



Cardio-vascular risk factors Senegalese military personnel: a looming threat

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ABSTRACT

Chronic non-communicable diseases (CNCDs) are a public health issue. The epidemiological transition coexists with infectious diseases and international guidelines recommend that resources-limited countries make population surveys on CNCDs. In absence of national data this study aimed to assess CNCDs risk factors in the senegalese armed forces personnel. A cross-sectional survey was conducted among active military people aged 25 to 60 years. Participation was voluntary. A two stages stratified sampling method was used. The adjusted sample was 1513 individuals. All data were analyzed using R software. A five factors risk score was determined. We included 1125 participants in the study with a mean age of 39.7 ± 9.1 years and sex ratio of 28.6. The prevalence of current smoking was 17.3 %. Mean intake of fruits and vegetables was about 4. About 72% of participants had a moderate or intense activity at least three times a week. The prevalences of overweight and hypertension were 30.5% and 28.4% respectively. More than one third presented a high cardiovascular risk (at least three risk factors). The high prevalence of CNCDs risk factors, can predict a real threat in general population. A program for CNCDs prevention and screening is needed.

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INTRODUCTION

Chronic non-communicable diseases (CNCDS) are a priority public health problem. Globally, the burden of non-communicable diseases has rapidly increased. In 2001, they accounted for almost 60% of the 56 million deaths annually and 47 % of the global burden of disease ^{1, 2}. Currently, in poor countries we assist to the double burden of infectious diseases and CNCDS^{1,3}. In 2004, global estimates of mortality by region showed that CNCDS caused 25% of deaths in sub-Saharan Africa (SSA), 48% in South Asia, 63% in the Middle East and North Africa, and 87% in high income countries ³. Since the 1990s many studies reported an increasing morbidity of CNCDS in African populations ^{1,3,4,5}.

For example, 63% of diabetics were living in developing countries in 1997, and World Health Organization (WHO) forecasts this proportion to reach 76% in 2025 ^{3,6}. Obesity, which is a mark for nutritional transition is becoming a worldwide epidemic. It affects over 300 million people with 115 million living in developing countries ^{7,8,9}. The gradual shift from a dominant stunting issue to overweight and obesity problem is observed in many countries ^{7,10}. Half of all deaths in SSA are attributed to infectious diseases, a quarter of them to CNCDS. Some authors state that 46% of deaths in SSA will be linked to CNCDS in 2030 ^{2,11,12}. Increased CNCDS is related to several factors. The decline of infectious diseases that disproportionately affect children, led to increase in life expectancy of adults and a relative aging of the population ³. Then the changing demographic profile of the population is an important factor that influences in the future, the epidemiology of CNCDS in Africa. Finally, urbanization and changing lifestyles linked to economic development are closely related to the occurrence of CNCDS ^{3,13,14}. These changes are related to diet, physical activity, smoking, obesity and alcohol consumption. In developed countries, about 90% of new cases of diabetes and 70 to 80 % of cardiovascular disease is attributable to lifestyle ^{3,15,16}.

A study in Senegal showed a higher frequency of high blood pressure (24.1%). Diabetes (9.7%), obesity (16.7 %) and chronic kidney disease (22.4 %) and most patients screened were unaware of their health status ¹⁷. The CNCDS constitute a significant economic burden in low- income and poor households are most affected ^{18,19}. The health insurance coverage is still limited, and medical costs are in general largely covered by families ^{18,20,21}. It is urgent to curb the growing trend of CNCDS in countries with low and middle incomes, and reduce the subsequent social and economic burdens ^{22,23,24}. Interventions must be focused on the consideration of risk factors such as smoking, alcohol consumption, physical inactivity, and poor diet ^{22,25,26,27}.

The objective of the study was to assess risk factors for CNCs and to estimate cardiovascular risk profile in Senegalese armed forces personnel.

MATERIALS AND METHODS

We performed a cross-sectional study of the major risk factors (behavioral, physical and biological) of CNCs. The STEPS 1, 2 and 3 tools were used for the survey. The sample was estimated from an initial proportion of 25 %, with an alpha error of 5 % and a design effect of 1.5. Thus, for each stratum a group of 432 people should be included. With these parameters, the final sample size was estimated to 1513 participants. A two stages stratification method was used for the selection of statistical units. STEPS questionnaire adapted to the context of Army Health Service was used ²⁸. It comprised sections on socio-demographic and behavioral information, an anthropometric and cardiovascular measures and finally on biochemical parameters. The study was authorized by the military hierarchy and ethical committee and participation was voluntary.

