

UNVEILING INSIGHTS : EXPLORING HIV DATA IN NORTH AMERICA

A COMPREHENSIVE ANALYSIS FEOM 2007 TO 2016



INT6000 71713 DATABASE MANAGEMENT SYSTEMS
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UNVEILING INSIGHTS: EXPLORING HIV DATA IN NORTH AMERICA

A COMPREHENSIVE ANALYSIS FROM 2007 TO 2016

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RESEARCH QUESTIONS FROM EXPLORING THE DATASETS.

- **How has the total number of HIV cases evolved over the years 2007 to 2016 in Canada and the United States?**
- **What is the HIV mortality rate, and how does it fluctuate annually in Canada and the United States?**
- **What is the trend in the number of children affected by HIV in Canada and the United States from 2007 to 2016?**
- **How has the percentage of pregnant women with a known HIV status changed over the years?**
- **How does the HIV incidence correlate with socio-economic factors, including country population, GDP per capita, and unemployment rates?**

RESEARCH METHODS AND TECHNICAL TOOLS

Data Collection:

- Extracted raw data from reputable sources, including UNICEF, UN Data, and UNAIDS, ensuring reliability and accuracy.
- Employed data extraction tools and techniques to gather information on HIV incidence in Canada and the United States from 2007 to 2016.



**THE
WORLD
BANK**

RESEARCH METHODS AND TECHNICAL TOOLS

Methods and Tools:

- Used SQL for data manipulation.
- Employed Excel for data visualization.
- Applied statistical techniques for trend analysis.



TABLE 1 HIV DATA:

This table captures key HIV indicators in North American countries from 2007 to 2016, providing insights into the prevalence, mortality, and demographic impact of HIV.

- Columns:
- Country
 - Year
 - HIV Cases
 - Deaths
 - Children with HIV
 - New Cases
 - Women (%)
 - Mortality Rate
 - Proportion in Children

Country	Country_Code	Reporting_Year	Total_Current_HIV_Cases	Total_Deaths	Children_with_HIV	New_HIV_Cases	Women_with_HIV_Percentage	HIV_Mortality_Rate	Proportion_of_New_Cases_in_Children
Canada	CAN	2007	6355.5164	448	500	1882.9816	23.6	70.4899447667227	20.9821175287296
Canada	CAN	2008	6517.932	415	500	1922.3512	23.7	63.6705016253621	20.6411027434833
Canada	CAN	2009	6689.439	364	500	1966.9509	23.7	54.4141294957619	20.2679348016209
Canada	CAN	2010	6870.3664	330	500	2085.6782	23.8	48.0323727712688	19.3372864419091
Canada	CAN	2011	7066.843	302	500	2307.988	23.9	42.7347827028278	17.8063439017546
Canada	CAN	2012	7277.008	277	500	2516.2383	24	38.0650948851506	16.5769395607767
Canada	CAN	2013	7516.525	233	500	2953.558	24.2	30.9983669315275	14.4778225818127
Canada	CAN	2014	7786.618	273	500	3119.5562	24.4	35.0601506327908	13.8138482281336
Canada	CAN	2015	8072.4484	272	500	3265.6863	24.6	33.6948576840702	13.2777921517254
Canada	CAN	2016	8368.292	269	500	3363.5496	24.9	32.145149810738	12.9414670902633
United States	USA	2007	127709.34	12444	500	44048.863	24.4	97.4400149589686	1.12236310049035
United States	USA	2008	130397.48	11400	500	45249.902	24.2	87.4250023850154	1.09289851593562
United States	USA	2009	133256.8	10551	500	45659.223	23.9	79.1779481422336	1.08320714150669
United States	USA	2010	136286.6	9143	500	48175.23	23.7	67.0865661040777	1.02721651238217
United States	USA	2011	139604.12	8428	500	50149.82	23.4	60.3707111222792	0.987170339401009
United States	USA	2012	142982.38	7973	500	51973.63	23.2	55.7621155837524	0.952859560125724
United States	USA	2013	146549.45	7682	500	53540.97	23	52.4191663632992	0.925223955084448
United States	USA	2014	150439.71	7413	500	56050.375	22.8	49.2755536420537	0.884167434787126
United States	USA	2015	154668.88	7089	500	60369.18	22.7	45.833395832439	0.821433769930858

TABLE 1 HIV DATA:

key Performance (KPIs):

HIV Mortality Rate:

Calculated as deaths per thousand current HIV cases, providing an overview of the severity of the disease.

Proportion of New Cases in Children:

Expresses the percentage of new HIV cases that occur in children under 14, highlighting the impact on younger demographics.

