ORIGINAL RESEARCH ARTICLE

Provincial differentials of the effect of internal migration on teenage fertility in South Africa

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Abstract

This study investigated the association between internal migration and teenage fertility in South Africa. Data were from the 2007 and 2016 South African community surveys, N_{2007}= 89800 and N_{2016}=239733, age range 12 to 19, black teenagers= 81.5% and 89.4%, respectively. Results showed that between 2007 and 2016 internal migration levels decreased by 2% nationally, but increased for Gauteng, Western Cape and KwaZulu Natal provinces. Teenage fertility levels decreased in all provinces except the Northern Cape in the study period. In both years teenage fertility was observed at higher levels among girls that were older, heads of households, and who were in secondary schooling. Random-intercept multilevel binary logistic regression revealed that the risk of teenage fertility differed between more rural and urban provinces. In provinces that were predominantly rural the risk of teenage pregnancy increased as community-levels of internal migration increased while the risk decreased as internal migration increased in provinces that were predominantly urban. Findings suggest that the effects of internal migration on teenage pregnancy are largely dependent on the local context making it necessary to create interventions that are context-specific at sub-national levels. *(Afr J Reprod Health 2022; 26[11]: 119-128).*

Keywords: Teenage fertility, internal migration, multi-level modelling, provincial differences, contextual analysis

Résumé

Cette étude a examiné l'association entre la migration interne et la fécondité des adolescentes en Afrique du Sud. Les données provenaient des enquêtes communautaires sud-africaines de 2007 et 2016, N2007 = 89800 et N2016 = 239733, tranche d'âge de 12 à 19 ans, adolescents noirs = 81,5 % et 89,4 %, respectivement. Les résultats ont montré qu'entre 2007 et 2016, les niveaux de migration interne ont diminué de 2 % à l'échelle nationale, mais ont augmenté pour les provinces de Gauteng, du Cap occidental et du KwaZulu Natal. Les niveaux de fécondité des adolescentes ont diminué dans toutes les provinces à l'exception du Cap Nord au cours de la période d'étude. Au cours des deux années, la fécondité des adolescentes a été observée à des niveaux plus élevés chez les filles plus âgées, chefs de famille et qui fréquentaient l'enseignement secondaire. La régression logistique binaire multiniveau à interception aléatoire a révélé que le risque de fécondité chez les adolescentes différait entre les provinces plus rurales et urbaines. Dans les provinces à prédominance rurale, le risque de grossesse chez les adolescentes augmentait à mesure que les niveaux communautaires de migration interne augmentaient, tandis que le risque diminuait à mesure que la migration interne augmentait dans les provinces à prédominance urbaine. Les résultats suggèrent que les effets de la migration interne sur la grossesse chez les adolescentes dépendent largement du contexte local, ce qui rend nécessaire la création d'interventions spécifiques au contexte au niveau infranational. *(Afr J Reprod Health 2022; 26[11]: 119-128).*

Mots-clés: Fécondité des adolescentes, migration interne, modélisation à plusieurs niveaux, différences provinciales, analyse contextuelle

Introduction

Teenage pregnancy remains a global health and social challenge as it affects both developed and developing countries alike[1,2]. The Population Reference Bureau (PRB) (2017)[3] recorded that sub-Saharan Africa continues to remain the region with the highest proportion of teenage births. East Africa has seen declines in teenage pregnancy, while West Africa has exhibited increased levels and Southern Africa shown the lowest and steady levels over time[4]. Specifically in Southern Africa, Zambia reported a teenage birth rate of 141 births per 1000 15-19 year olds, while Lesotho had a rate of 94 births per 1000 15-19 year olds and Namibia's rate was 82 births per 1000 15-19 year olds[3]. Fertility among teenage females in South Africa remains a nexus of concern and alarm socially as well as to

public health practitioners. It accounts for 80,000 unplanned babies annually and occurs among 30% of females by the age of 20 in South Africa[5-7]. Teenage fertility has adverse health, social and economic consequences for both mother and child making it a critical issue requiring urgent address[8-10].

There have been numerous attempts to prevent teenage pregnancy with varying degrees of success in South Africa. These include programmes such as the Love Life and Soul City initiated campaigns as well as early childhood and youth development programs that encourage school commitment through support, creating positive experiences and enforcing career aspirations among young people[11,12]. However, levels remain unwavering nationally with approximately one in three (34%) women reporting that they were pregnant while teenagers[13].

