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Completeness of HIV reporting on death certificates for Floridians reported with HIV infection, 2000-2011

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Abstract

HIV mortality is used as a key measure to monitor the impact of HIV throughout the world. It is important that HIV be correctly recorded on death certificates so that the burden of HIV mortality can be tracked accurately. The objective of this study was to determine the extent of failure to correctly report HIV on death certificates and examine patterns of incompleteness by demographic factors. Causes of death on death certificates of people infected with HIV reported to the Florida HIV surveillance system 2000–2011 were analyzed to determine the proportion without mention of HIV who had an underlying cause of death suggestive of HIV based on World Health Organization recommendations. Of the 11,989 deaths, 8,089 (67.5%) had an HIV code (B20-24,

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R75) as any of the causes of death, 3,091 (25.8%) had no mention of HIV and the underlying cause was not suggestive of HIV, and 809 (6.7%) had no mention of HIV but the underlying cause was suggestive of HIV. Therefore, 9.1% (809/8898) of probable HIV-related deaths had no mention of HIV on the death certificate. Dying within 1 month of HIV diagnosis was the factor most strongly associated with no mention of HIV when the underlying cause was suggestive of HIV on the death certificate. The results suggest that HIV mortality using only vital records may underestimate actual HIV mortality by approximately 9%. Efforts to reduce incompleteness of reporting of HIV on death certificates could improve HIV-related mortality estimates.

Keywords

HIV; mortality; vital statistics; cause of death

BACKGROUND

Human immunodeficiency virus (HIV) mortality data are used to monitor the impact of HIV throughout the world (World Health Organization, 2011); in the United States, it is also used in community assessment and planning (Centers for Disease Control & Prevention and Health Resources and Services Administration, 2014). Thus, it is important that HIV be correctly recorded on death certificates so that the burden of HIV mortality can be tracked accurately over time and among population groups and geographic areas. Only two studies were identified that reported the extent of HIV reporting on a death certificate (Hessol et al, 1992; Sackoff, Hanna, Pfeiffer, & Torian, 2006), and only one analyzed deaths in the highly active antiretroviral therapy era (Sackoff, Hanna, Pfeiffer, & Torian, 2006). The objective of this study was to determine the completeness of HIV mention on death certificates and patterns of completeness by demographic factors in Florida.

METHODS

HIV cases in the Florida Department of Health Enhanced HIV/Acquired Immunodeficiency Syndrome (AIDS) Surveillance System (eHARS) diagnosed during 2000–2011 were linked with Florida vital records data for deaths through 2011 to obtain vital status, multiple causes of death, and significant conditions. The causes and conditions were coded by the Florida Bureau of Vital Statistics with the International Classification of Diseases, Tenth Revision (ICD-10) (World Health Organization, 2014). Records with deaths outside Florida were excluded due to incomplete data on causes of death and because reporting practices are likely to vary by state.

The vital records of people in eHARS were classified into three groups. The first included records with mention of HIV on death certificate as defined by an ICD-10 code B20-B24 (“HIV disease”) or R75 (“laboratory evidence of HIV”), in any cause or significant condition. The second group, to be referred to as “NMUCs”, included death records with no mention of HIV infection, but had an UC that was suggestive of HIV disease. (An UC according to the ICD system is defined as “the disease or injury which initiated the train of morbid events leading directly to death...” [UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance, 2014]). The NMUC group (see ICD-10 codes in Appendix

1) was defined as having an UC for which the World Health Organization recommends use of HIV disease codes (B20-B24) in a person with HIV infection (UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance, 2014). For example, *Pneumocystis jirovecii* pneumonia in a person with an HIV infection should be coded as B20.6 (“HIV disease resulting in *Pneumocystis jirovecii* pneumonia”), not B59 (“pneumocystosis”). Deaths with UC codes of “immunodeficiency, unspecified” (D84.9) and “disorder involving the immune system, unspecified” (D89.9) were classified as NMUCs because they were deemed suggestive of HIV disease. The third group included those with no mention of HIV infection (i.e. no B20-B24 or R75) and no UC suggestive of HIV on death certificate.

