HIV and Its impact on Economic Development: Implications for Africa

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HIV and Externality

- HIV is another form of negative externality
- One person's risky behavior will affect others
- People who have HIV will increase the infection risk of other people(wife, husband, partners and children)
- Children are infected from breast-milk of mother with HIV
- Higher community level of HIV will affect other economic behaviors.
- When millions people dies, it has a drastic effect.

History of HIV

- In July 1981, the New York Times reported an outbreak of a rare form of cancer among gay men in New York and California
- first referred to as the “gay cancer” but medically know as Kaposi Sarcoma

History of HIV

- About the same time, Emergency Rooms in New York City began to see a rash of seemingly healthy young men presenting with fevers, flu like symptoms, and a pneumonia called Pneumocystis.

History of HIV

- About a year later, the CDC (Centers for Disease Control) linked the illness to blood and coins the term AIDS (Acquired Immune Deficiency Syndrome). In that first year over 1600 cases are diagnosed with close to 700 deaths.

History of HIV

- In 1984, Institut Pasteur of France discovered what they called the HIV virus, but it wasn't until a year later a US scientist, Dr.Robert Gallo confirmed that HIV was the cause of AIDS.
- Following this discovery, the first test for HIV was approved in 1985.

Basic Knowledge of HIV

- HIV is a virus.
- Viruses infect the cells of living organisms and replicate (make new copies of themselves) within those cells. A virus can also damage human cells, which is one of the things that can make an infected creature become ill.

Basic Knowledge of HIV(2)

- People can become infected with HIV from other people who already have it, and when they are infected they can then go on to infect other people. Basically, this is how HIV is spread.
- HIV stands for the '*Human Immunodeficiency Virus*'. Someone who is diagnosed as infected with HIV is said to be 'HIV+' or 'HIV positive'.

Why is HIV dangerous?

- Different viruses attack different parts of the body - some may attack the skin, others the lungs, and so on.
- What makes HIV so dangerous is that it attacks the immune system itself - the very thing that would normally get rid of a virus. It particularly attacks a special type of immune system cell known as a CD4 lymphocyte.

Why is HIV dangerous?

- HIV has a number of tricks that help it to evade the body's defences, including very rapid mutation. This means that once HIV has taken hold, the immune system can never fully get rid of it

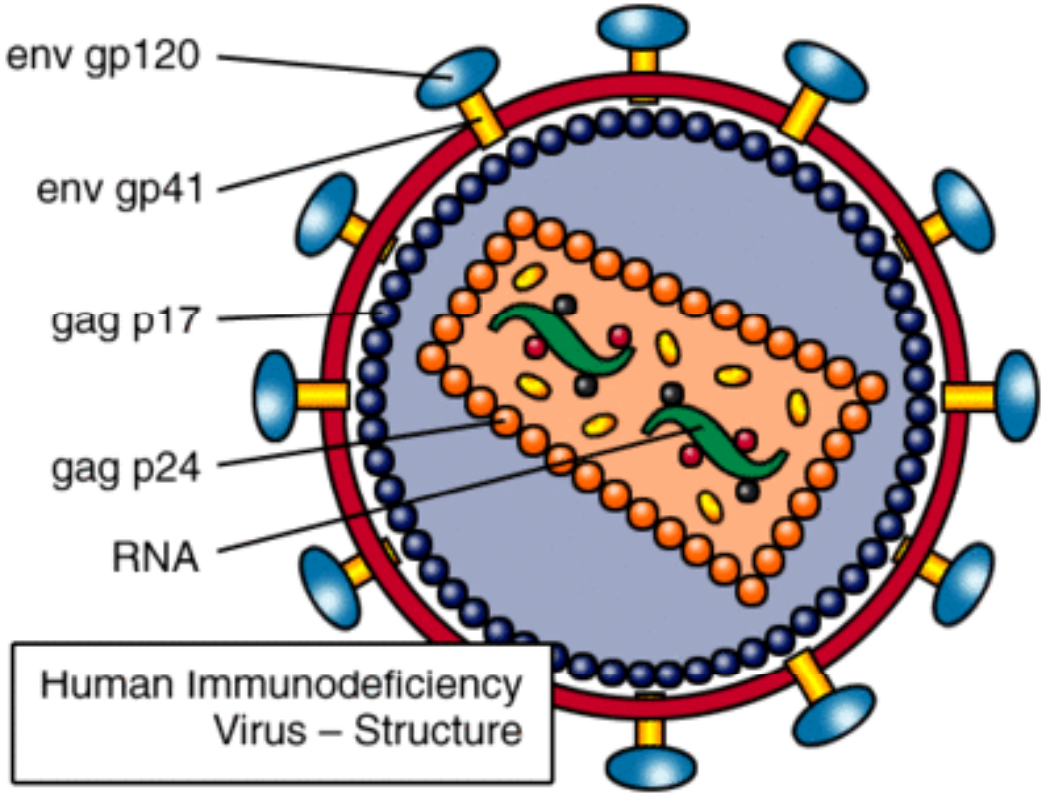
What is AIDS?