Previous studies have found that predictors of teenage pregnancy include older age, lower education, poverty and gender dynamics[7,13]. However, the effect of internal migration on the sexual and reproductive health and rights (SRHR) of teenage females requires further exploration in sub-Saharan Africa. Residential mobility may lead to premarital sex among adolescents through cutting familial links, decreasing levels of societal monitoring as well as increasing social exclusion and loneliness[14]. This may lead to higher risk of teenage pregnancy as previous literature has shown an independent positive association in Kenya[15,16]. However, the study by Haynie, Petts, Maimon, and Piquero (2009)[17] was unable to establish an association between internal migration and teenage pregnancy. Finally, Mkwananzi (2017)[18] found that internal migration was protective against teenage pregnancy, according to South African census data.

South Africa's history of migration is affected by apartheid racially-based legislation on forced resettlement and urbanisation controls[19]. South Africa's 5-year migration intensity according to the 2011 census was estimated at 21.2%[20]. Wentzel and Tlabela (2004)[21] posit that the long-term effects of forced removals during apartheid still exist including high levels of inequality with associated poor well-being for most of South Africa's black African population.

Therefore, this study sought to extend findings of previous studies through determining the association between internal migration and teenage fertility in 2016 in the South African setting. The current study sought to estimate fertility and internal migration among teenage females in South African provinces between 2007 and 2016 as well as examine the association between internal migration and fertility among teenage girls in 2016. The following research questions were addressed: What are the trends of fertility and internal migration among teenage girls between 2007 and 2016? and How does internal migration affect teenage fertility within different South African provinces?

Methods

The study setting, sources of data and procedure

The study was conducted in South Africa. It is situated at the most southern tip of the African continent. South Africa is bordered by the Indian and Atlantic oceans on its eastern and south-western aspects respectively. On its northern and north-eastern borders lie its neighbouring countries: Namibia, Botswana, Zimbabwe, Mozambique and Swaziland and within it lies Lesotho. South Africa is comprised of nine provinces namely Limpopo, North West, Gauteng, Mpumalanga, Northern Cape, Free State, KwaZulu-Natal, Eastern Cape and Western Cape.

This secondary data analysis study utilized the South African community surveys of 2007 and 2016[22,23]. These datasets are publicly available from the StatsSA database located at http://nesstar.statssa.gov.za:8282/webview/. The 2007 community survey was used to show the trends in teenage fertility and internal migration over time. The 2016 community survey is currently the most recent nationally representative data with teenage fertility, provincial and internal migration data available in South Africa. Data included 12-19year old female adolescents from the South African community surveys, the sample sizes were $N_{2007}= 89800$ and $N_{2016}=239733$.

Measures

We analysed data on these variables: teenage fertility, internal migration, race, marital status,

education level, and relationship to head of household in each province. The variable measures are described below.

Outcome variable

The outcome variable was teenage fertility defined as birth occurring below the age of 20 years in the past 12 months, coded as yes and no.

Predictor variables

The predictor variable was community-level internal migration defined by whether that individual moved municipality in the past 5 years (The percentage was calculated per municipality and coded into three equal categories of low, medium and high mobility in the complete dataset). Individuals that moved in the past year were excluded from the analysis to ensure that moving municipalities happened before birth.

Control variables

The control variables included:
- Age
- Race (coded as Black, White, Coloured- A South African term that refers to an individual of mixed decent or Indian/Asian)
- Marital status (coded as never married, cohabiting and ever married)
- Education Level (coded as no schooling, primary, secondary or tertiary)
- Relationship to head of Household (coded as head, immediate relative, distant relative or not related). Adolescent South Africans do not usually migrate on their own and thus retain their previous head of household [24].
- Province (coded as Gauteng, Eastern Cape, North West, Northern Cape, Western Cape, Kwa-Zulu Natal, Mpumalanga, Free State, Limpopo). Provincial localisation helps to understand the specific patterns of internal migration that are varied by province in South Africa as individuals normally migrate to urban hubs from rural areas.

Data analysis

The study used random-intercept multilevel logistic regression with the Laplacian approximation to test the independent association between internal migration at the community-level and teenage fertility within provinces in the past year. The STATA 15 statistical programme computed two models for each of the nine provinces to test heterogeneity of teenage fertility in different communities as well as establish the association between internal migration and teenage fertility for 2016 in unadjusted models then adjusted models controlling for the control socio-demographic variables.

