DETERMINANTS OF INDIVIDUAL HIV / AIDS KNOWLEDGE AMONG WOMEN IN SWAZILAND:
AN ANALYSIS OF INDIVIDUAL, HOUSEHOLD, AND COMMUNITY CHARACTERISTICS IN 2007

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DETERMINANTS OF INDIVIDUAL HIV/AIDS KNOWLEDGE AMONG WOMEN IN SWAZILAND:

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ABSTRACT

Allocating limited resources is a challenge for any organization engaged in health awareness and prevention activities. For most programs that target HIV/AIDS, the desired outcome is comprehensive, correct knowledge about the disease in order to prevent transmission. As progress is made in expanding comprehensive, correct knowledge about HIV/AIDS, populations with knowledge gaps must be addressed. Identifying, reaching out to groups, and reducing their knowledge gaps can allow for better targeting of messages and resources. Thus, the central question motivating this analysis is: what are the individual, household, and community-level determinants of individual HIV/AIDS knowledge among women in Swaziland?

With the highest HIV/AIDS prevalence rate in the world, much is at stake in Swaziland for addressing knowledge gaps. Using the 2006-07 Swaziland Demographic and Health Survey (SDHS), this paper assess the determinants of individual HIV/AIDS knowledge among Swazi women using a logit regression model that includes individual, household and community characteristics. This paper finds that individual education and household wealth are large and significant determinants of HIV/AIDS knowledge.

Dedication

To all the individuals who have supported and contributed to my desire to learn and

improve the lives of others around the world, especially my parents and grandmothers,

who have made incredible sacrifices to ensure I have a life filled with opportunities.

Thank you.

PAUL A. BONILLA

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I. Introduction

A significant portion of international aid and assistance goes towards prevention and treatment of HIV/AIDS.[1] Between 2001 and 2007, financial resources for HIV programs saw a six fold increase in low and middle-income countries.[2] As the deadlines for meeting Millennium Development Goal targets on HIV/AIDS in 2010 and 2015 approach, it is important to identify characteristics of populations receiving and missing key messages aimed at curbing this global health challenge.[3]

Though financing for education and awareness programs has increased, it remains constrained from fiscal and effectiveness perspectives, the latter specifically related to targeting and allocation of funds. Beyond monetary requirements, organizations face challenges in allocating time, expertise, and other resources to address the challenges of HIV/AIDS. In sub-Saharan Africa, home to 67% of the world's infected population, proper use of resources is key to overcoming the high rates of new infections and prevalence.[4] Consequently, calls for increased accountability, aid effectiveness, and sustainability have accompanied the surge in financial resources.

The desired outcome of most HIV/AIDS programs is comprehensive, correct knowledge about the disease in order to prevent transmission. Other areas of emphasis include proper treatment and addressing social factors such as gender inequality, HIV stigmas, and discrimination. As progress is made in expanding comprehensive, correct knowledge about HIV/AIDS, populations not meeting knowledge thresholds must be addressed and targeted. Identifying, reaching out to groups, and reducing their

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[1] According to OECD in 2006, the Development Assistance Committee (DAC) countries provided $4.3 billion in commitments to HIV/AIDS in 2005, over 4% of official development assistance; Kates, Jennifer, and Eric Lief. *International Assistance for HIV/AIDS in the Developing World: Taking Stock of the G8, Other Donor Governments, and the European Commission*. Issue Brief. Kaiser Family Foundation, (2006): 1, 5.
[2] 2008 Report on the Global Aids Epidemic: Executive Summary. Geneva: UNAIDS, (2008): 3.
[3] Millennium Development Goal 6 is "Combat HIV/AIDS, malaria, and other diseases." Target 1 is to have halted by 2015 and begun to reverse the spread of HIV/AIDS.
[4] 2008 Report on the Global Aids Epidemic: Executive Summary. Geneva: UNAIDS, (2008): 30.

knowledge gaps can allow for better targeting of messages and resources. Thus, the central question motivating this analysis is: what are the individual, household, and community-level determinants of individual HIV/AIDS knowledge among women in Swaziland?

This paper seeks to support efforts to more effectively address the HIV/AIDS pandemic in Swaziland. The next section provides an overview of Swaziland and the political, social and economic toll HIV/AIDS has taken on the country. Then, the literature review provides insight regarding previous studies on determinants of HIV/AIDS knowledge, especially in sub-Saharan Africa. This helps shape a conceptual framework and methodology for addressing the research question using data from the 2006-2007 Swaziland Demographic Health Survey. Descriptive statistics and multivariate regression results are then presented and analyzed, followed by a concluding discussion on improving knowledge outcomes related to HIV/AIDS.

II.   Background

The Kingdom of Swaziland is a small, landlocked African nation home to 1.2 million people located between South Africa and Mozambique.[5] In 2007, Swaziland's Central Statistics Office estimated that 25.9% of the population was infected with HIV/AIDS, the world's highest prevalence rate, up from 0.018% when first measured in 1987.[6] As a result, Swaziland now stands as ground zero for combating HIV/AIDS. The World Bank notes, "the ravages of the HIV/AIDS pandemic have affected

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[5] United States. CIA. *CIA World Factbook: Swaziland*. 10 Mar. 2010. Accessed 15 Mar. 2010.
[6] Swaziland. Central Statistical Office (CSO). *Swaziland Demographic and Health Survey 2006-07*. By Macro International Inc. Mbabane (2008): 222.

Swaziland not unlike a civil war, worse in many ways than a natural disaster, and are now the country's single greatest threat."[7]

Though Swaziland endured over 60 years of British colonial rule, its traditions and culture remained at the center of society. King Mswati III is the only sovereign monarch in Africa, serving as both the head of state and the *Ingwenyama*, the traditional leader "regarded as the custodian and embodiment of Swazi culture."[8] Under his reign, the prevalence of many traditional practices including *Sitsembu*, polygamy; *Bunganwa*, having multiple female partners; *Kushenda*, having extramarital relationships; *Kungena*, wife inheritance; and *Kujuma*, occasional overnight or short-term visits for unmarried lovers, remain common and deep rooted.[9] The pervasiveness of these traditions has clashed with the realities of regional and global interconnectedness in the most horrifying fashion: the spread of HIV/AIDS. As a result, cultural norms and practices have been exposed to the scientific realities of infectious disease. Today, the Swazi traditions above are linked to the pandemic level of HIV/AIDS in Swaziland.

Classified as a lower-middle income country since the 1970s, Swaziland appeared to be on a positive development trajectory through the mid 1990s. However, as the HIV/AIDS pandemic took over Swaziland during the past ten years, important health indicators in **Table 1** weakened including the infant mortality rate and, most dramatically, life expectancy, which fell by almost 50% from 1997-2007 to 31 years.

Table 1: Basic Demographic Indicators

	1976 PHC	1986 PHC	1997 PHC	2006-07 SDHS
Population	494,534	681,059	929,718	1,200,000
% Urban	15.2	22.8	23.1	21.1
Total Fertility Rate	5.2	6.4	4.5	3.8

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[7] *Interim Strategy Note: A Framework for Scaling up Support for the Kingdom of Swaziland*. Tech. Washington: International Bank for Reconstruction and Development (2008): 8.
[8] *The Socio-Economic Impact of HIV/AIDS in Swaziland*. National Emergency Response Council on HIV/AIDS, (2006): 18.
[9] Ibid. 18-20.

Infant Mortality Rate	u	99	78	85
Male	205	u	u	u
Female	180	u	u	u
Life expectancy (years)	46	56	60	31

u = No information
Source: Swaziland Central Statistics Office; 1976 Population and
Housing Census PHC), 1986 PHC, 1996 PHC, 2006-07 Swaziland
Demographic & Health Survey; & World Bank

As a result, while many developing countries progress towards nearing or reaching the

United Nations Millennium Development Goals (MDGs), Swaziland has actually lost

ground since their establishment and is likely to only meet three of eight MDGs:

achieving universal primary education, promoting gender equality and empowering

women, and ensuring environmental sustainability.[10] The challenge in reaching the

MDGs, supplemented by the further decline of several key indicators, may serve as

evidence that the thresholds pushed by the United Nations and other international

organizations and development agencies are not currently attainable in Swaziland due

to the HIV/AIDS pandemic.