- A damaged immune system is not only more vulnerable to HIV, but also to the attacks of other infections.
- As time goes by, a person who has been infected with HIV is likely to become ill more and more often until, usually several years after infection, they become ill with one of a number of particularly severe illnesses. It is at this point that they are said to have AIDS

How long does HIV take to become AIDS?

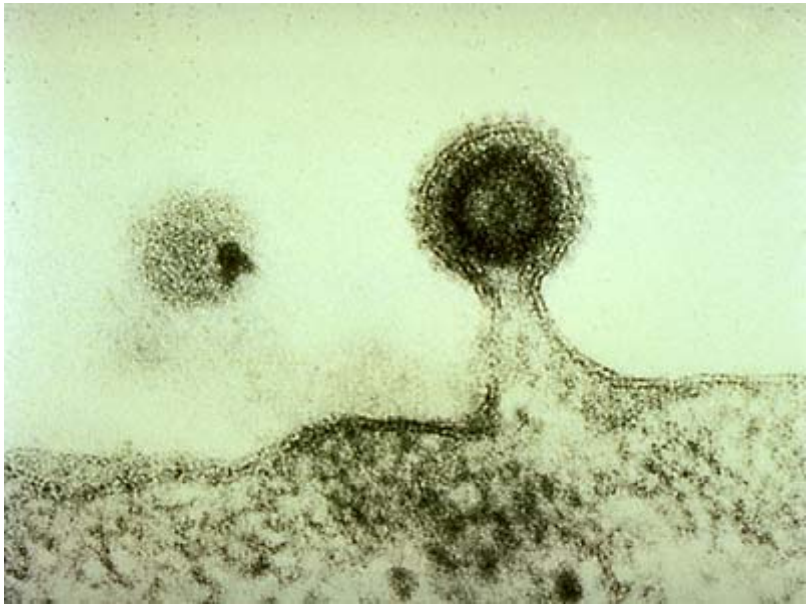
- Without drug treatment, HIV infection usually progresses to AIDS in an average of ten years. This average, though, is based on a person having a reasonable diet. Someone who is malnourished may well progress to AIDS and death more rapidly.

Image of HIV


env gp120
env gp41
gag p17
gag p24
RNA
Human Immunodeficiency Virus – Structure

Cell infected by HIV

HIV virus budding from cell



Many dimensions of HIV

- Contrary to other infectious disease such as Ebola, the effect of HIV is slow(average 10 years).
- In case of Ebola, people with Ebola will die within a week. Thus, although Ebola is infectious, the spread is also limited since the people who have Ebola virus will die quickly.

Many dimensions of HIV

- In case of HIV, sometime people who have HIV virus start to have AIDS only after years.
- During this period, it is very likely that those people spread HIV virus through sexual contacts.

Many dimensions of HIV

- Because HIV virus is usually transmitted through sexual contact, it is accompanied through social stigma.
- Potential patients might not take a test
- Patients who know that he/she has a HIV virus does not tell his/her spouse, girl friend or boy friend.
- Patients might not take a proper care.
- If mother has HIV, children have high chance of HIV infection through breastmilk

Many Dimensions of HIV

- Some conservative Christian group and US government officials says that the best prevention of HIV is not to have a sex.
- Roman Catholic strongly opposes a use of condom for any reasons(including prevention of HIV and contraception).
- Intensified debate on this issue

Many dimension of HIV

- Encouraging safe sex seems to be the simplest solution.
- In zambia, CSW (commercial sex workers) ask customers to use condum, their revenue will go down half.
- In very poor areas, female with no skill, CSW is only jobs for living.
- When women becomes widows, often they work in CSW to support themselves.