Demographic variables (age at time of death, race/ethnicity, and country of birth) and reported mode of HIV transmission were obtained from eHARS. These variables are obtained from health care providers and laboratories that report the cases. Five-year estimates of percentage of people living under the U.S. federal poverty level (U.S. Census Bureau 2015) for the ZIP code of residence at time of death, which served as a proxy for individual-level poverty, were obtained from the 2007–2011 American Community Survey (US Census Bureau, 2013a). These estimates were linked to the surveillance data using the ZIP code tabulation area (ZCTA)(an approximation of ZIP code) (US Census Bureau, 2013b). The rural/urban status of the ZIP code was based on categorization C of Version 2.0 Rural-Urban Categorization (RUCA) data codes (Hart, Larsen, & Lishner, 2005; WWAMI Rural Health Research Center, 2013).

Demographic characteristics of decedents in the first two groups (HIV mentioned and NMUCs) were compared. A multi-level, multivariable logistic regression model with NMUCs as the dependent variable using the GLIMMIX procedure in SAS was run. Clustering within the ZCTA was accounted for through random intercepts. Independent variables were characteristics associated with ‘mention of HIV’ in the bivariate analysis based on a level of significance $\alpha < 0.25$ (Hosmer & Lemeshow, 2000). Analyses were conducted using SAS 9.3 (SAS 2010). The institutional review boards of Florida International University and the Florida Department of Health approved this study.

RESULTS

Of the 11,989 deaths in Florida among people reported to have HIV infection during 2000–2011 with an underlying cause of death code, 8,089 (67.5%) had an HIV code (B20–24, R75) as any of the causes of death or significant conditions including 7,291 with an UC of HIV (B20–B24: $n = 7,288$; R75: $n = 3$) (Table 1). An additional 809 (6.7%) were NMUCs. Therefore, 9.1% (809/8898) of probable HIV-related deaths were NMUCs.

In bivariate analyses, sex and rural/urban residence were not associated with NMUCs (p -values = 0.9326 and 0.3520 respectively). All other variables were included in the multivariate analysis (Table 2), and the following factors were associated with NMUCs: death during 2009–2011, age 60 vs. 40–59 years, heterosexual mode of transmission relative to injection drug use, did not meet AIDS case definition, and death within 1 month of HIV diagnosis (Table 2).

DISCUSSION

The principal finding of this study was that 9.1% of deaths in Floridians who were reported to eHARS with HIV infection and who died from 2000-2011 were NMUCs. It is not possible to determine with certainty using surveillance data alone that each of these deaths was due to HIV infection, although the likelihood is high, given that all cases were reported to the HIV/AIDS surveillance system and had an UC consistent with HIV disease. The ICD 10 codes used to classify HIV cases as NMUCS (e.g. D84.9 immunodeficiency, unspecified; see appendix 1) can occur, albeit rarely, as underlying causes of death in populations without HIV infection. To estimate the number of deaths that would have occurred in a general population of the same size of our cohort due to the ICD 10 codes in the NMUC group, age-specific national mortality rates (Murphy, Xu, & Kochanek, 2013) for infections (except HIV) and the malignant neoplasms that were in the NMUCs group were applied to the entire cohort (including those that did not die), giving 62 expected deaths using indirect age standardization (Szklo & Nieto, 2007). Subtracting the 62 expected deaths from the 809 NMUCs, would lower the proportion of NMUCs among probable HIV-related deaths to 8.5% (747/[747+8,089]). Thus, even considering the background mortality for causes in the NMUC group, the percentage of NMUCS among probable HIV-related deaths declines from 9.1% to 8.5%.

