**Supplementary Online Material**

**Estimated HIV Incidence in the United States, 2003 – 2010**

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1. **Detailed steps for solving the equations**

(Equation 1)

(Equation 2)

(Equation 3)

(Equation 4)

(Equation 5)

*R*: diagnosis rate, which is the probability of an HIV-infected individual being diagnosed in a year;[1](#_ENREF_1),[2](#_ENREF_2)

*Di*: number of new diagnoses in year *i*, where *i* = 1, 2, or 3;

*Ui*: number of undiagnosed persons at the beginning of year *i*, where *i* = 1, 2, or 3;

*Ii*: HIV incidence in year *i*, where *i* = 1, 2, or 3

Solve for *U1* in equation

Substitute the value for *U1* in equation

1. **An example – HIV incidence in the United States, 2003**

**Total**

Number of new diagnoses in 2002: D1 = 56715

Number of new diagnoses in 2003: D2 = 53106

Number of new diagnoses in 2004: D3 = 52758

HIV incidence in 2003:

**Male**

Number of new diagnoses in 2002: D1 = 41010

Number of new diagnoses in 2003: D2 = 38783

Number of new diagnoses in 2004: D3 = 38958

HIV incidence in 2003:

**Female**

Number of new diagnoses in 2002: D1 = 15705

Number of new diagnoses in 2003: D2 = 14323

Number of new diagnoses in 2004: D3 = 13800

HIV incidence in 2003:

The sum of males and females (38,945 + 13,482 = 52,427) is 0.5577% smaller than the total ((52,427 – 52,721)/52,721 = -0.5577%). We require that the sum of estimated HIV incidence by sex equals the estimate of the total.[3](#_ENREF_3) In this case, the estimates for males and females need to be rescaled up by 0.5608% ((52,721 – 52,427)/52,427 = 0.5608%). The new estimate for males is 39,164 (38,945 \* (1 + 0.5608%) = 39,164), the new estimate for females is 13,557 (13,482 \* (1 + 0.5608%) = 13,557), and the sum (39,164 + 13,557 = 52,721) equals the total (52,721).

**References**

**1.** Xia Q, Kobrak P, Wiewel EW, Torian LV. The high proportion of late HIV diagnoses in the United States is likely to stay: findings from a mathematical model. *AIDS Care.* 2015;27(2):206-212.

**2.** Xia Q, Torian LV, Shepard CW. Limitations of indicators of HIV case finding. *Epidemiology.* 2015;26(1):e6-e8.

**3.** Murray CJ, Ortblad KF, Guinovart C, et al. Global, regional, and national incidence and mortality for HIV, tuberculosis, and malaria during 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet.* 2014;384(9947):1005-1070.