



ESP CASE DETECTION ALGORITHM

Human Immunodeficiency Virus (HIV)

Document Version 3.3

Prepared by the Department of Population Medicine at Harvard Medical School and Harvard Pilgrim Health Care Institute on behalf of the Massachusetts Department of Public Health.

esphealth@harvardpilgrim.org

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Modification History

| Version | Date | Modification | By |
|---------|------------|---|----------|
| 3.3 | 10/7/2021 | <ul style="list-style-type: none"> Replaced hiv_geenius with new abstract lab name hiv_ab_diff Clarified wording for 3 meds criteria Added abstract lab names to lab mapping table Updated lab mapping table to separate out historical labs Updates to entire lab mapping table for descriptions, positive results, etc. Corrected Lab Table Label (from 4 to 5) | CII/DPM |
| 3.2 | 1/10/2020 | Added new HIV medications | CII/DPM |
| 3.1 | 1/8/2020 | Added new HIV medications | DPM |
| 3.0 | 3/1/2019 | Added new provider reporting fields | DPM |
| 2.5.1 | 1/24/2018 | Added new HIV medication | DPM |
| 2.5 | 9/14/2018 | Added additional OI diagnosis codes | MDPH/DPM |
| 2.4 | 12/8/2017 | <ul style="list-style-type: none"> Removed site-specific language Indicated which variables are not yet being reported via ESP. Added reporting time frames for lab results and medications. | DPM |
| 2.32 | 10/11/2017 | Added ESP Logo and MDPH branding, formatting | DPM |
| 2.31 | 10/4/2017 | Transferred to updated algorithm template | DPM |
| 2.3 | 7/14/2017 | Added Multispot and Geenius tests to case criteria | MDPH/DPM |
| 2.2 | 3/15/2017 | <ul style="list-style-type: none"> Added modified criteria to revoke a case. Minor modifications to reportable diagnosis codes. | DPM |
| 2.1 | 10/20/2016 | Removed criteria to revoke a case. | DPM |
| 2.0 | 9/22/2016 | <ul style="list-style-type: none"> Added conditions to the case criteria. Increased RNA Viral Load threshold. Increased timeframe in which 3 different antivirals can occur. | DPM |
| 1.0 | 5/10/2016 | Original circulated version. | DPM |



Section 1. Overview

The purpose of this document is to describe the criteria used to identify and report Human Immunodeficiency Virus (HIV) cases and their continuum of care from electronic medical records (EMR) using ESP and report them to the Massachusetts Department of Public Health (MDPH). In addition, ESP will provide follow-up reports for subsequent events relevant to the continuum of care (e.g., serial CD4 and viral load testing, HIV treatment, etc.).

Section 2. Criteria used to identify cases using ESP data

I. CASE TYPES

This algorithm was developed to identify both new and prevalent HIV cases. Once identified, additional information will be captured on each case on an ongoing basis to evaluate the continuum of care.

II. TIME WINDOW

Once HIV is acquired, cases are considered to be active lifelong. Thus, there is no recurrence window for this disease.

III. CASE CRITERIA

Classify patient as HIV positive if any of the following conditions are true:

- A. Positive Western Blot, Multispot, or Antibody Differentiation test result
 - a. Western Blot & Multispot are deprecated labs. Used only for historical case detection on historical labs.
- B. Positive HIV Antigen/Antibody test AND positive HIV ELISA (any time window)
- C. HIV RNA Viral Load > 200 copies/mL.
- D. HIV Qualitative PCR
- E. ≥ 2 ICD codes for HIV and history of prescription for ≥ 3 HIV meds ever
- F. HIV on problem list and history of prescription for ≥ 3 HIV meds ever
- G. Concurrent prescriptions for 3 or more *different* antiretrovirals for at least 1 month
 1. If patient prescribed combo pill then count as 2 or 3 meds as appropriate
 2. Rationale for prescription criteria:
 - a. Need med-based detection to capture patients on treatment with negative viral loads (since they'd be classified as negative using lab criteria alone)
 - b. 3 meds prescribed over two intervals at least 30 days apart to exclude patients on treatment for hepatitis B and patients receiving pre- or post-exposure prophylaxis
 3. Two approaches to meeting this criteria are valid: (a) based on the frequency and number of pills dispensed or (b) two start dates for each of 3 or more antiretrovirals at least 30 days apart but no more than 400 days apart.
 - a. The start dates for any set of 3 drugs need not be the same. For example, if 2 drugs are started Jan 1, and the 3rd drug is started Jan 10, this would count as meeting the 3 or more meds criteria as of Jan 10.
 - b. The sets of prescriptions for 3 or more antiretrovirals need not be for the same combination of drugs.