The immensity of the HIV/AIDS challenge has reshaped the interaction of Swazi

politics and social traditions. After the first domestic case of HIV/AIDS was reported

in 1986, Swaziland established the National AIDS Prevention and Control Programme

and was one of the first countries to create a development plan that included

addressing HIV/AIDS.[11] However, "despite a sound strategy, a strong national

HIV/AIDS institution, and considerable international support, the country has not been

able to cope with this threat."[12] Political leaders face difficult predicaments in curbing

the traditional behaviors listed earlier that increase risks for infection. The influx of

international knowledge, ideas, and norms associated with controlling and reducing the

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[10] *The Socio-Economic Impact of HIV/AIDS in Swaziland*. National Emergency Response Council on
HIV/AIDS, (2006): 29-30.
[11] Ibid. 16.
[12] The World Bank. *Swaziland Country Brief*. 11 Mar. 2010. Accessed 15 Mar. 2010.

prevalence of HIV/AIDS place pressure on the close relationship of Swazi traditions and political power and responsibility.

The additional influx of foreign assistance and resources to combat the HIV/AIDS pandemic in Swaziland also plays a role in the development of the Swazi economy. In 2006, expenditures on HIV/AIDS in Swaziland were US$49.1 million, approximately 1.8% of gross national income. Of this amount, 39.8% came from domestic spending while 60.2% was financed by international sources.[13] Bilateral donors, multilateral organizations, and the Global Fund, the latter which contributed 31% of national HIV/AIDS funding alone, have become central players in the development, implementation, and execution of prevention and treatment programs.

In order to combat HIV/AIDS, increasing efforts and resources are dedicated to improving knowledge about the disease. HIV is most commonly transmitted between adults through heterosexual contact between infected and non-infected partners. Furthermore, Swaziland's epidemic is "feminized" with 31% of women being infected compared to 21% of men.[14] Most HIV prevention programs focus messaging on three types of behavior: use of condoms; limiting the number of sexual partners or staying faithful to one partner; and abstinence. For over a decade, a large number of consistent awareness and education campaigns have exposed a large majority of the population to these key HIV/AIDS prevention messages.

In 2006, the Swazi government prepared the *Second National Multisectoral HIV and AIDS Strategic Plan 2006-2008*. The prevention section of the document addresses eight central areas including: behavior change; mother to child transmission; HIV and AIDS in the workplace; and condoms logistics, promotion, and management. Strategies to

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[13] 2008 Report on the Global AIDS Epidemic. Rep. Geneva: UNAIDS (2008): 260.
[14] Unites States of America. USAID. *Swaziland HIV/AIDS Health Profile*. (2008): 1.

expand knowledge on these topics include engagement of tribal leaders community mobilization, education campaigns in schools, and public awareness initiatives using various forms of media.[15] These efforts, combined with the massive toll of HIV/AIDS on the population, have resulted in 99.8% of Swazi's having heard of HIV/AIDS, making the country ideal for an analysis on levels of comprehensive and correct knowledge about the disease.[16]

III.   Literature Review

Over the past several years the HIV/AIDS landscape has shifted as prevention activities are supplemented with treatment and increased funding towards both activities. However, as the costs for antiretroviral therapy remain high and delivery restricted, HIV/AIDS interventions continue to focus on education and information sharing.[17] "The desired effect of improving the level of knowledge about AIDS and its prevention is that individuals will become motivated to alter the behaviors that put them at risk for contracting the HIV virus."[18] Long-term preventative medical solutions, such as vaccines, remain years away, also leading to an emphasis on risk behavior reduction as the most viable way to reverse the pandemic.[19] As a result, much analysis has been dedicated to levels of HIV/AIDS knowledge, especially in sub-Saharan Africa with the hope of enhancing prevention policies and programs.

Many studies target HIV/AIDS knowledge because "an obvious prerequisite for behavior change is that people have an understanding of the disease and how infection

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[15] Swaziland. *Second National Multisectoral HIV and AIDS Strategic Plan 2006-2008*. Mbabane (2006): 19-32.
[16] Swaziland. Central Statistical Office (CSO). *Swaziland Demographic and Health Survey 2006-07*. By Macro International Inc. Mbabane (2008): 184.
[17] Janine Barden-O'Fallon and Joseph DeGraft-Johnson. "Factors Associated with HIV/AIDS Knowledge and Risk Perception in Rural Malawi." *AIDS and Behavior* 8.2 (2004): 131.
[18] Ibid. 131.
[19] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 385.

can be averted."[20] However, the causal link between behavioral change and increases in knowledge and risk perception is not well established.[21] As a result, many analyses seek to "identify vulnerable groups among the population [in an effort] to devise appropriately targeted policies to improve HIV/AIDS knowledge."[22]

Several individual, household, and community-level characteristics provide insight into the likelihood that an individual has correct knowledge about various risks associated with HIV/AIDS transmission. A central factor in considering various determinants of knowledge is the relevant marginal cost for sharing and gaining information.[23] In studies across multiple countries in sub-Saharan Africa, Glick and Sahn explore the role of various determinants of HIV/AIDS knowledge using DHS country surveys.

At the individual-level, education influences the level of access and understanding one has of HIV/AIDS knowledge. "Educated individuals are more likely to read the newspaper and to visit private or public health services where HIV-related information (and possibly also, condoms) is dispensed."[24] As a result, the marginal cost of informing the poorly educated will be higher than for well-educated individuals.[25] "Schooling is one of the most consistent predictors of behavior and

[20] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 383.

[21] Janine Barden-O'Fallon and Joseph DeGraft-Johnson. "Factors Associated with HIV/AIDS Knowledge and Risk Perception in Rural Malawi." *AIDS and Behavior* 8.2 (2004): 131.

[22] Peter Glick, Josée Randriamamonjy, and David Sahn. "Determinants of HIV Knowledge and Condom Use among Women in Madagascar: An Analysis Using Matched Household and Community Data." *SAGA Working Paper*. Strategies and Analysis for Growth and Access, June 2008: 4.

[23] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 385.

[24] Ibid. 385.

[25] Ibid. 385.

knowledge: educational achievement predicts protective behaviors such as condom use, HIV testing, discussion of AIDS between spouses, and knowledge about HIV/AIDS."[26]

An individual's marital status has varying effects on knowledge outcomes, based on the question being considered. "Individuals in such a relationship are usually more likely than those who are single to indicate that HIV risk can be reduced by limiting the number of partners (which incorporates having one partner/being faithful to ones' spouse). In contrast, individuals in partnerships are usually less likely than single people to report that avoiding sexual relations altogether can prevent HIV transmission."[27] This highlights possible differences in relevant determinants of HIV/AIDS knowledge based on the question being asked.

Household wealth should be "positively correlated to access to HIV/AIDS information, through means such as ownership of a TV or radio or more frequent use of health care practitioners," all factors that help reduce the marginal cost of knowledge transfer.[28] In the same multi-country analysis, Glick and Sahn find that "although there are fewer statistically significant impacts than for education, overall, we do see the expected pattern of more HIV prevention knowledge among those in wealthier households."[29] Part of the variation in significance may stem from the correlation between education and wealth.[30]

Community- level factors, including whether one lives in an urban or rural area and access to health facilities, also influence the likelihood of knowledge transfer to individuals because access to HIV/AIDS information is "presumably scarcer in rural

[26] Damien De Walque. "Does Education Affect HIV Status? Evidence from Five African Countries." *World Bank Economic Review* 23.2 (2009): 231.
[27] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 409.
[28] Ibid. 387.
[29] Ibid. 405.
[30] Ibid. 385.

areas, hence more costly to obtain."[31] Glick and Sahn find that HIV knowledge is generally "greater among urban residents, given the higher density of social networks and of channels for public messages about the disease in urban environments."[32] However, no concrete patterns emerge regarding the urban-rural divide, with only a few cases statistically significant.[33] Access to health facilities and workers may also play a role in determining HIV/AIDS knowledge, though part of this effect may be captured in levels of education, wealth, and the urban-rural differential.[34]

There are many other variables that may serve as determinants of HIV/AIDS knowledge. Exposure to mass media has been attributed to knowledge about HIV/AIDS, leading to positive changes in behavior, the goal of most prevention programs.[35] Community characteristics, such as access to water and electricity, create contextual effects on individuals, shaping their knowledge and perceptions of HIV/AIDS. However, in constructing a conceptual framework, Glick and Sahn include only potential determinants that are exogenous to the outcome variables. As a result, they exclude "'daily radio listening', as both this and HIV knowledge may be jointly determined by unobservable preferences or abilities."[36] They also use the DHS wealth index, which serves as a strong proxy for household expenditures and captures household durable goods and resources.[37]

This analysis seeks to contribute to existing literature by taking advantage of the first countrywide demographic survey supported by DHS in Swaziland from 2006-2007.

