Impact of tuberculosis exposure at home on mortality among children less than 5 years old in Guinea-Bissau

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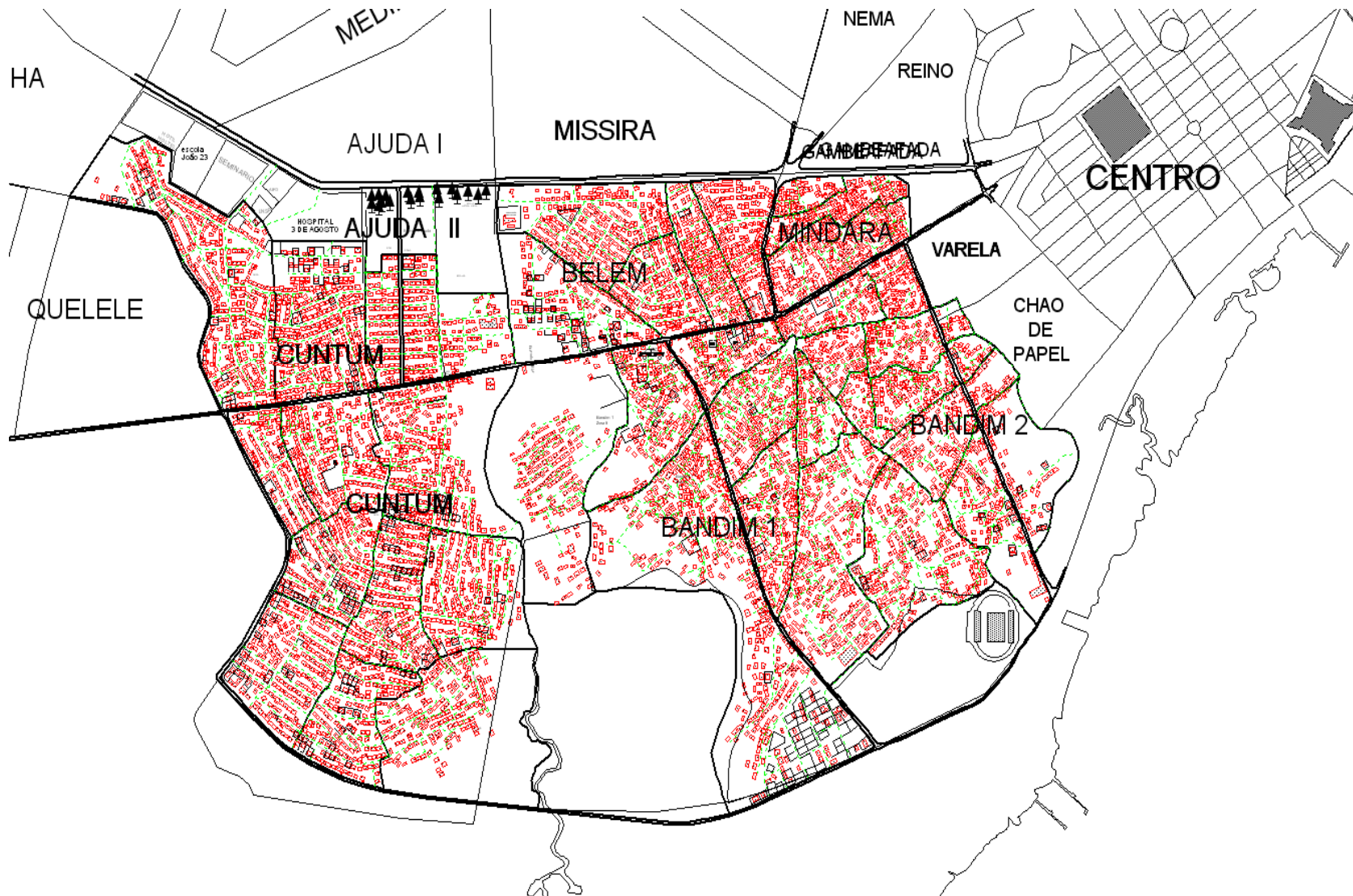Projecto de saúde

