



# Canadian and international recommendations on the frequency of HIV screening and testing: A systematic review

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## Abstract

**Background:** In 2014, the Public Health Agency of Canada estimated that 21% of the people living with human immunodeficiency virus (HIV) in Canada were unaware of their infection. Increased screening and testing for HIV is crucial to reducing the number of undiagnosed infections. To ensure the best use of available resources, it is important to determine the optimal intervals for HIV screening and testing.

**Objective:** To conduct a systematic review of the recommendations for the frequency of HIV screening and testing in different populations.

**Methods:** To identify eligible guidelines, a comprehensive two-tiered search strategy of journals and websites of governments and non-governmental organizations and a three-tiered screening strategy (title, abstract and full content screen) were used. Guidelines were eligible for inclusion if they, a) were published between 2000 and 2015 in English or French, and b) provided guidance on HIV screening/testing intervals for at least one population.

**Results:** Of the 609 documents retrieved from the search, 34 guidelines met the eligibility criteria. The most frequently mentioned populations were pregnant women, men who have sex with men (MSM) and the general population. Overall, there was consensus on at least annual testing for MSM, intravenous drug users, individuals with HIV-positive sex partners, individuals with multiple partners, sex workers and their clients, migrants from HIV-endemic countries and indigenous peoples. Of the 20 guidelines that provided recommendations for pregnant women, the most common recommendation (n=9) was to test as early as possible during each pregnancy; four guidelines recommended screening during the first prenatal visit; three recommended routine HIV testing; and four suggested retesting in the third trimester regardless of maternal risk of HIV infection. Consensus on HIV testing of the general public, incarcerated people and individuals diagnosed with other sexually transmitted infections (STIs) was lacking. Four guidelines cited a lack of data for not providing specific recommendations in the general population.

**Conclusions:** Additional evidence is needed to refine the recommendations for pregnant women and inform the optimal timing of HIV testing, especially in the general population, individuals diagnosed with other STIs and incarcerated people.

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## Introduction

Diagnosed and treated human immunodeficiency virus (HIV) infection is considered a chronic disease (1). Early detection and treatment of HIV is important not only for the individuals who are infected but also to prevent transmission of the virus (2). Clinical trials have shown that early initiation of HIV treatment reduces viral load, thereby decreasing infectivity and potentially preventing HIV transmission (3,4).

Low rates of screening and testing have been identified as a potential limiting factor in the success of HIV-prevention strategies (5,6). Approximately 30–50% of new infections are a result of individuals who are unaware of their infection (7,8). Research among men who have sex with men (MSM), injection drug users (IDUs) and heterosexual men and women indicates that once individuals learn of their HIV-positive status they are more likely to take steps to minimize the likelihood of transmission (9). However, it was estimated that at the end



of 2014, about 21% of people living with HIV in Canada were unaware of their infection (10).

The Public Health Agency of Canada (PHAC)'s *HIV Screening and Testing Guide* recommends HIV screening as part of routine care and annual testing for individuals involved in high-risk practices (2). In addition to MSM and IDU, other commonly identified risk groups for HIV infection include individuals with HIV-positive sex partners and individuals with multiple or anonymous partners (2,11-15).

However, the benefits and frequency of HIV testing must be weighed against costs, and there is a lack of clarity as to the ideal frequency of testing in other populations.

The objective of this systematic review was to address the question: What are the recommended intervals for HIV screening and testing among various population groups in Canada and elsewhere?

## Methods

### Search strategy

A research librarian–designed comprehensive search of electronic databases identified guidelines published in peer-reviewed journals. Government and non-governmental organization (NGO) websites were also searched to identify any guidelines that may have been posted but not published in the scientific literature. The electronic databases searched included MEDLINE, Embase, Scopus, Cochrane Library and the Canadian Electronic Library (CEL). See **Appendix 1** for a complete list of the government and NGO websites searched.

The search terms were the same for both types of searches: "HIV testing frequency," "HIV testing interval," "HIV guideline," "HIV testing guideline," "HIV screening," "HIV screening frequency," "HIV screening guideline," "HIV screening and testing guideline," "HIV screening and testing recommendations," "HIV screening recommendations," "HIV testing recommendations," "STI guidelines," "STI testing intervals" and "STI testing frequency." Search strings for the different databases are identified in **Appendix 2**.

Inclusion and exclusion criteria are listed in **Table 1**. The search was restricted to guidelines published or posted within the last 15 years to capture the influence of new HIV prevention methods (e.g., treatment as prevention [TasP]).

