Health disparities between racial groups in South Africa : a decomposition analysis

(First and incomplete draft)

Cécile Charasse-Pouélé
Maître de Conférences
C.Charasse@.u-clermont1.fr
Tel : 04 73 17 74 19

Martin Fournier
Maître de Conférences
M.Fournier@u-clermont1.fr
Tel : 04 73 17 75 00

CERDI
65 bd François Mitterrand
63 000 Clermont-Ferrand
Fax : 04 73 17 74 28

Introduction

Some recent theoretical and empirical papers are devoted to the measurement and the explanation of health and social health inequality [Wagstaff *et al.* (1991), Kakwani *et al.* (1997), Wagstaff et van Doorslaer (2002)].

In South Africa, the study of health disparities especially between racial groups is crucial. Since the colonisation of the country, a selective restriction of economical, political, social and curative rights and an institutional segregation have been implemented. It created discriminations, differences on poverty levels, on health care supply, and education between racial groups. Health risks factors as health status became also different between racial groups.

Since 1990, Apartheid has been officially taken over by a multiracial democracy confronted to poverty and inequality. In 1994, the Government of National Unity defined five key human development priorities : employment, housing, education, nutrition and health. Five programs have thus been implemented to combine reconstruction with development and growth, and also redistribution with democratisation. Health reforms aimed at an entire reorganisation of the health care system, based on an increased community participation and focussed on the promotion of primary health care. Today, a decade after South Africa democratisation, several human development objectives have still not be achieved, and discrimination still persists. Racial and economical discrimination seem still to have significant impacts on under-five mortality, anthropometrical measures and demand for curative health care [Charasse (1999)]. In South Africa, racial group seems still to be a strong determinant of individual income and educational attainment, individual and community health care supply, but also of individual health care demand and quality of medical treatment.

The objectives of this paper are twofold.

First, we intend to measure health disparities between racial groups in 1999 using a self-assessed health indicator. This indicator is not only a complex human judgement on current health of the individual, but also a representation of the history of his/her family, as well as an indication on life expectancy and potential health problems [Idler and Kasl (1991), Idler and Benyamini (1997)].
Second, we explain observed health disparities using the Oaxaca-Blinder decomposition method [Oaxaca (1973), Blinder (1973)]. Our aim is to isolate what is due to structural socio-economical

differences between racial groups (what we will name in the following "indirect segregation"), and what is due to a permanent racial segregation phenomenon on access to health care and type/quality of treatment ("direct segregation").

Our work is based on the 1999 October Household Survey[1] covering more than 100 000 individuals, which provides valuable information on health and structural explanatory variables.

Background

This paper is part of a research conducted on health and discriminations in South Africa. Initially, in this country, racial segregation was only serving Whites' interests. Cultural pluralism, first chose to create a development respective of the African culture, created racism and cultural imperialism [Giliomee (1993)]. Until the 70's, white superiority enabled prejudices and discrimination. Afterwards, the principle of « separation in equality » conducted to systematic racial segmentation and to a positive apartheid based on a separated development of potentially equal nations. Racism, discriminations and human dignity shortfalls were real. South Africans were not equally treated on a racial basis. The policies of Apartheid and the whole social system in South Africa have created institutional and structural discriminations and large disparities between racial groups[2] in terms of socio-economic status, employment, education, housing and health services.

On the health care side, the political and institutional development of the country created a fragmented health care system[3] with inequitable access to it. Resources, health care supply and quality had been distributed along racial basis. Health care policy couldn't be adequately explained merely as a symptom of the differential access to political and economic power. Health policies were also instruments of the state in achieving Apartheid goals [Price (1986)]. They cannot be separated from either the pursuit of the economic prosperity of the White or the maintenance of their political domination. Buch (2000) points that "there was a predominant focus on hospital care, with hospitals serving Whites having more resources. Primary health care was severely underdeveloped even if the

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[1] Statistics South Africa; October Household Survey (South Africa), 1999; Pretoria, South Africa : Statistics South Africa (producer); Pretoria : South African Data Archive (distributor), 2001. http://www.nrf.ac.za/sada. SADA 0114.

[2] The term 'Black' refers collectively to all radically oppressed groups and not just to 'Africans'. However, since the social, economic and political institutions in South Africa were structured along legally defined racial categories which divide Blacks into 'Indians', 'Coloured' and 'Africans', their daily experience and consequent health patterns couldn't be described without recourse to such racial terminology. Their use in this paper, however, does not imply their legitimacy. Note that, population group classification was based on a legal definition, but it is now based on self-perceptions and self-classification. An African is someone who classifies him/herself as such.

primary health care infrastructures were the most commonly site for Africans to be cared. In the Homelands, services were more integrated, but decidedly sparse, while elsewhere preventive services provided by local authorities were separated from the curative services of the four former provinces".

Budgets were overspent, backlogs in hospital maintenance and repair were massive, human resources maldistributed and trained to serve an elite rather than the national need. The public health care system was then characterised by racial, geographical (see table 1) and economic inequalities in access, a misallocation of resources, and the inefficiency and irrationality of the many political and administrative structures that were involved in health care delivery.

