Online search trend reveals declining interest in AIDS-related searches relative to HIV-related searches in South Africa

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Abstract

Background

The Acquired Immune Deficiency Syndrome (AIDS) caused by the Human Immunodeficiency Virus (HIV) is a leading cause of mortality on the African continent and world. HIV and AIDS are among the greatest public health challenges confronting health authorities around the world, with Nigeria and South Africa having the greatest incidence of the disease in the world. There is little research into how Africans meet their health information needs on HIV/AIDS online, and this research gap impacts programming and educational responses to the HIV/AIDS pandemic.

Methods

Data on search trends on HIV and AIDS for South Africa was found using the search terms ‘‘HIV’’ and ‘‘AIDS’’ (categories: health, web search), on Google Trends. This was compared with data on estimated adults and children living with HIV, and AIDS-related deaths in South Africa, the Joint United Nations programme on HIV/AIDS, and also with search interest in the topics ‘‘HIV’’ and ‘‘AIDS’’ on Wikipedia Afrikaans, the most developed local language Wikipedia service in South Africa. Nonparametric statistical tests were conducted to support the trends and associations identified in the data.

Results

Google Trends shows a statistically significant decline in search interest for AIDS relative to HIV in South Africa. This trend mirrors progress on the ground in South Africa, significantly associated with a decline in AIDS-related deaths and people living longer with the HIV virus. This trend was also replicated on Wikipedia Afrikaans, where there was a greater interest in HIV than AIDS.

Limitations of the study

This paper reports on how in general, interest in search terms ‘‘HIV’’ and ‘‘AIDS’’ mirrors the decline in AIDS cases and the increase in people living with HIV in South Africa. Nevertheless, there is an acknowledgement that the population of health information seekers on HIV/AIDS online may be quite different from the offline population. For instance, not everyone living with HIV/AIDS may be connected online or use search engines, and there is a difference in the number of people connected to the Internet over the years of the study 2004 – 2019. Hence, this paper is not an exact mapping of the online behaviour of all the people living with HIV/AIDS in South Africa.

Conclusion

This observed trend might be an indicator that multilateral efforts at combating HIV/AIDS, particularly through awareness raising and behavioural interventions in South Africa is bearing fruit, not just on the ground, but also reflected in the online information seeking on the HIV/AIDS pandemic.

A major obstacle to combating the impacts of disease in developing countries is the paucity of high-quality health data, particularly understanding the health information needs of people. Without understanding people's everyday concerns, health organizations and policymakers are less able to effectively target education and programming efforts for all gender and age-groups. The information needs of people, and their everyday concerns are often expressed via search engine queries as millions go online to meet health information needs.

Keywords: HIV/AIDS, Web search, online behaviour, Big Data.

1. Background

HIV/AIDS remains a major public health concern for nations of the world, despite concerted efforts aimed at combating the disease. There are an estimated 37.9 (32.7- 44.0) million people living with HIV (Human Immunodeficiency Virus) – the virus which causes AIDS in the world (1). The greatest burden of the HIV/AIDS scourge is felt in sub-Saharan Africa, with South Africa and Nigeria bearing the greatest burdens of the disease in the world. An estimated 7.7 million people were living with HIV and AIDS in South Africa in 2018, with an adult prevalence rate of 20.4% (1). In 2018, 71,000 South Africans died of AIDS related causes. Nigeria has the second highest number of new HIV infections globally after South Africa, and an estimated 1.5% of the population living with HIV (1). Having the largest population on the African continent, this translates to about 1.9 million people living with HIV as at 2018.

Considerable progress has been made in the fight against HIV/AIDS globally. Globally, an estimated 37.9 (32.7–44.0) million

people were living with HIV in 2018 (1), an increase from previous years (for example 35.3 million in 2012) as more people are receiving the life-saving antiretroviral therapy. At the same time the number of AIDS deaths is also declining with 770,000 deaths in 2018 (1), from 1.6 (1.4–1.9) million deaths in 2012, down from 2.3 (2.1–2.6) million in 2005 (2). Gains have also been made towards many of the 2020 Sustainable Development Goal targets and elimination commitments, although significant challenges remain (3).

