

THE PREVALENCE OF MALARIA INFECTION AMONG SECONDARY SCHOOL STUDENTS IN OBA IDEMILI SOUTH LOCAL GOVERNMENT AREA, ANAMBRA STATE NIGERIA

*Article Review by Ogolo B.A.¹; Urindwanayo D.²; Obieze, K.O.³, Ogbuagu C. N.⁴
and Ekwunife, C.A.⁵, Rwanda*

*Department of Nursing Services, Nnamdi Azikiwe University Teaching Hospital
Trauma Center Oba, Idemili South Local Government Area, Anambra State
Nigeria¹*

*Department of Training and Research, University Teaching Hospital of Butare,
Rwanda²*

*Department of Microbiology, Nnamdi Azikiwe University Teaching Hospital
Trauma Center Oba, Idemili South Local Government Area, Anambra State
Nigeria³*

*Department of Accident and Emergency, Nnamdi Azikiwe University Teaching Hospital
Nnewi, Nnewi North Local Government Area Anambra State Nigeria⁴*

*Department of Parasitology and Entomology, Nnamdi Azikiwe University Awka,
Anambra State Nigeria⁵*

Email: - urindes@yahoo.fr

ABSTRACT

A cross sectional study on the prevalence of malaria infection among secondary school students in Oba Idemil South Local Government Area Anambra State, Nigeria was carried out between January and April 2009. A total of 300 students (161 males and 139 females) were involved in the study. Venous blood containing Ethylene Diamine Tetra acetic Acid (EDTA) of the 300 students was screened for malaria parasites using Giemsa-stained thick and thin blood films. Of the 300 blood samples examined, 31 (10.3%) were positive for malaria parasite. Plasmodium falciparum was identified in all the positive cases. Prevalence rate of 16 (9.9%) was recorded in males while prevalence rate in females was 15 (10.8%); this difference was not statistically significant ($p=0.809$, $p> 0.05$). The private schools recorded a higher prevalence 23(13.5%) than the public schools 8(6.2%); this difference was statistically significant ($p=0.026$, $p< 0.05$). The findings of this study emphasize the need for health education in school, churches and community in order to control malaria in the area.

KEYWORDS

Malaria, prevalence, Secondary school, students.

Malaria is a parasitic disease which is easily preventable, treatable and curable, but still it remains one of the major public health problems in Nigeria (FMOH 2000). The malaria burden as reported in the country is on the increase in spite of numerous interventions that have been instituted. The obstacles to the success of these interventions are socio-cultural, economic and political in nature. According to (UNICEF, 2004), it kills a child somewhere in the world every 30 seconds. 90% of malaria deaths occur in Africa, where malaria accounts for about one in five of all childhood deaths. Each year, there are approximately 515 million cases of malaria, killing between one and three million people, the majority of whom are young children in Sub-Saharan Africa (Snow *et al*, 2005).

The overwhelming bulk of the world's malaria burden rests upon the population of sub-Saharan Africa because of the unique coincidence of expanding human populations, weak health systems, the world's most effective vector mosquito species, and environmental conditions ideal for transmission. Approximately 40% of the world's populations live in regions where malaria transmission is endemic, mainly tropical and sub-tropical regions (Aultman *et al*, 2002). At the start of the new millennium, malaria is still deeply entrenched in Africa and effective malaria control is under threat from the inexorable spread of parasite strains resistant to anti-malarial drugs and the emergence of mosquitoes resistant to the pyrethroid insecticides used to impregnate bed nets.

In Africa, on an average about one in 20 children die from malaria. In areas of low endemicity, where the immunity is low, severe infection occurs in all age groups including adults. The morbidity and mortality due to malaria in children tends to be very high in these areas. Severe *falciparum* malaria is the commonest cause of death in infants and children in areas endemic and hyper endemic for malaria. Inadequate immunity results in rapid increase in the parasite count and development of complications. Delay in diagnosis and treatment also contributes to the mortality.

In Nigeria, malaria is endemic throughout the country. World Health Organization (WHO) estimated malaria mortality rate for children under five in Nigeria at 729 per 100, 000. Malaria has a great morbidity and mortality than any other infectious diseases of the world (World Malarial Report, 2005; Smith, 1978; WHO, 2000); a child will be sick of malaria between two and four times in one year (FMOH, 2005). The Ministry of Health reported in April 2004 that malaria is responsible for one out of ten deaths in pregnant women and has caused the Federal Government of Nigeria over one billion Naira annually in treating malaria (Government in action, 2005). At least, 50% of the population suffers from at least one episode of malaria each year. The disease is the commonest cause of outpatient attendance across all age groups.

