

## PROBABLE CAUSES OF THE INCREASE IN HIV AND AIDS CASES IN THE CZECH AND SLOVAK REPUBLIC BETWEEN 2003 AND 2022

### PRAVDĚPODOBNÉ PŘÍČINY NÁRŮSTU PŘÍPADŮ HIV A AIDS V ČESKÉ A SLOVENSKÉ REPUBLICE MEZI LETY 2003 A 2022

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#### Abstract

This paper aims to respond to why there has been an increase in HIV and AIDS cases in the Czech and Slovak Republics between 2003 and 2022. For this purpose, official statistics from the respective national health organizations were analyzed. It was searched for differences in the occurrence of HIV and AIDS in both countries using a t-test. This way, no statistically significant differences were identified. However, it was found that there is a statistical significance in the evolution of HIV in men and women in both countries. Among the probable causes of the increase in HIV and AIDS cases are the migration accelerated after the entry of both countries to the European Union, the beginning of the Russo-Ukrainian conflict, the lack of prevention among homosexual and bisexual pairs, and the injecting drug use.

Keywords: HIV, AIDS, Czech Republic, Slovak Republic

#### Introduction

Research on various dimensions of HIV, and AIDS is one of the foremost areas not only in the world of medical science but also in the social sciences. It is also characterized by a flourishing interdisciplinary approach (Parker, 2001; Schoepf, 2001; Marshall and Bennett 1990; Herdt, 1987). One of the reasons for this interest is the fact, that the world has seen a huge change in sexual behavior since the first cases of the HIV epidemic were officially reported by the US CDC in 1981, and the virus was isolated for the first time in 1985 by the Pasteur Institute (Prieto and Romero-Leiton, 2021; Parker, 2001). Since then, it has been easier to identify its existence in

individuals through spontaneous testing or testing of donated blood bags. Science has increased its knowledge about immunology and the importance of the prevention of risky sexual behavior (Worede *et al.*, 2022; Jackson *et al.*, 2012; Whaley, 1999).

After more than 40 years of existence, HIV has spread over all continents and it has transformed the world, not completely the same everywhere (Mikl *et al.*, 1998; MacQueen, 1994). During the critical phase of the HIV pandemic in the world, the Czech Republic and Slovakia were also experiencing several social changes at home: the fall of the Berlin Wall in 1989 and, consequently, the end of the USSR, and soon afterward the separation from both countries,

becoming independents, capitalists countries (Profantova, 2009; 2005; Krapfl, 2013). Even during this period, there was no significant increase in the number of cases of HIV or AIDS (UNAIDS, 2023).

In 2022, about 39 million people globally were estimated to be living with HIV and around 630,000 people worldwide died in the same year from AIDS-related illnesses, compared to 1.3 million in 2010 (Ibid.). Although there have been various more or less efficient approaches to eradicate it, such as different public policies and therapies, some social groups are still highly affected by the virus. The Czech and Slovak data show that since the dissolution of Czechoslovakia, the number of new HIV/AIDS cases has been mostly prevalent in men with gay/bisexual partners, this being maintained and accentuated over the years, contrary to the global perspective of some other countries, which for years have had the number of new infections predominantly in people with heterosexual behavior or drug users of both sexes (ECDC & WHO Regional Office for Europe, 2023; Stanekova *et al.*, 2014; Kinkorova and Topolcan, 2012; Mikl *et al.*, 1998). However, a serological genetic screening study showed that not long after the dissolution of the two countries, there was a greater variability of HIV-1 subtypes in the Czech Republic from regions other than Western Europe. This shows that since the 1990s the country has been dealing with the immigration of HIV+ people and perhaps has not been able to include them efficiently in the health system (Hnilicova and Dobiasova, 2011).

Since the advent of protease inhibitors, anyone with the virus who is aware of their condition, and who starts and remains on treatment, becomes undetectable, breaking the cycle of new possible infections (Linka *et al.*, 2008). Currently, an increasing tendency to apply computational algorithms based on machine/deep learning methods can be observed in HIV-1 prediction, because this way it is possible to analyze big data and produce critical interpretations with utmost accuracy, not available by the conventional experimental or computational tools (He *et al.*, 2022; Kumar *et al.*, 2022).

