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Maternal and child health in a rural area of northern Angola: epidemiology of malaria, schistosomiasis, geohelminths, anaemia and malnutrition in a demographic surveillance area

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CISA CENTRO DE INVESTIGAÇÃO EM SAÚDE EM ANGOLA

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Main Objective

To determine the prevalence levels of (and associated variables for) malaria, schistosomiasis (urinary and intestinal), soil-transmitted helminths (STH), anaemia and malnutrition among pre-school (0-5 years old), school-aged (6–15 year old) children and their mothers or caregivers.

THE CISA PROJECT

In 2007 the **CISA project** (*Health Research Centre in Angola,* Visit us on http://www.cisacaxito.org/) was established as a result of a partnership between the Angolan Ministry of Health, the Bengo Provincial Government, the Portuguese Institute for Development Support and the Calouste Gulbenkian Foundation. The aim of the CISA health research centre is to contribute towards solving the main health problems affecting the Bengo region. CISA's first venture was to start a Demographic Surveillance System (DSS) in Northern Angola monitoring >60,000 people

SAMPLE SIZE CALCULATION AND SELECTION

Sample size calculation was based on estimates of infection prevalence levels according to national surveys (21% for schistosomiasis and 35% for STH). **Final sample size estimate number = 2835**. Each commune was divided in 3 regions of equal area, and from each subdivision 3 hamlets were randomly selected (estimated total of 27 hamlets, 9 per commune). From each hamlet, randomly selection of 35 households from the DSS list of eligible households was to take place (at least one caregiver and 2 children); leading to estimated 105 people/hamlet, 945/commune, total of 2835. **Final sample: 36 total hamlets, representing 972 households, 960 mothers and 2379 children (1-15 year old).** See Figures 1 and 2

Fig. 1—Location of CISA Project´s DSS in Angola: Bengo Province (grey and green); a largely rural area surrounding the capital Luanda

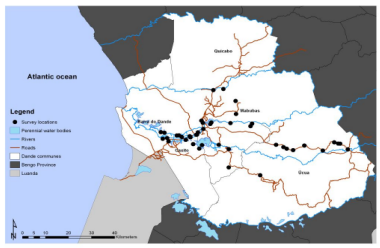

Fig. 2 – Map showing the location of the selected hamlets (black dots) within the DSS area . CISA´s DSS has 60,075 registered inhabitants in 15,643 households distributed in 69 hamlets

Anthropometric measure	No. (%)	CI_{95} (%)
Underweight	437 (23.3)	21.4-25.2
Stunting	781 (32.2)	30.3-34.1
Wasting	104 (9.9)	8.2-11.9
Thinness	258 (10.7)	9.5-12.0

Table 1 – Prevalence of individuals with -2 Z-scores or lower (malnutrition) relating to each of the anthropometric measurements taken in the field: underweight or weight-for-age Z-scores (914 boys and 965 girls aged 6 to 120 months); stunting or height-for-age Z-scores (1148 boys and 1278 girls aged 6 to 240 months); wasting or weight-for-height Z-scores (501 boys and 545 girls aged 6 to 60 months); thinness or BMI-for-age Z-scores (1145 boys and 1276 girls aged 6 to 240 months); BMI stands for body mass index

	N	Mean Hb (SD) in g/L	Prevalence in % (and CI_{95}) of anaemia*
Children (0.5–5 years)	1203	105.4 (15.5)	56.9 (54.0–59.7)
Children (6–12 years)	946	116.2 (14.1)	41.5 (38.4–44.8)
Teenagers (13–15 years)	169	121.5 (13.3)	43.8 (36.2–51.6)
Women (pregnant)	131	110.1 (14.5)	44.3 (35.6–53.2)
Women (non-pregnant)	805	120.4 (14.5)	44.5 (41.0–48.0)

Table 2 – Anaemia (and mean haemoglobin concentrations) in the studied population. SD = standard deviation; CI_{95} = 95% confidence intervals; * anaemia was classified according to age, according to WHO guidelines

Fig 3—General overview of field work, which took place between May and August 2010

Fig 4—Lab technicians and field workers performing rapid diagnostic tests

Principal Findings

Malnutrition and anaemia were found at elevated levels and should be considered public health problems. Malaria and urinary schistosomiasis were frequent, varying heavily according to geographical location, with some hamlets reaching levels above 50%. STH infections, particularly *Ascaris lumbricoides*, were present. Only two cases of egg-patent intestinal schistosomiasis were

	Preschool–aged children	School–aged children	Mothers
No. of individuals recruited	1237	1142	960
Malaria (Giemsa-stained microscopy)	18.4 (16.2–20.6)	18.2 (16.0–20.6)	9.6 (7.8–11.6)
Micro-haematuria (proxy for *S. haematobium*)	10.0 (8.2–11.9)	16.6 (14.5–18.9)	21.7 (19.1–24.4)
Ascaris lumbricoides (Kato–Katz):	15.3 (13.2–17.6)	17.3 (15.1–19.7)	10.7 (8.7–12.9)
Trichuris trichiura (Kato–Katz):	7.2 (5.8–8.9)	13.9 (11.8–16.1)	9.7 (7.8–11.8)
Hookworms (Kato–Katz):	4.2 (3.1–5.6)	6.7 (5.3–8.4)	13.7 (11.5–16.1)
Other intestinal parasites (Kato–Katz)			
Enterobius vermicularis	0.3 (0.1–0.8)	0.2 (0.0–0.7)	0.1 (0.0–0.6)
Hymenolepsis nana	6.2 (4.9–7.8)	7.3 (5.8–9.0)	1.9 (1.1–3.1)
Taenia spp.	0.1 (0.0–0.5)	0.2 (0.0–0.7)	0.1 (0.0–0.6)

Table 3– Prevalence (and CI_{95}) of malaria and neglected tropical diseases. Children were divided into two groups: preschool children (0-5 years of age) and school-aged children (6-15 years of age).

STATISTICAL ASSOCIATIONS

Anemia: In children, associated with malaria and micro-haematuria. None of the variables tested was significantly associated with anaemia prevalence in mothers.
Malaria: In children, knowledge of mothers decreases odds of infection; in mothers, being pregnant and having been treated for malaria in the past decrease the odds of infection
Schistosomiasis: in children, bathing at the dam or river increase odds of infection; in mothers, frequent contact with water bodies increases odds of infection.
STHs: having seen worms in stool in the past, regular abdominal pain, are risk factors for infection. Infection with one STH increases the risk of infection for other STHs, in children and mothers.

CONCLUSIONS

- **Malaria, urinary schistosomiasis and STHs were endemic in the studied population. Even though prevalence levels may not be as dramatic as those documented for many endemic areas of sub-Saharan Africa, their impact is felt by the communities surveyed, with levels of anaemia and malnutrition significantly linked to many of the infections investigated here.**
- **Using a demographic surveillance system as platform for planning and implementation of a cross-sectional survey could allow for rigorous follow up of subsequent intervention strategies attempting to tackle these problems.**
- **Further studies should also investigate the geographical variation in the prevalence of infections and associated morbidities investigated here, which can impact disease control policies.**

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