

## **Chapter 25**

### **MLOMP DSS, SENEGAL**

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#### **Site description**

##### **Physical geography of the Mlomp DSA**

The Mlomp DSS site, about 500 km from the capital, Dakar, in Senegal, lies between latitudes 12°36' and 12°32'N and longitudes 16°33' and 16°37'E, at an altitude ranging from 0 to 20 m above sea level (Figure 25.1). It is in the region of Ziguinchor, Département of Oussouye, in southwest Senegal, near the border between Senegal and Guinea-Bissau. It covers about half the Arrondissement of Loudia-Ouolof. The Mlomp DSS site is about 11 km × 7 km and has an area of 70 km<sup>2</sup>. Villages are households grouped in a circle with a 3-km diameter and surrounded by lands that are flooded during the rainy season and cultivated for rice.

**Figure 25.1. Location of the Mlomp DSS site, Senegal (monitored population, 6200).**



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The site is in a Guinea savannah and mangrove ecological zone. The area has a rainy season from June to October and a dry season from November to May and had an average rainfall of 1230 mm a year during 1984–95.

#### **Population characteristics of the Mlomp DSA**

The Mlomp DSS site had a population of 7591 on 1 January 2000 and a population density of 108 inhabitants/km<sup>2</sup>. It has 11 villages. Most people belong to the Diola ethnic group and are animists, with a large minority of Christians and a few Muslims. People speak Diola, and most also speak Oulof, the main national language in Senegal, and French, the teaching language at school. The area is rural, and rice cultivation is the main economic activity. The majority of the adult population engages in seasonal migrations. The residential unit is a household housing a family of 6.3 persons on average, and polygyny is rare.

The first school opened in 1949; two other primary schools, in 1960 and 1972; and a secondary school, in 1985. That year 17% of women  $\geq 15$  years old had been to school for at least 1 year compared with 53% of girls 7–14 years old.

Most dwellings are of mud. Houses are covered with thatched roofs (66% of houses in 1990) or corrugated iron (33%). A large majority of them (74%) have no toilet facilities; the rest (26%) have pit latrines. Water is from wells. No one has electricity. The area is 10 km from the small city of Oussouye and 50 km from the regional capital, Ziguinchor. Ziguinchor has the closest hospital where a caesarian section can be performed. Local tar roads are passable most of the year.

A nongovernmental health centre, run by French Roman Catholic nurses, was opened in 1961 in the centre of the area. It is well supplied with medicines and equipped to perform simple laboratory tests. The village also runs a maternity clinic, opened in 1968, close to the health centre. The proportion of deliveries occurring at a maternity facility increased from 50% in 1961 to >95% in 1970 (Enel et al. 1993). Most of the children (99%) are correctly vaccinated with measles, yellow fever, BCG (bacillus Calmette-Guérin), and diphtheria–pertussis–tetanus–polio vaccines (as recommended by the expanded immunization program) (Pison, Trape, et al. 1993).

In the 1970s and 1980s, anthropometry surveys with monthly visits for children <5 years old were conducted (the age limit was reduced to 3 years old in 1985). Most children were enrolled in this program (94% in 1989). Since 1989 the program has continued, but with diminishing coverage, as parents have no longer been receiving supplementary food for themselves and their children.

Malaria surveys carried out in the 1960s indicated that malaria was mesoendemic. An antimalaria program was started in 1975, promoting regular intake of chloroquine for everyone during the rainy season. Families were also encouraged to keep a stock of chloroquine at home and treat any case of fever with this drug. Until 1989, this program reduced the parasite rate in children during the rainy season to <10%. Following the emergence of chloroquine resistance in 1990, the parasite rate in children rose sharply, reaching 46% in 1992 and 51% in 1994. Chloroquine resistance (measured in vivo) progressed from 36% in 1991 to 46% in 1995 (Trape et al. 1998).

Serological surveys conducted in 1990 and 1995 showed an HIV seroprevalence close to 1% among individuals  $\geq 20$  years old and an annual incidence rate of 1 per 1000 each year during the period 1990–95 (Le Guenno et al. 1992; Diop et al. 2000).

