

# Human mobility and malaria history in a periurban community of the Peruvian Amazon

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## INTRODUCTION

- Human mobility is a main driver of *Plasmodium vivax* local transmission in rural amazonian communities.<sup>1</sup>
- However, in periurban settings the same mechanisms may not apply due to roads and electricity availability resulting in a broad range of night activities.<sup>2</sup>
- We applied a movement/travel patterns survey to assess the effect of being outside the house during mosquito-biting hours on malaria episodes in a year.

## METHODS

- Site: Zungarococha have four villages (aprox. 2700 inhabitants) interconnected by dirt road and one river.
- Location: 5km southwest of Iquitos city (45min by car from main square) connected by paved and dirt road.
- Population: Adults (>18years-old) from Zungarococha community during the dry season (July-August 2017).
- Data collection: Cross-sectional household survey.

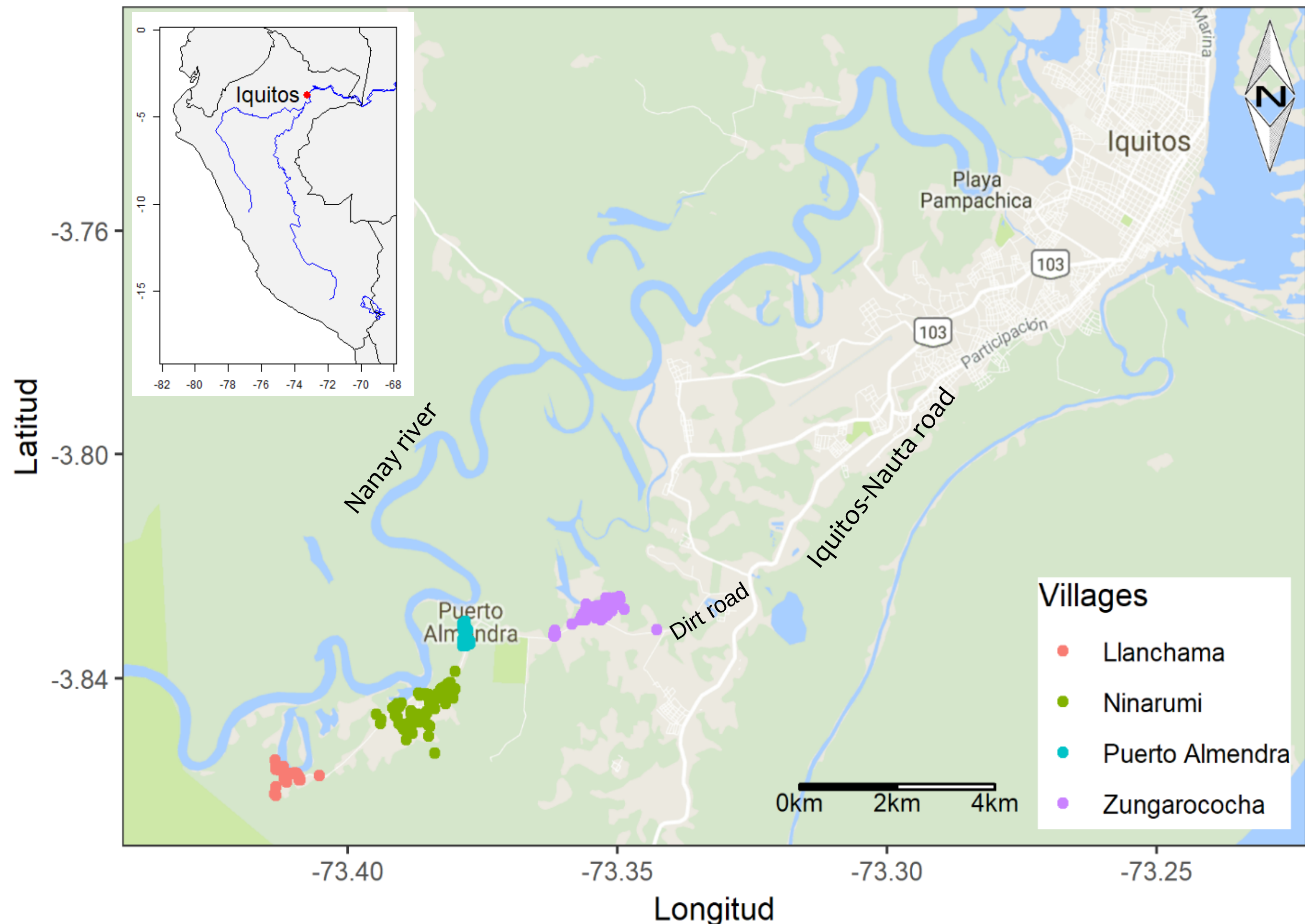


Figure 1. Map of study site.