Data were computed with Epi info 6 software and analyzed using R. Five factors were used to determine the score of cardiovascular risk: daily smoking, consumption of less than 5 fruits and vegetables per day, undergoing at least three intense or moderate physical activities per week, being hypertensive (systolic BP \geq 140 and/or diastolic BP \geq 90 mmHg or taking any antihypertensive drug) and finally overweight (BMI \geq 25kg/m²). World Health Organization recommends a daily intake of 400 grams or 5 portions of fruits and vegetables. Moderate physical activity was defined as a sustained activity for 30 minutes and leading to a moderate increase in heart rate. Intense physical activity was defined by a leisure or sport activity sustained for at least 30 minutes and resulting in a significant increase in heart rate ²⁹.

The combination of these determinants was used to define a score based on the number of risk factors present. According to WHO, those who have no risk factor are classified as "low cardiovascular risk" and those have at least three determinants are classified "high risk cardiovascular" ²⁹. Chi-square and Student tests were used to compare proportions and means and the level of significance was set at 5%.

RESULTS AND DISCUSSION

Epidemiological studies on CNCs risk factors are rare in sub-Saharan Africa and most of studies are focused on specific groups ³. The present study was conducted in Senegalese armed forces personnel. We included a total of 1125 active duty military across the whole country. The mean age was 39.7 \pm 9.2 years (25-60 years) and almost all participants were male (sex ratio = 28.6). More than 80% participants were married and singles accounted for < 2%. More than half

of the participants reached at least the secondary school level and the average number of years spent in school was 10.8 ± 3.5 years.

Prevalence of smoking was 17.3 % and it did not differ significantly between age groups ($p=0.57$). People started smoking at mean age of 20.8 ± 4.0 years (ranges 12-39 years). The mean number of cigarettes smoked/day was 9.5 ± 4.7 among current smokers with a median of 10 and ranges of 2-20 cigarettes (Table I).

Table 1: Sociodemographical and clinical characteristics of participants (N=1125)

Variables	Mean	Standard deviation
Age (years)	39.73	9.17
Number of school years	10.86	3.46
Age of smoking start	20.8	4.0
Number of cigarette/day	9.5	4.7
Portions of fruits and vegetables /day	4.23	11.1
Systolic blood pressure (mm Hg)	80.13	10.47
Diastolic blood pressure (mm Hg)	128.79	21.03
Body mass index (kg/m ²)	23.7	3.1

Smoking prevalence found in this study (17.3%) is higher than the ones previously reported in Senegalese private sector workers¹⁷ or in South African adults³⁰. However, it is comparable to the proportion observed in Nigeria^{31, 32}. Furthermore, most of military smokers started smoking in their early career. Occupational stress could explain the importance and consistency of this practice in military personnel.