Multilevel modelling is a suitable statistical technique when individuals from the same geographical areas have the potential of being included in a study sample[25]. This indeed is the case for the community survey data as multiple individuals from the exact communities are included in data collection and every member within the household was interviewed. Additionally, multiple individuals from the same communities were included in the study sample. Therefore, the two-level model established the variation between individuals and individuals within the same communities in the risk of teenage fertility. Simple logistic regression would fail to capture this accurately as members within communities are similar thereby violating the logistic regression assumption of independence of residuals[26,27]. This would result in underestimation of standard errors and very small p-values, making estimates of association appear falsely significant.

Representation of the model follows:

$$\log\left(\frac{\pi_{ik}}{1-\pi_{ik}}\right) = \delta_{0ik} + \sum_{ik=1}^{\omega} \delta_{ik}\, z_{ik} +$$

$$\varepsilon_{ik}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where: π_{ik}=probability of having been recently pregnant for the ith individual in the kth community –the dependent variable

δ_{ik} are the parameter coefficients of the model $\quad z_{ik}$ are the independent regressors $\quad \varepsilon_{ik}$ are the residual errors.

Results

Descriptive results

The study sample in most provinces had a median age of 15 years old in The Eastern Cape, Northern Cape, KwaZulu Natal, Mpumalanga and Limpopo and 16 years old in Western Cape, Free State, North

Table 1: Study participants characteristics by province, 2016 community survey

Characteristics	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Age (median; IQR)	16;4	15; 4	15; 4	16; 3	15; 4	16; 3	16; 4	15; 3	15; 4
Race									
African/Black	41.25	91.95	52.61	94.74	94.81	96.13	90.25	97.97	98.95
Coloured	52.94	6.70	44.36	2.44	0.94	1.50	3.25	0.54	0.20
Indian/Asian	0.30	0.18	0.22	0.09	3.16	0.20	1.30	0.16	0.12
White	5.51	1.17	2.81	2.72	1.09	2.17	5.19	1.32	0.72
Marital Status									
Never Married	95.95	96.84	96.79	96.94	95.63	96.36	96.14	95.90	95.47
Cohabiting	2.80	1.98	2.90	2.42	3.00	3.04	3.06	3.60	3.60
Ever Married	1.25	1.18	0.32	0.63	1.37	0.59	0.80	0.49	0.93
Educational Level									
No Schooling	0.37	0.75	0.49	0.44	0.82	0.73	0.46	0.77	0.71
Primary	29.37	36.65	36.50	34.78	25.92	34.33	24.89	29.70	27.52
Secondary	69.92	62.37	62.76	64.38	72.92	64.64	73.96	69.23	71.52
Tertiary	0.34	0.23	0.25	0.40	0.34	0.30	0.70	0.30	0.24
Relationship to Head of HH									
Head	1.97	3.23	1.30	2.88	1.98	2.51	2.94	2.65	4.17
Immediate Relative	88.41	84.61	87.27	85.23	86.23	86.51	89.31	88.06	87.95
Distant Relative	8.26	10.90	10.55	11.13	10.95	10.40	7.12	8.87	7.43
Not Related	1.35	1.26	0.87	0.75	0.84	0.58	0.63	0.43	0.45
Place of Residence									
Urban	95.77	36.57	73.24	86.06	36.03	42.66	97.08	34.26	13.44
Rural	4.23	63.43	26.86	13.94	63.97	57.34	2.92	65.74	86.56
Comm. internal migration									
Low	2.69	45.53	6.72	6.28	74.99	17.47	0.00	78.50	68.18
Medium	85.24	54.47	66.19	86.46	25.01	58.75	37.86	6.95	27.49
High	12.07	0.00	27.09	7.26	0.00	23.78	62.14	14.54	4.33
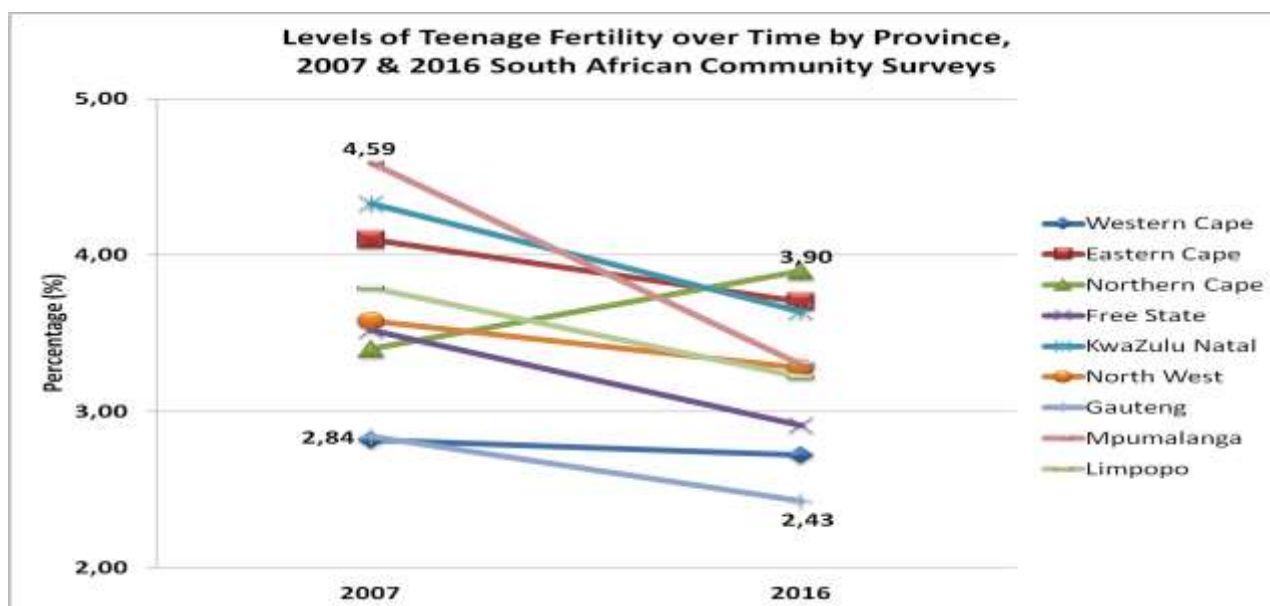
Figure 1: Percentage of teenage fertility by province in 2007 and 2016, South Africa

