Understanding the Life Expectancy Sex Gap: Disparate Patterns in Non-Communicable Disease Mortality

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BACKGROUND

Life expectancy (LE) of PWH has increased considerably in the last decades, but LE gains among females with HIV have fallen behind.[1,2]

Previously we demonstrated a **lower LE among females with HIV** in British Columbia, Canada compared to among males and an **increasing sex gap** in LE from 1996-2020.[1]

In part, this can be explained by a different distribution of socio-structural factors.[1]

To **better understand the underlying drivers** for this finding, we aimed to establish whether female sex is associated with higher mortality from **two broad categories of non-communicable disease**:

(1) cardiovascular disease (CVD) and non-AIDS defining cancer (NADC), and
(2) liver (excluding viral hepatitis), renal, and chronic respiratory (lung) disease.

METHODS

Study population: We used clinical and administrative health data from the Comparative Outcomes And Service Utilization Trends (COAST) study, population-based cohort study that includes virtually all known adults with HIV in BC.

Outcomes: We assessed cause-specific non-communicable disease mortality between April 1, 1996 and March 31, 2020, distinguishing mortality from (1) CVD and NADC, and (2) liver, renal, and chronic respiratory disease, defined using International Classification of Diseases (ICD) diagnostic codes in death records (Table 1).

Table 1: Definitions of selected non-communicable grouped causes of death

	ICD-9 (1996-1999)	ICD-10 (2000 onward)
CVD	390-434, 436-8, 451-9	I00-99
NADC	140-75, 179, 181-99, 201, 203-39	C00-45, C47-52, C54-81, C84-D48
Liver disease	570-3	K70-77
Renal disease	580-90, 592, 593.0-.2, 593.8-.9	N00-29
Lung disease	490-3, 496	J40-46

Statistical analysis: Using competing risk Cox regression, we modelled the association between female sex and mortality rates from each of these categories.

We adjusted for baseline age and socio-structural factors: history of injection drug use, residence in Vancouver's inner city, living in a rural area, and area-level income. In addition, we adjusted for CD4 count at ART initiation.

Higher mortality from liver, renal, and chronic lung disease among females with HIV in BC, Canada, could not be explained by socio-structural disparities and immune status at initiation of antiretroviral therapy.

RESULTS

In total, 11,738 males and 2,534 females with HIV, aged ≥20 years were included in the analysis (Table 2).

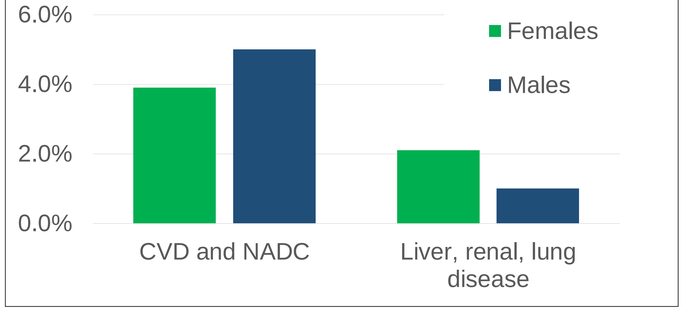
Between April 1, 1996 and March 31, 2020, 587 males (5.0%) and 99 females (3.9%) died of CVD and NADC; 117 males (1.0%) and 53 females (2.1%) died from renal, liver, and respiratory disease (Figure 1).

Table 2: Baseline characteristics

	Males N=11,739	Females N=2,534
Age, years (median, IQR)	32 (38–46)	34 (28–42)
Transmission risk injection drug use	26.0%	43.5%
Residence in Vancouver inner city	7.1%	12.3%
Residence in rural area	3.7%	6.2%
Lowest quintile area level income	30.9%	38.6%
Initiated ART during follow-up	92%	88%
CD4 count at ART initiation <200 cells/mm^3	25.8%	26.3%

ART, antiretroviral therapy; IQR, interquartile range

Figure 1: Non-communicable disease mortality among males and females with HIV in BC, between April 1, 1996 and March 31, 2020.



RESULTS (continued)

Adjusted for age, female sex was associated with higher mortality from renal, liver, and lung disease (Hazard ratio (HR) 2.84, 95% CI 2.05 – 3.97).

However, female sex was not significantly associated with mortality from CVD and NADC after adjusting for age (HR 1.18, 95% CI 0.95 –1.47).

After further adjusting for socio-structural factors and CD4 count at ART initiation**, female sex remained significantly associated with mortality from renal, liver, and lung disease** (Table 3).

Table 3: Association between female sex and mortality from selected non-communicable grouped causes between April 1, 1996 - March 31, 2020.

	Adjusted for baseline age HR (95% CI)	Adjusted for age and socio-structural factors HR (95% CI)	Adjusted for age, socio-structural factors and CD4 count at ART initiation HR (95% CI)
Mortality from CVD and NADC	1.18 (0.95 - 1.47)	1.04 (0.84 - 1.29)	1.02 (0.82 - 1.27)
Mortality from renal, liver, and lung disease	2.84 (2.05 - 3.97)	2.31 (1.66 - 3.22)[$]	2.31 (1.66 - 3.22)[$%]

ART, antiretroviral therapy; CI, confidence interval; HR, hazard ratio.
The following variables were not selected during confounder model selection [$]area-level income, residence in Vancouver's inner city, and living in a rural area; [%]CD4 count at ART initiation. For covariates with missing data, we incorporated a missing category in the models.

CONCLUSIONS

The **higher hazard for mortality from liver, renal, and chronic lung disease** among females compared to males with HIV in British Columbia, Canada could not be explained by socio-structural disparities and immune status at initiation of antiretroviral therapy.

Our findings highlight the **need for directed public health efforts, including preventive strategies and screening**, for these diseases among females with HIV.

These findings should also be explored in other settings.

ADDITIONAL KEY INFORMATION

References: 1. Samji et al, PlosOne 2013; 2. Marcus et al, JAMA Netw Open 2020; 3. Kooij et al, Lancet Public Health 2025.

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Disclaimer: Further information on the data sets used for this project is at: https://my.popdata.bc.ca/project_listings/18-223/ All inferences, opinions, and conclusions drawn in this material are those of the author(s), and do not reflect the opinions or policies of the Data Steward(s).

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