

Global epidemiology of yaws: a systematic review

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Summary

Background To achieve yaws eradication, the use of the new WHO strategy of initial mass treatment with azithromycin and surveillance twice a year needs to be extended everywhere the disease occurs. However, the geographic scope of the disease is unknown. We aimed to synthesise published and unpublished work to update the reported number of people with yaws at national and subnational levels and to estimate at-risk populations.

Methods We searched PubMed and WHO databases to identify published data for prevalence of active and latent yaws from Jan 1, 1990, to Dec 31, 2014. We also searched for ongoing or recently completed unpublished studies from the WHO yaws surveillance network. We estimated yaws prevalence (and 95% CIs). We collected yaws incidence data from official national surveillance programmes at the first administrative level from Jan 1, 2010, to Dec 31, 2013, and we used total population data at the second administrative level to estimate the size of at-risk populations.

Findings We identified 103 records, of which 23 published articles describing 27 studies and four unpublished studies met the inclusion criteria. Prevalence of active disease ranged from 0·31% to 14·54% in yaws-endemic areas, and prevalence of latent yaws ranged from 2·45% to 31·05%. During 2010–13, 256 343 yaws cases were reported to WHO from 13 endemic countries, all of which are low-income and middle-income countries. 215 308 (84%) of 256 343 cases reported to WHO were from three countries—Papua New Guinea, Solomon Islands, and Ghana. We estimated that, in 2012, over 89 million people were living in yaws-endemic districts.

Interpretation Papua New Guinea, Solomon Islands, and Ghana should be the focus of initial efforts at implementing the WHO yaws eradication strategy. Community-based mapping and active surveillance must accompany the implementation of yaws eradication activities.

Funding None.

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Introduction

Yaws is a neglected tropical disease caused by *Treponema pallidum* subspecies *pertenue*.¹ This bacterium causes a chronic relapsing non-venereal treponematosi, characterised by highly contagious primary and secondary cutaneous lesions and non-contagious tertiary destructive lesions of the bones. The infection can become latent at any time, with only serological evidence of infection, and relapses can occur for up to 5–10 years. The ratio of clinically apparent to latent cases has been estimated to be as high as 1:6.¹

In 2012, WHO launched a new initiative to eradicate yaws by 2020.² Undertaking surveys and mapping the disease at a community level and immediately treating the entire endemic community with single-dose azithromycin³ is recommended.² The efficacy of this approach has been shown in a study of mass treatment in Papua New Guinea.⁴ A key principle inherent in an eradication campaign is the need to intervene everywhere the disease occurs. However, the present geographic extent of yaws is incompletely known, because yaws is

not a notifiable disease in many affected countries. To guide the WHO eradication programme, a better knowledge of yaws epidemiology is needed.

Data that can be used to identify the burden of yaws in a community include the prevalence of active infectious yaws (ie, ulcers or papilloma), which shows the intensity of yaws transmission, and the prevalence of latent yaws (ie, seropositivity in healthy individuals), which shows the extent of latent or hidden infection in the community. Clinical surveys for active yaws lesions can be done without any sophisticated laboratory test through interviews and physical examinations, whereas serological tests measuring yaws antibody (treponemal and non-treponemal) are needed for surveys of latent disease.⁵ Another important source of information is national routine surveillance data, which allow estimation of the incidence of yaws at country and regional levels; countries report the number of cases at the first administrative level.

In this study, we undertook a systematic review of published and unpublished work to improve our

Lancet Glob Health 2015; 3: e324–31

This online publication has been corrected. The corrected version first appeared at thelancet.com on June 8, 2015

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understanding of yaws epidemiology stratified by country, and to provide an update on the number of people with active yaws to estimate at-risk populations in endemic countries.

Methods

Search strategy and selection criteria

We did a systematic review to identify all relevant studies that examined yaws prevalence and incidence. We searched PubMed and WHO databases for (“yaws” OR “treponematosi” AND “prevalence” OR “incidence”) OR (“yaws” AND [each individual previous and current yaws-endemic country]⁶). We consulted the Department for the Control of Neglected Tropical Diseases at WHO regarding previous and present yaws-endemic countries.⁶ We limited the search to studies published between Jan 1, 1990, and Dec 31, 2014. This period covers studies published since the last systematic review of yaws epidemiology, which was published in 1992.⁷ No language restrictions were set for searches. We hand-searched the reference lists of all recovered documents for additional references. We also searched for ongoing or recently completed but unpublished studies from the WHO yaws surveillance network.