A key component of the fight against HIV/AIDS has been behavioural interventions (4). A global meta-analysis of studies determined that behavioural interventions reduce sexual risk behaviour and avert sexually transmitted infections and HIV (4). Behavioural interventions typically involve harmonizing messages and the dissemination of information about HIV transmission and various prevention approaches using television, radio, outdoor advertising and information and communications technology. The outcome of all these behavioural interventions is that in sub-Saharan Africa, the percentage of young people (15–24 years) demonstrating comprehensive and accurate understanding of HIV has generally increased over the years. For example, this understanding rose by five percentage points for men and by three for women from 2002 to 2011, although knowledge levels remain low (5) (36% for young men and 28% for young women).

In South Africa, there have been a number of nationwide communication campaigns related to raising awareness of HIV and AIDS. Soul City and MTV Shuga are two examples of such multi-media campaigns with effective outcomes and promote good sexual health and well-being (6). Research into the impact of the Soul City and other communication campaigns found that they had a positive effect on the sexual behaviour of adults that had been exposed to the campaign message, for instance by bringing about positive changes in condom use and HIV testing (7).

In Nigeria, educational campaigns in schools, where Family Life and HIV Education lessons are part of the Nigerian school curriculum (8) and nationwide multimedia campaigns like the one created by the Society for Family Health (9) are thought to have been successful in increasing knowledge and changing behaviour.

The combined effects of these awareness campaigns have been an increase in knowledge and understanding of HIV/AIDS in these two countries. An outcome of an increase in awareness of HIV/AIDS in South Africa and Nigeria is probably that a percentage of the population will turn to the Internet via search engines for information on HIV/AIDS. Internet penetration in South Africa and Nigeria is put at 56% and 42% respectively (10).

An increasing number of people are using the Internet to support their healthcare (11) and search engines such as Google, Yahoo!

and Bing are often their first port of call. One of the early studies on search engine use found that one in every 28 (3.5%) pages viewed on the Web is a search results page, making the use of a search engine the second most popular Internet task next to email (12). Another early study found that worldwide there are over 6.75 million health-related internet searches carried out every day, representing approximately 5% of all internet searches (13). Search engine use is the most important approach to online information seeking (14), and a study by the Pew

research centre found that half of all Internet users now use search engines on a typical day (15).

This paper examines trends in online search on HIV and AIDS on Google which is the dominant search engine worldwide (16) and is the top search engine in most countries with a few exemptions such as Russia (Yandex) and China (Baidu). In South Africa, Google is also the dominant search engine (16). Google data have been used severally in the aid of understanding health trends and in health forecasting (17 – 23). And although the use of Google search engine data in the aid of health and development in general have been criticized (24, 25) in recent years for an unbalanced and opaque approach which did not satisfy scientific transparency, in recent years organizations such as the World Bank (26, 27) and several government departments around the world have begun revisiting the behavioural Bigdata methods of search engines data in the aid of international development. Drawing on feedback from the scientific community on the best practices of Bigdata research (28 – 33), particularly paying attention to integrating both Bigdata and “small data” (e.g., survey data and other traditional data collection mechanisms) to create more complete and accurate datasets, they have made significant advances in this field.

This paper shows that search trends on Google Trends for the terms “HIV” and “AIDS” in South Africa for the years 2004 – 2019, with a pattern of the search interest for “aids” declining significantly relative to “hiv” (Figure 1, $p\text{-value} < 2.2 \times 10^{-16}$, Mann-Kendall test) perhaps revealing increasing general understanding on the difference between HIV and AIDS, particularly the awareness that with proper treatment HIV infection may not lead to AIDS. This observed trend might be an indicator that multilateral efforts at combating HIV/AIDS, particularly through awareness raising and behavioural interventions in South Africa is bearing fruit. This relative shift in search interest mirrors the reality of the disease on the ground, with significantly declining numbers of deaths from AIDS ($p\text{-value} = 2.90 \times 10^{-7}$, Mann-Kendall test; $p\text{-value} < 2.2 \times 10^{-16}$, test on association with “AIDS” search trend) and with more people living with HIV in the country ($p\text{-value} = 4.42 \times 10^{-11}$, Mann-Kendall test) (Figure 2). The data from Google (34) however also shows that in the years under study 2004 – 2019, there was greater search volume for HIV relative to AIDS. This greater interest in HIV relative to AIDS is also reflected in other online information sources such as Wikipedia. For example, Pageview analysis of Wikipedia Afrikaans (35) also shows a greater interest in HIV over AIDS, from 2015 - 2020 (Figure 3).

