Assessing health impacts of an environmental pan-African development project: A migration perspective

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A B S T R A C T

The general objective of this article is to analyze to what extent the implementation of the Great Green Wall project is likely to disrupt migratory movements towards the rural environment and, consequently, the socio-economic structures and health status of local populations. This study was carried out in 2015 on a population sample of 500 individuals living in the municipality of Tessekere, constructed using the quota method. Socioeconomic and demographic characteristics, migratory status and self-rated health of individuals were collected during face-to-face interviews. Statistical analyses used were Chi-square tests, student and binary logistic regressions. Results show that internal migrants in the municipality of Tessekere represent 13.40% of the study population. Migrants more often work as civil servants, artisans, craft workers or traders than the region's native population, who are generally livestock breeders or jobless. While place of birth does not play a significant role, it appears that the length of residence of migrants in rural areas influences health status: migrants residing in the municipality of Tessekere for less than 10 years are less likely to report poor health, regardless of their sex, age, occupation, material well-being and perceived stress. In conclusion, an environmental requirement (combating desertification), addressed by an international political project - the Great Green Wall - and then applied at the national level, has transformed the demographic, economic and health structure of a local population. In conclusion, our study showed that (1) an examination of migration can offer a means of interpreting the impact of development projects and the local changes they entail, and (2) migration is a unique prism through which one can study how exposure to a new physical and social environment influences the health of populations.

1. Introduction

Climate change is a global phenomenon with multiple consequences. In the Sahel, one of the most vulnerable regions in the world, the 1970s were marked by intense droughts (Hulme, 1992), that ushered in an aridification process accentuated over the following decades by anthropogenic factors such as the exploitation of timber resources and intensive livestock operations (Duboz et al., 2019). From that decade onward, local populations in Senegal adapted to the deterioration of their environment. One of these adaptations consists of migration, particularly circular migration, to diversify people's incomes (Bourgeois et al., 2018). The region therefore has not been "drained" of its inhabitants, but population movements grew in intensity: the inhabitants of the Senegalese Sahel have in fact become accustomed to moving more and more often in order to diversify their economic resources.

As Black and colleagues (Black et al., 2011) point out, migration decisions are driven by economic, political, social, demographic and environmental factors. These factors may interact with each other, making the study of the links between migration and climate change more complex. These links are all the more complex to study as, in addition to climate change itself, many projects to combat climate change are now also being implemented, and are likely to have an influence on migration movements. This is particularly the case in the Senegalese Sahel, where a reforestation project called the Great Green Wall began in 2008 to restore the ecosystem. The general objective of this article is to analyze to what extent the implementation of this project is likely to disrupt migratory movements towards the rural environment and, consequently, the socio-economic structures and health status of local populations.

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1.1. Interest of the study area: the municipality of Tessekere (Ferlo, Senegal)

The municipality of Tessekere (Louga region) is located in the Senegalese Sahel, within the sylvo-pastoral zone of Ferlo (Fig. 1). Ferlo is a destination for migration. The lifestyle of the majority population there, the Fulani, is closely related to transhumance, enabling them to offset the effects of climate variations. These seasonal pendular movements bring pastoralists and their herds from pastoral areas (in the rainy season) to irrigated areas (in the dry season), in search of pastures (Sine-Saloum, Eastern Senegal (Ba et al., 2018)). In addition, since the 1970s and 1980s, droughts, irregular rainfall and livestock intensification have led to severe environmental degradation (Fall 2017; Niang et al., 2014). In this isolated rural environment, where basic social services are very inaccessible (Agence Nationale de la Statistique et de la Démographie, 2011) and where neither electricity nor running water are available, people have logically sought a way to diversify their economic resources through migration. This is why in 2018, in Senegal, the Louga region became much more a departure region for internal migrants than a host region; it is one of the two regions that is losing the most internal migrants (ANSD/OIM, 2018).