*See [Section 4](#) for codes used to define each component.

I. CRITERIA TO REVOKE A CASE

For patients meeting criteria (e), (f), or (g) above, a case should be revoked (i.e., classified as HIV negative) if he/she subsequently has a negative ELISA or negative Ag/Ab. If there are ≥ 2 ELISA or Ag/Ab results on the same day, then only revoke if all tests are negative. Note, however, that these patients are eligible to become cases again if they subsequently meet one of the above criteria.

Section 3. Specifications for reporting diseases/conditions to the Massachusetts Department of Public Health

I. INITIAL CASE REPORTING CRITERIA

All cases will be reported to MDPH upon initial detection.

II. CASE REPORT UPDATE CRITERIA

A repeat report will be sent to MDPH whenever any of the following occur:

1. New CD4 test result
2. New viral load test result
3. Prescription for HIV med (new meds, not a renewal)
4. Encounter with diagnosis code for HIV
5. Encounter with a diagnosis code for an opportunistic infection

III. DATA TO INCLUDE IN INITIAL REPORTS TO MDPH

A. Demographic

| | |
|------------------------|---|
| Name | Last, first, middle |
| Date of birth | yyyy/mm/dd |
| Social security number | Last 4 digits |
| Gender | Male / Female |
| Race | American Indian / Asian / Black / White / Other / Unknown |
| Ethnicity | Hispanic / Non-Hispanic / Unknown |
| Address | Line 1, line 2, city, state, zip, country |
| Phone | xxx-xxx-xxxx |
| Language spoken | |
| Medical record number | |
| PCP | Name, office address, phone number, email |
| Country of birth | |
| Housing status | |
| Insurance status | |

B. Lab Ordering Facility Information



| | |
|-------------------------|----------------------------------|
| Facility name | |
| Facility address | Line 1, line 2, city, state, zip |
| Facility contact person | |
| Contact person email | |
| Contact person phone | xxx-xxx-xxxx |
| Facility phone | xxx-xxx-xxxx |
| Facility NPI | |

C. Encounter Data

See [Table 5](#) below for the NA codes to send provider fields in HL7 messages

| | |
|--------------------------------------|---|
| Lab test ordering provider | Name and NPI |
| Prescribing provider | Name and NPI |
| Primary care provider | Name and NPI |
| Managing treatment provider | Name and NPI |
| Treatment encounter facility name | |
| Treatment encounter facility address | Line 1, line 2, city, state, zip |
| Treatment encounter facility NPI | |
| HIV visit date | Date of most recent encounter with an HIV code and all encounters following case identification |

D. Laboratory Results

Report results within 30 days prior to the day on which case established and any time after the case date.

Include test dates.

| | |
|----------------------------------|--------------------|
| HIV Antigen/Antibody Screen | |
| HIV ELISA Test (Antibody Screen) | |
| Western Blot | |
| Multispot | |
| Geenius | |
| HIV Quantitative RNA Viral Load | Most recent result |
| HIV Qualitative PCR | |
| CD4 Count | Most recent result |

E. Pregnancy

| | |
|---------------------------------|-----------|
| Pregnancy flag active | Yes or No |
| Expected Date of Delivery (EDD) | |

F. Medications

Report all medications from the specified ARV and OI medications lists given with 30 days prior to the case date and any time after the case date.

| | |
|---|---|
| Treatment given | Yes or No |
| Current prescription for HIV medication | Text string including medication name, dose, frequency, and duration (calculated using start and end date). See Table 3 for specific medications. |



| | |
|---|--|
| Currently prescribed prophylactic medications | Text string including medication name, dose, frequency, and duration (calculated using start and end date). See Table 4 for specific medications. Note: <i>OI medications will not be reported upon initial implementation. Modifications will need to be made in ESP to send these medications separately from the above.</i> |
| Treatment date | Date on which each prescription was ordered. |

G. Opportunistic Infections

If a diagnosis code for an opportunistic infection (see Table 2, below) are present within 30 days prior to case establishment, then report the following:

| | |
|--|-----------------------------|
| Infection name | See Table 2 |
| Date of last encounter with diagnosis code for opportunistic infection | |

H. Variables requiring further exploration

Several variables of interest for HIV still need to be explored with clinical providers. The following items are still under discussion, but will not hold up initial implementation.

