

Research

Distribution of new HIV infections among key risk population groups in Togo

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Abstract

Introduction: good data on the epidemiology of modes of transmission of HIV among population at risk are important for development of prevention strategies, and resource allocation for the implementation of the interventions. We sought to estimate new HIV infections among key risk groups in Togo. **Methods:** we conducted a systematic review of epidemiological data on HIV and AIDS as part of the HIV control strategies in Togo from 2001 to 2012 following the PRISMA guidelines. We used the Mode of Transmission (MoT) modelling tool to estimate the incidence of new HIV infections in high risk groups. The MoT tool was developed and validated by UNAIDS and implemented by several countries using data on the HIV epidemic to estimate new HIV infections that will appear in the core groups. We used Epi-MoT tool to assess the availability and the quality of data. A score of availability of data over 50% and the quality over 1.5 were required to proceed to the MoT analysis. Uncertainty analysis to assess the reliability of the results was performed. **Results:** incidence of new HIV infections was estimated at 6,643 (95% CI = 5274, 9005) with an incidence rate of 203 per 1,000,000 inhabitants. The proportion of new HIV infections was 61.9% (95% CI = 46.2 to 71.7) in stable heterosexual couples compare to 14.01% (95% CI = 7.2 to 23.3) in people having casual sex. In high-risk groups new HIV infections accounted for 2.4% among sex workers (SWs) (95% CI = 1.2 - 4.1), 7.9% among clients of SWs (95% CI = 3.9-14.1) and 6.9% among men who have sex with men (MSM) (95% CI = 3.1 to 13.1). **Conclusion:** we describe the prediction of the HIV epidemic with a large contribution of stable heterosexual couples in the occurrence of new infections. But HIV incidence remains high in key risk populations. Innovative strategies for risk reduction should be strengthened to reduce the transmission especially in stable heterosexual couples.

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Introduction

At the end of 2011, UNAIDS estimated the number of people living with HIV/AIDS (PLWHA) to be was 34 million in the world, of which 69% were in living sub-Saharan Africa [1]. It was estimated 2.5 million new infections occurred in 2011 with a decrease of 20% compared to 2001 [1]. Significant progresses have been made in the response to HIV in recent years with improved geographic coverage of different control strategies [2]. In recent years, the financial resources to invest in the control of HIV infection are being scarce [3,4]. Effective prevention strategies of HIV infection control and resources allocation in a country require knowledge of the epidemiology of transmission modes and the types of higher risk behaviors among key population groups [5]. Know your HIV epidemic package used for analysis and estimation of expected new infections in a population developed is a tool by UNAIDS to help countries assess the proportion of new infections that can occur in the key target populations using epidemiological and socio-behavioral data [5]. This model was therefore recommended to countries in the framework of the initiative "know your epidemic, know your response" to encourage the use of strategic information to help planning of more appropriate and effective responses strategies to the HIV epidemic [5-8]. Togo, with an HIV prevalence of 3.4% in 2011, got the third highest prevalence in West Africa [9]. Since 2001, resources were mobilized for HIV infection control in Togo [10,11]. Several sero prevalence and behavioral studies, as well as evaluation of the implementation of control strategies have been carried out in the country to better understand the trends of the national HIV epidemic [9]. Mathematical modelling and epidemiological predictions are increasingly used for the development of health policies, the design of prevention programs and allocation of resources for the HIV infection control worldwide [12,13]. But since the provision of modes of transmission analysis tool, any study has been conducted to estimate new HIV infections by exposure group in Togo. Our objectives were to estimate new HIV infections in the key exposure groups in Togo.

Methods

We estimate the incidence of new HIV infections among core risk groups using the Know your HIV epidemic package. The modes of transmission (MoT) spreadsheet model was developed and validated by UNAIDS and serves to perform modelling from relevant HIV

epidemic data in the country and to determine new infections and major groups among which these new HIV infections may appear [5, 12, 14].

Study populations

Populations groups at risk defined by the Council of HIV and Control in Togo include female sex workers (SWs) and their clients, injecting drug users (IDUs), men who have sex with men (MSM), people with multiple heterosexual partners, partners of these individuals with higher risk behaviour, people with stable heterosexual relationships mutually faithful (including married and unmarried) and persons who are at risk of infection through medical injections or blood transfusions [5]. In this model, IDUs, MSM and SWs were considered as high-risk groups to HIV while people who have had more than one sexual partner in the last year were considered as people who have casual sex [6, 15].