Underreporting of HIV has been found in two other studies in the United States. A study of New York City residents with HIV during 1999–2004 reclassified 4% (385/9613) of deaths because the underlying cause was an opportunistic illness not coded as HIV disease (Sackoff, Hanna, Pfeiffer, & Torian, 2006). A study in San Francisco found that 9% of death certificates during 1978–1990 from the San Francisco AIDS registry had no mention of HIV/AIDS (Hessol et al, 1992). However, it included deaths where HIV was not likely the UC such as accidental deaths. If only infections, neoplasms, immune disease, and liver disease that were classified as HIV as in the current study were included, the result in the San Francisco study would be 6.9% (82/1194). Underreporting of other infections on death certificates has been found in other studies (Washko & Frieden, 1996; Govindan, Shapiro, Langa, & Iwashyna, 2014).

There are several potential reasons for HIV underreporting on death certificates. Dying within a month of HIV diagnosis was most strongly associated with HIV not being reported on the death certificate, which could reflect HIV test reporting lag. A confirmatory HIV test result may take up to a week, and the death certificate is supposed to be completed within 5 days of death (Florida Department of Health 2015). Nevertheless, only 21% of the NMUCs died within a month of HIV diagnosis, and in many cases there was enough information for a specific UC (e.g. pneumocystis or non-Hodgkin lymphoma) that it would be unlikely for the physician not to have known the HIV diagnosis. Another probable reason for underreporting is that the physician may not have been knowledgeable about proper documentation of causes of death on death certificates, as found in certain studies (Cambridge & Cina, 2010; Messite & Stellman 1996; Smith Sehdev & Hutchins 2001). In some cases, physicians may have been reluctant to put HIV on the death certificate because of the stigma attached to HIV and may have believed that families would be adversely

affected if the diagnosis was on the death certificate (King, 1989). This tendency might have been more pronounced for families who just recently learned of the HIV diagnosis.

One study limitation is that our analyses are limited to cases in eHARS. Therefore, we cannot determine if there were people with a reported UC of HIV infection who did not have HIV infection. The Florida Bureau of Vital Statistics sends all death certificates with an underlying cause of death of HIV to eHARS for matching to ensure that the HIV case has been reported. If an unreported case is identified, it is investigated. Although surveillance staff do not recall a case with an UC of HIV infection that did not have HIV infection, there is no systematic recording of non HIV cases. A second limitation is that physician patterns in attributing cause of death may vary by state, thereby affecting generalizability.

In summary, the results for the cohort of people diagnosed with HIV infection in Florida who died from 2000–2011 suggest that HIV mortality using vital records only may underestimate actual HIV mortality by approximately 9%. Underreporting may vary by state or country, and it would be useful to evaluate completeness of reporting in other jurisdictions. Efforts to evaluate the extent of and reasons for underreporting of HIV on death certificates are needed to improve reporting because HIV mortality data are essential to the monitoring of the burden of HIV infection.

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Appendix 1: Explanation and ICD-10 Codes for each Group in Analysis

Group 1 (Records with mention of HIV infection)

Mention of HIV on death certificate as defined by an ICD-10 code B20-B24 (“Human immunodeficiency disease”) or R75 (“laboratory evidence of HIV”), in any of the causes or significant conditions.

Group 2 (NMUC Group: Records with no mention of HIV infection, but had an underlying cause of death that was suggestive of HIV disease)

1) Underlying cause of death codes for which the World Health Organization recommends use of the HIV disease codes (B20-B24) in a person with HIV infection C46, C81 to C96 for neoplasms and A00-B19, B25-B49, B58-B64, B99 and J12-J18 for infections excepting the following codes: A00, A05.1, A20-A23, A27, A33-39, A70, A75-A79, A80, A81.0, A81.1, A82-86, A91-92, A95, A96.0-A96.2, A98, B03-06, B16-17.1, B26, B50-57, B90-92, B94.0, B94.1, B94.2 (UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance, 2014).

