Testing is a potentially important intervention to slow the HIV epidemic in Africa and elsewhere. Some countries in Africa have achieved high levels of testing but most have not. Cost, price, and questions of confidentiality have limited the expansion of testing. It looks possible, however, that there are choices as to the design of testing programs that would expand the number of people who could know their HIV status in ways that would be worthwhile. JEL codes: I18, H4, H23

Now is a time of great change in how testing for HIV is done. Gone are the orthodoxy and exclusivity of the Voluntary Counseling and Testing (VCT) protocol so long advocated by the World Health Organization (WHO). Today, routine testing is being adopted widely in Africa in parallel with VCT. Furthermore, the technology for self-testing is available, with the potential to move testing outside the medical sector and into homes and other unregulated places. At the same time, the epidemic rages on in many countries, especially in Africa, which is the main focus of this paper.

I will review information about how HIV testing is done and about what people do with the test results. I therefore provide information on the supply side, including options in setting up testing facilities, and on the demand side, including the roles of cost and confidentiality. The many details of how to design testing programs are important, the nitty-gritty of what works.

The broad goal is to understand the role for testing in the dynamics of the epidemic and the implications for public policy. Many things that would seem relevant to this goal are not known, however, and I point them out and speculate about them. In particular, not much is known about the effect of scaling up HIV testing because much of the evidence comes from small-scale studies.¹ The feasibility and consequences of scaling up any proposed intervention are critical for its practical importance. Scaled-up interventions may be inherently different from pilot projects. It is therefore hard to know whether getting many
more people tested ultimately can prevent many new infections and thereby mitigate the national epidemics. Knowledge of what would happen is, however, central to how much governments should subsidize testing. Even so, at the level of the individual, it is clear that many people value the opportunity to get tested and know their results. Understanding individual responses to testing programs is a necessary condition for using testing to achieve the social goal of dealing with the epidemic.

Testing is, however, controversial among commentators, at least in part because there are disputes about the benefits and costs of testing, even at the level of the individual. Examples of extreme skepticism about testing include: “In contrast with the doubtful benefits of HIV C[ounseling] T[esting], the social risks to the tested individual are real” (Kipp and others 2002, p. 700) and “A few years back, diagnosis of HIV sero-positivity resulted only in disheartenment due to lack of effective therapy” (Lau and others 2005, p. 42). Similarly an editorial in The Lancet (2006) stated that “most research indicates that testing alone has little or no effect on behaviour. The crucial step is counselling and promotion of behavioural change.” Somewhat differently, however, an editorial in the American Journal of Public Health (Koo and others 2006, p. 963) argued that “discovering one is HIV-infected and the subsequent counseling around this diagnosis explains the reduced risk behavior, rather than pre-test counseling.” At many junctures, however, I will provide information that suggests this skepticism may be unjustified.

The Benefits and Costs of Tests and People’s Associated Strategies

Naturally, the benefits of a test arise from what people can do with the resolution of the uncertainty about whether they are infected or not. It is important to find out what people do with the results of their tests. For instance, despite their skepticism just quoted, Kipp and others (2002, p. 703) report that “inhabitants from neighbouring areas who were not eligible, tried desperately to get enrolled in the earlier study in order to have an opportunity for HIV counselling and testing” (my emphasis). On the face of it, this observation suggests that the authors might want to reconsider their previously quoted position that the benefits of testing are doubtful and only the costs are real.

HIV tests can be used to avoid activities, primarily unprotected sexual intercourse, that result in a person infecting another who is not. Consider this vignette: “One HIV positive man [in Uganda] explained: ‘I cannot have sex with her anymore—why kill someone who is your wife and going to look after your children?’ This couple had good communication and even wrote a contract in which the man agreed that the woman could look for an HIV-negative sexual partner.
outside their relationship, provided she would continue to live with him and look after him when he fell sick” (Bunnell and others 2005, p. 1008). However grim their existential predicament, the benefits of a test to this couple would hardly seem to be “doubtful” nor the test to have resulted “only in disheartenment.”

A test could also be used to initiate prenatal treatment of an HIV+ woman and then of her new-born child to lessen the chances of mother-to-child transmission. Knowing that one is HIV+ is a prerequisite for timely treatment with drugs to prevent opportunistic infections and with antiretroviral (ARV) drugs to suppress the virus and postpone disease progression. Knowing that one is HIV+ can also help in planning for the future, such as making provision for dependents, most especially children. King and others (2008, p. 241) give the following example from a Ugandan interview: “I discussed it [the HIV result] with my wife: ‘I am sick and you are not sick, what is the future of our family?’ We [can now] start planning...[if] you leave [the children] a house, you know they will not suffer for rent.”

HIV− people might use the information on their status to increase their efforts to remain negative once they are more certain that they have something to lose by taking risks and have a partner whom they know to be safe, as illustrated by this Tanzanian interview (Maman and others 2001, p. 600): “After receiving results together, for truth, even work that day I didn’t do. I saw it as if that day is when I married my wife. Because between us every person started to trust each other. As if we have locked our marriage today! It brought confidence for us. Each of us said, ‘I was suspecting you thus.’ Everything was put open that day.”

Testing allows these important benefits among others, and they accrue either to the person being tested or to others or both, especially if the person being tested cares about some of the other people who may share in the consequences of the test result.

So much for the potential benefits. What are some of the costs that determine whether benefits exceed costs for either the person being tested or for everyone who is affected in any way by this person’s being tested (the social calculation)? These costs include those of getting the test done and the costs if people other than the person being tested learn that someone has been tested or is infected.

The narrowest definition of cost is the price of the test kit. But other conventional economic costs are more important. There is the monetary cost of the testing facility and the counseling personnel. Then there are other more indirect costs in getting the test done, such as out-of-pocket travel expenses and the time spent traveling and waiting, and in getting the test results, especially if separate trips are involved. The particulars of how a testing intervention is designed affect all these costs. Individuals pay many of these costs, but so too do governments through subsidized testing programs.
Another class of costs, however, are even more indirect and involve costs to the person tested if others find out that the person has been tested or learn the actual result of the test. Just as the benefits of a test arise from what can be done with the knowledge of someone’s test outcome (serostatus), so do some of the costs. A major deterrent to testing is the possible revelation of one’s serostatus to others, either inadvertently through a failure to maintain the confidentiality of the test result itself or as a by-product of behavior that reflects the test result. But just knowing that someone has been tested may be troublesome because it allows the inference that the person had reason to be concerned about exposure even if the test is subsequently negative. Sometimes bundled under the imprecise term “stigma,” these costs of revelation seem to fall into two distinct categories. The particulars of how a testing intervention is designed affect all these costs, just as they affect the economic costs, and it would seem well worthwhile trying to understand how these costs arise in their particulars so as to devise interventions to make the best of the situation.

In the first category of stigma costs would be costs imposed on the person tested as a consequence of a variety of unreasoning or emotional or moral(istic) reactions by other people. For instance, people may fear being infected in ways that are actually impossible or nearly impossible. They may simply find it disturbing to contemplate the reality of a person infected with a deadly disease. They may view infection with the disease as reflecting badly on the infected person. People with these reactions may shun or otherwise discriminate against people who test HIV+. It may be possible to mitigate this behavior through information or exhortations or, in cases such as workplace discrimination, overt regulation. Otherwise, to the extent that these unappealing and harmful reactions, or the fear of them, exist, they naturally influence people contemplating a test and therefore must be incorporated in the design and analysis of HIV testing.

A second category of stigma costs, however, arises from the very real consequences to other people of someone’s serostatus and the test result that reveals it. Uninfected people may want to avoid unprotected sexual relations with people who they learn are HIV+. They may fear trying to have children with an infected partner. They may make inferences about the past sexual history of their partner. Marriages may break up. For a myriad of reasons, people may feel that interaction of all sorts with someone presumed to have a shortened life span is of less value to them. These situations are all potentially bad, but they are also the often unavoidable and very real circumstances and decisions that people face in a time of such an epidemic.

All these aspects of the HIV epidemic and many others involve people making choices, even if some people whose interests are at stake lack wide latitude for choice. A discussion about choice needs an overall view of how people make decisions, and the starting point throughout this paper is a rational actor
perspective, that people take decisions to achieve the outcomes they value most, subject to the constraints they encounter. They strategize about their predicament. Constraints may include economic ones, such as their own incomes and the prices that they pay for tests, their sexual strategic situation, and the relevant information they have. In other words, they weigh benefits against costs as they perceive them. I therefore use this general perspective to organize the evidence from the epidemiological and other literature about people’s behavior. The same perspective provides guidance on public policy toward testing as well as on the role of private providers of tests.

But before getting to all these considerations, it seems worthwhile to start with the basics: How does an HIV test work from the perspective of people who want to know if they are infected? How many people have been tested and what did they suspect about their serostatus before they were tested? After laying out these considerations, the core of the paper deals with: the design of testing programs and with people’s decision to be tested; how they are affected by all sorts of costs and benefits; what actions people subsequently take; and what happens afterwards.