Searching strategy

We conducted a systematic review of epidemiological data on HIV and AIDS as part of the HIV control strategies in Togo following the PRISMA guide lines [16]. Recommendations of Meta-analysis of Observational Studies in Epidemiology (MOOSE) statement were also used for conducting and reporting this systematic review [17]. Two investigators (LDE, PVP) helped by a librarian performed a systematic literature search for peer-reviewed studies published between 2001 and 2012 from the following electronic databases: Pub Med, Google scholar and the Scientific Research Journals of Lomé University. We combined a range of the following terms in this review: "HIV prevalence" or Sexual transmitted infection", "MSM" or "Gay", "Partners of MSM", "FSW", "client of FSWs", "Partners of FSWs"; clients "IDU" or "Drug users", "Partners of IDU", "Casual sex", "Partners of Casual sex", "Stable heterosexual", "Togo". The literature review was completed by a manual search in the non-computerized institutions using the same targeted terms. We also contacted experts in the field for additional information on unpublished data on HIV and AIDS. All the resulting citations were screened to find out whether they meet the Epi-MoT tool criteria [14, 18].

Studies eligibility

For the Epi-MoT requirement, among each risk group, the most recent studies that were conducted in Togo at the national level or

are representative to the entire country were eligible [9, 18]. We excluded studies that were not conducted in Togo. Studies that were conducted at district or regional level were excluded. We have summarised the search and selection process for this review in **Figure 1**.

Data extraction

For data extraction we used the MoT spreadsheet model requirement described elsewhere [19]. Disagreements on the prevalence of HIV among injecting drug users were resolved by discussion and consensus among reviewers. The model utilises data on the sizes of risk populations, current HIV prevalence, patterns of risk behaviour and levels of protection against HIV infection (reported use of condoms during sexual contact), together with the transmission probabilities associated with specific risk behaviours. It uses a binomial function to estimate the probability of transmission in each identified risk population. The number of sexual/injecting partners and unprotected sex/injecting acts per partner per year determines the annual number of potential risk encounters in each population group, while the likelihood that any contact will be with an HIV infected partner is determined by the HIV prevalence in the corresponding partner population [5]. These characteristics from eligible studies were extracted directly into the Epi-MoT tool which is a structured Microsoft Excel spreadsheet called "know your HIV epidemic evaluation package"[5,19]. Variables recorded included: type of risk group, number of studies reported, year of publication, estimate, geographic area, sample size, population size, HIV prevalence, STI prevalence, sexual behaviour, condom use and number or percent of each risk group receiving ART.

Data availability and data quality assessment

The Epi-MoT tool (know your HIV epidemic evaluation package) was used to assess the availability of data and the quality of these data [5, 12, 14, 20]. First the epidemiology review checklist was filled out. Then data quality was assessed by giving a quality score ranging from "0" when there is no data available for specific groups: "1" indicating poor data quality, "2" indicating fair and "3" indicating good data quality. The total score of data availability for each population at risk was used as a measure of decision making to proceed to the MoT analysis. To perform MoT modelling and uncertainty analysis, it is recommended that the overall score of the data availability to be greater than 50% and the average of data quality score greater than 1.5 [18]. After validating the data

availability, the MoT tool was used to perform the modelling and estimate proportion of new HIV infections by risk group.

Type of data included in the MoT model

The MoT model uses data on the size of risk population groups, the most recent prevalence of HIV in these risk population groups, the prevalence of sexually transmitted infections as well as the reported condom use during intercostals sex in each population group [5, 18]. The current coverage of antiretroviral therapy by risk group was also introduced [5] in the model. The circumcision rate in Togo was estimated at 98%. The incidence of HIV was estimated between 5,200 and 12,000 new HIV infections at the national level from the spectrum conducted in 2012 [10] and HIV sero prevalence from sentinel surveillance data [9]. The estimate of the size of risk population groups in Togo (**Table 1**) was made from different studies conducted in Togo and in the West African sub-region [7, 9]. From the data of the general census of population and housing, the size of the population 15 to 49 years in Togo was estimated to be 3,269,420 in 2013 [21].