- 2) Underlying cause of death code of “immunodeficiency, unspecified” (D84.9) and “disorder involving the immune system, unspecified” (D89.9)

Group 3 (Records with no mention of HIV infection and underlying cause of death not suggestive of HIV disease)

All other ICD-10 codes for underlying cause of death.

REFERENCES

- Cambridge B, Cina SJ. Accuracy of death certificate completion in a suburban community. *Am J Forensic Med Pathol*. 2010; 31(3):232–235. doi: 10.1097/PAF.0b013e3181e5e0e2. [PubMed: 20512028]
- Centers for Disease Control and Prevention & Health Resources and Services Administration. Integrated guidance for developing epidemiologic profiles: HIV prevention and Ryan White HIV/AIDS programs planning [Internet]. 2014. Retrieved from http://www.cdc.gov/hiv/pdf/guidelines_developing_epidemiologic_profiles.pdf
- Florida Department of Health. What the physician should know about certifying cause of death on the Florida death certificate. 2015. (No date) [Internet]. Retrieved from http://www.floridahealth.gov/certificates/certificates/EDRS/_documents/DH150-849MD_brochure.pdf
- Govindan S, Shapiro L, Langa KM, Iwashyna TJ. Death certificates underestimate infections as proximal causes of death in the U.S. *PLoS One*. 2014; 9(5):e97714. doi: 10.1371/journal.pone.0097714. [PubMed: 24878897]
- Hart LG, Larsen EH, Lishner DM. Rural Definitions for Health Policy and Research. *Am J Public Health*. 2005; 95(7):1149–1155. doi: 10.2105/AJPH.2004.042432. [PubMed: 15983270]
- Hessol NA, Buchbinder SP, Colbert D, Scheer S, Underwood R, Bamhart JL, O'Malley PM, Doll LS, Lifson AR. Impact of HIV infection on mortality and accuracy of AIDS reporting on death certificates. *Am J Public Health*. 1992; 82(4):561–564. [PubMed: 1546772]
- Hosmer, DW.; Lemeshow, S. *Applied Logistic Regression*. 2nd. John Wiley and Sons, Inc.; New York, NY: 2000.
- King MB. AIDS on the death certificate: the final stigma. *BMJ*. 1989; 298(6675):734–736. [PubMed: 2496825]
- Messite J, Stellman SD. Accuracy of death certificate completion: the need for formalized physician training. *JAMA*. 1996; 275(10):794–796. doi:10.1001/jama.1996.03530340058030. [PubMed: 8598597]
- Murphy SL, Xu J, Kochanek KD. Deaths: final data for 2010. *Natl Vital Stat Rep*. 2013; 61(4):1–117. [PubMed: 24979972]
- Sackoff JE, Hanna DB, Pfeiffer MR, Torian LV. Causes of death among persons with AIDS in the era of highly active antiretroviral therapy: New York City. *Ann Intern Med*. 2006; 145(6):397–406. doi:10.7326/0003-4819-145-6-200609190-00003. [PubMed: 16983127]
- Smith Sehdev AE, Hutchins GM. Problems with proper completion and accuracy of the cause-of-death statement. *Arch Intern Med*. 2001; 161(2):277–284. doi:10.1001/archinte.161.2.277. [PubMed: 11176744]
- Szklo, M.; Nieto, FJ. *Epidemiology: Beyond the Basics*. 2nd. Jones and Bartlett Publishers; Sudbury, MA: 2007.
- UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance. Guidelines for HIV mortality measurement. 2014. 2014. Retrieved from <http://www.ncbi.nlm.nih.gov/books/NBK236997/pdf/TOC.pdf>
- US Census Bureau. American FactFinder. Government Printing Office; Washington, DC: 2013a. No date. Retrieved from <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>
- US Census Bureau. ZIP Code tabulation areas (ZCTATM). Government Printing Office, no date; Washington, DC: 2013b. Retrieved from <http://www.census.gov/geo/reference/zctas.html>