2. Methods

The methods employed in this study were derived from the considerable literature utilizing search data to understand and gauge public interests in specific topics and health surveillance (17 – 23). The first step involved search term selection. The search terms chosen as proxies to gauge public interest in HIV and AIDS in South Africa were “HIV” and “AIDS”. These were the only search terms selected given the specificity of the topics concerned. Data on online searches on the terms “HIV” and “AIDS” were thus obtained on Google Trends (categories: health, web search) in order to visualize how searches were conducted on both search terms. This data was obtained for the years 2004 – 2019 (Figure 1). Data on regional interests in both search terms for South Africa were downloaded, together with the top and rising search queries related to “HIV” and “AIDS” was accessed via Google Trends (34). Non-parametric Mann-Kendall test (36) was conducted on the log-ratio of search volumes between “HIV” and “AIDS”, suggesting significant increasing trend of “HIV” search interest relative to “AIDS”. Review studies on the use of search engine data to understand public interests and trends have noted the “traps in bigdata” (24 – 25), emphasizing that data sources such as search engine data are best used to supplement traditional data sources, and that in general confidence in such data is strengthened when their findings can be replicated in other data sources and platforms. Thus, this paper also plotted data (37) on estimated adults and children living with HIV, and AIDS-related deaths in South Africa 2004 - 2019 (Figure 2). Non-parametric Mann-Kendall tests were conducted to indicate the significant decline in AIDS-related deaths in South Africa and the increasing trend for estimated adults and children living with HIV. Permutation test based on non-parametric Spearman’ rho (38) was conducted to verify the association between Google search interest of “AIDS” and the AIDS-related deaths in Africa. Due to the difference in time frequency, monthly Google search data for “AIDS” were aggregated through moving average to estimate yearly search interest. Pageviews for the topics “HIV” and “AIDS” in Wikipedia Afrikaans from 2015 - 2020 (Figure 3), the most developed indigenous language Wikipedia service in South Africa. 2015 is the year of the earliest data on HIV and AIDS on Wikipedia Afrikaans. All statistical analysis was conducted with R: Mann-Kendall tests by package “trend” and Spearman test by package “stats”.

3. Results

Search term trends for “HIV” and “AIDS” from 2004 – 2019 in South Africa showed a decline in “AIDS” searches relative to “HIV” (Figure 1). This observed online behaviour

mirrors progress on the ground for both HIV and AIDS where there has been a decrease in AIDS-related deaths and an increase in the number of people living with the HIV virus in the country from 2004 – 2019 (Figure 2). Some of the most important search queries (top and rising) searched for by South Africans on ‘‘HIV’’ and ‘‘AIDS’’ can be seen in Tables 1 and 2. A complete visualization of the search data, regional interest in South Africa for the search terms ‘‘HIV’’ and ‘‘AIDS’’, and rising and top search queries on ‘‘HIV’’ and ‘‘AIDS’’ can be accessed via Google Trends (34). Similarly, on Wikipedia Afrikaans, for the years 2015 – 2020, there was greater interest in ‘‘HIV’’ than ‘‘AIDS’’ (Figure 3).

4. Discussion and conclusion

The data on the search terms ‘‘HIV’’ and ‘‘AIDS’’ in South Africa (2004 – 2019) reveals a decrease in interest over time in ‘‘AIDS’’ related search queries relative to ‘‘HIV’’ related search queries. This mirrors the progress on the ground in both countries where AIDS related deaths have reduced over the years (2004 – 2019) and people have lived longer with the HIV virus as life changing medications have prolonged the lives of people living with the disease. Similarly, behavioural interventions through messages delivered through media sources, including the Internet in South Africa have increased the numbers of people with accurate understanding of the differences between HIV and AIDS (4). In response to these behavioural interventions a proportion of the populations in these countries will resort to the Internet via search engines to seek information on HIV and AIDS. From the earliest data available on Wikipedia Afrikaans (2015 – 2020), there has been a greater interest in HIV than on AIDS in South Africa.