To compare relevant factors such as risk behaviors, preventive measures, and stigma among two key populations—men who have sex with men (MSM) and people who inject drugs (PWID)—, a non-systematic literature review was performed by Mravcik *et al.* (2018). It was found that there is significantly higher coverage and provision of preventive measures in PWIDs as compared to MSM in the Czech Republic. Nevertheless, a lack of support for effective interventions such as post-exposure or pre-exposure prophylaxis (PEP and PrEP), a significant additional prevention tool for MSM, was identified by the authors (Sepodes *et al.*, 2021). The current Czech HIV/AIDS prevention strategy already incorporates the destigmatisation of MSM, missing in the previous versions (Ministry of Health of the Czech Republic and NIPH, 2023).

The destigmatisation of substance use has been a part of the drug policy earlier.

Papadopoulos *et al.* (2022) informed about HIV/AIDS surveillance in Europe declaring that substantial differences in the epidemiology of antiretroviral therapy (ART) had been observed between countries in Western, Central, and Eastern Europe during their research, which was based on two identical multicenter cross-sectional online surveys done in 2019 and 2021. Interestingly, the COVID-19 pandemic did not significantly interrupt ART delivery in most of the 18 centers that participated in data collection. However, various administrative and financial obstacles persist in some countries (especially in Eastern Europe) hindering the harmonization of strategies promoted in the European AIDS Clinical Society guidelines (EACS, 2023).

Miculikova *et al.* (2018) performed an anonymous questionnaire survey among Czech students assessing the level of knowledge and attitudes related to HIV/AIDS. 1,627 adolescents 13 to 15 years old selected from a sample of 25 elementary and grammar schools in the Czech Republic filled in the survey. It was found students have good knowledge regarding primary HIV/AIDS prevention and are aware that even a healthy-looking man can be HIV+, HIV is transmitted through sexual intercourse, blood, and sharing needles, not through hugging. Nonetheless, adolescents tended to stigmatize HIV+ people in their opinions.

The perspectives and attitudes of people living with human immunodeficiency virus (PLHIV) in Slovakia were investigated by Sojak *et al.* (2021), who did a cross-sectional, computer-assisted web survey on a representative sample of >10% of all local PLHIV (N=895). According to the study, most respondents received ART and were satisfied with that. The majority of research participants (60.8%) had informed only close friends or relatives about their HIV status. Almost a similar number (60%) often or always hide their HIV medication from others. 31.6% of respondents experienced stigmatization, primarily from physicians who refused to treat them. Compared to that, Pitonak and Machackova (2023) on a sample of 3,429 respondents from the Czech Republic found that 41% of PLHIV do not disclose information about their HIV status to anyone (this is 5% more than in 2018), 41% only talk about their HIV status with those closest to them, and 14% reported that they only share information if someone asks them directly. Only 4% of respondents are generally open about their life with HIV. Stasek *et al.* (2024) consider the education of professionals and the public, the availability of testing, PrEP, and other types of protection as one of the key steps to achieve the change in CZ/SR in healthcare provision.

Kovac *et al.* (2023) analyzed the main causes of avoidable mortality in Slovakia, partly referring also to HIV/AIDS that could be prevented with adequate preventive measures, vaccination, or available treatment. Authors considered PrEP to be very

effective in non-HIV patients who are at high risk of HIV infection and willing to adhere to prescribed medications. The US Preventive Services Task Force supports this argument. Adequate evidence that PrEP is associated with small harms, including kidney and gastrointestinal adverse effects, was found in previous studies (USPSTF, 2019).