- US Census Bureau. American Community Survey and Puerto Rican Community Survey 2011 Subject Definitions. 2015. No date [Internet]. Retrieved from http://www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2011_ACSSubjectDefinitions.pdf
- Washko RM, Frieden TR. Tuberculosis surveillance using death certificate data, New York City, 1992. Public Health Rep. 1996; 111(3):251–255. [PubMed: 8643817]
- World Health Organization. Global health sector strategy on HIV/AIDS 2011–2015 [Internet]. 2011. Retrieved from http://whqlibdoc.who.int/publications/2011/9789241501651_eng.pdf?ua=1
- World Health Organization. International Classification of Diseases (ICD) [Internet]. 2014. Retrieved from <http://www.who.int/classifications/icd/en/>
- WWAMI Rural Health Research Center. Rural Urban Commuting Areas (RUCA), no date. 2013. Retrieved from <http://depts.washington.edu/uwruca/ruca-uses.php>

TABLE 1

Mention of human immunodeficiency virus (HIV) on death certificate by underlying cause of death among people diagnosed with HIV infection and who died during 2000–2011 in Florida

Underlying cause of death	Total, n	Mention of HIV (B20-B24, R75) n (%)	No mention of HIV and underlying cause suggestive of HIV (NMUCs) n (%)	No mention of HIV and underlying cause not suggestive of HIV n (%)
Total	11,989	8,089	809	3,091
Medical causes				
HIV disease or laboratory evidence of HIV (B20-B24, R75) ^a	7,291	7,291 (90.1)	0 (0.0)	0 (0.0)
Infections that should be coded as B20-B24 in a person with HIV infection ^b	496	57 (0.7)	439 (54.3)	0 (0.0)
Other infections (all A and B codes except for B20-B24 and codes in footnote b)	42	5 (0.1)	0 (0.0)	37 (1.2)
Cancers that should be coded as B20-B24 in a person with HIV infection (C46, C81-C96)	232	7 (0.1)	225 (27.8)	0 (0.0)
All other cancer (C00-C45, C47-C80, C97)	763	180 (2.2)	0 (0.0)	583 (18.9)
Immunosuppression, unspecified (D84.9, D89.9)	146	1 (0.01)	145 (17.9)	0 (0.0)
Heart disease (I00-09, I11, I13, I20-I51)	851	162 (2.0)	0 (0.0)	689 (22.3)
Stroke (I60-I69)	156	11 (0.1)	0 (0.0)	145 (4.7)
Chronic lower respiratory diseases (J40-J47)	121	44 (0.5)	0 (0.0)	77 (2.5)
Diabetes (E10-E14)	128	54 (0.7)	0 (0.0)	74 (2.4)
Chronic liver disease (K70, K72.9-K74)	157	49 (0.6)	0 (0.0)	108 (3.5)
Other medical (all other codes)	910	196 (2.4)	0 (0.0)	714 (23.1)
External causes				
Homicide (U01-U02, X85-Y09, Y87.1)	116	1 (0.01)	0 (0.0)	115 (3.7)
Suicide (U03, X60-X84, Y87.0)	158	1 (0.01)	0 (0.0)	157 (5.1)
Unintentional injuries (V01-X39 including W codes, X50-X59, Y85-Y86)	174	10 (0.1)	0 (0.0)	164 (5.3)
Psychoactive drug use (F10-F19)	50	14 (0.2)	0 (0.0)	36 (1.2)
Accidental overdose (X40-X49)	175	4 (0.1)	0 (0.0)	171 (5.5)
Other external (S00-T98, all V and Y codes not included in homicide, suicide or unintentional injuries)	23	2 (0.02)	0 (0.0)	21 (0.7)

^aThree deaths had R75 as an underlying cause of death.

^bA00-B19, B25-B49, B58-B64, B99 and J12-J18 for infections excepting the following codes: A00, A05.1, A20-A23, A27, A33-39, A70, A75-A79, A80, A81.0, A81.1, A82-86, A91-92, A95, A96.0-A96.2, A98, B03-06, B16-17.1, B26, B50-57, B90-92, B94.0, B94.1, B94.2.