### Guideline selection

We conducted a three-tiered screening process: title screen, abstract screen and full content screen. Three authors (TA, GT and SH) independently screened the titles. Titles with the

**Table 1: Inclusion and exclusion criteria**

Item	Inclusion criteria	Exclusion criteria
Nature of recommendation	Provides position, recommendations or guidance on HIV testing intervals or frequency of testing (all populations and subgroups) Multiple recommendations published from the same organization (e.g., updates or addendums)	No mention of testing intervals or frequency of HIV testing Recommendations related to individuals who already have HIV (e.g., TB/HIV co-infection or HIV treatment/management)
Language of publication	English, French	Languages other than English and French
Date of publication	Recommendations published from January 2000 to August 2015	Guidelines published prior to January 2000

Abbreviations: HIV, human immunodeficiency virus; TB, tuberculosis

terms "guideline," "strategy," "directive," "recommendation," "guidance" or "position" were included. Guidelines on HIV treatment or the management of opportunistic infections and co-infected populations were excluded. Two authors (TA, GT) independently screened the abstracts and excluded those that did not refer to HIV screening and testing. Disagreements between reviewers at either stage were resolved through discussion with a third reviewer (KT) and a fourth, if required. Two authors (TA, GT) then completed the full content screen. Guidelines that did not provide specific information on the recommended frequency or intervals of HIV screening and testing for any population group were excluded. Only primary source guidelines were included. Guidelines were considered duplicates if the same recommendation was published in multiple locations or if an article summarized or endorsed a guideline.