Analysis

We used the MoT analysis model to estimate the number of new infections expected in a particular population group based on the number of people belonging to the group and the annual risk of infection [5, 12, 14]. The annual risk of infection was determined from the HIV prevalence among each population group, the number of partners in a year, the number of sex contacts per partner per year, the prevalence of other sexually transmitted infections (STIs) in the risk groups and their partners (for sexual transmission only), the proportion of protected sex and the proportion of PLWHA on ART. The model allows to conduct an uncertainty analysis to assess the reliability with 95% confidence interval around our estimates calculated using the uncertainty package incorporated in the MoT model tool [5, 22].

Ethical aspects

It was a national study commissioned by the National Council for the HIV, AIDS and sexually transmitted infections control of Togo (Ref N° 114/SP/CNLS-IST/CN/2013). The study was conducted using secondary data already available or published. Participants

were not involved in this study; therefore, the consents and ethics committee approval were not required.

Results

Our search yielded 244 records. Of these, 52 duplicate records were excluded. Based on their title and abstracts 125 studies were removed because they were not relevant to the Epi-MoT review. In total, 38 studies were found to be potentially relevant and were assessed. Of these, 24 were excluded because they were not representative to the whole country (n= 18) or they were conducted since more than 7 years (n=6). A total of 14 studies were included in this review (**Table 2**).

Availability of data: the average score of data availability was 68.7% with a highest score of data availability in the SWs population group (**Table 3**).

Data quality: The quality of data by key risk groups varied between 0 and 2.2 with an average score of 1.53/3 (**Figure 2**).

Characteristics of risk populations: the size of the population aged 15 to 49 years was estimated at 3,269,420 inhabitants accounting for 48% of the total population of Togo in 2013. Of the 3,269,420 inhabitants, stable heterosexual couples represented 78% and people having casual sex represented 11.4% (**Table 4**). The size of high risk group population among the population of 15 to 49 years old retrieved from the available studies is shown in **Table 1**. HIV prevalence was respectively 19.6% among MSM, 13.1% in SWs and 3.1% among clients of SWs (**Table 4**). The proportion of protected sex acts was 79% in SWs, 72% among MSM, and 61% among clients of SWs (**Table 4**). Partners of population groups at high risk and stable heterosexual couples had low HIV prevalence however these groups accounted for a large proportion of the sexually active population (**Table 4**).

Distribution of new HIV infections: the incidence of HIV in Togo was estimated at 6643 new HIV infections in 2013, 95% CI: (5,274 to 9,005). The incidence rate of HIV was 203 cases per 1 million inhabitants. The proportion of the incidence of new HIV infections was 61.9 % (95% CI = 46.2 to 71.7) in stable heterosexual couples compare to 14.01% (95% CI = 7.2 to 23.3) in people who have casual sex (**Table 4**). We found a small

percentage of the incidence of new HIV infections among groups with high-risk sexual behaviors such as SWs 2.4%, (95% CI = 1.2 to 4.1), clients of SWs 7.9% (95% CI = 3.9 to 14.1) and MSM 6.9% (95% CI = 3.1 to 13.1) (**Figure 3**). New HIV infections occur mostly in stable couples 77%, followed by those who have casual sex 17% and partners of high-risk groups (6%).

Discussion

This study aimed to document the distribution of HIV new infection among key risk group in Togo to better direct resources for effective control of the HIV infection. Hence, it was necessary to conduct a comprehensive review of available HIV [5] epidemiological data. This data analysis was made possible by the Epi-MoT tool that has been developed and used by many countries around the world and especially those in sub-Saharan Africa and Asia [5].

Availability and quality of data

In the data assessment using Epi-MoT, data availability was 1.53 / 3 while the quality of the data was 68.7% which are acceptable levels for the implementation of the MoT according to the standards recommended by the UNAIDS [18]. Data availability was good for core groups such as SWs and clients of SWs. In fact for a long time, the SWs were considered as high-risk group driving transmission of sexually transmitted infections and HIV in Togo. Hence, resources were mobilized for the control of these infections among this vulnerable group [10,11]. Population size of high-risk groups (SWs and clients of SWs) in Togo was within the range of West African sub regional estimates [7] while IDUs and MSM are groups that are not yet well organized and documented due to repression and stigma [23-25]. The limited availability of data on IDU and MSM in Togo has affected the quality of data including estimation of the size, the prevalence of STIs and HIV in these population groups.