The result of the most comprehensive study of the malaria situation in Nigeria conducted across the six geographical zones in Nigeria have signified the public health importance of malaria (FMOH, 2001), the study confirmed that malaria is a major cause of morbidity and mortality especially among vulnerable groups including pregnant women and children aged less than 5 years. The incidence of malaria among the under fives across six geographical zones during the study were as follows: South-South 32.7%, South-West 36.6%, South East 30.7%, North-Central 58.8%, North-East 55.3% and North-West 33.6%. Malaria also accounted for 63% of the diseases reported in healthcare facilities across the six geographical zones. Malaria constitutes a major economic burden on endemic communities in Africa, and it costs sub-Sahara African countries including Nigeria, more than US\$12billion in 1997 (WHO, 1998). Malaria is implicated in the reduction of human work capacity and productivity; consequently, it adversely affects the socio- economic development of the nation (FMOH, 2001). The disease thus constitutes a great burden on the already depressed Nigerian economy (Netmark, 2001); moreover the high rate of absenteeism among school children in Nigeria is attributed in part to malaria (Gbadessin, 2001.). Malaria causes a lot of misery to sufferers, and adversely affects the social and psychological well being of individuals, families and the nation at large. It can also sabotage the investment drive efforts of the Government through negative impact on tourism especially during high transmission seasons.

Malaria is a vector-borne infectious disease caused by protozoan parasites of the genus *Plasmodium* (Sherman, 1998). It is widespread in tropical and subtropical regions, including parts of the Americas, Asia, and Africa. Only four types of the *Plasmodium* parasite can infect humans; the most serious forms of the disease are caused by *Plasmodium falciparum* and *Plasmodium vivax*, but other related species (*Plasmodium ovale*, *Plasmodium malariae*) can also affect humans. This group of human-pathogenic *Plasmodium* species is usually referred to as malaria parasites (Sherman, 1998).

Usually, people get malaria by being bitten by an infective female *Anopheles* mosquito. Only *Anopheles* mosquitoes can transmit malaria, and they must have been infected through a previous blood meal taken on an infected person. Malaria transmission can be reduced by preventing mosquito bites with mosquito nets and insect repellents, or by mosquito control measures such as spraying insecticides inside houses and draining standing water where mosquitoes lay their eggs.

Children, pregnant mothers, people in emergency situations and people living with HIV/AIDS are particularly vulnerable to malaria (WHO, 2007). *Falciparum* malaria is an important cause of maternal anaemia (Steketee et al, 1996), intra-uterine growth retardation (Kochar et al, 1999), intrauterine death, stillbirth, premature delivery and low birth weight (Verhoeff et al, 1999 and Aribodor et al, 2007).

Intermittent preventive therapy (IPT) using Sulphadoxine and Pyrimethamine (SP) has demonstrated great potentials in preventing malaria during pregnancy (WHO, 2004; Valley *et al*,

2007 and Mbanefo *et al*, 2009). Although some are under development, no vaccine is currently available for malaria; preventive drugs must be taken continuously to reduce the risk of infection.

MATERIALS AND METHODS

The objective of this study is to determine the number of students infected with malaria parasite and its specific species.

THE STUDY LOCATION

The study was carried out in Oba, Idemili South Local Government Area Anambra State Nigeria. It has area coverage of about 68 square kilometers lying between latitude 6° 03N and longitude 6°52E (The world Gazetteer, 2007). The town is located in the tropical rain forest zone of Nigeria with network of streams and other water bodies that favor the breeding of the mosquito vectors.

SAMPLE AND STUDY DESIGN

Participants for this cross sectional study were selected by stratified random sampling from two government/public secondary schools and two private secondary schools. The sample included 300 secondary school students enrolled in four schools in the study area Study participants ranged between 15 to 20 years with a mean age of 16 years.

SAMPLING TECHNIQUE AND SAMPLE SIZE CALCULATION

Adequate sample size was calculated using malaria prevalence from previous studies (Okocha *et al*, 2005).