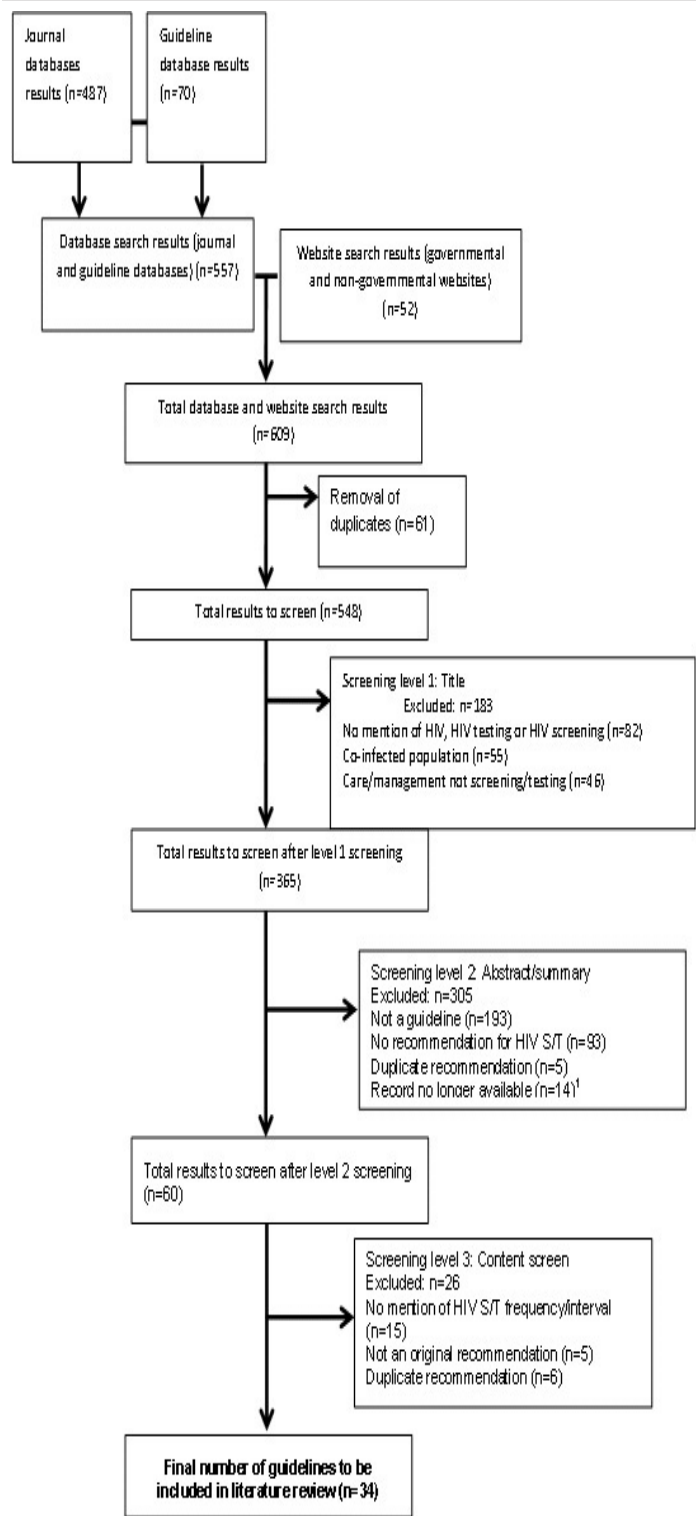
### Data extraction

Data were extracted on the country of publication, population screened and testing frequency. Guidelines were categorized as Canadian, foreign, or international (spanning multiple countries, such as those from the World Health Organization). The population groups initially targeted in this review were the general population, MSM and IDU, but other population groups were also noted.

## Results

A total of 609 documents were retrieved from the search. After duplicates were removed and inclusion/exclusion criteria applied, the final review included 34 guidelines (**Figure 1**).

**Figure 1: Screening methodology and final results flow chart**



Abbreviations: HIV, human immunodeficiency virus; S/T, screening/testing

<sup>1</sup> Refers to documents for which abstracts were identified but full texts were either unavailable or inaccessible

The characteristics of included guidelines are summarized in **Table 2**. Two-thirds (65%) came from the United States and Europe. In addition to the general population, MSM and IDU, several other key populations emerged: pregnant women, migrants from HIV-endemic regions, indigenous peoples, adolescents, incarcerated individuals, partners of unknown HIV status and others.

**Table 2: Overview of 34 guidelines on the frequency of HIV testing by geographic region and key populations groups**

Type	Characteristic	Number (%)
Geographic region	United States	12 (35)
	Europe	10 (29)
	Canada	5 (15)
	Africa	2 (6)
	Australia	2 (6)
	World Health Organization	2 (6)
	Asia	1 (3)
Key populations mentioned	Pregnant	20 (59)
	MSM	19 (56)
	General population	14 (41)
	IDU	13 (38)
	Multiple partners	7 (21)
	HIV-positive sex partner	7 (21)
	Other STI diagnosis	5 (15)
	Sex workers and their clients	4 (12)
	Migrants from HIV-endemic countries	4 (12)
	Indigenous peoples	3 (9)
	Adolescents	3 (9)
	Incarcerated individuals	3 (9)
	Transgender men and women	2 (6)
	Partner with unknown HIV status	2 (6)

Abbreviations: IDU, injection drug user; HIV, human immunodeficiency virus; MSM, men who have sex with men; STI, sexually transmitted infection

All 34 Canadian, foreign and international guidelines are summarized in **Table 3**. Of these, 9 provided recommendations only for high-risk groups and the remaining 25 provided recommendations for other risk groups (e.g., pregnant women and the general population). Five guidelines were updates to previous guidelines.



Table 3: Summarized Canadian, foreign and international HIV screening and testing frequency recommendations