Distribution of new HIV infections

MoT model estimated 6643 new HIV infections in Togo. These estimates are within the ranges of predictions made by the Spectrum, which provides an incidence that varies between 5200 and 12,000 new HIV cases in Togo [10]. The number of new infections appear mostly in stable heterosexual couples (77%) followed by those having casual sex (17%). This could be explained

by the high proportion of these groups compared to the proportion of SWs, MSM and IDUs in the general population. With HIV prevalence of 3.4%, Togo has a generalized epidemic type, and the MoT model results of Togo confirms the dynamic of this epidemic dominated by heterosexual transmission [5] with a strong female vulnerability [26]. The epidemic in this population group is probably due to the existence of discordant couples and maintained by ignorance of HIV status of one of the partner who has been infected prior to their union. This high incidence of HIV within stable heterosexual couples and those with casual sex has also been reported in most countries of West Africa and Southern Africa [5] and Malawi [8]. Contrariwise, in the East Asia countries, Latin America and Iran [5, 27] where the HIV epidemic is concentrated, predictions reported a larger number of new infections among IDUs and MSM. This difference could be explained by the fact that use of injection drug is not a widespread practice in most countries of sub-Saharan Africa where the prevalence of injection drug use was estimated at 0.2 % in the general population [28]. Also, men who have sex with other men are still stigmatized and frowned in African societies. As consequence, the sizes of these population groups are underestimated in most of sub Saharan Africa countries. This is not the case in Asia, America and Europe where, on the one hand these practices are more widespread and sometimes officially recognized. On the other hand, several studies have been conducted in the Western countries in these population groups providing more reliable estimates of the size of these key groups [29,30]. The prediction of new HIV infection in Togo confirm that SWs, IDU and MSM populations remain at high risk for HIV and strategies to control HIV epidemic must be strengthened for these groups. It is therefore important to improve the mapping of these risk groups for better planning of their health needs. Like any estimation model tool, the MoT tool has structural limits. In fact it does not take into account Mother to child HIV transmission and behavioral aspects of specific age groups such as young people aged 15-24 years. Also some groups or individuals may have multiple partner groups. This could have affected the results from the model.

Conclusion

Our study describes the prediction of new HIV infection and shows high contribution of stable heterosexual couples in the occurrence of new HIV infections in Togo. However, the incidence of HIV remains relatively high in populations at high risk. These data must be taken

into account by the national policies makers for innovative and effective strategies planning to mitigate the number of new HIV infections. Special emphasis should be put on prevention interventions among stable heterosexual couples and key risk populations. In this perspective, these data are taken into account in the ongoing development of the 2013-2017 national plan of elimination of Mother to child HIV transmission, and the development of a framework for investment in the coming years. Moreover, the implementation of new WHO recommendations 2013 [31] on medical management of HIV ($CD4 \leq 500$, and the systematic treatment for discordant couples) and the implementation of the strategy of combined prevention among key populations are opportunities to sustainably reverse the trends of the epidemic in 2020 in Togo.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

LED coordinated the collection, analysis and interpretation of data and drafted the manuscript. AAM and KD participated in the study design, was involved in the analysis and interpretation of data. PVP was responsible for the study design and scientific coordination in the analysis and interpretation of results and preparation of the final manuscript. All the authors have read and approved the final manuscript to be submitted for publication.

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Tables and figures

Table 1: estimation of size of high risk population groups in Togo

Table 2: characteristics of included studies

Table 3: average score of data availability

Table 4: characteristics of risk population groups

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| Table 1: estimation of size of high risk population groups in Togo | | | |
|---|---|---------------|---|
| Population group | Proportion of population with risk behaviour | | Size of population with risk behaviour |
| | Male | Female | |
| Injecting Drugs Users (IDU) | 0.10 | 0.00 | 1637 |
| Partners of IDU | 0.00 | 0.04 | 638 |
| Sex workers (SWs) | 0.00 | 0.59 | 9645 |
| Clients des PS | 6.11 | 0.00 | 99861 |
| Partners of SWs Clients | 0.00 | 0.52 | 8488 |
| Men having Sex with Men (MSM) | 1.00 | - | 16347 |
| Female partner of MSM | 0.00 | 0.15 | 2387 |
| Casual sex | 19.00 | 3.80 | 372714 |
| Partners of casual sex | 0.14 | 3.61 | 61374 |
| Stable heterosexual couples | 73.00 | 84.00 | 2566495 |
| No risk | 0.65 | 7.30 | 129836 |
| Medical Injections | 100 | 100.0 | 3269420 |
| Blood transfusion | 100 | 100.0 | 3269420 |
| Total 15 – 49 years population | 100 | 100 | 3269420 |