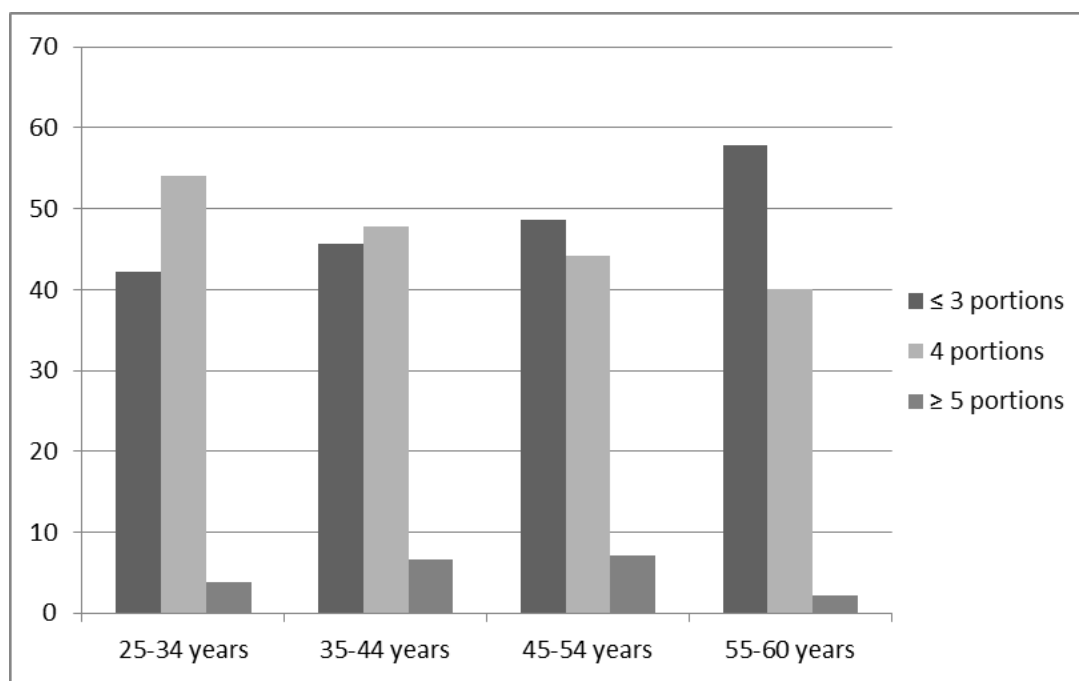


Figure 1. Fruits and vegetables consumption according to age groups

Adequate consumption of fruits and vegetables is not a common practice among participants. Daily consumption of fruits and vegetables was ≤ 3 portions in 46% of respondents, exactly 4 portions in 48.4 % and ≥ 5 portions in 5.7% of people. However there was a considerable variability between different age groups. Figure 1 illustrates the level of consumption of fruits and vegetables at each stratum.

Nearly three out of 10 respondents had limited physical activity and this proportion varied by age category. It was high among those aged 55-60 years (53.3 %) and relatively low among those aged 25-34 (17.9%). The average frequency of sport activity was 2.7 ± 1.5 days/weeks (0-7 days) (Table II). Sedendarity is lower in military personnel compared to private sector workers in Senegal ¹⁷. This was expected as the military have in their timetable two days of collective physical training each week. In addition, physical activity is an important evaluation tool for all military professional exams.

The proportion of respondents with systolic hypertension was 22.6 % ($p=0.002$) and the prevalence of diastolic hypertension was 28.4 % ($p<0.001$). Hypertension was less frequent among the 25-44 years (19.2%) compared to those aged 45-60 years (29%). Diastolic hypertension has a comparable prevalence of 22 % ($p = 0.003$). Only 25 respondents were under antihypertensive medical treatment. Among participants aged 25-44 years one quarter was hypertensive and this prevalence reached 30% among those older ≥ 48 years (table II).

Table 2: Cardiovascular risk factors according to participants' age (N=1125)

Total	25-34 years	35-44years	45-54years	55-60years	p-value	
Daily smokers	194(17.3)	52(15.0)	73(18.5)	62(18.3)	07(15.6)	0.570
Consumption of fruits and vegetables						
3 portions or less	517(46.0)	146(42.2)	180(45.6)	165(48.7)	26(57.8)	0.140
4 portions	544(48.4)	187(54.0)	189(47.8)	150(44.2)	18(40.0)	0.044
5 portions or more	64(05.7)	13(03.8)	26(06.6)	24(07.1)	01(2.2)	NA
Physical activity						
At work						
Low	492(43.7)	116(33.5)	153(38.7)	196(57.8)	27(60.0)	< 0.001
Moderate	436(38.8)	141(40.8)	171(43.3)	108(31.9)	16(35.6)	0.012
Intense	267(23.7)	117(33.8)	98(24.8)	48(14.2)	04(8.9)	< 0.001
During leisure or sport						
Low	741(65.9)	203(58.7)	272(68.9)	232(68.4)	34(75.6)	0.006
Moderate	213(18.9)	55(15.9)	72(18.2)	77(22.7)	9(20.0)	0.145
Intense	230(20.4)	107(30.9)	75(19.0)	44(13.0)	04(8.9)	<0.001
High blood pressure (HBP)						
Systolic HPB	254(22.6)	63(18.2)	79(20.0)	99(29.2)	13(28.9)	0.002

