

Seroprevalence and risk factors of Lassa fever infection in Nasarawa State, Nigeria – 2013

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Outline

- Background
- Methodology
- Results
- Conclusion

Background 1/3

- Lassa fever is an epidemic-prone zoonotic viral haemorrhagic disease
- It is caused by Lassa fever virus (LFV) – member of the *Arenaviridae* family
- Reservoir: *Mastomys natalensis*, the multimammate, peridomestic rat
- Endemic in Nigeria, Liberia, Sierra Leone, and Guinea
- Circulating in Mali and Cote d'Ivoire

Background 2/3

- In West Africa, 300,000-500,000 cases and 5000 deaths yearly
- Case-fatality rate:
 - 1-2% overall
 - 20% in hospitalized patients
 - 50% during epidemics
 - 70-80% in third trimester pregnancy
 - >90% rate of foetal loss

Background 3/3

- Exported to Europe and North America (US, UK, Germany, France)
- Affects both sexes and all age-groups
- Seasonal clustering in the dry months with nosocomial spread
- Transmission
 - Rodent-to-human
 - Human-to-human

Biosafety and surveillance

- No vaccine for prevention
- Treatment only effective if instituted early
- Classified as category A bioweapon by US CDC and NIAID
- Designated Biosafety level 4 (BSL-4)
- Designated a priority disease in the National Technical Guidelines for IDSR

Justification

- IDSR collects limited information
- Limited in-country laboratory capacity
- Many cases are missed
- Knowledge gap in magnitude and geographical pattern of exposure to the virus, risk factors
- Nasarawa is a high risk state that has reported cases of Lassa fever over the years

Objectives

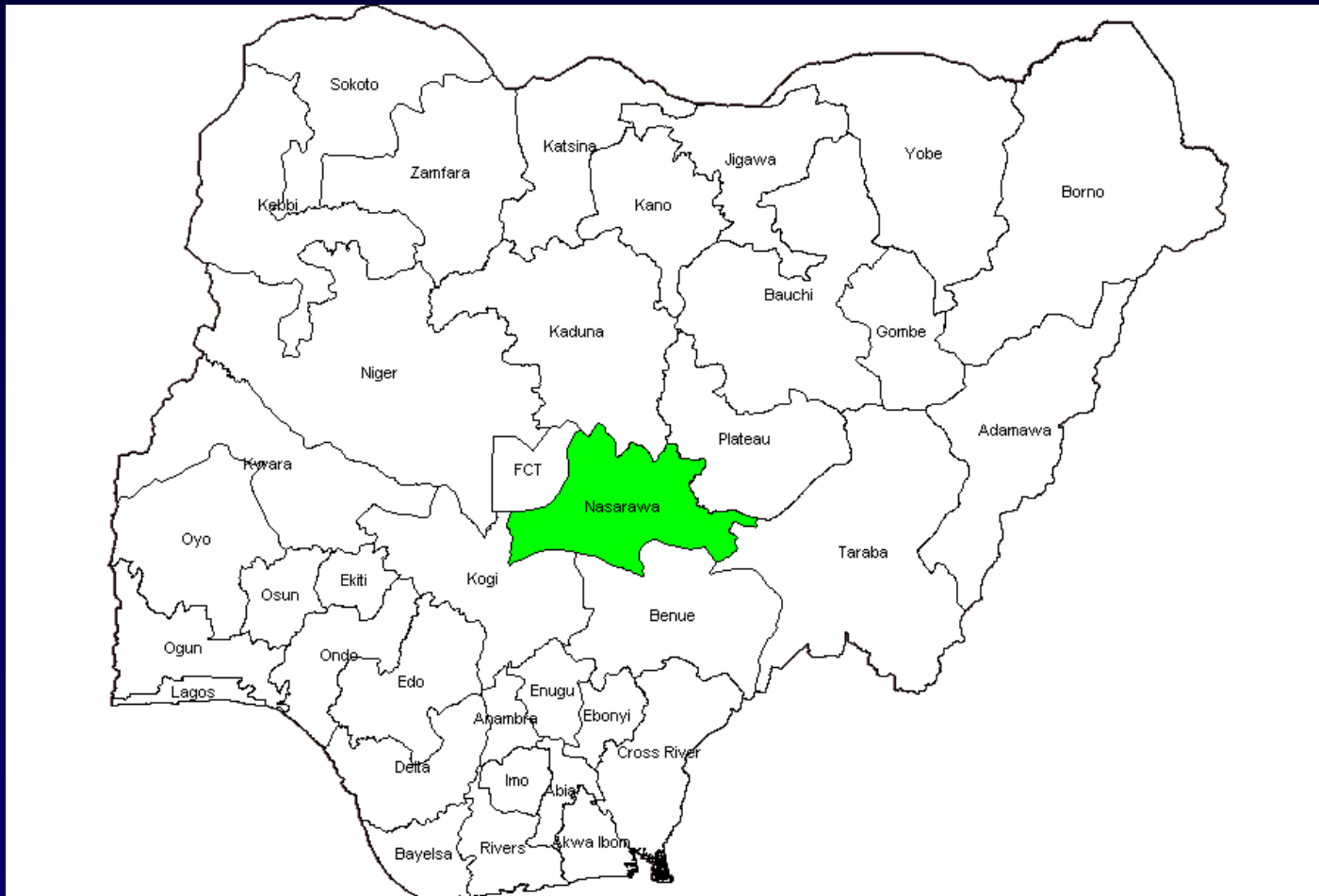
1. To determine the prevalence of LFV IgG and IgM antibodies in the sera of selected residents of Nasarawa State
2. To determine the prevalence of known risk factors to Lassa fever infection in the state
3. To determine the factors associated with testing positive for Lassa fever antibodies in the state