BANDIM

Objective

- To assess the mortality related to tuberculosis (TB) exposure at home among children in an urban area of Guinea-Bissau
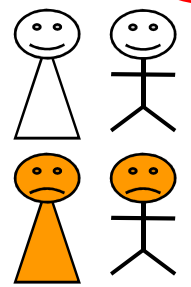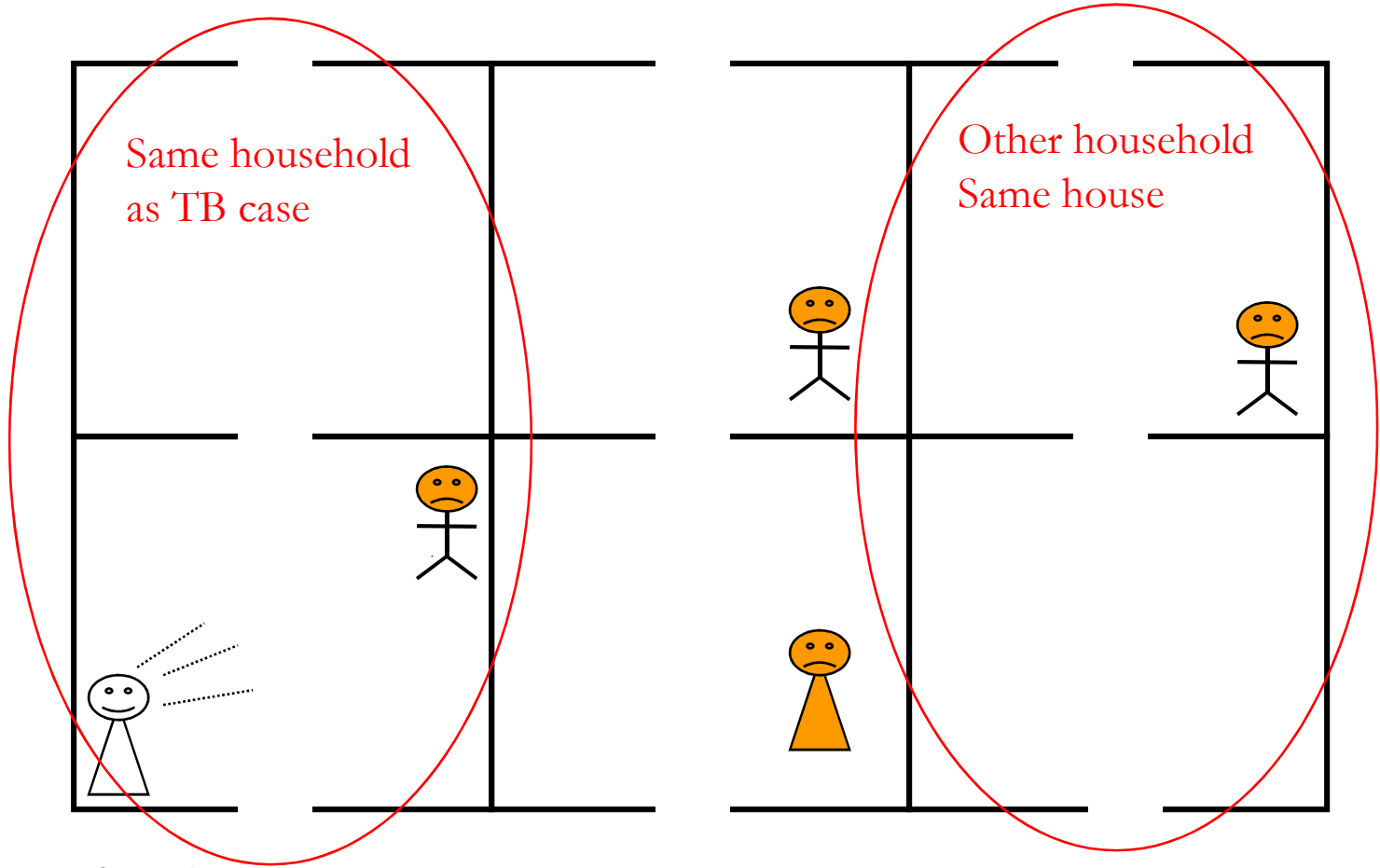
Settings (Where?)