Diastolic HBP	247(22.0)	58(16.8)	82(20.8)	95(28.0)	12(26.7)	0.003
Systolodiastolic HBP	320(28.4)	77(22.3)	105(26.6)	123(36.3)	15(33.3)	<0.001
Under treatment	25(2.2)	01(0.3)	06(1.5)	13(3.8)	05(11.1)	NA
Body Mass Index (kg/m ²)						
Normal	781(69.4)	311(89.9)	257(65.1)	191(56.3)	22(48.9)	<0.001
Overweight	304(27.0)	32(9.2)	120(30.4)	130(38.3)	22(48.9)	<0.001
Obesity	40(3.6)	03(0.9)	18(4.6)	18(5.3)	01(2.2)	NA
Cardiovascular risk score						
0	06(0.5)	01(0.3)	04(1.0)	01 (0.3)	00(0.0)	NA
1	129(11.5)	44(12.7)	48(12.2)	35(10.4)	02(4.4)	0.34
2	549(48.8)	191(55.2)	200(50.6)	140(41.4)	18(40.0)	0.002
3	359(31.9)	100(28.9)	125(31.6)	117(34.6)	17(37.8)	0.36
4	81(7.2)	10(2.9)	18(4.6)	45(13.3)	08(17.8)	NA

The prevalence of hypertension observed in this study is similar to those found in previous studies^{17,33}. Hypertension remains a growing threat in developed and also developing countries³⁴. Some studies show significant variations between 6 and 48 % depending on the country and according to rural or urban areas³. However, in the next decades some authors predict an increase in hypertension prevalence that will reach 80% and 24 % respectively in developing and in developed countries³⁴.

Overweight was present in 27% of military personnel with considerable increase according to age group. Almost half of military personnel between 55-60 years showed overweight, 40% in the 45-54 years, 30% of those aged 35-44 and less than 10% among those aged 25-34 years. Prevalence of obesity (BMI \geq 30 kg/m²) was 3.6% (Table II).

In sub-Saharan Africa, there is a complex relationship between underweight and overweight. The underweight is mostly found with children while overweight/obesity concerns mainly female adults³. The prevalence of obesity and of overweight found in this study are relatively low compared to results of Seck et al who reported respectively 16.7% and 81% in private sector workers in Dakar¹⁷. The explanation is the practice of physical activity that is much more common in our study. Recent data from active duty US military personnel showed high prevalence of overweight (53.4%) and obesity (18.3%).

Concerning the cardiovascular risk score, we found less than 1 % of participants without any risk factor, versus 11.5% with only one risk factor, 49% with two factors, and 39.5% with three risk actors or more. According to the classification of cardiovascular risk by World Health Organization, less than 1% was at low risk and 39.1% presented a high risk. The analysis of cardiovascular risk shows variability between age groups (p <0.001); the presence of at least

three risk factors was 31.8% and 36.2% respectively for 25-34 and 35-44 years, 47.8% and 55.5% in the 45-54 years and 55-60 years. Figure 2 illustrates the distribution of risk score based on age.