How Tests Are Done: The Biochemistry

The tests for HIV infection in general clinical use today infer infection with the virus by detecting antibodies to the virus, and not by the presence of the virus itself (although such a test is technically feasible). The tests therefore depend on a person’s immune system making detectable levels of antibodies which requires some time after infection. Consequently there is a period after infection during which the virus cannot be detected (dependent on the type of test), which is known as the “window.” Within this window an infected person is infectious but negative on an antibody test. Thus for someone to be confident that he or she is negative, he or she must wait out the period of the window before being tested. For many tests in recent use, this window is roughly three months from the last activity that could infect a person. The natural history of HIV makes the window particularly dangerous. An infected person is highly infectious during this period—in excess of ten times as infectious as even a chronically infected person who is not on ARV treatment (Butler and Smith 2007, table 1). Indeed it may arguably be safer to have sexual relations with someone who knows they are HIV+ and therefore outside the window than to have relations with someone who tests negative but might be inside the highly infectious window. Which of these two strategies of partner choice is safer depends on the proportion of seemingly HIV—people who are in fact infected and inside the window, which in turn depends on the stage of the epidemic when the partnership occurs (Butler and Smith 2007).
To further complicate matters, the inexpensive tests that provide results within the same day (actually within 30 minutes) may generate false positives (although not false negatives outside the window if properly performed). Thus to confirm that someone is positive requires at least one additional test depending on the protocol. Confirmation may require a blood sample to be sent for a different type of

<table>
<thead>
<tr>
<th>Country and year of DHS</th>
<th>Urban respondents of any age who have been tested (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td></td>
</tr>
<tr>
<td>Benin, 2001</td>
<td>7</td>
</tr>
<tr>
<td>Burkina Faso, 2003</td>
<td>7</td>
</tr>
<tr>
<td>Cameroon, 2004</td>
<td>16</td>
</tr>
<tr>
<td>Ethiopia, 2000</td>
<td>2</td>
</tr>
<tr>
<td>Ghana, 2003</td>
<td>9</td>
</tr>
<tr>
<td>Kenya, 1998</td>
<td>17</td>
</tr>
<tr>
<td>Kenya, 2003</td>
<td>16</td>
</tr>
<tr>
<td>Madagascar, 2003–04</td>
<td>1</td>
</tr>
<tr>
<td>Malawi, 2000</td>
<td>15</td>
</tr>
<tr>
<td>Mali, 2001</td>
<td>9</td>
</tr>
<tr>
<td>Mozambique, 2003</td>
<td>4</td>
</tr>
<tr>
<td>Namibia, 2000</td>
<td>25</td>
</tr>
<tr>
<td>Nigeria, 2003</td>
<td>14</td>
</tr>
<tr>
<td>Rwanda, 2000</td>
<td>7</td>
</tr>
<tr>
<td>Tanzania, 1996</td>
<td>12</td>
</tr>
<tr>
<td>Tanzania, 2004</td>
<td>14</td>
</tr>
<tr>
<td>Uganda, 1995</td>
<td>11</td>
</tr>
<tr>
<td>Uganda, 2000–01</td>
<td>12</td>
</tr>
<tr>
<td>Zambia, 2001–02</td>
<td>13</td>
</tr>
<tr>
<td>Zimbabwe, 1999</td>
<td>9</td>
</tr>
<tr>
<td>Elsewhere</td>
<td></td>
</tr>
<tr>
<td>Armenia, 2000</td>
<td>4</td>
</tr>
<tr>
<td>Turkmenistan, 2000</td>
<td>—</td>
</tr>
<tr>
<td>Uzbekistan, 2002</td>
<td>13</td>
</tr>
<tr>
<td>Cambodia, 2000</td>
<td>—</td>
</tr>
<tr>
<td>Philippines, 2003</td>
<td>3</td>
</tr>
<tr>
<td>Bolivia, 2003</td>
<td>6</td>
</tr>
<tr>
<td>Colombia, 2000</td>
<td>—</td>
</tr>
<tr>
<td>Dominican Republic, 2002</td>
<td>41</td>
</tr>
<tr>
<td>Haiti, 2000</td>
<td>5</td>
</tr>
<tr>
<td>Peru, 2000</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: — Not available.
Source: Summary statistics from the DHS surveys on the DHS website.
test to a testing facility with more capabilities. There are typically relatively few such laboratories in poor countries, perhaps only a central one. Consequently confirmatory results may be unavailable for a few weeks, requiring a separate visit to collect results by the person who has been tested.

These two characteristics of the test, the window and false positives, must be understood by people at risk of HIV infection. Information on the window and false positives is presumably an important part of the counseling that often accompanies HIV testing (see for example Corbett and others 2006, p. 1009). Nonetheless there is no evidence as to whether Africans generally have this knowledge that they need for testing to be useful as opposed to being actually misleading and therefore dangerous.

Information has always been an important component of programs for controlling the epidemic, and many aspects of the epidemic do seem to be widely understood in African countries. People need to understand that there is such an infection and how it spreads. The Demographic and Health Surveys (DHSs) and other information suggest that these broad messages have been disseminated to a large degree (Gersovitz 2005), although not perfectly. By contrast Castle (2003) describes considerable skepticism about the existence of HIV/AIDS from focus groups in 2001 in Mali, a relatively low prevalence country. Of course, the same messages need to be disseminated to each new cohort before its members become sexually active. But beyond this general knowledge, there is a need to find out what the general population knows about such specifics of HIV testing as the window and false positives. To the extent that such information is not already widely known, it needs to be disseminated as part of a second generation of information provision.

Furthermore giving people the opportunity to test without warning them in advance by at least the amount of time involved in the window (so that they can abstain from risky behavior prior to the test) means that such a test cannot assure people that they are uninfected even if they test negative. A test without warning therefore has a diminished value, perhaps very much so as implied by the calculations of Butler and Smith (2007). People must understand this point if the test is not to mislead; though if they do understand it they may not want such a test. None of the studies that evaluate testing of which I am aware discuss this point insofar as it influences the demand for testing.

The Prevalence of Testing and Prior Knowledge

Table 1 provides information on the rate of HIV testing of men and women for countries that have done one or more DHSs that asked the relevant question. These surveys try to be national randomly representative samples. Among the
African countries with these surveys, the East African countries (Kenya, Malawi, Tanzania, Uganda, Zambia) tend to have percentages of men who have been tested in the teens, with a generally lower percentage of women, although this percentage is also in the teens in Kenya and Tanzania. The percentages for women are lower despite the fact that women often have access to testing through antenatal clinics (ANCs). Kenya, Tanzania, and Uganda have more than one survey, but, with the exception of Tanzanian women, the rates of HIV testing have not been increasing substantially for either gender. Elsewhere in Africa the rate of testing is generally lower, although Cameroon, Nigeria, and, in particular, Namibia have high rates. In Botswana, the first African country to adopt routine testing in 2004, 48 percent of people aged 18 to 49 reported that they had at some time been tested by the end of 2004 according to a population-based survey (Steen and others 2007). Among countries outside Africa, listed in table 1, the Dominican Republic is notable for rates of testing just above 40 percent, more than double any African country except Botswana and Namibia. Thailand which does not have a DHS with this information also seems to have high rates of testing with 47 percent of adults 19–35 having been tested in Chiang Mai city and its surroundings (Kawichai and others 2005). Although the rate of testing in a country as a whole is generally lower than in its urban areas (see table 1), this Thai experience much exceeds that of the African countries except Botswana and Namibia.

Table 2. Kenyan and Tanzanian Respondents’ Information about HIV Testing, 2003 DHSs (Weighted by population probabilities)

<table>
<thead>
<tr>
<th>Question</th>
<th>Kenya</th>
<th>Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>1. % tested prior to survey as reported in previous DHS (Kenya, 1998; Tanzania, 1996)</td>
<td>17.0</td>
<td>15.0</td>
</tr>
<tr>
<td>2. % tested prior to 2003 DHS</td>
<td>15.6</td>
<td>14.9</td>
</tr>
<tr>
<td>3. % who got result of prior test</td>
<td>94.7</td>
<td>89.2</td>
</tr>
<tr>
<td>4. % want test if no prior test</td>
<td>71.9</td>
<td>69.6</td>
</tr>
<tr>
<td>5. % HIV+ according to 2003 DHS</td>
<td>4.8</td>
<td>8.7</td>
</tr>
<tr>
<td>6. % HIV+ if prior test</td>
<td>7.6</td>
<td>12.4</td>
</tr>
<tr>
<td>7. % HIV+ if no prior test</td>
<td>4.3</td>
<td>8.3</td>
</tr>
<tr>
<td>8. % with prior test if HIV+ in 2003 DHS</td>
<td>24.2</td>
<td>20.1</td>
</tr>
<tr>
<td>9. % with prior test if HIV– in 2003 DHS</td>
<td>14.8</td>
<td>13.8</td>
</tr>
<tr>
<td>10. % who got result of prior test if HIV+ in 2003 DHS</td>
<td>91.4</td>
<td>88.0</td>
</tr>
<tr>
<td>11. % who got result of prior test if HIV– in 2003 DHS</td>
<td>95.3</td>
<td>90.0</td>
</tr>
</tbody>
</table>

Note: — Not available.
Table 3. Kenyan (DHS, 2003) and Tanzanian (DHS, 2003) Information about HIV Testing by Self-declared Risk of HIV, Weighted by Population Probabilities

<table>
<thead>
<tr>
<th>Question</th>
<th>A Kenya</th>
<th></th>
<th></th>
<th></th>
<th>B Tanzania</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
<td>Women</td>
<td>Women</td>
<td></td>
</tr>
<tr>
<td>1. %HIV+</td>
<td>3.5</td>
<td>5.4</td>
<td>4.6</td>
<td>7.5</td>
<td>5.4</td>
<td>9.6</td>
<td>14.3</td>
<td>14.9</td>
</tr>
<tr>
<td>2. % tested prior to survey</td>
<td>13.9</td>
<td>16.0</td>
<td>19.6</td>
<td>16.2</td>
<td>13.3</td>
<td>15.4</td>
<td>17.0</td>
<td>15.9</td>
</tr>
<tr>
<td>3. % who get result of prior test</td>
<td>68.6</td>
<td>72.2</td>
<td>77.3</td>
<td>78.1</td>
<td>90.6</td>
<td>90.9</td>
<td>81.5</td>
<td>90.6</td>
</tr>
<tr>
<td>4. % HIV+ if pre-tested and got prior result</td>
<td>4.6</td>
<td>8.3</td>
<td>6.3</td>
<td>19.9</td>
<td>6.8</td>
<td>13.3</td>
<td>14.5</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Tables 2 and 3 give more detail on testing from the DHSs done in 2003 in Kenya and in Tanzania (corresponding to the most recent surveys for these countries in table 1). These surveys are two of the recent generation of DHSs that included a test for HIV as part of the survey. On an anonymous basis, these surveys make available to researchers the HIV test results of individual respondents linked to their answers to the main sociodemographic questionnaire. Most people who had been tested prior to the survey did get their results, somewhat more so if they proved HIV+ on the test administered as part of the survey itself but not markedly so (table 2, lines 10 and 11). These results differ from many of the findings from samples of convenience or other smaller scale surveys in Africa which often report a low proportion of people returning for results and this proportion is even lower if people are HIV+ (see the references reported in Gersovitz 2005). The DHS information, however, is based on self-reports whereas the small-scale studies are usually based on the actual records of testing centers which provide both the serostatus of people and whether they returned for their results. The Kenyan DHS asked if people who had not been tested wanted to be, and the vast majority said they did (table 2, line 4), a result that appears in other DHSs from East Africa (Gersovitz 2005).