The Bandim Health Project study area

Crowding and intensive exposure

Same household
as TB case

Other household
Same house

TB case

Exposed to TB case

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TB in the study area

- Study population: 92,000 inhabitants

- TB Incidence (adults): 471 per 100,000 PYO

- Smear positive (adults): 177 per 100,000 PYO

- Around 40% TB/HIV co-infected

- Mortality: 27% at 1½ year of follow up

Ref: Gustafson P, et al. Tuberculosis in Bissau: incidence and risk factors in an urban community in sub-Saharan Africa. Int J Epidemiol 2004; 33(1):163-172.

TB cases & exposed children
(May 1996-June 1998)

Adult TB cases

- Resident or guest (temporarly)
- Sputum smear positive
- Sputum smear negative
  - Broad spectrum antibiotics with no improvement after 2 weeks, persistance of cough and fever,
  - Chest **X-ray** suggestive of active TB (WHO guidelines)

Children

- <5 years of age
- Living in the same house as the adult TB case 3 months before treatment initiation

Survival analysis

- Retrospective cohort study
- High neonatal mortality: Analysis was delayed to start at 3 months of age.
- Follow up terminated at 5 years of age
- Follow-up stopped in June 1998 (civil war)

- 3 months delay from symptoms to treatment was assumed. Children living with the TB index cases 3 months before treatment were considered exposed
  - Contributed with unexposed PYO until exposure
  - Contributed with exposed PYO after exposure
- All other children in the community were used as controls
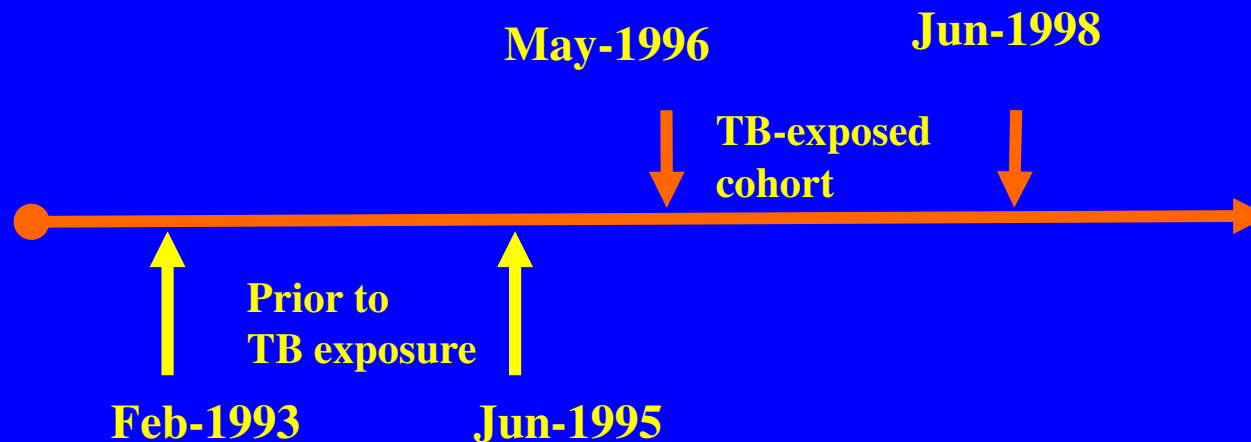
The effect of exposure on mortality
Feb 1996 - June 1998

Age Months	Exposed N=841 Rate (Deaths/PYO)	Unexposed N=12483 Rate (Deaths/PYO)	MRR
3-11	0.05 (4/73)	0.07 (191/2800)	0.80 (0.3-2.2)
12-35	0.06 (22/360)	0.04 (247/6590)	**1.68 (1.1-2.6)**
36-60	0.04 (15/418)	0.02 (88/5720)	**2.38 (1.4-4.1)**
All	0.05 (41/851)	0.03 (526/15100)	**1.66 (1.2-2.3)**

TB exposure associated with 66% higher child mortality.

Adjustment for gender, ethnicity, district, socio-economic status, schooling of the mother and child crowding did not have any impact.

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TB exposure and Mortality

May-1996   Jun-1998

TB-exposed
cohort

Prior to
TB exposure

Feb-1993   Jun-1995

Maybe the effect could be due to TB being more common in houses with high mortality, we looked at the same houses 3 years earlier.

