Life (Evaluation), HIV/AIDS, and Death in Africa

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1. Introduction

The HIV/AIDS epidemic has brought large increases in morbidity and mortality to many countries in sub-Saharan Africa. For some countries, the epidemic has eliminated the large gains in life expectancy that took place between 1950 and 1990. More than 20 million Africans are estimated to be HIV positive, and between one and a half and two million die from AIDS every year. In the South African province of KwaZulu-Natal, it has been estimated that more than half of women aged between 25 and 29 are HIV positive (Welz et al., 2007), and according to data from the Demographic and Health Surveys (DHS), national infection rates in Zimbabwe are more than 30% for women aged 30 to 39 and men aged 35 to 44. According to data from the 2006 wave of the Gallup World Poll, more than 80% of people in Kenya, Malawi, Rwanda, Uganda, Zambia, and Zimbabwe reported knowing someone who had died of AIDS. In the 2007 wave, more than a third of respondents in Uganda and Tanzania reported having lost an immediate family member to AIDS in the last year.

In the context of this epidemic, we use the African data from the Gallup World Poll, supplemented with information from the African DHS, to look at the links between disease and self-reported wellbeing. Among the measures we examine is an overall life-evaluation measure, Cantril's (1965) ladder of life, as well as measures of emotion or affect, including sadness, depression, happiness, and enjoyment. These data provide direct evidence on the emotional and hedonic impact of one of history's most serious epidemics as reported by those who are directly experiencing it. The World Poll also contains a set of questions about the perceived importance of HIV/AIDS relative to other factors restricting wellbeing, and we use these, together with the wellbeing questions, to investigate the importance that Africans place on HIV/AIDS compared with other factors in their lives, such as other diseases, as well as income, poverty, employment, and education.

We use this information to address two distinct questions. The first is the value of life in sub-Saharan Africa, a topic that has long been controversial. We use self-reported wellbeing measures to calculate the change in income required to compensate people for the reduction in wellbeing associated with the death of an immediate family member. The second question concerns the self-reported wellbeing measures themselves. Is it legitimate to use them as a basis for calculating compensation? Beyond that, can self-reported wellbeing, or "happiness," the blanket term often used in the literature, serve as an adequate guide to wellbeing in designing policies for public health and social welfare?

The use of self-reported wellbeing measures to calculate compensation for the death of relatives has previously been recommended by Oswald and Powdthavee (2009). Their paper is part of a literature that uses self-reported wellbeing measures to calculate the income compensation associated with nonmonetized factors such as the value of informal care (van den Berg and Ferrer-i-Carbonell, 2007), airport noise (van Praag and Baarsma, 2005), and urban renewal (Dolan and Metcalfe, 2008, who argue that these measures will often be superior to direct assessment of willingness-to-pay). In earlier work using the Gallup World Poll, one

of us found a strong positive — and approximately linear — relationship between average national life-evaluation and the logarithm of national income but, conditional on income, could find no effect of life expectancy, or of the national prevalence of HIV infection (Deaton, 2008). If this finding is correct — and the more comprehensive analysis here will suggest that it is, at least if we confine ourselves to the life-evaluation measure — it would appear that Africans require little compensation for the consequences of the epidemic and attach relatively little priority to dealing with it. Such a finding has implications for a number of important topics, including the design of foreign assistance for Africa, and more broadly, the measurement of the level and distribution of international wellbeing using measures that incorporate both health and income. We shall address these issues in the final section of the paper.

Our findings are also important for the "happiness" literature, about the meaning of measures of self-reported wellbeing, and about how and whether they can be used in assessing welfare and in directing public policy. The African results show that the death of immediate family members has little effect on life evaluation, but a substantial effect on measures of negative affect, such as depression and sadness. These results show that different measures of wellbeing, although correlated, are by no means the same thing; measures of life evaluation capture different aspects of experience than do measures of affect. The sums of money required to compensate *affect* for the death of a family member are much larger than those required to compensate *life evaluation*. In consequence, it is not legitimate to subsume both into a blanket measure of "happiness," let alone to use them more or less interchangeably as the practical counterparts of Benthamite utility and as a guide to utilitarian public policy. In the final section we argue that while measures of both life evaluation and affect are relevant for assessing wellbeing, each is seriously compromised as an exclusive guide.

The paper is laid out as follows. Section 2 uses data on HIV prevalence from the DHS together with data on self-reported wellbeing from the Gallup World Poll. Within countries in both data sets, we match means by sex and age group. These calculations are designed to reexamine and extend to subnational aggregates the aggregate results in Deaton (2008), who found no effect of national health measures on average life evaluation across countries. In Section 3, we move to microdata from the World Poll, and look at the consequences for subjective wellbeing (SWB) of knowing someone who has died of HIV/AIDS (2006 survey), or of having a family member who died in the previous year (2007 survey). We compare these effects to the effects of higher income, placing a monetary value on the health outcomes. Following Tortora (2008), we also summarize the results of questions about the importance that people attach to dealing with various problems — such as joblessness, poverty, education, and disease — and compare these with the results of the hedonic regressions. Section 4 discusses the implications of our findings.

In the remainder of this section, we briefly describe the African data from the Gallup World Poll on which our analysis is based. We use data from the 2006 and 2007 waves of the Poll, which is a representative survey of adults from countries around the world. Samples of around 1,000 adults are drawn from each country: 140 countries in 2006 and 150 in 2007. In developing countries, including all of those we cover here, data are collected in face-to-face interviews. In both years the surveys almost always covered more than 95% of the population age 15 or over in each country. An example of where this coverage did not occur is in Angola where areas with land mines were not surveyed. Typically, the frame consists of a list of Enumeration Areas used by the country's central statistical office, from which primary sampling units (PSUs) were selected by Gallup. In each country, the PSUs are stratified into six strata, from those in cities of more than a million people to the very few rural areas with a population less than 10,000, and are selected with probability proportional to population within each stratum. One hundred and twenty-five PSUs are selected within each country, and eight interviews are obtained in

each. A random route procedure is used to select households and the Kish Grid is used to select one respondent, age 15 or older, at random from each selected household. The Gallup World Poll covers more than 90% of the population of sub-Saharan Africa as a whole. A core set of questions, including questions on wellbeing, education, and income, is asked in every country. There are also questions that are different in each region, and the questions about death from HIV/AIDS and other diseases are asked only in sub-Saharan Africa, where 32 countries were covered by either or both of these two waves.

2. HIV Infection and Wellbeing in Africa

Deaton (2008) found that, conditional on the logarithm of national income, national HIV prevalence is uncorrelated with mean life evaluation. In this section, we use better data on HIV prevalence from the DHS to investigate in more detail the link between HIV and life evaluation within some of the most highly affected countries. We also broaden the set of outcomes to include measures of affect, including enjoyment, smiling, sadness, and depression. We use HIV-related data drawn from the DHS for 14 countries in sub-Saharan Africa: Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Niger, Rwanda, Senegal, Tanzania, Zambia, and Zimbabwe. In these 14 countries, a recent wave of the DHS has included the collection of blood samples for HIV testing. These blood samples, as well as responses to the individual questionnaire, yield information about HIV prevalence, HIV knowledge, and perceived HIV risk. HIV prevalence estimates from these data are arguably the best estimates available. The data from the DHS are described in the data notes at the end of the paper.

Table 1 shows, separately for each country, three measures of HIV from the DHS — HIV prevalence, the fraction of respondents who say that they know someone who has AIDS or has died of AIDS, and the fraction of respondents who say that they are at moderate or higher risk of being infected with HIV. The last five columns show national average levels of life evaluation, enjoyment, smiling, sadness, and depression, calculated using data from the Gallup World Poll. Life evaluation is measured using the Cantril ladder, which ranges from 0, "the worst possible life," to 10, "the best possible life"; we shall refer to points on this evaluative ladder as "rungs" or "steps," of which there are 11, from 0 to 10. Enjoyment, sadness, and depression are indicators for whether, on the previous day, the respondent experienced these emotions a lot of the day. Smiling is an indicator for whether the respondent reported smiling and laughing a lot on the previous day. The national averages of these outcomes in Table 1 show no significant correlations across countries between HIV prevalence and average levels of subjective wellbeing.

Our approach here is to look within countries at the relationship between HIV and measures of subjective wellbeing. In particular, we use individual-level HIV testing data from the DHS for each country to calculate prevalence separately by sex for each of seven five-year age-groups (spanning ages 15 to 49). Figure 1 provides an overview of what drives our more detailed results. The first panel shows DHS estimates of HIV prevalence for each age-group and sex, separately for high and low HIV prevalence countries. High prevalence countries are those with prevalence above 6% (Kenya, Malawi, Tanzania, Zambia, and Zimbabwe). The figure shows the high degree of variability in HIV prevalence across countries and shows that, within countries, HIV infection is strongly related to age and sex, with prevalence in high HIV countries peaking among women ages 30 to 34 and men ages 40 to 44.