West and Gauteng provinces with an inter-quartile range of 3 or 4 years. Table 1 provides a summary of characteristics of the study participants. From Table 1, the teenage females were predominantly Black in all provinces except the Western Cape, never married, currently attending high school, immediate relatives of the household head and from communities with medium or low levels
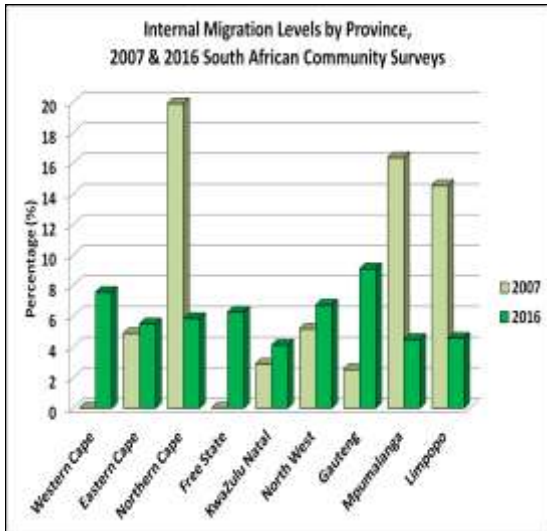
Figure 2: Levels of internal migration over time by province in South Africa, 2007 and 2016 communiyy survey

Figure 3: Levels of internal migration by province in South Africa, 2016 community survey

of internal migration except for Gauteng where most participants were from communities with high levels of internal migration.

Teenage fertility was reported nationally across both years with 3362 cases (3.74%) in 2007 and 7693 cases (3.21%) in 2016 and decreased by 14% over the interrogated period. Chi- squared test results revealed teenage fertility statistically significantly decreased over time from 2007 to 2016 with $p < 0.000$. As seen in Figure 1, teenage fertility levels by province showed that in 2007 the Mpumalanga province had the highest percentage of teenage girls giving birth at 4.59% followed by KwaZulu Natal and the Eastern Cape, while the lowest levels occurred in Gauteng and the Western Cape. In 2016 highest fertility levels among teenage girls occurred in the Northern and Eastern Cape while lowest percentages were seen in Gauteng and the Western Cape again.

Internal migration levels by province are shown in Figure 2. Between the years 2007 and 2016 internal migration decreased in the Northern Cape, Mpumalanga and Limpopo while it rose in the Western Cape, Free State and Gauteng. Figure 3 shows internal migration levels across provinces of South Africa for 2016 with lighter provinces having lower internal migration and darker areas having higher levels. Highest levels of internal migration in 2016 were seen in Gauteng, the Western Cape and North West while lowest

levels occurred in KwaZulu Natal, Mpumalanga and Limpopo. The Eastern Cape, Northern Cape and Free State showed moderate levels of internal migration.