Methodology

Study area

- Nasarawa State – north-central Nigeria
- Population: 1,869,377
 - predominantly farmers
- Land size: 27,271 km²
- Comprises 13 Local Government Areas (LGA) divided into wards
- Lacks laboratory capacity for Lassa fever diagnosis

Map of Nigeria highlighting Nasarawa State



Study design and methods

- Cross-sectional study
- Demographic and risk factor data collected via a pre-tested interviewer-administered questionnaire
- Laboratory methods
 - Blood samples obtained and tested for IgG & IgM antibodies to Lassa fever virus using ELISA technique

Study population

- Residents of Nasarawa State in selected LGAs and wards
- **Inclusion criterion:** having resided in Nasarawa State for one year by day of interview
- **Exclusion criterion:** children less than 5 years of age

Sample size calculation

$$n = \frac{(Z_{1-\alpha/2})^2 \times p \times q}{d^2}$$

Where :

n = minimum sample size

$$(Z_{1-\alpha/2}) = 1.96, p = 0.21^*$$

$$q = 0.79, d = 0.04$$

$$n \approx 398$$

(↑420)

*Tomori et al 1988

Sampling technique

- Multistage sampling
- Simple random sampling at state, LGA, ward and household levels
- State level – 6 LGAs selected out of 13
- LGA level – 7 wards selected out of 10-13
- Ward level – 1 household
- Household – 1 respondent

Data collection

- Socio-demographic and risk factor data collected by trained field assistants:
 - age, sex, occupation, marital status
 - rats in the house, hunting of rodents, food storage
- Blood samples collected by local phlebotomists trained for the purpose
- Samples analyzed at the Institute of Lassa Fever Research and Control, Irrua

Data management 1/2

- Data entered in EpiInfo7™
- Data checked for consistency and cleaned
- Data analysis with EpiInfo7 and Microsoft Excel®
- Univariate analysis:
 - frequencies, proportions, means
- Bivariate analysis:
 - prevalence odds ratio
 - determine factors associated with seropositivity
 - χ^2 test for statistical significance

Ethical considerations

- Ethical approval was obtained from Research Ethics Committee at the Nasarawa State Ministry of Health
- Informed consent was obtained before collecting data from respondents
- Every aspect of research was conducted mindful of best practices

Results

Socio-demographic characteristics

- 420 respondents were interviewed and had their blood taken
- Median age \approx 35 years (IQR: 25-47.5).
- The male to female ratio was 1.8:1
- 73.4% had attended at least primary school