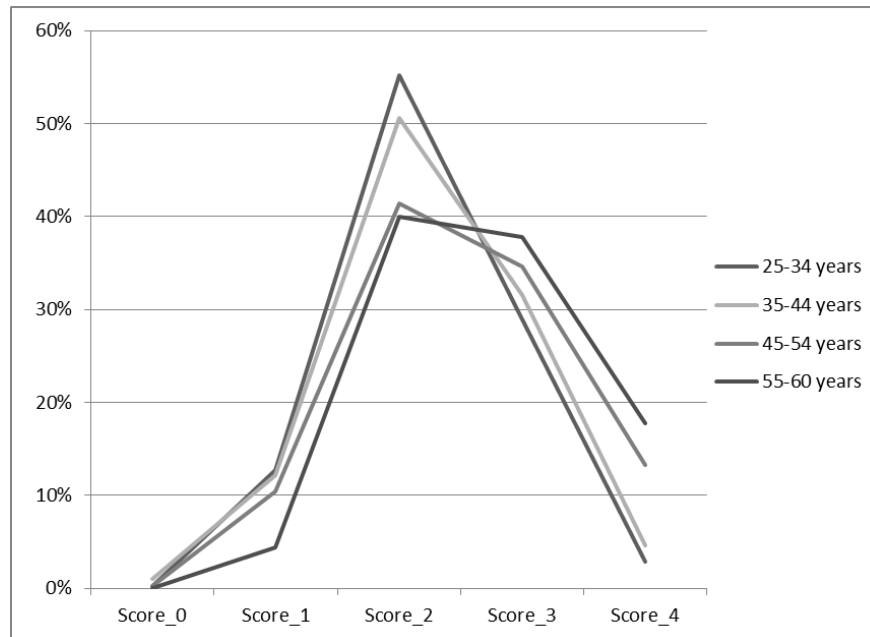


Figure 2 : Distribution of cardiovascular risk score according to age groups

Hypertension and other cardiovascular risk factors are increasing in sub-Saharan Africa ^{3, 13, 34, 35}. However, these factors are still poorly quantified in most countries. Available data are disparate and probably could be an illustration of the changing situations that occur between groups, countries, but among which there is no reliable data ³. The stroke and myocardial infarction were observed more frequently in younger subjects.

Research on CNCDS in sub-Saharan Africa has been very poor compared to that conducted in developed countries and the majority of published studies have been performed in a hospital or clinical setting. Community studies often show a high prevalence of CNCDS ^{3, 36, 37, 38}. It is urgently needed to mitigate the emerging epidemic of CNCDS in Africa.

Despite its high epidemiological importance, this study presents some limitations due its cross-sectional nature. Also, the study population is restricted to a specific category (armed forces personnel) that is supposed to have access to regular medical check-up. Thus results are not necessarily representative of the general Senegalese population.

CONCLUSION

This study demonstrated the importance of risk factors for CNCDS and especially highlight the high cardiovascular risk in the Senegalese military, according to WHO classification . Like HIV/AIDS, the outbreak of an epidemic of CNCDS will also be a security concern and may

impact negatively on the functioning of the institution. Some ongoing policies such as the management of expensive diseases would be difficult in the long term. The alternative would be to set up a primary prevention program, against tobacco, prevention of overweight, and the promotion of good nutrition. The Army Health Service should strongly establish a technical program for the early detection and management of cardiovascular emergencies at all levels of the health system. More research is needed to identify risk factors and modifiable health behaviors that could help to fight CNCDS.

REFERENCES

1. OMS. Rapport sur la Stratégie mondiale pour l'alimentation, l'exercice physique et la santé. Genève: OMS; 2004: 24p.
2. Gaylin DS, Kates J. Refocusing the lens: epidemiologic transition theory, mortality differentials, and the AIDS pandemic. *Soc Sci Med* 1997; 44:609-21.
3. Dalal S, Beuza JJ, Volmink J et al. Non-communicable diseases in sub-Saharan Africa: what we know now. *Int J Epidemiol* 2011; 28:1-17
4. Ezzati M, Vander HS, Lawes CM et al. Rethinking the diseases of affluence paradigm: global nutritional risks in relation to economic development. *PloS Med* 2005; 2:133.
5. Conner MD, Walker R, Warlow CP, et al. Burden of stroke in black population in sub-saharan Africa. *Lancet Neurol* 2007; 6:269-78.
6. OMS. Rapport sur la santé dans le monde 1998. La vie au XXI^e siècle, une perspective pour tous. Genève: OMS 1998; 257 p.
7. Marie B, Lioret S, Gartner A, Delpuech F. Transition nutritionnelle et maladies chroniques liées à l'alimentation dans les pays en développement. *Cahiers santé* 2002 ; 12(1):45-55.
8. Manton KG. The global impact of non-communicable diseases: estimates and projections. *World Health Stat Q* 1998; 41:255-266.
9. Feachem RGA, Kjellstrom T, Murray CJL, et al. The health of adults in the developing world. New York: Oxford University Press, 1996, 900p.
10. OMS. L'adulte en excès pondéral. In. Utilisation et interprétation de l'anthropométrie. Rapport d'un comité d'experts. OMS série rapport technique 854. Genève: OMS ; 1995 :348-83.
11. World Health Organization. Global burden of disease. Projection of mortality and burden of disease, 2002-2030.
12. World Health Organization. The global burden of disease: 2004. Update. Geneva: World Health Organization; 2008.