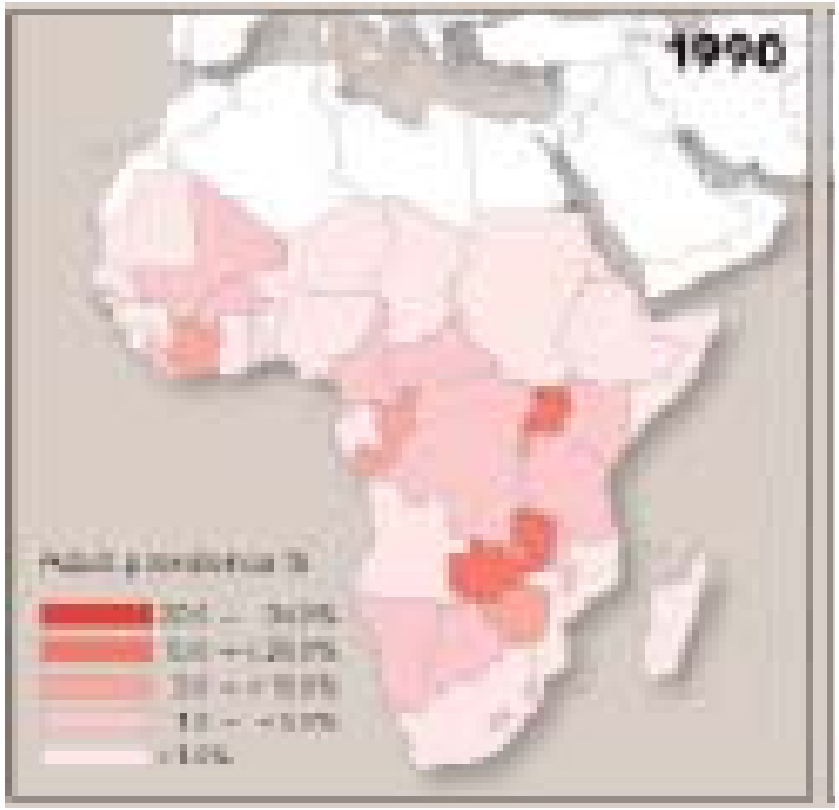
Many dimension of HIV

- A case of Nyanza(Kenya)
- Nyanza is district facing lake Victoria in Kenya.
- The main industry in this district is fishing.
- To ride on small boat and getting fish is men’s job.
- Many women get income by selling those fishes.
- In order to get fishes, women need to have sex with men.

Some comments from locals

- "I have children to feed and take to school, and I also have rent to pay; selling fish is the only business I know ... if having sex with a fisherman will make it easier, let it be," said Mary Owenga, a single mother whose four children were fathered by different fishermen. "I know when I am old they will not want me; because I still look like a girl, let me use the opportunity."