The best way to know one’s status is to be tested, but people have a lot of information about the risks that they and others are infected even without a test (Watkins 2004). The value of a test depends on how much someone knows beforehand including knowledge of the results from prior tests. Table 3 provides results on the average values of some variables cross-classified by whether the people believe themselves to be in one of four increasingly risky categories for exposure to HIV infection. These categories are obviously subjective and all but the first, no risk, do not correspond to any numerical value of probability. As row 1 for both Kenyan and Tanzanian men and women shows, people who describe themselves as more at risk are more likely to be infected according to the test that is part of the surveys.

Nonetheless, it is anomalous that over 5 percent of people are infected in three of the four groups declaring no risk. This anomaly is somewhat more marked if the people declaring their risk of infection were tested prior to the survey and received this prior test result (table 3, row 4). Of course, the respondents could have become infected after they were tested but before they participated in the survey, hinting that people who have chosen to be tested may be a special group. There is a mild tendency for groups declaring an intermediate risk to have been more likely to have been tested prior to the survey (row 2, two middle columns). In principle, it is these groups who should believe they have the most to learn from a test and therefore should be more inclined to undertake the costs of being tested (Philipson and Posner 1995). There is no pattern, however, as to
which risk group tends to get the results of these tests prior to the survey (table 3, row 3).

Chao and others (2007) asked primary and secondary teachers in KwaZulu-Natal about the HIV prevalence among the teachers themselves and the general population (Chao and others 2007). The question format (p. 455) was: “Out of every ten [of each group] how many do you think have been infected with HIV?” This question is clearly a better match to the concept of probability than the qualitative categorization embodied in the data of Bignami-Van Assche and others (2007) or the DHSs (table 3). Chao and others found that the teachers overestimated prevalence among both groups relative to the estimates for KwaZulu-Natal from a national HIV seroprevalence study for South Africa. Thus the teachers estimated 48 percent of other teachers and 61 percent of the general population to be infected versus the national survey’s 22 and 17 percent respectively. Condom use by the teachers in this study was positively associated with their (exaggerated) estimate of HIV prevalence. Their erroneous beliefs may therefore have been leading them to take fewer risks rather than becoming hopeless and thereby abandoning precautions (rational fatalism, see the references and discussion in Gersovitz and Hammer 2003), but it may also be the case that inherently fearful people both overestimate risks and are more cautious in their behavior.

Even more striking examples of anomalies involve confusion about people’s knowledge of their own test results. In Botswana, the Tefelopele VCT network tested 117,234 first-time clients between April, 2000 and September, 2004 (Creek and others 2006). Of these people, 16.2 percent said they had been tested elsewhere and of these 12.1 percent (2,300 people) said they had tested positive. Furthermore 38.7 percent of these 2,300 claimed that they expected a negative test result from their Tefelopele test and 11.7 percent of these 2,300 actually received a negative result. Needless to say, this last observation raises a lot of questions, most especially about the details of these people’s stories, their perceptions of the biology of HIV and the biochemistry of a test, and the nature of the prior test. In a much smaller study in Zambia, Chintu and others (1997) reported similar results, that 30 percent of 71 volunteers who self-reported as HIV+ were shown to be HIV−. In discussions in Uganda in 2007, a staff member at The AIDS Support Organization (TASO), an NGO, told me that HIV− people would report to their organization that they were HIV+, but in this case there was a clear incentive for such misreporting because TASO provides material support to its (HIV+) members, something that does not seem to have occurred in the Creek or Chintu studies.

Discordant couples are ones in which one partner is HIV+ and the other is not; concordant couples are ones in which both partners have the same HIV status. Those discordant couples who misunderstand their situation pose especially pressing informational problems because they most likely should be...
taking additional precautions to avoid infection of the negative partner. Bunnell and others (2005) interviewed 67 members of discordant couples and also gathered information from 62 counselor trainers about the meaning of discordant couples. Participants were recruited through the AIDS Information Center (AIC) in Kampala, one of the oldest and largest testing organizations in Africa. Among other prevalent misinformation held by both groups, these researchers found (p. 1003) that a “majority of both clients and counsellors explained discordance by denying it was possible.” The finding about counselors is especially disturbing because it is hard to see how clients can be properly instructed by the AIC if their counselors are so lacking in basic understanding. Bwambale and others (2008) administered a questionnaire to a random sample of 780 men in rural western Uganda and found that 62 percent of them did not believe that HIV discordant partnerships were possible, a finding confirmed in focus groups. Mlay and others (2008) report on focus groups involving both men and women recruited through an ANC in Dar es Salaam as well as some ANC counselors. Most of the ANC attendees were unaware that couples could be discordant but, on being informed, thought it important that counseling should address the topic. By contrast with the AIC, the counselors at this ANC were said to understand the concept of discordance.

The proportions of people who have been tested might lead to some sense that African rates of testing are low given the high rates of infection and the dispersed nature of these epidemics, but it is hard to tell what such a judgment means. One way to think about whether testing is too low is to look at the supply of and demand for testing. If testing seems too low is it because of factors operating on supply or demand? Thus Fylkesnes (2000, s43) writes: “Where voluntary HIV counseling and testing has been made available, however, demand is disturbingly low.” But this conclusion is hard to reconcile with the diversity of results from different studies that offer testing in very different contexts of price, access and attributes that bear on the confidentiality of groups with potentially very different valuations of testing. I now turn to these issues.

How Tests Are Done: Norms of Initiation and Counseling

Laboratory protocols for establishing HIV infection, given the natural history of the virus and the biochemistry of the test, are only some determinants of the process of testing. There are many details of implementation that have implications for costs and availability, and for the provision of information and confidentiality. Many people see the defining characteristic of testing programs to be who initiates the testing. Testing may either be at the initiative of the person who
is to be tested or at the initiative of others. There are potentially several different types of these other initiators.

The WHO among other organizations has promoted the VCT approach, the standard protocol in Africa of the 1990s. In this approach testing was undertaken at the initiative of the person to be tested, hence it was voluntary. Any person wanting to be tested was to be counseled before and after the testing. Such counseling is designed to provide general information about the disease and the meaning of a test result, to prepare people for receiving their results, and to advise them about ways to conduct their lives after they have received the results, either positive or negative. This protocol has been widely adopted by government testing sites and by NGOs and is by far the one that has been most heavily documented. The paper therefore disproportionately discusses the experience with it.

Beginning in January, 2004 with Botswana (Steen and others 2007), some African governments have been moving to complement VCT with an alternative protocol called routine testing (RT) (De Cock and others 2006). In this approach people in most medical settings, including ANCs, tuberculosis clinics, and sexually transmitted disease (STD) clinics, would be tested unless they chose to opt out. Counseling would be available before and after testing but need not be mandatory for receiving results. RT has been scaled up rapidly in Botswana from 60,746 people tested in all of 2004 to 88,218 tested in the first half of 2006 (Steen and others 2007, table 3). At the main VCT program in Botswana, the number of tests was 61,221 in all of 2004 compared to 45,846 in the first half of 2006, so that routine testing does not seem to be crowding out VCT. In the first half of 2006, the number of people tested by RT was therefore almost double that by the main VCT program. Furthermore, RT does not seem to be a deterrent to ANC attendance which remains at 95 percent of all pregnancies.

Africans seem to be favorable to RT. In a probability sample of 1,268 adults in five districts of Botswana with the highest HIV infection rates done in late 2004 after the beginning of RT, 89 percent believed the program would lower barriers to testing, although 43 percent of interviewees did express the opinion that people would avoid health providers (Weiser and others 2006). Perez and others (2006) found that 89 percent of 520 ANC attendees in two Zimbabwe districts said that they would accept routine (opt-out) testing. Only 55 percent of these women had been tested through VCT. In a study in Mombasa, 416 of 500 ANC attendees accepted and received test results in an opt-out program. The study started by offering testing (to the first 50 women) through the hospital laboratory with resultant delays cited by 13 out of 15 women who declined out of this first group of 50. Consequently the study switched to finger-stick testing at the point of care. Of the remaining women who opted out, only 7 of 67 gave lack of time as their reason for not testing, so these women apparently felt able to opt out for such reasons as being afraid of a positive test (Chersich and others 2008).
An additional 276 women, however, had refused to participate in the study when first approached, although none gave the opt-out HIV testing and counseling procedures as their reason.

RT is, however, controversial among many commentators (see for instance Macklin 2005 and Tarantola 2005). Opponents of RT worry that even though people are told they may opt out they may feel inhibited from doing so and thus that a fundamental right has been infringed, “the right not to know” (Temmerman and others 1995). It is said that people may avoid contexts in which they may face RT, such as providers of medical care. Furthermore, Ruth Macklin maintains that respect for persons (minimally, not treating an individual “merely as a means”) entails that the testing process must be systematically linked with “existing or planned treatment or prevention programs” (Macklin 2005, p. 27). Her argument implies that testing would be wrong if treatment were not available and no systematic prevention program were in place. What follows from respect for persons, however, is more complex. Macklin’s reasoning ignores people’s own role in making choices about their own lives. Testing can allow people to make informed choices, both about prevention for themselves and others, and, when someone is already infected, about arrangements for a spouse and children. These choices are the ones faced by the people in the vignettes presented above, who deserve respect. Ideally, testing programs would be accompanied with prevention and treatment programs, but it does not follow from the fact that this situation is the ideal that the next best thing is no testing at all.