| Table 2: characteristics of included studies | | |
|---|-----------------------|--|
| Authors and year | Method used | Targeted risk group for HIV reported in the study |
| Sobela F et al. 2005 | Cross sectional Study | Female Sex workers (FSW), Clients of FSWs, Partners of FSW clients |
| Conseil National de lutte contre le SIDA (CNLS) 2012 | Annual report | Blood transfusion |
| Programme National de Lutte contre le SIDA (PNLS - Togo) 2011 | Cross sectional Study | Female Sex workers (FSW), Clients of FSWs, Partners of FSW clients |
| SODJI KD et al. 2009 | Cross sectional Study | Female Sex workers (FSW), Clients of FSWs, Partners of FSW clients |
| Organisation du Corridor Abidjan Lagos (OCAL) 2012 | Cross sectional Study | Men who have Sex with Men (MSM), Injecting Drug users (IDU), |
| (PNLS - Togo 2010 | Cross sectional Study | Men who have Sex with Men (MSM), Partners of MSM |
| PNLS - Togo 2011 | Cross sectional Study | IDU, Partners of IDU |
| PNLS - Togo 2012 | Annual report | Partners of IDU, Partners of MSM, Medical injection, Stable heterosexual, Partners of casual sex, Partners of FSW clients |
| Unité de Recherche Démographique (URD). 2010 | Cross sectional Study | Partners of IDU, Partners of MSM, Casual sex, Stable heterosexual, Partners of casual sex, Partners of FSW clients, Clients of FSW |
| Population service International (PSI), 2009 | Annual report | MSM |
| PSI, 2010 | Cross sectional Study | MSM, Partners of MSM |
| Direction Générale de la Statistique et de la Comptabilité Nationale 2010 | Population survey | Partners of FSW clients, Partners of casual sex, Stable heterosexual, Partners of MSM, Partners of IDU |
| Conseil National de Lutte contre le SIDA (CNLS) 2012 | Annual report | Partners of FSW clients, Partners of casual sex, Stable heterosexual, Partners of MSM, Partners of IDU |
| PNLS - Togo 2011 | Cross sectional Study | Casual sex, Partners of FSW clients |

| Table 3: average score of data availability | |
|--|---------------|
| Indicators | Average score |
| Injecting Drug Users | 62.5 |
| MSM | 62.5 |
| Sex Workers | 87.5 |
| Clients of Sex workers | 75.0 |
| Casual sex | 62.5 |
| Stable heterosexual couples | 62.5 |
| No risk | 62.5 |
| Average score | 68.7 |