However, in 2008, a pan-African development project, the Great Green Wall Initiative (GGW) for the Sahara and the Sahel, jointly decided by 11 Saharan-Sahelian countries, including Senegal, was launched. The objectives of this project are (1) the restoration of woody species in order to slow down desertification and (2) the local economic development of the terroirs. In Senegal, the Great Green Wall covers 16 rural communities, including Tessekere; a pioneering area in reforestation and local development related to GGW (Duboz et al., 2019).

To our knowledge, no studies have been carried out on the consequences of the implementation of environmental development projects in this region. Studies on the influence of climate change and disasters on migration are numerous [i.e. (Abel et al., 2019; Call et al., 2017; Mastrorillo et al., 2016),]. On the other hand, there are few studies on the migratory impact of ecological restoration projects. However, these projects are concrete policy solutions to climate change (effective or not), and therefore, are likely to lead to new forms of migration.

1.2. Migrations in Senegal

International migration plays an important role in adding to the population in metropolises in the developed world, but it only marginally contributes to population redistribution in less developed countries (Rees et al., 2017). In Senegal, as in many developing countries, the strongest migration flows are not international, but internal (Harttgen & Klasen, 2009; Mercandalli et al., 2018). Since the recurrent droughts in the 1970s and 1980s and the consequential degradation of the environment, income diversification strategies adopted by the populations have logically resulted in migratory movements [i.e. (Van der Land & Hummel, 2013),] that are fairly short-term and pendular, and usually internal (Ba et al., 2018). In Senegal, nearly 2 million individuals, or 14.6% of the general population, are internal migrants (Diagne & Diagne, 2015). Dakar is naturally the primary destination for these migrants, as it is the economic and administrative capital of the country. The city alone accounts for 43.6% of internal migrants (ANSD/OIM, 2018). But according to Ba and colleagues (Ba et al., 2018), a high level of migration from one rural area to another is well documented, as is the emergence of urban-rural migration. To our knowledge, however, in Senegal, few studies on internal migration to rural areas have been conducted so far, or they pertain mainly to pendular migrations.
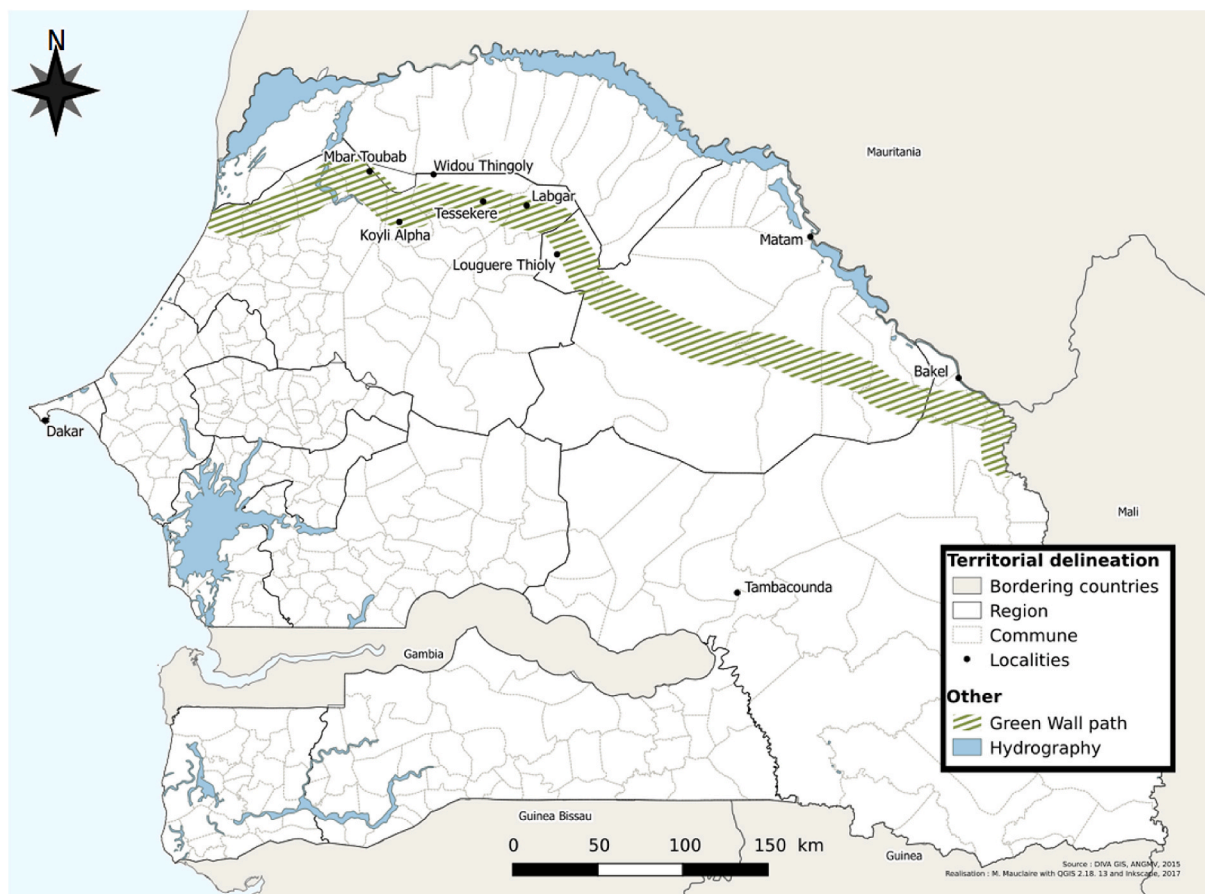