Country	Country_Code	Reporting_Year	Total_Current_HIV_Cases	Total_Deaths	Children_with_HIV	New_HIV_Cases	Women_with_HIV_Percentage	HIV_Mortality_Rate	Proportion_of_New_Cases_in_Children
Canada	CAN	2007	6355.5164	448	500	1882.9816	23.6	70.4899447667227	20.9821175287296
Canada	CAN	2008	6517.932	415	500	1922.3512	23.7	63.6705016253621	20.6411027434833
Canada	CAN	2009	6689.439	364	500	1966.9509	23.7	54.4141294957619	20.2679348016209
Canada	CAN	2010	6870.3664	330	500	2085.6782	23.8	48.0323727712688	19.3372864419091
Canada	CAN	2011	7066.843	302	500	2307.988	23.9	42.7347827028278	17.8063439017546
Canada	CAN	2012	7277.008	277	500	2516.2383	24	38.0650948851506	16.5769395607767
Canada	CAN	2013	7516.525	233	500	2953.558	24.2	30.9983669315275	14.4778225818127
Canada	CAN	2014	7786.618	273	500	3119.5562	24.4	35.0601506327908	13.8138482281336
Canada	CAN	2015	8072.4484	272	500	3265.6863	24.6	33.6948576840702	13.2777921517254
Canada	CAN	2016	8368.292	269	500	3363.5496	24.9	32.145149810738	12.9414670902633
United States	USA	2007	127709.34	12444	500	44048.863	24.4	97.4400149589686	1.12236310049035
United States	USA	2008	130397.48	11400	500	45249.902	24.2	87.4250023850154	1.09289851593562
United States	USA	2009	133256.8	10551	500	45659.223	23.9	79.1779481422336	1.08320714150669
United States	USA	2010	136286.6	9143	500	48175.23	23.7	67.0865661040777	1.02721651238217
United States	USA	2011	139604.12	8428	500	50149.82	23.4	60.3707111222792	0.987170339401009
United States	USA	2012	142982.38	7973	500	51973.63	23.2	55.7621155837524	0.952859560125724
United States	USA	2013	146549.45	7682	500	53540.97	23	52.4191663632992	0.925223955084448
United States	USA	2014	150439.71	7413	500	56050.375	22.8	49.2755536420537	0.884167434787126
United States	USA	2015	154668.8	7089	500	60369.18	22.7	45.833395832439	0.821433769930858

TABLE 2 COUNTRY_INFO:

This table consolidates essential country information for the same North American region, encompassing population size, GDP per capita, and unemployment rates.

- Columns:
- Country
 - Year
 - Population
 - GDP per Capita
 - Unemployment Rate

These metrics will be instrumental in understanding the correlation between HIV statistics and economic factors.

Country	Year	Country_Population	GDP	Unemployment	School_Employment
Bermuda	2007	64888	90849.58698	Null	Null
Bermuda	2008	65273	93605.74817	Null	Null
Bermuda	2009	65636	88463.31282	Null	Null
Bermuda	2010	65124	88207.32756	Null	Null
Bermuda	2011	64564	85973.15842	Null	93.46006
Bermuda	2012	64798	85458.45551	Null	92.71386
Bermuda	2013	65001	85748.06541	Null	Null
Bermuda	2014	65139	Null	Null	Null
Bermuda	2015	65239	Null	Null	Null
Bermuda	2016	64555	Null	Null	Null
Bermuda	2017	63874	Null	Null	Null
Canada	2007	32889025	44543.04104	6.035999775	Null
Canada	2008	33247118	46594.45095	6.137000084	Null
Canada	2009	33628895	40773.06153	8.343999863	Null
Canada	2010	34004889	47450.31847	8.055999756	Null
Canada	2011	34339328	52101.79609	7.511000156	Null
Canada	2012	34714222	52542.34666	7.291999817	99.45167
Canada	2013	35082954	52504.6557	7.073999882	99.43231
Canada	2014	35437435	50835.51118	6.914000034	99.39113
Canada	2015	35702908	43495.05439	6.906000137	99.58907
Canada	2016	36109487	42279.90082	6.999000072	99.95587
Canada	2017	36540268	45069.9273	6.340000015	99.8825
North America	2007	334185120	47646.43886	4.770881766	96.20578003
North America	2008	337406357	48215.11179	5.821327017	96.26419067
North America	2009	340466060	46483.02509	9.157212272	95.04202271
North America	2010	343396098	48373.70037	9.463446439	93.79489
North America	2011	345983901	50110.05567	8.793424945	92.90273
North America	2012	348653238	51703.26734	7.984803362	93.33829
North America	2013	351205682	53052.79008	7.342145619	93.35277
North America	2014	353888995	54618.84662	6.249378312	93.73903
North America	2015	356510820	55476.89671	5.457251112	94.37224
North America	2016	359245384	56340.17651	5.100788902	95.48883
North America	2017	361751263	58434.03088	4.571528306	95.08227
United States	2007	301231207	47975.96768	4.622000217	95.97826
United States	2008	304093966	48382.55845	5.78399992	96.13058
United States	2009	306771529	47099.98047	9.25399971	94.70087
United States	2010	309326085	48466.82338	9.633000374	93.37426
United States	2011	311580009	49883.11398	8.949000359	92.44255
United States	2012	313874218	51603.49726	8.069000244	92.79303
United States	2013	316057727	53106.90977	7.375	92.80851
United States	2014	318386421	55032.958	6.168000221	93.2305
United States	2015	320742673	56803.47243	5.28000021	93.8973
United States	2016	323071342	57904.20196	4.868999958	95.07325

