to 2010, we multiplied the rural ASFRs by a factor of 1.39 for the Northern Region and a factor of 1.1 for the Central Region. These factors are the ratio of each region's TFR to Ghana's overall rural TFR of 4.9. For estimating births from 2000 to 2005, we adjusted the Northern Region's ASFRs upward using a factor of 1.25.

Appendix 2: Supplementary tables

Table A-7: Migrants identified by Ghana census questions on migration, 2000 and 2010 (10% microdata)

2000 Census questions	Migrants identified in 2000 (%), by sex	2010 Census questions	Migrants identified in 2010 (%), by sex
P06a BORN IN THIS TOWN/VILLAGE: Was (NAME) born in this town or village? If YES go to P07. [Note: Only asked of respondents who were Ghanaian by birth.]	335,951 of 955,504 females (35.2%) Ghanaian female migrants = 274,167 (81.6%) International foreign female migrants = 61,784 (18.4%) 349,023 of 935,654 males (37.3%) Ghanaian male migrants = 262,911 (75.3%) International foreign male migrants = 86,112 (24.7%)	P05 BIRTHPLACE: Was (NAME) born in this town/village? If Yes, go to P07.	450,071 of 1,262,598 females (35.6%) 412,035 of 1,203,691 males (34.2%)
P06b BIRTHPLACE OUTSIDE THIS TOWN/VILLAGE: In what region or country was (NAME) born? [Note: Only asked of respondents who were Ghanaian by birth.]	274,167 of 274,167 females (100%) Female internal migrants = 265,153 (96.7%) Female (Ghanaian) international migrants = 9,014 (3.3%) 262,911 of 262,911 males (100%) Male internal migrants = 254,048 (96.6%) Male (Ghanaian) international migrants = 8,863 (3.4%)	P06 BIRTHPLACE: In what region or country was (NAME) born?	450,071 of 450,071 females (100%) Female internal migrants = 434,948 (96.6%) Female international migrants = 15,123 (3.4%) 412,035 of 412,035 males (100%) Male internal migrants = 394,703 (95.8%) Male international migrants = 17,332 (4.2%)
P07 USUAL PLACE OF RESIDENCE: In what district is (NAME'S) usual residence?	28,679 of 955,504 females (3%) Female internal migrants = 28,329 (98.8%) Female international migrants = 350 (1.2%) 29,797 of 935,654 males (3.2%) Male internal migrants = 29,338 (98.5%) Male international migrants = 459 (1.5%)	P07 LIVING IN THIS TOWN/VILLAGE: Has (NAME) been living in this village or town since birth? If Yes, go to P09.	478,783 of 1,262,598 females (37.9%) 439,930 of 1,203,691 males (36.5%)
P08 PLACE OF RESIDENCE FIVE YEARS AGO IF (NAME) IS FIVE YEARS OR OLDER: In what district was (NAME'S) usual place of residence five years ago?	187,027 of 816,989 females (19.6%) Female internal migrants = 185,228 (99%) Female international migrants = 1,799 (1%) 189,490 of 935,654 males (20.3%) Male internal migrants = 187,194 (98.8%) Male international migrants = 2,296 (1.2%)	P08 NUMBER OF YEARS LIVED IN THIS TOWN/VILLAGE: For how long has (NAME) been living in this village or town?	451,686 of 1,262,598 females (35.8%) 413,681 of 1,203,691 males (34.4%)
	Total number of migrants identified in 2000 microdata, by sex: 359,960 of 955,504 females (37.7%) Female internal migrants = 297,031 (31.1%) of all females Female international migrants = 62,929 (6.6%) of all females 371,577 of 935,654 males (39.7%) Male internal migrants = 284,269 (30.4%) of all males Male international migrants = 87,308 (9.3%) of all males		Total number of migrants identified in 2010 microdata, by sex: 487,376 of 1,262,598 females (38.6%) Female internal migrants = 472,253 (37.4%) of all females Female international migrants = 15,123 (1.2%) of all females 447,485 of 1,203,691 males (37.2%) Male internal migrants = 430,153 (35.7%) of all males Male international migrants = 17,332 (1.4%) of all males

Table A-8: Lifetime female in-migrants by region of origin, out-migrants by region of destination, and net lifetime migration streams, Ghana, 2000 and 2010

	2000 Census			2010 Census		
Region of origin and destination	Lifetime in-migrants	Lifetime out-migrants	Net lifetime migration	Lifetime in-migrants	Lifetime out-migrants	Net lifetime migration
Western	239,600	87,570	152,030	260,940	145,370	115,570
Central	93,920	239,510	–145,590	185,660	318,530	–132,870
Greater Accra	548,090	99,020	449,070	844,110	156,690	687,420
Volta	55,310	263,130	–207,820	73,670	343,070	–269,400
Eastern	157,800	276,400	–118,600	207,770	388,770	–181,000
Ashanti	275,470	221,720	53,750	432,430	302,070	130,360
Brong Ahafo	168,770	102,940	65,830	217,110	172,800	44,310
Northern	54,980	121,000	–66,020	52,900	214,690	–161,790
Upper East	24,390	118,540	–94,150	30,640	161,050	–130,410
Upper West	18,140	106,640	–88,500	21,630	123,820	–102,190
Total	1,636,470	1,636,470	0	2,326,860	2,326,860	0