Certainly, the RT opponents raise some important considerations, and RT practitioners should be alive to them. Nonetheless, there is no simple moral calculation involved here because there are also important considerations on the side of RT, especially given that RT makes testing more available and in a way that many people prefer. Proponents of RT stress that testing can affect people’s behavior, prevent the spread of the epidemic, and give people access to treatment (De Cock 2005). Their concerns can also be expressed in terms of “rights.” Most fundamental is the right to life: the right of the uninfected not to be infected by people unaware of their status; the right of children not to be infected at birth or through breast feeding; the right of uninfected couples to establish their uninfected status and to decide to proceed with a mutually monogamous life; and the right of the infected to seek and obtain treatment. As well, there is the basic right to be make informed choices about one’s life, choices that can be influenced crucially by knowledge of one’s status: the right to choose not to infect one’s partner; the right to choose not to infect the mother or father of one’s children; the right to try to make all sorts of economic and other provisions when one is still able for one’s children and other survivors. Once again, these rights are the ones of the people discussed in the vignettes above. Talk of “rights” in general is
controversial among philosophers of ethics, though this paper is not the place for such a discussion. Anyway, as Brockway (2007) argues, there is no easy way to convince everyone that one set of rights should dominate another. But everyone should agree that the moral considerations raised by proponents of RT are very weighty too, whatever words describe them, and that a decision over RT should not be made by outsiders who are looking at only one side of a complex moral calculation.

Private for-profit establishments also provide testing but there is little information on their protocols and practices in poor countries in general and in Africa in particular. In Kenya, Marum and others (2006, p. 861) report that “responding to the popularity of VCT, some private practitioners and community groups have opened nonregistered sites, often using a handmade version of the national VCT logo. Although it is the prerogative of the Ministry of Health to close such sites, this has rarely been done.”

In a study of peri-urban areas of Chiang Mai, Thailand, about 50 percent of respondents who were tested in the private sector reported they did not receive counseling before or after the test in contrast to 15 percent of respondents tested at government facilities (Kawichai and others 2005, p. 239).

Workplace testing is another variant of private sector involvement. Corbett and others (2006) randomly assigned 24 Harare businesses that had (1) an on-site clinic, (2) 100–600 employees, and (3) employee absentee records to receive either on-site HIV VCT or on-site counseling plus a voucher for off-site testing. Of 3,950 workers with the on-site-testing option, 1,957 (49.5 percent) were tested and got results in contrast to only 125 (3.5 percent) out of 3,532 with the off-site option.

A final option is self-testing because the rapid tests that exist now can be packaged in a self-contained kit with all the reagents necessary to perform the test, much the same as the do-it-yourself pregnancy kits available in pharmacies (Pant Pal and Klein 2008). Advantages are cost and confidentiality if people take the test alone. There is not, however, much evidence on how self-testing might work, at least in part because most practitioners, even proponents of RT such as public health officials in countries with RT, greet the idea of making such test kits available with skepticism if not outright horror. Self-testing kits are, however, apparently marketed over the counter in Hong Kong (Wright and Katz 2006). Baiden and others (2007), based on their survey and focus groups in Ghana, propose the use of self-testing in Africa for people who have been counseled.

Certainly there are important concerns about self-testing. At the top of the list is whether people can perform a self-test accurately. Branson (1998) reports on 174,316 users of home collection kits in the US, 94.8 percent of whom provided samples that were suitable for testing at a lab, very close to the 95.2 percent achieved by health professionals. But these users did not actually
perform the test itself, which was done after they had sent the sample to a laboratory; nor did these users interpret the test. Lee and others (2007) found that 85 percent of participants in a sample of convenience in Singapore failed to perform all the steps correctly in genuine self-testing so that 56 percent ended up with invalid results. Spielberg and others (2004) report on a study of 240 people in the United States who already knew they were HIV+ and were largely successful in administering and interpreting a self-test. Finally, Lippman and others (2007, p. 425) report on a study of self-testing for bacterial STDs in São Paulo in which “94% of [the 410 women in the home-testing group] were able to complete collection and self-testing at home on their first attempt.” Although relevant to HIV self-testing, a complete interpretation of an HIV test requires understanding of the window and the need for confirmation of all positives and not just the ability to read the test strip. Self-testing might therefore be more suitable for repeat testers who have already gained information of this sort from counseling through traditional VCT. Skeptics also worry about whether individuals can cope with learning their results outside the structured counseling of VCT and that they might be made to take the test in front of others, denying them confidentiality.

African churches are important institutions, and there are many reports of tests required by churches for people planning marriage, either for purposes of making the couple themselves aware of their serostatus or with the results to be made available to the church. These tests could be undertaken through traditional VCT, but with the results to be provided to the church authorities. In discussions in Tanzania and Uganda in 2007 with people working on HIV testing, I was told that a church representative may attend the meeting at the testing site when a couple planning marriage get their results and thus the representative receives the results directly from the counselors. Maman and others (2001) report on in-depth interviews in which 2 of 15 couples recruited from a health information center in Dar es Salaam said that they had been required by their church to be tested before marriage. Some Ghanaian churches first instituted mandatory HIV testing prior to marriage but claim to have substituted voluntary testing after objections from the National Anti-AIDS Commission (Luginaah and others 2005). Some Ghanaian churches promote testing before the public announcement of a couple’s intention to marry so that the cancelation of a wedding consequent on a positive test does not breach confidentiality; but nonetheless the presumption is that many people, in addition to the prospective couple, learn what happened and why. In Burundi, the Catholic Church instructed priests not to marry couples unless they had a certificate stating that they had been tested, although it did not want to know the results of the tests (The Lancet 2006). In Nigeria, compulsory premarital testing by churches seems to be widespread, with the church marriage committee monitoring the process and with health centers
notifying the churches of the results even before the couples. Nigerian law does not mandate premarital testing, however, both national and regional governments are said to endorse the churches’ activities (Uneke and others 2007). In a study of 320 HIV+ men and women attending two health facilities in Eastern Nigeria, 19.4 percent gave a compulsory premarital test as their reason for testing (Obi and Ifeunandu 2006).

How Tests Are Done: Important Details of Design and Implementation

Who initiates the test is, however, just one aspect of testing. There are many others. Cost and price are important. Location is important both for cost and confidentiality. Who the counselor is is important in several ways. How results are made available is also important. Corbett and others (2006, p. 1010) conclude from their study and from their reading of the extant literature that “the consistent finding is that relatively minor differences in accessibility translate into major differences in acceptability of VCT in Africa.” Some evidence for this conclusion is presented in the following sections.

Testing may be done at a facility offering other medical services such as a hospital or clinic, including ANCs or at standalone facilities. Facilities are sometimes easily accessible to the person being tested, other times not. Testing may even be done by mobile units that administer the test in a special temporary facility erected for the purpose or in people’s homes. Testing may provide results quickly on the same day or they may require a return after some weeks. Those doing the counseling and administering the test may be medical personnel or so-called laypeople trained especially to counsel and administer tests but otherwise lacking medical training. They may be local or from outside the area where the testing is done. Choices about where the test is done and by whom affect the cost of providing the test. But these choices also affect the actual or perceived confidentiality of the test: who other than the person tested learns that someone has been tested or even the results of the test? There is also the issue of whether the testing process facilitates partner notification, a large topic that is deferred to the section on disclosure.

The wholesale cost of a rapid test kit is now about one U.S. dollar, and the cost of confirmation of an HIV+ result could be an additional five dollars; see for example Thielman and others (2006) for northern Tanzania in 2003. The cost of providing the conventional VCT package, however, is much higher, depending on the exact design of the package.

Some of the most detailed and comparable estimates for different choices about the provision of testing are given by Forsythe and others (2002) for the case of
Kenya in 1999. At the rates of capacity utilization that these authors observed VCT integrated into a hospital setting with salaries at non-government rates cost $16 and VCT with salaries at government rates cost $11. At maximum capacity and government salaries, cost could be reduced to $8. In all cases, tests that were HIV+ were assumed to be confirmed by a subsequent test.

Capacity utilization and its attendant effect on the average cost of a test seem to be problematic. After being open for more than two years at several sites, another health-facility-based program in Kenya still reported capacity utilization of only 40 percent even though it offered tests without charge (Arthur and others 2005). An intervention in Tanzania, which was based in already existing AIDS information centers and which excluded from consideration the costs already incurred by the centers, had an average cost of $11.92 per test in 2003, using local women who were trained as counselors (and paid $3.30 per day). When the test was offered for free, average cost per test fell to $7.38 as capacity utilization rose (Thielman and others 2006). These authors speculated that even higher capacity utilization could have pushed costs as low as $6.45 per test. If increased tests at a facility lead to a decrease in average cost, the cost of each of the additional tests is, of course, even lower than the average cost at which they take place.

Whether testing should be standalone or integrated with other health facilities most likely affects costs, especially capital and overhead costs; but I have seen no study that gathers cost data for standalone and integrated alternatives in the same place and time. Sweat and others (2000) estimate the cost of VCT in 1998 in standalone testing facilities to be $26.65 in Kenya and $28.93 in Tanzania. Forsythe and others (2002), working in Kenya one year later, compare these results to their own findings on integrated facilities. To the extent that these costs are comparable, they suggest integration has a large cost advantage relative to standalone. Similarly whether the facility is standalone or not may affect confidentiality because a multi-use facility does not implicitly label its attendees as concerned with their HIV status. Bradley and others (2008) reports on VCT programs at 28 clinics in Ethiopia run by one NGO that integrates them with family planning services either by having them in the same facility, in the same room but at different times, or done by the same counselor in the same session. But there is no information given on costs.