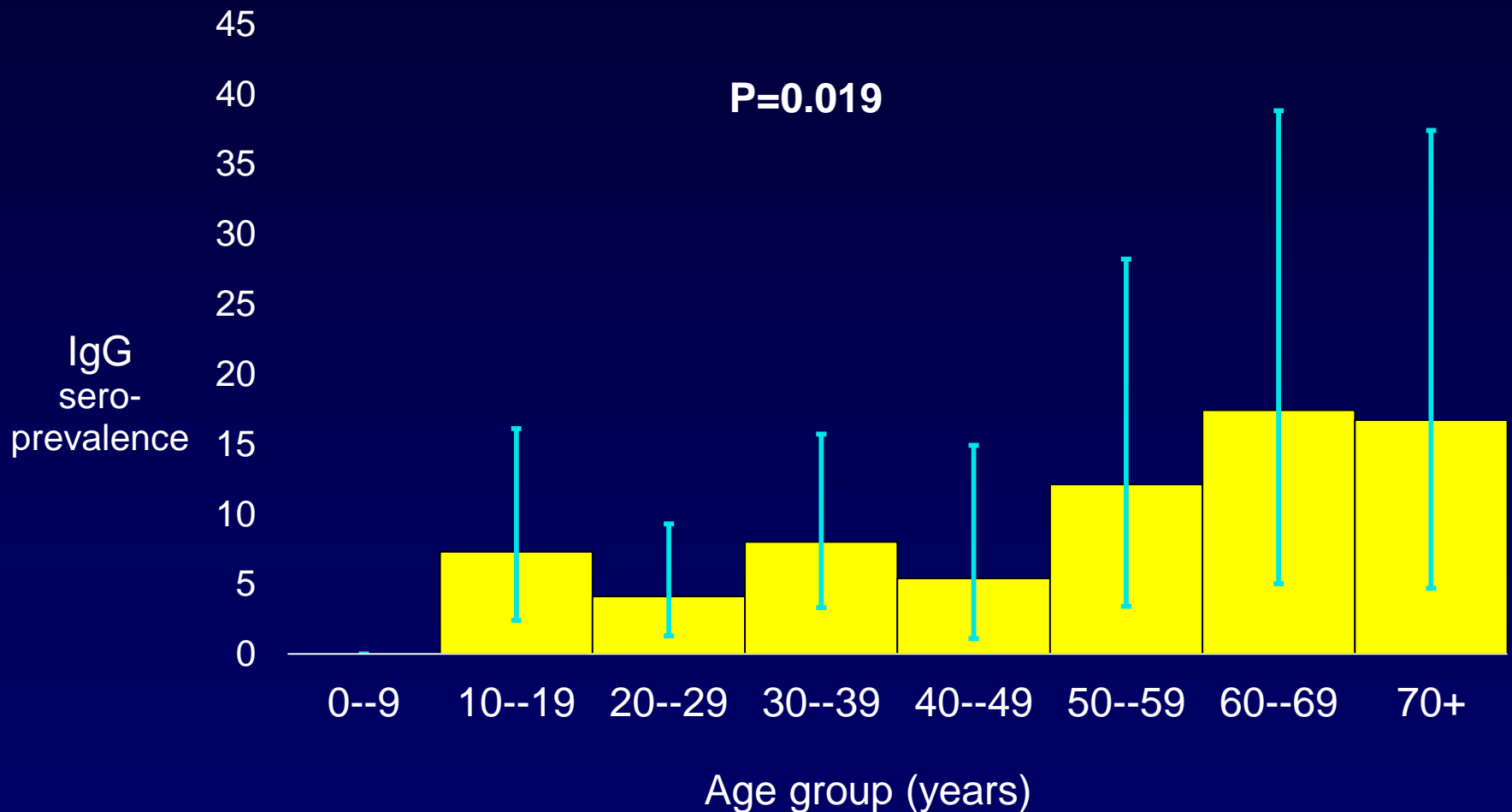
Clinical history

- None of the respondents had features suggestive of Lassa fever within the past fortnight or even one year by interview date