Fig. 1. Geographic locations of the Tessekere municipality in the Ferlo region in Northern Senegal.

1.2.1. Determinants of internal migration

According to Baker and Aina (Baker & Aina, 1995), the major causes of internal migration described in the literature are natural and unnatural disasters, unequal development, demographic pressure, low agricultural production, poverty and the lure of cities. In Senegal, economic reasons appear to be one of the major factors for migration. (Duboz, Macia, Gueye, et al., 2012). However, according to Harttgen and Klasen (Harttgen & Klasen, 2009), these economic differences offer only a partial explanation of migration patterns. Other determinants of migration must be considered, including climate change, a theme that is becoming increasingly important in the study of migration on the African continent (Bourgeois et al., 2018). Most of the studies that provide this quick overview of migration motivations focus on international migration or rural-urban migration. However, Chamberlin et al., (Chamberlin et al., 2018) describe rural migration as a blind spot, despite the potential benefits it could have on local development opportunities.

1.2.2. The consequences of internal migration

This overview of studies pertaining to the determinants of internal migration seems to indicate that migrants arriving in their host environment are thus generally people in search of economic opportunities or seeking better social and economic living conditions in a different geographic area. The study of the evolution of these migrants is complex in that it depends at once on their initial demographic, sociological and economic characteristics and opportunities related to the physical, economic and social environment they are immersed in, as well as the political and institutional frameworks of the host milieu.

Moreover, as Agyemang and colleagues (Agyemang et al., 2017) point out, migration represents a unique opportunity to study the influence of environmental exposure on health. Although a causal relationship cannot be established directly through these studies due to the complexity of the links between migration and health (Anglewicz et al., 2015), many hypotheses have now been developed to explain changes in health status associated with migration (Ginsburg et al., 2016): The "healthy migrant hypothesis," according to which migrants are healthier and have a socio-economic advantage in their home society [e.g. (Anson, 2004; Lu, 2008),] is by far the best known. However, this initial health benefit is believed to be lost over time, with prolonged exposure to the new environment, a hypothesis known as the "adaptation effect," or the gradual alignment of migrants' health status on that of their host population [i.e. (Duboz, Macia, Chapuis-Lucciani, et al., 2012),]. On the contrary, the "socialization effect" describes the fact that migrants maintain their initial state of health.