Table 1 : Provincial inequality in income, health and health care supply

Provinces	GDP per person rands (1994) (a)	Ex-Homeland population rate (b)	Number of hospital beds per 1000 (1992/93) (a)	Infant mortality rate 1998 (DHS) (c)	Immunisation coverage rate 12-23 months 1998	Public Health expenditures per person (1993) rands (b)
Northern Province	725	22.88	2.5	37.2	74.9	164.1
Eastern Cape	1368	23.42	3.5	61.2	52.6	242
North West	1789	11.07	3.3	42	60.6	177
Kwazulu-Natal	1910	30.15	3.8	52.1	49.5	290
Mpumalanga	2164	10.13	2.1	47.3	67.2	131
Free State	2419	2.34	4.1	53	67.8	354
Northern Cape	2865	0	4.0	41.8	80.8	325
Western Cape	4188	0	5.4	30	64.2	583
Gauteng	4992	0	6.0	36.3	72.4	489
Pays	2566	100%	4.0	45	63.4	305

Sources : (a) Development Bank of South Africa (1994),
(b) P.S.L.S.D. (1993).
(c) Bradshaw et al. (2001)

Furthermore, the private sector model of garanted fee-for-service payment to providers through for-profit medical administration companies, kept private health inflation above that prevailing in the economy. The Medical Schemes Act enabled subsequent package manipulation and risk rating of members, leading to a loss of cross-subsidisation, a central element of effective health insurance. In 1990, 20% of the South African population (Whites for a large part) consumed 56% of private and public sector expenditures. The citizens could be under and/or overserviced at the same time by a health care system where basic needs were omitted and economical and racial discrimination coexisted.

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[3] The health system had been fragmented into not contiguous National, Coloured, Indian and White "own affairs", four provincial and 10 homeland health departments.

Then, at the end of Apartheid, disparities between racial groups were huge (table 2).

Table 2 : Socio-economic conditions and access to health care by racial group in 1993.

	Africans	Coloured	Indians	Whites
Percentage of the entire population	76,3	8,5	2,5	12,7
Infant mortality rate (1993) *	65	36	14	9
Average monthly income (rands)	679	1 474	2 679	3 544
Illitteracy rate (%)	20.3	10.2	2.9	0.2
Piped water connecting rate (%)	19.1	83.4	99.2	99.9

*Source : P.S.L.S.D. (1993), * Van Rensburg et al. (1994).*

In 1993, the average monthly income of an african household is 679 rands, seven times less than for a white household. It was estimated that[4] 61% of Africans, 38% of Coloureds, 5% of Indians and 1% of Whites fall below the poverty line. In South Africa, Whites enjoyed better socio-economic and sanitary environment (for example 99.9 per cent of them are connected to piped water) and better access to a high quality of health care services.

Unequal access to health care services and bad socio-economic conditions induced a large burden of disease amongst Africans, especially infectious and parasitary diseases. McIntyre *et al.* (1995) showed that social diseases conducted seven times more to death amongst Africans (14%) than among Whites (2%) and cardio-vasculary diseases induced 40 per cent of Whites' deaths against 12 per cent of Africans' deaths. In 1993, the infant mortality rate for Whites could be compared to the rate in high income countries. Among Africans, the situation is similar to an under-developed population. Benatar (1997) estimated that Africans could live in average nine years less than Whites in South Africa.

The consequence was an unequal health status between population groups, urban/rural areas and provinces in South Africa and an average low health status in comparison with countries at a similar level of Gross Domestic Product (Bostwana, Malaysia, Chile), that spend a lower percentage of their Gross Domestic Product for a healthier population [McIntyre *et al.* (1995)], even discounting HIV/AIDS. Bradshaw *et al.* (2000) compared South Africa with other medium development countries. They showed that the Gross Domestic Product is higher than the average of the medium development countries (PPP $3390) but income inequality is higher. Life expectancy is lower than the average of

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[4] Statistics South Africa. Mid year estimates 1999. Statistical Release P0302. (Available at http://www.statssa.gov.za/Statistical_releases/Statistical_releases.htm.)

67.5 years but the human development index is higher than the average of 0.67. Health expenditure is high in relative and absolute terms but it is very skewed by the high spending in the private sector that serves a minority of the population.

On the 27th of April 1994, the new South Africa was born. At this date, the first multiracial government was democratically elected. A new health ministry was in place and the first African Minister of Health was designated, Nkosazana Dlamini Zuma. She was in charge of elaborating a unitary and egalitarian health care system for all South-Africans. The Reconstruction and Development Program indicated the main ideas of a long and audacious reform against inequalities. On the health care side, its aim was to improve the availability, the geographical and the financial accessibility of essential health care. Its final objective was the organisation of a unitary and coherent national health care system oriented by the primary health care approach and an increased community participation. Between 1994 and 1999 a lot of progress have been made in overcoming the apartheid legacy as the Department of Health stated in the 1999-2004 Health Sector Strategic Framework [Department of Health (1999)]. The first reforms, in April 1994, concerned the disadvantaged groups (women and children under six) to be extended in 1996. Since April 1996, free basic curative health care is available in the day hospitals and the public clinics for all. Buch (2000) noticed that achievements in the health sector from 1994 to 2000 include also :

i) the establishment of a unitary health system with a single national department and nine provincial health departments,

ii) the removal of structural racism,

iii) the upgrading of many clinics and health centres and the building of 500 new ones in under-served communities,

iv) progress in the establishment of a District Health System,

v) a community service for newly qualified doctors especially in the poorest part of the country,

vi) the contract with Cuban doctors to improve medical care in under-served areas,

vii) a massive primary school nutrition programme,

viii) the improvement of vaccination,

ix) or the launch of Patient's Charter to serve as a benchmark of how patients could expect to be treated...