HIV in Africa 1990

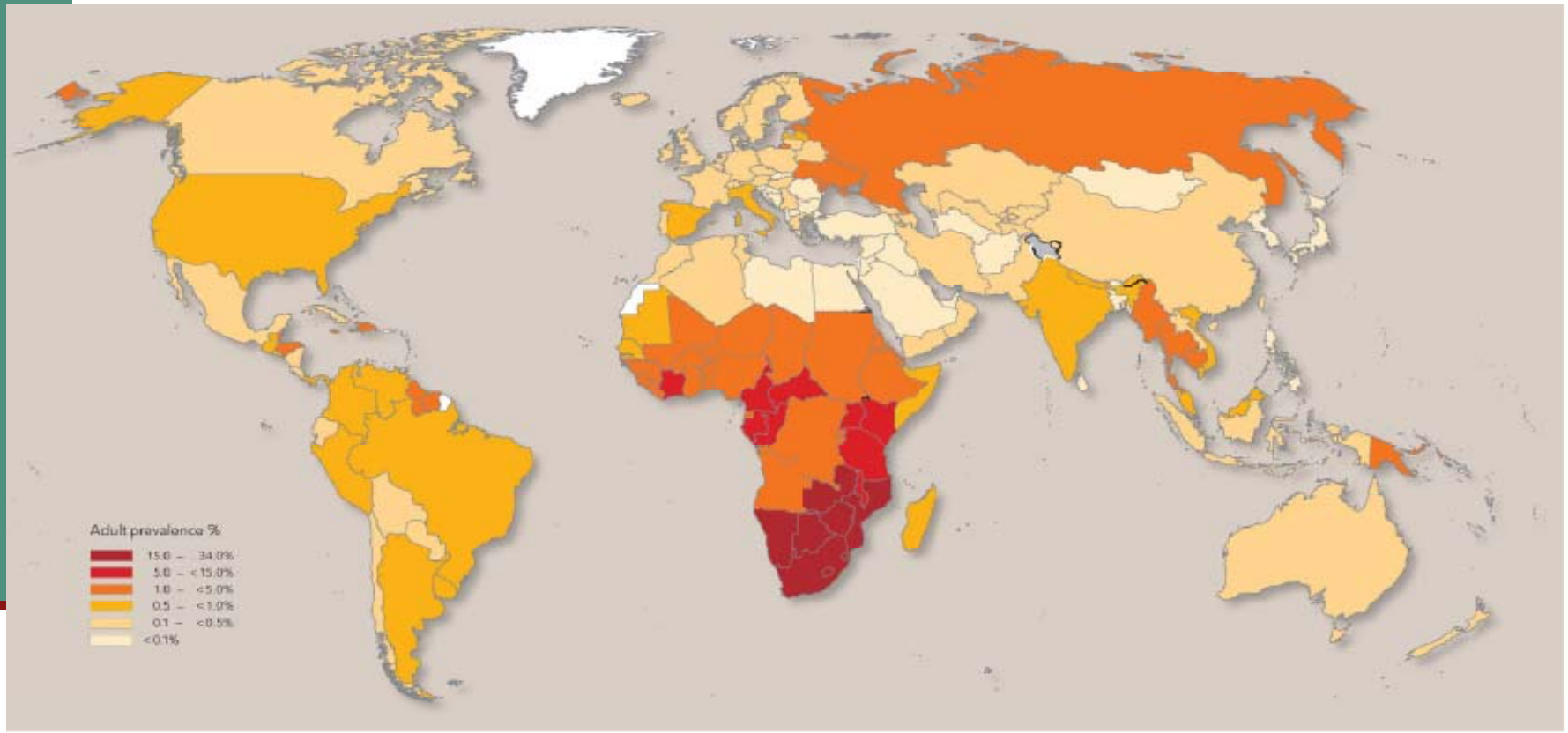


HIV Africa in 1995

HIV in Africa 2000

HIV in Africa in 2005

World HIV Map



Country	People living with HIV/AIDS	Adult (15-49) rate %	Women with HIV/AIDS	Children with HIV/AIDS	AIDS deaths	Orphans due to AIDS
Angola	320,000	3.7	170,000	35,000	30,000	160,000
Benin	87,000	1.8	45,000	9,800	9,600	62,000
Botswana	270,000	24.1	140,000	14,000	18,000	120,000
Burkina Faso	150,000	2	80,000	17,000	12,000	120,000
Burundi	150,000	3.3	79,000	20,000	13,000	120,000
Cameroon	510,000	5.4	290,000	43,000	46,000	240,000
Central African Republic	250,000	10.7	130,000	24,000	24,000	140,000
Chad	180,000	3.5	90,000	16,000	11,000	57,000
Congo	120,000	5.3	61,000	15,000	11,000	110,000
Côte d'Ivoire	750,000	7.1	400,000	74,000	65,000	450,000
Dem. Republic of Congo	1,000,000	3.2	520,000	120,000	90,000	680,000
Ethiopia	420,000-1,300,000	0.9-3.5	190,000-730,000	30,000-220,000	38,000-130,000	280,000-870,000

Gabon	60,000	7.9	33,000	3,900	4,700	20,000
Gambia	20,000	2.4	11,000	1,200	1,300	3,800
Ghana	320,000	2.3	180,000	25,000	29,000	170,000
Guinea	85,000	1.5	53,000	7,000	7,100	28,000
Guinea-Bissau	32,000	3.8	17,000	3,200	2,700	11,000
Kenya	1,300,000	6.1	740,000	150,000	140,000	1,100,000
Lesotho	270,000	23.2	150,000	18,000	23,000	97,000
Liberia*	-	2.0-5.0	-	-	-	-
Madagascar	49,000	0.5	13,000	1,600	2,900	13,000
Malawi	940,000	14.1	500,000	91,000	78,000	550,000
Mali	130,000	1.7	66,000	16,000	11,000	94,000
Mauritania	12,000	0.7	6,300	1,100	<1,000	6,900
Mauritius	4,100	0.6	<1,000	-	<100	-

Mozambique	1,800,000	16.1	960,000	140,000	140,000	510,000
Namibia	230,000	19.6	130,000	17,000	17,000	85,000
Niger	79,000	1.1	42,000	8,900	7,600	46,000
Nigeria	2,900,000	3.9	1,600,000	240,000	220,000	930,000
Rwanda	190,000	3.1	91,000	27,000	21,000	210,000
Senegal	61,000	0.9	33,000	5,000	5,200	25,000
Sierra Leone	48,000	1.6	26,000	5,200	4,600	31,000
Somalia	44,000	0.9	23,000	4,500	4,100	23,000
South Africa	5,500,000	18.8	3,100,000	240,000	320,000	1,200,000
Swaziland	220,000	33.4	120,000	15,000	16,000	63,000
Togo	110,000	3.2	61,000	9,700	9,100	88,000
Uganda	1,000,000	6.7	520,000	110,000	91,000	1,000,000
United Rep. Of Tanzania	1,400,000	6.5	710,000	110,000	140,000	1,100,000
Zambia	1,100,000	17	570,000	130,000	98,000	710,000
Zimbabwe	1,700,000	20.1	890,000	160,000	180,000	1,100,000
Total sub-Saharan Africa	24,500,000	6.1	13,200,000	2,000,000	2,000,000	12,000,000