The pattern by sex and age of averages of wellbeing measures — including life evaluation, enjoyment, smiling, sadness, and depression — do not mirror the age profile in HIV prevalence in any obvious way. The difference in mean wellbeing for a sex/age-group between high and low HIV countries at the top of the third column of Figure 1 bears little relation to the sex/age-group pattern in HIV infection in other rows. The figures show that adults in high HIV countries are *more*

likely to report smiling and *less* likely to report depression; women in high HIV countries report more enjoyment than women in low HIV countries. Of course, the differences illustrated in Figure 1 could well be driven by the fact that high HIV countries have other characteristics, such as better economic conditions, that raise wellbeing.

In Table 2, we estimate the relationship between life evaluation and HIV, controlling for other individual and country characteristics. Here (as elsewhere), we do not weight by country population so that, for example, a person in Ghana gets the same weight as a person in Nigeria. Standard errors are clustered at the country, sex, and age-group level. Controlling for log GDP per capita, HIV prevalence in a country, sex, and age-group is associated with lower life evaluation (Table 2, column 2). The coefficient is about a third larger (more negative) in column 3, which also includes country fixed effects. The addition of the sex dummy in column 4 does very little, as does the replacement of national income by individual household income in column 5, although income itself has a large positive effect on the ladder. These magnitudes imply that adults in a country, sex, and age-group with prevalence of 10% report life evaluation values about a tenth of a rung lower than those in a country, sex, and age-group without HIV.

One problem with these estimates is that the previous literature has established the existence of pronounced age-patterns in life evaluation; see for example Helliwell (2006) or Blanchflower and Oswald (2008), who argue that there is a universal U-shape in life evaluation with a minimum in middle age. This is approximately the mirror image of the age pattern in HIV prevalence (see Figure 1), so that it is possible that the results in columns 2 and 3 are driven purely by a correlation in these age profiles. Since life satisfaction is U-shaped in countries where HIV prevalence is low or zero, we cannot safely use these patterns in countries in Africa where the infection rate is high. To deal with these concerns, we add controls for age groups. Our preferred specification is in column (6), where we control for sex, log family income, age-group, and country. Here the estimated coefficient, although negative, is no longer statistically significant. In a check to see whether this finding might come from the small sample size, or range of explanatory variables, we have repeated (but do not show) the regressions adding data from Cambodia, the Dominican Republic, Haiti, and India — for which there is also DHS HIV testing data — and have found the same insignificant result.

Table 3 repeats the specification in the final column of Table 2, but with measures of affect replacing the ladder measure of life evaluation. Controlling for sex, log income, age-group, and country, HIV is not significantly associated with enjoyment, smiling, or sadness, but is significantly associated with depression. Adults in a country, sex, and age-group with HIV prevalence of 10%, compared to adults in a country, sex, and age-group without HIV, are about two percentage points more likely to report experiencing depression a lot of the day on the previous day. In Appendix Tables A.1 and A.2, we estimate these regressions substituting for HIV prevalence the fraction of adults who report knowing someone who has AIDS or has died of AIDS. The results are broadly consistent with the results in Tables 2 and 3, and the preferred specification (Table A.1, column (6)) shows no significant relationship between life evaluation and HIV knowledge. Likewise, and with the exception of smiling, HIV knowledge is unrelated to the outcomes in Table A.2. Adults in country/sex/age-groups in which a higher fraction know someone affected by AIDS are less likely to report smiling a lot on the previous day. Appendix Tables B.1 and B.2, for which the sample sizes are admittedly much smaller, likewise show little relationship between HIV — now measured as the fraction of adults who report being at moderate or higher risk of being infected with HIV — and these outcomes.

Overall, these results are indecisive, but they provide no clear evidence of strong effects of HIV on any of the measures of self-reported wellbeing. But they can hardly be taken to establish that HIV/AIDS has little effect on wellbeing:

being HIV-positive is not the same as having AIDS, and people who are infected may have no knowledge of the fact. High rates of infection in the population may not imply an increase in morbidity for respondents, especially if, in the absence of ARV therapy, survival times with full-blown AIDS are short. Mortality from AIDS may also be attributed to other causes, especially in populations where background adult mortality is high, so that group variation in infection rates may not have a perceptible effect on group variation in life evaluation or affect, so that we may be looking at the wrong variables. Moreover, the use of the two different data sources means that we can only merge at the country, age-group and sex level. The lack of individual-specific data is likely to reduce the precision of our estimates, and we do not know for sure that the prevalence rate in one's own sex and age-group is the one that people are aware of or care about.

3. Wellbeing and Mortality Among Individuals

In this section, we take a more direct approach by looking at the effects on respondents of knowing someone who has died. In the 2006 sub-Saharan Africa module of the Gallup World Poll, respondents were asked "Do you personally know anyone that has died from X?" where X includes tuberculosis, malaria, HIV/AIDS, smallpox, polio, hepatitis, and cholera. In the 2007 round, with an overlapping group of countries, the question was changed to "Please tell me if any one in your immediate family has died from X in the past 12 months?" where X includes the same diseases as before plus death from chronic (more than six months) diarrhea and deaths of women in childbirth. In countries where people often have little contact with doctors or clinics, some of these diagnoses are manifestly unreliable, but at the least they provide an indication of how people perceive the effects of these diseases. In interpreting the usefulness of these answers, it should also be kept in mind that reliable data on adult mortality are almost completely absent in many of the countries covered here, and even official estimates of mortality from HIV/AIDS are little more than intelligent guesses based on small surveillance sites or projections from infection rates from surveys or ante-natal clinics. Note also, that even where qualified personnel are in attendance, cause of death is not easily ascertained, especially when the decedent suffered from multiple diseases. In the current context, this is particularly important for HIV/AIDS, which opens the way to opportunistic infections, particularly tuberculosis, with which a large fraction of the population has long been asymptomatically infected. A substantial fraction of what are recorded as deaths from TB are likely attributable to HIV infection.

Table 4 lists the fractions of people in the 2006 wave who reported that they knew someone who died of malaria, HIV/AIDS, and TB. In columns 4 and 5, we report the fractions of people who know someone who died of *either* HIV/AIDS *or* of TB as well as who died of any of the seven listed diseases, including also polio, hepatitis, smallpox, and cholera. There are close to 1,000 respondents in each country. Clearly, these numbers should be treated with great caution as indicators of mortality rates. For example, only people with long memories could have known people who died of smallpox, yet in one or two countries, smallpox is frequently listed, for example by 41% of respondents in Chad, 20% in Sierra Leone, and 13% in Niger (not shown in the tables). These figures are most likely indicative of the quality of these data from those countries. Even so, the figures in Table 4 are broadly sensible; the correlations between column 2 or column 4 on the one hand, and the UNAIDS (2008) estimates of mortality rates — themselves subject to error — are 0.57 and 0.56. The combined TB and HIV/AIDS numbers are probably the more accurate for AIDS deaths in the countries where the epidemic is severe, but this would not be the case where HIV/AIDS prevalence is low, as in most of West Africa.

One important feature of Table 4 is that respondents typically know more people who died of malaria than who died of HIV/AIDS. This is true, not only where it is to be expected, in the countries of West Africa where HIV/AIDS is relatively rare, such as Benin, Burkina Faso, Ghana,

Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo, but it is also true, or within a point or two of being true, in some of the countries where HIV/AIDS is most severe, such as Burundi, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, and Zambia. There is clearly substantial background mortality from disease in Africa, even before the advent of HIV/AIDS.

Table 5 presents data from the 2007 wave of the Gallup World Poll on an overlapping group of countries using the more focused question of whether respondents have lost a member of their immediate family in the last 12 months. These data also include two causes of death that were not asked in 2006: death of a family member in childbirth and death of a family member to chronic diarrheal disease. The latter did not generate many positive responses, and is not included in the table. The numbers in Table 5 are much smaller than those in Table 4, as must be the case, and a few remain implausible, such as the very high numbers for HIV/AIDS in Chad and the Central African Republic. The correlation between column 2 and the UNAIDS-based estimates of mortality rates is now only one-third. However, perhaps the most important numbers are those in the fifth column for women in the immediate family who have died in childbirth. For half of the countries, particularly those in West Africa, these numbers are higher than the numbers of family members dying from HIV/AIDS, though typically not higher than those dying from malaria. Once again, there is a major cause of (at least perceived) mortality that is currently present, and was present (and presumably more severe than now) long before the advent of HIV/AIDS.

Table 6 presents the first evidence on the effects of having recently lost an immediate family member on five measures of self-reported wellbeing. The measure of loss we have used is whether the respondent has lost an immediate family member in the last 12 months to one of (a) malaria, (b) TB, (c) HIV/AIDS, and (d) death in childbirth. The World Poll does not have a question on all-cause mortality, and we have ignored the other reported causes (hepatitis, cholera, polio, smallpox, and chronic diarrhea) because the fractions reporting are very small, and because there are substantial numbers of missing values from "don't knows" or refusals. We look at five different measures of wellbeing (described in Section 2): (a) the Cantril ladder of life, (b) enjoyment, (c) smiling, (d) sadness, and (e) depression. Each of these measures captures a potentially different aspect of feelings and of life assessment, and we have no prior expectation that they will respond in the same way to the deaths of family members.