The negative aspects include :

i) the HIV/AIDS epidemic,

ii) a reduction in health budgets in real terms after an increase in the first two years of reforms.

Furthermore, in 1996, negative discrimination was officially taken out of the new South African constitution. This constitution was adopted "as to health the divisions of the past and establish a society in based on democratic values, social justice and fundamental human rights…" in which "every citizen is equally protected by law ; improve the quality of life of all citizens and free the potential of each person…". Health became a fundamental right. The bill of rights announced that each South African "has the right to an environment that is not harmful to his health or wellbeing (article 24), to have access to health services…social security" (article 27). Children have the right to basic health care services, basic nutrition and social services (article 28). Moreover, this principle of legal equality doesn't mean effective equity, justice or immediate disappearance of discriminations.

Richter (2001) showed that discrimination was still active in South Africa from 1993 to 2001 against persons who live with AIDS. Richter pointed that discrimination is multifaceted and could come in "a multitude of shapes and sizes. Examples include ostracism from intimate relationships, families, communities and places of work, rejection of membership of groups or economic institutions, the refusal of applications for work, and emotional and direct physical violence". Richter (2001) noted that "discrimination can be seen as unfairly disadvantaging a person on the basis of some capacity or quality attributed to that person. Discrimination is a highly subjective phenomenon as it is mostly determined by perceptions and preconceived notions of the person who is discriminating. It does not have to be based on verifiable facts – for example, a person who is rumoured or suspected to have HIV/AIDS can be target of discrimination as much as someone who has tested positive and has disclosed her/his status to others".

Using the Project for Statistics on Living Standards Measurement Survey, Charasse (1999) could not excluded that racial and economical discrimination still have significant impacts on under-five mortality, anthropometrical measures or demand for curative health care in South Africa in 1993. The author pointed that among South African children 8,5% of Indians, 6,7% of Whites, 21% of Coloureds and 27.5% of Africans were chronically malnourished or stunted (insufficient height for age : height for age standard deviation score<-2 units).
Using the same dataset, Makinen *et al.* (2000) noted that, in South Africa, the wealthier quintiles are generally more likely to be seen by a doctor, to use the private health sector, to receive medicine when they are ill, to spend a higher percentage of their overall consumption spending than the poorer quintiles. Moll (1995) showed that even if occupational and wage discrimination is still active in 1993, total discrimination fell from 20% of the Africans' wage in 1980 to 12% in 1993.

The fundamental question is now : what is the situation for all South Africans in terms of racial discrimination in health after the first wave of reforms? What are the explanations of health disparities between racial groups?

Is racial group still a strong direct determinant of health status showing a racial discrimination phenomenon and/or is it an indirect one acting through the social, economical or medical environment associated with each group?

Methodology

The survey

We use the 1999 October Household Survey (1999 OHS). It's an annual cross-sectional survey[5] based on a probability sample of a large number. The OHS of 1999 was drawn from a master sample. The sampling procedure (of the Primary Sampling Units PSU and of the households) for the master sample involved explicit stratification by province and within each province, by urban/rural areas. For 1999, 3000 PSU were drawn, by means of probability proportional to size principles in each stratum. The measure of the size was the number of households in each primary sampling unit. For the 1999 OHS, ten households were drawn systematically in each. This means that almost 30 000 households were visited as ultimate sampling units in 1999. The 1999 OHS, in common with 1997 and 1998, was weighted to reflect estimates of the population size based on the population census of October 1996, as adjusted by a post-enumeration survey, using post-stratification by province, gender and five-year interval age groups.

Since the 1994 OHS, different samples were designed. But, all OHSs cover a range of development indicators regarding individuals or households. For example, access to the labour market, access to housing, main source of water, toilet facilities, health services utilisation are examined. Data do not show a slight improvement or deterioration of the socio-economic environment of South Africans [Hirschowitz (2001)].

Nevertheless, from 1995 to 1998, the OHS recorded that public facilities were the most commonly used health-care facility (70% of people who required medical attention during the past twelve months prior the 1999 survey) in South Africa and that there is a gradual increase over time in their use since 1995. Furthermore, fewer than 20% of South Africans reported that they had some form of

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[5] The CD-rom of the OHSs could be ordered at User Enquiries, Statistics South Africa, electronic mail : info@statssa.pwv.gov.za or at the South African Data Archive, National Research Foundation, electronic mail : sada@nrf.ac.za, web site : http://www.nrf.ac.za/sada.

private medical cover. From 1996 to 1999, the lowest level of medical insurance coverage is among Africans (with 10%) and the highest is among Whites (with 70%).