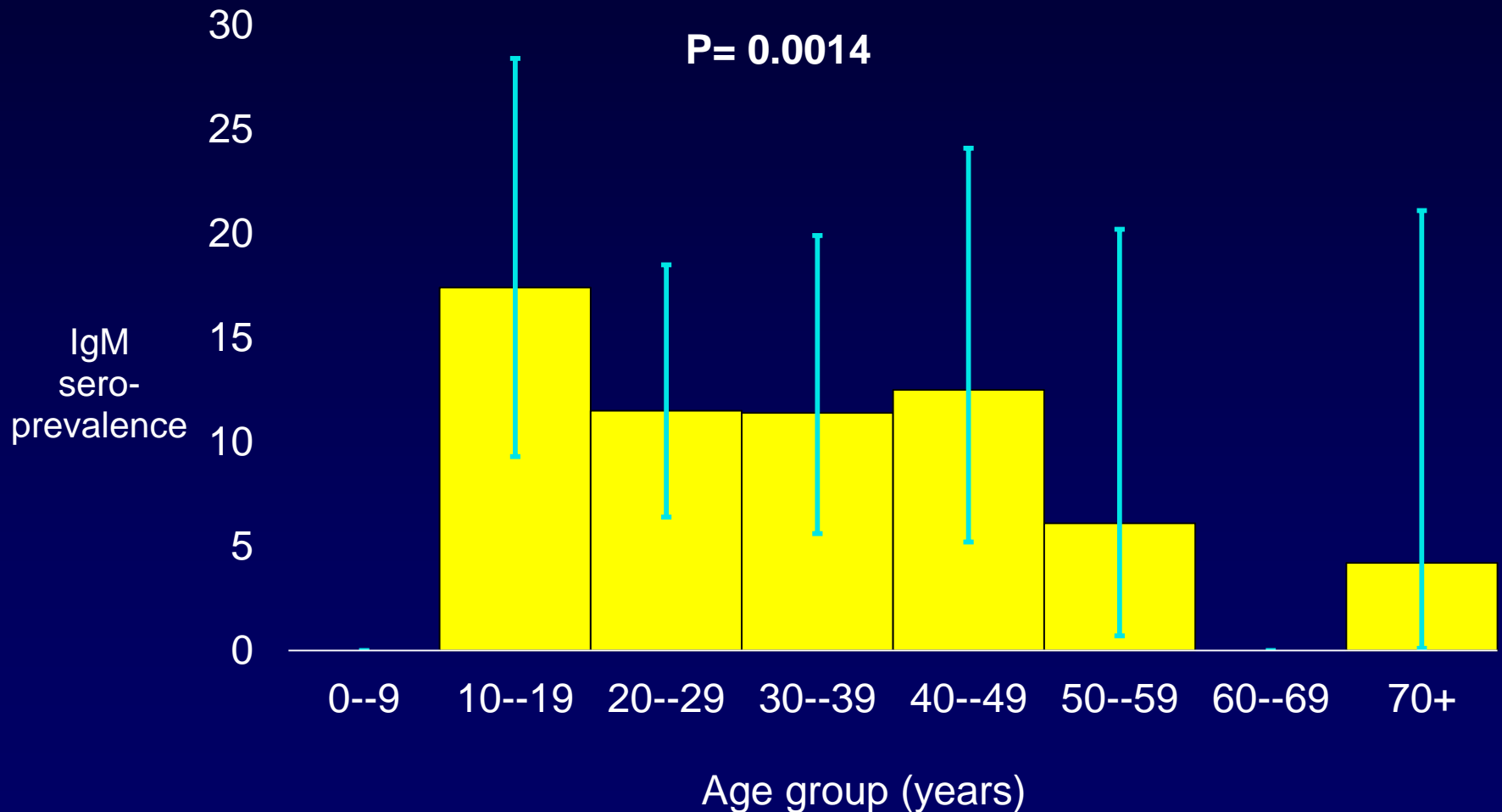
Prevalence of Lassa fever antibodies in Nasarawa State, Jan, 2013

Antibody	Frequency (%) (n=420)	95% CI
Either IgG or IgM	76 (18.1)	14.6-22.2
IgG only	32 (7.6)	5.4-10.7
IgM only	46 (11.0)	8.2-14.4
Both IgG & IgM	3 (0.7)	0.2-2.3