ETHICAL APPROVAL

Approval to carry out the study was obtained from the Scientific and Ethical Review Boards of Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi, Anambra State, South East Nigeria. On the scheduled sample collection dates, a recruitment script approved by the NAUTH Ethical committee was read to the students followed by an informed consent script for those who volunteered to participate and under 18 years, the parents signed for them. The recruitment script explained the purpose, significance, benefits and potentials risks of the study. The informed consent stated that participation in the study was anonymous and voluntary and non participation will not have any social or academic consequences.

DATA COLLECTION AND EXAMINATION OF BLOOD SAMPLES

Blood samples were collected from the students by venipuncture. A touniquette was tied around the upper arm to increase blood pressure in the veins. The upper arm area of the venipuncture was

thoroughly cleaned with cotton wool soaked in methylated spirit. Venous blood was collected and transferred into an Ethylene Diamine Tetra-acetic Acid (EDTA) sample tube.

PREPARATION OF THICK AND THIN FILM FOR DETECTION OF MALARIA PARASITE

Thick film Method: The thick film was prepared according to Fleck et al (1988).

Two drops of blood were placed on a slide and spread to cover an area of about 15 mm in diameter and allowed to dry. The unfixed film is then stained for 15 minutes using Giemsa solution diluted 1:20 with distilled water at p. H 7.2. The slide was then gently washed with a few drops of distilled water dried and examined under x100 oil immersion objective lens to detect the presence of Plasmodium. The film was considered to be positive for malaria parasite if the presence of the ring form trophozoites or any other blood stage of erythrocyte schizogony was detected. A film was considered negative if no parasites were seen after scanning at least 100 fields.

Thin film method: The thin film was prepared according to Fleck et al (1988).

Two drops of blood were placed on a slide and using another slide as a ‘‘spreader’’, and with the slide with the blood drops resting on the flat firm surface the small drop of blood was touched with the spreader and the blood allowed to run along its edge. Finally, the spreader was pushed along the slide away from the largest drops at an angle of 45°. The thin film was fixed in absolute methanol for 2 minutes and stained with Giemsa solution diluted 1:20 with distilled water at p: H 7.2 for 15 minutes. The slides were then washed in running water, dried and examined under microscope with x100 oil immersion objective lens to identify the species of Plasmodium. The identification of Plasmodium species undertaken was based on species-specific, including morphological features with respect to size and shape of infected red cells, chromatin dot, pattern of ring form, trophozoites, number of ring forms per red blood cells, shape and features of gametocytes in peripheral blood as outlined by Fleck *et al*, (1988).

DATA ANALYSIS

Data collected were analyzed using descriptive statistics. Variations between groups were treated using chi-square of Minitab for windows, version 11.

RESULTS

The mean age of the examined students was 16years. Of the 300 students whose blood samples were examined, 31(10.3%) were infected with malaria parasite. All parasite species found were of the Plasmodium falciparum strain. The findings were shown in Tables and figures.

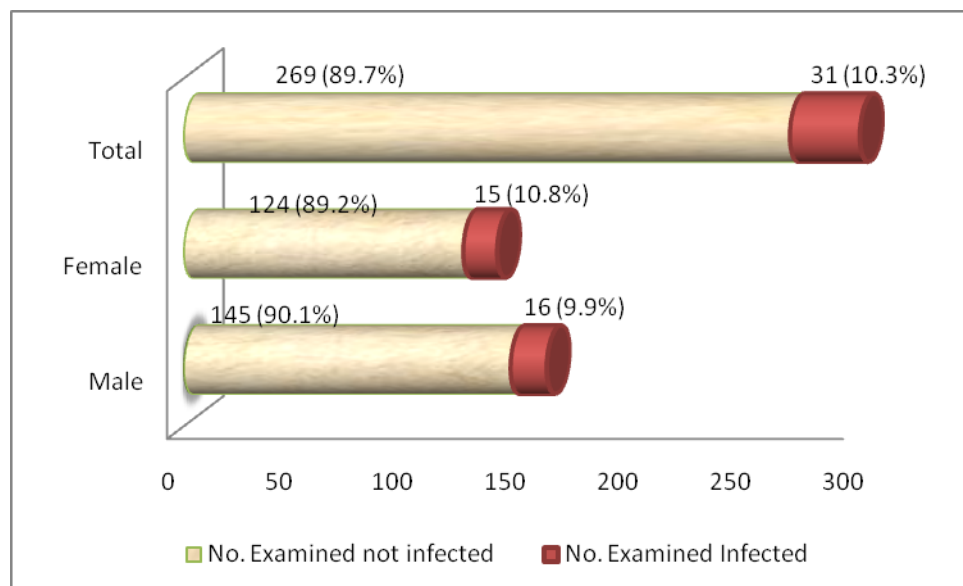


Figure 1: Prevalence of Malaria Parasite among Secondary School Students in Oba by Sex