The indicator of health

Theoretically and empirically, there are different measures of health status which may be applied to the study of health disparities between groups of population. Health analysts could use global mortality and morbidity indicators as measures of health capital for individuals or countries. These indicators are open to criticism either on a theoretical point of view or on a qualitative one especially for developing countries. South African global health statistics were also open to criticism. Botha and Bradshaw (1985) noticed that Africans' statistics were not suitable for detailed descriptions because there was evidence of under-registration and misclassification. For example, a large proportion of the deaths in the African population from 1970 to 1980 are classified as caused by symptoms, signs and ill-defined. Dorrington (1989) pointed also that the origin of only one death for two was correctly reported.

Thus, before 1994, the study of racial disparities in health using existing official statistics is partly loosing interest. As a result, at the beginning of the 90's, the South African Government decided to facilitate the elaboration, collection and exploitation of surveys' data covering the entire population. Several households surveys were conducted, new health indicators and a lot of socio-economic data were collected.

If, Grossman's model of demand for health (1972) is able to quantify theoretically the individual health status and health care needs at each period of life cycle, empirically measuring health status is complex due to the multidimensional nature of health and the lack of objective ordering except in the case of life and death or when pathologies appeared.

Empirical papers on health inequality, health production, health care demand could use individual declared mortality[6]. But, evaluations of health status and morbidity are more and more used and are now routinely collected in households surveys. In the literature, one can find the professional (objective) evaluation of health (measures 1 and 2) or the subjective (profane) appreciation (measures 3 and 4) :

> (1) physical examination by a medical practitionner or in a medical infrastructure [Butler et al. (1987), Feachem et al. (1992)],
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> (2) anthropometrical measures [Strauss and Thomas (1995), Lee *et al.* (1997)],

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[6] Strauss and Thomas (1995) assessed that declared mortality systematically under-estimates real mortality especially when the respondent has a low social status.

(3) self-assessment of illness symptoms [Butler *et al.* (1987), Kandrack *et al.* (1991), Muller (1998)], of epidemiological history [Acton (1975), Hershey et al. (1975)], or health status [Kandrack *et al.* (1991), Idler and Benyamini (1997)],

(4) self-evaluation of the ability to do normal or common activities [Colle and Grossman (1978), Living Standards and Measurement Surveys].

Aiach and Curtis (1990) pointed that self-assessed measures are very important on the point of view of illness experienced through life, of individual evaluation of the worsering of health capital and for the understanding of psychological, social and economical implications of bad health. On the other hand, a polemic exists on the measure and use of these self-evaluated indicators. This is because these measures are the conjunction of medical and socio-economic reality. So, medical sociologists as Zempléni (1988) distinguish between illness (socially defined), sickness (psychically defined) and disease (essentially medically defined).

Consequently, one could observe that education of head of the household, culture, medical and sanitary information of populations, social norm of disase [Gilbert *et al.* (1996)][7] can induce measurement errors[8] and systematic bias of self-assessed health and morbidity. These bias can be linked to health services accessibility and availability, to the use of health system [Strauss and Thomas (1998)], to individual income [Schultz and Tansel (1997), Strauss and Thomas (1998)], to employment status. In this case, Butler *et al.* (1987) showed that white American workers who are not working tend to report their disease incorrectly, perhaps owing to social pressure to justify not having a job. In South Africa, social and economic discriminations between racial groups have induced a number of people to hide their disease [Charasse (1999)].

In this paper, we use an indicator of self-assessed health. For the 1999 OHS, every person in the household was asked to describe her health as very poor, poor, average, good, excellent. The utilisation of this indicator is informative for three main reasons.

At first, on the basis of several epidemiological, economical or sociological surveys conducted in developed countries, Idler and Kasl (1991), Idler and Benyamini (1997) showed that this indicator is not only a complex human judgement on current health of the individual, but also a representation of the history of his/her family, as well as an indication on life expectancy and potential health problems. They conclude that "self-ratings represent a source of very valuable data on health status. They assess a currently unknown array of perceptions and weight them according to equally unknown and varying

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[7] Social recognition of disease depends on the economic and social value of the person.
[8] For a review of the inherent problems of health interview surveys, see Kroeger A. (1983), "Health Interviews Surveys in Developing Countries", International Journal of Epidemiology , Vol; 12, n°4, pp.465-481.

values and preferences, provide the respondents' views of global health status in a way than nothing else can". An important dimension reflected by self-evaluation of health is the individual perception of own physical performance and suffice. Flylkesnes and Helge Forde (1991) pointed this type of indicator is an independent predictor of survival related to individuals' perception of long standing chronic illness and number of complaints and medications and to be among the best predictors of patient-initiated visits.

Second, this indicator is able to indicate how equally or unequally health is distributed in the population of South Africa. Since recently, decrease of health inequalities, raise in equity and improvement of health of the poor became again major objectives for international institutions. Table 3 shows that there are intra-South Africa differences in health status in 1999. Even if there is a marked difference between Whites and Africans in terms of health status (50.84% of Africans considered having an excellent health compared to 57.14% of Whites), it is not really possible to see the SES gradient on the entire population.

Table 3 : Self-assessment of health status by racial group in 1999.

