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# On the Probability of any Individual being infected by HIV/Aids in a Year

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***Abstract**:*

*In this work, sexual activities of the susceptible population is taken into consideration. It is believed that each sexually active individual has sexual intercourse with at least a partner for at least once in a year. The probabilities of getting infected with the disease by sex was obtained given the same sexual behaviour.*

***.Keywords Sexual Behaviour, Susceptible Population, Infection, Probability, Transmission***

## 1. Introduction

Sexual intercourse of the most vulnerable means of the spread of HIV/AIDS. This is because the likelihood is 1 that there will be at least one act of sexual intercourse every hair and this is the more reason why the mode of transmission of HIV/AIDS is highly probable through sex. According to the statistical fact sheet published by WHO (World Health Organization), the likelihood of a male contacting the disease is 0.2 and that of a female as 0.8.

The spread of HIV/AIDs through sex depends on the number of sexual partnerships, the number of acts of intercourse per partnership as well as the likelihood of transmission in a single act of sex. It also depends on the probability that a randomly selected partner is HIV positive.

## 2. Materials and Methods

Let individuals have ***m*** sexual partnerships per annum, and that the average number of acts of intercourse per partnership is ***n***. Furthermore, assume that the probability of transmission in a single act of sex is **β**, and the HIV positive is **P** (the endemic prevalence). Then the probability that any sexually active individual being HIV positive in a year based on the multiplication rule of probability can be obtained as follows:

$P_y = 1 - P_y^1$ ($P_y^1$is the probability of not getting infected in a year) $= 1 -$ [$P_y^1$is the probability of not getting infected in a year]$^{\mathbf{m}}$

$P_y = 1 -$ [ (Probability that a randomly selected partner is HIV positive *****

(Probability of not getting infected by an HIV positive pertner)$^{\mathbf{n}}$ **+** the probability that randomly selected partner is HIV negative]$^{\mathbf{m}}$

Therefore,

$$P_y = 1 - [P(1-\beta)^n + (1-P)]^m$$

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$P_y$ = probability of an individual becoming HIV positive in a year

m = number of sexual partnerships per annum

n = number of acts of intercourse per partnership

β = the probability of transmission in a single act of sex.

P = the probability that a randomly selected individual is HIV positive.

## 3. Results and Discussion

According to the epidemiological fact sheet an HIV and AIDs, 2008, the probability of a female getting infected with the disease in a single act of sex with an infected male is 0.8 and that of the male is 0.2.

From the data of HIV/AIDS prevalence in Nigeria, the endemic prevalence P is

$$P = \frac{2,714,000}{40,900,000} = 0.06$$

and with β = (0.8, 0.2), varies probabilities of infection can be obtained based on varying values of the **m** and **n**.

For example, if an uninfected male had 4 sexual partnerships in a year and 10 acts of intercourse per partner, then $P_y = 1 - [0.06(1 - 0.2)^{10} + (1 - 0.06)]^4$

$= 0.1976260023$

Similarly, if an uninfected female had 4 sexual partnerships in a year and 10 acts of intercourse per partnership, then

$$P_y = 1 - \left[0.06(1-0.8)^{10} - (1-0.94)\right]^4 = 0.2193$$

Suppose that **m** = 2 and **n** = 30

For Male

$$P_y = 1 - \left[0.06(1-0.2)^{30} + (1-0.06)\right]^2 = 0.1163$$

For Female $P_y = 0.1164$

Also with **m** = 2 and **n** = 40

For Male

$$P_y = 1 - \left[0.06(1-0.2)^{2} + (1-0.06)\right]^{40} = 0.5825$$

For Female

$$P_y = 1 - \left[0.06(1-0.8)^{2} + (1-0.06)\right]^{40} = 0.9068$$

with **m** = 2 and **n** = 30

For Male $P_y = 0.4806$

For Female $P_y = 0.8313$

## 4. Conclusion

The results showed clearly that given the same sexual activities and under the same condition of sexual partnership, females are at a higher risk of getting
infected than males. This may be due to the fact that the female reproductive opening has a longer area compared to that of male and the virus can easily be passed to them.

## 5. References

[i] May R.M. and Andersan (1985): Endemic Infections in growing population. Matt biosci: 77:1411-156.

[ii] Busenberg S and Hadeler K. P. (1990). Demographics and Epidemics Matt Broscil 101, 41-62.

[iii] Sylvain Garden, Margaret Mackinnan, Sean vee and Andrew Recd (2003). Imperfect vaccination: some epidemiological and evolutionary consequences prof R. Soc London 270: 1129-1136.

[iv] Inaba H., Kermack and Mc Kendrick (2001). The variable susceptibility model for infections diseases. Japan J. Industr. Appli Matts, 18 (2) :273-292.