- Operationalization of Human Movement variables:
- For one or at least two daily trips, in the last week:
  - 1)**Outside the house in a range of hours**: Subtraction of the arrival and departure time from house, within two ranges: 18h-05:59h, 06h-15:59h. R function available\*\*.
  - 2)**Destination**: Place you went during time out of house.
  - 3)**Transport**: Mode used to arrive to the destination.
  - 4)**Length**: Time it took to arrive to the destination.
- Malaria history: Self-report of past episodes diagnosed by a health worker by microscopy, in the last year.
- Statistical analysis: Determine prevalence ratios (PR) of malaria episodes (last year) w/ a poisson-log regression using age, sex, work, village, education as confounders.

## FUNDING



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**Code**\*\*<sup>§</sup>: [github.com / avallecam / movmal](https://github.com/avallecam/movmal)

## RESULTS

Table 1. Adult Population of Zungarococha, Iquitos 2017 (N=427)

Characteristics	N (%)
Age (years) *	39.1 ± 15.6
Sex: Women	276 (65.7)
Village	
Llanchama	76 (17.8)
Ninarumi	166 (38.9)
Puerto Almendra	62 (14.5)
Zungarococha	123 (28.8)
Education	
Primary	192 (46.7)
Secondary	182 (44.3)
Superior	37 (9.0)
Main activity	
Indoor	326 (77.4)
Outdoor <sup>†</sup>	95 (22.6)
Short travel (1 night - 1 month): Yes	71 (20.3)
Long travel (more than 1 month): Yes	64 (17.8)
Outside the house between 06:00-17:59h: Yes	347 (81.3)
Outside the house between 18:00-05:59h: Yes	54 (12.6)
Malaria episodes (last year): Yes	86 (20.5)

\* Mean ± standard deviation  
<sup>†</sup> Agriculture, farming, fishing, construction, logging, and transport

Table 2. Movement patterns by day of the week

Characteristic	Weekday	Weekend	p <sup>†</sup>
	N (%)	N (%)	
Destination			
Market	53 (41.1)	76 (58.9)	<0.001
Work	83 (68.6)	38 (31.4)	0.003
House of friend	7 (58.3)	5 (41.7)	1.000
House of family	21 (36.8)	36 (63.2)	0.002
Chacra	44 (81.5)	10 (18.5)	<0.001
Educational center	16 (88.9)	2 (11.1)	0.010
Other	26 (36.1)	46 (63.9)	<0.001
Transport			
Omnibus or Jumbo	22 (44.0)	28 (56.0)	0.085
Public “mototaxi”	71 (37.0)	121 (63.0)	<0.001
Private motorcycle	26 (43.3)	34 (56.7)	0.041
bote or “peque peque”	29 (80.6)	7 (19.4)	0.005
walking	137 (73.7)	49 (26.3)	<0.001
Length (minutes)	15 [5 - 45]	40 [10 - 60]	<0.001

<sup>†</sup> Fisher or Wilcoxon test for differences between days against any other alternative in destination or transport

## RESULTS (cont.)

- 427 subjects were enrolled. Living time in current household median was 12 years [IQR: 3 – 23 years].
- 66.2% lived in households with four walls. Self-report high usage of bednets (99.8%) and insecticide (93.7%).
- The main indoor activity was housewife (n=268, 63.7%), and outdoor was agriculture (n=49, 11.6%).
- In weekdays, work (33.2%) and walking (48.1%) were the main pattern, while weekends was market (35.7%) and public “mototaxi” (50.6%) with longer trips.