Table 6 shows the differences in the SWB measures between people who report having lost a family member and those who do not. Figures in bold are more than twice their standard errors, computed taking into account the survey design. The results are generally in the direction that would be expected: deaths of immediate family members reduce the ladder value, reduce the probability of having smiled, laughed, or enjoyed oneself yesterday, and increase the likelihood of experiencing sadness or depression. But there are exceptions, a few of which are significantly different from zero (e.g., the positive effect of a death on the ladder in Sudan, or on enjoyment in Kenya), and only about a quarter of the differences are significantly different from zero. Sadness and depression are the two most consistent of the indicators, with only two negative signs for sadness (Senegal and Sudan) and four for depression (Benin, Kenya, Mozambique, and Sudan), and these six differences are small and insignificantly different from zero.

We deal with the heterogeneity by pooling across countries, and by either running regressions with country fixed effects, or by averaging the results over countries, taking simple averages with each country as a data point. (Weighting by population would give most of the weight to Nigeria.) In the fixed effect regression, we regress each SWB measure on a dummy for a death and a set of country dummies. This regression also yields an average of the country effects, but where each country difference is weighted by the inverse of its estimated variance, so that more precisely estimated

differences get higher weights. Both numbers are shown in the bottom panel of Table 6. As it turns out, the two sets of estimates are almost the same. Over sub-Saharan Africa as a whole, the death of an immediate family member reduces the ladder values by 0.11 or 0.12 of a step, the probability of enjoyment or smiling/laughter by two to four percentage points, and increases the probability of experiencing sadness and depression by five to six percentage points.

These estimates come from simple differences of averages in each country, with no controls for other differences across people who have and have not lost a family member in the last year. SWB is generally sensitive to demographic status, such as age and sex, as well as to education and income, all of which could potentially confound the effects of a death. As we shall see, education is positively related to SWB and more educated people are more likely to be HIV positive in several of these countries (Fortson, 2008). Tables 7 and 8 move to a multivariate analysis, using the same outcomes as Table 6 (an 11-point scale for the ladder, and linear probability models for the other SWB measures) and including age, sex, education, and income as controls. As before, we present estimates based on pooled regressions with country fixed effects (Table 7) and estimates that come from estimating regressions for each country, and then averaging the coefficients (Table 8). Given that the World Poll data have about 1,000 observations for each country, the estimation of separate regressions for each country is entirely feasible, and the averaging recognizes that fact. Nor is it clear that when we average across countries, we wish to give more weight to the more precisely estimated coefficients rather than counting each country as a unit. Even so, Tables 7 and 8, while differing in detail, are remarkably similar, so that little depends on which we use, and we have the comfort of knowing that our results are robust to the choice of procedure.

For each measure of SWB, we present two regressions, one with and one without income. We want to condition on income, which has consistently proved to be one of the most powerful predictors of the ladder and of the affect measures in the World Poll, but there are two countries here (Guinea and Mali) where we do not have usable income data, and there are many missing observations within countries that do have income data, so that we lose about a quarter of the sample size when income is introduced. By showing regressions with and without income, we can check that the restriction of the sample does not have a major effect on the results. We also note that the income measure comes from a *single* question in which the *individual* respondent is asked to choose an income bracket for *family* income. In sub-Saharan Africa — as in other poor, largely agricultural areas of the world — such questions are unlikely to elicit more than an extremely imprecise estimate of the usual concept of income. As a result, there is likely to be substantial attenuation bias in the estimates of the effects of income. We work with the logarithm of income; previous work by Deaton (2008) and by Stevenson and Wolfers (2008) has shown that the logarithmic form works well both within and between countries, at least as far as the ladder is concerned.

Table 7 presents the fixed effect regression results for the five SWB measures. All coefficients and their *t*–values are shown, other than the country fixed effects. In each case, the first column shows the estimates without income, and the second column shows the estimates including the logarithm of income; the second column always has two fewer countries. Of the nonmortality variables, education — whether the respondent has eight or more years of completed schooling — and income have consistently positive effects on life satisfaction and on reported emotions. More educated and higher income people report higher values on the ladder of life, are more likely to remember laughing and smiling and enjoying themselves yesterday, and are less likely to remember being sad or depressed. The effects of being better educated are similar in size to an increase of one unit in the logarithm of income, which corresponds to a 172% increase. Given the errors of measurement in the income variable, it would be a mistake to interpret the tables as showing the

separate effects of income and education since the latter is likely to pick up at least some effects of the former.

The effects of gender and age are inconsistent and usually weak. In the World Poll in general, women are more likely than men to report both more positive and more negative emotion, but these results are not clearly apparent in these sub-Saharan African countries and the significance of estimates depends on whether or not income is included. We do not replicate the standard finding that life evaluation is U-shaped over the life-cycle, though there is a U-shape for smiling and laughing (reaching the minimum around age 50), and (more weakly) for being depressed, with a minimum around age 40.

Our main results are in the first four rows which report the effects on wellbeing of having lost an immediate family member in the last 12 months. The pattern of these estimates differs sharply across the SWB measures as well as across causes of death within the measures. The ladder of life is close to the life satisfaction or "happiness" measure that is used by Layard (2005) and others to measure overall wellbeing. Yet the loss of immediate family members has only a modest negative effect on the ladder. Deaths from TB, malaria, and childbirth have negative effects, while a death from HIV/AIDS has an apparent *positive* effect. The *t*–values for all of the estimates are unimpressive, and we can barely reject the hypothesis that all are zero (final row, *F* statistic is 2.76 with *p*–value of 0.027) or that a death has the same effect no matter what its cause (*F*-statistic is 2.80 with a *p*–value of 0.039). In Table 8, where the country regressions are averaged, the *t*–values are somewhat larger and the tests of no effects and of equality are larger and more significant. The anomalous effects of HIV/AIDS may have some real basis — for example, there is some evidence that some deaths, such as deaths from cancer or other "dread diseases," are feared more than others (Sunstein, 2004). Different causes of death will typically involve different family members of different ages — we do not know who died in these data — but it seems likely that in most of Africa, even now, HIV/AIDS deaths are more common among those who are relatively well-off, which is consistent with the reduction of the positive effect when income is introduced, albeit imperfectly given the measurement error in income. Note also that the change in the estimates with income also comes from the change in sample size; for example, the upward revision of the effect of an AIDS death on sadness in Table 8 can be replicated without income but with the regression confined to the sample for which income is not missing.

Even if we take the largest negative coefficient, which is for the loss of a family member to tuberculosis, the estimate in Table 8 is –0.129, compared with 0.374 for log income, so that the income equivalent of losing an immediate family member to TB is a change in log income of –0.129 divided by 0.374, or –0.345, equivalent to a 29% reduction in income. Alternatively, the compensation for the loss would be 41% of income for as many years as the effect lasts. By the same token, the compensation for a loss to HIV/AIDS or to childbirth (at least in Table 8) is *negative*. These numbers seem absurd on their own terms, even before we consider comparing those monetary values to similar monetary values from rich countries. And they are almost certainly gross *overestimates*, given attenuation bias in the estimates of income through measurement error.

The estimated effects of mortality on the two positive emotions, smiling and enjoyment, are qualitatively similar to the estimated effects of mortality on the ladder. Deaths from TB and malaria inhibit smiling or laughing and inhibit enjoyment, but deaths from HIV/AIDS or from childbirth have sometimes positive and sometimes negative effects, depending on whether income is included. The coefficients are sufficiently far from zero that we can reject the null of no effect from any death in most cases, but we can usually accept the hypothesis that all deaths have the same effect on the experience of these emotions.

The results for the last two measures — sadness and depression — are closely in line with what we might expect,

and at variance with the results for the ladder. People are sharply and significantly more likely (up to five percentage points) to report feeling sad or depressed if they have lost a family member. All four causes of death have similar effects, and in spite of their individual and joint significance, we cannot reject the hypothesis that the four estimates are identical. The anomalous effect of an HIV/AIDS death on the ladder or on positive feelings — and in some cases of a death from a woman in childbirth — does not recur for sadness or depression. A death is a death and leads to sadness and depression. The evident coherence and sensibleness of these results contrasts with those for the ladder, and make it much harder to attribute the latter to the effects of poorly designed questions, lack of understanding by respondents, or general measurement error.

If we were to choose to express the effects on sadness and depression in terms of the effects of income, the results would be much larger than for the ladder of life. For example, if we were to take –0.04 as a representative estimate of the effects of disease, and 0.025 as a representative estimate of the effect of log income, the ratio is –1.6, so that the effects of the death on sadness or depression would be reproduced by an 80% reduction in income, or offset by a fivefold increase. Of course, if we were to decide to use these numbers to calculate the monetary equivalent of the death of a family member, we would have to explain why they are to be preferred over the much smaller (and barely significantly different from zero) numbers that come from looking at the ladder of life, particularly given that the ladder is much closer to the life satisfaction measures that have been used in the previous literature.