Table 2 displays row percentage levels of teenage fertility across the categories of characteristics by province. Differences were observed between teenage girls that gave birth and their counterparts that did not. Teenage fertility occurred at higher levels among girls that were older, Blacks in most provinces except the Western Cape, Northern Cape, Free State and North West. Additionally, predominately highest fertility levels were seen among cohabiting teenage girls, those with no schooling or attending secondary or tertiary education and girls that were heads of households. Highest teenage fertility was depicted among girls from communities with low internal migration of the Western Cape, Eastern Cape and Gauteng and communities with high internal migration of the Northern Cape and Limpopo. All variables showed statistical significance according to the chi-squared test and Wilcoxon ranksum test for age (p-value<0.05), showing that the differences in levels of birth across categories were truly different at population level.

Inferential results: Odds of teenage fertility

Table 3 below shows the results of the provincial adjusted regression models for 2016. The constant across provinces remained largely similar with the

Table 2: Bivariate results of teenage fertility by characteristics per province, 2016 community survey

Characteristics	WC	EC	NC	FS	KZN	NW	GP	MP	LP
Age (median; IQR)	18; 2*	18; 2*	18; 2*	18; 2*	18; 2*	18; 2*	18; 2*	18; 2*	18; 2*
Race									
African/Black	2.83	**3.80***	3.91	2.95	**3.78***	3.33	**2.58***	**3.32**	**3.25***
Coloured	2.89	2.80	**4.15**	**3.72**	1.86	**3.38**	2.18	2.61	3.03
Indian/Asian	**3.70***	1.59	0.00	0.09	0.92	0.00	0.70	2.86	0.00
White	0.20	1.71	0.00	1.03	0.54	1.04	0.40	1.78	0.00
Marital Status									
Never Married	2.39	3.50	3.44	2.62	5.55	2.86	2.10	2.92	2.72
Cohabiting	**11.66***	7.63	**17.92***	**14.16***	**7.78***	**14.84***	10.48	12.01	**14.14***
Ever Married	7.96	**14.01***	15.79	5.56	3.48	12.38	**11.82***	**12.38***	13.04
Educational Level									
No Schooling	2.99	**7.66***	3.45	**6.35***	**5.52***	2.34	**6.57***	4.32	**9.17***
Primary	0.93	1.30	1.94	1.17	0.90	1.84	0.63	1.21	0.95
Secondary	**3.49***	5.05	**5.11***	3.83	4.60	4.06	3.04	4.18	4.04
Tertiary	3.33	6.25	0.00	3.51	5.20	**9.43***	1.32	**6.35***	5.13
Relationship to Head of HH									
Head	**9.80***	**7.31***	**15.38***	6.55	**7.65***	**9.21***	**6.85***	**7.64***	6.33
Immediate Relative	2.41	3.45	3.54	2.64	3.45	3.06	2.21	2.85	2.89
Distant Relative	3.61	4.23	5.07	3.77	4.34	3.53	3.32	6.41	5.18
Not Related	7.38	6.80	7.69	**7.48***	4.42	5.88	3.97	3.30	**6.85***
Place of Residence									
Urban	2.63	2.70	3.50	2.90	3.11	2.78	2.43	3.22	2.75
Rural	**4.71***	**4.28***	**4.98***	3.01	**3.93***	**3.65***	**2.66**	**3.33**	3.30
Comm. internal migration									
Low	**5.13***	**4.37***	4.48	2.90	3.57	3.42	**2.54**	3.23	3.23
Medium	2.57	3.14	3.49	**2.94**	**3.83**	**3.49***	2.37	**3.72**	3.02
High	3.25	0.00	**4.75**	2.60	3.64	2.66	2.43	3.43	**4.29***

*= p-value <0.05

Table 3: Provincial adjusted multilevel logistic regression results, 2016 community survey