## Methods

In this paper, the time series from 2003 to 2022 were analyzed. The data was obtained from the Czech and Slovak Ministry of Health databases. The analysis began in 2003 because no annual reports were available for the earlier period. The trends in the number of HIV and AIDS patients were first compared in their absolute numbers to get an idea of the trends in the number of infected in the two countries under study. Due to the different populations in the Czech and Slovak Republics, these numbers were recalculated to 1 million inhabitants and this new information was again included in the graphs (this time the data on the status and evolution of infections can be assessed in one graph due to their comparability). Growth coefficients have been calculated to show the year-on-year change in infections. Since we

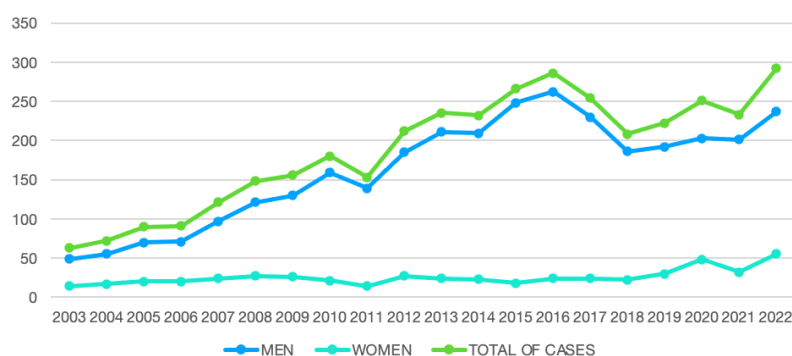
were working with time series, differences were calculated from the data (both for HIV and AIDS), thus removing the trend effect from the series, and a t-test was calculated from the adjusted data for two independent sets (Czech Republic and Slovakia).

## Results

No statistically significant differences in the evolution of HIV ( $t = 0.684473$ ;  $p = 0.24903$ ) and AIDS ( $t = 0.324062$ ;  $p = 0.373883$ ) infection rates between the two countries under study were found.

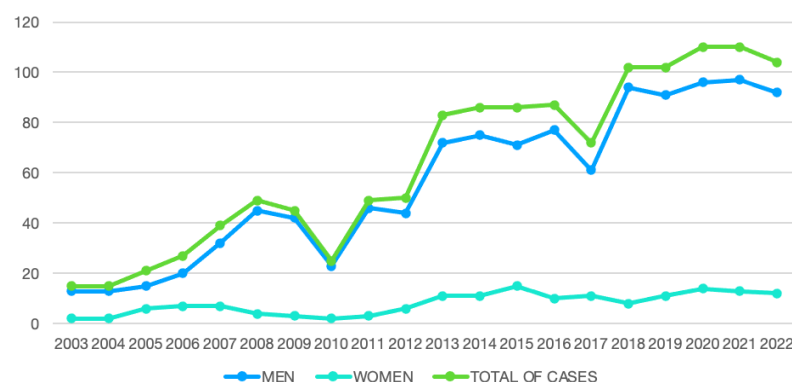
In Fig. 1, it can be seen that over the 20 years analyzed, the number of new HIV cases has grown significantly, especially since 2011. It can also be observed that in the Czech Republic, the number of cases in men has always prevailed since the beginning of the data collection, and even though the number of cases in women has decreased, it has increased in men.

Although the number of new HIV cases has grown mainly since 2011 in the Czech Republic, it can be seen in Fig. 2 that in Slovakia the number of infected men has always prevailed since the beginning of the data collection, and even though the number of cases in women has decreased, in men it has increased.



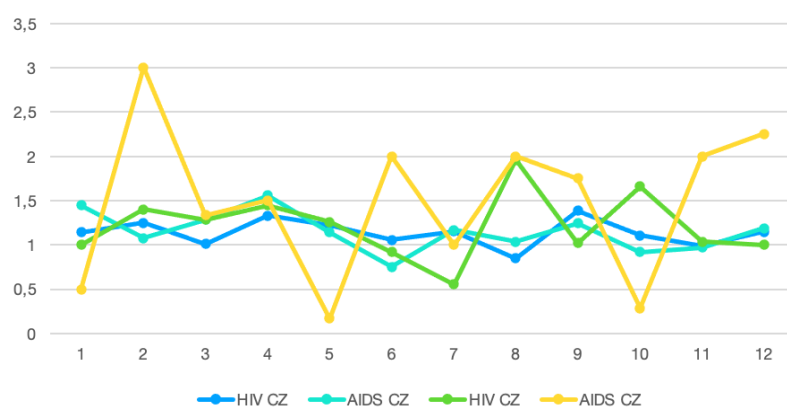
1: Number of HIV+ cases between 2003 and 2022 in the Czech Republic in men and women