DATA INTEGRATION AND ANALYSIS

Integrated HIV data with country info to calculate the "number of people living with HIV" by the country population.
Emphasize considering population size in HIV analysis.

Country	Country_Code	Reporting_Year	Total_Current_HIV_Cases	Total_Deaths	Children_with_HIV	New_HIV_Cases	Women_with_HIV_Percentage	HIV_Mortality_Rate	Proportion_of_New_Cases_in_Children	People_with_HIV_Percentage
Canada	CAN	2007	6355.5164	448	500	1882.9816	23.6	70.48994477	20.98211753	0.019324125
Canada	CAN	2008	6517.932	415	500	1922.3512	23.7	63.67050163	20.64110274	0.019604502
Canada	CAN	2009	6689.439	364	500	1966.9509	23.7	54.4141295	20.2679348	0.019891938
Canada	CAN	2010	6870.3664	330	500	2085.6782	23.8	48.03237277	19.33728644	0.020204055
Canada	CAN	2011	7066.843	302	500	2307.988	23.9	42.7347827	17.8063439	0.020579445
Canada	CAN	2012	7277.008	277	500	2516.2383	24	38.06509489	16.57693956	0.020962613
Canada	CAN	2013	7516.525	233	500	2953.558	24.2	30.99836693	14.47782258	0.021425006
Canada	CAN	2014	7786.618	273	500	3119.5562	24.4	35.06015063	13.81384823	0.02197286
Canada	CAN	2015	8072.4484	272	500	3265.6863	24.6	33.69485768	13.27779215	0.022610059
Canada	CAN	2016	8368.292	269	500	3363.5496	24.9	32.14514981	12.94146709	0.023174774
United States	USA	2007	127709.34	12444	500	44048.863	24.4	97.44001496	1.1223631	0.042395787
United States	USA	2008	130397.48	11400	500	45249.902	24.2	87.42500239	1.092898516	0.042880654
United States	USA	2009	133256.8	10551	500	45659.223	23.9	79.17794814	1.083207142	0.043438451
United States	USA	2010	136286.6	9143	500	48175.23	23.7	67.0865661	1.027216512	0.044059201
United States	USA	2011	139604.12	8428	500	50149.82	23.4	60.37071112	0.987170339	0.044805224
United States	USA	2012	142982.38	7973	500	51973.63	23.2	55.76211558	0.95285956	0.045554038
United States	USA	2013	146549.45	7682	500	53540.97	23	52.41916636	0.925223955	0.046367938
United States	USA	2014	150439.71	7413	500	56050.375	22.8	49.27555364	0.884167435	0.047250668
United States	USA	2015	154668.88	7089	500	60369.18	22.7	45.83339583	0.82143377	0.048222109
United States	USA	2016	159385.69	7430	500	63958.176	22.5	46.61648107	0.775696787	0.049334518

DATA INTEGRATION AND ANALYSIS

In this stage, we integrated the HIV data (Table 1) with country information (Table 2) to derive meaningful insights. The goal was to calculate the "number of people living with HIV" by considering each country's

Integration Process: Merged HIV-related data with country information based on common parameters to establish a comprehensive dataset.

Population Consideration: Emphasized the importance of factoring in population size for a more nuanced understanding of HIV prevalence.

