Costs and Consequences of Four HIV Testing, or Counseling & Testing Scenarios for the State of Michigan, 2009

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Introduction

In September of 2006 the US Centers for Disease Control and Prevention (CDC) recommended that opt-out HIV testing should be offered in all health care settings in the nation. Testing would be offered to all 13-64 year old persons in health care. Consent to HIV testing would accrue from general medical consent and not from specific written consent for the HIV test itself. No risk assessment or pretest counseling would be required. Post-test counseling may be offered for HIV-seronegative persons at high behavioral risk just as long as the counseling does not become a barrier to routine testing. For those who test positive for HIV, links to care, treatment and prevention services would be provided but scant detail is given by CDC as to how this is to be achieved.

Our current analysis aims to estimate the overall costs and consequences of CDC's opt-out testing recommendation pertaining specifically to the State of Michigan. We estimate the potential impact of these recommendations in terms of persons newly learning of their HIV infection and estimate the number of potential infections averted in Michigan. Further the medical care resources that will need to be made available quickly to meet the clinical needs of persons newly diagnosed with HIV are estimated. For comparative purposes four distinct scenarios are examined: (a) opt-out HIV testing as recommended by CDC (the base case analysis); (b) opt-out HIV testing that induces increases in risk behavior due to lack of counseling; (c) HIV testing accompanied by client-centered counseling; and (d) using the same level of resources needed for routine opt-out testing (as estimated in the analyses shown here, provide HIV counseling and testing targeted to geographic cares and settings with a higher HIV seropositivity than is found in typical health care settings in Michigan but still within the range seen in publicly-funded HIV testing sites in the State.

Methods

The following analyses employed a payer's perspective so as to best estimate the resources needed to implement the CDC's recommendations. All costs are in 2007 US dollars, and a one year time horizon was employed to examine the intensive initial impact of CDC's recommendations and the alternative scenarios.

Table 1 contains the input parameter values for the base case analysis as well as the sources for each value. Of course, some parameter estimates contain uncertainty, and where parameter estimation called for judgment to be made, a bias was introduced in the favor of CDC's opt-out testing recommendation.

For simplicity, it was assumed that all incident and prevalent HIV infections in Michigan are among 13-64 year olds. We estimate that 84% of persons diagnosed with HIV in Michigan had previously visited a health care facility and could have been tested for HIV had routine testing been available. The analysis assumes that CDC's routine HIV testing recommendations will achieve a first-year uptake of 44% of eligible persons

tested. However, 27% of this population is already being tested for HIV so the actual uptake is the difference between those two percentages (17%).

The full cost of delivering a testing strategy with pre- and post-test counseling from the payer's perspective has been estimated at $30.68 per HIV negative test and $189.59 per HIV positive test; these costs were used here, but when a scenario called for omission of a counseling component, the counseling costs were subtracted from these figures.

The analyses separately calculated the number of persons who newly learn that they are HIV seropositive, and the number of persons who already know that they are HIV seropositive but are tested again due to new testing initiatives. Prior analyses have estimated that of persons testing HIV seropositive, 37% already know they are HIV seropositive or do not return for the results.

To estimate the number of HIV infections averted, I first examined transmissions prevented from persons who newly learned that they are HIV positive due to the proposed program. We estimate that in Michigan persons who are unaware that they are living with HIV transmit at a 10.93% rate per year, and persons who are aware that they are living with HIV infection have been estimated to transmit at a 3.15% rate. Therefore as a person learns of their HIV seropositivity it is assumed that their transmission rate drops accordingly.

With the above input parameters it is possible to calculate the following outputs; (a) number of persons tested under the recommended program; (b) number of undiagnosed HIV-seropositive persons newly reached; (c) total cost of testing program; (d) HIV transmission averted; (e) gross cost per transmission averted; and (f) public sector medical care resources needed in one year to care for persons newly diagnosed with HIV infection.

In line with CDC's recommendation the "Basic Case Analysis" (Opt-Out Testing) makes a simplifying assumption that the removal of HIV counseling for seronegative persons at high behavioral risk of infection does no harm. This assumption is counter to the academic literature (and CDC's own website, in fact) which notes that client-centered counseling accompanying testing can reduce incident sexually transmitted infections by 20%; therefore the following scenario was assessed.

The "Behavioral Offset Case Analysis" is exactly the same as the Basic Case Analysis (Opt-Out Testing) with one exception. It has been estimated by CDC's National Center for Health Statistics that roughly 11.9% of the US population 15-44 years old is at high behavioral risk of HIV infections. I make a simplifying assumption that this percentage holds for 13-64 year olds but recognize that the actual percentage is not know and may very by age. (Note that the Basic Case Analysis is actually the same as a Behavioral Offset Case sensitivity analysis but assumes that 0.0% rather than 11.9% of person are at behavioral risk.) It is possible that persons at high risk of HIV infection who are tested via CDC's recommended program (which omits risk assessment and counseling for HIV

seronegative persons) could actually increase their risk behavior. For instance, if an injecting drug user who is given an HIV test on an opt-out basis without being questioned about substance use or counseled about risk gets an HIV-negative result, the individual could easily take that testing experience as a confirmation that injecting drugs is not posing an HIV related risk. Indeed some persons repeatedly seeking HIV testing use the experience as a risk confirmation strategy. Further, CDC and Kaiser Family Foundation have estimated that roughly four in ten persons in the US have some basic misconceptions about HIV. Hence, perfect HIV-related knowledge cannot be assumed among patient populations. In the Behavioral Offset Case, the rate of HIV incidence is calculated for person at high risk of infection tested under CDC's recommended program, and it is assumed that the rate increase by 5% due to behavioral offset. This behavioral offset parameter is not know with much precision and suggests an important area for additional research.