Before addressing that question, it is worth considering another measure, previously reported by Tortora (2008). The World Poll asked respondents in Africa to rank in importance 12 objectives based on the Millennium Development Goals. The objectives were (1) providing more jobs for youth, (2) achieving primary education for all, (3) reducing the spread of malaria and TB, (4) improving access to safe drinking water, (5) reducing the death rate among children under five, (6) reducing poverty, (7) reducing the number of women dying during childbirth, (8) reducing the spread of HIV/AIDS, (9) achieving gender equality and empowering women, (10) improving access to sanitation facilities, (11) providing access to new technology, and (12) reducing hunger. Each respondent was given a random selection of six of the twelve objectives and asked to rank them from one (most important) to six (least important).

Tortora's Table 1 shows that reducing poverty and reducing hunger handily win this race, with average ranks of 2.41 and 2.48, respectively. Next, but with a considerably lower rank, comes reducing the spread of HIV/AIDS, with an average rank of 3.05, followed by jobs for youth (3.17), reducing the death rate from children under five (3.34), reducing deaths in childbirth (3.38), achieving primary education for all (3.62), reducing the spread of malaria and TB (3.64), and improving access to safe drinking water (3.75). There is then another substantial gap in the rankings before we come to improved sanitation (4.09), gender equality (4.38), and providing access to new technology (4.65).

Kharas (2008) reports similar findings from the Afrobarometer surveys from Kenya, Mozambique, Nigeria, South Africa, Tanzania, Uganda and Zambia, where respondents listed their top priorities as jobs, income, support for agriculture, and improvement in infrastructure, with health, including HIV/AIDS, attracting much lower rankings.

These results are consistent with some, although not all, of the findings from the SWB analysis. The high rank for reducing poverty and hunger is consistent with the (dominant) importance of income and education as determinants of life evaluation. That HIV/AIDS comes next, and is ranked higher than TB and malaria, in spite of the higher prevalence of both of the latter (Tables 4 and 5), is perhaps attributable to the current attention given to HIV/AIDS relative to the more long-established and familiar diseases. TB and malaria are ranked well behind deaths of children

and deaths of mothers in childbirth; the former might have been captured by the World Poll question on deaths from chronic diarrhea, but evidently were not. Note also that only some of the ranking questions refer explicitly to mortality, and the "spread" questions presumably elicit responses about morbidity or other consequences of the diseases. So perhaps differences are to be expected. But the important point about all of the results is the huge importance attached to income (poverty and hunger) relative to the importance attached to disease.

4. Discussion: Value of Life and Subjective Wellbeing

Consider first our findings on the value of life in sub-Saharan Africa, and suppose for the moment that it is appropriate to use the life evaluation measures in this way, an issue to which we will return. Given this, we find very small numbers. The largest estimates are 30% to 40% of income, and even those estimates are biased upwards by errors of measurement in income. These compensations refer to annual income for the death of an immediate family member in the past 12 months; we have no information on the required compensation in subsequent years. In a comparable exercise for Britain, using data from 1992 to 2002, Oswald and Powdthavee (2009) estimate compensation for the loss of a family member to be between £200,000 (upper end estimate for loss of a partner) and £16,000 (lower end estimate for loss of a sibling) with monetary amounts in 1996 prices. Median earnings in 1997 were approximately £12,500. Viscusi and Aldy (2003) review estimates of the value of a statistical life; these are based on the now standard methodology, dating back to Rosen's (1988) formulation, in which a value of life is inferred from the earnings premium that workers receive in riskier jobs. For the U.S., their central estimate for the value of a statistical life is $6.8 million for a prime age worker earning $26,000 a year, or more than 250 times annual earnings. They review comparably based estimates from around the world — though none from Africa — and estimate that the international income elasticity of the value of life is 0.6 to 0.8, which would imply that the ratio of the value of life to income will be higher in lower income countries. The theoretical concept underlying these estimates is the value of a person's *own* life, which is arguably higher than the value of the life of a family member, but they nevertheless provide an indication of the magnitude that is used in the literature and by various government agencies.

There is additional, albeit less precise, evidence for a low value of life in Africa. We have already cited the findings on policy priorities from the World Poll and the Afrobarometer surveys. Related evidence comes from the high price elasticity of demand in Africa for healthcare, with large negative responses to user fees or to small charges for medicine or preventative measures (see Easterly, 2009, for a review and discussion). These findings may reflect a lack of understanding of the benefits of Western medicine, or they may reflect a more fundamental adaptation to and acceptance of the high levels of morbidity and mortality that have long been a feature of African history (Iliffe, 1995). Certainly, the World Poll's findings on mortality rates in childbirth, or from malaria and tuberculosis, show that HIV/AIDS is not usually the leading cause of disease compared with other, long-standing scourges. African households have many mechanisms that might help them deal with the consequences of losing family members. Households are large and there is a great deal of coming and going, particularly in those economies that depend heavily on migration which, not coincidentally, are those most heavily afflicted by the HIV/AIDS epidemic. In such places, even before this latest epidemic, it is not unusual for people to depart for long periods, and sometimes never to return.

These arguments are all supportive of the belief that the value of life in Africa is very low. Yet it is important to clarify exactly what this means. It *does* mean that Africans are prepared to give up relatively little money in order to prolong the life of immediate relatives, if not their own. It *does not* mean that African lives are worth less than American or European lives, that international health policy should be

conditioned on that supposition, or that we can assess the level and distribution of international wellbeing based on these low values. The belief in the relatively low worth of African lives was a feature of imperialism, as documented by historians such as Davis (2002) and Watts (1997), who begins his book with an 1835 statement about how little the plague meant to the Egyptians. It is even incorporated into the UNDP's Human Development Index which, by adding life expectancy to the logarithm of income, values an additional year of life expectancy in the U.S. as worth 20 times an additional year in India and nearly 50 times an additional year in Tanzania (Ravallion, 1997). Similarly, the analysis of the global convergence of full income by Becker, Philipson, and Soares (2005) accepts willingness to pay as relevant for international comparisons, though the convergence they document would be much reduced or eliminated if African lives were valued at the low income equivalents found here.

Even if we accept our and the other estimates of the value of life as representing people's own trade-offs between health and income, that does not imply that we must attach the same social value to additional money to all people in the world. Indeed, international agencies, by prioritizing aid to the poor, particularly in Africa, certainly believe that money is worth more to poorer people. One way to think about this has been developed by Fleurbaey (2005), who works in terms of money-metric utility; the approach been applied to international comparisons by Fleurbaey and Gaulier (2007). If each individual has a utility function $\upsilon(h,y)$, where h is a list of health conditions, and y is income, we can define the quantity $\tilde{y}$ by

$$\upsilon(h^*,\tilde{y}) = \upsilon(h,y) \qquad (1)$$

where h^* is the list of health states corresponding to perfect health. The difference between y and $\tilde{y}$ is the amount that the person would reduce income to be restored to perfect health, and $\tilde{y}$ is the money-metric utility that captures both current health and current income. Social welfare — here international, or cosmopolitan social welfare — is defined over the individual levels of $\tilde{y}$, and we can use this social welfare function to calculate, not only the priority in income that should be given to the poor, but also the social value of health interventions directed towards them. Suppose that we write W for the social welfare function, and there is a health innovation θ, the effect of changing θ on social welfare takes the form

$$\frac{\partial W}{\partial \theta} = \sum_i \frac{\partial W}{\partial y_i}\left[\sum_j \frac{\partial \tilde{y}_i}{\partial h_j}\frac{\partial h_j}{\partial \theta}\right] \qquad (2)$$

where i indexes individuals, and j indexes the health states. The term outside the square brackets on the right-hand side is the social value of money to individual i, which is higher the poorer the individual is — the standard argument for foreign aid — while the weights applied to the derivatives of the health states inside the brackets are each individual's own willingness to pay for health. The point of this formulation is that each individual's own monetary evaluation of health is respected in making social judgments, but the overall value of the intervention depends in addition on the marginal social value of income to each person. So it is entirely rational for international agencies to attach great value to improving health in Africa, even if Africans themselves are prepared to give up relatively little money to do so.

This analysis leaves unresolved a number of difficult issues. For example, giving money to Africa would be even better than giving healthcare, and the assistance intended for healthcare is likely to be subverted towards poverty reduction and income enhancement by local politicians, even those who are acting in the interests of their constituents. So the low value placed on life by Africans still poses problems for the current refocusing of foreign aid away from support for growth towards support for healthcare, perhaps because it is more difficult to reach people with cash, or because aid agencies value lives differently than individuals do, or because the methods based on self-reported wellbeing do not tell us what we want to know, an issue to which we now turn.

The immediate issue is that we have two different measures of wellbeing, a life evaluation measure for which the monetary compensation for a death is low, and affect measures, for which the monetary compensation for a death is large. The ladder question requests an overall evaluation of life; this, or the related question about life satisfaction, is often loosely referred to as "happiness" and has a more plausible claim than momentary feelings or emotions to be a comprehensive measure of individual wellbeing. Yet the affect measures yield more plausible measures of compensation. If we are to decide between them, or possibly rule both to be incorrect, we need a better understanding of what these measures tell us.

