The health transition among urban migrants and rural stayers in South Africa
[UAPS Extended Abstract Submission]

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Introduction

Health outcomes are a concomitant feature of the demographic transition, and they will likely figure prominently in realizing the Demographic Dividend in Africa. This study recognizes these interwoven dynamics, and it also reflects the concern for worldwide increases in prevalence of obesity and chronic disease. These concerns are particularly manifest in South Africa. In this paper, we report preliminary results regarding blood pressure (BP) and body mass index (BMI) from the initial wave of a longitudinal study of approximately 3,000 persons originating in a rural district of South Africa: The *Migration and Health Follow-Up Study*. The sample is composed of both urbanward migrants and non-migrants (stayers) who remain in the rural district. BP levels and hypertension tend to be higher in urban migrants compared to non-migrants from the same rural source population. Factors such as migrant selectivity, exposure to urban diets and physical activity patterns, increased psychosocial stress and differential access and use of health systems may be partially responsible for these rural non-migrant versus urban migrant differences. This study reports on levels of BP, hypertension, and BMI and overweight, as measures of adiposity levels, among migrants from Agincourt, South Africa compared to non-migrants who have remained in the origin district. We show these cardiometabolic disease risk levels at the baseline of our longitudinal study of migration, urbanization and health.

Methods

A sample of adults age 18-39 years was drawn from the Agincourt Health and Demographic Surveillance System in Mpumalanga Province, northeast South Africa. Initial recruitment contacts and subsequent fieldwork resulted in 3,103 successful interviews (82% of eligible sampled persons.) The working sample (of those who participated and contributed anthropometric measures) was about one-fourth migrants, many residing in Gauteng Province where Johannesburg and Pretoria are located. Gauteng is a major destination for migrants from the origin community. Four waves of data collection are planned over 5 years with annual interviews, some by telephone. Human biological assessments, including BP and adiposity were included in Wave 1 and are scheduled to be performed again in Wave 4.

For this interim analysis a representative sample of 1,589 men and women now 19-42 years of age from the rural and urban areas had BP and body mass index (BMI) measured and were interviewed at baseline of a longitudinal study.

BP was measured after a 10-minute seated rest period blood pressure (BP) was measured three times, with 3-minute rest periods between measurements, using an Omron HEM907 XL digital blood pressure monitor (Omron Healthcare, IL). Hypertension was defined as having either a systolic BP $\geq$ 140 mm Hg or diastolic BP $\geq$ 90 mm Hg, or currently taking

medication for hypertension. Height and weight were measured with standard methods and BMI calculated as weight divided by the square of height. BMI was categorized into four groups based on BMI (See Table 1): Underweight - BMI < 18.5 kg/m^2; Normal weight - 18.5 $\leq$ BMI < 25.0 kg/m^2; Overweight – 25.0 $\leq$ BMI < 30.0 kg/m^2 ; Obese – BMI $\geq$ 30.0 kg/m^2. > 25 kg/m^2.

This concise descriptive report highlights the basic differences between the two samples; non-migrants compared to migrants, stratified by sex. We also run exploratory multivariable models of BP levels and hypertension to understand the roles of age and BMI on any differences between migrants and non-migrants.

Results

Among non-migrants hypertension prevalence was 11.1% and 17.0%, in women and men, respectively. Among migrants prevalence was significantly higher in each sex, 22.1% and 32.3%, p= 0.0004 for women and p< 0.0001 for men, respectively (Table 1). The sex difference in hypertension prevalence was significantly different in the Agincourt origin community, p= 0.002, but among migrants (Gauteng) the difference was marginal, p=0.052.

Few people with hypertension reported current use of hypertensive medication. Overall only 7.5% and 5.6% of hypertensives were using medication among non-migrants and migrants, respectively. There were strong sex differences in use of medication among those with hypertension. In the rural nonmigrant population, 13.8% (11/80) of women with hypertension used medication, compared to 2.2% (2/93) among men. Similarly, among migrants, 13.8% (4/29) of women and 1.6% (1/61) of men use hypertensive medication.

