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Mind the Gap: Life Expectancy and Mortality in Males & Females With HIV in British Columbia, Canada

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BACKGROUND

Globally, and throughout history, females tend to live longer than males.[1] In some populations of people with HIV (PWH), an inversed pattern has been observed. Life expectancy (LE) of PWH has increased considerably in the last decades, but **LE gains among females with HIV have fallen behind**.[2,3]

We hypothesized that the sex gap in LE would be visible up to the most recent calendar period and is **largely due to underlying socio-structural factors.**

We assessed LE and mortality among PWH in British Columbia (BC), Canada, between 1996–2020 and investigated to what extent differences in mortality could be explained by individual and social determinants of health.

1. World Health Organization, 2024 2. Samji et al, PlosOne 2013; 3. Marcus et al, JAMA Netw Open 2020

METHODS

Study population: The Comparative Outcomes And Service Utilization Trends (COAST) study is a cohort study including virtually all PWH in BC. COAST links clinical data from the BC Centre for Excellence in HIV/AIDS to administrative health data from Population Data BC.

Statistical analysis: LE at age 20 was calculated using life tables stratified by sex and calendar period (1996-2002, 2002-2012, and 2012-2020).

We used multivariable Cox regression to model the association between female sex and all-cause mortality, throughout the study period and in each calendar period.

Models were consecutively adjusted for age (Model 1); age and socio-structural factors at baseline: self-reported transmission risk category being injection drug use, residence in Vancouver's inner city (Downtown Eastside), residence in a rural area, area-level income in the lowest quintile (Model 2); age, socio-structural factors, and CD4 count at antiretroviral therapy (ART) initiation (Model 3).

We then modeled the association between sex and mortality from communicable disease, non-communicable disease, and injuries and external causes (defined using ICD codes).

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Unlike in the general population, females with HIV in British Columbia **continue to have a shorter life expectancy** than males. The **sex gap increased with time**. We could **not fully explain the higher mortality among females** by observed differences in clinical and socio-structural factors.

RESULTS

A total of 11,739 males and 2,534 females aged ≥20 were included in the analysis (Table 1).

Table 1: 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%
CD4 at ART initiation <200 cells/mm^3	25.8%	26.3%

LE at age 20 increased between 1996-2020 but remained lower among females and the sex gap increased over time (Table 2, Figures 1, 2).

Table 2: Life expectancy (LE) at age 20 and sex gap in life expectancy (years, 95% CI)

Calendar period	Male LE	Female LE	Sex gap in LE
1996–2002	24.5 (22 – 27)	22.1 (20 – 24)	2.3 (-0.8 – 5.4)
2002–2012	37.1 (35 – 39)	32.8 (31 – 35)	4.4 (1.6 – 7.1)
2012–2020	48.0 (46 – 50)	40.9 (38 – 44)	7.1 (3.1 – 11)

Figure 1: Life expectancy at age 20 among males and females with HIV

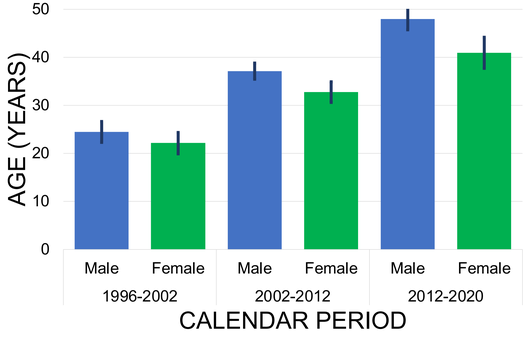
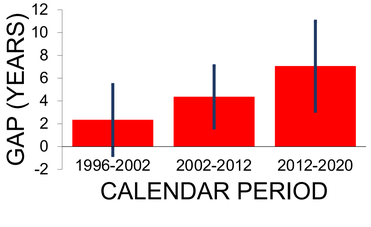


Figure 2: Sex gap in life expectancy at age 20



Although the association was attenuated upon inclusion of socio-structural factors and CD4 at ART initiation in the model, female sex remained associated with a higher hazard for all-cause mortality in fully adjusted models (Table 3).

Table 3: Associations between sex and all-cause mortality

	Model 1 Hazard ratio (95% CI)	Model 2 Hazard ratio (95% CI)	Model 3 Hazard ratio (95% CI)
Overall	1.37 (1.3 – 1.5)	1.14 (1.1 – 1.2)	1.11 (1.0 – 1.2)
1996-2002	1.24 (1.1 – 1.5)	1.04 (0.9 – 1.2)	0.99 (0.8 – 1.2)
2002-2012	1.44 (1.3 – 1.6)	1.18 (1.1 – 1.3)	1.15 (1.0 – 1.3)
2012-2020	1.52 (1.3 – 1.8)	1.24 (1.1 – 1.4)	1.24 (1.1 – 1.4)
	Adjusted for age	*Adjusted for age and socio-structural factors*	*Adjusted for age, soc-str factors, CD4 at ART initiation*

In fully adjusted models, female sex was significantly associated with a higher hazard for mortality from non-communicable diseases, but not for mortality from communicable disease and injuries and external causes (Table 4).

Table 4: Associations between sex and cause-specific mortality

	Hazard ratio (95% CI)
Communicable disease mortality	0.96 (0.9 – 1.1)
Non-communicable disease mortality	1.33 (1.2 – 1.5)
Injuries and external causes	1.10 (0.9 – 1.3)

Models adjusted for age, socio-structural factors, and CD4 at ART initiation

CONCLUSIONS

In contrast to what is observed in the general population, in this setting with universal health care and free antiretroviral therapy, **life expectancy among females with HIV remains lower than among males**, and the sex gap in life expectancy continues to increase with time.

Overall, **clinical and socio-structural factors do not fully explain the sex-gap in mortality** and hazard ratios are increasing over time.

A better understanding of the sex gap in life expectancy, and its determinants, is **vital to design targeted programs to try and improve life expectancy among people living with HIV.**

ADDITIONAL KEY INFORMATION

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