1.3. Objectives

As explained above, the general objective of this article is to analyze to what extent the implementation of the project to combat desertification - the Great Green Wall Initiative - is likely to disrupt migratory movements towards the rural environment and, consequently, the socioeconomic structures and health status of local populations. To this end, migration to the remote rural municipality of Tessekere (located in the Senegalese Sahel), a pioneering area in the establishment of the Great Green Wall, will be analyzed and its impact on the demographic, economic, social and health situations of the local population will be assessed.

2. Material and methods

2.1. Population sample

To carry out this study, a comprehensive survey was conducted from February to August 2015 in the municipality of Tessekere (Ferlo region, northern Senegal). In 2015, according to Senegal's National Agency for Statistics and Demography (ANSD), a total of 8999 individuals were living in Tessekere municipality (ANSD, 2014). The population sample selected for this study comprised 500 individuals aged 20 and over. The sample was constructed using the combined quota method (cross-section by age and gender) to strive for representativeness of the population of Tessekere of the above-mentioned age group. Data from the ANSD dating from the last census (2013) were used. The quota variables used were gender (male/female) and age (20–29/30-39/40–49/50 and over). In practical terms, this method requires constructing a sample that reflects the proportions observed in the general population: for example, according to the last census; 20.6% of the population were women of the age group '20–29'. The sample was constructed to match this proportion by including 103 women aged 20 and 29 years of age. The method was the same for each quota by gender, age and place of residence.

Eight investigators (PhD students in Sociology, Medicine and Pharmacy) started out from different points each day to interview individuals in Wolof or Haalpulaar in the three villages of the commune of Téssékéré (Amaly, Widou Thiengoly and Téssékéré) as well as in the surrounding camps. Investigators had a certain number of individuals to interview (women aged 20–29/men aged 20–29/women aged 30–39/men aged 30–39/women aged 40–49/men aged 40–49/women aged 50 and over/ men aged 50 and over) to meet the quotas. Only one person was selected as a respondent in each house (for villages) and each family (for camps). The investigators went into the homes, inquired about the inhabitants and then chose the first person they saw who met the characteristics needed for the quotas. In-person interviews were conducted. They ranged from 30 to 45 min, depending on respondent availability and desire to talk.

2.2. Sociodemographic variables

The socioeconomic and demographic variables collected were:

- age (20–29/30-39/40–49/50 and over)
- gender (male/female)
- occupation (civil servant/artisan, craft worker, trader/livestock breeder/none)
- economic conditions: the following question was used as an indicator of economic conditions: "Given your household income, do you feel you … a) live well? b) live okay? c) live okay, but you have to be careful? d) have difficulty making ends meet?" This question, taken directly from Razafindrakoto and Roubaud's study, has demonstrated validity and relevance in eight African capitals, including Dakar, to measure economic conditions in the context of subjective well-being (Razafindrakoto & Roubaud, 2006).
- migratory status: migrants were defined as individuals who were not born in the Louga region and were living in the Tessekere municipality for more than one year, in accordance with the definition of 'internal migrant' as per Senegal's National Agency for Statistics and Demography. Three groups were distinguished among the migrant population: the first was made up of individuals born in one of the principal cities (Saint-Louis, Kolda, Louga, Ziguinchor, Tambacounda, Thiès, Diourbel, Fatick, Kaolack and Matam); the second, of individuals born in one of Senegal's secondary cities (population of 10,000 inhabitants or more according to Geopolis). Last, the third group corresponds to people born in rural Senegal (elsewhere than the Louga region)
- for migrants, the length of residence in Tessekere municipality (<10 years/< 20 years/≥ 20 years)
- to analyze internal migration, migrants from foreign countries were removed from the general sample, bringing the total number of individuals to 496.

