Economics 172

Issues in African Economic Development

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Why does HIV spread? A simple model

• Timing: two periods, Youth (t=1), Old age (t=2)
• Key decision in Youth: Engage in unsafe sex or not

• Likelihood of living to Old age:
  – $P \in (0,1)$ if HIV-
  – $P^{HIV} \in (0,P)$ if HIV+, so $P^{HIV} < P$

• Value of one period of life: $V > 0$
• Value of unsafe sex: $S > 0$

• Assume the agent is HIV- in her/his youth
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• “Rational” decision rule: engage in unsafe sex if the “expected utility” of unsafe is greater than of safe sex

\[ EU(\text{Safe sex}) = V + \{PV + (1 – P)\cdot 0\} = V(1+P) \]

• Assume unsafe sex always leads people to be HIV+

\[ EU(\text{Unsafe sex}) = \{V+S\} + \{PHIVV + (1 – PHIV)\cdot 0\} \]
\[ = V(1+PHIV) + S \]

•  
\[ EU(\text{Unsafe sex}) - EU(\text{Safe sex}) = S + V(PHIV - P) > 0 \]

Benefits (+) Costs (-)
Why does HIV spread? An extension

• Imagine people do not know their infection status. S/he thinks she has likelihood $R \in [0,1]$ of already being HIV+

$$EU \ (Safe \ sex) \ = \ V \ + \ [RP_{HIV} + (1 - R)P]V$$
Why does HIV spread? An extension

- Imagine people do not know their infection status. S/he thinks she has likelihood \( R \in [0, 1] \) of already being HIV+

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- “Nothing to lose”: cost of unsafe sex smaller than before
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• What are implications of this model for public health messages that stress how widespread the HIV virus already is?

• What are the implications of this model for efforts to boost ARV treatment (e.g., Botswana)?

  ➔ In both cases, the model predicts that unsafe sex could increase due to these health policy changes
What is this model missing?

(1) People are altruistic
   - Allow the benefits of unsafe sex to be a function of $R$: $S = S(R)$. This may offset the “nothing to lose” effect
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• For example, let $S = S(1 - R)$

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$$= S(1 - R) + V(P^{HIV} - P)(1 - R)$$

$$= (1 - R)(S + V(P^{HIV} - P)) > 0$$
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   • For example, let $S = S(1 - R)$
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     $= (1 - R)(S + V(P^{HIV} - P)) > 0$

   $\rightarrow$ In this case the “nothing to lose” effect and the “altruism effect” exactly cancel out
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(4) Pockets of poor information about HIV/AIDS

(5) Others?
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   -- In the model, testing would change $R$ to zero (if the person is HIV-) or to one (if HIV+). So it could theoretically either increase or decrease unsafe sex, depending on what people’s expectations are about their infection status
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(6) Development of an HIV vaccine
• For next time: finish the HIV/AIDS section
Whiteboard #1
Whiteboard #5