The AIC of Uganda reported cost per test of $13.39 in 1997 of which a very low $1.02 was attributed to the remuneration of counselors who had backgrounds in medical fields, social work, or teaching (UNAIDS 1999, pp. 26, 51). Shetty and others (2005) describe a project in which volunteer churchwomen were trained to counsel pregnant women in Zimbabwe and who were compensated only nominally with refreshments and recognition. The study did, however, use paid supervisory personnel, but it does not report overall cost data. The
Table 4. Studies on the Uptake of Testing

<table>
<thead>
<tr>
<th>Study</th>
<th>Location</th>
<th>Dates</th>
<th>Population</th>
<th>Total People Approached</th>
<th>% Agreed to be Tested</th>
<th>% of Column 6 Returning for Test Results</th>
<th>General Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fylkesnes and others (1999)</td>
<td>Lusaka residential and rural district, Zambia</td>
<td>October, 1995 to March 1996</td>
<td>Men and woman recruited by random sample</td>
<td>4920</td>
<td>3.5</td>
<td>47.1</td>
<td>Test free, people recruited within 3km in urban area, through outreach elsewhere</td>
</tr>
<tr>
<td>Kilewo and others (2001)</td>
<td>Dar es Salaam, Tanzania</td>
<td>June, 1996 to May, 1996</td>
<td>Pregnant women visiting three antenatal clinics pursuant to PMTCT trial</td>
<td>10010</td>
<td>76.4</td>
<td>68.1</td>
<td></td>
</tr>
<tr>
<td>Msellati and others (2001)</td>
<td>Abidjan, Côte d’Ivoire</td>
<td>October, 1998 to April, 1999</td>
<td>Pregnant women visiting four antenatal clinics pursuant to PMTCT trial</td>
<td>4309</td>
<td>80.1</td>
<td>69.1</td>
<td>All services free</td>
</tr>
<tr>
<td>Grésenguet and others (2002)</td>
<td>Bangui, Central African Republic</td>
<td>July, 1997 to March, 2001</td>
<td>Men and women attending a VCT center</td>
<td>6821</td>
<td>83.4</td>
<td>89.0</td>
<td>Tests at an urban VCT clinic: fee of $1.20 except on annual national AIDS days when free Rapid tests</td>
</tr>
<tr>
<td>Pignatelli and others (2006)</td>
<td>Ouagadougou, Burkina Faso</td>
<td>May, 2002 to April, 2004</td>
<td>Pregnant women attending S. Camille Medical Center</td>
<td>6639</td>
<td>18.3</td>
<td>99.6</td>
<td>Rapid tests, VCT free of charge</td>
</tr>
<tr>
<td>Sherr and others (2007)</td>
<td>Rural Manicaland, Zimbabwe</td>
<td>July, 1998 to February, 2000</td>
<td>Men and woman recruited by random sample</td>
<td>8036</td>
<td>5.9</td>
<td>34.0</td>
<td>Test free by mobile clinic at survey sites at time of survey</td>
</tr>
<tr>
<td>Fabiani and others (2007)</td>
<td>Gulu District, Uganda</td>
<td>2001 to 2003</td>
<td>Woman presenting for first time during pregnancy at St. Mary’s Hospital, ANC</td>
<td>12252</td>
<td>55.6</td>
<td>100.0</td>
<td>Rapid tests, apparently meant that everyone who agreed to testing received their results in about one hour</td>
</tr>
</tbody>
</table>

Note: PMTCT Prevent mother-to-child transmission.
volunteers were judged to have performed reliably with no reported breaches of confidentiality, although the ultimate receipt of test results was relatively low for an ANC setting (table 4). Other programs use specially trained midwives as counselors (see for example Pignatelli and others 2006). Menzies and others (2009) report costs for four testing strategies in Uganda, including non-VCT options.

Although data on costs, especially ones that compare different choices about project design under the same circumstances, are scarce, there is a lot of information on prices charged. Prices range from presumably full cost (when tests are provided by the for-profit private sector without any governmental subsides) to free (in some governmental, non-governmental, or research facilities, although even the former two groups often charge a fee).

Information on prices is of most interest when it is part of a discussion of price responsiveness. Among other things, this responsiveness tells how effective subsidies will be in expanding the number of people who are tested. There is effectively no study that estimates a conventional demand for testing. What is available are either studies that report on the experience of testing facilities that have varied their prices or on the hypothetical willingness-to-pay of respondents. In general, these studies indicate that getting people to pay the full cost of a test with counseling is a tough sell, although most of the evidence is almost certainly from times and places in which ARVs were unavailable, though getting tested is, of course, a prerequisite for access to these medicines as they become available in Africa.

Grésenguet and others (2002) provide information on price responsiveness from the experience of a testing center in Bangui. Normally the center would have had an average attendance of 160 people per month and charged the equivalent of $1.20 per test. In the Central African Republic, however, there is an annual AIDS day when testing is free. On the four AIDS days in the period under consideration, the center had 250–450 people coming for tests, indicating a clear price responsiveness. On the free testing days, people were more likely to be young, single and to have had fewer partners. They were less likely to be HIV+ but not statistically significantly so. This last finding accords with Philipson and Posner’s (1995) model of rational testers in which people who think they are either most likely or least likely to be infected are the ones who least benefit from a test. If the price of being tested falls, new (marginal) testers come from either extreme in their probability of infection, and there is no presumption as to whether these marginal testers are more or less likely to be infected on average than people who were tested at a higher price.

Thielman and others (2006) report that their VCT clinic went from an average of 2.7 clients (25 years and older for whom fees were not usually waived) per day, at first when the charge was $0.95, to 11.4 clients per day when the test was free for two weeks, to 4.6 clients after the resumption of the $0.95 fee over the next four months. Again, there is a fairly dramatic response to free testing from
an already heavily subsidized initial price. Of course the difference between the
2.7 and the 11.4 could partially reflect the drawing of people away from other
clinics because the free testing was not countrywide as it seems to have been on
the national AIDS days discussed by Grésenguet and others (2002). Interestingly,
the number of clients after the fee was resumed remained much higher than
before the free period, a possible indication of the spread of information about the
desirability or availability of testing. Such an outcome goes against the expectation
that demand might fall after the free period ends because some people who would
have paid the fee chose instead to be tested earlier than otherwise to receive a free
test. This study also reported no significant difference in the average HIV serosta-
tus of the people being tested in the three different periods, consistent with

Several studies report on the willingness to pay for an HIV test. The experience
reported by Sweat and others (2000, p. 119) is instructive, concerning both the
reliability of self-declared willingness-to-pay and what people seem actually willing
to pay: “after receipt of the [VCT], they said that they would pay an average of
$1.64 in Kenya and $5.11 in Tanzania. After the study ended and the sites were
converted to pure service provision, each site implemented fees based on these
results. However, demand for the service declined significantly, especially in
Tanzania. Therefore, each site lowered the fee to about $0.50 in Kenya and $1 in
Tanzania, and the number of clients increased to that before the initiation of fees.”
Of course, the total demand at any price depends not just on the average willing-
ness to pay but on the distribution of the willingness to pay because anyone with a
willingness to pay below the price charged will not demand the service. Both these
sites were also in capital cities and presumably had some competition from other
sites that were not increasing their prices, thereby magnifying the response to
changes in their prices alone, as some people may have changed where they were
tested.

Of 270 ANC attendees in northern Ghana, 30 percent wanted the test to be
free, the median amount that these women would pay was $0.25, and only 15.6
percent considered $1 to be affordable (Baiden and others 2005). In a survey of
780 men chosen randomly from the general population in rural western Uganda
(who were not tested in conjunction with the survey), Bwambale and others
(2008) report that 45 percent said they would not pay for VCT. In Lagos, Nigeria,
345 ANC attendees participated in a study of HIV testing (Ekanem and
Gbadegezin 2004), of whom 309 participants said they were willing to be tested
and 278 said they were willing to pay the $3 fee charged for VCT. In a study in
Kampala, 42 percent of adult patients who had not been tested during their hospi-
talization at Mulago Hospital gave lack of money as their reason, the most
common one reported (Wanyenze and others 2006). A focus-group respondent in
Tanzania (Urassa and others 2005, p. 847) stated: “If it were free I think many
women would go for the test because I wouldn’t dare ask my husband for money for an HIV test.” This response seems to connect the question of cost with another great barrier to testing, that is fears about confidentiality, and might suggest making the test free to women but not to men, although this response might merely reflect who controls the household budget in general.

Information on the response of testing to income is even scarcer. In their study of patients at Mulago, Wanyenze and others (2006) found that income was a significant predictor of having been tested before hospitalization in a multivariate regression.

People who get tested face other costs than just what they pay for the test. The cost of transport to and from the testing location is important and so is the time involved. People want easy access to minimize these costs. Were and others (2003) report on a population-based study in rural Uganda in which 99 percent of 3,072 participants who were tested and given their results preferred to receive them at home rather than at the study site. These authors believe that transport costs were an important reason as well as people’s preference for the privacy of their own homes. Wolff and others (2005) conducted both focus groups and in-depth interviews in conjunction with an intervention that provided home-based testing in Uganda. Participants stressed the non-monetary costs avoided through home testing, including travel time and long unpredictable waiting times to get results that discouraged testing in the past. Kipp and others (2001, p. 285) sampled randomly 469 villagers in Kigoyera Parish, western Uganda, and report that “most participants expressed the need for HIV testing at the village level, as opposed to traveling 65 km to the district capital.”

Ease of access to minimize cost is tied to an offsetting consideration: people fear that being tested near where they live is more likely to lead to a breach of confidentiality that matters to them. In focus groups convened in western rural Uganda, Bwambale and others (2008) report that men both feared being identified while being tested in the local health subdistrict but wanted proximity for easier access. Kipp and others (2001, p. 284) report that 90.6 percent of their respondents “emphasized that the counselors should not be residents in the area.” Pool and others (2001) studied the responses of 208 women in 24 focus groups in rural south-west Uganda: “Women made a distinction between local rural maternity clinics and hospitals (which are only found in the towns), saying that hospitals would be more confidential because staff do not live in the same community and patients are anonymous” (p. 611). One woman noted that gloves were not available at the clinics and staff would be reluctant to help with delivery if women were known to be HIV+, so women would not want the staff to know their status, whereas at a hospital gloves would be available so the problem would not arise. Of course, such strategic behavior would put clinic staff at risk and also makes it impossible to prevent mother to child transmission.
By contrast, these concerns seem not to arise with home testing. Thus Wolff and others (2005, p. 113) were surprised to find that “most participants were adamant that maintaining privacy for discussion and hiding the true purpose of the visit [by the test providers] from others in the family or village was or would be relatively easy.” These authors also found that “those who went to counselling offices were also aware their visits were being observed and that they then become the subject of rumours. What distinguished them from home-VCT clients is their decision not to care.” Baiden and others (2007) also report on interviews with 403 respondents as well as on focus groups in northern Ghana showing widespread although not unanimous preference for home-based testing. Angotti and others (2009) provide evidence from Malawi that people prefer home testing for cost and confidentiality. Furthermore, they argue that people value the ability to see the test strip and see it destroyed afterwards.