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Mortality 3 years before the exposure
Feb 1993 - June 1995

Age Months	Exposed N=720 Rate (Deaths/PYO)	Unexposed N=11543 Rate (Deaths/PYO)	MRR
3-11	0.09 (6/70)	0.08 (199/2570)	1.14 (0.5-2.5)
12-35	0.05 (19/383)	0.06 (348/5930)	0.85 (0.5-1.3)
36-60	0.02 (5/303)	0.02 (87/4800)	0.91 (0.4-2.2)
All	0.04 (30/756)	0.05 (634/13300)	0.90 (0.6-1.3)

The high mortality in the TB houses was not because these families always had a high mortality

Mortality Rate Ratio from a model with age as underlying time

Mortality by time since exposure and age at exposure

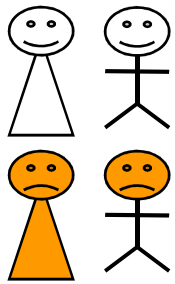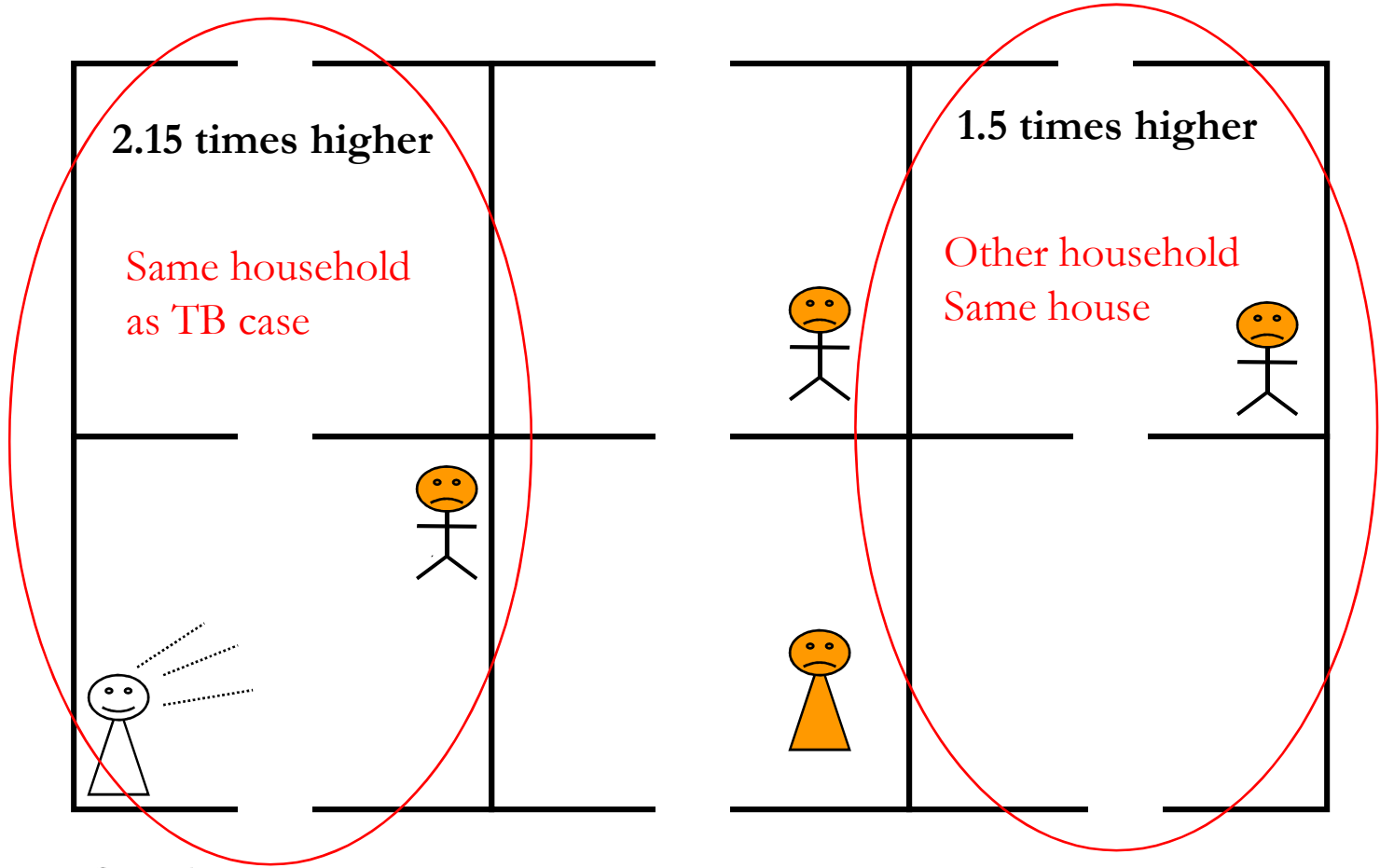| Months since exposure	Age at exposure (Months)			
	0-11	12-35	36-59	Total
0-5 months	1.23 (0.5-2.8)	0.96 (0.4-2.3)	1.52 (0.5-4.8)	1.16 (0.7-2.0)
6-11 months	**2.22 (1.1-4.7)**	1.89 (0.8-4.2)	**4.68 (1.7-13)**	**2.36 (1.5-3.8)**
12+ months	0.89 (0.2-3.6)	1.91 (0.8-4.6)	**7.18 (2.1-24)**	**1.88 (1.0-3.5)**
Total	1.46 (0.9-2.5)	1.46 (0.9-2.4)	**3.00 (1.6-5.8)**	**1.66 (1.2-2.3)**