[31] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 387.
[32] Ibid. 387.
[33] Ibid. 405.
[34] Ibid. 385.
[35] P. Hutchinson, X. Mahlalela, and J. Yukich. "Mass Media, Stigma, and Disclosure of HIV Test Results: Multilevel Analysis in the Eastern Cape, South Africa." *AIDS Education and Prevention,* 19.6 (2007): 489.
[36] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 392.
[37] Ibid. 392-93

By building on previous studies on determinants of HIV/AIDS knowledge, this paper will analyze the effect of individual, household and community-level characteristics on knowledge outcomes in Swaziland in order to provide a tool for organizations engaged in HIV/AIDS prevention activities to better target their activities to the more vulnerable populations facing the pandemic.

IV.   Conceptual Framework

A chain of individual, community, and household characteristics shapes the distal determinants of HIV/AIDS.[38] Consequently, all three must be considered when evaluating individual knowledge about the disease. At the macro level, socioeconomic factors such as wealth, income distribution, culture, religion, and governance have demonstrated qualitative and quantitative links to HIV/AIDS.[39] Components of one's microenvironment, including mobility, urbanization, access to health care, levels of violence, and women's rights and status, are also considered to have causal effects on the chances of an individual contracting HIV/AIDS.[40] Consequently, organizations must account for these factors when shaping interventions. Furthermore, when assessing target populations, there is a need to differentiate effects of the individual, household, and community levels in order to fully understand the factors that increase the risk of an individual contracting HIV/AIDS.

Since avoiding transmission of HIV/AIDS from one individual to another is the primary goal of prevention programs targeting the disease, focusing on measurement and analysis at the individual level is usually a logical starting point. However, as an individual is usually part of a greater whole, especially in sub-Saharan African,

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[38] Alan Whiteside. "Poverty and HIV/AIDS in Africa." *Third World Quarterly* 23.2 (2002): 316.
[39] Ibid. 316-317.
[40] Ibid. 318.

exploring characteristics of an individual's household and community environment can provide insight into factors that must be addressed in order to achieve the successful transfer of knowledge. When assessing individual outcomes, there is a "need to measure the specific contribution of household-level and community-level attributes and the relevance of separating the social from the purely economic effects of household SES [socioeconomic status] variables."[41] Household-level indicators may include education, employment, income, ownership of consumer durables, water, sanitation, and housing.[42] Taking these into account also helps address the challenge of measuring wealth, especially in rural Africa where approximately 90% of non-human assets are physical items such as livestock and consumer durables.[43] As household, family, and socioeconomic status shape individual behavior, these attributes are important to models designed to predict individual knowledge about HIV/AIDS.[44]

Building on the work of Glick and Sahn, this analysis seeks to understand what individual, household, and community-level characteristics contribute to the probability that a Swazi female has comprehensive knowledge about HIV/AIDS. Control variables include age, marital status, and region of residence. Each of these variables has the potential to affect knowledge outcomes based on the HIV/AIDS question being asked. For example, younger individuals may be more likely to have heard about HIV/AIDS during schooling compared to older adults.[45] Explanatory

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[41] Jean-Christophe Fotso and Barthelemy Kuate-Defo. "Measuring Socioeconomic Status in Health Research in Developing Countries: Should We Be Focusing on Households, Communities or Both?" *Social Indicators Research* 72.2 (2005): 191.
[42] Ibid. 193.
[43] David Bloom, Jeffrey Sachs, Paul Collier, and Christopher Udry. "Geography, Demography, and Economic Growth in Africa." *Brookings Papers on Economic Activity* 1998.2 (1998): 286.
[44] Jiajian Chen, Minja Kim Choe, Shengli Chen, and Shikun Zhang. "Community Environment and HIV/AIDS-Related Stigma in China." *AIDS Education and Prevention* 17.1 (2005):. 2.
[45] Peter Glick, Josée Randriamamonjy, and David Sahn. "Determinants of HIV Knowledge and Condom Use among Women in Madagascar: An Analysis Using Matched Household and Community Data." *SAGA Working Paper*. Strategies and Analysis for Growth and Access, June 2008: 11.

variables for knowledge, including education, wealth, sex of household head, type of place of residence, and health facility access, can affect an individual's level of knowledge because they shape both the micro and macro environments for acquiring information. Furthermore, these variables can affect the marginal cost for getting information to an individual, shaping the viability and outcomes of programs aimed at increasing HIV/AIDS knowledge. **Figure 1** below illustrates the conceptual framework for determinants of HIV/AIDS knowledge. Though it captures the factors discussed above, there are some unobservable characteristics, especially at the individual level, that are not captured by the data set which may influence individual knowledge levels such as interest in health, motivation, and other psychological variables.

Figure 1: Conceptual Framework for Determinants of HIV/AIDS Knowledge
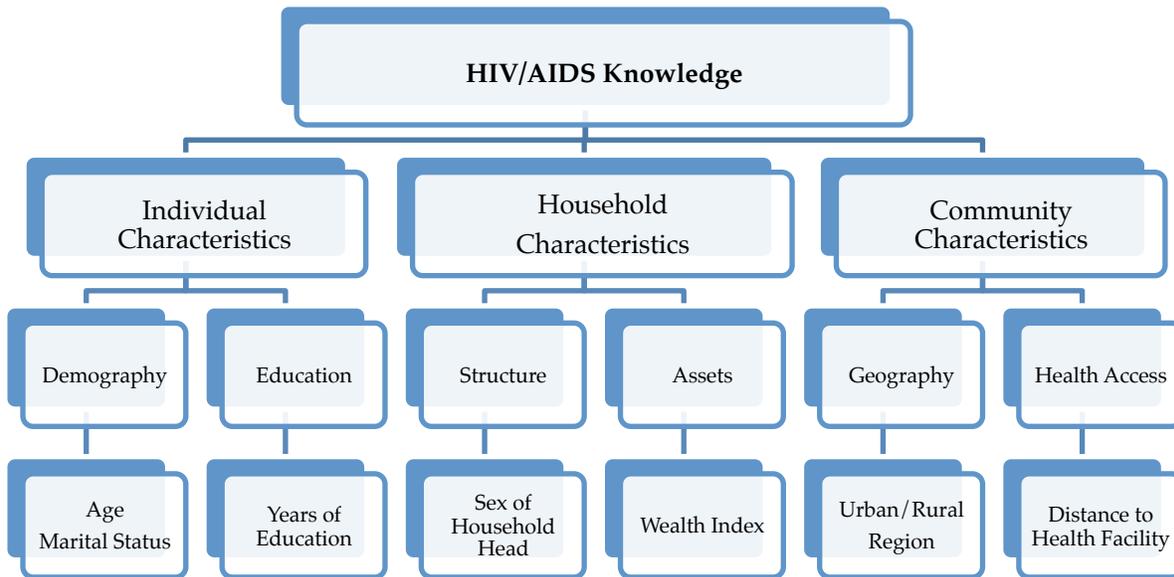
While there will be variation based on the specific HIV/AIDS knowledge question asked, individual education and household wealth should have a positive, causal effect on comprehensive knowledge about HIV/AIDS among Swazi women.