The ladder is an evaluation of life as a whole, affected by momentary experiences and feelings, but distinct from them (Kahneman and Riis, 2005). One interpretation is that the ladder is a measure of life *achievement,* in which material success, education, and social standing are the key ingredients. If so, it is easy to imagine why someone who has lost a parent, for example, could be sad and depressed, but would not necessarily downgrade his or her sense of achievement in life, though we would hardly expect this to be true for the death of a partner or of a child. It is even possible that a sense of dealing well with the misfortune might lead to an improvement in life evaluation; it is possible to wake up in the morning feeling depressed, but still believe that one's life as a whole is going well (Annas, 2004). If this argument is accepted, neither life evaluation nor life satisfaction measures, informative though they may be, are useful for calculating the compensation for emotional distress. To quote Annas, "if you rush to look for empirical measures of an unanalyzed 'subjective' phenomenon, the result will be confusion and banality." Here the "banality" is our finding that the loss of an immediate family member makes people sad, while the "confusion" is that this sort of unhappiness is the same thing as "happiness" measured as life evaluation.

A reasonable position is one in which life evaluation *and* affect are both components of wellbeing, without having an exclusive claim either separately or together; it is good to have a sense of achievement, and it is good not to be depressed, but other things — such as health — matter too, even if they are not fully captured in either a sense of achievement or in a lack of depression. Any argument for focusing on either affect or life evaluation would also need to deal with the imperfections of each. Affect measures are subject to adaptation, and are easily influenced by trivial features of the situation, while life evaluations often misremember the affective content of past episodes (Kahneman, Wakker, and Sarin, 1997). We are surely on safer ground if we take a capability approach, through which we value health, or income, or other things, by the opportunities for freedom that they provide (Sen, 2001). Improving health extends capabilities, even if those capabilities are not adequately captured by self-reported wellbeing.

For more information about the Gallup World Poll, please e-mail worldpollpartners@gallup.com or call 202.715.3030.

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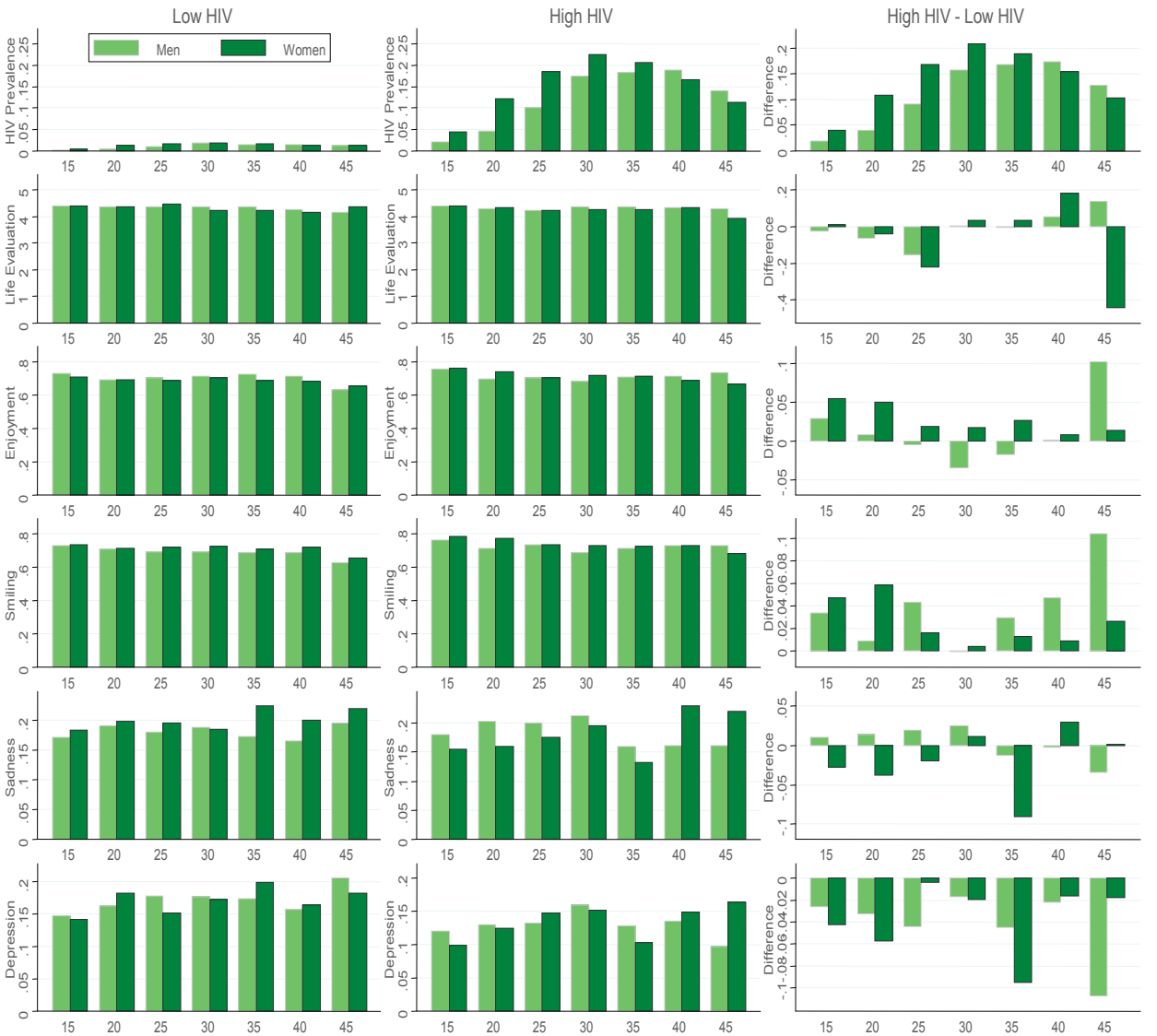
Data Notes

This analysis uses data from the 2006 and 2007 waves of the Gallup World Poll in conjunction with data from the Demographic and Health Surveys (DHS). The DHS data come from the following country-years: Burkina Faso (2003), Cameroon (2004), Ethiopia (2005), Ghana (2003), Guinea (2005), Kenya (2003), Malawi (2004), Mali (2001), Niger (2006), Rwanda (2005), Senegal (2005), Tanzania (2003), Zambia (2001/2002), and Zimbabwe (2005/2006). In some robustness checks, we also use data from Cambodia (2005), Dominican Republic (2002), Haiti (2005), and India (2005/2006). The data from the following countries are from preliminary releases of the data: Cambodia, Ethiopia, Haiti, India, Niger, Senegal, Tanzania, and Zimbabwe. The DHS are nationally representative household surveys that are available from ORC Macro (http://www.measuredhs.com). DHS surveys include a household questionnaire, a women's questionnaire, and a men's questionnaire. An exception is the 2003 DHS for Tanzania (also referred to as the HIV/AIDS Indicator Survey (AIS) and which covers only mainland Tanzania); this survey has an individual questionnaire (administered to both men and women), rather than separate men's and women's questionnaires.

In the 14 cross-sections in our sample, the survey also includes an HIV test. The household questionnaire and women's questionnaire are administered to all households responding to the survey; the men's questionnaire and HIV test are, in some countries, administered to only a subsample of households. Results of HIV testing can be linked to individual survey responses, except in Mali and Zambia. However, the HIV testing component in these countries includes some information about respondents tested, including basic demographic characteristics. Our analysis using DHS data uses three measures of HIV. Though in a few cases these are calculated at the national level, for the most part they are calculated within each country for each five-year age-group, separately by sex. Five-year age-groups are as follows: 15 to 19, 20 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 44, and 45 to 49. In some countries, the DHS collects HIV test results from men (but not women) ages 50 to 59 but for consistency across countries (as well as across genders), we restrict the analysis to adults 15 to 49. HIV Prevalence is the fraction of adults infected with HIV (among those tested), using results from the HIV testing component. HIV Knowledge is the fraction of DHS respondents who say that they know someone who has AIDS or has died of AIDS. This question was asked only of those who say that they have heard of AIDS; the fraction is calculated among those who have heard of AIDS. Responses are drawn from the women's and men's questionnaires; this question was not asked in Tanzania. HIV Risk is the fraction of DHS respondents who say that they are at moderate or greater risk of getting AIDS (including those who say that they have AIDS). This question was asked only of those who say that they have heard of AIDS; the fraction is calculated among those who have heard of AIDS. Responses are drawn from the women's and men's questionnaires; this question was asked only in Kenya, Tanzania, Zambia, and Zimbabwe. When calculating the prevalence of HIV infection, we weight results using DHS-provided HIV sample weights. When calculating the fractions with HIV Knowledge and HIV Risk, we weight results using DHS-provided individual sample weights. Data on GDP per capita are for 2005 and come from the latest round of the International Comparison Program, World Bank (2008).