Source	General	Pregnant	Multiple partners	HIV+ partner	MSM/MSM sex partner	IDU/IDU sex partner	Incarcerated individuals	Adolescents	Transgender men/women	Partner of unknown HIV status	Sex workers and their clients	Migrants from HIV-endemic countries	Indigenous peoples	Other STIs	
Canadian	Quebec (2011) (19)	NSR	First prenatal visit	More frequent	ALA	ALA	Annual risk evaluation	Annual risk evaluation	NSR	NSR	NSR	NSR	Annual risk evaluation	3-6 months	
	PHAC (2012) (2)	Normalized testing	First prenatal visit; repeat if high risk	NSR <sup>2</sup>	NSR <sup>2</sup>	NSR <sup>2</sup>	NSR <sup>2</sup>	NSR	NSR	NSR	NSR <sup>2</sup>	NSR	NSR	NSR	
	Ontario (2012) (32)	After high risk exposure	NSR	ALA	ALA	ALA	NSR	NSR	NSR	ALA	NSR	ALA	ALA	NSR	
	Saskatchewan (2014) (22)	Every 5 years	Routine prenatal care	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	British Columbia (2014) (20)	Routine; every 5 years	First prenatal visit; repeat if high risk	ALA	ALA	ALA	After incarceration	NSR	NSR	NSR	ALA	ALA	ALA	NSR	
	CDC (multiple years) (13,17,24,25,31,33,34)	Routine; re-test based on risk (1,3,17,25)	Each pregnancy (31); retest in 3 <sup>rd</sup> trimester (13,17,25,31)	ALA (13)	ALA (13)	ALA (13,17,31)	Routine (34)	Re-test based on risk (17)	Re-test based on behavioural history (17)	NSR	NSR	ALA (13)	NSR	NSR	Retest with new complaint (13)
	Seattle/King County (2001) (35)	NSR	NSR	NSR	NSR	ALA	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	UK (2006, 2008) (21,36)	Routine; retest after window (21,36)	Beginning of pregnancy (21)	NSR	NSR	ALA (21)	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	Liberia (2007) (37)	Re-test after window	Re-test in 3 <sup>rd</sup> trimester	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	Afghanistan (2008) (28)	Additional research needed	NSR	6-12 months	6-12 months	6-12 months	6-12 months	NSR	NSR	NSR	NSR	6-12 months	NSR	NSR	
Foreign	ACP/HIV Medicine Association (2009) (38)	Routine	Each pregnancy	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	France (2009) (29)	Routine; additional research needed	NSR	NSR	NSR	Annually (if multiple partners)	NSR	NSR	NSR	NSR	NSR	Annually (if sex partner is from HIV endemic region)	NSR	NSR	
	Central African Republic (2010) (39)	Routine testing at STI clinics	Beginning and end of each pregnancy	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	STIs in Gay Men Action Group (2010, 2014) (40,41)	NSR	NSR	NSR	NSR	ALA (40,41)	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	NICE (2011) (27,42)	Routine at specialised clinics (27)	NSR	NSR	Routine (27)	Annually (42); routine (27)	Routine (27)	NSR	NSR	NSR	NSR	Routine (27)	NSR	Routine (27)	
	New York (2011) (43)	NSR	Re-test 3 <sup>rd</sup> trimester	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	USPSTF (2014) (18)	No retest for low risk <sup>3</sup>	Every pregnancy	NSR <sup>3</sup>	NSR <sup>1</sup>	NSR <sup>1</sup>	NSR <sup>3</sup>	Screen for risk	NSR	NSR	NSR	NSR <sup>3</sup>	NSR <sup>1</sup>	NSR	
	ACOG (2015) (44)	NSR	Beginning of pregnancy; retest in 3 <sup>rd</sup> trimester	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	Europe (2008, 2014) (16,30)	Routine; additional research needed (16,30)	Routine (16)	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	WHO (2009, 2010) (15,45)	NSR	Beginning of pregnancy; repeat if high risk (15,45)	NSR	ALA (45)	ALA (15,45)	ALA (15,45)	NSR	NSR	ALA (45)	ALA (45)	ALA (15,45)	NSR	NSR	Re-test with new complaint (45)
International <sup>1</sup>	EMCDDA (2010) (14)	NSR	NSR	NSR	NSR	6-12 months	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	
	ECDC (2010, 2015) (23,26)	NSR	Routine (23)	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NSR	Routine (23)	

Abbreviations: ACOG, The American Congress of Obstetricians and Gynecologists; ACP/HIV, American College of Physicians and HIV Medicine Association; ALA, at least annually Common risk behaviours/risk groups; CDC, United States Centers for Disease Control and Prevention; ECDC, European Centre for Disease Prevention and Control; EMCDDA, European Monitoring Centre for Drugs and Drug Addiction; HW, human immunodeficiency virus; IDU, intravenous drug use; NSR, No Specific Recommendation; STI, sexually transmitted infection; USPSTF, United States Preventive Services Task Force; WHO, World Health Organization

<sup>1</sup> International = includes multiple countries such as those from the World Health Organization

<sup>2</sup> There is insufficient evidence to provide recommendations for the exact frequency of HIV testing for each scenario. More frequent STI testing for MSM with multiple anonymous partners, MSM who have sex in conjunction with illicit drug use or whose sex partners engage in similar activities

<sup>3</sup> Routine rescreening may not be necessary for individuals not at increased risk since last negative test



More recent guidelines have focused on routine testing (i.e., not recommending a specific testing interval but rather providing a recommendation to test everyone) with more frequent testing for individuals who engage in high-risk behaviours (2,16-18).

The most frequently mentioned populations were pregnant women, MSM and the general population. Of all 20 guidelines that provided recommendations for pregnant women, the most common recommendation (n=9) was to test as early as possible during each pregnancy; 4 guidelines recommended screening during the first prenatal visit (2,19-21); 3 recommended routine HIV testing (16,22,23); and 4 suggested retesting in the third trimester regardless of maternal risk of HIV infection (13,17,24,25).