Figure 1 shows that among males involved in study, 16 were positive (9.9%) and considering females, only 15 females were positive on test of malaria which presents 10.8%. Out of 31 (100%) infected students, amazingly we found more males 16 (51.6%) than females 15 (48.4%) were positive for malaria parasite. Bearing in mind the total sample size used, positive males present 5.3% (16) and the females present 5.0% (15). However, this observed difference was not statistically significant ($p=0.809$, $p>0.05$).

Table 1: Intensity of Malaria Infection among Secondary School Students in Oba by Age and Sex.

Age Group	Sex	No Examined	No Infected (%)	+	++	+++	++++
< 18	M	82	10(12.2)	9(90.0)	1(10.0)	0(0.0)	0(0.0)
	F	82	12(14.6)	11(91.7)	1(8.3)	0(0.0)	0(0.0)
	T	164	22(13.4)	20(90.9)	2(9.1)	0(0.0)	0(0.0)
≥18	M	79	6(7.6)	6(100.0)	0(0.0)	0(0.0)	0(0.0)
	F	57	3(5.3)	3(100.0)	0(0.0)	0(0.0)	0(0.0)
	T	136	9(6.6)	9(100.0)	0(0.0)	0(0.0)	0(0.0)
TOTAL	M	161	16(9.9)	15(93.8)	1(6.3)	0(0.0)	0(0.0)
	F	139	15(10.8)	14(93.3)	1(6.7)	0(0.0)	0(0.0)

T	300	31(10.3)	29(93.6)	2(6.5)	0(0.0)	0(0.0)
T	300	31(10.3)	29(93.6)	2(6.5)	0(0.0)	0(0.0)

Key:

HPF: High Powered Field

+ = 1-10/100HPF

++ = 11-100/100HPF

+++ = 1-10/HPF

++++ = >10/HPF

Table 1 shows that there was a low intensity of malaria infection among the subjects. None of the subjects' recorded +++ and ++++ levels of malaria intensity. However, two students (6.5%), one male and one female aged below 18 years recorded ++ level of malaria intensity, while the other 29 (93.6%) infected subjects recorded + level of malaria intensity.

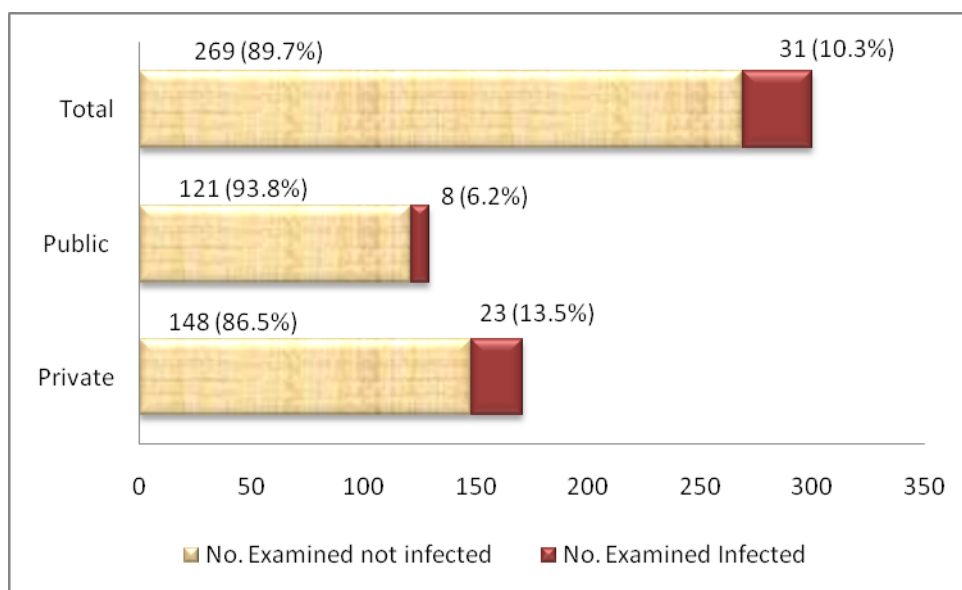


Figure 2. Prevalence of Malaria among the Public and Private School Students in Oba.