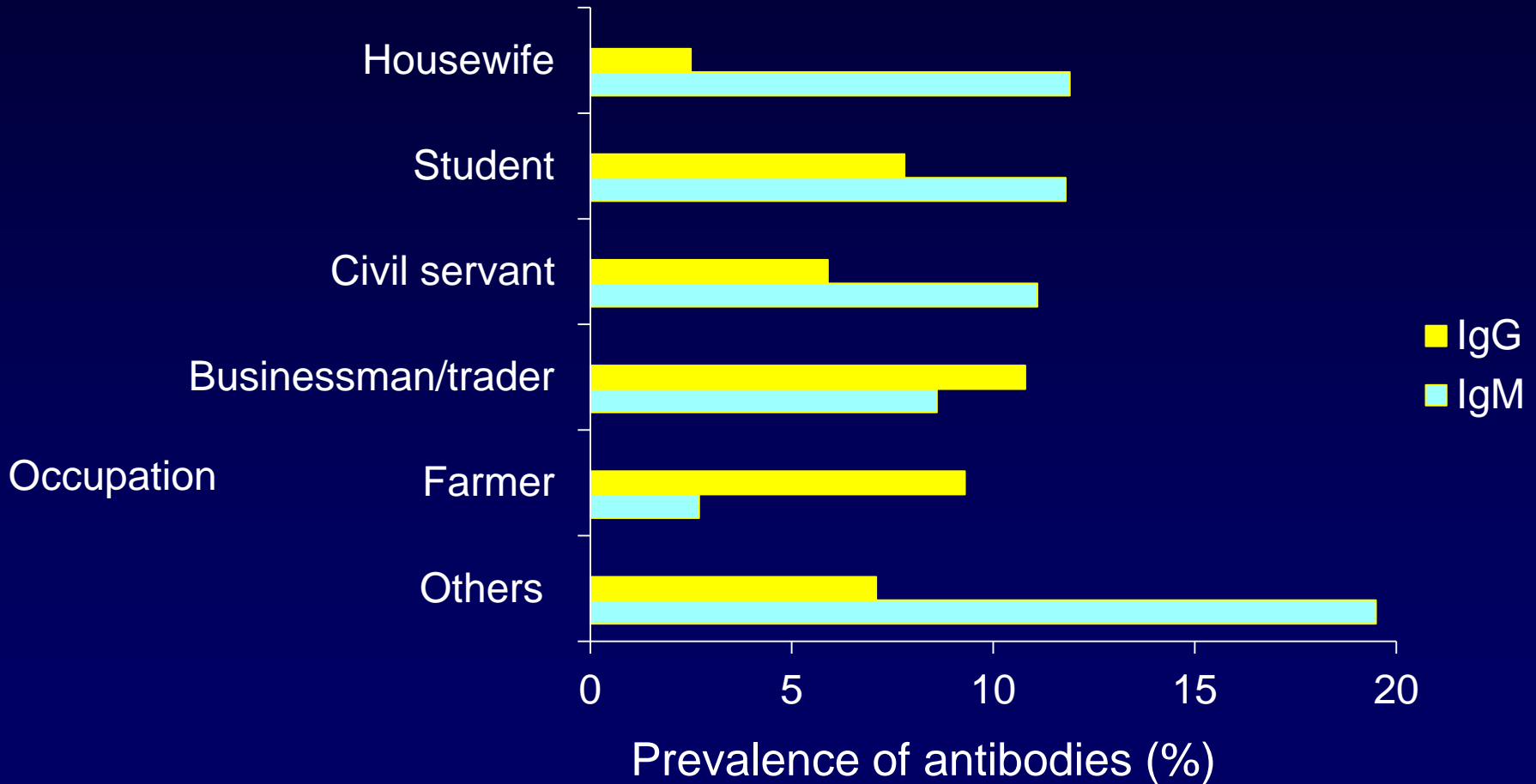
IgG seroprevalence by age group in Nasarawa State, Jan 2013