| Variable | Question in MAVEN | Status |
|--------------------|--|--|
| Income level | "Income level as a percentage of poverty" | In the ESP model, but current reporting providers do not have this in their ESP data. Need to work with providers to understand if/how this information is captured. |
| Insurance type | "Type of health insurance?" | |
| Housing status | "Official Residence Type" | |
| Country of origin | "Country of birth" | |
| Sex risk | "HIV related risk" | Needs to be added to the ESP model and added by all providers. |
| Transgender status | "Gender" | Current reporting providers need to add "Transgender" as an option for gender in the ESP model. |
| Others | <ul style="list-style-type: none"> "Did the case attend their last scheduled HIV appointment?" "Was resistance testing performed prior to initiating ARV?" "Was the patient provided with risk reduction counseling?" "Was patient referred to health department for partner services?" "Date of HIV Care Coordination Event" (separate from "HIV clinical visit date") | Need to work with providers to understand if/how this information is captured. These variables would need to be added to the ESP model. |



Section 4. Codes, laboratory tests, and medications used to identify criteria listed in Sections 1 and 2.

I. DIAGNOSES CODES

Table 1. Diagnosis Codes Used to Identify HIV

| Code Type | Code | Description |
|-----------|---------|--|
| ICD-9-CM | 042 | HIV disease |
| ICD-9-CM | V08 | Asymptomatic HIV infection status |
| ICD-10-CM | B20-B24 | Human immunodeficiency virus (HIV) disease |
| ICD-10-CM | Z21 | Asymptomatic HIV infection status |
| ICD-10-CM | B97.35 | Human immunodeficiency virus, type 2 [HIV 2] as the cause of diseases classified elsewhere |
| ICD-10-CM | O98.7 | HIV complicating pregnancy or childbirth |

Table 2. Diagnosis Codes Used to define Opportunistic Infection

| Code Type | Code | Description |
|-----------|--|--|
| ICD-9-CM | 136.3 | PCP pneumonia |
| ICD-10-CM | B59 | PCP pneumonia |
| ICD-9-CM | 130.* | Toxoplasmosis |
| ICD-10-CM | B58, B58.2, B58.9 | Toxoplasmosis |
| ICD-9-CM | 117.5, 321.0 | Cryptococcus and Cryptococcal meningitis |
| ICD-10-CM | B45, B45.0, B45.1, B45.2, B45.3, B45.7, B45.8, B45.9 | Cryptococcus and Cryptococcal meningitis |
| ICD-9-CM | 007.4 | Cryptosporidiosis |
| ICD-10-CM | A07.2 | Cryptosporidiosis |
| ICD-9-CM | 010-018 | Tuberculosis |
| ICD-10-CM | A15-A19.9 | Tuberculosis |
| ICD-9-CM | 112.0 | Candidiasis of mouth |
| ICD-9-CM | 112.4 | Candidiasis of lung |
| ICD-9-CM | 112.5 | Disseminated candidiasis |
| ICD-9-CM | 112.84 | Candidal esophagitis |
| ICD-10-CM | B37.0 | Candidal stomatitis |
| ICD-10-CM | B37.1 | Pulmonary candidiasis |
| ICD-10-CM | B37.81 | Candidal esophagitis |
| ICD-10-CM | B37.83 | Candidal cheilitis |
| ICD-9-CM | 031.2 | Disseminated MAC |
| ICD-10-CM | A31.2 | Disseminated MAC |
| ICD-10-CM | A31, A31.0, A31.1, A31.8, A31.9 | Mycobacterium infection |
| ICD-9-CM | 046.3 | Progressive multifocal leukencephalopathy (JC Virus) |
| ICD-10-CM | A81.2 | Progressive multifocal leukencephalopathy (JC Virus) |
| ICD-10-CM | D06, D06.0, D06.1, D06.7, D06.9 | Invasive cervical carcinoma |