source: own processing

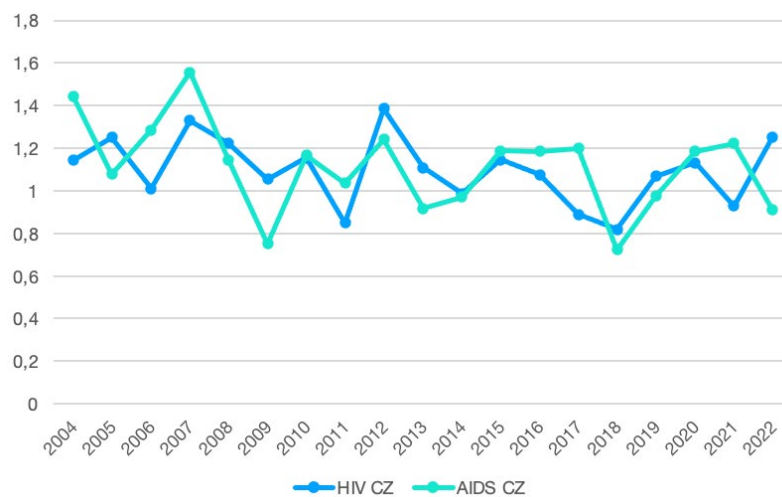


2: Number of HIV+ cases between 2003 and 2022 in Slovak Republic in men and women

source: own processing



3: Number of growth coefficients HIV+ cases and AIDS between 2003 and 2022 in the Czech Republic  
source: own processing



4: Number of growth coefficients HIV+ cases and AIDS between 2003 and 2022 in the Czech Republic  
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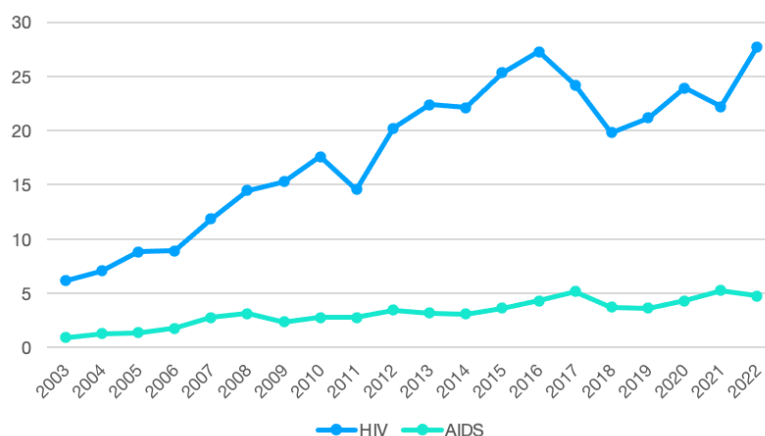


5: Number of growth coefficients per 1 million people of AIDS cases between 2003 and 2022 in the Czech Republic and Slovakia Republic  
source: own processing

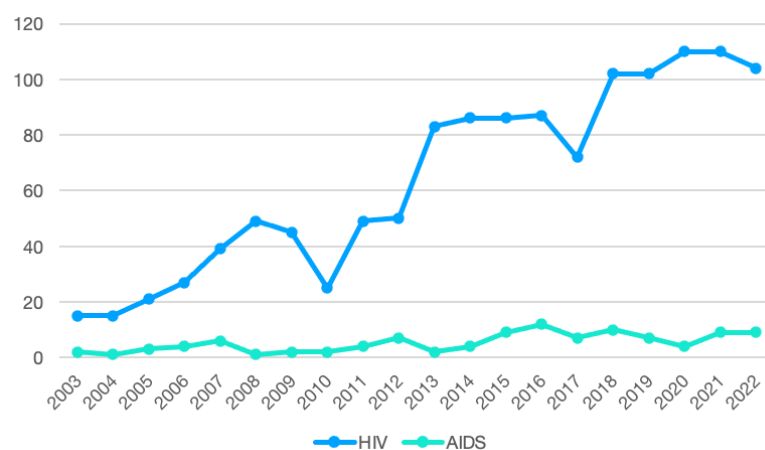
In Fig. 3, the comparison of the growth coefficient of HIV and AIDS cases in both countries showed that cases in men fluctuated more frequently with both HIV and AIDS. During the analysis, it was observed that the peak in AIDS cases occurred in 2006, which