Level of health	African	White
Very Poor	0.80 %	0.27%
Poor	4.57 %	2.13%
Average	8.01 %	6.20%
Good	35.78 %	34.31 %
Excellent	50.84 %	57.14 %
Number of people	82601	7876

Source : OHS 1999

At the end, using the 1999 OHS dataset, we can try to explain health disparities and to isolate a potential impact of racial discrimination. Several interesting papers have been published to measure and analyse pure or socio-economic inequalities in the health sector [Wagstaff *et al.* (1991), Kakwani *et al.* (1997), Wagstaff *et al.* (2001), Wagstaff and van Doorslaer (2002)]. The most traditional approach has been to think of differences in health status according to an individual's income or economic standing [Wagstaff (2000), Makinen *et al.* (2000), Castro-Leal *et al.* (2000)]. Gender inequalities in health status have also received a great deal of attention [Arber (1997), Macintyre *et al.* (1996), Montoya Diaz (2002)] and ethnic inequalities in health have also been of particular concern in recent years. Nevertheless, the statistical study of racial discrimination in health remain rare.

The methodology

Second, we explain observed health disparities using the Oaxaca-Blinder decomposition method [Oaxaca (1973), Blinder (1973)]. Our aim is here to isolate what is due to structural socio-economical differences between racial groups, and what is due to a permanent racial segregation phenomenon on access to health care and type/quality of treatment. The aim of this type of decomposition techniques is to propose counterfactual situations corresponding to health that would be observed for blacks had they been faced with the "health demand function" observed for whites and reciprocally. By "health demand process" we understand here the mechanisms through which individuals affect their health given their socio-economic characteristics. A difference between observed health for blacks and the counterfactual health under the "white model" thus provides an evaluation of the segregation that occurs in health demand. If there was no segregation, health under the black model (observed health) should be equal to health under the white model (counterfactual) for any given socio-economic characteristics.

Formally, let represents, health h_{ij} of individual i belonging to racial group j. In order to model the demand for health, we use the framework of the household production model [Berman *et al.* (1994), Strauss and Thomas (1995)]. The household allocates time and goods to produce commodities, some of which are sold on the market, some are consumed at home and for some (as health), no market exists at all. In this framework, reduced forms demands for commodities and leisure depend on commodity prices, wages and non monetary income.

Thus, h_{ij} may be assumed to depend on three sets of arguments: its observable socio-demographic characteristics or those of its household (x)[9], unobservable characteristics and health hazard summarized by ε and a set of parameters corresponding to the health production process linking socio-demographic characteristics to observed health (β):

(1) $\qquad h_{ij} = H(x_{ij}, \varepsilon_{ij}; \beta_j)$

Within this framework, observed differences in average health between two racial groups may come from two different potential sources:

    i)   A difference in average socio-demographic characteristics between the two racial groups: average

    ii)   A difference in the health production process between the two racial groups

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[9] A variety of factors at the household and community levels have a direct influence on individual health outcomes. They cover household actions and risk factors, household assets, community factors, health service provision, health finance, supply in related sectors and public policies. All these informations are unfortunately not available in the 1999 OHS.

The former source can be seen as indirect segregation since it is segregation on socio-demographic characteristics such as education or living conditions that lead to differences in average health. The latter corresponds to direct segregation since individuals with the same socio-demographic characteristics will have different health levels.

It is thus possible to decompose observed health differences into these two components as follows (2 racial groups: *a* and *w*):

(2)   Indirect segregation $I_{wa}^{i}=H(x_{iw},\varepsilon_{iw};\beta_{w})-H(x_{ia},\varepsilon_{ia};\beta_{w})$

(3)   Direct segregation: $D_{wa}^{i}=H(x_{iw},\varepsilon_{iw};\beta_{w})-H(x_{iw},\varepsilon_{iw};\beta_{a})$

The preceding formulation presented here at the individual level can then be averaged to evaluate the overall average effect. It is important here to compute the simulations at the individual level since health shocks included in the ε term play a central role.

In other words, the indirect segregation effect, *I*, is obtained by comparing the observed health for racial group *w* and the hypothetical health obtained by simulating on racial group *a* the health production process parameters of racial group *w*. Likewise, the direct segregation effect is obtained by comparing observed health for racial group *w* and the hypothetical health obtained by simulating on racial group *a* the health production process parameters of racial group *w*. In other words, our point here is to answer the following to questions:

i)   What would be the difference in average health between Whites and Africans if they were facing the same model in terms of health demand and production processes? (Indirect segregation effect)

ii)   What would be the difference in average health between Whites and Africans if they had the same socio-demographic characteristics? (Direct segregation effect)

This approach falls in the line of the well-known Blinder-Oaxaca decomposition methodology. A common problem with this methodology is path dependence. The two effects are likely to depend on the reference population that is used to evaluate them. In other words, it is generally the case that:

$$I^{wa} \neq I^{aw}; \qquad D^{wa} \neq D^{aw}$$

In the application that follows, this ambiguity will be taken into account by considering simultaneously alternative definitions of the various effects, which provides a robustness test for the decomposition results.

This decomposition of health differences has strong policy implication since the evidence of direct segregation would reflect that some mechanisms are still in place, which do not give Blacks and Whites equal chances even when endowed with the same socio-demographic characteristics. If only

indirect segregation is at work however, the only way to equalize health between racial groups is to focus on long term programs aiming at equalising socio-economic determinants of heath such as education.

Econometric estimations

The econometric estimation of health production functions is done using self-evaluated health status, which includes five health levels (very poor health, poor health, average health, good health, very good health).