The high number of students used during this study came from private schools 171 (57%) and other 129 (43%) are students who studied in public schools. Distribution of malaria by schools shows that the private schools recorded the highest prevalence of malaria infection 23(13.5%) while the public schools recorded the least prevalence 8(6.2%). This difference in the distribution of malaria infection by schools was found to be statistically significant ($p=0.026$, $p < 0.05$).

DISCUSSION

This study has shown a total malaria prevalence of 10.3% with low and medium intensity. The observed low parasitaemia agrees with the study of Ahmed (2001) who reported a prevalence rate of 6% in Maiduguri North Eastern Nigeria. However, this is in contrast with reports of Mbanugo et al, (2004) who recorded a high prevalence rate of 77.4% in Owerri and Ukpai and Ajolu, (2001) with prevalences of 75% in Owerri and 85.5% in Okigwe. *P.falciparum* being the only species found is in line with other studies that malaria is holoendemic in Nigeria with *P.falciparum* as the dominant species (Umeanaeto et al, 2006 and Mbanugo et al, 2004).

Prevalence rates of malaria infection were similar in males and females because observed difference was not statistically significant ($p=0.809$, $p> 0.05$). This explains the fact that the mosquito vectors can bite anybody and does not discriminate between age and sex. The low prevalence and intensity (+) of parasitaemia recorded could be as a result of the period of the study January to April, which is the early part of the wet season when the mosquito breeding sites are few. Other studies carried out in the wet season showed a higher prevalence. Eneanya (1998) recorded a prevalence of 59.8% in Udi, Enugu state and Aribodor et al, (2003) recorded a prevalence of 76% in Azia community Anambra state.

The private schools had higher malaria prevalence than the public schools. The low prevalence among the public schools may be attributed to the fact that the public schools have boarding facilities and the students use mosquito bed nets which is expected to reduce mosquito bites and malaria parasite transmission. The students of the private schools are all day students without boarding facilities and may be exposed to mosquito bites and transmission within the community.

CONCLUSION AND RECOMMENDATIONS

Since malaria infection and fever rates are increased in areas of stable transmission, the challenge is to step up malaria control efforts at various levels of health system, tailor responses to community needs and optimize the use of scarce resources for integrated service delivery. The findings of this study emphasize the need for health education in school, churches and community in order to control malaria in the area. In this case, a more plausible rapid and cheap approach in the control should be through education, individual and community participation, which must focus on the cause, prevention and control of infection. Strategies include:

- Including malaria preventive measures in the existing school curriculum
- Health education should lay emphasis on mosquito avoidance measures as an important component of education and counseling in malaria endemic areas.

- Awareness campaign on the benefits of Insecticide treated Bed nets should be promoted and if possible supplied to secondary school students as a means of preventing mosquito bites.

COMPETING INTERESTS

The authors declare that they have no competing interests.

ACKNOWLEDGEMENT

The warm thanking is directed to Associated Professor Nwora Ozumba and Dorothy Ezeagwuna for their help during this study.