2.3. Psychosocial and health variables

2.3.1. Self-rated health

SRH was measured using a questionnaire with five possible answers: "Overall, would you say that your health is: excellent, very good, good, fair or poor?" For the majority of bivariate analyses and multivariate analyses, this variable was dichotomized. In accordance with Jylhä's (Jylhä, 2009) remark – "the baseline [that] does not normally need to have a cause" – showing a break between good health and less than good health, the split was made between the answers "excellent," "very good," " and "good" (scored 1) and the answers "fair" and "poor" (scored 0).

2.3.2. Perceived stress

Perceived Stress Scale (Cohen et al., 1983) was used to measure psychosocial stress in individuals. Six out of the ten items of PSS-10 are considered negative (1, 2, 3, 6, 9, 10) and the remaining four as positive (4, 5, 7, 8), representing perceived helplessness and self-efficacy, respectively. Each item was rated on a five-point Likert-type scale (0 = never to 4 = very often). Total scores are calculated after reversing positive items' scores and then summing up all scores. Total scores for PSS-10 ranged from 0 to 40. A higher score indicates greater stress.

2.4. Statistical analyses

Bivariate and multivariate analyses were used to test associations between dependent and independent variables. Bivariate analyses included Chi^2 tests. Student's t-test and ANOVAs were used to compare mean stress scores. Logistic regression was then used to assess the extent to which the various factors assessed predicted good self-rated health. The software used for the statistical analysis was IBM SPSS Statistics 22.

3. Results and discussion

3.1. Migration and its sociodemographic and economic consequences

The results of this study show that the population of internal migrants living in the municipality of Tessekere is extremely high in terms of demographic weight. While ANSD gives an average of 3.4% of internal migrants in the region (ANSD/OIM, 2018), our representative sample of the population has 13.4%. This particularly high level of internal migration in one of Senegal's most isolated municipalities is more than likely linked to implementation of the Great Green Wall project as of 2008. In fact, although migrants do not differ significantly from the natives of the Louga region in terms of age and gender distribution, they are more often civil servants, artisans, craft workers or traders (Table 1).

To carry out the Great Green Wall project, the National Agency of the Great Green Wall in Senegal employs many agents, living and working in the area throughout the year (Sarr et al., 2019). Thus, a whole crew of nursery workers, drivers, mechanics, horticulturists and laborers form a segment of the population that previously did not inhabit this region. These workers, who are state employees, are more often from Senegal's secondary and principal cities, which explains why the distribution of migrants by geographical origin and in particular the large proportion of people from the main and secondary cities (more than half of the migrants: 56.72%). The privileged situation of these migrants certainly explains why they have a higher level of material well-being than other people from this region (more often herders) and migrants from rural areas (more often artisans, craft workers and traders). Finally, regardless of their migratory status (secondary town, main towns or rural areas), migrants have mostly settled in the municipality for less than 10 years (49.2% of internal migrants), i.e. since the beginning of the Great Green Wall project.

It is therefore undeniable that the implementation of the Pan-African Great Green Wall project, while it does not fundamentally change the age and gender structure of the population of the municipality of Tessekere, does change its socio-economic structure. Thus, the GGW development project leads to the creation of an original population profile, clearly distinct from the general population of the region. This result can be compared to that obtained by Chamberlin et al., (Chamberlin et al., 2018), because migration to the municipality of Tessekere mainly brings in individuals holding wage-earning jobs (especially civil servants) and non-agricultural jobs (artisans, craft workers or traders), who report a good level of material well-being. In such conditions, migration to rural areas (from urban or rural areas), far from being an act of desperation, would appear to be experienced more as an opportunity, both for the local populations – who thus benefit from an injection of cash in the local economy – and for the migrants themselves.