V.   Data & Methods

The MEASURE DHS (Demographic Health Surveys) project has provided technical assistance to over 80 countries since 1984, helping collect and distribute accurate and nationally representative data from developing countries. The program is funded by the United States Agency for International Development (USAID). Surveys collect basic individual and household information in addition to modules on fertility, family planning, infant and child mortality, maternal and child health, nutrition, malaria, HIV/AIDS, women's empowerment, and youth. "Data quality for the DHS is considered to be generally high, and nonresponse, even for relatively sensitive questions about behavior, is typically not a major problem."[46] Furthermore, the potential for misreporting is usually higher when asking about an individual's own sexual behavior but less likely when discussing knowledge, which is presumably less personal.[47]

The 2006-07 Swaziland Demographic and Health Survey (SDHS) was the first national survey to generate estimates at the national, regional, and urban/rural levels. The Swaziland Central Statistical Office (CSO) implemented the survey and fieldwork was carried out between July 2006 and March 2007. Of the 5,500 households selected for the sample, 5,086 were occupied at the time of fieldwork and successful interviews were conducted in 4,843 households, yielding a response rate of 95%. All women and men ages 15-49 in these households were eligible for either the female or male individual questionnaire; 4,987 women (94% response rate) and 4,156 men ages 15-49 (89% response rate) participated. "The principal reasons for non-response among both

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[46] Glick, Peter, and David Sahn. "Are Africans Practicing Safer Sex? Evidence from Demographic and Health Surveys for Eight Countries." *Economic Development and Cultural Change* 56 (2008): 402
[47] Peter Glick, Josée Randriamamonjy, and David Sahn. "Determinants of HIV Knowledge and Condom Use among Women in Madagascar: An Analysis Using Matched Household and Community Data." *SAGA Working Paper*. Strategies and Analysis for Growth and Access, June 2008: 7-8.

eligible men and women were refusal and the failure to find individuals at home despite repeated visits to the households."[48] Household information is linked to individuals living in the household, allowing for analysis of characteristics at both levels. At the time of this analysis, only data from the female individual questionnaire was publicly available for the SDHS.

The sample for this analysis pulls from 4,684 women aged 15-49 surveyed in the SDHS with the following characteristics: have heard of HIV/AIDS; usual resident of household; household size of 23 individuals or less; and no missing responses to knowledge questions. With the widespread reach of HIV/AIDS in Swaziland, someone that has not heard of HIV/AIDS is an outlier, reflected by the fact that only 13 observations were dropped from the sample. Residents and visitors in a household were interviewed if surveyors were present and accounted for 172 observations, which were dropped as visitors are usually more affected by a separate household environment. Seven observations included individuals who lived in households with more than 23 people; they were dropped because of their status as outliers. Finally, 111 observations were dropped because of missing data, resulting in the final sample size of 4,684 Swazi women.

A central feature of the 2006-07 SDHS was the inclusion of HIV/AIDS knowledge questions in the female and male individual questionnaires. Behavior related questions included: can people reduce their chance of getting the AIDS virus by: abstaining from sexual intercourse; having just one sex partner who is not infected and who has no other partners; and using a condom every time they have sex? Also asked: can people get the AIDS virus from having oral sex; and anal sex? Questions regarding

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[48] Swaziland. Central Statistical Office (CSO). *Swaziland Demographic and Health Survey 2006-07*. By Macro International Inc. Mbabane, (2008): 7.

local misconceptions about HIVS/AIDS included can people get the AIDS virus: from open wounds or sores of an infected person; because of witchcraft or other supernatural means; by sharing food with a person who has AIDS; and from mosquito bites? Individuals were asked, can the virus that causes AIDS be transmitted from a mother to her baby: during delivery; by breastfeeding; and during pregnancy. Two additional questions linked to perceptions about HIV/AIDS included: is it possible for a healthy-looking person to have the AIDS virus; and is there anything else a person can do to avoid or reduce the chances of getting the AIDS virus?[49] Each question could be answered yes, no, or don't know. Several questions yielded high numbers of "don't know" responses, however, this analysis will focus solely on the predicted probability that an individual answers a question correctly. As a result, the outcome variable is a dummy variable where incorrect knowledge=0 and correct knowledge=1.

Beyond each individual knowledge question, a picture of comprehensive knowledge will be helpful in confirming overall trends and discussing policy implications. SDHS constructed a composite variable to determine comprehensive knowledge of HIV prevention and transmission, which it defined as "knowing that consistent use of condoms during sexual intercourse and having just one uninfected faithful partner can reduce the chances of getting HIV, knowing that a healthy-looking person can have HIV and rejecting the two most common local misconceptions about HIV transmission or prevention: that HIV can be transmitted by mosquito bites and by sharing food with a person who has HIV or AIDS."[50] Using this metric, SDHS estimated that 51.9% of women 15-49 have comprehensive knowledge about HIV/AIDS. This analysis will use the SDHS comprehensive knowledge variable structure and also create

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[49] Swaziland. Central Statistical Office (CSO). *Swaziland Demographic and Health Survey 2006-07*. By Macro International Inc. Mbabane, (2008): 417-418.
[50] Ibid. 186.

a second comprehensive knowledge variable that take into account all 14 knowledge questions. This variable should have much lower numbers of individuals with correct comprehensive knowledge. Both will be structured as dummy outcome variables where 0=incorrect knowledge and 1=correct knowledge.

Following the conceptual framework discussed above, this analysis will use individual, household, and community-level variables to explore the determinants of a Swazi female having correct knowledge about HIV/AIDS. Using data from the SDHS individual female questionnaire, variables for age, marital status, and years of education will be included. Following the work of Glick and Sahn, marital status is recoded as a dummy variable (0=Not Married; 1=Currently Married).[51] Data used from the household-level questionnaire will include wealth and the sex of the household head. SDHS uses the wealth index "as a proxy for long-term standard of living of the household."[52] Each household surveyed was assigned a total factor score based on assets and ranked. The national ranking were then divided into quintiles which are reflected in the data set as 1=poorest, 2=poorer, 3=middle, 4=richer, and 5=richest. Community-level variables for geography and health access were also included from both the individual and household questionnaires. The latter includes information on whether the household is in a rural or urban area, 0=rural and 1=urban. A dummy variable created for each of Swaziland's four regions, Hhohho, Manzini, Shiselweni,

[51] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 409.
[52] The wealth index is based on the data on the household's ownership of consumer goods; dwelling characteristics; type of drinking water source; toilet facilities; and other characteristics that are related to a household's socioeconomic status. To construct the index, each of these assets was assigned a weight (factor score) generated through principal component analysis, and the resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and standard deviation of one. Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The sample was then divided into quintiles from one (lowest) to five (highest).
Swaziland. Central Statistical Office (CSO). *Swaziland Demographic and Health Survey 2006-07*. By Macro International Inc. Mbabane, (2008): 23.

and Lubumbo. In the regression analysis, Lubumbo will be used as the reference group. Responses to an item in the female questionnaire asking if distance to a health facility is a problem or not will be used as an indicator for access to community health facility with 0=a problem and 1=not a problem. Descriptive statistics will be run on all of these variables, with extensive analysis on differences in knowledge levels between different wealth quintiles and regions.

Approaching knowledge as a dichotomous variable (0=incorrect knowledge; 1=correct knowledge), a logit model will be used to determine the probability that an individual has knowledge about a single or composite set of questions on HIV/AIDS. The logit regression model to test the hypothesis that individual education and household wealth should have a positive, causal effect on comprehensive knowledge about HIV/AIDS among Swazi women is as follows:

$$Knowledge = \beta_0 + \beta_1 InDemography + \beta_2 InEducation + \beta_3 HHStructure$$
$$+ \beta_4 HHAssets + \beta_5 CommGeography + \beta_6 CommHealth$$

Using the STATA statistical software package, logit regressions will be run for each of the 14 HIV/AIDS knowledge questions asked in the SDHS. Two additional logit regressions will also be run to evaluate the determinants of comprehensive knowledge about HIV/AIDS as defined by the SDHS and full comprehensive knowledge based on an individual answering all the HIV/AIDS knowledge questions correctly. Marginal effects from the results of these regressions should be able to demonstrate comparable and statistically significant links between individual, household, and community-level characteristics and knowledge about HIV/AIDS, answering the research question.