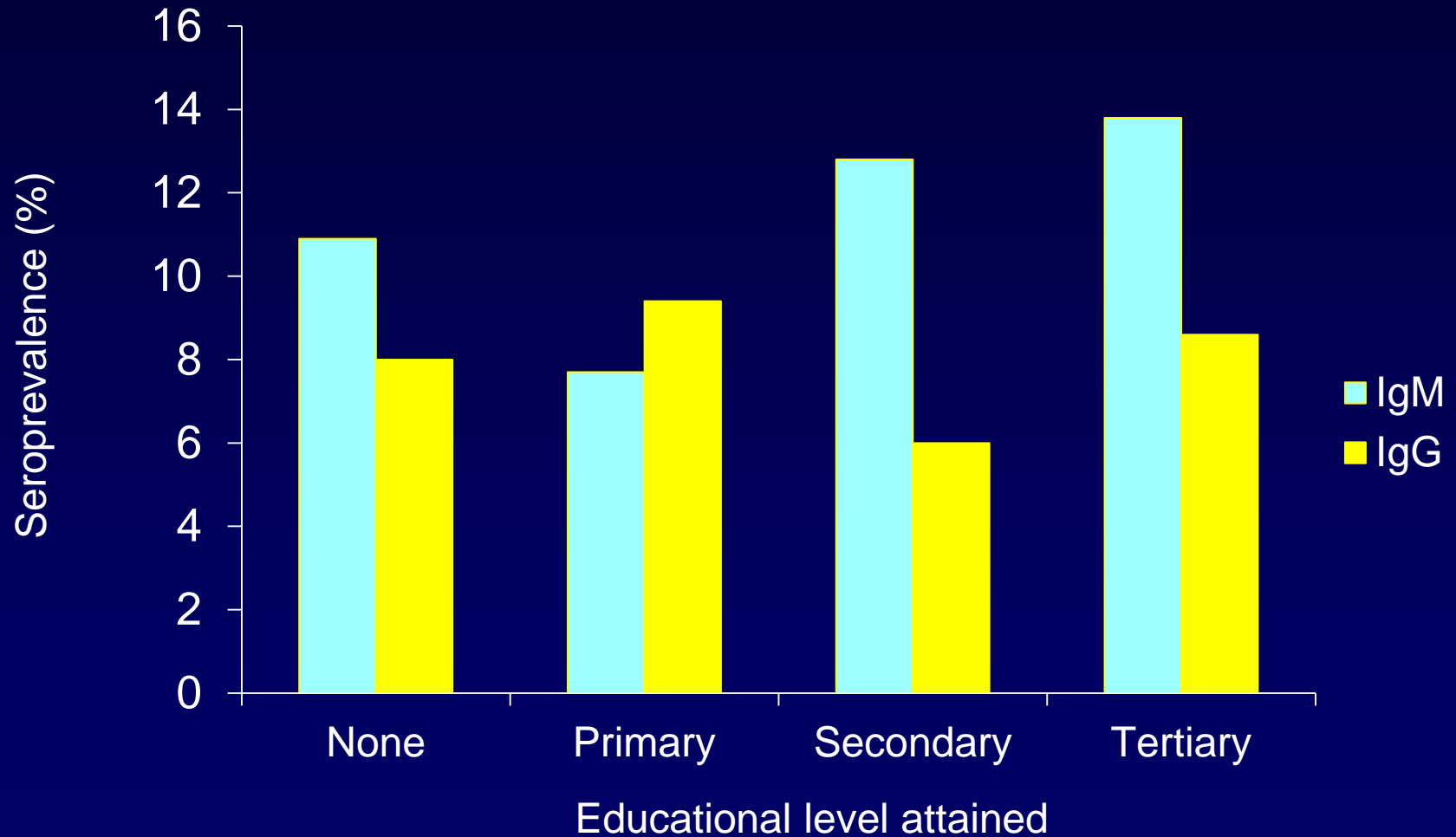
IgM seroprevalence by age group in Nasarawa State, Jan 2013