3.2. Self-rated health and migrations

From a general point of view, self-rated health in the Tessekere municipality appears to be linked to gender, age, material well-being and stress. Controlling the relationship between self-rated health and migration by other potentially health-related variables shows that women (OR = 0.624; p < 0.005), people over 50 years of age (OR = 0.191; p < 0.001), those who are stressed (OR = 0.922; p < 0.001) and those reporting poor material well-being (OR = 0.313; p < 0.005) are more likely to report poor health, all other things being equal. The link between occupation and self-rated health initially described in the bivariate analyses (Table 2) disappears in the logistic regression

Table 1
Socio-demographic and economic characteristics of the general sample by migration status (N = 496).

Variables	Categories	Natives		Secondary cities		Principal cities		Rural area[a]		Total		Test
		N	%	N	%	N	%	N	%	N	%	
Sex	Men	210	48,50	11	42,31	6	50,00	11	44,00	238	47,98	$\chi^2 = 0{,}560$ p = 0,905
	Women	223	51,50	15	57,69	6	50,00	14	56,00	258	52,02	
Age	<50 years	348	80,37	23	88,46	9	75,00	20	80,00	400	80,65	$\chi^2 = 1290$ p = 0,731
	≥50 years	85	19,63	3	11,54	3	25,00	5	20,00	96	19,35	
Occupation	Civil servant	20	4,62	2	7,69	3	25,00	1	4,00	26	5,24	$\chi^2 = 39{,}321$ p < 0,001
	Artisans, small merchants	121	27,94	14	53,85	6	50,00	15	60,00	156	31,45	
	None	133	30,72	9	34,62	0	0,00	6	24,00	148	29,84	
	Herder	159	36,72	1	3,85	3	25,00	3	12,00	166	33,47	
Lenght of residence	<10 years			14	53,85	5	41,67	12	48,00	31	6,25	$\chi^2 = 0{,}334$ p = 0,846
	<20 years			6	23,08	2	16,67	5	20,00	13	2,62	
	≥20 years			6	23,08	5	41,67	8	32,00	19	3,83	
Material well-being	Have difficulty making ends meet	62	14,32	5	19,23	5	41,67	1	4,00	73	14,72	$\chi^2 = 19{,}129$ p = 0,024
	Live ok but have to be careful	140	32,33	7	26,92	2	16,67	7	28,00	156	31,45	
	Live ok	181	41,80	9	34,62	3	25,00	17	68,00	210	42,34	
	Live well	50	11,55	5	19,23	2	16,67	0	0,00	57	11,49	
Total		433	100,00	26	100,00	12	100,00	25	100,00	496	100,00	

[a] Other than Louga region.

Table 2

Socio-demographic, economic and psychosocial related characteristics of the general sample by self-rated health (N = 496).

Variables	Categories	Very poor/Poor		Good/very good/excellent		Total		Test
		N	%	N	%	N	%	
Sex	Men	86	40,19	152	53,90	238	47,98	χ^2 = 9168 p = 0,002
	Women	128	59,81	130	46,10	258	52,02	
Age	<50 years	146	68,22	254	90,07	400	80,65	χ^2 = 37,203 p < 0,001
	≥50 years	68	31,78	28	9,93	96	19,35	
Occupation	Civil servant	7	3,27	19	6,74	26	5,24	χ^2 = 12,401 p = 0,006
	Artisans, small merchants	58	27,10	98	34,75	156	31,45	
	None	80	37,38	68	24,11	148	29,84	
	Herder	69	32,24	97	34,40	166	33,47	
Migration status	Natives	192	89,72	241	85,46	433	87,30	χ^2 = 3372 p = 0,338
	Secondary cities	8	3,74	18	6,38	26	5,24	
	Principal cities	6	2,80	6	2,13	12	2,42	
	Rural area	8	3,74	17	6,03	25	5,04	
Lenght of residence	<10 years	5	2,34	26	9,22	31	6,25	χ^2 = 12,695 p = 0,005
	<20 years	5	2,34	8	2,84	13	2,62	
	≥20 years	12	5,61	7	2,48	19	3,83	
	Natives	192	89,72	241	85,46	433	87,30	
Stress		18,55 ± 5834		15,77 ± 5812		16,97 ± 5977		t = 5278; p < 0,001
Material well-being	Have difficulty making ends meet	51	23,83	22	7,80	73	14,72	χ^2 = 28,296 p < 0,001
	Live ok but have to be careful	52	24,30	104	36,88	156	31,45	
	Live ok	90	42,06	120	42,55	210	42,34	
	Live well	21	9,81	36	12,77	57	11,49	
Total		214	100,00	282	100,00	496	100,00	