VI.   Descriptive Statistics

Table 2 below displays the mean and standard deviation for each dependent variable, presenting a first look at HIV/AIDS knowledge levels regarding each question aimed at gauging individual understanding of HIV/AIDS.

Table 2: Descriptive Statistics: Dependent Variables

Variable	Mean	Std.Dev
Behavior: People reduce their chance of getting the AIDS virus by:		
Not having sex	0.947	0.224
Only one sex partner	0.931	0.253
Using condoms during sex	0.912	0.284
Not having oral sex	0.645	0.479
Not having anal sex	0.586	0.493
Local Questions: Can people get the AIDS virus:		
From open wounds or sores	0.963	0.188
Because of witchcraft or supernatural means	0.924	0.266
By sharing food	0.825	0.38
From mosquito bites	0.661	0.474
Childbearing: Can the virus that causes AIDS be transmitted from a mother to her baby:		
During delivery	0.886	0.318
By breastfeeding	0.848	0.359
During pregnancy	0.73	0.444
Perceptions: Is:		
It possible for a healthy-looking person to have the AIDS virus	0.964	0.187
There anything else a person can do to avoid or reduce the chances of getting the AIDS virus	0.944	0.229
Comprehensive Knowledge		
SDHS comprehensive knowledge	0.526	0.499
Full comprehensive knowledge	0.056	0.229
N=4684		
0=Incorrect knowledge; 1=Correct knowledge		

Seven of the questions asked, reached a knowledge level above 90%, demonstrating relatively widespread understanding of the relationship between HIV/AIDS and abstinence, condom-use, and have one sexual partner. However, the remaining questions reveal wide knowledge gaps on the links between HIV/AIDS and several issues including anal sex, oral sex, and mother to child transmission. Individuals that answered each question correctly, less than 6% of the sample surveyed, demonstrated

full comprehensive knowledge regarding HIV/AIDS while 52.6% of the sample met the comprehensive knowledge threshold set by the SDHS survey.

Exploring individual, household, and community-level characteristics helps identify the distribution of knowledge gaps and variables that may have an effect on HIV/AIDS knowledge. **Table 3** provides an overview of the sample population of Swazi women, including individual demographic and education information.

Table 3: Descriptive Statistics: Individual Characteristics

	Mean	Std.Dev
Age	27.910	9.737
Marital Status*	0.414	0.493
Years of Education	8.135	3.896

Note: N=4684
*0=Not married; 1=Currently Married

The sample's average age is 28 years old and 41% of women are currently married. Furthermore, the average level of individual education is just over 8 years.

Household-level characteristics also provide insight to the environment that shapes the knowledge environment for Swazi women. Women head 57% of Swazi households. Sex of household head may have an effect on the opportunities for knowledge exchange at home. However, the variable with the greatest potential effect at the household level is wealth. **Table 4** compares levels of each HIV/AIDS knowledge indicator by wealth index quintile.

Table 4: Correct AIDS Knowledge % by Wealth Index

	Poorest	Poor	Middle	Richer	Richest	Total
Behavior						
Not having sex	91.60	94.31	94.67	95.27	96.31	94.71
Only one sex partner	89.26	91.58	92.05	94.06	96.31	93.13
Using condoms during sex	85.95	90.97	89.90	92.66	94.04	91.18
By having oral sex	55.37	58.42	63.56	65.69	73.33	64.52
By having anal sex	46.97	51.86	54.71	59.76	71.22	58.58
Local Questions						
From open wounds or sores	94.08	96.04	97.05	96.68	97.10	96.35
From witchcraft or supernatural means	86.23	91.21	93.42	93.36	95.06	92.36
From sharing food	70.52	78.47	81.38	87.12	88.86	82.45

From mosquito bites	51.52	58.91	63.34	69.52	78.04	66.05
Childbearing						
Transmission during delivery	88.57	86.88	87.74	87.02	91.53	88.60
Transmission by breastfeeding	84.30	84.41	85.13	82.80	86.67	84.80
Transmission during pregnancy	76.31	70.42	71.96	71.33	74.75	72.99
Perceptions						
Healthy person can have AIDS	90.63	95.67	97.28	97.08	98.90	96.37
Can avoid AIDS	88.15	92.70	94.67	95.98	97.73	94.43
Comprehensive Knowledge						
SDHS comprehensive knowledge*	35.12	43.32	49.60	56.24	67.53	52.56
Full comprehensive knowledge**	5.23	6.81	5.56	5.63	4.86	5.55

N=4684

*SDHS Comprehensive Knowledge means knowing that consistent use of condom during sexual intercourse and having just one uninfected faithful partner can reduce the chance of getting the AIDS virus, knowing that a healthy-looking person can have the AIDS virus, and rejecting the two most common local misconceptions: AIDS can be transmitted by mosquito bites and by sharing food with a person who has AIDS.
**Full Comprehensive Knowledge means correct answers to all questions.

The poorest quintile has the lowest level of knowledge for each question except those related to pregnancy and delivery where the poor quintile is lowest. On the other hand, the richest quintile has the highest level of knowledge for all questions. The pattern of weaker knowledge levels for the poor and stronger knowledge levels for the rich is relatively consistent and should be evident in the regression analysis for all dependent variables including SDHS Comprehensive Knowledge. Interestingly however, the Full Comprehensive Knowledge variable does not follow this trend, with the second quintile, poor, having the highest level of comprehensive knowledge (6.81%) and the fifth quintile, rich, with the lowest level of comprehensive knowledge (4.86%).

Community-level characteristics are also expected to play a role in shaping the knowledge environment for HIV/AIDS. **Table 5** illustrates that the majority of the sample lives in rural areas (68.8%) versus urban centers (31.2%).

Table 5: Descriptive Statistics: Community Characteristics

	Mean	Std.Dev
Type of Place of Residence*	0.312	0.463
Distance to Medical Facility**	0.752	0.432

Another community-level indicator related to health, distance to a medical facility being a problem, was not a challenge for over 75% of women in the sample, indicating that most of the population lives in somewhat decent proximity to health resources.

Swaziland is divided into four regions, Hhohho, Manzini, Shiselweni, and Lubumbo. Mbabane, the capital, is the country's largest urban area and located in Hhohho. Knowledge levels vary slightly by region according to **Table 6** below:

Table 6: Correct AIDS Knowledge % by Region

	Hhohho	Manzini	Shiselweni	Lubumbo	Total
Behavior					
Not having sex	94.79	96.33	92.59	94.53	94.71
Only one sex partner	93.87	93.09	93.76	91.75	93.13
Using condoms during sex	92.36	91.65	91.61	88.88	91.18
By having oral sex	65.66	67.10	60.39	63.86	64.52
By having anal sex	59.87	62.42	54.15	56.44	58.58
Local Questions					
From open wounds or sores	96.81	96.11	96.39	96.11	96.35
From witchcraft or supernatural means	94.54	93.09	90.63	90.64	92.36
From sharing food	84.05	85.10	82.83	76.92	82.45
From mosquito bites	70.61	70.63	57.76	63.02	66.05
Childbearing					
Transmission during delivery	89.84	88.77	88.10	87.49	88.60
Transmission by breastfeeding	85.98	86.32	83.61	82.67	84.80
Transmission during pregnancy	73.72	75.81	72.88	68.67	72.99
Perceptions					
Healthy person can have AIDS	97.31	97.19	96.00	94.62	96.37
Can avoid AIDS	95.21	95.68	95.32	91.10	94.43
Comprehensive Knowledge					
SDHS comprehensive knowledge*	57.26	56.95	46.44	47.54	52.56
Full comprehensive knowledge**	5.88	5.98	6.44	3.80	5.55

N=4684
*SDHS Comprehensive Knowledge means knowing that consistent use of condom during sexual intercourse and having just one uninfected faithful partner can reduce the chance of getting the AIDS virus, knowing that a healthy-looking person can have the AIDS virus, and rejecting the two most common local misconceptions: AIDS can be transmitted by mosquito bites and by sharing food with a person who has AIDS.
**Full Comprehensive Knowledge means correct answers to all questions.

