A Simple Method for Estimating the Epidemiology of Undiagnosed HIV Infection
Practical Guidance for Designing a New HIV Screening Program

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OBJECTIVES

The effectiveness of HIV screening depends in large part on the prevalence of undiagnosed disease. While difficult to ascertain, this knowledge would help select screening strategies, and could motivate screening when prevalence within a venue is erroneously assumed to be below the threshold recommended for screening.

HIV case rate (incidence per 100,000) may be equated with the lower limit of undiagnosed prevalence, and we hypothesized that:

- case rates specific to various emergency department (ED) settings can be computed
- case rate differs for diverse yet geographically proximate settings

METHODS

Zip codes were obtained for patients seen at an urban academic ED, urban community ED, and suburban community ED during 2002. Zip codes of newly diagnosed HIV patients (N = 291, 1999-2003) were obtained from a clinic serving 85% of regional HIV patients that are in a care relationship. Population counts for 5-digit zip code tabulation areas (ZCTA) were obtained from census data. ZCTA case rates were calculated as the ratio of incident diagnoses to population. The ED case rate was estimated as the mean ZCTA case rate, weighted by the proportion of ED patients living in each ZCTA.

RESULTS

The academic ED had 65,606 patients (mean age 37, 58% African American, 49% male), the urban community ED had 27,620 patients (mean age 44, 48% African American, 37% male), and the suburban community ED had 25,606 patients (mean age 48, 27% African American, 39% male). The reported local Metropolitan Statistical Area (MSA) AIDS case rate for 1999-2003 ranged from 2.4-3.8, excluding 2002 for spurious data.
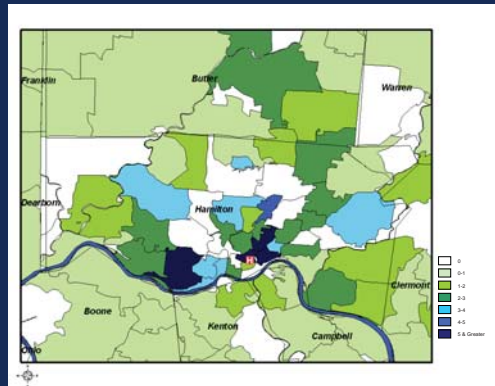

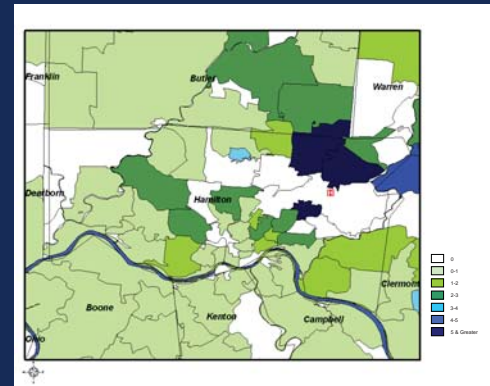**Figure 1** Proportion of Urban Community ED patients residing in zip codes

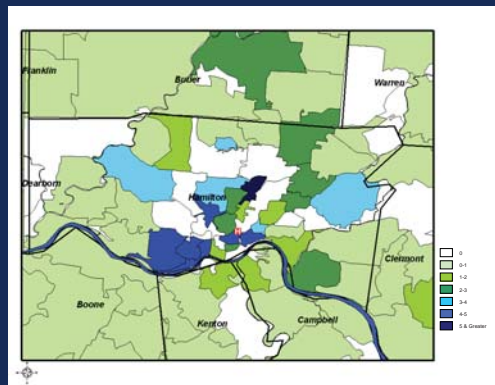**Figure 2** Proportion of Suburban Community ED patients residing in zip codes

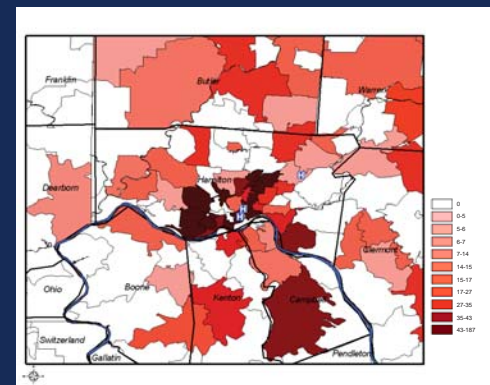**Figure 3** Proportion of Academic Center ED patients residing in zip codes

Figure 4 Case rates fo reach zip code

Postal zip codes matched one of 273 5-digit ZTCAs in the MSA for 98% of cases. Our estimate of the 2002 HIV case rate was 1.7 in the metropolitan statistical area, 7.8 at the academic center ED, 6.0 at the urban community ED, and 3.5 in the suburban community ED).

If time to diagnosis was 5 years (mean CD4 at diagnosis was 353; CI95 317 to 388), the 5-year case rate would reflect the lower limit of undiagnosed ED HIV prevalence, calculated as 43.3, 37.1, and 16.8, respectively.

LIMITATIONS

- Undiagnosed HIV patients within a given zip code may not select health care providers in the same way as the general population within a zip code.

- This analysis equates a single year of ED utilization with geographic representation of HIV diagnosis over 5 years.

- The HIV diagnoses available for analysis were collected from the local HIV specialty care center; patients diagnosed with HIV but never successfully linked with that center are not represented.

- Data represent the lower limit of undiagnosed prevalence, and are more useful for comparing health care settings relative to each other than estimating the actual proportion of patients with undiagnosed HIV.

CONCLUSIONS

- Setting-specific case rates can be readily estimated from existing data, and this method might be used to help decide where to implement universal HIV screening in health care settings.

- Publicly reported regional AIDS or HIV statistics do not reflect setting-specific epidemiology and are of limited utility in motivating screening or selecting screening strategies.