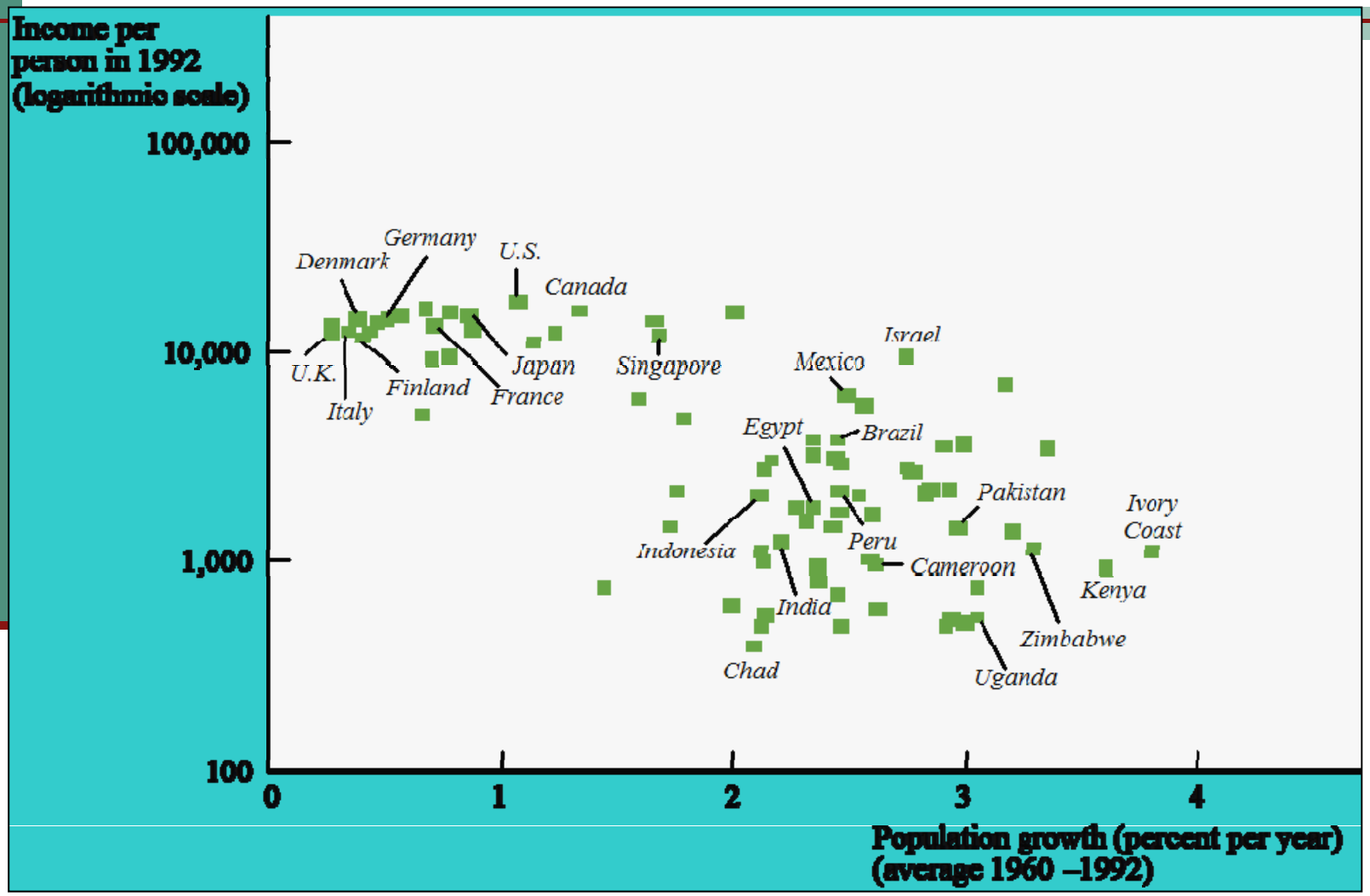
The effect of HIV on economic development of developing countries

- Two views:
- It might help the living standard of LDCs.
- It will worsen the situation of LDCs.

First view

- High population growth rate is one of important factors that decreases the living standard of LDCs.
- The established economic theory (Solow model)proves that high population growth rate leads to lower living standard.
- The data supports this fact strongly.