This discussion suggests that where a study or intervention recruits its counselors could affect the success of the intervention. Some studies use counselors from outside the area and others do not, and it is not always easy to tell which. Thus Killewo and others (1998) undertook a pilot study in the remote village of Ruhoko, Tanzania, which is reachable only after a two-hour drive on a rough road and is isolated from HIV research and intervention. The study used research assistants as counselors, presumably outsiders, although not explicitly reported as being so.

All in all, however, acceptance by people of an offer of even a free test and the return to receive the test result are by no means universal, and the rate of acceptance and return is often a small fraction of the population that is initially offered the opportunity. Table 4 gives some detail on eight studies that report on relatively large numbers of people. Context seems to be important.

One venue for the offer of a test is an ANC, and here the rate of acceptance and receipt of the result is often high. Kilewo and others (2001), Msellati and others (2001), and Fabiani and others (2007) offered tests to pregnant women attending ANCs as part of programs to prevent mother-to-child transmission (PMTCT). Over half of these women were tested and got their results. Shetty and others (2005), however, report that only 21 percent of ANC attendees in Zimbabwe chose to be tested and received their test results when offered. Pignatelli and others (2006) found that an even lower 18 percent of women at an ANC in Ouagadougou accepted VCT and got their results.

Outside the context of ANCs, Grésenguet and others (2002) report that of 6,821 people who visited a VCT clinic in Bangui from 1997 to 2001, 74 percent received their test results. Studies in the Rakai area of Uganda also find high rates of acceptance of (free) testing and receipt of results (Matovu and others 2002, 2005), but these studies report on an area that has been subject to years of interventions and research projects and so its experience may not be easy to generalize.
to programs that operate on a large scale to deliver testing services without any other activities. By contrast Fylkesnes and others (1999) and Sherr and others (2007) provide results for random samples of both men and women from the general populations of regions in Zambia and Zimbabwe respectively. In these two cases, less than 2 percent of the people contacted were tested and got their results. Fylkesnes and others (1999, p. 2473) believe this disparity between the large-scale studies and the clinic-based ones arises because the clinics establish a presumption that people should be tested and get their results, violating their “right not to know,” while the other studies better reflect what people really want. An alternative is that clinic attendees, including pregnant women in contrast to the general population, have good reasons to know, such as preventing the infection of unborn children or their partners, and that this motivation results in the different outcomes on uptake. As documented below, many of the people who can benefit from tests, namely people in discordant couples, may not realize that they are in a situation where someone is being put at risk, whereas ANC attendees know that if they are infected their unborn child is put at high risk. Furthermore prospective testers may feel more comfortable about confidentiality at multipurpose testing facilities such as ANC sites because people who know them and observe their presence at the facility cannot infer that their purpose is a test. Finally, neither of these last two studies provided easy access, which is very important and a recurrent theme of many of the studies reviewed in this paper.5

Disclosure: Partner Notification and Partner Testing

In the 1990s, samples of convenience provided evidence that sero-discordant couples were just as likely to be female HIV+/male HIV− as female HIV−/male HIV+ (see Gersovitz 1999, 2005 for further discussion and references). Without systematic data from randomly representative national surveys, however, one could not rule out that bias in the samples of convenience used in the epidemiological studies somehow produced this conclusion about discordant couples. With the newly available serostatus DHSs, however, it can be seen that this finding characterizes large, national samples that try to be randomly representative, although not entirely successfully (see the references and discussion in Renier and Eaton, 2009). This experience is a good example of when research based on non-representative samples nonetheless pointed to an important result and one found well before the representative surveys were available. Furthermore de Walque (2007) shows that even for couples that have been together for 10 years the proportion of female HIV+ and male HIV+ discordant couples remains roughly equal. This finding in turn suggests that the women were not infected prior to marriage.
Such findings call into question the conventional workhorse of HIV epidemiology, the core group model, in which a man becomes infected through commercial sex outside marriage and then infects his wife (Anderson and May 1991; Over and Piot 1993). It is becoming clear that ignorance about the pattern of discordant couples has sent the public health community off on a false scent and for quite a long time. What one believes about model specification has implications as to how to define information campaigns and other interventions such as testing to control the epidemic. Not, however, that the symmetric results on discordant couples by gender imply symmetry in all relevant matters for the genders. There is long-standing debate over whether a woman is more likely than a man to be infected through a single act of unprotected intercourse with an infected partner. Furthermore, one could speculate on whether the modalities of extramarital and marital partnerships are more likely to leave men or women having relations with their marital partner within the highly infectious window if they become infected extramaritally which in turn affects how long a discordant couple endures before converting to an HIV+ concordant one.

In five African countries, de Walque (2007, p. 505) reports that over two-thirds of couples with at least one partner who is infected are discordant. Table 5, columns 1 and 2, reproduce his findings for Kenya and Tanzania and, in conjunction with column 3, show that rates of infection of people in couples are similar to rates of infection in the population as a whole. Further calculations reported in column 4 show that a high proportion of people in these countries are members of couples. Taking all these factors together, column 5 shows that about 30 percent of all men and women in Kenya who are HIV+ are in discordant couples, the rest are either in concordant HIV+ couples (column 6) or do not report being a member of a couple. In Tanzania the corresponding percentages are 37 and 29 percent. Thus, these couples, relatively numerous among all people who are HIV+, could benefit from using knowledge about their HIV status to protect the uninfected partner on the presumption that they are sexually active within the couple. But for this outcome to occur, both partners have to get tested, share their results, and devise strategies for avoiding infection of the uninfected partner.

The proportion of people who inform their partners about their HIV test results differs considerably among studies. These studies depend on self-reports of the people who would be disclosing. I know of no study that asks people whether their partners had disclosed to them. Essentially all these studies precede any widespread access to ARVs. Medley and others (2004) survey 14 studies on disclosure in Africa (and one in Thailand) by pregnant women between 1990 and 2001; most had samples below 500. The range in disclosure rates in these studies was between 17 and 79 percent. One study enrolled 1,078 HIV+ pregnant women and tried to follow them for 46 months, reporting on disclosure at each assessment. It found that 22 percent of 815 women had disclosed to a partner
Table 5. The importance of Discordant Couples, Weighted by Population Probabilities

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of this gender in couples who are in concordant positive couples</td>
<td>% of this gender in couples who are in discordant couples in which this gender HIV+</td>
<td>% of respondent population that is HIV+, by gender</td>
<td>% in couples, married, or living together, by gender</td>
<td>% of all HIV+ people of this gender who are in discordant couples in which this gender is HIV+</td>
<td>% of all HIV+ people of this gender who are in concordant positive couples</td>
</tr>
<tr>
<td><strong>Kenya</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>3.64</td>
<td>2.84</td>
<td>4.75</td>
<td>50.81</td>
<td>30.38</td>
<td>38.94</td>
</tr>
<tr>
<td>Women</td>
<td>3.64</td>
<td>4.44</td>
<td>8.72</td>
<td>60.30</td>
<td>30.70</td>
<td>25.17</td>
</tr>
<tr>
<td><strong>Tanzania</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.59</td>
<td>4.39</td>
<td>6.26</td>
<td>53.10</td>
<td>37.24</td>
<td>21.97</td>
</tr>
<tr>
<td>Women</td>
<td>2.59</td>
<td>3.48</td>
<td>7.70</td>
<td>63.56</td>
<td>28.73</td>
<td>21.38</td>
</tr>
</tbody>
</table>

Source: Columns 1 and 2: de Walque (2007, table 1); columns 3–6: calculations by the author from the 2003 DHSs for Kenya and Tanzania.
within two months and 40 percent (of 730 of these women) within 46 months (Antelman and others 2001), so the length of time over which disclosure is measured is potentially important, although it is not clear from the study what role sample attrition might have played in these results. Kipp and others (2001) contacted 469 men and women in Kigoyera Parish, western Uganda, of whom 343 were tested and 107 of these said they informed partners (including seven out of nine HIV+ people). Wanyenze and others (2006) report that 40 percent of 131 patients at Mulago Hospital who had had an HIV test reported sharing results with partners. Obi and Ifebunandu (2006) report that 67 percent of 320 HIV+ men and women who filled out questionnaires at two health clinics in eastern Nigeria informed their partners. These 320 people had known their HIV status for an average of 3.2 years and 48 percent reported having informed their partners within one week of learning their serostatus. Thirty-three percent, however, had still not informed a partner at the time of the study; almost all of these people were reported as asymptomatic and not married to their partners although my presumption from the authors’ write-up is that these people do have a partner whom they could have informed. Forty percent of these 320 people were on ARVs.

Perhaps even more important than disclosure from one partner to another is if both partners are tested and share their results. What little evidence there is, however, suggests that roughly 10 percent of people who are tested do so as couples. Creek and others (2006) report that in the large-scale Tebeloole system of Botswana, 8.2 percent of all VCT clients came as couples, a number that was relatively stable between 2000 and 2004. Semrau and others (2005) report that 868 (9.2 percent) of 9,409 women at an ANC program in Zambia were counseled as couples and both partners of 794 couples agreed to HIV testing. By contrast, de Graft-Johnson and others (2005) found in an attitudinal survey in Malawi that 68 percent of men and 74 percent of women said they preferred to receive results with their partner present. Here, as elsewhere in HIV-related behavior, it seems that what people say they want may not be what they end up doing. It seems likely that the discrepancy arises from a difference between what they declare and their ultimate intent because overall supply constraints on testing would not seem to explain why people test relatively less as couples than they say they want to.