Characteristic	Western Cape Adjusted OR (95% CI)	Eastern Cape Adjusted OR (95% CI)	Northern Cape Adjusted OR (95% CI)	Free State Adjusted OR (95% CI)	KwaZulu Natal Adjusted OR (95% CI)	North West Adjusted OR (95% CI)	Gauteng Adjusted OR (95% CI)	Mpumalanga Adjusted OR (95% CI)	Limpopo Adjusted OR (95% CI)
Community-level of Residential Mobility: (Low†)									
Medium	0.65 (0.34 - 1.26)	1.01 (0.93 -1.039)	0.72 (0.59 - 1.48)	0.57 (0.48 - 1.69)	1.13(0.94-1.37)	1.21 (0.90 - 1.61)	0.93 (0.82-1.06)	1.10 (0.84 - 1.44)	1.15(0.64 -1.58)
High	0.54 (0.29- 1.02)	0.80 (0.64- 0.98)*	0.68 (0.34- 1.36)	0.48 (0.38- 1.18)	1.48 (0.56-2.01)	1.33 (0.75 -1.89)	0.87 (0.73-1.10)	1.23 (0.88 -1.71)	1.55 (1.12-2.09)*
Controlling Background Characteristics									
Age	1.73 (1.62- 1.84)*	1.80 (1.73- 1.88)*	1.85 (1.73-1.96)*	1.65 (1.45-1.96)*	1.81 (1.75-1.87)*	1.63 (1.51 -1.78)*	1.79(1.71-1.87)*	1.79 (1.70 -1.89)*	1.85(1.53 -1.96)*
Race: (Blacks†)									
Coloured	0.93 (0.76- 1.14)	1.05 (0.78-1.41)	0.98 (0.84- 1.29)	0.87 (0.59- 1.23)	0.49 (0.25-0.96)*	0.52 (0.19- 1.99)	0.85 (0.59-1.23)	0.67 (0.21- 2.17)	0.78 (0.25-1.83)
Indian/Asian	1.45 (0.33 -6.35)	0.54 (0.07-3.97)	1.51 (0.40 -5.79)	1.23 (0.38 -2.37)	0.26 (0.16-0.44)*	1.18 (0.79 -4.33)	0.29 (0.11-0.79)*	1.23 (0.16 -9.47)	0.25 (0.13-0.51)*
White	0.07 (0.02- 0.26)*	0.74 (0.34-1.61)	0.11 (0.07- 0.43)*	0.19 (0.12- 0.37)*	0.16 (0.05-0.49)*	0.62 (0.35 -1.70)	0.14 (0.07-0.27)*	0.54 (0.21 -1.36)	0.11 (0.06-0.35)*
Education Level: (No Schooling†)									
Primary	2.05 (0.45-9.36)	0.97 (0.58-1.60)	2.52 (0.33-6.89)	2.05 (0.45-9.36)	1.18(0.74-1.91)	1.72 (0.65- 2.73)	0.87 (0.45-1.66)	1.90 (0.83- 4.33)	1.35 (0.46-1.79)
Secondary	1.72 (0.39- 7.60)	0.91 (0.57-1.47)	1.89 (0.45- 6.81)	1.72 (0.39- 7.60)	1.14(0.74-1.76)	1.50 (0.72- 2.18)	0.70 (0.39- 1.27)	1.43 (0.65- 3.15)	1.28 (0.81-1.65)
Tertiary	1.00 (0.13-7.84)	0.64(0.23-1.80)	1.25 (0.27-5.53)	1.00 (0.13-7.84)	0.71(0.32-1.59)	1.14 (0.35- 2.70)	0.13 (0.04 -0.42)	1.05 (0.29- 3.82)	0.65 (0.40 -1.83)
Relationship to Head of HH:(Head†)									
Immediate Relative	0.57 (0.39- 0.85)*	1.06(0.83-1.34)	0.43 (0.22- 0.78)*	0.64 (0.41- 0.78)*	0.91(0.71-1.16)	0.63 (0.38- 1.57)	0.88 (0.69-1.11)	0.79 (0.57- 1.11)	0.83 (0.72-1.23)
Distant Relative	0.65 (0.41- 1.04)	1.06(0.80-1.41)	0.58 (0.32- 1.76)	0.72 (0.32- 1.26)	1.02(0.78-1.34)	1.29 (1.08 -2.57)*	0.96 (0.70-1.29)	1.44 (1.01 -2.11)*	1.22 (1.06-1.58)*
Not Related	0.99 (0.52- 1.89)	1.19(0.76-1.85)	0.87 (0.59- 1.56)	0.92 (0.32- 1.24)	0.72 (0.42-1.21)	0.49 (0.20 -1.76)	0.70 (0.37 -1.35)	0.54 (0.16 -1.83)	0.64 (0.50 -1.62)
Marital Status (Ever Married†)									
Cohabiting	1.36 (0.76-2.45)	0.84(0.55-1.28)	1.49 (0.42-2.91)	1.67 (0.53-1.85)	1.20 (0.81-1.78)	1.16 (0.36- 1.45)	0.86 (0.58 -1.26)	1.09 (0.57-2.09)	1.29 (0.59-1.47)
Never Married	0.37 (0.22-0.62)*	0.48(0.36-0.66)*	0.69 (0.54-0.88)*	0.43 (0.18-0.74)*	0.70 (0.49-0.99)*	0.57 (0.39- 0.88)*	0.25 ().17-0.35)*	0.42 (0.23- 0.78)*	0.53 (0.24-0.87)*
Place of Residence (Urban†)									
Rural	1.59 (1.07-2.36)*	1.28(1.06-1.56)*	1.30 (1.10-1.59)*	1.63 (1.02-1.71)*	1.16 (1.02-1.32)*	1.10 (0.90 -1.42)	1.17 (0.81- 1.68)	1.03 (0.83 -1.28)	1.22 (1.08-1.46)*
Constant	0.01 (0.001-0.11)*	0.04(0.01-0.90)*	0.09 (0.02-0.31)*	0.03 (0.01-0.61)*	0.02 (0.01-0.50)*	0.04 (0.01 -0.50)*	0.08 (0.02- 0.27)*	0.03 (0.01 -0.70)*	0.05 (0.02-0.38)*
Community-level Intercept	0.08 (0.02-0.27)*	0.09 (0.05 -0.19)*	0.11 (0.03- 0.33)*	0.04 (0.01- 0.19)*	0.03 (0.01- 0.07)*	0.03 (0.01-0.12)*	0.03 (0.01- 0.23)*	0.01 (0.0002-0.26)*	0.03 (0.030-0.037)*
ICC	0.21 (0.08- 0.54)*	0.22(0.13-0.37)*	0.35 (0.16- 0.46)*	0.35 (0.12- 0.62)*	0.19 (0.13-0.30)*	0.43 (0.18- 0.65)*	0.50 (0.01-0.67)*	0.54 (0.05- 0.78)*	0.26 (0.18-0.42)*