One particular feature of Mlomp is seasonal migration (Enel and Pison 1992; Pison, Le Guenno et al. 1993; Enel, Pison et al. 1994): the majority of the adult population is absent for more than half of the year (7 months on average). Eighty percent of unmarried women 15–24 years old are employed as house servants in the main cities of Senegal and The Gambia; once married, women usually stay at home all year round. Eighty percent of men 20–40 years old migrate and continue to migrate after marriage and until of advanced age. The proportion of migrants diminishes among those  $\geq 40$  years old, however, and is  $< 50\%$  among those  $\geq 60$  years old. Middle-aged men migrate to harvest palm wine in other villages of the same region, or in other regions, or near the main cities of Senegal or The Gambia. Younger men migrate to fish.

## **Mlomp DSS procedures**

### **Introduction to the Mlomp DSS site**

When the Mlomp project started in 1985, Senegal already had two rural areas under long-term demographic and epidemiological surveillance: Bandafassi, in the southeast, where surveillance started in 1970; and Niakhar, in the west centre, where surveillance started in 1962. As in Bandafassi, the Mlomp project's main objective was to study the demographic and health situation of an African rural population to observe changes over time and examine the factors involved (Pison, Trape et al. 1993). The Mlomp site is in the southwest Casamance region of Senegal, a region with historic, economic, and ethnic patterns very different from those of the other sites and consequently providing the opportunity to better cover the diversity of demographic and epidemiological situations in the country.

The baseline survey, conducted in Mlomp in late 1984 and early 1985, found a population of 6218. The extent of the area under surveillance has not changed, but the population had increased to 7591 by the beginning of 2000.

The Mlomp studies are managed by a team of researchers from several institutions based in Senegal and France, and several doctoral students from both countries work in the projects. In France, the main institution involved is the Institut national d'études démographiques (national institute for demographic studies) in Paris. In Senegal, the institutions involved are the Unité de paludologie afro-tropicale (organization for the study of tropical African malaria) from the Institut de recherche pour le développement (institute for development research), the Programme national de lutte contre le SIDA (national program for the fight against AIDS) of the Ministry of Health, and Cheikh Anta Diop University (University of Dakar), which has several students working in the project.

### **Mlomp DSS data collection and processing**

#### *Field procedures*

**INITIAL CENSUS** — The initial census was followed by several surveys designed to improve the information of the census and collect other data needed for subsequent studies. These included an age survey to estimate ages of adults and children or improve the unreliable data collected on these during the census. It also included a genealogical survey to collect

genealogies, going up to known ascendants and down to living collateral relatives. One use of the genealogies in the project is to get detailed information on the relationships between members of a compound and in particular the relationship of each one to the head of the compound (Pison 1985). Finally, a union- and birth-histories survey was conducted for adult men and women.

At the census, a person was considered a member of the compound if the head of the compound declared it to be so. This definition was broad and resulted in a *de jure* population under study. Thereafter, a criterion was used to decide whether and when a person was to be excluded or included in the population.

A person was considered to exit from the study population through either death or emigration. Part of the population of Mlomp engages in seasonal migration, with seasonal migrants sometimes remaining 1 or 2 years outside the area before returning. A person who is absent for two successive yearly rounds, without returning in between, is regarded as having emigrated and no longer resident in the study population at the date of the second round. This definition results in the inclusion of some vital events that occur outside the study area. Some births, for example, occur to women classified in the study population but physically absent at the time of delivery, and these births are registered and included in the calculation of rates, although information on them is less accurate. Special exit criteria apply to babies born outside the study area: they are considered emigrants on the same date as their mother.

A new person enters the study population either through birth to a woman of the study population or through immigration. Information on immigrants is collected when the list of compounds of a village is checked ("Are there new compounds or new families who settled since the last visit?") or when the list of members of a compound is checked ("Are there new persons in the compound since the last visit?"). Some immigrants are villagers who left the area several years before and were excluded from the study population. Information is collected to determine in which compound they were previously registered, to match the new and old information.

Information is routinely collected on movements from one compound to another within the study area. Some categories of the population, such as older widows or orphans, frequently move for short periods of time and live in between several compounds, and they may be considered members of these compounds or of none. As a consequence, their movements are not always declared.