Similarly, after people are tested, their partner only rarely comes for testing. Shetty and others (2005) report that of 1,547 women in Zimbabwe who attended an ANC, and who were offered HIV testing and chose to be tested, only 93 had male partners who agreed to be tested as well. Temmerman and others (1995) report that of 324 HIV+ women identified through ANCs in Nairobi, only 66 disclosed to their partner and only 21 of these 66 showed up with their partner to be counseled and tested. Perhaps if people were better informed about the prevalence of discordant couples, more of them would get tested. Perhaps if ARVs become available to such people, more of them would get tested.
The failure of pregnant women to disclose their test results to their partners is particularly troublesome. By its nature, a PMTCT protocol requires medication for the mother and child and avoidance of breast feeding which is a usual and therefore expected practice in Africa. But this behavior is hard to conceal from one’s partner so that low partner disclosure does not bode well for adherence to the protocol. When asked hypothetically, Urassa and others (2005) report that 49 percent of 249 Tanzanian ANC attendees in late pregnancy said that they would prefer to receive the drug nevirapene to prevent HIV transmission to their baby without an HIV test to learn their own serostatus (which these women apparently did not know).

Another issue related to disclosure is whether people are given their results verbally or in writing, allowed to bring a third party to meet with a person having access to the test results, or both. A written result can be used to substantiate serostatus to a third party most especially a partner but also to others such as the churches mentioned above, assuming that counterfeiting is not an issue. King and others (2008, p. 237) report the following vignette from Jinja, Uganda, about the disclosure of serostatus by an HIV+ woman to her partner: “So that evening when he came, we just conversed and then I got out my book plus the card [from the health center]. I showed them to him.” These authors consider this vignette to be indicative of a general class of indirect approaches to disclosure involving the intentional display of referral cards or HIV related medications.

In Botswana, in 2006, the test result was written in a person’s health booklet which the person keeps and can therefore show to others (and which in principle others could get to see accidentally or demand to see under threats of various kinds). In Malawi, in 2006, HIV results were purposefully not written into the health booklet. Kenya’s national guidelines discourage sites from providing written results (Marum and others 2006). A large VCT clinic in Bangui provides the test result in a sealed envelope to the person tested (Grésenguet and others 2002). At the Rakai project in Uganda, however, “HIV results were communicated verbally and no documents disclosing HIV status were retained by the client” (Matovu and others 2005, p. 504). Their rationale for this decision is given by the Rakai researchers in Gray and others (2006, p. 247): “Disclosure of HIV-negative status on consent forms also entails risks to research subjects and their sexual partners because it could lead to unsafe sexual behaviors (disinhibition) if participants use the consent copy as ‘proof’ of HIV-negative status to negotiate unsafe sex. Moreover... some are likely to become infected during follow-up, but they could continue to use the copy of the original as proof of negativity, thus placing their partners at risk for infection.” Elsewhere in Africa I have encountered a third variant: public clinics that provide written results only if negative, which means that a third party may presume that someone is positive if they
have been tested and cannot produce a negative slip, although, as elsewhere in life, pleas such as that the slip was lost are always possible.

Further Responses to Test Results

Once people know their serostatus there are potentially many consequences. Couples can take measures to minimize the risk of infection either from outside (seronegative couples) or from within the couple (serodisordant couples). Women can act to prevent the infection of their unborn and infant children. Couples may also break up and men have reacted violently when informed that their partners were tested or on learning of their partners’ test results.

If people have good knowledge, however, especially from a recent test, there may be little effect from giving them a new test even though they value the knowledge of their serostatus and it affects their decisions. For instance, studies that recruit people to be tested and then try to observe changes in their behavior after they have received their test results need to distinguish between people who had a good or even certain prior knowledge of their serostatus and those who did not, but of course the prior choice to be tested and get results is not random.6 Using data from San Francisco, Boozer and Philipson (2000) classify people by their prior beliefs and show that people who are surprised by their results in either way respond and people who are not do not respond. Specifically, people who thought they were at low risk but turn out to be HIV+ decrease their number of partners and people who thought they were at high risk but are HIV− increase their number of partners (see also Thornton 2008 on Malawi).

Most studies conclude that many people who learn they are HIV+ reduce behavior that puts others at risk, especially within discordant couples. A recent survey (Denison 2008, p. 372) that includes some of the studies considered in detail in this paper, concludes that “the significant effect [of a decrease in] unprotected sex is found primarily in studies conducted among HIV-infected persons or discordant couples.” These studies are, however, rarely randomly representative of the population of couples as a whole but instead are recruited from VCT participants, PMTCT participants, or hospital attendees, not the groups among which one expects to find people who do not care about the consequences for their partners of their own infection status. Nonetheless, I know of no study in Africa that asserts that people who discover that they are HIV+ typically increase risky behavior, but, given the potential for selection bias in the samples of extant studies, this topic is a clear priority for research based on randomly representative surveys.

From 1995 to 1998, the Voluntary HIV-1 Counseling and Testing Efficacy Study Group (2000) studied 1,563 individuals and 389 couples in Kenya,
Tanzania, and Trinidad and Tobago who received VCT (as well as approximately the same number of controls, who only received health information). In the follow-up, after receiving test results, both HIV+ men and women tested as individuals decreased unprotected intercourse with both primary and non-primary partners. There were similar results for HIV+ men who were tested as part of a couple; but HIV+ women who were tested as part of a couple only reduced unprotected intercourse with their enrolment partner. Roth and others (2001) report on 684 Rwandan couples recruited through women attending antenatal and pediatric clinics. The biggest effect was for discordant couples in which the man was learning his HIV status for the first time. The percentage of these couples who were regular condom users went from 5 to 65 percent at the one-year follow-up. Allen and others (2003) identified 963 discordant couples who attended a VCT clinic in Lusaka between 1994 and 1998, 818 of whom participated in the study: “The frequency of sex with the spouse did not change after VCT, but the proportion of [self-] reported contacts with a condom increased to >80% [from < 3% prior to receiving test results] and remained stable through ≥12 months of follow-up” (p. 736). Discordant couples with HIV+ men were less likely to report sexual activity and were more likely to report 100 percent condom use than discordant couples with HIV− men.7

From 2003 to 2004, Bunnell and others (2006) followed 235 male and 691 female HIV+ members of TASO. Eligibility required that these people had progressed significantly in the lifecycle of HIV. At baseline, 53 percent of men and 79 percent of women abstained. Consistent condom use increased and unprotected sexual acts with partners of negative or unknown status decreased after a package of ART and prevention interventions. Overall there was a 70 percent decrease in unprotected sexual acts and an estimated 98 percent decrease in seroconversions by uninfected partners over six months. These results occurred even though ART presumably increased these people’s health status and their interest in sexual activity. ART may also have reduced their infectiousness, thereby decreasing seroconversion resulting from a given level of unprotected intercourse.

But there are studies that report no behavioral change in response to test results. A study by Kipp and others (2001) undertook a random sample of people who had had VCT and got their results one year previously as part of an intervention. They did not have a different number of partners or use condoms more than those who had not had the intervention; but then these people had chosen to participate in the previous testing program and the others had not. Nebié and others (2001) report on 306 HIV+ pregnant women given VCT in urban Burkina Faso and followed after childbirth. After two years, fertility was equivalent to rates in the general urban population. Pregnancy of course is a good objective measure,
and one that is relevant not just as an indicator of unprotected sexual activity but also because it puts the child who has been conceived at risk.

Based on data from Lusaka, Zambia, Semrau and others (2005) report some evidence that women who disclose to their partners do not experience more violence than women who do not disclose. This result might be qualified if non-disclosers have chosen at least partially not to disclose because they have reason to be more fearful, and so their background level of violence would be expected to be higher, biasing the comparison to no difference. This study also found that there was a slight tendency toward higher levels of separation and divorce among discordant couples in comparison to concordant ones. Using data from the project in Rakai, Uganda, Porter and others (2004) find in a multivariate analysis that female HIV+ discordant couples had higher odds of breaking up than either HIV+ male discordant couples or HIV− concordant couples. The latter two groups had roughly equal rates of breakup. These correlations could reflect inherent characteristics of the couples rather than causality.

Scale-up

This section looks at issues that arise when testing is made widely available. The essential mechanisms at work are two. First, as an intervention such as testing scales up it may recruit people who are inherently different from the early recruits. This dynamic may arise either on the demand or supply side. The people who are tested as the program expands may be fundamentally different in their valuation of the benefits and costs of risky behavior, in their previous exposure to risk, in their inclination to undertake risks in the future, and so on in comparison to the first people to be tested. On the supply side, the expansion of testing facilities may draw on inherently different employees, for instance if initial pilot projects recruited the best suited people first. On the other hand, it may be that a pilot goes through teething problems and is less successful than the scaled-up project as a whole which benefits from learning by doing. Second, enlarging the scale of testing programs may change the environment of people’s decisionmaking and thereby their choices. For brevity, I will term the former considerations “selection effects” and the latter “systemic effects.”

The evaluation literature gives great prominence to selection effects, and Glick (2005) applies this approach to the study of HIV testing. Most of what follows on selection summarizes his concerns. In trying to infer the effect of testing on outcomes such as HIV risk taking, the danger is that studies do not recruit people randomly from the population at large. Instead, the people in these programs choose to participate and choice is still involved at an initial stage of participation even if people are subsequently assigned randomly to different interventions.
Consequently, it is to be expected that the participants are likely to be people who value the project’s interventions disproportionately relative to the general population because they made the effort to join. Therefore, their response to the project may differ from that of the average person and in particular is likely to be the sort of response that makes the project look more efficacious than it would be if it were scaled up. Similarly, the personnel running the project are likely to be more dedicated and efficient than the average personnel that will be recruited for scale up. For these reasons, the project most likely will become less and less successful as it scales up. Epidemiologists are well aware of these selection effects and most studies are careful to qualify their results.