Table A-9: Lifetime male in-migrants by region of origin, out-migrants by region of destination, and net lifetime migration streams, Ghana, 2000 and 2010

	2000 Census			2010 Census		
Region of origin and destination	Lifetime in-migrants	Lifetime out-migrants	Net lifetime migration	Lifetime in-migrants	Lifetime out-migrants	Net lifetime migration
Western	262,520	81,550	180,970	300,660	130,280	170,380
Central	92,160	234,820	–142,660	186,880	292,890	–106,010
Greater Accra	530,700	106,930	423,770	756,850	164,430	592,420
Volta	54,470	265,580	–211,110	71,190	340,920	–269,730
Eastern	156,980	270,710	–113,730	206,480	359,620	–153,140
Ashanti	296,640	222,440	74,200	418,030	313,050	104,980
Brong Ahafo	191,180	104,720	86,460	242,520	164,200	78,320
Northern	53,650	133,190	–79,540	48,160	222,990	–174,830
Upper East	25,040	136,250	–111,210	31,000	167,780	–136,780
Upper West	15,490	122,640	–107,150	21,840	127,450	–105,610
Total	1,678,830	1,678,830	0	2,283,610	2,283,610	0

Table A-10: Estimates of the net number of female in-migrants of those born outside by age group, Ghana, 2000–2010

Age	Net in-migration by region									
	Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West
0–4	14,435	12,723	36,360	6,209	10,905	22,305	12,166	4,150	2,973	2,028
5–9	–4,145	4,389	11,515	–202	1,934	–2,869	383	–1,771	234	–1,753
10–14	–3,555	6,799	23,160	–338	3,252	7,882	532	–2,841	–82	–2,158
15–19	–996	12,709	34,634	–362	8,352	18,632	4,793	–275	1,324	–1,561
20–24	11,244	12,676	54,945	71	7,763	34,082	11,923	656	196	–374
25–29	8,227	10,342	53,576	747	7,080	28,664	10,100	771	825	–1,482
30–34	1,106	6,620	27,830	368	3,714	17,041	4,532	–195	324	–1,117
35–39	2,434	6,133	25,010	–255	4,713	13,139	3,773	–531	416	–1,602
40–44	1,112	4,223	15,822	633	4,970	9,440	3,183	–115	176	–1,048
45–49	3,190	3,853	13,032	–110	4,104	6,666	2,561	–383	46	–552
50–54	3,690	4,033	16,898	876	4,687	7,931	3,306	518	233	–438
55–59	–505	1,237	9,211	–404	985	2,741	–34	–459	–70	–461
60–64	1,930	2,191	9,027	475	2,364	4,056	2,304	359	208	–115
65–69	98	796	4,192	–351	189	577	–136	–141	14	–337
70–74	1,776	1,470	5,967	409	2,371	4,894	2,968	347	79	–229
75+	2,166	1,579	9,211	419	3,624	5,592	2,280	571	–72	–643
Total	42,208	91,774	350,391	8,186	71,007	180,774	64,635	662	6,823	–11,844

Table A-11: Estimates of the net number of female out-migrants by region of birth and age group, Ghana, 2000–2010

Age	Net out-migration by region									
	Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West
0–4	8,804	15,223	14,731	14,866	17,387	17,114	10,317	11,588	8,436	6,051
5–9	1,376	244	2,739	–1,250	1,899	577	3,340	2,173	–1,392	–1,762
10–14	4,221	4,451	2,044	3,305	6,238	2,865	4,857	5,955	380	–1,272
15–19	7,113	8,556	5,448	8,451	9,453	5,384	7,094	14,071	5,542	3,033
20–24	9,215	14,769	6,808	14,832	18,058	14,897	13,556	20,691	14,284	7,567
25–29	6,734	13,343	5,101	17,184	21,035	11,459	12,956	16,897	10,333	6,055
30–34	3,871	7,619	2,524	9,009	11,223	4,429	6,432	11,386	3,884	2,276
35–39	3,505	9,254	3,189	7,274	9,337	4,314	6,513	6,710	3,375	2,110
40–44	1,939	6,155	3,170	5,856	8,351	2,910	3,993	5,775	1,204	817
45–49	1,814	4,646	2,108	5,289	7,786	2,959	3,616	3,260	1,741	441
50–54	2,407	7,506	1,588	7,300	9,104	5,416	3,108	3,467	1,661	1,265
55–59	1,490	2,234	–79	2,327	4,471	1,080	1,273	291	–264	271
60–64	1,470	3,902	420	4,105	5,750	2,693	816	1,911	1,078	1,268
65–69	176	1,311	–332	1,511	1,843	265	454	–26	189	–95
70–74	3,006	3,362	783	3,917	4,193	1,859	694	2,202	1,463	1,037
75+	–1,221	5,320	–63	5,769	5,758	1,124	556	3,396	2,120	828
Total	55,919	107,894	50,179	109,747	141,887	79,344	79,573	109,747	54,035	29,890