Figure 1
HIV Prevalence, Life Evaluation, Enjoyment, Smiling, Sadness, and Depression, by Age–group and Sex (separately for low and high HIV countries)



Notes: "High HIV" countries are Kenya, Malawi, Tanzania, Zambia, and Zimbabwe. "Low HIV" countries are Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Mali, Niger, Rwanda, and Senegal. In the left and middle columns, each bar represents the weighted mean in a particular age-group, separately by sex. In the right column, each bar represents the difference, within an age-group/sex category, between high and low HIV countries (i.e., middle column – left column). HIV Prevalence data are drawn from the DHS. Life evaluation, enjoyment, smiling, sadness, and depression are drawn from the Gallup World Poll. Enjoyment, sadness, and depression are indicators for whether, on the previous day, the respondent experienced these emotions a lot of the day. Smiling is an indicator for whether, on the previous day, the respondent smiled and laughed a lot of the day. Five year age-groups are as follows: 15 to 19 ("15" in the figure), 20 to 24 ("20" in the figure), 25 to 29 ("25" in the figure), 30 to 34 ("30" in the figure), 35 to 39 ("35" in the figure), 40 to 44 ("40" in the figure), and 45 to 49 ("45" in the figure).

Table 1
HIV and Subjective Wellbeing, Means by Country

Country	HIV Prev.	HIV Knows	HIV Risk	Ladder	Enjoyment	Smiling	Sadness	Depression
Burkina Faso	0.02	0.47	--	3.91	0.68	0.69	0.19	0.08
Cameroon	0.06	0.46	--	4.18	0.63	0.63	0.24	0.21
Ethiopia	0.01	0.10	--	4.03	0.58	0.54	0.22	0.46
Ghana	0.02	0.38	--	4.93	0.65	0.74	0.17	0.14
Guinea	0.02	0.13	--	4.32	0.71	0.67	0.25	0.14
Kenya	0.07	0.75	0.22	4.24	0.72	0.70	0.15	0.09
Malawi	0.12	0.66	--	4.41	0.70	0.72	0.17	0.13
Mali	0.02	0.25	--	4.05	0.80	0.75	0.14	0.10
Niger	0.01	0.18	--	4.01	0.78	0.73	0.13	0.08
Rwanda	0.03	0.78	--	4.23	0.68	0.82	0.25	0.25
Senegal	0.01	0.08	--	4.65	0.78	0.75	0.16	0.04
Tanzania	0.07	--	0.23	4.14	0.73	0.76	0.19	0.18
Zambia	0.16	0.79	0.50	4.50	0.68	0.72	0.20	0.11
Zimbabwe	0.18	0.29	0.27	3.64	0.68	0.73	0.25	0.20

Notes: In all cells, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. HIV Prevalence, the mean of HIV Knowledge, and the mean of HIV Risk are calculated using DHS data. Means of life evaluation, enjoyment, smiling, sadness, and depression are calculated using Gallup data. HIV knowledge is the fraction of DHS respondents who say that they know someone who has AIDS or has died of AIDS. HIV Risk is the fraction of DHS respondents who say that they are at moderate or higher risk of being infected with HIV. Life evaluation is the Cantril ladder on a scale from 0 ("the worst possible life") to 10 ("the best possible life"). Enjoyment, sadness, and depression are indicators for whether, on the previous day, the respondent experienced these emotions a lot of the day. Smiling is an indicator for whether, on the previous day, the respondent smiled and laughed a lot of the day.

Table 2
Life Evaluation and HIV Prevalence

Life Evaluation	(1)	(2)	(3)	(4)	(5)	(6)
HIV	–0.483	–0.986*	–1.392*	–1.348*	–1.323*	–0.860
	(0.322)	(2.512)	(3.305)	(3.167)	(2.648)	(1.426)
ln *GDP*	0.401	0.388*				
	(1.834)	(5.834)				
Female				–0.020	0.001	–0.011
				(0.527)	(0.015)	(0.254)
ln *y*					0.414*	0.415*
					(14.984)	(14.967)
Country FEs?	No	No	Yes	Yes	Yes	Yes
Age-group FEs?	No	No	No	No	No	Yes
R^2	0.264	0.010	0.035	0.035	0.081	0.082
N	14	21663	21663	21663	14210	14210
N (Countries)	14	14	14	14	12	12

Notes: In all columns, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. The dependent variable is the ladder. In column (1), the dependent variable is the country-level weighted average of the ladder. In columns (2) to (6), the dependent variable is the individual ladder. HIV is country-level HIV prevalence among adults 15 to 49 in column (1) and country/sex/age-group-level prevalence in columns (2) to (6). Ln *GDP* is the log of country-level GDP per capita in 2005, as measured by the International Comparison Program, World Bank (2008). Ln *y* is the log of family income, using individual responses from the Gallup survey. In columns (2) to (6), standard errors are clustered at the country/sex/age-group-level. Absolute values of *t*-statistics are in parentheses. * $p < 0.05$

Table 3
Emotions and HIV Prevalence

	(1) Enjoyment	(2) Smiling	(3) Sadness	(4) Depression
HIV	–0.151	–0.087	–0.053	0.198*
	(1.060)	(0.598)	(0.413)	(2.083)
Female	0.001	0.013	0.009	–0.005
	(0.136)	(1.249)	(0.919)	(0.716)
Ln*y*	0.056*	0.050*	–0.029*	–0.020*
	(10.992)	(9.446)	(6.264)	(4.902)
Country FEs?	Yes	Yes	Yes	Yes
Age–group FEs?	Yes	Yes	Yes	Yes
R^2	0.036	0.030	0.017	0.091
N	14172	14048	14157	14127
N (Countries)	12	12	12	12

Notes: In all columns, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. In column (1), the dependent variable is an indicator for whether, on the previous day, the respondent experienced enjoyment a lot of the day. In column (2), the dependent variable is an indicator for whether, on the previous day, the respondent smiled and laughed a lot of the day. In column (3), the dependent variable is an indicator for whether, on the previous day, the respondent experienced sadness a lot of the day. In column (4), the dependent variable is an indicator for whether, on the previous day, the respondent experienced depression a lot of the day. HIV is country/sex/age-group-level HIV prevalence in all columns. Ln *y* is the log of family income, using individual responses from the Gallup survey. In all columns, standard errors are clustered at the country/sex/age-group-level. Absolute values of *t*–statistics are in parentheses. * $p < 0.05$

Table 4
Fractions of People Who Report Knowing Someone Who Died of Various Conditions

	Malaria	HIV/AIDS	TB	TB or HIV/AIDS	Any of seven	UNAIDS mortality
Angola	0.69	0.26	0.54	0.60	0.84	0.69
Benin	0.40	0.18	0.16	0.28	0.54	0.39
Botswana	0.13	0.58	0.29	0.64	0.69	6.23
Burkina Faso	0.71	0.54	0.31	0.60	0.79	0.70
Burundi	0.84	0.85	0.53	0.88	0.99	1.46
Cameroon	0.56	0.58	0.49	0.71	0.79	2.39
Chad	0.85	0.87	0.66	0.90	0.96	1.44
Ethiopia	0.74	0.71	0.51	0.82	0.95	0.94
Ghana	0.49	0.33	0.24	0.43	0.64	0.95
Kenya	0.81	0.83	0.50	0.88	0.93	2.91
Madagascar	0.39	0.02	0.19	0.20	0.53	0.03
Malawi	0.83	0.85	0.79	0.93	0.98	5.28
Mali	0.77	0.21	0.33	0.43	0.84	0.43
Mauritania	0.52	0.04	0.38	0.39	0.65	0.16
Mozambique	0.78	0.61	0.41	0.71	0.95	4.09
Niger	0.87	0.29	0.43	0.50	0.91	0.29
Nigeria	0.40	0.32	0.22	0.40	0.59	1.29
Rwanda	0.74	0.93	0.46	0.95	0.98	0.86
Senegal	0.73	0.06	0.28	0.31	0.78	0.15
Sierra Leone	0.78	0.13	0.48	0.52	0.91	0.60
Tanzania	0.64	0.60	0.40	0.67	0.78	2.50
Togo	0.58	0.47	0.24	0.54	0.75	1.48
Uganda	0.88	0.93	0.43	0.94	0.99	2.67
Zambia	0.78	0.82	0.66	0.89	0.97	4.80
Zimbabwe	0.62	0.88	0.73	0.94	0.96	10.76

Notes: Fractions of respondents, weighted by sampling weights, who in the 2006 wave of the Gallup World Poll answer positively to the question "Do you know someone who has died from X?" where the column heads show X. The seven diseases are those listed, plus cholera, hepatitis, polio, and smallpox. The final column is an estimate of AIDS mortality per thousand based on the estimate of AIDS deaths taken from UNAIDS (2008), divided by a thousand times 2005 population taken from the 2007 World Development Indicators.