(Table 3).

The fact that women and older people report poor health more often than men and younger people has been described many times in African and European populations (Chola & Alaba, 2013; Darviri et al., 2012; Duboz et al., 2017; Onadja et al., 2013), as has the relation between material well-being and self-rated health in Tessekere municipality (Duboz et al., 2017). As Darviri and colleagues (Darviri et al., 2012) have shown, stress is also a major variable to consider since it is closely linked to self-rated health and, therefore, to short-term and long-term mortality (Benyamini & Idler, 1999).

Moreover, specifically with regard to migration, it should be noted that the results of logistical regressions performed have shown that individuals' migratory status mattered little: whether born in a secondary city, main city or rural area, people showed the same likelihood to self-

rate their health positively or negatively. On the other hand, when length of residence in the Tessekere municipality is factored in, it appears that migrants who have settled in the Tessekere municipality for less than 10 years are significantly more likely to consider themselves in good health (OR = 3.349; p < 0.05), regardless of age, sex, occupation, stress level or material well-being. It is therefore the length of residence in the new environment that influences the way in which migrants rate their health, rather than their geographic origin. Thus, the "healthy migrant hypothesis," studied extensively in research pertaining to relations between migration and health, seems to be borne out for rural-bound internal migrants. Self-assessment of health among migrants therefore remains better than among the local population during the first 10 years of settlement, but it diminishes over time with the length of their stay. This result also indicates that, in addition to the economic

Table 3

Adjusted odds ratio (OR) for excellent/very good/good self-rated health (N = 496).

Variables	Categories	Categories	p	Odds Ratios	CI for OR (95%)			p	Odds Ratios	CI for OR (95%)		
Sex (Men)	Women	Women	0,040*	0,624	0,398	-	0,979	0,039*	0,619	0,392	-	0,975
Age (< 50 years)	≥50 years	≥50 years	<0,001***	0,191	0,112	-	0,326	<0,001***	0,214	0,124	-	0,368
Occupation (Herder)	Civil servant	Civil servant	0,663	1,262	0,442	-	3,606	0,777	1,162	0,410	-	3,295
	Artisans, small merchants	Artisans, small merchants	0,136	1,494	0,881	-	2,534	0,157	1,467	0,863	-	2,491
	None	None	0,108	0,634	0,363	-	1,105	0,121	0,644	0,369	-	1,123
Material well-being (Live well)	Have difficulty making ends meet	Have difficulty making ends meet	0,006**	0,313	0,136		0,722	0,008**	0,320	0,138		0,743
	Live ok but have to be careful	Live ok but have to be careful	0,447	1,318	0,647		2,683	0,396	1,359	0,669		2,763
	Live ok	Live ok	0,507	0,797	0,408		1,557	0,586	0,831	0,427		1,616
Stress	Continuous	Continuous	<0,001***	0,922	0,889	-	0,957	<0,001***	0,919	0,886	-	0,954
Migration status (Natives)	Secondary cities	Secondary cities	0,453	0,699	0,275	-	1,780					
	Principal cities	Principal cities	0,700	1,296	0,347	-	4,846					
	Rural area	Rural area	0,583	0,644	0,134	-	3,093					
Lenght of residence (Natives)	<10 years	<10 years						0,026*	3,349	1,152	-	9,734
	<20 years	<20 years						0,796	1,174	0,347	-	3,972
	≥20 years	≥20 years						0,392	0,628	0,216	-	7,825

*p < 0.05.