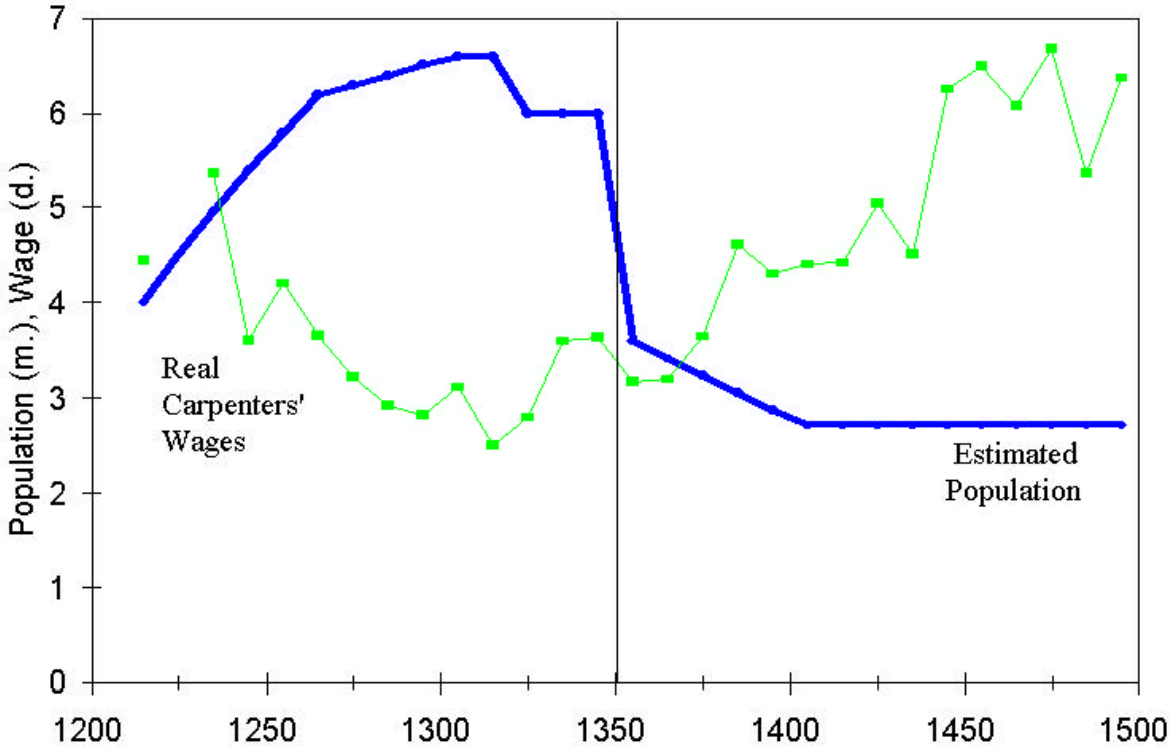
Population growth and income per person



The first view(2)

- Since HIV will decrease the population growth, it will benefit those who survived.
- Historically a similar things happened in Europe, too. Black death in 14 century.
- After black death in Europe, real wage rate and living standard increased in Europe in 14 century.（only applied if you survied.)

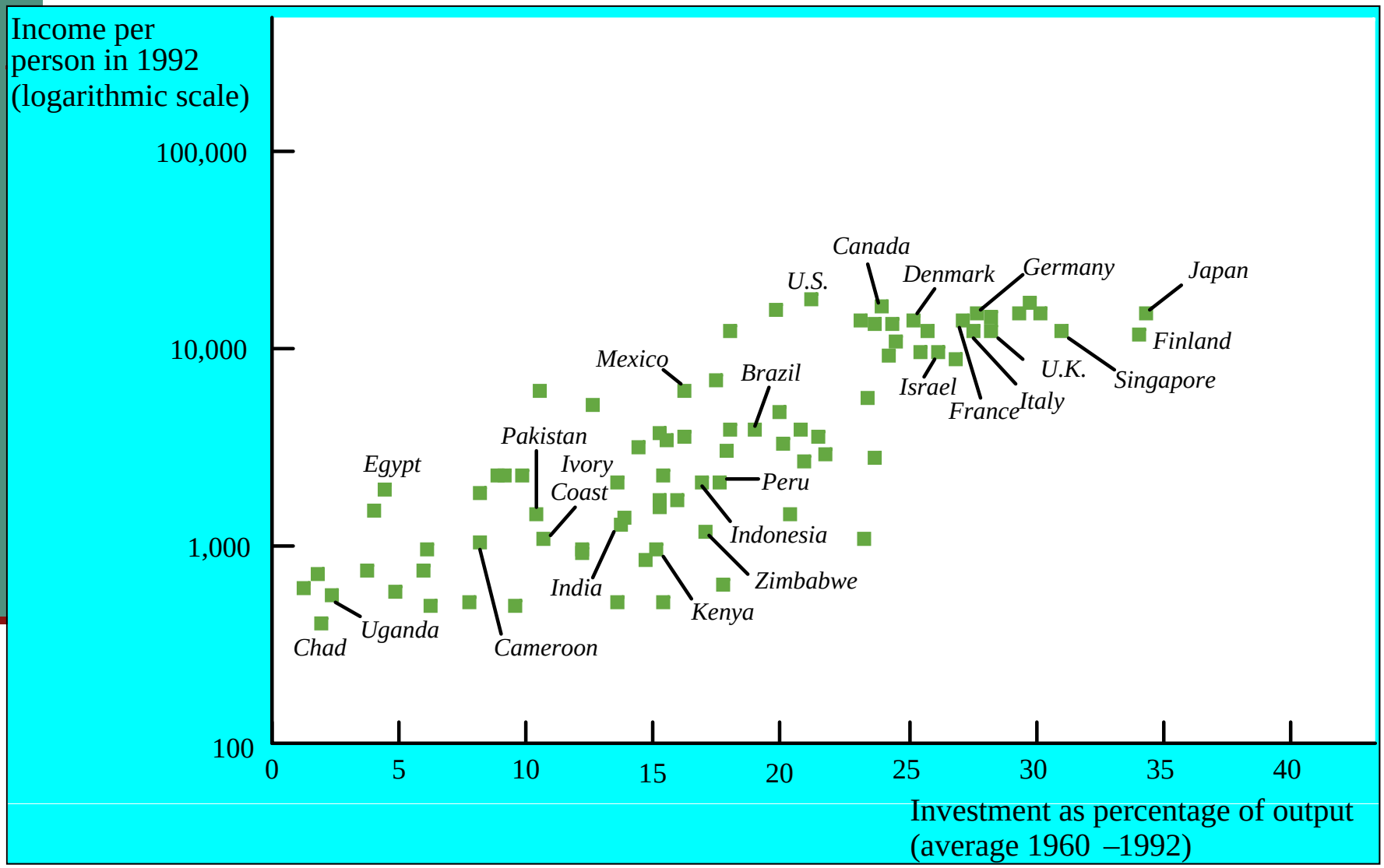
British Wage during 1200-1500



The second view

- For economic development, investment is important.
- The economic theory and empirical data also supports this concept.