Table 5
Fractions of People Who Report Losing an Immediate Family Member in the Last 12 Months

	Malaria	AIDS	TB	TB or AIDS	Childbirth	Any
Angola	0.19	0.07	0.07	0.11	0.10	0.30
Benin	0.09	0.05	0.02	0.07	0.22	0.32
Burkina Faso	0.25	0.10	0.05	0.13	0.11	0.33
Cameroon	0.29	0.17	0.17	0.27	0.18	0.48
Central African R.	0.26	0.44	0.26	0.51	0.17	0.62
Chad	0.52	0.47	0.32	0.51	0.36	0.69
D. R. of the Congo	0.19	0.12	0.11	0.20	0.16	0.39
Ethiopia	0.11	0.08	0.10	0.16	0.07	0.29
Ghana	0.06	0.01	0.03	0.04	0.11	0.16
Guinea	0.24	0.04	0.10	0.12	0.11	0.38
Kenya	0.18	0.17	0.06	0.19	0.10	0.35
Liberia	0.15	0.01	0.05	0.05	0.09	0.23
Madagascar	0.10	0.00	0.06	0.06	0.10	0.18
Malawi	0.26	0.15	0.18	0.26	0.11	0.45
Mali	0.18	0.03	0.05	0.07	0.09	0.27
Mauritania	0.13	0.03	0.04	0.06	0.04	0.17
Mozambique	0.15	0.08	0.09	0.14	0.05	0.27
Namibia	0.05	0.19	0.08	0.21	0.01	0.23
Niger	0.39	0.02	0.09	0.11	0.21	0.45
Nigeria	0.06	0.02	0.03	0.04	0.07	0.13
Senegal	0.20	0.00	0.02	0.02	0.08	0.24
Sierra Leone	0.33	0.03	0.10	0.11	0.21	0.47
South Africa	0.00	0.11	0.05	0.13	0.02	0.14
Sudan	0.09	0.03	0.02	0.03	0.08	0.17
Tanzania	0.33	0.35	0.19	0.39	0.25	0.60
Uganda	0.27	0.38	0.03	0.39	0.11	0.52
Zambia	0.21	0.13	0.10	0.19	0.07	0.35
Zimbabwe	0.14	0.28	0.18	0.34	0.10	0.38

Notes: Fractions of respondents in the 2007 wave of the Gallup World Poll, weighted by sampling weights, who answer positively to the question "Please tell me if any one in your immediate family has died from X in the past 12 months?" where the column heads show X. The correlation between the HIV/AIDS fractions in column 2 and the UNAIDS mortality numbers in the final column of Table 4 for the countries shown here (excluding Sudan, for which there are no UNAIDS data) is 0.40.

Table 6: Differences in Wellbeing Measures Between Those Who Know Someone Who Has Died and Those Who Do Not
(Differences in bold are more than twice their estimated standard errors.)

	Ladder	Enjoy	Smile	Sad	Depressed
Angola	–0.03	**–0.16**	–0.08	**0.10**	0.06
Benin	–0.15	–0.03	0.08	0.05	–0.02
Burkina Faso	–0.08	–0.02	0.04	0.05	**0.08**
Cameroon	0.24	–0.01	–0.03	0.05	**0.08**
Central African R	0.11	–0.05	–0.00	**0.12**	**0.04**
Chad	–0.19	–0.03	0.08	0.04	0.02
D.R. Congo	–0.11	**–0.08**	–0.05	0.03	**0.06**
Ethiopia	**–0.44**	–0.06	–0.06	**0.09**	0.10
Ghana	–0.06	0.13	0.01	0.05	0.10
Guinea	0.18	–0.05	–0.08	0.06	**0.08**
Kenya	–0.07	**0.11**	0.05	0.00	–0.01
Liberia	**–0.48**	0.01	0.05	0.00	0.03
Madagascar	–0.08	**–0.12**	–0.04	0.05	**0.18**
Malawi	–0.22	–0.05	**–0.11**	0.00	0.02
Mali	–0.23	**–0.06**	**–0.13**	**0.11**	0.03
Mauritania	0.04	**–0.18**	**–0.17**	0.09	0.09
Mozambique	**–0.36**	–0.03	–0.01	0.06	–0.01
Namibia	–0.04	–0.03	–0.05	**0.13**	**0.08**
Niger	**–0.40**	–0.08	**–0.12**	**0.07**	0.04
Nigeria	–0.00	**–0.14**	**–0.10**	**0.12**	**0.15**
Senegal	**–0.38**	–0.06	–0.01	–0.03	0.00
Sierra Leone	0.07	0.04	0.05	0.07	0.01
South Africa	0.22	0.00	–0.07	**0.14**	**0.13**
Sudan	**0.39**	–0.05	0.02	–0.01	–0.02
Tanzania	–0.32	0.01	0.01	0.08	0.07
Uganda	–0.23	0.04	**0.13**	0.01	0.01
Zambia	–0.16	0.04	0.04	0.09	0.03
Zimbabwe	–0.36	**–0.16**	**–0.13**	**0.14**	**0.11**
Average	**–0.11**	**–0.04**	**–0.03**	**0.06**	**0.05**
FE regression+	**–0.12**	**–0.04**	**–0.02**	**0.06**	**0.05**

Notes: The average is a simple average over countries (calculated using the within country weights) without population weighting. Each column shows the difference in means between those reporting to have lost, in the last twelve months, an immediate family member to malaria, HIV/AIDS, TB, or childbirth and those who did not so report. Standard errors are corrected for design effects. The FE regression in the last row comes from regressing the dependent variable on a dummy for mortality from any cause and a set of country fixed effects, with standard errors corrected for survey design.

Table 7: Country Fixed Effect Regressions on SWB of Knowing a Family Member Who Died and Other Controls, Including Income

	Ladder		Enjoy		Smile		Sad		Depressed	
Malaria	–0.083	–0.082	–0.025	–0.029	–0.004	–0.011	0.027	0.034	0.026	0.030
	(2.0)	(1.8)	(2.3)	(2.3)	(0.4)	(0.9)	(2.9)	(3.1)	(3.1)	(3.2)
TB	–0.104	–0.128	–0.032	–0.024	–0.038	–0.028	0.038	0.038	0.045	0.045
	(1.9)	(2.2)	(2.1)	(1.4)	(2.5)	(1.6)	(2.8)	(2.5)	(3.4)	(3.1)
AIDS	0.104	0.100	0.009	–0.002	0.006	–0.001	0.050	0.050	0.017	0.020
	(1.9)	(1.8)	(0.7)	(0.1)	(0.4)	(0.1)	(4.0)	(4.0)	(1.6)	(1.8)
Childbirth	–0.035	0.042	–0.010	0.005	–0.016	–0.014	0.029	0.013	0.034	0.028
	(0.7)	(0.8)	(0.7)	(0.3)	(1.2)	(0.9)	(2.5)	(1.0)	(3.2)	(2.3)
Age	0.00452	–0.00153	–0.00218	–0.00225	–0.00543	–0.00488	0.00051	–0.00044	0.00249	0.00153
	(1.1)	(0.3)	(1.9)	(1.6)	(5.1)	(3.7)	(0.5)	(0.3)	(2.6)	(1.3)
Age^2	–0.00006	0.00002	0.00001	0.00001	0.00005	0.00004	0.00000	0.00001	–0.00003	–0.00002
	(1.3)	(0.3)	(0.7)	(0.4)	(3.8)	(2.8)	(0.3)	(0.5)	(2.5)	(1.3)
Female	–0.013	–0.011	0.004	0.000	0.018	0.008	0.012	0.021	–0.002	–0.004
	(0.5)	(0.4)	(0.6)	(0.0)	(2.5)	(1.0)	(1.9)	(2.8)	(0.4)	(0.6)
Education	0.458	0.273	0.098	0.070	0.053	0.024	–0.053	–0.032	–0.041	–0.028
	(14.4)	(7.6)	(11.9)	(7.1)	(6.7)	(2.6)	(7.6)	(4.0)	(6.5)	(3.6)
Ln*y*	..	0.366	..	0.057	..	0.046	..	–0.035	..	–0.024
		(19.2)		(11.7)		(10.1)		(8.6)		(6.2)
obs	26,232	19,459	26,172	19.396	26,060	19,320	26,295	19,439	26,255	19,414
countries	28	26	28	26	28	26	28	26	28	26
F(equal)	2.80	3.36	1.55	1.17	1.45	0.41	0.75	1.42	0.80	0.48
F(zero)	2.76	2.70	3.03	2.14	2.23	1.42	15.31	13.14	13.37	10.88

Notes: Each pair of columns shows two country fixed-effect regressions with the dependent variable as column head, the first excluding the log of income, the second including it. Education is a dummy that is 1 if the person has completed more than an elementary education. Obs is the number of observations in each regression; note the drop when income is included. The two *F*-statistics are *F*-tests for the coefficients on the four causes of death being equal, and for all effects being zero.