Either Shiselweni or Lubumbo consistently have the lowest level of correct knowledge for each of the HIV/AIDS questions asked. A few questions, such as "Can one get AIDS from mosquito bites?" demonstrate larger levels of variation, though for the most part, levels of knowledge are relatively close by region.

These descriptive statistics begin to draw a picture about the state of HIV/AIDS knowledge among women in Swaziland. However, regression analysis is required to determine if there is a causal relationship between the explanatory and knowledge outcome variables.

VII. Results & Analysis

This section provides results from the logit regression models run on the 14 HIV/AIDS knowledge outcomes and two comprehensive knowledge variables. The values presented are the marginal effects of individual, household, and community-level variables on the likelihood that a Swazi female has correct knowledge about HIV/AIDS. All regressions were controlled for regional effects, with Lubumbo serving as the baseline category. The regressions run are divided into five different knowledge areas: sexual behavior; local misconceptions; childbearing; perceptions of HIV/AIDS; and comprehensive knowledge. The following sections will present results and analysis of the regressions from each knowledge area.

Sexual Behavior

Five regressions were run to estimate correct knowledge regarding the relationship between sexual behaviors and HIV/AIDS. **Table 7** below provides the marginal effects of each variable on the probability of having correct knowledge of five sexual behavior questions: can people reduce their chance of getting the AIDS virus by:

abstaining from sexual intercourse (*Abstinence*); having just one sex partner who is not infected and who has no other partners (*One sex partner*); and using a condom every time they have sex (*Use condoms*); and can people get the AIDS virus from having oral sex (*Oral sex*); anal sex (*Anal Sex*).

Table 7: Marginal Effects of Logit Estimates of Correct Knowledge on Sexual Behavior Questions

	Abstinence	One sex partner	Use condoms	Oral sex	Anal sex
INDIVIDUAL CHARACTERISTICS					
Age	0.0010***	0.0008**	0.0006	0.0062***	0.0052***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Marital Status	-0.0040	0.0211	0.0251***	0.0010	0.0270
	(0.007)	(0.008)	(0.009)	(0.017)	(0.017)
Years of Education	0.0035***	0.0068***	0.0042***	0.0101***	0.0157***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
HOUSEHOLD CHARACTERISTICS					
Sex of Household Head	0.0135**	-0.0001	0.0082	-0.0164	-0.0210
	(0.006)	(0.007)	(0.008)	(0.015)	(0.016)
Wealth Index	0.0063**	0.0067**	0.0082**	0.0242***	0.0238***
	(0.003)	(0.003)	(0.004)	(0.007)	(0.007)
COMMUNITY CHARACTERISTICS					
Type of Place of Residence	-0.0148	0.0050	0.0123	0.0253	0.0711***
	(0.009)	(0.009)	(0.011)	(0.019)	(0.019)
Hhohho	-0.0067	0.0024	0.0160	-0.0184	-0.0152
	(0.009)	(0.009)	(0.010)	(0.021)	(0.022)
Manzini	0.0090	-0.0073	0.0085	-0.0051	0.0060
	(0.008)	(0.009)	(0.010)	(0.020)	(0.021)
Shiselweni	-0.0247**	0.0083	0.0204**	-0.0378*	-0.0271
	(0.011)	(0.009)	(0.010)	(0.022)	(0.022)
Distance to Medical Facility Not a Problem	-0.0001	-0.0003	0.0135	0.0256	0.0385**
	(0.007)	(0.008)	(0.010)	(0.017)	(0.018)

Notes: Standard errors are in parenthesis
* Significant at 10%; ** significant at 5%; *** significant at 1%

Education and wealth are significant for each behavior question at the 1% or 5% levels, supporting the thesis' hypothesis. The marginal effects for each additional year of education range from 0.35 percentage points for the *abstinence* question to 1.57 percentage points for the *anal sex* question, all resulting in effects of a large magnitude for those with more schooling. These findings are similar to those of Glick and Sahn in other sub-Saharan African countries where eight years of education was estimated to

increase the likelihood of correct knowledge on behavior questions by up to 4.80

percentage points.[53] Effects for the *wealth index* are smaller for some behavior questions

but extremely large for the *oral sex* and *anal sex* outcome variables, with estimated

marginal effects of 2.4 percentage points for each (significant at the 1% level).   The

effects for *age* were also the largest for these two variables (significant at the 1% level).

Another notable result is the coefficient for type of place of residence in the *anal sex*

regression; living in an urban area increases the likelihood that one has correct

knowledge about this issue by 7.11 percentage points. This falls in line with other

studies, which note that anal sex is a risky behavior practiced more often in urban areas

in sub-Saharan Africa. This may also explain the 3.85 percentage point increase from

the *distance to medical facility* variable, as individuals in urban areas are likely to live in

closer proximity to medical facilities.

The statistical significance and magnitude of other explanatory variables in the

behavior regressions is varied and inconsistent. However, a few other effects stand out,

such as the 2.51 percentage point increase in the likelihood of a Swazi female knowing

that using condoms during sex reduces the likelihood of HIV transmission if a woman

is married (significant at the 1% level). This may serve as initial evidence that programs

to educate married women to use condoms with their husbands, especially due to the

widespread practice of polygamy in Swaziland, is reaching its audience, though more

research directed specifically to these programs would be necessary. Only the

Shiselweni regional dummy variable is statistically significant in any of the regressions,

yielding one positive and two negative effects (significant at 5% and 10% levels) on

different knowledge questions. As found in the descriptive statistics, this may be a

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[53] Peter Glick and David Sahn. "Changes in HIV/AIDS Knowledge and Testing Behavior in Africa: How Much and for Whom?" *Journal of Population Economics* 20.2 (2007): 417

function of the overall lower levels of HIV / AIDS knowledge in this region compared to others.

Local Misconceptions

Four regressions were run to estimate correct knowledge regarding several common misconceptions about HIV / AIDS specific to Swaziland. **Table 8** below provides the marginal effects of each variable on the probability of having correct knowledge of four local misconception questions: can people get the AIDS virus: from open wounds or sores (*Open wounds/sores*) of an infected person; because of witchcraft or other supernatural means (*Witchcraft/supernatural means*); by sharing food with a person who has AIDS (*Sharing food*); and from mosquito bites (*Mosquito bites*).

Table 8: Marginal Effects of Logit Estimates of Correct Knowledge on Local Misconceptions

	Open wounds/sores	Witchcraft/ supernatural means	Sharing food	Mosquito bites
INDIVIDUAL CHARACTERISTICS				
Age	0.0003	-0.0005	-0.0026***	0.0002
	(0.000)	(0.000)	(0.001)	(0.001)
Marital Status	0.0030	-0.0081	-0.0262**	-0.0451***
	(0.006)	(0.008)	(0.012)	(0.017)
Years of Education	0.0025***	0.0072***	0.0183***	0.0321***
	(0.001)	(0.001)	(0.001)	(0.002)
HOUSEHOLD CHARACTERISTICS				
Sex of Household Head	0.0062	0.0017	0.0116	-0.0053
	(0.005)	(0.007)	(0.011)	(0.015)
Wealth Index	0.0021	0.0097***	0.0204***	0.0194***
	(0.002)	(0.003)	(0.005)	(0.007)
COMMUNITY CHARACTERISTICS				
Type of Place of Residence	0.0111**	-0.0162	-0.0211	0.0067
	(0.006)	(0.010)	(0.015)	(0.019)
Hhohho	0.0034	0.0187**	0.0184	0.0048
	(0.007)	(0.009)	(0.014)	(0.021)
Manzini	-0.0052	-0.0007	0.0158	-0.0117
	(0.007)	(0.010)	(0.014)	(0.021)
Shiselweni	0.0005	-0.0160	0.0133	-0.1087***
	(0.008)	(0.011)	(0.015)	(0.023)
Distance to Medical Facility Not a Problem	-0.0129**	-0.0070	-0.0006	0.0326*

	(0.005)	(0.008)	(0.012)	(0.017)

Notes: Standard errors are in parenthesis
* Significant at 10%; ** significant at 5%; *** significant at 1%

Years of Education is the only variable that is statistically significant (at 1% level)

for all four of the local misconceptions outcome variables. The magnitude of the

marginal effects varies, with much larger effects for the *sharing food* and *mosquito bites*

variables. Education has the largest effect on the *mosquito bites* variable compared to all

other variables in this study, with an estimate of an additional 3.21 percentage points

for each year of education. The marginal effect of education is also large for the *Sharing*

food variable at 1.83 percentage points. While still significant, the magnitude of the

effect of education is smaller on *open wounds/sores* and *witchcraft/supernatural means*,

driven by a lack of variation in knowledge levels, which are above 90%. Wealth follows

a similar patter to education, except that it is not significant for the *open wounds/sores*

variable. The *wealth index* variable also has larger marginal effects for *mosquito bites* and

sharing food, both approximately 2.00 percentage points for each additional wealth

quintile.