Of the 19 guidelines that considered MSM, 14 provided a specific testing frequency, 3 recommended routine testing without specific testing intervals (23,26,27) and 2 cited insufficient evidence to determine a testing interval but recommended that MSM be screened more frequently (2,18). Altogether 14 recommended testing at least annually.

Testing at least annually was also the most common recommendation for IDU (11 of 13 guidelines), individuals with HIV-positive sex partners (6 of 7), individuals with multiple partners (4 of 7), sex workers and their clients (4 of 4), migrants from HIV-endemic countries (3 of 4) and indigenous peoples (2 of 3). Overall, the recommendations for frequency of testing higher-risk populations varied little.

Recommendations for the general population varied slightly. Some (2 of 14) focused on a specific time, whereas the majority (8 of 14) focused on routine or normalized testing without providing a specific interval (e.g., PHAC, European Union, Central African Republic). Four guidelines cited a lack of data as reason for not providing specific recommendations in the general population (16,28-30).

The guidelines differ regarding whether sufficient evidence exists to formulate testing frequency recommendations in certain populations (2,18,28,29). This is the case for both populations in which there is consistency across guideline recommendations (e.g., MSM and IDU), and for populations in which there was some consistency or no guideline (e.g., incarcerated people).

Guidelines for people diagnosed with STIs commonly recommend routine HIV testing (n=3) or re-testing with each new STI diagnosis (n=2). The emergence of this population in this review highlights STI diagnoses as a potential proxy for high-risk sexual behaviour and identifying individuals at higher risk for HIV infection.

The least frequently mentioned populations included incarcerated individuals, adolescents, individuals with partners of unknown HIV status, and transgender men and women.

## Discussion

This review identified 34 guidelines on the frequency of HIV testing. In addition to testing frequency recommendations for high-risk groups, several guidelines also included recommendations for the general population and pregnant

women, highlighting a shift from risk-based and targeted-testing (13,24,33,46) to incorporating HIV testing into routine care (2,13,16,18,21,32,39). There was good consensus that testing at least annually is recommended in higher-risk populations.

Most guidelines suggest testing early in pregnancy, and some recommend testing again in the third trimester. There is a lack of consensus on some subgroups (i.e., incarcerated individuals, the general population and individuals diagnosed with other STIs), and there appears to be insufficient evidence to make recommendations for the general population and incarcerated people. Differences in the recommendations for population groups may be a result of the varying types of evidence used to inform the guidelines.

Several factors should be considered when interpreting these results. The strengths of this review include a thorough search strategy, and consistent, objective assessment and data extraction of the studies. There are also a number of limitations. Guidelines that may have been published in languages other than French and English were not included in this review. Of note, there were few published guidelines from Asia and Africa. Since these regions have high HIV incidence and prevalence rates, guidelines from these regions were either not captured by our search parameters or there is a lack of guidance on the optimal intervals for HIV screening and testing in these regions.

Research is needed to examine and critically appraise the evidence for the frequency of HIV testing recommendations in various populations. Specific research could be aimed at identifying the optimal testing interval for the general population, for adolescents, for transgender men and women and for incarcerated people (47,48) as well as the optimal frequency of testing for indigenous peoples, ethnocultural communities with high incidences of HIV and domestic migrant workers.

In summary, HIV screening and testing is an extremely important tool within the continuum of HIV care. Although many guidelines have been developed to identify the ideal frequency of testing for different populations, there are inconsistencies among them and the evidence base for some populations appear to be lacking. Additional evidence to inform the optimal frequency of HIV screening and testing in different populations could strengthen the global efforts to eradicate this disease.

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## Conflict of interest

None.



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### Appendix 1: Websites searched

The website search was divided into national and international sites and government and non-governmental/stakeholder sites.