Among rural women and men cross-sectional age was significantly correlated with both systolic and (r = 0. 0.22, p<0.001, and r= 0.14 p=0.01, respectively) and diastolic BP levels (r = 0.27, p<0.001, and r= 0.30 p< 0.001, respectively). Among urban migrant women cross-sectional age was significantly correlated with both systolic and diastolic BP (r = 0. 0.1922, p=0.03, and r= 0.18 p=0.04, respectively). In contrast age was not associated among migrant men (r = 0. 04, and r= 0.09, both p>0.20, for systolic and diastolic BP respectively). This is unusual since BP levels are generally positively associated with adult age.

BMI was not different among women when comparing the two locations (Table 1). However, among men BMI was significantly higher, 1.12 kg/m^2, among the migrant sample. BMI was associated with age in women and men from Agincourt, (r = 0. 0.24 and r= 0.25 both p< 0.001, respectively). However, among migrants age was not associated with BMI in women but was in men, r=0.22, p=0.003.

The unadjusted positive association between weight status, assessed by BMI category, and hypertension was significant in both sexes and in both locations, although the level of hypertension was greater in the overweight and obese groups among migrants (Table 2).

In all women multiple regression of mean systolic BP and diastolic BP on age, BMI and location showed significant (all p<0.0001) positive associations of age and BMI with both BPs and that age and BMI adjusted BPs were significantly higher among the migrants. For systolic BP for example, adjusted BPs were higher by 4.5 mm Hg in the migrant women. In men adjusted

systolic BP was significantly associated, $p<0.0001$, only with BMI, and neither age nor location were. Adjusted diastolic BP in men was significantly positively associated with age, BMI, and location, with Gauteng men having an adjusted diastolic BP approximately 2.7 mm Hg higher than Bushbuckridge men.

Logistic regression with hypertension as the outcome showed that for both women and men the migrants had higher odds for hypertension, 2.7 (95 % CIs: 1.6, 4.5) and 1.9 (1.3, 2.9), respectively (Table 3).

Discussion

The higher hypertension prevalence among the migrants from rural Bushbuckridge (the Agincourt sub-district study site) to elsewhere (predominant urban Gauteng Province locations) is notable with more than one-fifth of women and almost one-third of men having hypertension. The analysis of this ongoing cross-sectional baseline of a longitudinal study indicated that even after adjusting for the expected positive association of adiposity, assessed by BMI, and age, there was a 2 – 3 fold greater odds of hypertension in the migrants relative to the non-migrants. This suggests that factors beyond age and adiposity influence hypertension and BP levels.

These preliminary analyses will be improved with additional detail in the measurement of duration and geographic distance of migration. The basic contrasts described here do not assume that we should find differences in the complete baseline data, nor that we understand the various factors that may be contributing to the differences detected in this early analysis. We are careful about over-interpreting the BP and hypertension differences reported here as due to migration. The purpose of the longitudinal interdisciplinary study is to focus on much more on transitions among individuals, allowing for adjustment of health selectivity in migration. Future work (prior to the African Population Conference) will also make further adjustments for non-response and migrant selectivity. These factors include indicators of diet, well-being, occupational and residential factors in each location, and *a priori* hypothesized interactions among some of these.

Nonetheless, the results here are consistent with other studies in South Africa and Sub-Saharan Africa in the early 21st century and indicate the need to more fully understand the impact of migration and urbanization on BP and hypertension. The findings about the low level of hypertensive medication use among those with hypertension, especially among men, is of special note and public health and primary care systems should be aware of these unmet needs as the health transition proceeds in S Africa and elsewhere.