The other explanatory variables provide insight into individual questions.

Marital status has a negative marginal effect on the two most common misconceptions,

with estimates of 2.62 percentage points for *sharing food* (significant at the 1% level) and

4.51 percentage points for *mosquito bites* (significant at the 1% level), indicating that

unmarried females are more likely to have correct knowledge. Older females are

somewhat less likely to know that HIV/AIDS cannot be spread by sharing food, with

and estimate of -0.26 percentage points for each year of age (significant at the 1% level).

Regional effects are mostly minimal and insignificant, except for the estimate on the

Shiselweni dummy variable, with a very large marginal effect of -10.87 percentage

26

points. This large of an estimate should also have an effect on comprehensive knowledge estimates for the Shiselweni region.

Childbearing

Three regressions were run to estimate correct knowledge regarding the ways HIV is transferred from mother to child. **Table 9** below provides the marginal effects of each variable on the probability of having correct knowledge of three childbearing questions: can the virus that causes AIDS be transmitted from a mother to her baby: during delivery (*delivery*); by breastfeeding (*breastfeeding*); and during pregnancy (*pregnancy*).

Table 9: Marginal Effects of Logit Estimates of Correct Knowledge on Childbearing Questions

	Delivery	Breastfeeding	Pregnancy
INDIVIDUAL CHARACTERISTICS			
Age	0.0005	0.0003	-0.0001
	(0.001)	(0.001)	(0.001)
Marital Status	0.0186*	0.0107	0.0105
	(0.011)	(0.012)	(0.015)
Years of Education	0.0077***	0.0050***	-0.0030
	(0.001)	(0.002)	(0.002)
HOUSEHOLD CHARACTERISTICS			
Sex of Household Head	0.0098	0.0124	-0.0271**
	(0.010)	(0.011)	(0.014)
Wealth Index	-0.0064	-0.0107**	-0.0124**
	(0.004)	(0.005)	(0.006)
COMMUNITY CHARACTERISTICS			
Type of Place of Residence	0.0344***	0.0355***	0.0529***
	(0.011)	(0.013)	(0.016)
Hhohho	0.0143	0.0249*	0.0486***
	(0.013)	(0.014)	(0.018)
Manzini	0.0005	0.0265*	0.0702***
	(0.012)	(0.014)	(0.017)
Shiselweni	0.0006	0.0064	0.0507***
	(0.013)	(0.015)	(0.018)
Distance to Medical Facility Not a Problem	-0.0149	0.0093	0.0404**
	(0.010)	(0.013)	(0.016)

Notes: Standard errors are in parenthesis
* Significant at 10%; ** significant at 5%; *** significant at 1%

The individual and household-level explanatory variables are mixed and weaker indicators of knowledge for the childbearing questions compared to the previous sections. Unlike other knowledge question areas, the marginal effects of the *wealth index* variable are negative for these questions, -1.07 percentage points for *breastfeeding* and -1.24 percentage points for *pregnancy* (both significant at the 5% level). This could be the result of campaigns about mother to child transmission campaigns targeting poorer populations. The *years of education* variable is positive and significant at the 1% level for the questions related to delivery and breastfeeding, but negative and statistically insignificant at conventional levels for the *pregnancy* outcome variables. The *sex of household head* dummy variable estimates that living in a household headed by a female makes it 2.71 percentage points less likely that an individual has correct knowledge about transmission during pregnancy. The remaining individual and household-level variables have mostly insignificant effects.

Community characteristics provide the most insight for estimating the likelihood a Swazi female has correct knowledge about HIV/AIDS. This is the only set of questions where the *type of place of residence* variable is statistically significant for each regression (all at the 1% level). Living in an urban area is estimated to have a positive effect on having correct knowledge about mother to child transmission of HIV, with marginal effects of 3.44 percentage points for *delivery*, 3.55 percentage points for *breastfeeding*, and 5.29 percentage points for the *pregnancy* outcome variables. For the latter, which has the lowest level of knowledge of the childbearing questions at 72.99% of the sample, all the regional dummy variable are significant at the 1% level and of a large magnitude. Compared to Lubumbo, the baseline category, women in the other regions are between 5 and 7 percentage points more likely to have correct knowledge about mother to child transmission during pregnancy. Overall, community

characteristics have the largest marginal effects for estimating that a Swazi female has correct knowledge about the childbearing questions.

Perceptions of HIV/AIDS

Two regressions were run to estimate correct knowledge regarding perceptions of HIV/AIDS. **Table 10** below provides the marginal effects of each variable on the probability of knowing that: it is possible for a healthy-looking person to have the AIDS virus (*Healthy person*); and are there other things a person can do to avoid or reduce the chances of getting the AIDS virus (*Other ways to avoid*).

Table 10: Marginal Effects of Logit Estimates of Correct Knowledge on Perception Questions

	Healthy person	Other ways to avoid
INDIVIDUAL CHARACTERISTICS		
Age	0.0001	0.0007**
	(0.000)	(0.000)
Marital Status	0.0075*	-0.0096
	(0.004)	(0.006)
Years of Education	0.0046***	0.0062***
	(0.001)	
HOUSEHOLD CHARACTERISTICS		
Sex of Household Head	0.0021	0.0090*
	(0.004)	(0.005)
Wealth Index	0.0053***	0.0079***
	(0.002)	(0.002)
COMMUNITY CHARACTERISTICS		
Type of Place of Residence	0.0044	0.0088
	(0.005)	(0.007)
Hhohho	0.0055	0.0125**
	(0.004)	(0.006)
Manzini	0.0022	0.0116*
	(0.005)	(0.006)
Shiselweni	-0.0003	0.0150**
	(0.005)	(0.006)
Distance to Medical Facility Not a Problem	-0.0039	-0.0102**
	(0.004)	(0.005)

Notes: Standard errors are in parenthesis
* Significant at 10%; ** significant at 5%; *** significant at 1%

The magnitude of the marginal effects for the two perception outcome variables is small, most likely because both questions have knowledge levels above 94%.

Following the pattern of the sections above, wealth and education both provide positive and statistically significant marginal effects at the 1% level. Together with the *marital status* variable, these were the only statistically significant explanatory variables for the *healthy person* question. Community-level characteristics contributed small, but statistically significant insight to the *other ways to avoid* outcome variable, with each region dummy variable having a positive effect of more than 1 percentage point. However, the *distance to a medical facility not a problem* variable has a counterintuitive, negative effect on the likelihood that a Swazi female knows of other ways one can avoid HIV/AIDS, -1.02 percentage points (significant at the 5% level). While not of a large magnitude, this may indicate that further information about more ways to avoid HIV/AIDS needs to be shared in areas located close to health facilities, though the presence of the *type of residence* variable in the regression may negate this assertion.

Comprehensive Knowledge

Two regressions were run to estimate correct, comprehensive knowledge of HIV/AIDS. **Table 11** below provides the marginal effects of each variable on the probability that a Swazi female has comprehensive knowledge of HIV/AIDS as defined by SDHS (*SDHS Comprehensive Knowledge*) and answering all 14 questions in this analysis correctly (*Full Comprehensive Knowledge*).