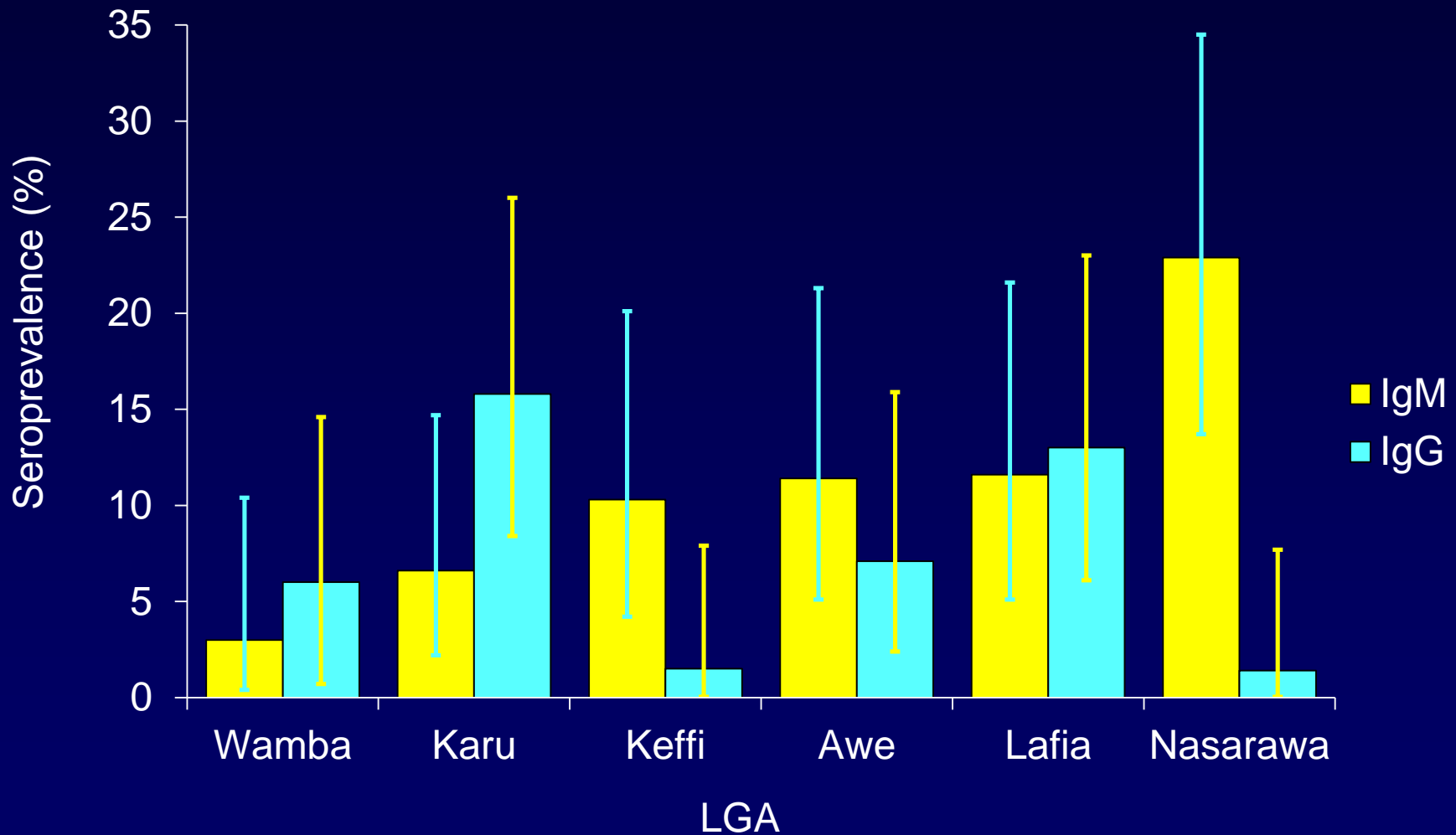
Seroprevalence by occupation in Nasarawa State, Jan 2013



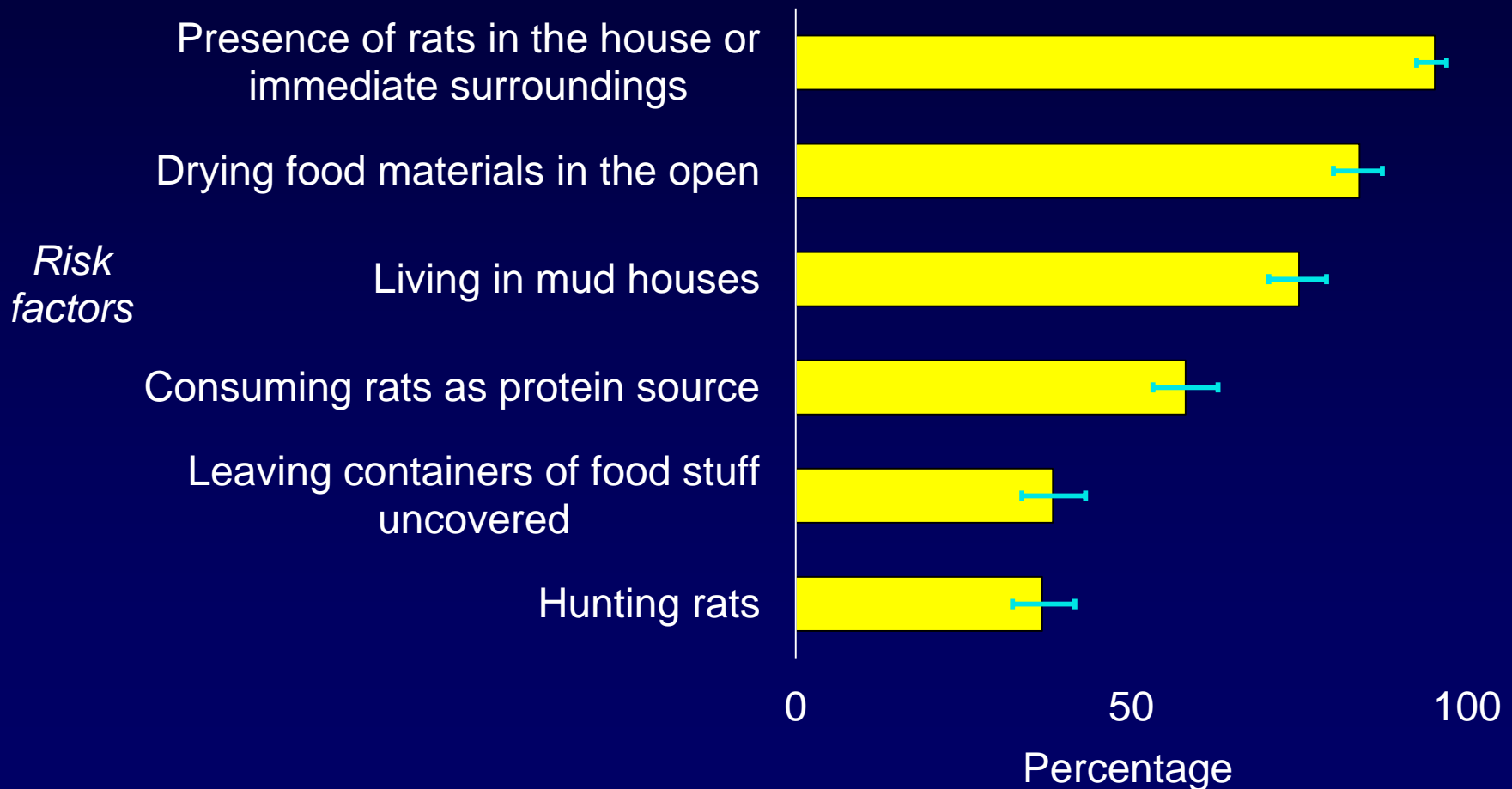
Seroprevalence by educational level in Nasarawa State, Jan 2013