Investment and income per capita



Second view

- Human capital investment such as schooling is another form of investment.
- Therefore, if HIV decrease human capital investment in Africa, it will make the economic development of Africa worse.

Question on the second view?

- Does higher HIV decrease human capital investment?

Orphan effect

- the impact of HIV on human capital accumulation is through the fact that parents dies and children become orphan
- Due to income constraint, orphan cannot go to school.
- Further, policy implication is that as long as the government supports the education of orphan, the impact of HIV on society is minimized.

The rate of return effect

- There is the rate of return effect.
- What is the rate of return effect?
- In LDCs, education is a form of investment from the point of parents: parents expecting children having higher income and get some of them.

The rate of return effect

- Higher probability of death implies that the expected rate of return of educating children becomes lower.
- The rate of return of high school education in LDC is normally 10%.
- But higher probability of adult death makes this number lower.
- Lower incentive of sending children to school.

A study by Fortson

- Fortson (2013) looked at African Countries and investigated whether the rate of return effect exists in the data

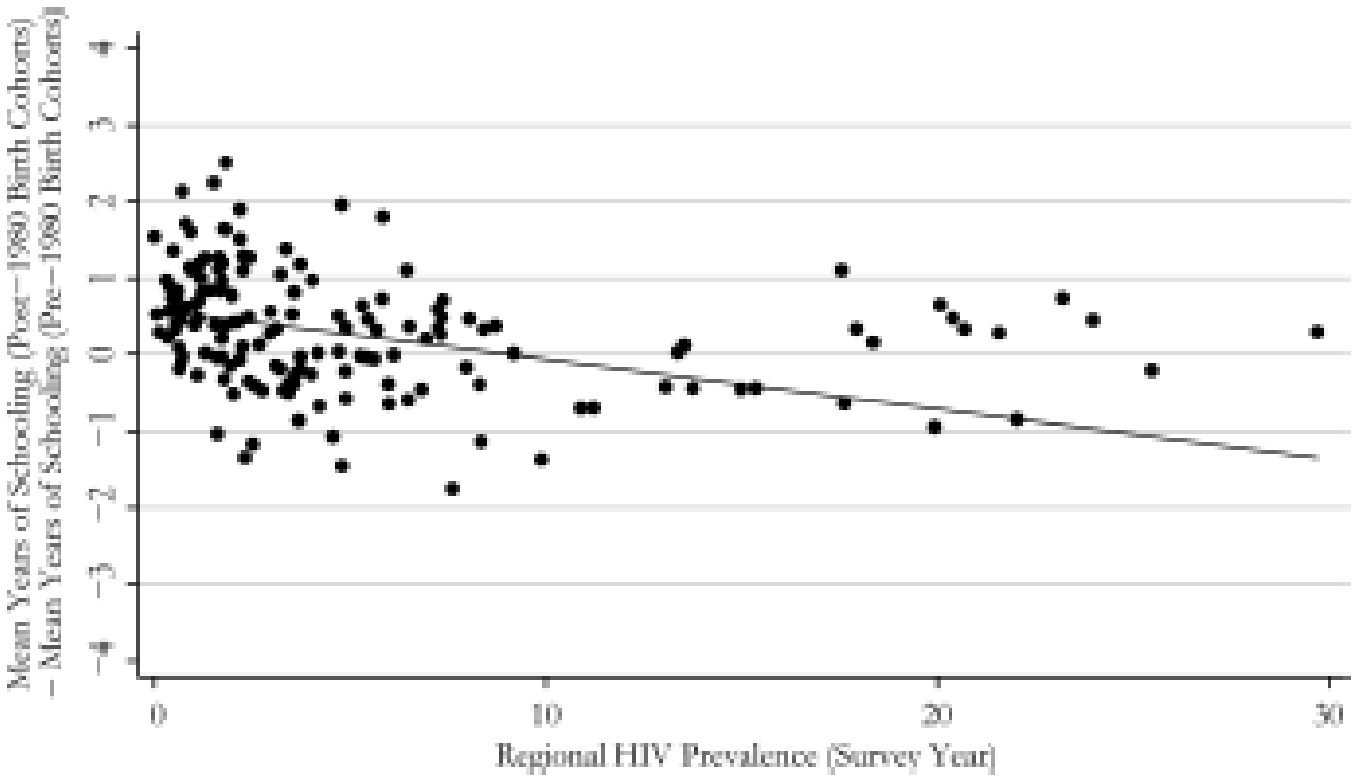
Summary statistics

TABLE 3.—SAMPLE ADULT CHARACTERISTICS: SUMMARY STATISTICS

	N	Mean	Standard Deviation
Regional HIV prevalence in survey year	304,084	4.479	4.658
Years of schooling	302,495	4.426	4.382
Years of schooling > 0	302,495	0.617	0.486
Completed primary school	302,747	0.385	0.487
Year of birth	304,084	1976	9.639
Female	304,082	0.525	0.499
Rural	304,084	0.697	0.459
Burkina Faso	304,084	0.044	0.205
Cameroon	304,084	0.060	0.237
Côte d'Ivoire	304,084	0.078	0.268
Ethiopia	304,084	0.237	0.425
Ghana	304,084	0.074	0.262
Guinea	304,084	0.029	0.168
Kenya	304,084	0.124	0.330
Lesotho	304,084	0.008	0.087
Malawi	304,084	0.041	0.199
Mali	304,084	0.035	0.183
Niger	304,084	0.034	0.181
Rwanda	304,084	0.033	0.178
Senegal	304,084	0.041	0.198
Tanzania	304,084	0.125	0.331
Zambia	304,084	0.037	0.189

Relationship between HIV and schooling

FIGURE 2.—DIFFERENCE-IN-DIFFERENCES SCATTER PLOT



The estimated model

$$S_{icr} = \beta_0 + \beta_1 HIV_r \times I(c \geq 1980) + \beta_2 F_{icr} + \beta_3 rural_{icr} + \gamma_c + \alpha_r + \varepsilon_{icr}, \quad (4)$$

The results

TABLE 4.—DIFFERENCE-IN-DIFFERENCES REGRESSION: POOLED

	(1) Years	(2) Years > 0	(3) Primary
Regional HIV prevalence	−0.053*	−0.006*	−0.008*
× Post-1980 Cohort	(0.021)	(0.002)	(0.002)