**p < 0.01.

***p < 0.001.

aspect, which obviously influences migrant health status (knowledge and attitudes towards disease, access to health care, etc.), health is also environment-dependent. In this case, it is the "adaptation effect" hypothesis (also called "assimilation effect") that appears to be verified by this study. Indeed, after about ten years, levels of self-rated health gradually converge, while migrants' self-rated health is initially far better. Given that almost half of the migrants settled in the municipality of Tessekere less than ten years ago, it is likely that migration not only changes the socio-economic structure of the population, but also its health status.

Finally, the Great Green Wall project, although it is now 10 years old, is at a very early stage in many participating countries, mainly because of significant geopolitical difficulties. Moreover, as pointed out earlier, migration to rural areas remains little studied, especially in developing countries. This is why, as far as authors know, no study has been carried out on the relationship between the Great Green Wall project in Africa, the health of the populations living there and the migrations linked and/or induced by this development project. The original results obtained during this study are the first to highlight the fact that the Great Green Wall project, as conceived and implemented in Senegal, has implications that go far beyond the fight against desertification or the development of local terroirs.

This study has several limitations. A principal limitation is its cross-sectional design, which does not permit longitudinal measurement to examine how self-rated health evolves over time in relation to migration. Moreover, despite the large size of the population sample (compared to the general population of the commune of Téssékéré), the number of migrants present in our sample is small, and the results obtained must be interpreted with caution. Finally, it is obvious that the rural environment studied here cannot be compared to other rural areas in Senegal: indeed, the presence of the Great Green Wall, as a development project, distinguishes this rural environment from the rest of the region. However, it should be noted that many development projects are located in rural Senegal (more than 30 projects for the Agence Française de Développement, for example), and most certainly modify the population and socio-economic structures of these areas.

4. Conclusions

The overall aim of this study was to analyze migration to an isolated rural area: the municipality of Tessekere in Senegal. The results have enabled us to outline a chain of events that explain the unusual population profile of this municipality in the Sahel. First, the desertification process underway in Sahelian ecosystems since the 1970s prompted eleven African countries to develop the Great Green Wall for the Sahara and the Sahel Initiative in 2005. Three years later, the GGW Agency in Senegal was created and actions were undertaken at the local level (particularly in the municipality of Tessekere). From that point on, the arrival and installation of staff dedicated to the Great Green Wall (including state employees) began. This situation has now led to a transformation of the population structure: migration to this isolated rural municipality is more important than in the rest of the Louga region (often providing migrants). The socio-economic and health situation of the municipality of Tessekere is also affected by this internal migration. It increases the proportion of individuals living in the municipality who enjoy a good level of material well-being. It also increases the proportion of individuals reporting good self-rated health. In short, an environmental requirement (combating desertification), addressed by an international project - the Great Green Wall - and then applied at the national level, has transformed the demographic, economic and health structure of a local population.

In conclusion, our study showed that (1) an examination of migration can offer a means of interpreting the impact of development projects and the local changes they entail, and (2) migration is a unique prism through which one can study how exposure to a new physical and social environment influences the health of populations.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2020.100633.

Ethics approval and consent to participate

Ethic approval was provided by the Comité National d'Ethique pour la Recherche en Santé (Protocole SEN 13/67).

Availability of data and materials

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

Authors' contributions

P.D. has contributed to study design and data acquisition. She analyzed the data and has contributed to the interpretation of the results. She has been involved in drafting the manuscript. She has given final approval of the version to be published. She agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. GB and AG have been involved in drafting and revising the manuscript. They have given final approval of the version to be published. They agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. E.M. has contributed to study design and data acquisition. He has contributed to the interpretation of the results. He has been involved in drafting the manuscript. He has given final approval of the version to be published. He agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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