We first estimate a global health equation using this variable through an ordered Probit model for the pooled sample of Africans and Whites, which results are shown in table 4. Here, race is conceptualised as a control variable representing group membership, indicating whether Africans differ from Whites, after other factors are controlled. Unsurprisingly, we find a strong positive and significant coefficient for the white dummy showing that some type of segregation is at stake since Whites are, all things being equal, in better health than Africans. In South Africa, race constituted a significant differential connected with inequality in health care. Apartheid's oppressive and discriminatory measures secured the Whites their privileged position in the South African society. The Blacks were excluded from any participation in health decision-making by the failure to grant them political rights. There was a long tradition of concentrating the health care supply (in terms of both quality and quantity) in favour of the white population. There was also a long history of exclusion of Blacks from facilities which were reserved exclusively for Whites or kept separate, but strikingly unequal, for the different colour groups. In fact, the white population is better served and provided for in almost every area of health care, while the other population groups are in markedly deprived position.

Table 4 : Ordered Probit estimation of a reduced health demand function

	White and African	Whites	Africans
White	0.041 *(0.019)*		
Male	0.057 *(0.008)*		0.060 *(0.0081)*
Education	0.030 *(0.001)*	0.014 *(0.0032)*	0.030 *(0.0012)*
Age	-0.013 *(0.001)*		-0.013 *(0.0008)*
Age ^{2}	-0.0009 *(0.00001)*	-0.0002 *(0.00001)*	-0.0008 *(0.00001)*
Household size	-0.004 *(0.0014)*	-0.024 *(0.0103)*	-0.004 *(0.0013)*
Male head	0.035 *(0.0088)*	-0.074 *(0.0442)*	0.039 *(0.0089)*
Age of the head	-0.003 *(0.0003)*	-0.007 *(0.0014)*	-0.002 *(0.0003)*
Health insurance coverage in the household	0.048 *(0.0139)*	0.057 *(0.0298)*	0.038 *(0.0158)*
Hunger in the household during the preceeding year	-0.175 *(0.0095)*		-0.178 *(0.0096)*
Clinic/hospital within 30 minute walk	0.032 *(0.0082)*	-0.051 *(0.0307)*	0.038 *(0.0085)*
Instrumented total monthly income	0.041 *(0.0058)*	0.214 *(0.0264)*	0.036 *(0.0059)*
Urban location	-0.034 *(0.0090)*	0.081 *(0.0419)*	-0.040 *(0.0092)*
Number of observations	90477	7876	82601
LR chi2	11846.34	1051.40	10675.76
Pseudo-R2	0.0605	0.0698	0.0591
Cut 1	-3.038 *(0.0256)*	-2.812 *(0.1449)*	-3.029 *(0.0261)*
Cut 2	-2.135 *(0.0217)*	-1.876 *(0.1259)*	-2.125 *(0.0222)*
Cut 3	-1.543 *(0.0209)*	-1.151 *(0.123)*	-1.540 *(0.0214)*
Cut 4	-0.336 *(0.0204)*	0.174 *(0.1223)*	-0.341 *(0.0208)*

Notes : A stepwise estimation was used.
All coefficients are statistically significant at 0%, except for the variable White at 3.4%.
Standards deviation are in brackets.

We also find usual and intuitive results concerning the main socio-demographic variables. Be a **male** is a strong positive determinant of health status as well as belonging to a household where head is a

man. This is due to the fact that women are generally recognised to be in worst health than men because of biological risks, acquired risks, limited access to health care, or social and personal segregation. **Be educated** is in favour of declaring a high level of health. Strauss and Thomas (1995) noted that education affects human capital outcomes by raising the technical efficiency with which inputs are used or by increasing the allocative efficiency of inputs use. **Age** is a negative determinant of health level as the level of health capital decreased with age [Grossman (1972)].

In each sample, the **wealth effect** act in a positive way on the health status. The economical variables seem to be discriminate elements on the access to health care in RSA. The instrumented level of monthly income was used as an indicator of resources. It is positively correlated to health level.

This is confirmed by the estimated effect of the family size. Large families penalised South African to have a good health level. The **size of the household** partly determines the family financial capacity but also the learning effects of self-medication or the increase of the sanitary risks [Ellis and Mwabu (1990), Heller (1982)]. Having an **hunger experience** is deterious to health status.

Having at least one person covered by a **medical insurance** is positively related to health level. It is an indication of the capacity to pay, the orientation of the preferences of the household and the quality of care. Two types of risks (economic and medical) are reduced and the cost of care is lower. In South Africa, historically, the membership of a medical scheme is part of the employment benefits for the formal workers. It is also very common for the rest of the family to be covered. The kind of benefits package varies from a relatively comprehensive ones with free choice of provider paid on a fee-for-service basis to a lowest benefit coverage largely restricted to primary health care services, with panel doctors on a contract basis. They are paid a fixed amount per client. The estimated effect of this variable supports the choice of a national medical insurance as a vector of decrease in unequal health status. A National Health Insurance is seen, by the government, as the mechanism that will allow the centralisation of health care financing, the most rational allocation of resources and the integration of the private fragments of health services.