was not accompanied by the same proportion of HIV cases (see Fig. 4).

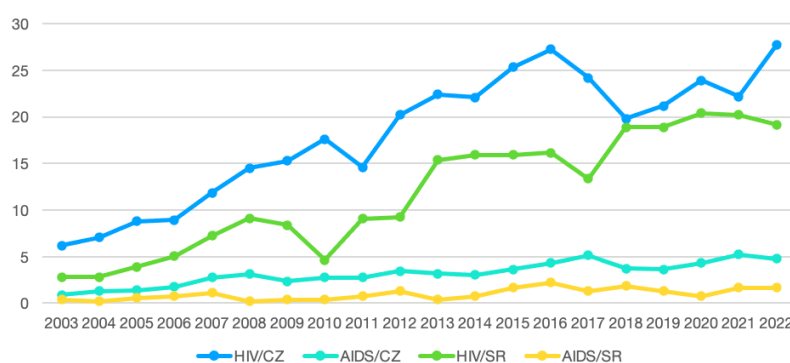
However, it can be seen in Fig. 4 that HIV cases fluctuated significantly, rising considerably in 2010 and 2022. Another interesting fact is that



6: Number of coefficients of growth of HIV+ and AIDS cases between 2003 and 2022 in the Czech Republic in men and women  
source: own processing



7: Number of coefficients of HIV+ and AIDS cases between 2003 and 2022 in Slovakia Republic in men and women  
source: own processing



8: Number of the growth coefficients of HIV+ and AIDS cases between 2003 and 2022 in Czech and Slovakia Republic in men and women  
source: own processing



the number of HIV and AIDS cases were found in 2010, 2014, 2015, and 2019, which means that the new HIV+ patients identified in those years were probably already in the AIDS stage.

Comparing both countries, the growth coefficient per 1 million inhabitants also showed interesting results such as the intersection of the number of cases in 2011, 2015, and 2020 (see Fig. 5).

In addition, there is a clear lack of stability in both countries, i.e., the number of cases is mostly rising positively in the perspective of 1 and when the graph goes down it is also in the same proportion of 1. Demonstrating that in these 20 years, there has not been a stabilized fall in the two countries.

The graph in Fig. 6 shows that even though the number of HIV cases has risen positively in the Czech Republic since the first year of observation, AIDS cases have remained stable over the years, hardly ever rising above 5.

Another observation that can be made from Fig. 6 is that even though the number of HIV+ and AIDS cases rose between 2003 and 2013, the peak occurred in 2014, the year in which the conflict between Russia and Ukraine began, and consequently, the major wave of immigration started. This spike lasted from 2014 to 2015 and decreased the following year. However, another significant spike could be seen in 2020, when the conflict worsened, and again in 2022.

The graph in Fig. 7 shows that although the number of HIV cases has also increased positively in Slovakia since 2003, AIDS cases have remained stable over the years, rarely rising above 5.

Another important observation that can be made from Fig. 7 is that since 2011 Slovakia has seen exponential growth in HIV cases, with 2012 being the last year in which cases were below 50 annually. Afterwards, the growths have been expressive especially between 2018 and 2022 with all years respectively closing above more than 100 annual cases.

The graph in Fig. 8 shows that from the outset, the Czech Republic has led the way in the number of HIV and AIDS cases. However, in 2018 both countries show extremely close numbers, almost crossing each other on the graph. Since 2012 both countries have experienced exponential growth, with a lull only between 2017 and 2018 and then another wave of growth from 2019 onwards.

