The impact of highly active antiretroviral therapy on sexual behaviour among homosexual men
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Chapter 1

Introduction
INTRODUCTION

By the end of 2004 the total number of people living with the *human immunodeficiency virus* (HIV) rose to its highest level ever: almost 5 million people acquired HIV in 2004, and an estimated 39.4 million people are living with the virus [1]. The steepest increases in people living with HIV occurred in Eastern Europe, and East and Central Asia, where the epidemic mostly concentrates in marginalized and stigmatized population groups such as commercial sex-workers, injecting drug users and men who have sex with men [1]. These groups are comparable with the groups that were affected most in industrialised countries during the early stages of the epidemic. Although the epidemic currently hits people in non-industrialised countries like sub-Saharan Africa hardest, homosexual men still are the largest affected group in industrialised countries. In the Netherlands, the estimated number of HIV cases was 16,400 by the end of 2004, with the highest prevalence found among homosexual men (0-22%) [2]. The proportion of homosexual transmission of HIV decreased from 59% in 1996 to 44% in 2003, but seems to be increasing again in 2004 [3].

The impact of highly active antiretroviral therapy (HAART)

A drastic change in the HIV/AIDS epidemic occurred with the availability of highly active antiretroviral therapy (HAART) in industrialised countries around the mid-nineties. Until then, no effective therapy was available for people infected with HIV, and people eventually developed AIDS and died. Effective treatment with HAART, using a combination of drugs in HIV-infected individuals, leads to a substantial reduction in plasma HIV-1-RNA levels, and increasing number of CD4 cell counts [4]. As a result of these improved treatment regimens rates of AIDS-related morbidity and mortality in industrialised countries strongly decreased [5], and the quality of life of HIV-infected individuals remarkably improved [6]. In the Netherlands, mortality rates among people with HIV dropped from 4.4 per 100 treated patients each year in 1996, to 1.8 per 100 treated patients in 2004 [7]. In addition to the clinical benefits, HAART decreases the probability of transmitting HIV to others during sexual intercourse [8-10], as it decreases the viral load in blood and semen [11, 12].

Shortly after the introduction of HAART, however, sexual risk behaviour and sexually transmitted infections (STI), especially rectal gonorrhoea and syphilis, started to increase among homosexual men in Western Europe, the United States, and Australia [see chapter 2]. These trends raised questions about what was happening; what could be the underlying processes of these behavioural changes, and what would be the impact of increasing risk behaviour and STI on the HIV/AIDS epidemic? Moreover, it confirmed the need for reinforcement of prevention activities in the era of HAART, with HIV-infection being changed from a deadly disease into a serious, but chronic condition.

The Amsterdam Cohort Study

The Amsterdam Cohort Study (ACS) provides a longitudinal database that includes epidemiological, behavioural, and clinical data collected among homosexual men in Amsterdam. This combination of data is very valuable in addressing questions that were raised as a result of changing trends in sexual risk behaviour and STI, which occurred after the introduction of HAART. The ACS among homosexual men started in 1984, and the general aim was to study the epidemiology and natural history of HIV infection and AIDS in relation to (sexual) risk behaviour among homosexual men [13]. Included were asymptomatic homosexual men aged 18-
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65, with at least two sexual partners in the six months prior to intake. At present, the study population consists of 650 homosexual men. Clinical, epidemiological and behavioural data are collected every six months, using standardised questionnaires and blood is taken for virological and immunological tests and storage.

The ACS makes it possible to monitor trends in the incidence (the number of new infections in a period of time) of HIV infection and other STI, and trends in sexual risk behaviour. As a result, changes can be identified in an early phase, so that action can be taken if and when required.

Moreover, the longitudinal structure of the ACS provides the opportunity to investigate causal relationships on an individual level. This is particularly true for biological outcomes like HIV infection and other STI, as information that precedes the disease onset can be obtained during study visits. The longitudinal structure of the ACS, however, is also useful for a better understanding of psychological processes underlying behavioural change over time. The combination of information about risk factors for HIV and other STI, and the psychological processes underlying behavioural change are important for developing effective interventions to reduce sexual risk behaviour and STI transmission.

As homosexual men participating in the ACS might not be representative for the general population of homosexual men, validation of findings in other populations (e.g. STI clinic visitors) is recommended, and undertaken regularly [e.g. chapter 3.1, 4.3 and 5].

Outline of this thesis

The objective of the present thesis was to investigate the impact of highly active antiretroviral therapy on sexual risk behaviour and trends in STI, especially rectal gonorrhoea and infectious syphilis, among homosexual men. The research presented in this thesis has been conducted at the Municipal Health Service, Cluster of Infectious Diseases, HIV&STI research, in Amsterdam, the Netherlands. Studies used both data from the Amsterdam Cohort Study and data collected at the clinic for STI in Amsterdam.

Chapter 2 provides an overview of the available literature concerning the rising trends in sexual risk behaviour and STI among homosexual men in industrialised countries in the late nineties. This chapter also discusses some potential causes that were provided in attempts to explain these changing trends, and the possible impact they could have on the HIV/AIDS epidemic.

Chapter 3 includes two studies investigating time trends in STI among homosexual men. The first study describes trends and risk factors for rectal gonorrhoea and syphilis among homosexual visitors of the Amsterdam STI clinic. Special attention is given to changes in STI and risk factors before and after the introduction of HAART. The second study describes time trends in the incidence of gonorrhoea, syphilis, and HIV among younger homosexual men participating in the Amsterdam Cohort Study. Furthermore, risk factors for these STI were determined.

Chapter 4 covers three studies investigating psychological processes underlying behavioural change in the era of HAART, with a main focus on optimistic HAART-related beliefs, and other motivational factors (including safer sex fatigue and sexual sensation seeking).

The first study presents results from a longitudinal study among HIV-negative young homosexual men participating in the Amsterdam Cohort Studies. The aim of this study was to investigate whether and which specific HAART-related beliefs were associated with a change from protected to unprotected anal intercourse on an individual level. The second study covers a longitudinal study conducted among older HIV-infected homosexual men from the Amsterdam
Cohort Studies. In addition to HAART-related beliefs, treatment related aspects such as immunological and virological measurements were investigated as determinants of subsequent sexual risk behaviour. The third study compares behavioural determinants and STI rates among homosexual visitors of the Amsterdam STI clinic, according to their HIV status. Additionally, the hypothesis of sexual risk behaviour being a mediator of the association between HAART-related beliefs and rectal gonorrhoea was investigated among homosexual men according to their HIV status.

The study described in chapter 5 investigates HIV-testing behaviour among homosexual visitors of the Amsterdam STI clinic, by assessing history of testing, current HIV-testing rates and HIV prevalence. Additionally, target groups for active promotion of HIV testing are identified. In the general discussion, chapter 6, the main findings are interpreted in the light of updated literature. Furthermore, implications for prevention programs are discussed, and recommendations for future research are presented.

References
1. UNAIDS/WHO. AIDS epidemic update December: 2004 (p 2-6)
3. RIVM fact sheets April 2005: Thermometer STI and HIV 2004, STI increase again [in Dutch]