| | | |
|-----------|--|--|
| ICD-10-CM | B38, B38.0, B38.1, B38.2, B38.3, B38.4, B38.7, B38.8, B38.81, B38.89, B38.9 | Coccidioidomycosis |
| ICD-10-CM | B25.0, B25.2, B25.8, B25.9 | Cytomegalovirus disease |
| ICD-10-CM | G93.40, G93.49 | Encephalopathy |
| ICD-10-CM | B00, B00.0, B00.1, B00.2, B00.3, B00.4, B00.5, B00.50, B00.51, B00.52, B00.53, B00.59, B00.7, B00.8, B00.81, B00.82, B00.89, B00.9 | Herpesviral infection |
| ICD-10-CM | B39, B39.0, B39.1, B39.2, B39.3, B39.4, B39.5, B39.9 | Histoplasmosis |
| ICD-10-CM | A07.3 | Isosporiasis |
| ICD-10-CM | C46, C46.0, C46.1, C46.2, C46.3, C46.4, C46.5, C46.50, C46.51, C46.52, C46.7, C46.9 | Kaposi sarcoma |
| ICD-10-CM | J84.2 | Lymphoid interstitial pneumonia |
| ICD-10-CM | C83.70, C83.71, C83.72, C83.73, C83.74, C83.75, C83.76, C83.77, C83.78, C83.79 | Burkitt lymphoma |
| ICD-10-CM | C83.30, C83.39, C83.80, C83.89 | Diffuse large B-cell lymphoma |
| ICD-10-CM | J09.X1, J10.0, J11.0, J12, J12.0, J12.1, J12.2, J12.3, J12.8, J12.81, J12.89, J12.9, J13, J16, J16.0, J16.8, J17, J18, J18.0, J18.1, J18.2, J18.8, J18.9 | Recurrent pneumonia |
| ICD-10-CM | A02.1 | Salmonella sepsis |
| ICD-10-CM | A81.2 | Progressive multifocal leukoencephalopathy |
| ICD-10-CM | R64, M62.5, M62.50, M62.58, M62.59 | Wasting syndrome |

II. MEDICATIONS

Table 3. HIV Medications

| Drug Class | Generic Name | Brand Name |
|------------|---------------------------|------------|
| NRTI | Zidovudine (AZT) | Retrovir |
| | Didanosine (DDI) | Videx |
| | Stavudine (D4T) | Zerit |
| | Lamivudine (3TC) | Epivir |
| | Emtricitabine (FTC) | Emtriva |
| | Tenofovir (TDF) | Viread |
| | Abacavir (ABC) | Ziagen |
| | Tenofovir + Emtricitabine | Truvada |
| | Zidovudine + Lamivudine | Combivir |



| | | |
|------------------------|---|------------------|
| | Abacavir + Lamivudine | Epzicom |
| | Abacavir + Lamivudine + Zidovudine | Trizivir |
| | Emtricitabine + Tenofovir alafenamide | Descovy |
| NNRTIs | Efavirenz | Sustiva |
| | Nivirapine | Viramune |
| | Rilpivirine | Eduvant |
| | Etravirine | Intelence |
| | Delavirdine | Rescriptor |
| | Doravirine | Pifeltro |
| Integrase Inhibitors | Raltegravir | Isentress |
| | Dolutegravir | Tivicay |
| | Elvitegravir | |
| Fusion Inhibitors | Enfuvirtide | Fuzeon |
| | Maraviroc | Selzentry |
| Protease Inhibitors | Tipranavir | Aptivus |
| | Ritonavir | Norvir |
| | Indinavir | Crixivan |
| | Darunavir | Prezista |
| | Saquinavir | Invirase |
| | Atazanavir | Reyataz |
| | Nelfinavir | Viracept |
| | Fosamprenavir | Lexiva |
| | Lopinavir + Ritonavir | Kaletra |
| Single Tablet Combos | Efavirenz + Tenofovir + Emtricitabine | Atripla |
| | Rilpivirine + Tenofovir + Emtricitabine | Complera |
| | Dolutegravir + Abacavir + Lamivudine | Triumeq |
| | Elvitegravir + Cobicistat + Tenofovir + Emtricitabine | Stribild |
| | Dolutegravir + Cobicistat | Prezcobix |
| | Bictegravir + Emtricitabine + Tenofovir alafenamide | Biktarvy |
| | Elvitegravir + Cobicistat + Emtricitabine + Tenofovir alafenamide | Genvoya |
| | Emtricitabine + Rilpivirine + Tenofovir alafenamide | Odefsey |
| | Darunavir + Cobicistat + Emtricitabine + Tenofovir | Symtuza |
| | Efavirenz + Lamivudine + Tenofovir | Symfi / Symfi Lo |
| | Dolutegravir + Lamivudine | Dovato |
| | Atazanavir + Cobicistat | Evotaz |
| | Dolutegravir + Rilpivirine | Juluca |
| | Doravirine + Lamivudine + Tenofovir | Delstrigo |
| Lamivudine + Tenofovir | Cimduo | |



Table 4. Medications for Primary Prevention of Opportunistic Infections

| Infection | Generic Name | Brand Name |
|---------------|---------------|----------------------|
| Pneumocystis | TMP-SMX | Bactrim |
| | Dapsone | None (?) |
| | Pyrimethamine | Daraprim |
| | Atovaquone | Mepron |
| | Pentamidine | Nebupent, Pentam 300 |
| Toxoplasmosis | TMP-SMX | |
| | Dapsone | |
| | Pyrimethamine | |
| MAC | Azithromycin | Zithromax, Zmax |