Next, a "Routine Counseling and Testing Case" was created in which clients received testing accompanied by counseling. However if someone reported no risk behaviors and tested HIV negative, no post-test counseling would be needed. While the additional counseling in this scenario would of necessity increase the cost relative to the basic program, this counseling would prevent infections among high risk seronegative persons. It is assumed that the impact of counseling is a 15% reduction in the number of incident HIV infections among HIV-seronegative persons at high risk of infection. This 15% is actually reduced from 20% which is the projected estimate to ensure any potential bias is in favor of opt-out testing rather than against it.

Finally, a "Targeted Counseling and Testing" scenario was analyzed. The level of available resources for service delivery in the targeted strategy is estimated to be exactly the same as was estimated in the opt-out testing analysis described above, along with an additional assumption. This case assumes a highly targeted program where counseling and testing was offered with priority to persons in geographic areas or in venues with heightened HIV seroprevalence. This scenario analysis assumes that 0.5% of persons being tested are HIV seropositive which is the Michigan rate for publicly funded testing sites. We assume that only 63% of persons who test positive are newly aware of their HIV seroposivity.

Results

In the Basic Case Analysis of opt-out testing, it could be expected that 1,201,382 people would be tested, where 544 of those tested would test positive HIV who were previously undiagnosed. The total testing cost would be $17,246,008. Transmissions averted would number 42 and the gross cost per transmission averted would be $407,280. In one year, public support in the amount of US $12,284,498 would be needed to provide care for these persons newly diagnosed with HIV who are on public assistance or underinsured.

The Behavioral Offset Case Analysis found that the lack of risk assessment and counseling for the 142,792 persons at high behavioral risk tested in this program might

increase infections byseven per year lowering the net number of transmission and infections averted to 35. This scenario also increases the gross cost per transmission and infection averted to $488,560.

The Routine Counseling and Testing Case Analysis found that with additional counseling services the total testing cost would be $28,354,611. The total number of transmission and infections averted climb to 63 persons and the gross cost per transmission or infection averted is estimated at $448,172 which falls between the Basic Case and Behavioral Offset Case Analysis.

Finally, the Targeted Counseling and Testing Case outperforms all other scenarios. It is by far the lease expensive in terms of gross cost of each transmission or infection averted is $114,069. (This gross cost is actually less than the net present value of lifetime care and treatment costs for HIV indicating that this policy strategy would be cost-saving.) This policy reaches more than three times the number of undiagnosed HIV+ individuals as do other scenarios. The policy also prevents more than double the transmissions averted at 134. Since this scenario is so successful at reaching the number of undiagnosed HIV+ the public resources for medical care in one year are significantly higher at $38,975,956.

Conclusion

It would appear that by far the better investment for Michigan would be a highly targeted program of HIV counseling and testing. This targeted program could combine a mixture of both clinical and community-based counseling and testing. The result is very robust to changes in the input parameter values. This general conclusion was found in earlier national-level analyses; it is of interest that the national findings were confirmed here for Michigan using highly State-specific parameter values.

Table 1- Input Parameter Values and Sources

Parameter	*Value*	*Reference*
Number of persons 13-64 years old in Michigan	7,066,950	Census; MI
Number of persons living with HIV in Michigan	18,200	MI
Percentage of persons unaware that they are HIV+	21%	CDC
Percentage of newly diagnosed HIV patients previously in contact with health care system	84%	CDC; MI
Uptake of screening recommendation	44%	MI
Adult population already receiving HIV testing	27%	MI
Persons testing HIV+ who are already aware of or do not receive results	37%	PLOS Medicine
Cost of counseling and testing for one HIV-client	$ 30.68	PLOS Medicine; MI
Cost of counseling and testing for one HIV + client	$ 189.59	PLOS Medicine; MI
Annual per patient medical costs for one HIV+ patient	$ 30,093.00	MI Medicaid
Transmission rate from unaware HIV+ persons	10.93%	PLOS Medicine; MI
Transmission rate from aware HIV+ persons	3.15%	PLOS Medicine; MI
Percentage of persons in age group at high risk of HIV infection	11.90%	CDC
Percentage of HIV+ persons uninsured or on public health care assistance	75%	PLOS Medicine

Table 2- Cost and Consequences of Four HIV Testing or Counseling and Testing Scenarios

Outcome	*Basic Case (Opt-Out Testing)*	*Behavioral Offset Case*	*Routine Counseling and Testing Case*	*Targeted Counseling and Testing Case*
Number of Persons Tested	1,201,382	1,201,382	1,201,382	547,973
Number of Undiagnosed HIV Positive Persons Reached	544	544	544	1,726
Number of High-Risk HIV Negative Persons Reached	142,792	142,792	142,792	128,468
Total Testing Cost	17,246,008	17,246,008	28,354,611	17,246,008
Transmissions Averted	42	42	42	134
Infections Averted	----	(7)	21	17
Transmissions and Infections Averted	42	35	63	151
Gross Cost Per Transmission or Infection Averted	407,280	488,560	448,172	114,069
Public Support for Medical Care Needed Y1	12,284,498	12,284,498	12,284,498	38,957,956