Table 4: characteristics of risk population groups

| | VIH prevalence (%) | Number of PLWHA* | STI** prevalence (%) | Number of partners per year | Number of exposed acts per partner per year | Sex act protected (%) | PLWHA on ART*** (%) | HIV Incidence | % Incidence 95% CI | Incidence per 100,000 |
|-----------------------------|---------------------------|-------------------------|-----------------------------|------------------------------------|--|------------------------------|----------------------------|----------------------|---------------------------|------------------------------|
| Injecting Drug users (IDU) | 5.5 | 1 | 6.7 | 2 | 224 | 59.7 | 0 | 100 | 1.50 (0.39 – 2.69) | 6098 |
| Partners of IDU | 3.4 | 22 | - | 2 | 108 | 2.5 | 24.0 | 8 | 0.12 (0.05 – 0.08) | 1232 |
| Sex workers (SWs) | 13.1 | 1263 | 36.3 | 171 | 9 | 79.0 | 15.0 | 158 | 2.37 (1.17 – 4.17) | 1634 |
| Clients of SWs | 5.4 | 5392 | 6.8 | 15 | 9 | 61.0 | 10.0 | 478 | 7.20 (3.99 – 14.02) | 479 |
| Partners of SWs Clients | 3.1 | 263 | - | 1 | 108 | 2.5 | 30.0 | 47 | 0.71 (0.60 – 0.92) | 556 |
| MSM | 19.6 | 3204 | 27.0 | 4 | 10 | 72.0 | 10.0 | 458 | 6.90 (3.12 – 13.04) | 2804 |
| Female partners of MSM | 3.1 | 74 | - | 2 | 108 | 2.5 | 42.0 | 136 | 2.04 (1.15 – 2.41) | 5685 |
| Casual sex | 4.0 | 14909 | 5.0 | 3 | 108 | 57.0 | 20.0 | 931 | 14.01 (7.21 – 23.24) | 250 |
| Partners of casual sex | 3.1 | 1903 | - | 1 | 108 | 2.5 | 30.0 | 214 | 3.22 (2.71 – 4.14) | 349 |
| Stable heterosexual couples | 3.1 | 79561 | 3.0 | 1 | 108 | 2.5 | 35.3 | 4114 | 61.92 (46.9 – 71.71) | 160 |
| No risk | 0.0 | 1 | 0.0 | 0 | 0 | 0.0 | 24.0 | 0 | 0 (0,0 – 0,0) | 0 |
| Medical Injections | 3.1 | 0 | - | 1 | 1 | 100 | - | 0 | 0 (0,0 – 0,0) | 0 |
| Blood transfusion | 3.1 | 0 | - | 1 | 1 | 100 | - | 0 | 0 (0,0 – 0,0) | 0 |
| Total population | 3.3 | 106593 | - | - | - | - | 30.8 | 6643 | 100 | 203 |

* PLWHA: People living with HIV/AIDS; **STI: Sexual Transmitted Infections; ***ART: Anti retro Viral Treatment

