Incidence of primary syphilis infection and reinfection estimated from routine laboratory testing data in the Northern Territory, Australia, 2010 to 2024: a retrospective cohort study

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Background:

Infectious syphilis is a major public health concern in the Northern Territory (NT). While surveillance is largely based on case notifications, trends in notifications vary with changes in testing intensity. We used laboratory testing data to estimate primary syphilis infection and reinfection incidence among NT residents, 2010-2024.

Methods:

We analysed syphilis laboratory tests conducted among NT residents aged ≥16 years, with repeat tests matched via deidentified laboratory identifier. Primary (first) infection was defined as EIA seroconversion with RPR or TPPA positivity; and reinfection as a ≥4-fold RPR titre rise from prior low, ≥90 days apart. Incidence was estimated with exact Poisson 95% CIs. Risk factors were estimated as adjusted hazard ratios (aHR) with midpoint imputation from Cox regression for primary infection (single event), and Prentice-Williams-Petersen total-time models for reinfection (recurrent event), both adjusted for age, sex, and region.

Results:

Among 59,248 people seronegative at first test, 1,294 primary infections occurred over 313,728 person-years (4.1 per 1,000 PY [95%CI 3.9-4.4]). Among 10,636 treponemal-seropositive people, 571 reinfections occurred over 60,915 PY (9.4 per 1,000 PY [95%CI 8.6-10.2]). Primary infection incidence peaked in 2018 at 6.1 then decreased to 3.6 by 2023; reinfection increased from 4.1 to 10.8 per 1,000 PY. Primary infection was associated with younger age (aHR 0.43 [95%CI 0.38-0.48] for 25-34 vs 16-24 years), female sex (aHR 0.84 [95%CI 0.75-0.93]), and region (vs Top End: Central Australia 2.39 [95%CI 2.09-2.75]; Big Rivers 2.09 [95%CI 1.77-2.45]; Barkly 2.04 [95%CI 1.53-2.71]). Reinfection was associated with younger age (aHR 0.51 [95%CI 0.39-0.67]) and lower risk in East Arnhem (aHR 0.73 [95%CI 0.54-0.99] vs Top End), but not sex (aHR 1.03 [95%CI 0.87-1.22]).

Conclusion:

Routine laboratory data enabled testing-denominator-based incidence estimation, complementing notification-based surveillance. Reinfection incidence now exceeds primary infection incidence and is geographically broad, indicating a defined seropositive population needing targeted re-engagement alongside continued primary prevention.

Disclosure of Interest Statement:

All authors declare no competing interests.

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