**REGULAR UPDATE ROUNDS** — The Mlomp DSS is a multiround demographic surveillance, with annual rounds. Once each year, in February and March, all compounds are visited, and information on events occurring since the last visit is collected. This is done in three steps. First, the list of people present in each compound at the preceding visit is checked, and information is obtained on new births, marriages, migrations, deaths, and current pregnancies. Information is provided by the head of the compound or key informants in the village or hamlet. The information on events is recorded directly on the nominative list.

**CONTINUOUS SURVEILLANCE** — Information provided by local registers is matched with that collected independently during the surveillance. Information from registers with fair quality is used to systematically correct errors and complete the information collected at the yearly rounds. These are maternity-clinic registers (for prenatal visits and deliveries), civil and parish registers (for births), and dispensary or hospital registers (for death, growth

monitoring, and vaccinations). The local dispensary collaborates with the research project, and one completes several registers, in particular a death register. Although the local registers rarely cover the entire population and are sometimes subject to errors, using them improves the quality and the precision of data. Verbal autopsies (VAs) have been performed for all deaths since the beginning of the study. For each death identified in the first step of the annual surveillance, information on its cause is obtained from a close relative of the dead person, usually the mother in the case of a child's death, using a VA questionnaire.

Other information not part of the routine data has been collected at various times. These included serological, parasitological, or resistance surveys for sexually transmitted disease and malaria studies (Enel and Pison 1992; Enel, Lagarde et al. 1994; Enel, Pison et al. 1994; Lagarde et al. 1995; Lagarde et al. 1996a, b, 1997, 1998; Diop et al. 2000; Lagarde et al. 2000); and contraceptive-prevalence, breastfeeding, and nutritional surveys.

#### *Data management and analysis*

Information collected during the baseline and follow-up surveys has been coded and stored in databases designed in the 1970s and 1980s, with some adaptations since then. The information collected during each annual surveillance is processed in two steps: in the villages, it is entered into laptops, with state-of-the-art software, during the surveillance; thereafter, the information is verified and added to the database, using PostgreSQL software.

### **Mlomp DSS basic outputs**

#### **Demographic indicators**

The total (*de jure*) population is 7591 (population size on 1 January 2000). The sex ratio in the total population was 1.04. The age structure in the total population was as follows: 1.7% was <1 year old; 9.8%, 0–4 years old; 23.3%, 5–14 years old; 59.3%, 15–64 years old; and 7.6%, ≥65 years old. The total fertility rate was 4.0. The dependency ratio was 0.687. The infant mortality rate was 59/1000. The mean household size was 6.3, and the adult literacy rate in females was 17% in 1985. Life expectancy at birth for females was 64 years and for males was 56 years. The maternal mortality ratio for the period 1985–98 was 436 per 100 000 live births.

#### **Fertility and child-mortality trends**

In Mlomp, the total fertility (Table 25.1) declined rather rapidly from 5.3 children per woman in 1985–89 to 4.3 in 1990–94 and 3.6 in 1995–99. In Bandafassi (see Chapter 24), in contrast, the total fertility rate has not changed over the last 20 years: it was 6.4 children per woman on average during the period 1980–89 and 6.5 during the period 1990–99.

Trends in child mortality also differ between these two sites. In Mlomp, child mortality, although comparatively low, has not decreased: under-five mortality rate (*sq0*) was 87 per 1000 in 1985–89, 124 per 1000 in 1990–94, and 100 per 1000 in 1995–99.

Table 25.2 shows the age- and sex-specific all-cause mortality at the Mlomp site.

**Table 25.1. Age-specific fertility rates at the Mlomp DSS site, Senegal, 1985–99.**

Age (years)	1985-89			1990-94			1995-99		
	PY	Births	Births/PY ( $\times 1000$ )	PY	Births	Births/PY ( $\times 1000$ )	PY	Births	Births/PY ( $\times 1000$ )
10-14	2146.94	3	1.40	2419.41	1	0.41	2213.92	1	0.45
15-19	2044.72	76	37.17	2215.70	76	34.30	2493.85	83	33.28
20-24	1532.74	187	122.00	1835.06	229	124.79	1947.26	199	102.39
25-29	789.01	159	201.52	1231.62	189	153.46	1440.96	208	144.35
30-34	537.74	146	271.51	693.27	135	194.73	984.57	178	180.79
35-39	562.38	143	254.28	487.66	100	205.06	631.37	100	158.39
40-44	529.44	81	152.99	539.55	68	126.03	491.84	46	93.53
45-49	716.07	19	26.53	517.40	14	27.06	535.50	3	5.60
50-54	672.50	1	1.49	699.31	0	0.00	525.16	1	1.90