Type of website	Organization
National governmental	Public Health Agency of Canada Health Canada All Canadian provincial and territorial health departments
International governmental	United States Centers for Disease Control and Prevention (CDC) European Centre for Disease Prevention and Control (ECDC) National Institutes of Health (NIH) National Institute for Health and Care Excellence (NICE) Haute autorité de santé (HAS)/French National Authority for Health United Kingdom Department of Health Australian Department of Health New Zealand Ministry of Health Scottish Intercollegiate Guidelines Network (SIGN) Royal Australian College of General Practitioners (RACGP) Australasian Society for HIV Medicine (ASHM) British Association for Sexual Health and HIV (BASHH)
National non-governmental / stakeholder	Canadian Medical Association Canadian AIDS Treatment Information Exchange (CATIE) Canadian Task Force on Preventive Health Care (CTFPHC) Canadian AIDS Society (CAS) Association of Medical Microbiology and Infectious Disease Canada (AMMI Canada) Canadian Nurses Association (CNA) College of Family Physicians of Canada (CFPC) British Columbia Centre for Excellence in HIV/AIDS Canadian Treatment Action Council (CTAC) Canadian Association of Nurses in HIV/AIDS Care (CANAC) Registered Nurses' Association of Ontario (RNAO)
International non-governmental / stakeholder	Joint United Nations Programme on HIV/AIDS (UNAIDS) World Health Organization (WHO) (accessed recommendations from Asia and Africa) British HIV Association (BHIVA) European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) United States Preventive Services Task Force (USPSTF) International AIDS Society (IAS) International Association of Providers of AIDS Care (IAPAC) Infectious Diseases Society of America (IDSA) Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) European AIDS Clinical Society (EACS)

### Appendix 2: Database search strings

#### MEDLINE search string

Database(s): Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present

No.	Searches	Results
1	(hiv or human immunodeficiency or human immune deficiency or vih).ti.	188944
2	exp *HIV Infections/ or exp *HIV/ or exp HIV Infections/ep	246368
3	(hiv positive* or hiv+ or vih positi* or vih+).ti.	161297
4	1 or 2 or 3	272101
5	exp Mass Screening/	106834
6	((frequency or schedule or interval?).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier])	1348682
7	((guideline? or recommendation? or policy).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier])	614880
8	[(Testing or screening) adj5 (frequency or interval or guideline? or recommendation?).ti,hw.	2834
9	4 and 7 and 8	178
10	4 and 5 and 6 and 7	94
11	9 or 10	265
12	10 not 9	87
13	[(Testing or screening) adj6 (frequency or interval or guideline? or recommendation?).ti,hw.	4611
14	4 and 7 and 13	238
15	14 not 9	60
16	limit 14 to (yr="2000 -Current" and (english or french))	182

Abbreviation: No., Number

#### Scopus search string

Scopus OECD ( TITLE ( hiv OR aids OR vih ) AND ( TITLE-ABS-KEY ( hiv OR aids OR vih ) W/6 ( testing OR screening ) W/6 ( frequency OR interval\* OR guidelin\* OR recommendation ) ) ) AND TITLE-ABS-KEY ( guidelin\* OR recommendation\* ) PUBYEAR > 2000 ) AND ( TITLE-ABS-KEY ( spain OR slovakia OR poland OR portugal OR greece OR germany OR france OR finland OR denmark OR "Czech Republic" OR canad\* OR belgium OR austria OR australia OR norway OR "New Zealand" OR netherlands OR mexico OR luxembourg OR korea OR japan OR italy OR iceland OR hungary OR ireland OR "United States" OR great-britain OR "United Kingdom" OR turkey OR switzerland OR sweden ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "French" ) ) 284



**Embase search string**

Database(s): Embase 1974 to 2015 September 21

No.	Searches	Results
1	(Spain or Slovakia or Poland or Portugal or Greece or Germany or France or Finland or Denmark or Czech-Republic or Canada or Belgium or Austria or Australia or Norway or New-Zealand or Netherlands or Mexico or Luxembourg or Korea or Japan or Italy or Iceland or Hungary or Ireland or United-States or Great-Britain or Turkey or Switzerland or Sweden).mp.	3697234
2	(hiv or human immunodeficiency or human immune deficiency or vih).ti.	213771
3	exp *Human immunodeficiency virus/	75032
4	Human immunodeficiency virus infection/ep	32614
5	*Human immunodeficiency virus infection/	154397
6	2 or 3 or 4 or 5	258779
7	exp mass screening/	174825
8	(frequency or schedule or interval?).mp.	1558540
9	(guideline? or recommendation? or policy).mp.	917993
10	6 and 7 and 8 and 9	62
11	[(Testing or screening) adj6 (frequency or interval or guideline? or recommendation?).ti,hw.	6001
12	6 and 9 and 11	313
13	1 and 12	123
14	12 not 13	190
15	limit 12 to [(english or french) and yr="2000 -Current"]]	245

Abbreviation: No., Number

**Cochrane library search string**

"hiv".ti and "interval".ti and "guideline".ti and "recommendation".ti Publication Year from 2000 to 2015 (Word variation have been searched)

**Canadian electronic library search string**

Canadian Electronic Library: Canadian Publishers Collection, Canadian Public Policy Collection, Canadian Health Research Collection

Title: HIV AND all:screening OR Testing

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