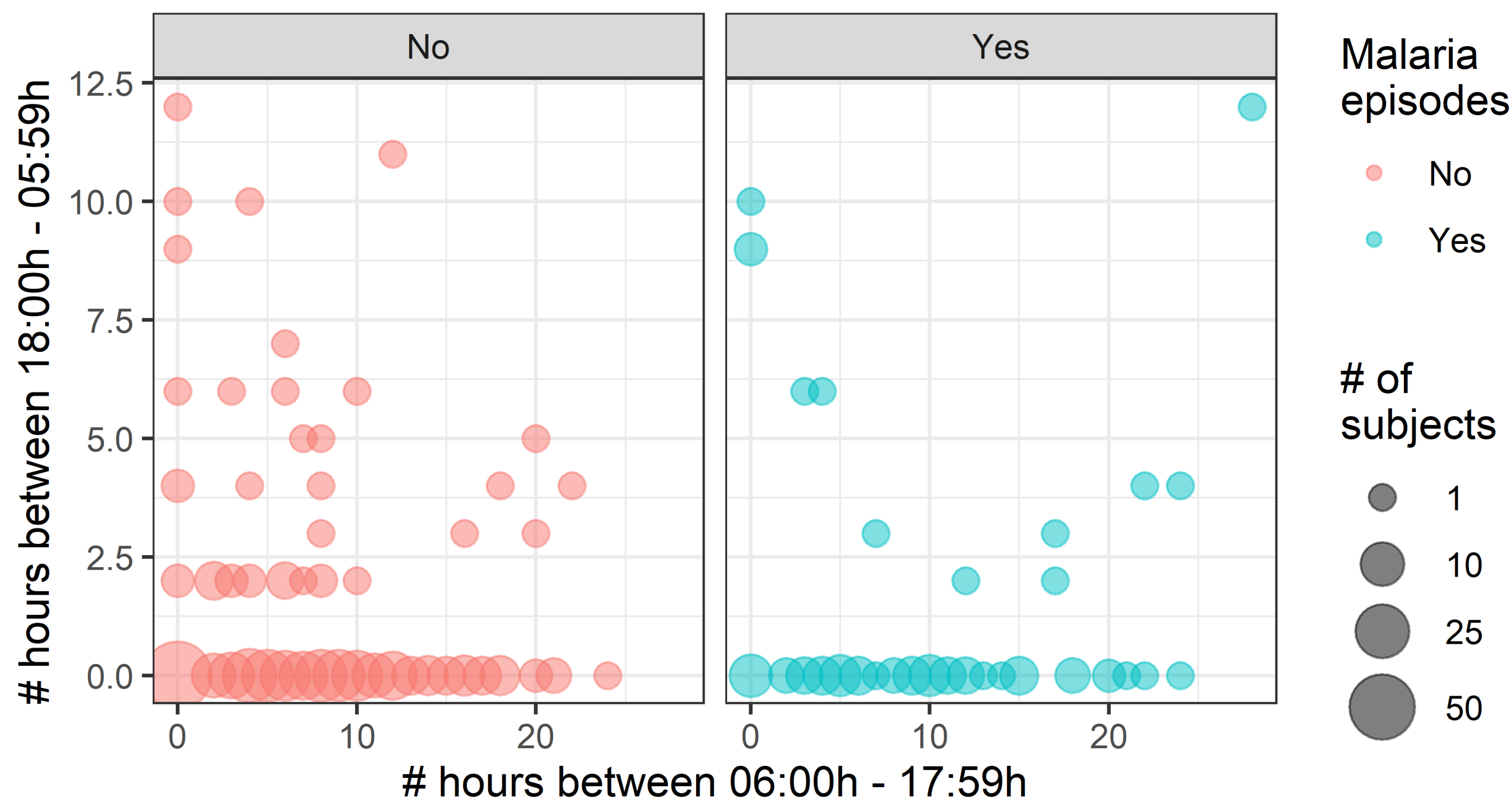


Figure 2. Relationship between ranges of hours outside the house and malaria episodes.

Table 3. Association between being outside the house between 18:00-05:59h and had at least one malaria episode in the last year. Zungarococha, Iquitos 2017.

Characteristics	Multiple regression <sup>‡</sup>		
	APR	95% CI	p
Short travel (1 night - 1 month)			
No	Ref.		
Yes	1.38	0.66 - 2.67	0.369
Long travel (more than 1 month)			
No	Ref.		
Yes	2.47	1.28 - 4.47	0.004
Outside the house between 06h-17:59h			
No	Ref.		
Yes	1.23	0.59 - 2.90	0.604
Outside the house between 18h-05:59h			
No	Ref.		
Yes	1.03	0.44 - 2.14	0.941

<sup>‡</sup> Adjusted by age, sex, village, work, and education

## CONCLUSIONS

- We did not identified difference in the prevalence of malaria history in the last year and being outside the house at mosquito-biting hours.
- Malaria history prevalence in subjects with long travels (greater than one month) was 2.47 times higher than subject without travels.
- For periurban settings, further studies should focus on describe long travel activities/destinations and prospectively detail outcome occurrence to discard if risk is due to a declining of immunity or higher exposure during the journey.

## REFERENCES

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