A major obstacle to combating the impacts of disease in developing countries is the paucity of high-quality health data, particularly understanding the health information needs of people (39). Without understanding people’s everyday concerns, health organizations and policymakers are less able to effectively target education and programming efforts for all gender and age-groups (39). The information needs of people, and their everyday concerns are often expressed via search engine queries as millions go online to meet health information needs. This paper reveals that search trends for HIV and AIDS in South Africa for 2004 – 2019 on Google show a declining interest in AIDS relative to HIV, which is also corroborated by progress on the ground with more people living longer with HIV and declining deaths from AIDS. Wikipedia Afrikaans pageviews on HIV and AIDS from 2015 – 2020 also show a greater interest in HIV than AIDS.

In these developing country contexts where high-quality data on the health information needs of people is often lacking, understanding the population’s use of search engines to meet health

information needs can provide useful data on health information needs disaggregated by gender and age, and revealing which information sources suggested by search engines are the most trusted. Understanding people's use of search engines to meet information needs can also reveal if education and programming efforts have been effective. Consequently, a natural progression of this study might be an ethnographic study of the use of search engines to meet HIV/AIDS-related health information needs in South Africa.

Figure 1: Search Interest in the search terms ‘HIV’ and ‘AIDS’ (Category: Health, Web search) in South Africa, 2004 – 2019, accessed December 24 2020.

Figure 2: UNAIDS HIV and AIDS data on estimated adults and children living with HIV, and AIDS-related deaths in South Africa (36)

Figure 3: Wikipedia Afrikaans pageviews statistics on HIV and AIDS 2015 – 2020, accessed November 5 2020.

Table 1: HIV, top and rising related queries 2014 – 2019

hiv aids	hiv/aids
aids	people with hiv
symptoms	signs of hiv
hiv symptoms	hiv negative
hiv and aids	what is hiv aids
hiv positive	what is aids
what is hiv	living with hiv
hiv test	tb
symptoms of hiv	hiv news
hiv cure	hiv aids in south africa
hiv in south africa	hiv meaning
hiv treatment	hiv prevention
hiv signs	what causes hiv
hiv infection	people living with hiv
hiv testing	effects of hiv
early hiv symptoms	how to get hiv
treatment for hiv	arv
hiv medication	hiv rash

hiv test kit	hiv and pregnancy
hiv pills	hiv symptoms men
hiv cure news	hiv positive news
meaning of hiv	hiv symptoms in men
cancer	sign of hiv
impact of hiv and aids	hiv symptoms women

Table 2: AIDS, top and rising related queries 2014 – 2019

hiv	aids symptoms
hiv aids	what is hiv
hiv and aids	what is hiv aids
aids in africa	hiv aids in south africa
aids in south africa	aids day
medical aids	hiv/aids
what is aids	what is hiv and aids
medical aids south africa	aids cure
hiv symptoms	hearing aids
hiv aids symptoms	world aids day
medical aid	people with aids
hiv and aids in south africa	medical aids in south africa
symptoms of aids	impact of hiv and aids
aids meaning	cure for aids
hiv cure	aids foundation
hiv and aids cure	symptoms of hiv and aids
visual aids	teaching aids
poverty	hiv aids statistics
aids 2016	aids statistics south africa
meaning of aids	causes of hiv and aids
discovery medical aid	aids stand for
difference between hiv and aids	definition of aids
bonitas (health cover)	aids symptoms

Declarations

Ethics Approval and consent to participate: Not applicable

Consent for publication: Not applicable

Availability of data and materials: The datasets generated and/or analysed during the current

study are available in Google Trends, [https://trends.google.com/trends/explore?cat=45&date=2004-01-01%202019-12-31&geo=ZA&q=aids,hiv] and Wikipedia Afrikaans [https://pageviews.toolforge.org/?project=af.wikipedia.org&platform=all-access&agent=user&redirects=0&start=2015-07&end=2020-10&pages=HIV|AIDS]

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Author's contributions: B.O. conceived, designed, and carried out the study. S.N. prepared the figures and performed statistical analysis on data. D.J. provided Wikipedia data and critical feedback on the manuscript. All authors read, reviewed, and revised the manuscript.

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