TABLE 2

Adjusted odds ratios and 95% confidence intervals for no mention of human immunodeficiency virus (HIV) on death certificate when underlying cause suggestive of HIV vs. mention of HIV (B20-B24 or R75) on death certificate among people reported with HIV infection who died, 2000–2011, Florida (n=8,704)

	No mention of HIV and underlying cause suggestive (NMUCs), n (%)	Mention of HIV (B20-B24 or R75), n (%)	Adjusted odds ratio ^a	95% confidence interval
Year of death				
2000–2002	158 (19.9)	1,334 (16.9)	0.87	0.69-1.09
2003–2005	203 (25.6)	2,142 (27.1)	0.79	0.64-0.97
2006–2008	214 (27.0)	2,539 (32.1)	0.73	0.60-0.89
2009–2011	219 (27.6)	1,895 (24.0)	Ref.	Ref.
Age group at time of death				
< 20 years	3 (0.4)	26 (0.3)	0.69	0.20-2.34
20–39 years	214 (27.0)	2,165 (27.4)	0.81	0.64-1.02
40–59 years	435 (54.8)	4,652 (58.8)	0.75	0.61-0.92
60 years or older	142 (17.9)	1,067 (13.5)	Ref.	Ref.
Race				
Non-Hispanic black	448 (56.4)	4,822 (61.0)	0.84	0.68-1.03
Hispanic	119 (15.0)	1,179 (14.9)	0.94	0.72-1.23
Non-Hispanic white	204 (25.7)	1,655 (20.9)	Ref.	Ref.
Other	23 (2.9)	254 (3.2)	0.82	0.51-1.29
Place of birth				
United States	642 (80.9)	6,241 (78.9)	1.21	0.98-1.49
Not United States	152 (19.1)	1,669 (21.1)	Ref.	Ref.
Percent of population below poverty line in ZCTA of residence at death			Ref.	Ref.
< 8.7%	60 (7.6)	422 (5.3)	0.81	0.58-1.13
8.7–12.9%	114 (14.4)	1,028 (13.0)	0.76	0.56-1.04
13.0–19.3%	215 (27.1)	2,133 (27.0)	0.74	0.55-1.01
19.4	405 (51.0)	4,327 (54.7)		
Mode of HIV transmission				
Men have sex with men (MSM)	232 (29.2)	2,206 (27.9)	1.01	0.83-1.24
Injection drug use (IDU)	69 (8.7)	990 (12.5)	0.70	0.53-0.93
MSM and IDU	18 (2.3)	215 (2.7)	0.88	0.53-1.45
Heterosexual	272 (34.3)	2,928 (37.0)	Ref.	Ref.
Other/unknown	203 (25.6)	1,571 (19.9)	1.21	0.99-1.49
AIDS status				
Met AIDS definition	671 (84.5)	7,093 (89.7)	Ref.	Ref.
Did not meet AIDS definition	123 (15.5)	817 (10.3)	1.53	1.24-1.88
Death within 1 month of				

	No mention of HIV and underlying cause suggestive (NMUCs), n (%)	Mention of HIV (B20-B24 or R75), n (%)	Adjusted odds ratio ^a	95% confidence interval
HIV diagnosis				
Yes	166 (20.9)	925 (11.7)	1.86	1.53-2.26
No	628 (79.1)	6,985 (88.3)	Ref.	Ref.

HIV: human immunodeficiency virus; AIDS: acquired immunodeficiency syndrome; ZCTA: zip code tabulation area

^aOdds ratios for no mention of HIV on death certificate when underlying cause suggestive of HIV vs. mention of HIV (B20-B24 or R75) on death certificate among people reported with HIV infection who died. Odds ratios adjusted for all variables in column. 194 records were not included in the analysis due to missing value for poverty status of ZCTA.