Having a clinic/hospital around is positively related to health status. In South Africa, the public clinic is the main supplier of basic health care. Our estimation confirm the fundamental role of primary health care supply for health. Africans. Nevertheless, after the implementation of the free health care policy in the public clinic, evaluations showed a lot of sick people were asked to go back home without being cared for. The increasingly frequent use of clinics was significant for pregnant women and children. Since 1994, there has been an increase in pregnancy care and a decrease of unsupervised deliveries. But the lack of personnel and medicine worsen the situation in public clinics. A lot of strikes amongst the medical professionals denounced the deterioration in the quality of public

care. The direct consequence was a reorientation of the demand in tertiary hospitals for illnesses that could be treated by primary health care. Since 1995, the development of medical facilities by construction, rehabilitation or transformation of hospitals in clinics has started to correct the free health care policy failure

The variable indicating the **urban location** takes two ideas into account. It shows the better medical supply in the south african urban areas but also the facility of access to health care for Whites in these areas. In the pooled sample of Africans and Whites, the urbanites seem to declare worst health status than rural people. But, in towns Whites are over serviced and Africans are generally under serviced. The rapid migration of Africans to the metropolitan centres has led to a growing problem of urban poverty. The townships and squatters camps are living in a lack of medical structures. The low standard of living added to the lack of medical infrastructure creates an environment where the geographical and financial access to health care has been reduced generating a low level of health among Africans. We conclude that living in an town could act in opposite ways for Africans and for Whites because of past geographical segregation in South Africa.

Effectively, the pooled sample estimation alone does not allow to distinguish indirect or segregation (Whites may be in better health because they have better socio-demographic characteristics) from direct segregation (even with similar characteristics, whites may be in better health than blacks). A first insight about direct segregation, which may be taking place, can be seen through the comparison of estimations conducted separately for Whites and Africans as shown table 4. Here, we supposed that models of demand for health should be stratified by race because race is resource that from a context for behaviour [Jackson (1989)]. As supposed by White-Means (1995), "the cultural norms of families, the experiences of discrimination, and the ability to cope with one's environment vary by race".

It can be seen from these estimations that some strong differences arise between Whites and Africans concerning health determinants.

First, concerning individual characteristics, the following differences can be observed: gender is an important factor for Africans but not for White, education plays a greater role for Africans, facing ageing causes more health degradation for Africans. This is due to structural backwardness of Africans on social integration, health expectancy or education in South Africa.

Concerning household characteristics, access to a public clinic/hospital, urban location and the sex of household head play opposite roles for Whites and Africans. In fact, Africans have a very limited access to the most sophisticated type of treatment dispensed at private practitioners and private

hospitals. Public clinic are the main supplier of essential health care for them acting favourably for health. Among Whites, being cared in a public hospital or a clinic is a sign of poverty and very bad health status or severity of illness.

Holding health insurance and income play a stronger role for Whites. In average, they have better health risks coverage and received more expansive health care of better quality than Africans.

Finally, differences in ordered Probit thresholds are quite important to note here. Indeed, thresholds for Africans are above those of Whites, which is consistent with the idea mentioned above of a potential bias in self-reported health leading Africans to declare being in a better health than Whites when facing the same health conditions.

Decomposition results

First decomposition results

In order to provide straightforward results, we computed the decomposition procedure on the estimation of a simple Probit model on the binary variable reported in good health / reported in bad health[10]. Results shown table 5 are very similar to those of the ordered Probit model. The simulation results shown in table 5 present the two possible ways of evaluating direct and indirect segregation.

Table 5 : Observed and simulated percentage of individual self-declared in bad health

	White population structure	African population structure
White health model	**2.36**	*7.23*
African health model	*3.69*	**5.37**

Note: Bold figures refer to the observed situation. Italic figures are counter-factual simulation results.

Table 5 can be read in two ways. Horizontally, differences in figures correspond to indirect segregation (segregation through differences in socio-demographic characteristics) and, vertically, differences are due to direct segregation (differences in health production models).

First, indirect segregation is clearly observable here: the first line shows that, if Africans' health were determined by the same model as Whites', differences in socio-demographic characteristics would lead to 4.8 percentage point more Africans in bad health than Whites. Similarly, the second line shows that, if Whites were facing the Black conditions, differences in socio-demographic characteristics would still lead to 1.69 percentage points more Africans in bad health than Whites.

However, as mentioned above, this type of decomposition may be path dependant, which is actually the case here for direct segregation. Indeed, the first column predicts that more Whites would be in bad health if facing the Blacks' model whereas the second column shows exactly the opposite effect: if Blacks were facing the Whites' health model, there would be more Blacks in bad health.

Path dependency serves here as a robustness test for our results. It shows that no robust direct segregation can be found. In particular, it could be argued here that each community health production model is better fitted for its community characteristics. However, our procedure is very dependent on the health measure that we use. Indeed, as discussed above, if Whites and Blacks do not have similar references as for being in "bad health" results could be biased.

Taking into account differences in health references

As discussed above, on striking feature of our estimation results lies in the differences between thresholds (Probit model) and constant terms (Probit model) between Blacks and Whites. These differences, as we pointed out above, reveals differences in references as for being in "bad health". A first simple way of dealing with this issue is to compute simulations keeping constant terms fixed for each group. The decomposition procedure thus becomes:

Indirect segregation $\qquad I_{wa}^{i}=H(x_{iw},\varepsilon_{iw};\beta_{w},\gamma_{w})-H(x_{ia},\varepsilon_{ia};\beta_{w},\gamma_{a})$

Direct segregation: $\qquad D_{wa}^{i}=H(x_{iw},\varepsilon_{iw};\beta_{w},\gamma_{w})-H(x_{iw},\varepsilon_{iw};\beta_{a},\gamma_{w})$

where γ represents estimated thresholds or constant terms.