**Note:** PY, person-years.

**Table 25.2. Age- and sex-specific mortality at the Mlomp DSS site, Senegal, 1995-99.**

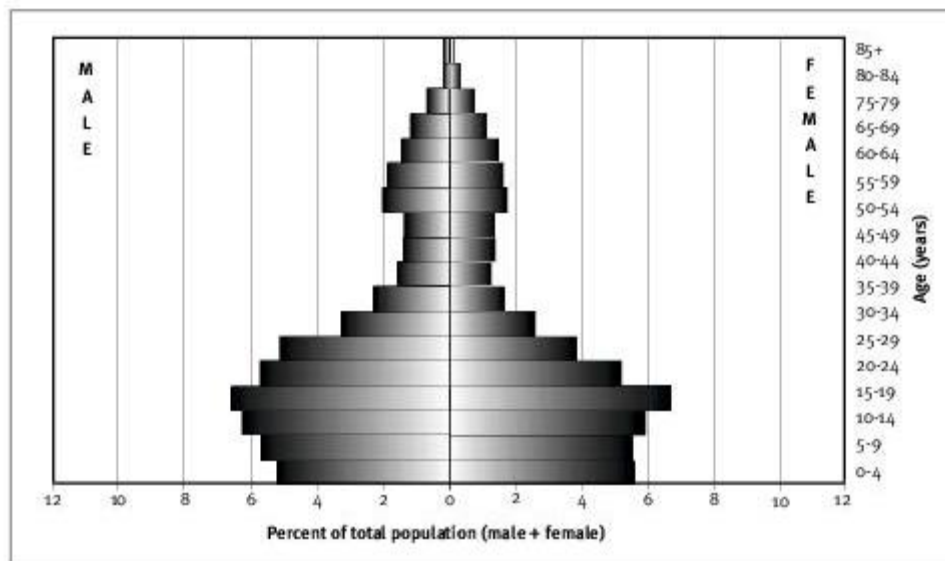
Age (years)	Deaths ( ${}_nD_x$ )		Person-years observed ( ${}_nPY_x$ )	
	Male	Female	Male	Female
<1	18	39	361	372
1-4	17	23	1551	1717
5-9	7	7	2097	2076
10-14	4	1	2298	2209
15-19	5	0	2417	2488
20-24	4	4	2097	1943
25-29	5	3	1884	1438
30-34	3	1	1187	982
35-39	8	2	824	630
40-44	2	2	558	491
45-49	7	6	491	534
50-54	5	1	484	524
55-59	9	7	719	665
60-64	10	13	664	620
65-69	20	5	509	569
70-74	25	20	408	433
75-79	30	22	221	293
80-84	7	23	38	143
$\geq 85$	9	20	38	78
Births	819			
CDR	10.09			
CBR	22.10			
CRNI	12.01			

**Note:** CBR, crude birth rate (actual number of births per 1000 population); CDR, crude death rate (actual number of deaths per 1000 population); CRNI, crude rate of natural increase (CBR minus CDR per 100; does not take into account migration);  ${}_nD_x$ , observed deaths between ages  $x$  and  $x+n$ ;  ${}_nPY_x$ , observed person-years between ages  $x$  and  $x+n$ .

### Age structure

The age pyramid of the Mlomp population on 1 January 2000 is affected by two troughs (Figure 25.2). The first is for those 40-59 years old; it corresponds to individuals who were born during the period 1940-60. Two factors have contributed to this trough. First, during World War II a large proportion of young adult men were enrolled in the French army; as a result, fewer marriages and births occurred during that period. Second, the emigration to cities may have increased with the generations born in 1940 and after. The second trough is at the base of the pyramid. It is a result of the recent fertility decline, which has been very rapid in the Mlomp community.

**Figure 25.2. Population pyramid for the observed population at the Mlomp DSS site, Senegal, 1 Jan 2000.**



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