Table 8: Averaged Coefficients From Country Regressions on SWB of Knowing a Family Member Who Died and Other Controls, Including Income

	Ladder		Enjoy		Smile		Sad		Depressed	
Malaria	–0.110	–0.102	–0.023	–0.030	0.003	–0.009	0.034	0.034	0.029	0.035
	(2.2)	(2.0)	(1.8)	(2.0)	(0.2)	(0.6)	(3.0)	(2.5)	(2.5)	(2.7)
TB	–0.116	–0.129	–0.036	–0.033	–0.053	–0.053	0.021	0.013	0.049	0.063
	(2.0)	(2.0)	(2.1)	(1.5)	(3.1)	(2.4)	(1.5)	(0.8)	(3.3)	(3.7)
AIDS	0.202	0.166	0.006	–0.005	–0.022	–0.010	0.085	0.127	0.016	0.025
	(2.9)	(2.0)	(0.4)	(0.2)	(1.2)	(0.5)	(3.7)	(5.0)	(0.9)	(1.1)
Childbirth	–0.035	0.094	–0.016	0.001	–0.011	–0.003	0.033	0.021	0.039	0.033
	(0.6)	(1.6)	(1.1)	(0.1)	(0.8)	(0.2)	(2.4)	(1.3)	(3.4)	(2.2)
Age	0.00052	–0.00471	–0.00226	–0.00275	–0.00536	–0.00439	0.00032	–0.00091	0.00282	0.00240
	(0.1)	(0.9)	(1.9)	(1.9)	(4.8)	(3.2)	(0.3)	(0.7)	(3.0)	(2.0)
Age^2	–0.00000	0.00006	0.00001	0.00001	0.00005	0.00004	0.00000	0.00002	–0.00003	–0.00003
	(0.0)	(1.0)	(0.8)	(0.8)	(3.7)	(2.3)	(0.0)	(0.9)	(3.0)	(2.1)
Female	–0.009	–0.020	0.005	0.002	0.019	0.004	0.012	0.025	–0.004	–0.007
	(0.4)	(0.6)	(0.7)	(0.2)	(2.6)	(0.5)	(1.9)	(3.3)	(0.7)	(1.1)
Education	0.456	0.273	0.102	0.071	0.057	0.029	–0.053	–0.028	–0.040	–0.029
	(14.1)	(7.1)	(12.3)	(7.1)	(7.0)	(3.0)	(7.5)	(3.3)	(6.4)	(3.7)
lny	..	0.374	..	0.064	..	0.055	..	–0.042	..	–0.028
		(16.8)		(12.0)		(10.7)		(9.1)		(6.8)
obs	26,232	19,459	26,172	19,396	26,060	19,320	26,295	19,439	26,255	19,414
countries	28	26	28	26	28	26	28	26	28	26
F(equal)	4.48	3.96	0.88	0.69	2.31	1.21	1.77	4.67	0.66	0.79
F(zero)	3.73	2.98	3.13	2.35	3.92	2.37	10.71	11.08	10.10	9.43

Notes: See Table 8 above. Here the regressions are run country by country, and the coefficients averaged over them.

Table A.1
Life Evaluation and HIV Knowledge

Life Evaluation	(1)	(2)	(3)	(4)	(5)	(6)
HIV Knows	0.079	0.012	–0.958*	–1.264*	–1.226*	–0.544
	(0.225)	(0.130)	(3.524)	(4.818)	(4.189)	(1.606)
ln*GDP*	0.410	0.421*				
	(1.815)	(5.740)				
female				–0.119*	–0.110*	–0.074
				(3.361)	(2.565)	(1.706)
Ln*y*					0.426*	0.426*
					(15.211)	(15.083)
Country FEs?	No	No	Yes	Yes	Yes	Yes
Age–group FEs?	No	No	No	No	No	Yes
R^2	0.264	0.010	0.037	0.038	0.084	0.085
N	13	19973	19973	19973	13056	13056
N (Countries)	13	13	13	13	11	11

Notes: In all columns, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. The dependent variable is the ladder on a scale from 0 ("the worst possible life") to 10 ("the best possible life"). In column (1), the dependent variable is the country–level weighted average of the ladder. In columns (2) to (6), the dependent variable is the individual ladder. HIV Knows is country–level HIV knowledge among adults 15 to 49 in column (1) and country/sex/age-group-level knowledge in columns (2) to (6). Knowledge is the fraction of DHS respondents who say that they know someone who has AIDS or has died of AIDS. ln*GDP* is the log of country-level GDP per capita in 2005, as measured by the International Comparison Program, World Bank (2008). ln*y* is the log of family income, using individual responses from the Gallup survey. In columns (2) to (6), standard errors are clustered at the country/sex/age-group-level. Absolute values of *t*–statistics are in parentheses. * $p < 0.05$

Table A.2
Emotions and HIV Knowledge

	(1) Enjoyment	(2) Smiling	(3) Sadness	(4) Depression
HIV Knows	0.002	–0.207*	–0.005	–0.065
	(0.017)	(2.033)	(0.058)	(1.023)
Female	–0.005	0.002	0.007	–0.005
	(0.401)	(0.122)	(0.645)	(0.568)
Ln*y*	0.060*	0.051*	–0.032*	–0.020*
	(10.770)	(8.845)	(6.788)	(4.566)
Country FEs?	Yes	Yes	Yes	Yes
Age–group FEs?	Yes	Yes	Yes	Yes
R^2	0.037	0.029	0.019	0.099
N	13019	12918	13015	12986
N (Countries)	11	11	11	11

Notes: In all columns, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. In column (1), the dependent variable is an indicator for whether, on the previous day, the respondent experienced enjoyment a lot of the day. In column (2), the dependent variable is an indicator for whether, on the previous day, the respondent smiled and laughed a lot of the day. In column (3), the dependent variable is an indicator for whether, on the previous day, the respondent experienced sadness a lot of the day. In column (4), the dependent variable is an indicator for whether, on the previous day, the respondent experienced depression a lot of the day. HIV Knows is country/sex/age-group-level knowledge in all columns. Knowledge is the fraction of DHS respondents who say that they know someone who has AIDS or has died of AIDS. ln*y* is the log of family income, using individual responses from the Gallup survey. In all columns, standard errors are clustered at the country/sex/age-group-level. Absolute values of *t*–statistics are in parentheses. * $p < 0.05$

Table B.1
Life Evaluation and HIV Risk

Life Evaluation	(1)	(2)	(3)	(4)	(5)	(6)
HIV Risk	1.155	0.467	–0.960*	–1.124*	–1.242	–1.321
	(3.574)	(1.698)	(2.245)	(2.658)	(1.951)	(1.135)
ln*GDP*	0.746	0.791*				
	(7.132)	(6.355)				
female				0.065	0.099	0.106
				(0.815)	(1.064)	(0.869)
ln*y*					0.374*	0.376*
					(7.849)	(7.898)
Country FEs?	No	No	Yes	Yes	Yes	Yes
Age–group FEs?	No	No	No	No	No	Yes
R^2	0.986	0.024	0.030	0.030	0.079	0.082
N	4	6894	6894	6894	5264	5264
N (Countries)	4	4	4	4	4	4

Notes: In all columns, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. The dependent variable is the ladder, on a scale from 0 ("the worst possible life") to 10 ("the best possible life"). In column (1), the dependent variable is the country–level weighted average of the ladder. In columns (2) to (6), the dependent variable is the individual ladder. HIV Risk is country–level HIV risk among adults 15 to 49 in column (1) and country/sex/age-group-level risk in columns (2) to (6). Risk is the fraction of DHS respondents who say that they are at moderate or higher risk of being infected with HIV. ln*GDP* is the log of country-level GDP per capita in 2005, as measured by the International Comparison Program, World Bank (2008). ln*y* is the log of family income, using individual responses from the Gallup survey. In columns (2) to (6), standard errors are clustered at the country/sex/age-group-level. Absolute values of *t*–statistics are in parentheses. * $p < 0.05$

Table B.2
Emotions and HIV Risk

	(1) Enjoyment	(2) Smiling	(3) Sadness	(4) Depression
HIV Risk	0.346	0.206	–0.072	–0.147
	(1.774)	(0.958)	(0.476)	(0.995)
female	–0.015	–0.016	0.014	0.013
	(0.728)	(0.659)	(0.803)	(0.726)
ln*y*	0.049*	0.050*	–0.024*	–0.023*
	(6.497)	(6.897)	(3.274)	(3.899)
Country FEs?	Yes	Yes	Yes	Yes
Age–group FEs?	Yes	Yes	Yes	Yes
R^2	0.024	0.023	0.019	0.026
N	5253	5206	5242	5229
N (Countries)	4	4	4	4

Notes: In all columns, the sample is restricted to adult respondents ages 15 to 49 and results are weighted using provided sample weights. In column (1), the dependent variable is an indicator for whether, on the previous day, the respondent experienced enjoyment a lot of the day. In column (2), the dependent variable is an indicator for whether, on the previous day, the respondent smiled and laughed a lot of the day. In column (3), the dependent variable is an indicator for whether, on the previous day, the respondent experienced sadness a lot of the day. In column (4), the dependent variable is an indicator for whether, on the previous day, the respondent experienced depression a lot of the day. HIV Risk is country/sex/age-group-level risk in all columns. Risk is the fraction of DHS respondents who say that they are at moderate or higher risk of being infected with HIV. ln*y* is the log of family income, using individual responses from the Gallup survey. In all columns, standard errors are clustered at the country/sex/age-group-level. Absolute values of *t*–statistics are in parentheses. * $p < 0.05$

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