We included studies if they investigated active or latent yaws prevalence or incidence. Studies on active yaws had to meet the surveillance case definition provided by WHO:⁸ a person with a history of residence in an affected area who presents with signs of clinically active yaws, consisting of chronic skin ulcers, multiple papillomata, squamous macules, bone or joint lesions, or plantar hyperkeratosis. For latent yaws seroprevalence studies, we deemed serological test rapid plasma reagin titres of at least 1:2 and venereal disease research laboratory titres of at least 1:2 as acceptable evidence of

untreated latent infection. Use of the treponemal test (*T pallidum* haemagglutination assay, *T pallidum* particle agglutination assay, and the fluorescent treponemal antibody absorption) alone was not sufficient evidence of latent infection because people who have had yaws at any time will test positive for life, even after successful treatment.

Procedures

We calculated the number of people with active disease at the first administrative level (eg, province, region, and prefecture) between Jan 1, 2010, and Dec 31, 2013. First, whenever possible, we obtained the country estimates of yaws cases at the first administrative level from the latest national reporting figures provided to WHO.⁶ Second, for countries for which no recent data were available, we contacted yaws control programme managers to request official national routine surveillance data. To estimate the maximum population at risk of yaws, we made calculations at the second administrative level (eg, district, department, and regency). We contacted yaws control programme managers to request data on the proportion of second-administrative level regions that reported yaws cases in 2012. We summed the population living in endemic districts using the 2012 reported populations.

Statistical analysis

For all qualifying studies, we extracted data on study country, sample size, diagnostic test used, number of people with latent or active yaws, and age range. We undertook descriptive analyses of the extracted data. Prevalence estimates are presented for each study with 95% CIs on the basis of binomial distribution. We did not undertake quantitative meta-analyses because the studies we identified did not sample populations at

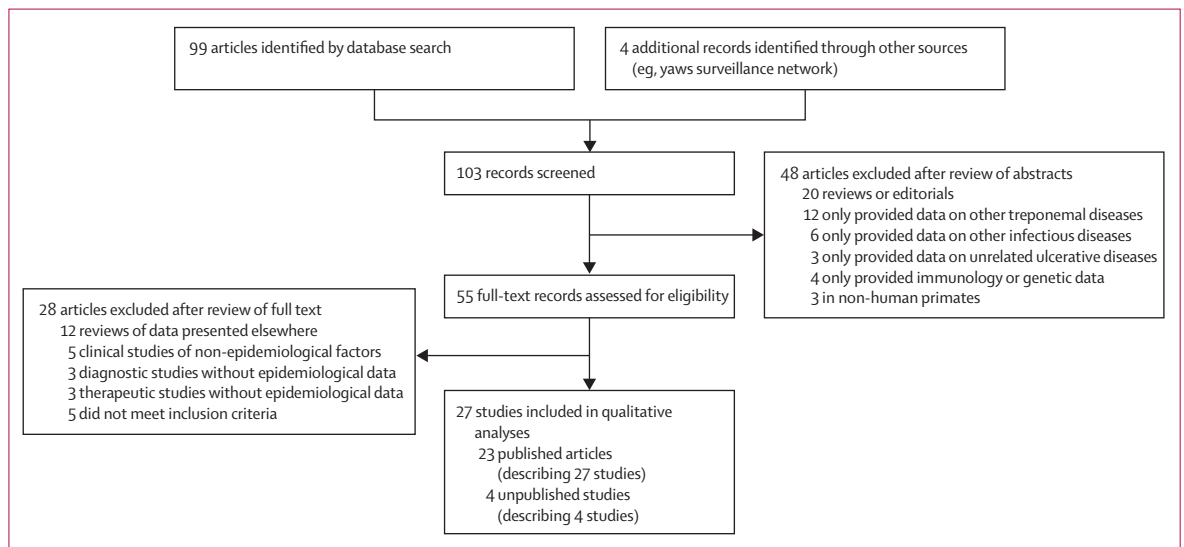


Figure 1: Selection of eligible articles

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