Table 11: Marginal Effects of Logit Estimates of Comprehensive Knowledge

	SDHS Comprehensive Knowledge^	Full Comprehensive Knowledge
INDIVIDUAL CHARACTERISTICS		
Age	-0.0007	0.0004
	(0.001)	(0.000)
Marital Status	-0.0229	0.0097
	(0.018)	(0.008)
Years of Education	0.0389***	-0.0022**
	(0.002)	(0.001)
HOUSEHOLD CHARACTERISTICS		
Sex of Household Head	-0.0003	0.0055
	(0.016)	(0.007)

Wealth Index	**0.0314***	-0.0023
	(0.007)	(0.003)
COMMUNITY CHARACTERISTICS		
Type of Place of Residence	**0.0116**	**0.0063**
	(0.020)	(0.009)
Hhohho	**0.0177**	0.0284**
	(0.023)	(0.013)
Manzini	**-0.0038**	0.0311**
	(0.022)	(0.012)
Shiselweni	**-0.0658***	0.0390***
	(0.023)	(0.014)
Distance to Medical Facility		
Not a Problem	**0.0179**	0.0148**
	(0.019)	(0.007)

Notes: Standard errors are in parenthesis
^SDHS Comprehensive Knowledge means knowing that consistent use of condom
during sexual intercourse and having just one uninfected faithful partner can reduce
the chance of getting the AIDS virus, knowing that a healthy-looking person can have
the AIDS virus, and rejecting the two most common local misconceptions: AIDS can
be transmitted by mosquito bites and by sharing food with a person who has AIDS.
* Significant at 10%; ** significant at 5%; *** significant at 1%

These last regressions provide some initial insight into the overall effects of the
explanatory variables on the likelihood a Swazi female has comprehensive correct
knowledge about HIV/AIDS. First, the negative estimates of -0.22 percentage points
(significant at the 5% level) for the *years of education* variable and -0.23 (not significant at
conventional levels) in the *full comprehensive knowledge* regression calls into doubt the
validity of measuring comprehensive knowledge as answering each of the 14 questions
correctly. Both have positive marginal effects on all the questions except those related
to childbearing. Their exclusion appears to boost the marginal effects for each in the
SDHS comprehensive knowledge regression, where each year of education leads to a 3.89
percentage point increase and each additional level of wealth to a 3.14 percentage point
increase in the likelihood that a Swazi females has comprehensive knowledge about
HIV/AIDS. The opposite occurs for some community characteristics; the regional
dummy variables for Manzini and Shiselweni demonstrate negative marginal effects
under the *SDHS comprehensive knowledge* parameters and positive ones under the *full
comprehensive knowledge* definition. This is not consistent with descriptive statistics,

which identify Shiselweni and Lubumbo as consistently having the lowest level of correct knowledge for each of the HIV/AIDS questions. Overall, the extremely low level of individuals having *full comprehensive knowledge*, 5.55% makes it difficult to estimate the marginal effects of the explanatory variables. Consequently, using the *SDHS comprehensive knowledge* variable may be most prudent in the concluding analysis, as long as accompanied by the caveat that it does not in fact represent full comprehensive knowledge and that there is much information that still needs to be shared about HIV/AIDS with just about the entire population of Swazi females.

VIII.   Conclusion

This thesis affirms the hypothesis that education and wealth are the most consistent and significant explanatory variables for estimating the likelihood that a Swazi female has correct knowledge about various questions related to HIV/AIDS. The broad spectrum of knowledge questions analyzed leaves room for few overall trends but the *years of education* and *wealth index* variables resulted in mostly positive and statistically significant effects for the sexual behavior, local misconceptions and perceptions of HIV/AIDS questions. The childbearing questions yielded negative effects for these variables, which may be attributed to large, concerted efforts to inform poorer and less educated women about the danger of mother to child transmission of HIV. The *SDHS comprehensive knowledge* outcome variable also confirms the hypothesis, with the marginal effects for each year of education and quintile of wealth increasing the likelihood a Swazi female has comprehensive knowledge by more than three percentage points. This means that a female with eight years of education from one of the richest households in Swaziland is 43.68 percentage points more likely to have comprehensive knowledge about HIV/AIDS than an uneducated Swazi woman from

one of the poorest. With an HIV/AIDS prevalence rate of 25.9%, the disease threatens individuals from every segment of society and such large gaps in knowledge reduce the efficacy of prevention and treatment programs throughout Swaziland.

Policymakers and organizations working on HIV/AIDS prevention programs, and health awareness programs in general, must study their target audiences in order to make efficient use of limited resources. Variables that aggregate overall comprehensive knowledge miss intricacies that can help tailor programs to target those with the largest information gaps, such as the large and significant urban-rural divide in knowledge about mother to child transmission of HIV/AIDS. This analysis demonstrates that segmenting knowledge areas is helpful in providing a deeper insight into the populations that need information on certain topics. Furthermore, this study supports the implementation of policies that allocate limited resources to prevention programs that target the poor and less educated, as they are the most vulnerable to HIV/AIDS because of broad knowledge gaps. Knowledge levels are generally lower in the Shiselweni and Lubumbo regions, where the efficacy of prevention programs and messages should be reviewed and resources evaluated in order to achieve stronger outcomes. Prevention messages regarding the risks of oral and anal sex, mother to child transmission, and misconceptions about sharing food and the role of mosquitoes in spreading HIV/AIDS, need more dedicated resources in order to clarify the threat of HIV/AIDS and increase comprehensive knowledge throughout the Swazi population. Balancing the continued need for improved prevention programs with the push to treat those afflicted with HIV/AIDS will require policymakers to clarify and fine tune the case for increased resources dedicated to preventing HIV/AIDS.

This thesis contributes to the literature of HIV/AIDS knowledge by using frameworks from previous work on the topic to the country with the highest prevalence

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rate of HIV/AIDS in the world. Swaziland is ground zero for addressing this relentless disease. An understanding of the knowledge gaps that hasten the spread of HIV/AIDS will help Swaziland and other countries sharpen their prevention strategies and evaluate the efficacy of programs in place or being considered. There are significant information deficiencies in Swaziland, especially regarding the riskiness of oral and anal sex, mother to child transmission, and the false perception that mosquitoes can spread HIV/AIDS. Together with the previous literature, this analysis hopes to shed light on who the target audiences need to be when addressing these challenges in prevention programs.

While knowledge is a significant component of prevention programs and stemming the spread of HIV/AIDS in Swaziland and worldwide, having correct information may not in and of itself be enough for people to change ingrained practices and social norms. Like people in the United States that unnecessarily take antibiotics, or have unprotected sex only to be surprised by a pregnancy, individuals in Swaziland are not going to simply change practices and beliefs that affect their level of exposure to HIV/AIDS because of an information campaign or the advice of a health professional. "Many prevention programs have been based on the premise that changes in knowledge and risk perception can lead to behavioral change, even though there are mixed findings and the causal link is not well established. Furthermore, it has been shown that even when individuals are motivated to modify their sexual behavior, the new behaviors are not always safer or any less risky."[54] Consequently, the literature on this subject must continue to move towards linking individual, household, and

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[54] Janine Barden-O'Fallon and Joseph DeGraft-Johnson. "Factors Associated with HIV/AIDS Knowledge and Risk Perception in Rural Malawi." *AIDS and Behavior* 8.2 (2004): 132.

community characteristics to knowledge and behavior outcomes in order to truly strengthen strategies to address HIV/AIDS prevention.

Amid the continued burden HIV/AIDS places on the people of Swaziland, there is good news: the pandemic seems to have peaked, prevention efforts are in full swing, and treatment programs are beginning to scale up. The latter will be important in providing hope to those afflicted with the disease and opening up the possibility that infected individuals can live and support their households, communities, and country. However, without a cure, the goal of reducing the prevalence level will only be met by more effective prevention efforts that address knowledge gaps, inform the most vulnerable populations, and find ways to reduce the practice of risky behaviors and practices that spread HIV/AIDS.

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