*= p-value <0.05

average odds of teenage fertility when all variables were equal to zero in the adjusted models being significant and ranged between 91 and 99 percent lower. Intra-class correlation coefficient results reveal that when all variables were controlled for, teenage females from the same community were 19% to 54% similar regarding the risk of teenage births in the preceding year.

Teenage girls from Mpumalanga (54%) and Gauteng (50%) were most similar, while their counterparts from KwaZulu Natal (19%) and Western Cape (21%) were least similar. The community-level intercept showed the differences in the risk of teenage fertility due to community-level variance and ranged from 1% to 11%. The highest risk of teenage fertility due to community-level variance occurred in the Northern Cape (11%) and Eastern Cape (9%) while the lowest risk was seen in Mpumalanga (1%).

Fertility data modelling by province

Results for Western Cape, Northern Cape, Free State, Gauteng and the Eastern Cape were comparable with the odds of teenage fertility decreasing as the community levels of internal migration increased. Likewise, results from KwaZulu Natal, North West, Mpumalanga and Limpopo were similar and showed that the likelihood of teenage fertility increased as the community levels of internal migration increased. In the Eastern Cape and Limpopo the association between teenage fertility and internal migration was statistically significant.

In the Western Cape upon controlling for all socio-demographic variables the likelihood of teenage fertility was 35 percent lower in communities with medium levels of internal migration and 46 percent lower in communities with high levels of internal migration compared to teenage girls from communities with low levels of internal migration. The adjusted model for the Eastern Cape showed that the odds of teenage fertility was statistically significant and 1% higher for girls in communities with medium levels of internal migration and 20% lower for girls living in communities with high levels of internal migration compared to their counterparts from communities with low levels of internal migration. Results from the Northern Cape showed that the odds of teenage

fertility was 28% lower among girls in communities with medium levels of internal migration and 32% lower in communities with high levels of migration. The Free State results showed that the likelihood of teenage fertility was 43% lower for girls from communities with medium levels of internal migration, and 52% lower for teenage females living in communities with high levels of internal migration.

KwaZulu Natal teenage females had 13% higher odds of fertility when living in communities with medium levels of internal migration, and 48% higher odds for when living in communities with high levels of internal migration. In the North West upon controlling for all socio-demographic variables the likelihood of teenage fertility was 21 percent higher in communities with medium levels of internal migration and 33 percent higher in communities with high levels of internal migration compared to teenage girls from communities with low levels of internal migration. The adjusted model for Gauteng showed that the odds of teenage fertility was 7% lower for girls in communities with medium levels of internal migration and 13% lower for girls living in communities with high levels of internal migration compared to their counterparts from communities with low levels of internal migration. Results from Mpumalanga showed that the odds of teenage fertility was 10% higher among girls in communities with medium levels of internal migration and 23% higher in communities with high levels of migration. The Limpopo results showed that the likelihood of teenage fertility was 15% higher for girls from communities with medium levels of internal migration, and 55% higher for teenage females living in communities with high levels of internal migration.