Systemic effects also get some attention in the epidemiological literature but their full implications are not drawn out. Although this task remains to be done formally, using concepts of informational equilibrium from economics and dynamic modeling from mathematical epidemiology, some of the issues deserve mention. For instance, a general concern of commentators on the HIV epidemic is that people who realize they are infected through a test may increase their sexual activity because they feel they have nothing to lose and thereby pose risks for others, which could be a first-round systemic consequence of making tests available. As discussed in the preceding sections, right now there does not seem to be evidence for this sort of behavior, so it may be hypothetical, but such evidence comes from samples that may not include people who are most likely to increase their activity once they learn they are infected and is based on the truthfulness of self-reports. This section outlines how this type of issue might be conceptualized even without formal models or empirical evidence.

The first consideration is how to value the consequences of such behavior for society as a whole. Economists would usually opt for a social-welfare-based criterion that aggregates (although does not necessarily add together) the well-being of all individuals as they value their own situation. Specifically, the social valuation would have to respect individuals’ own valuations of risky activity, the same risky activity that leads to the possibility of infection. That is, individuals care about engaging in risky activity as well as whether they become infected, and so should the social valuation. But by also taking into account all individuals’ valuations of the consequences of infection, the social valuation takes into account the consequences for other members of society of any individual’s actions that affect the probability that others become infected or have to take costly precautions to avoid infection or therapeutic measures if infected. An alternative to this comprehensive social valuation is to think exclusively about new infections, perhaps more the focus of epidemiologists, but as a final criterion for valuation it would be fundamentally inconsistent with the totality of individuals’ concerns.

Second, if hypothetically people who test positive disregard the well-being of their partners and engage in more risky behavior, analysis cannot stop at this
stage (Mechoulan 2004; Gersovitz 2009). This point can be made with confidence, even if its implications are not yet clear. If people who know themselves to be HIV+ increase their activity then it is reasonable to expect that their potential partners most likely come to understand that such behavior is going on and that the pool of their potential partners is becoming more risky. Consequently people who do not know their own serostatus, or know it to be negative, will become more cautious in engaging in risky activities, which in turn will make the pool of potential partners even riskier. Thus there are offsetting effects on the infection risk of people who have not tested positive: the pool is riskier but their participation in it is less. Whichever dominates will determine whether infection rises or falls overall if testing becomes more available. But a full welfare analysis needs also to take into account the loss by people who either are not or do not know they are HIV+ and who decrease the risky activity that they value as well as the gain by people who increase their risky activity once they learn they are HIV+. After all, if lower infection were the be all and end all of life, there would be much less infection because no one would ever choose to do anything that put him or herself at risk. Instead, many people choose to do so even if there are some people who do not have the scope to choose safe behavior.

Taken together with the dimensions of testing discussed in the earlier sections, these aspects of scale-up provide the elements for understanding how testing can affect the national HIV epidemics. In this way one can assess whether getting many more people tested ultimately can prevent many new infections and thereby determine how much to subsidize testing.

Conclusions

Like other interventions tried so far, testing is not a magic switch that can shut down the HIV epidemic. But there are good reasons not to give up on it yet as a potentially powerful intervention. Many of the studies reviewed in this paper suggest how to get the maximum impact from testing programs, but more information and analysis are needed.

Testing is all about information. Most narrowly, a testing program does the test and provides the result to the person being tested. It must make sure that people understand the meaning of the test, including the possibility of false positives and the window before infection can be detected. It must ensure that people can communicate their test results to others whom they want to know, while they are also able to keep their test results from people whom they do not want to know. People should know what their chances of being infected are, and in particular that a high proportion of all infected people in couples are in discordant couples. The situation of discordant couples seems badly
misunderstood and helping these people to be aware of their circumstances would most likely be very beneficial.

As with every other activity that produces a good or service, there are different ways to get a test done, and the choice of alternatives affects both the cost of the product and its quality, in this case the nature of the information, including its confidentiality. Some of the dimensions of choice involve: rapid with same-day results or return visit required; qualifications of personnel and their associated costs; distance; waiting times; type of counseling; standalone clinic or integrated with other health services; and capacity utilization. The cost of a test is important to poor governments and to the people being tested as it is reflected directly in the price they are asked to pay and in the ancillary costs people wanting to be tested incur in travel and waiting. Poor Africans do not seem willing to pay a high proportion of the cost of VCT, the price elasticity of the demand for testing seems high and they do not want to travel long distances except as far as distance enhances confidentiality. But confidentiality seems extremely important. Sometimes there may be trade-offs between costs and confidentiality, and sometimes lower costs and higher confidentiality may go together. In the case of nearby access, concerns about confidentiality may be dominated by convenience or the reverse, but in the case of home testing people may actually prefer it for both convenience and confidentiality. Testing facilities integrated with other medical facilities may lower costs and raise confidentiality.

Extant studies provide lots of information on the design of testing programs, but do not provide a multidimensional matrix of trade-offs that pinpoint optimal design. Nor do these studies really provide the answer to why so many people say they want to be tested but so few actually are. Much will be learnt from the accumulating experience of routine testing which looks poised to increase substantially the tested population in Botswana and probably in several other poorer countries with weaker health infrastructure and therefore of greater relevance to the bulk of African countries. It may well be that these programs will achieve widespread coverage and it will then be possible to learn at what costs and with what consequences.

Notes

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1. Most of the studies discussed in this paper are not based on national or regional, randomly representative surveys. Rather they are typically based on samples of convenience from pilot or research studies often using respondents who are attending some type of health facility, including HIV testing sites. Respondents, therefore, may be heavily self-selected relative to the general population. Nor do these studies typically use designs or statistical techniques that distinguish causation from correlation. Where studies use either unbiased samples or special statistical techniques, it is noted. Despite these shortcomings, these studies are all that are available, and it seems better to think about what hints they may give about the epidemic than to ignore them. The paper does not include all studies on testing in Africa, and is certainly not a formal meta-analysis. In general, the criteria for including studies is either that they are relatively systematic, especially in using a good sized sample, or that they speak eloquently about some special problem that is not discussed elsewhere. In this latter category are studies that present rich vignettes.

2. Note that line 3 of table 2 is not a weighted average of lines 10 and 11 because some people refused to be tested even though they answered the questionnaire and therefore are not included in either line 10 or line 11 but are included in line 3.

3. I interpret these qualitative answers about being at risk for infection differently from Bignami-Van Assche and others (2007) who use data similar to the DHSs from three sites in Malawi. In their data, people self-classify as having no, low, medium or high likelihood of being infected with HIV at the time of the survey. They then consider anyone answering in the three latter categories as falsely assessing their status as HIV+ if the test from the survey finds these people to be HIV-. But there is no reason to adopt this view because there is no numerical probability associated with these qualitative judgements, except that “no” likelihood should correspond to zero probability. For instance, a self-report of “high” likelihood could mean any non-negligible probability given a terrifying and probably ultimately fatal disease - it seems purely subjective as to what a high probability means to someone. For this reason some of their conclusions seem unjustified, such as (p. 38): “When they were inaccurate, it was primarily because they thought that they were HIV positive but were, in fact. HIV negative: false positives constitute almost 90% of all inaccurate self-reports.” Or, p. 39: “...most incorrect self-reports in our study are due to overestimating one’s likelihood of infection.” Such conclusions seem to require people to state the numerical value of their subjective probabilities, not an easy answer to elicit even from people familiar with the concept of probability. If one could succeed in the preceding task, however, it would then be possible to look at a group of people who state a common subjective probability and compare their subjective probability to the proportion of these people who are HIV+ to see whether the group as a whole under or overestimates its probability of infection. Or, on a much more limited basis, people could have been asked if they are absolutely certain that they are infected and then anyone answering that they were certain but were HIV- could have been classified as in error. Their data do not, therefore, speak to the ultimate fear raised by Bignami-Van Assche and others (2007, p. 39) that “…people may continue to falsely believe that they are already infected…resulting in lower incentives to use condoms, to remain monogamous or to seek medical care even for curable medical conditions….” These concerns are potentially very important and they could well be justified by the relentless scare tactics of many HIV information campaigns, but they are not supported by these data.

4. Thornton (2008) looks at price responsiveness using random assignments in rural Malawi. The test was free and people were given a subsidy for getting their result ranging from zero to a payment of the equivalent of $3. The local daily wage is approximately $1. There was quite a large response to the (randomly assigned) subsidy but people may be responding to the payment without any interest in being tested or knowing their results - it was well worth the time and effort just on the basis of the implied wage. It also took an exceptionally long two to four months for people to get results, couples were not told their results together and results were only provided verbally, all factors making them less useful to participants and the experiment less useful for assessing behavioral response. Furthermore, the results were delivered at locally erected special purpose facilities so the reason people were going might be quite public.
5. In Fylkesnes and others (1999, p. 2473), participants had to wait several weeks for their results. These authors seem to think that this wait benefitted participants, who had a chance to reflect on their pre-test counseling session and decide whether they wanted their results. They seem to believe the main reason for same day provision of test results is that it “reduces the potential for uncontrolled anxiety”. These opinions seem to ignore the very explicit self-declared desire of desperately poor Africans for easy access to their results when return is expensive in money and time. In Sherr and others (2007, p. 858), access to testing was also “at limited times”.

6. Despite the fact that by far the majority of people in African countries appear not to have been tested, repeat testing is not insignificant at least in the catchment areas of HIV research projects. Thus in the case of the Rakai Project in Uganda, Matovu and others (2007) found that 37.8 percent of the population on which they were basing their analysis of the effects of testing had been previously tested. These researchers stratified their results by whether people were repeat testers or not.

7. The study complemented self-reporting with vaginal smears for sperm with some contradiction of self reports. It also tested for other STDs and sequenced HIV in seroconverters to determine if infection occurred from inside or outside a partnership. This study was unusual in using bio-markers to assess self-reports.

References

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