13. Vorster HH. The emergence of cardiovascular disease during urbanization of Africans. *Public Health Nutr* 2002; 5:239-43.
14. Adeyi O, Smith O, Robles S. World Bank. Public policy and the challenge of chronic non-communicable diseases. Washington, DC: World Bank, 2007.
15. Stampfer MJ, Hu FB, Manson JE et al. Diet lifestyle, and risk of type 2 diabetes mellitus in women. *N Engl J Med* 2001; 345:790-97.
16. Stampfer MJ, Hu FB, Manson JE et al. Primary prevention of coronary heart disease in women through diet and lifestyle. *N Engl J Med* 2000; 343:16-22.
17. Seck SM, Gueye S, Tamba K, et al. Prevalence of chronic cardiovascular and metabolic diseases in Senegalese workers: a cross-sectional study 2010. *Prev Chronic Dis* 2013; 10: 110339.
18. Kankeu HT, Saksena P, Xu K, et al. The financial burden from non-communicable diseases in low and middle-income countries: a literature review. *Health research policy and system*. 2013, 11:31.
19. Abegunde DO, Mathers CD, Adam T, et al. The burden and costs of chronic diseases in low-income countries. *Lancet* 2007; 370: p. 1929-38.
20. Bloom DE, Cafiero ET, Jané-Llopis E et al. The Global Economic Burden of Non-communicable Diseases. Geneva: World Economic Forum; 2011.
21. World Health Organization: World Health Statistics 2012. Geneva: World Health Organization; 2012.
22. Jones AC, Geneau R. Assessing research activity on priority intervention for non-communicable disease prevention in low and middle-income countries: a bibliometric analysis. *Global Health Action* 2012, 5: 18847 –<http://dx.dio.org/10.3402/gha.v5io.18847>
23. Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. *Lancet* 2011; 377: 1438-47.
24. World Health Organization. Global status report on non-communicable diseases 2010. Geneva: World Health Organization; 2011.
25. World Health Organization. Scaling up action against non-communicable diseases: how much will it cost? Geneva: World Health Organization; 2011.
26. Lopez AD, Mathers CD, Ezzati M, et al. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet* 2006; 367: 1747-57.
27. Vorster HH. The emergence of cardiovascular disease during urbanization of Africans. *Public Health Nutr* 2002; 5:239-43.
28. World Health Organization. Instrument STEPS de l’OMS pour la surveillance des facteurs de risque des maladies chroniques(STEPS). www.who.int/chp/steps.

29. World Health Organization. L'approche STEPwise de l'OMS pour la surveillance des facteurs de risque des maladies chroniques(STEPS). www.who.int/chp/steps.
30. Thorogood M, Connor M, Tollman S, Lewando Hundt G, Fowkes G, Marsh J. A cross-sectional study of vascular risk factor in a rural South African population: data from the Southern African Stroke Prevention Initiative. *BMC Public Health* 2007; 7:326.
31. Okesina AB, Oparinde DP, Akindoyin KA, Erasmus RT. Prevalence of some risk factors of coronary heart disease in rural Nigerian population. *East Afr Med J* 1999; 76:114.
32. Huston SL, Bunker CH, Ukoli FA, Rautaharju PM, Kuller LH. Electrocardiographic left ventricular hypertrophy by five criteria among civil servants in Benin City, Nigeria: Prevalence and correlates. *Int J Cardiol* 1999; 70: 1-14.
33. Sow PG, Ka O, Goume M, Tall AB, Ndiaye AA. The Prevalence of Arterial Hypertension and associated factors in the Senegalese population in Dakar. *American J Pharm Health Res* 2014 *in press*.
34. Kearney PM,Whelton M, Reynolds K, Munter P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005; 365(9455): 217-23.
35. Eilerman PA, Herzog CM, Luce BK, Chao SY, Walker SM, Zarzabal LA, Carnahan DH. *A comparison of obesity prevalence: military health system and United States populations, 2009-2012*. *Mil Med* 2014; 179(5):462-70.
36. Njelekela M, Negishi H, Nara Y et al. Cardiovascular risk factors in Tanzania: a revisit. *Acta Trop* 2001; 79:231-39.
37. Daar AS, Singer PA, Persad DL et al. Grand Challenges in chronic non-communicable diseases. *Nature* 2007; 450:494-96.
38. Holmes MD, Dalal S, Volmink J et al. Non-communicable diseases in sub-Saharan Africa: the case for cohort studies. *PLos Med* 2010;7e1000244.
39. Volmink J, Dalal S. Addressing inequalities in research capacity in Africa. *BMJ* 2005; 331:705-06.



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