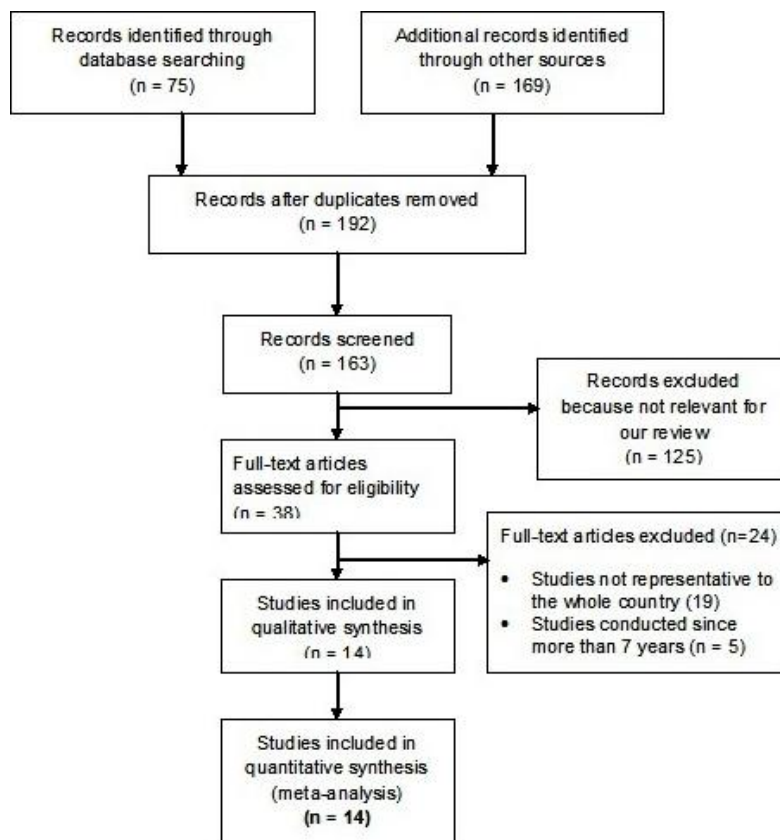


Figure 1: flow chart of identification and selection of studies for inclusion

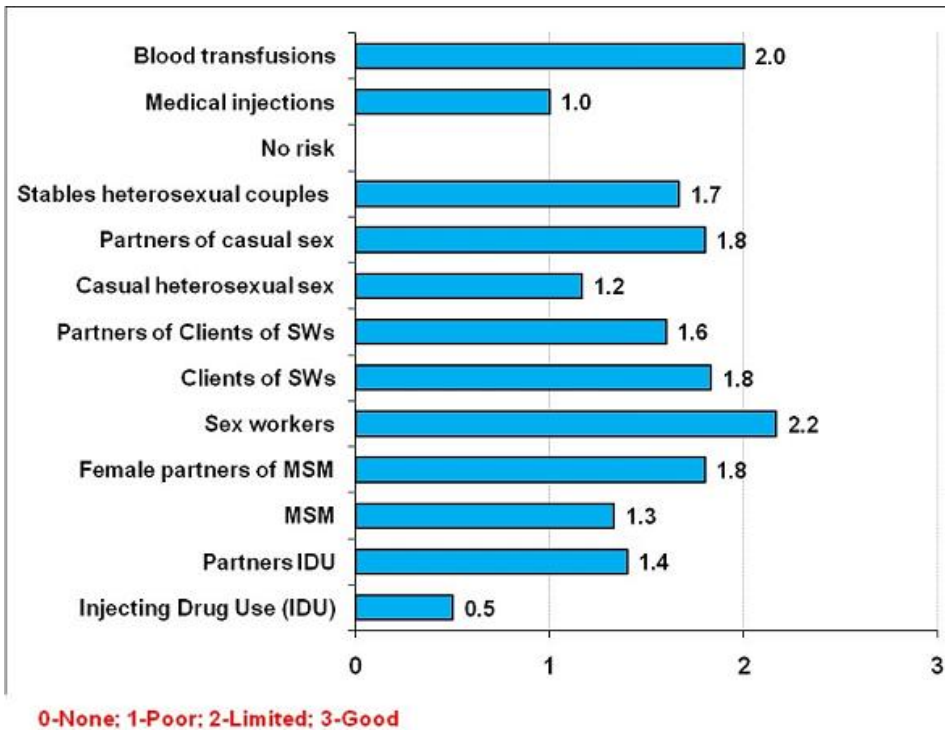


Figure 2: quality of data available by key risk population group

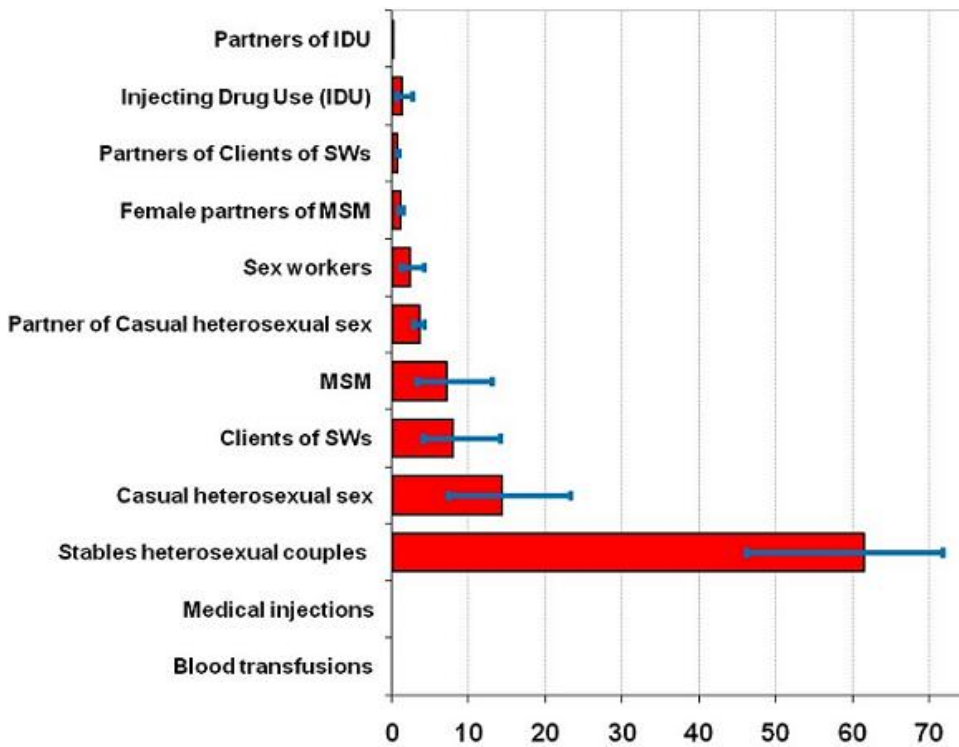


Figure 3: distribution of new infection by population group