With this procedure, simulation results are the following:

Table 6: Observed and simulated percentage of individual self-declared in bad health
(Constant term fixed for each racial group)

	White population structure	African population structure
White health model	**2.36**	*2.47*
African health model	*7.04*	**5.37**

Note: Bold figures refer to the observed situation. Italic figures are counter-factual simulation results.

Table 6 provides drastically different results. Indeed, direct segregation (columns) is large and robust since Whites facing Blacks conditions would be 7.04% in bad health against 2.36% observed and Blacks facing Whites' model would only be 2.47% in bad health against 5.37% observed. However, indirect segregation is not robust any more with this specification since the second line actually pleads for indirect segregation against Whites.

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[10] To estimate the probit model, a binary variable was created. It takes 0 for poor and very poor health.

This specification however has good chances to over-estimate the direct segregation effect since differences in estimated constant terms include more information than the sole differences in health evaluation.

A different and better answer to the differences in health references consists in running a single regression on Blacks and Whites with all explanatory variables (except the constant term) crossed with racial dummies. In that case, the decomposition procedure thus becomes:

Indirect segregation $\quad\quad I_{wa}^i = H(x_{iw}, \varepsilon_{iw}; \beta_w, \gamma_w) - H(x_{ia}, \varepsilon_{ia}; \beta_w, \gamma)$

Direct segregation: $\quad\quad D_{wa}^i = H(x_{iw}, \varepsilon_{iw}; \beta_w, \gamma_w) - H(x_{iw}, \varepsilon_{iw}; \beta_a, \gamma)$

where γ represents the common estimated constant term. With this procedure, simulation results are the following:

Table 7: Observed and simulated percentage of individual self-declared in bad health
(Common constant term)

	White population structure	African population structure
White health model	**2.36**	*4.79*
African health model	*3.40*	**5.37**

Note: Bold figures refer to the observed situation. Italic figures are counter-factual simulation results.

Using this specification, we find that direct segregation accounts for between 19.3% and 34.6% of the observed difference in self-evaluated health whereas indirect segregation explains between 65.4% and 80.7% of this difference.

Conclusion

In this paper we assessed the question of health discrimination in South Africa using a self assessed health indicator. Our aim was first to evaluate differences in self assessed health between Blacks and Whites. Unsurprisingly, we find strong evidence of Whites being in better health than Blacks even though the indicator has good chances to under-evaluate this gap.

In a second step, we ran health equation estimations using an ordered Probit specification. Estimation results, which are consistent with theories and former empirical results on health determinants, provide a first set of explanations for health differences between racial groups. Indeed, major health determinant variables such as education, income or household size play against poorer endowed Blacks compared to richer and better educated Whites. This line of explanation is what we call "indirect segregation", the health gap being induced by segregation in other dimensions such as

education of wealth. However, regression results still show a significant effect of racial dummies, which pleads in favour of "direct segregation", i.e. differences in health, which cannot be explained by differences in socio-economic characteristics.

The next step of our work consists in estimating health equations separately for Blacks and Whites. We find strong support for differences in the models. In particular, gender is an important factor for Africans but not for White, education plays a greater role for Africans and facing ageing causes more health degradation for Africans. These differences can be explained by structural backwardness of Africans on social integration, health expectancy or education in South Africa. Moreover, access to a public clinic/hospital, urban location and the sex of household head play opposite roles for Whites and Africans. In fact, Africans have a very limited access to the most sophisticated type of treatment dispensed at private practitioners and private hospitals. Public clinic are the main supplier of essential health care for them acting favourably for health. Among Whites, being cared in a public hospital or a clinic is a sign of poverty and very bad health status or severity of illness. These results show that besides the indirect segregation induced by lower socio-demographic endowments, Blacks suffer direct segregation in heath.

Finally, we try to evaluate the respective impacts of direct and indirect segregation on observed health differences between Blacks and Whites through Oaxaca-Blinder type decomposition procedures. In order to account for biases induced by the use of a subjective measure for health, we use three different types of decomposition. We find strong support for a large magnitude direct segregation accounting for between 19.3% and 34.6% of the observed difference in self assessed health. This result has strong policy implications. Indeed, direct segregation of such a large magnitude shows that, even though Apartheid has been officially abandoned since 1990, segregation on health is still taking place in 1999. Indeed, differences in health between Blacks and Whites cannot be solely explained by differences in health determinants such as education or income, which can be imputed to the former regime, but are also caused by persisting direct segregation.

Our work now needs to be completed on three major aspects. First, our decomposition results are dependent on the specification used and robustness should be formally tested in order to validate our findings. Second, our work shows that potential biases in self assessed health is a major issue, which should be further addressed. Finally, direct segregation is multi-dimensional. Our estimation results show that it affects major factors such as returns to education, income or access to hospitals. Each of these dimensions still needs to be further analysed and evaluated.

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