REFERENCES

1. AHMED, S.G., IBRAHIM, U.A. AND IBRAHIM, G. 2001. Prevalence and clinical significance of malaria parasitaemia in blood donors in Maiduguri, Nigeria. *Nigerian Journal of parasitology*, 22 (1 and 2): 29-34.
2. ARIBODOR, D.N., NJOKU, O.O., ENEANYA, C.I. AND ONYALI, I.O. 2003. Studies on the Prevalence of malaria and management practices of Azia Community in Ihiala L.G.A. *Nigerian Journal of Parasitology vol. 24*, 33-38.
3. ARIBODOR, D.N.; NWAORGU, O.C.; ENEANYA, C.I.; AND ARIBODOR, O.B. 2007. Malaria among Primigravid women attending Antenatal clinics in Awka Anambra State Nigeria. *The Nigerian Journal of Parasitology vol. 28 (1)*: 25-27.
4. De SAVIGNY D., MAYOMBANA C., MWAGENI E., MASANJA H., MINHAI A., MKILINDI Y., MBUYA C., KASALE, H., AND REID G. 2004. Care-seeking patterns for fatal malaria in Tanzania. *Malar J*, 3:27.
5. ENEANYA, C.I. 1998. Seasonal variation in malaria episodes among residents in Udi, a semi urban community in South East Nigeria. *Nigerian Journal of Parasitology vol. 19*, 39-43.
6. FLECK, S.L. AND MOODY, A.H. 1988. Characteristics of malaria parasites in; *Diagnostic Techniques in Medical Parasitology, 1st edition* , Butterworth publishers, London, 5-15.
7. KOCHAR, D.K.; THANYI, L.; JOSHI, A.; AGARWAL, N. AND JAIN, N. 1999. Mortality Trends in *Falciparum* malaria. Effect on gender differences and pregnancy. *Journal of Association of Physiol. India (47)*:774-778.

8. MBANEFO, E.C, OGOLO, B.A, OBI, P.C, OTIJI .M.O. AND ENEANYA, C.I. 2009. Effect of Intermittent Preventive Treatment (IPT) of malaria during pregnancy using Sulfadoxine and Pyrimethamine (SP) on neonatal birth weight in Anambra State, South East Nigeria. *J. of Scientific and Industrial Studies*, vol, 7:2.
9. MBANUGO, J.I. AND EMENALO, S.E. 2004. Prevalence of malaria parasitaemia among blood donors in Owerri, Imo State. *Nigerian Journal of Parasitology* 25:81-85.
10. MERMIN, J., EKWEANU, J.P., LIECHTY, C.A., WERE, W., DOWNING, R., RANSON, R., WEIDLE, P., LULE, J. AND COUTINHO, A. 2006. Effect of cotrimoxazole prophylaxis, antiretroviral therapy and insecticide treated bednets on the frequency of malaria in HIV infected adults in Uganda; a prospective cohort study. *Lancet*; 367:1256-61.
11. SHERMAN, I.W. 1998. A brief history of malaria and discovery of the parasite's life cycle. In. I.W Sherman (ed.), *malaria: Parasite Biology, Pathologogenesis and Protection*, ASM Press, Washington, D.C.
12. SNOW, R.W., GUERRA, C.A., NOOR, A.M., MYINT, H.Y. AND HAY, S.I. 2005. The global distribution of clinical episodes of Plasmodium falciparum malaria. *Nature* 434 (7030): 214-7.
13. STEKETEE, R.W.;WIRIMA, J.J. AND CAMPBELL, C. 1996. The burden of malaria in pregnancy in malaria endemic areas. *Am J Trop Med Hyg*, 64(1-2Suppl):28-53.
14. THE WORLD GAZETTEER, 2007. Location of Oba in Anambra State Nigeria. www.world-gazetteer.com
15. THE WORLD GAZETTEER, 2007. Location of Oba in Anambra State Nigeria. www.world-gazetteer.com
16. UKPAI, O.M. AND AJOLU, E.I. 2001. The prevalence of malaria in Okigwe and Owerri areas of Imo State. *Nigerian Journal of Parasitology*. 22(1and 2) 43-48.
17. UMEANAETO, P.U., EKEJINDU, I.M. AND IFEANYICHUKWU, M.O. 2006. Prevalence and Intensity of Malaria in blood donors at Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi, Anambra State, Nigeria. *Nigerian Journal of Parasitology*. Vol 27, 11-15
18. UNICEF .2004. *Malaria a major cause of child death and poverty in Africa*. United Nations Children's fund (UNICEF), New York.

19. VALLEY, A.; VALLEY, L.; CHANGALUCHA, J.; GREENWOOD, B. AND CHANDRAMOHAN, D. 2007. Intermittent preventive treatment for malaria in pregnancy in Africa: What's new, What's needed. *Malaria Journal* 2007, 6:16.
20. WHO. 2004. A strategic framework for malaria prevention and control in African region. *WHO document*. AFR/MAL/04/01:1-3.
21. WHO. 2007. WHO Fact sheet No. 94, May 2007
<http://www.who.int/mediacentre/factsheets/fs094/en/>.