Seroprevalence by LGA in Nasarawa State, Jan 2013



Prevalence of risk factors of Lassa fever infection in Nasarawa State, Jan 2013



Factors associated with Lassa virus infection 1/2

Risk factors	Seropositive	Seronegative	OR (95% CI)	p-value
Presence of rats in homes				
Yes	74	317	2.10 (0.48-9.25)	0.32
No	2	18		
Hunting rats				
Yes	31	123	1.22 (0.73-2.04)	0.43
No	45	219		
Consuming rats as protein				
Yes	42	199	0.93 (0.56-1.56)	0.78
No	32	141		

Factors associated with Lassa virus infection 2/2

Risk factor	Seropositive	Seronegative	OR (95% CI)	p-value
Drying food stuff in the open				
Yes	60	285	0.72 (0.38-1.36)	0.30
No	15	51		
Leaving food stuff containers uncovered				
Yes	26	133	0.79 (0.47-1.33)	0.38
No	50	202		
Building material of homes				
Mud	58	247	1.11 (0.62-2.02)	0.73
Cement	18	85		

Discussion

- Seroprevalence close to previous national prevalence (21%)
- None of the seropositives had clinical history of Lassa fever
- IgM prevalence unexpectedly high, why?
- Nasarawa LGA: least IgG, highest IgM why?
- Known risk factors highly prevalent in the state
- None of the risk factors was statistically significant at 95% confidence level

Conclusion

- The seroprevalence of Lassa fever in Nasarawa State was found to be 18.1%
- The known risk factors for infection were found to be highly prevalent
- None of the risk factors was found to be statistically significantly associated with serological evidence of infection

THANK YOU

Prevalence of risk factors for Lassa fever infection in Nasarawa State, Jan 2013

Risk factors	Prevalence (95% CI)
Presence of rats in the house or immediate surroundings	95.2 (92.5-97.0)
Hunting rats	36.7 (32.3-41.6)
Consuming rats as protein source	58.1 (53.2-62.9)
Leaving containers of food stuff uncovered	38.3 (33.7-43.2)
Drying food materials in the open	84 (80.1-87.4)
Living in mud houses	75 (70.5-79.1)

Discussion

- Seroprevalence close to previous national prevalence (21%)
- IgM prevalence higher than IgG, why?
- Nasarawa LGA: least IgG, highest IgM; why?
- Known risk factors are highly prevalent in the state
- None of the risk factors was statistically significant at 95% confidence level