Predictors of teenage fertility in the Western Cape, Northern Cape and Free State included increasing age and rural residence, while being an immediate relative or never married was protective of fertility amongst teenage girls. Increasing age was significantly positively associated with teenage fertility, while being a distant relative and never married were significantly negatively associated with teenage fertility in Limpopo, Mpumalanga and the North West. Finally, the odds of teenage fertility for girls living in Gauteng, KwaZulu Natal and the Eastern Cape were significantly higher with increasing age

and rural residence, while significantly lower among those that were never married. Results for the race variable showed provincial differences with all race groups having significantly lower odds of teenage fertility compared to Black girls in KwaZulu Natal, while only White girls had significantly lower odds in the Western Cape (93% lower odds), Northern Cape (88% lower odds) and Free State (81% lower odds). In Gauteng and Limpopo White and Indian/Asian girls had significantly lower likelihood of teenage fertility compared to Black girls.

Discussion

This study aimed to show the levels, differentials and association between internal migration at community-level and teenage fertility within South African provinces. Our results show that in predominantly urban provinces such as the Western Cape, Northern Cape, Free State and Gauteng there was a consistent negative association between internal migration and teenage fertility. Therefore, as the levels of internal migration increased the odds of teenage fertility increased. This was expected as internal migration was categorised based on the municipality they had moved to rather than the municipality they were from. Consequently, the results were more a reflection of the new place of residence rather than the old. These findings align with a South African quantitative study at national level using 2001 and 2011 census data and multilevel regression[18]. Reasons for this negative association may be attributed to the disruption hypothesis, which states that migration has consequences, particularly in the short term of uneasiness and concerns about reproduction inducing fertility reduction[28,29].

For more rural provinces such as KwaZulu Natal, North West, Mpumalanga and Limpopo internal migration and teenage fertility were positively associated. Thus, the likelihood of teenage fertility increased as internal migration levels increased. Upon controlling for other factors, teenage females from communities with medium levels of internal migration were 10-15 percent more likely to have been given birth in the preceding year. Similarly, girls from municipalities with high levels of residential mobility were 23-55% more likely to have given birth in the

preceding year compared to their counterparts from communities with low levels of internal migration. These results are similar to some studies looking at the effects of residential mobility on sexual and reproductive behaviour. A systematic review found that residential mobility was associated with higher rates of teenage pregnancy[30]. Similarly, Nettle, Coall, and Dickins (2011)[31] found that frequent family residential moves predicted an increase in the likelihood of earlier first pregnancy amongst young women in Britain. Rocha-Jimenez *et al* (2018)[32] attribute this positive relationship between internal migration and teenage fertility to economic hardship, social isolation and gender-based violence. While disruption of community-based social capital, adverse effects from school changes, decreased access and availability of sexual and reproductive health services due to cost and distance associated with residential mobility may also be involved[33,34].

Limitations

The study's main limitation was due to constraints of using community survey data the scope of which is predetermined. This ruled out the chance to consider any variables of interest not included in the data sets. For instance, the data sets included municipality rather than neighbourhood level data, greater interpretation of results could have been achieved if the data was at the neighbourhood or small area level. Future studies should attempt to acquire this lower-level data from StatsSA.

Conclusion

This study has shown that in predominantly urban provinces young people that are unable to migrate are at higher risk of teenage fertility, while in rural provinces young people that migrate are at higher risk. Therefore, it is recommended that Department of Health should ensure safe and youth-friendly services at health clinics particularly based in rural areas. These would assist the young people that are unable to migrate as well as their counterparts in predominantly rural provinces. These health clinics should establish comprehensive SRH services allowing young people to have numerous options to take ownership and have agency for their sexual reproductive health. Alatinga *et al* (2021)[35] found

that although migrant youth had high levels of contraceptive awareness and knowledge, levels of condom usage were very low at about 13% for adolescent girls and the odds of use increased with age, education and socio-economic status. Therefore, it is imperative that young people be given discrete contraceptive options beyond condoms that allow female adolescents to exercise reproductive agency independent of their partners. Baru *et al* (2020)[36] found that the levels of risky sexual behaviours were higher among young people that had migrated. Therefore, interventions that promote safe sex among this group to increase favourable attitudes for condom use, knowledge of early pregnancy consequences and sexually transmitted infection risks would also assist. This would hopefully assist in increasing levels of wanted, planned and safe pregnancies among migrant adolescent girls in South Africa

Acknowledgement

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