III. LABORATORY TESTS LOINCS

Table 5. Laboratory Test LOINC Mapping

| ESP Lab | Component Name | LOINC | LOINC Name | Positive Result |
|---------------|--|---------|--|--|
| hiv_ag_ab | Antigen/antibody combination immunoassay | 56888-1 | HIV 1+2 Ab+HIV1 p24 Ag : ACnc : Pt : Ser : Ord : EIA | Positive Reactive Confirmatory testing is required |
| hiv_elisa | Antibody, HIV1 | 29327-4 | HIV1 Ab : ACnc : Pt : Body fld : QI : Ord | Reactive Positive |
| hiv_elisa | Antibody, HIV2 | 30361-0 | HIV2 Ab [Presence] : ACnc : Pt : Ser : QI : Ord : EIA | Reactive Positive |
| hiv_elisa | Antibody, HIV1+2 | 43010-8 | HIV 1+2 Ab [Presence]: ACnc : Pt : XXX : Ord | Reactive Positive |
| cd4 | CD4 (#/volume) | 32515-9 | Deprecated CD4 cells [# /volume]: NCnc : Pt: XXX : Qn | N/A |
| cd4 | CD4 (/100cells) | 32516-7 | Deprecated CD4 cells [/100 Cells] : NFr : Pt: XXX : Qn | N/A |
| hiv_pcr | HIV Qualitative RNA/DNA HIV Qualitative PCR | 5018-7 | HIV 1 RNA [Presence] : ACnc : Pt : XXX : Ord : Probe.amp.tar | Detected |
| hiv_rna_viral | Quantitative Viral Load | 25836-8 | HIV 1 RNA [# /volume] (viral load) : NCnc : Pt : XXX : Probe.amp.tar | > 200 copies/mL |
| hiv_ab_diff | HIV 1/2 Antibody Confirmation/Differentiation | 80203-3 | HIV 1 and 2 Ab [Identifier] in Serum, Plasma or Blood by Rapid immunoassay | HIV-1 Positive HIV-2 Positive HIV-2 Positive with HIV-1 cross reactivity Positive |
| hiv_ab_diff | HIV 1 Antibody Differentiation | 68961-2 | HIV 1 Ab [Presence] in Serum, Plasma or Blood by Rapid immunoassay | Positive |



| | | | | |
|---|--------------------------------|---------|--|--------------------------------------|
| hiv_ab_diff | HIV 2 Antibody Differentiation | 81641-3 | HIV 2 Ab [Presence] in Serum, Plasma or Blood by Rapid immunoassay | Positive |
| Deprecated Labs – Used Only For Historical Labs & Case Detection | | | | |
| hiv_wb | Western Blot, HIV1+2 | 43185-8 | HIV 1 & 2 Ab band pattern [interpretation] : Imp : Pt : Ser : Nom : IB | |
| hiv_wb | Western Blot, HIV1 | 34592-6 | HIV 1 Ab [Presence] : ACnc : Pt : Body fld : Ord : IB | |
| hiv_wb | Western Blot, HIV2 | 5225-8 | HIV 2 Ab [Presence] : ACnc : Pt : Ser : Ord : IB | |
| hiv_multispot | Differentiating Multispot | 69668-2 | HIV 1 and 2 Ab [Identifier] in Serum or Plasma by Rapid immunoassay | HIV Type 1 HIV Type 2 Positive |

IV. NA CODES

Table 5. NA Codes for provider reporting fields

| NA code | Description |
|---------|--------------------------------------|
| NA-1746 | Prescribing provider name |
| NA-1747 | Prescribing provider NPI |
| NA-1748 | Treatment encounter facility name |
| NA-1749 | Treatment encounter facility address |
| NA-1750 | Treatment encounter facility city |
| NA-1751 | Treatment encounter facility state |
| NA-1752 | Treatment encounter facility NPI |
| NA-1753 | Primary care provider name |
| NA-1754 | Primary care provider NPI |
| NA-1755 | Ordering provider name |
| NA-1756 | Ordering provider NPI |
| NA-1757 | Lab ordering facility name |
| NA-1758 | Lab ordering facility address |
| NA-1759 | Lab ordering facility city |
| NA-1760 | Lab ordering facility state |
| NA-1761 | Lab ordering facility NPI |
| NA-1762 | Managing treatment provider name |
| NA-1763 | Managing treatment provider NPI |

V. CODE MAINTENANCE STRATEGY

Search all incoming new labs for strings that might indicate relevance to HIV including:

- HIV
- Immunodef
- CD4