Increased mortality:

- **Older than 3 years of age at exposure**
- **More than 6 months after exposure**

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Mortality according to proximity to and health status of the adult TB case

		Rate (Death/PYO)	MRR
Unexposed		3.48 (526/15100)	1
Proximity in the House	Same Household	5.94 (13/219)	**2.15 (1.3-3.7)**
	Different Household	4.43 (28/632)	**1.51 (1.0-2.2)**
Relation to the TB case in the house	Mother	17.9 (2/11)	**7.82 (2.1-30)**
	Other Relation	4.01 (22/548)	1.42 (0.9-2.2)
	TB case was a guest	5.82 (17/292)	1.92 (1.2-3.1)
Smear status of the TB case	Positive	5.35 (15/281)	**1.90 (1.1-3.2)**
	Negative	4.56 (26/570)	**1.55 (1.0-2.3)**

Close contact to the index case was associated with higher TB-related mortality

2.15 times higher

Same household
as TB case

1.5 times higher

Other household
Same house

TB case

Exposed to TB case

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Mortality according to proximity and HIV status of TB index case in the exposed cohort

		HIV positive Index case MRR	HIV negative Index case MRR
Unexposed		1	1
Proximity in the House	Same Household Same House	**2.58 (1.1-6.2)** 1.48 (0.8-2.7)	**1.91 (1.0-3.8)** 1.46 (0.9-2.4)
Relation to the TB case	Mother Other Relative TB case is a guest	**304 (164-566)** 1.27 (0.6-2.5) 2.31 (1.1-4.9)	**4.53 (0.8-26)** 1.47 (0.9-2.5) 1.66 (0.9-3.1)
Smear status of the TB case	Positive Negative	**1.76 (0.7-4.6)** 1.70 (1.0-3.0)	**1.93 (1.1-3.5)** 1.39 (0.8-2.4)

The risk of TB-related mortality was not modified
by the HIV status of TB index case.
(NB: 23% of index cases had no information about HIV status)

Limitations of the study

Problems	Response
No HIV status of children	The original TB study did not focus on exposed children and there were no resources to counsel, test and follow up all children
Isoniazid resistance in index case	Results were not available if done
Weight change in children	Not collected
Changes in socio-economic status	Not collected

CONCLUSIONS

House contact with an adult TB case:

Increased mortality among children < 5 years old

- 6 months or more after exposure

- For children 3-4 years old at the time of exposure

- Excess mortality particularly high if mother had TB

- Excess mortality was also high in the same household

- Mortality was not modified by HIV status of TB index case

CONCLUSIONS

Sputum smear positivity:

- Excess mortality was higher when adult TB case was sputum smear positive

- But there was also increased mortality among children exposed to a smear negative adult TB case

Thank you for your attention