From 1985 to 2017, the number of new infections increased. In 2018 and 2019, the number of new infections stabilized at the 2012 level. In other words, since the 2010s the country has never experienced an effective drop in new HIV infections. The highest number of cases in the country was identified in Prague.

## Discussion

Over the 20 years, the behavior and sexual route of most infections have never changed. Homo/bisexual

behavior is mostly found in men through sexual contact. Compared to the reports provided by the Slovak Republic, the Czech Republic unfortunately lags far behind. Both countries have problems with the detail and pattern of displaying the results, with the Czech Republic, for example, not separating the number of new cases by gender or the prevalence by gender. The Slovak Republic, on the other hand, does not publish a separate bulletin just on HIV/AIDS as the Czech Republic does but includes them in the health statistic yearbook. However, HIV/AIDS patients are mentioned and categorized here by gender, giving them better visibility and facilitating the understanding of figures. An informative pattern was not found in the documents, making the work not so simple. The creation of a pattern for reading and organizing the data is necessary for their study and interpretation. The difference between both countries was found in the amount of accumulated data, the description of the information that counts absolute numbers by region since 1980.

Another important observation is that it is complicated to find information in a system that is not unified on a national level. On the official website of the Ministry of Health of the Slovak Republic, it is possible to find the full national reports from 1995 onwards, unlike the Czech Republic provides them from 2003, and the period from 1985 shows only briefly. Nevertheless, it is also worth noting that since 2020, the Czech health system has also started to specifically report the number of HIV cases in Ukrainians separately, due to the recent worsening of the conflict and the wave of new immigrants arriving in the country.

The number of people arriving in the country who are HIV+ and seeking to continue treatment or discover their HIV status on arrival is alarming. It also demonstrates the authorities' difficulty in incorporating these people into the public policies for reception, prevention, and treatment with antiretroviral drugs, reducing the possibility of new infections among the Czech population.

The conflict between Ukraine and Russia, which began in 2014, can be seen as a trigger for major immigration to Central Europe, with the countries surrounding it being highly affected by its occurrence. Not only the armed conflict was the main reason for the increase in immigration to this region, but also the political and socio-economic instability linked to this situation, which gradually led to its main culmination in February 2022. It can also be observed in situations of social vulnerability such as wars that the integration of immigrants into host societies is not always so easy. Culture shock, language, and cultural barriers are common problems that make it difficult for newcomers to interact with the locals and generate problematic situations, including effective access to health services (Massmann *et al.*, 2023).

## Conclusions

The Czech Republic, predominantly atheist, shows a similar proportion of HIV/AIDS cases compared to Slovakia, where a significant portion of the population is Christian. This observation is notable, as both countries defy the global trend of the past 20 years, where the HIV/AIDS epidemic has predominantly affected specific social categories. Globally, marginalized groups such as men who have sex with men, sex workers, and PWID were initially the most affected by the epidemic. Subsequently, heterosexuals and PWID have become the predominant groups affected worldwide. Even though the Czech infection rates are one of the lowest in the world and Europe, HIV/AIDS is an acquired condition that is different from the rest of the world. Over the years, even during the most critical phase of the epidemic between the decades of 1980 and 1990, it was observed that the rate of infection among homosexuals fell and was eventually surpassed by PWID (Lazarus *et al.*, 2006). Later by heterosexuals, and in some cases where infections among homosexuals rose again, the disparity between hetero and homo/bi is not as great as that seen in Czechia, where more than 50% of infected cases are homo/bisexual. This shows that the country is predominantly heterosexual. It can be concluded that, unfortunately, HIV remains a highly stigmatized sexually transmitted infection in both countries, still being the disease of the “other” and that campaigns and advertising have probably been very ineffective in dealing with the homosexual population or men who have sex with other men to educate and prevent the prevalence or new infections in this segment of the population. Even with drugs as effective as protease inhibitors and PrEP, which break the cycle of infection, whether it's in an already infected person or risky behavior, communication between the Ministry of Health has failed to prevent new infections.

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## Conflict of Interest

The authors identified no conflict of interest.

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