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Table 1. Sample description by Migrant Status (Location)

Sample Characteristics		Non-Migrants (Rural) (n=1270)	Migrants (Urban) (n=319)
Sex % (n)			
Female		56.8 (n=722)	40.8 (n=130)
Male		43.2 (n=548)	59.2 (n=189)
Age yrs Mean (sd)			
Females		28.3 (6.0)	27.8 (5.2)
Males		26.5 (5.8)	29.7 (5.2)
Blood Pressure (BP) mm Hg & Hypertension[1] %			
Females	Systolic BP Mean (sd)	120.5 (12.6)	125.1 (14.4)
	Diastolic BP Mean (sd)	76.4 (9.6)	81.4 (11.1)
	Hypertension %	11.1	22.1
	Hypertension Medication[2] %	13.7 (n=11)	13.8 (n=4)
Males	Systolic BP Mean (sd)	129.2 (10.9)	131.1 (12.7)
	Diastolic BP Mean (sd)	77.2 (9.5)	81.7 (9.1)
	Hypertension %	17.0	32.3
	Hypertension Medication[2] %	2.1 (n=2)	1.6 (n=1)
Body Mass Index (BMI) & Weight status[3]			
Females			
	BMI kg/m^2 Mean (sd)	27.6 (6.4)	27.9 (5.9)
	Underweight %	4.2	2.3
	Normal weight %	34.2	29.2
	Overweight %	30.5	35.4
	Obese %	31.2	33.1
Males			
	BMI kg/m^2 Mean (sd)	22.7 (4.2)	23.9 (4.1)
	Underweight %	9.9	4.8
	Normal weight %	68.1	62.4
	Overweight %	16.8	24.3
	Obese %	5.3	8.5

[1] Hypertension: Systolic BP $\geq$ 140 mm Hg or Diastolic BP $\geq$ 90 mm Hg, or current use of antihypertensive medication.

[2] Hypertensive Medication: percentage of people with hypertension currently on antihypertensive medication.

[3] Weight Status: Underweight - BMI < 18.5 kg/m^2; Normal weight - 18.5 $\leq$ BMI < 25.0 kg/m^2; Overweight – 25.0 $\leq$ BMI < 30.0 kg/m^2 ; Obese – BMI $\geq$ 30.0 kg/m^2.

Table 2. Bivariate Association of Hypertension and BMI by Sex and Migrant Status

	Normal BP	Hypertension
NonMigrant Women		
Underweight[1]	93.3%	6.7%
Normal Weight	95.1%	4.9%
Overweight	91.4%	8.6%
Obese	85.8%	14.2%
Severely Obese	69.2%	30.8%
Chi-square 48.7, p<0.001		
NonMigrant Men		
Underweight	90.7%	9.3%
Normal Weight	87.4%	12.6%
Overweight	70.7%	29.3%
Obese	54.2%	45.8%
Severely Obese	40.0%	60.0%
Chi-square 38.1, p<0.0001		
Migrant Women		
Underweight	100%	0%
Normal Weight	86.8%	13.2%
Overweight	82.6%	17.4%
Obese	66.7%	33.3%
Severely Obese	53.9%	46.1%
Chi-square 9.7, p=0.046		
Migrant Men		
Underweight	88.9%	11.1%
Normal Weight	72.0%	28.0%
Overweight	63.0%	37.0%
Obese	41.7%	58.3%
Severely Obese	25.0%	75.0%
Chi-square 10.4, p=0.035		

[1]: Weight Status: Underweight - BMI < 18.5 kg/m^2; Normal weight - 18.5 $\leq$ BMI < 25.0 kg/m^2; Overweight – 25.0 $\leq$ BMI < 30.0 kg/m^2 ; Obese – BMI $\geq$ 30.0 kg/m^2.

Table 3. Logistic Regression of Hypertension on Age, BMI and Migrant Status by Sex

	ORs	95 % CI
Women N= 843		
Age	1.10	(1.06, 1.15)
BMI	1.10	(1.07, 1.14)
Location[1]	2.69	(1.62, 4.49)
Men N= 727		
Age	1.03	(0.99, 1.06)
BMI	1.15	(1.10, 1.21)
Location[1]	1.93	(1.28, 2.91)

[1]: Migrant Status (Location)

0= NonMigrant (rural Agincourt, Bushbuckridge);

1= Migrant (urban Gauteng, etc.)