Rural	−2.665*	−0.194*	−0.270*
	(0.261)	(0.025)	(0.026)
Female	−1.285*	−0.142*	−0.112*
	(0.079)	(0.018)	(0.007)
Additional controls	Region FEs, birth year FEs		
Sample	Ages 15–49, most recent wave		
Observations	302,494	302,494	302,745

Is this Orphan effect?

Years Behind Grade-for-Age	(1) Full Sample	(2) No Orphans
Regional HIV Prevalence	0.070*	0.075*
× Post-1992 Cohort	(0.012)	(0.013)
Rural	0.916*	0.929*
	(0.071)	(0.074)
Female	0.033	0.035
	(0.034)	(0.033)
Additional controls	Region FEs, age FEs, birth year FEs	Region FEs, age FEs, birth year FEs
Sample	Ages 7–14, most recent wave	Nonorphans, ages 7–14, most recent wave
Observations	161,250	136,550

Is this orphan effect? (2)

- From the above table, it is obviously no.
- How about care-taking effect?
- If there is HIV member, a child might need to take care of them instead of going to school. This is different from the rate of return effect.
- Next we need to examine such a possibility

Care-taking effect?

	(4)
Years Behind Grade-for-	No HIV+ Member
Regional HIV Prevalenc	0.074*
× Post-1992 Cohort	(0.021)
Rural	0.798*
	(0.095)
Female	0.021
	(0.048)
Additional controls	Region FEs, age FEs, birth year FEs
Sample	Nonorphans in known HIV-negative households, ages 7–14, most recent wave
Observations	49,336

Care-taking effect?

- It seems that it is not care-taking effect.
- How about the possibility of school quality effect.
- If many adults die, many teachers also die. Thus, in high HIV areas, there is a shortage of school teachers and children cannot lean in a school.
- Next, we examine such a possibility

TABLE 9.—CHANNELS: DIFFERENCES BY SEX

	(1) Years	(2) Years > 0	(3) Primary
Regional HIV Prevalence	−0.103*	−0.010*	−0.011*
× Post-1980 Cohort × Male	(0.015)	(0.002)	(0.002)
Regional HIV Prevalence	−0.003	−0.001	−0.003
× Post-1980 Cohort	(0.017)	(0.002)	(0.001)
Rural	−2.661*	−0.193*	−0.270*
	(0.262)	(0.025)	(0.026)
Female	−1.479*	−0.161*	−0.133*
	(0.078)	(0.019)	(0.007)
Additional controls	Region FEs, birth year FEs		
Sample	Ages 15–49, most recent wave		
Observations	302,494	302,494	302,745

Interpretation

- The above table shows that the effect of HIV on schooling mainly comes from male, not female.
- For the female, the effect of HIV is insignificant.
- For male, 10 percent increase of HIV will reduce schooling 1 year.

Interpretation (2)

- This suggests that school quality does not generate the negative relationship between HIV and schooling.
- If the schooling quality is the main reason, boy and girls should be affected by the same amount.
- But they are not in the data.
- This suggests that only the rate of return effect explains the negative relationship between HIV and schooling