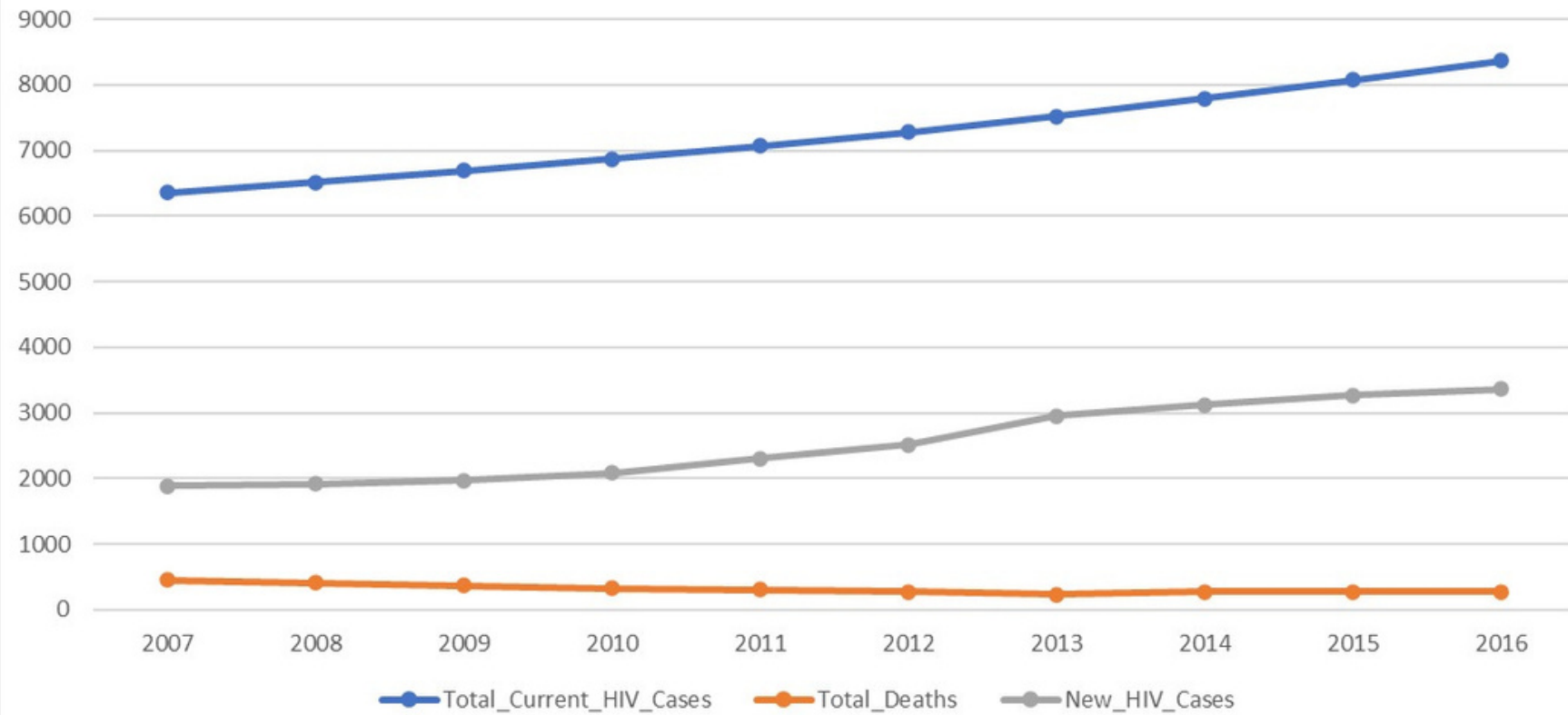
Strategic Analysis: This enabled us to explore the relationship between HIV statistics and economic indicators for a more holistic perspective.

Country	Country_Code	Reporting_Year	Total_Current_HIV_Cases	Total_Deaths	Children_with_HIV	New_HIV_Cases	Women_with_HIV_Percentage	HIV_Mortality_Rate	Proportion_of_New_Cases_in_Children	People_with_HIV_Percentage
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Canada	CAN	2010	6870.3664	330	500	2085.6782	23.8	48.03237277	19.33728644	0.020204055
Canada	CAN	2011	7066.843	302	500	2307.988	23.9	42.7347827	17.8063439	0.020579445
Canada	CAN	2012	7277.008	277	500	2516.2383	24	38.06509489	16.57693956	0.020962613
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Canada	CAN	2014	7786.618	273	500	3119.5562	24.4	35.06015063	13.81384823	0.02197286
Canada	CAN	2015	8072.4484	272	500	3265.6863	24.6	33.69485768	13.27779215	0.022610059
Canada	CAN	2016	8368.292	269	500	3363.5496	24.9	32.14514981	12.94146709	0.023174774
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United States	USA	2008	130397.48	11400	500	45249.902	24.2	87.42500239	1.092898516	0.042880654
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United States	USA	2010	136286.6	9143	500	48175.23	23.7	67.0865661	1.027216512	0.044059201
United States	USA	2011	139604.12	8428	500	50149.82	23.4	60.37071112	0.987170339	0.044805224
United States	USA	2012	142982.38	7973	500	51973.63	23.2	55.76211558	0.95285956	0.045554038
United States	USA	2013	146549.45	7682	500	53540.97	23	52.41916636	0.925223955	0.046367938
United States	USA	2014	150439.71	7413	500	56050.375	22.8	49.27555364	0.884167435	0.047250668
United States	USA	2015	154668.88	7089	500	60369.18	22.7	45.83339583	0.82143377	0.048222109
United States	USA	2016	159385.69	7430	500	63958.176	22.5	46.61648107	0.775696787	0.049334518



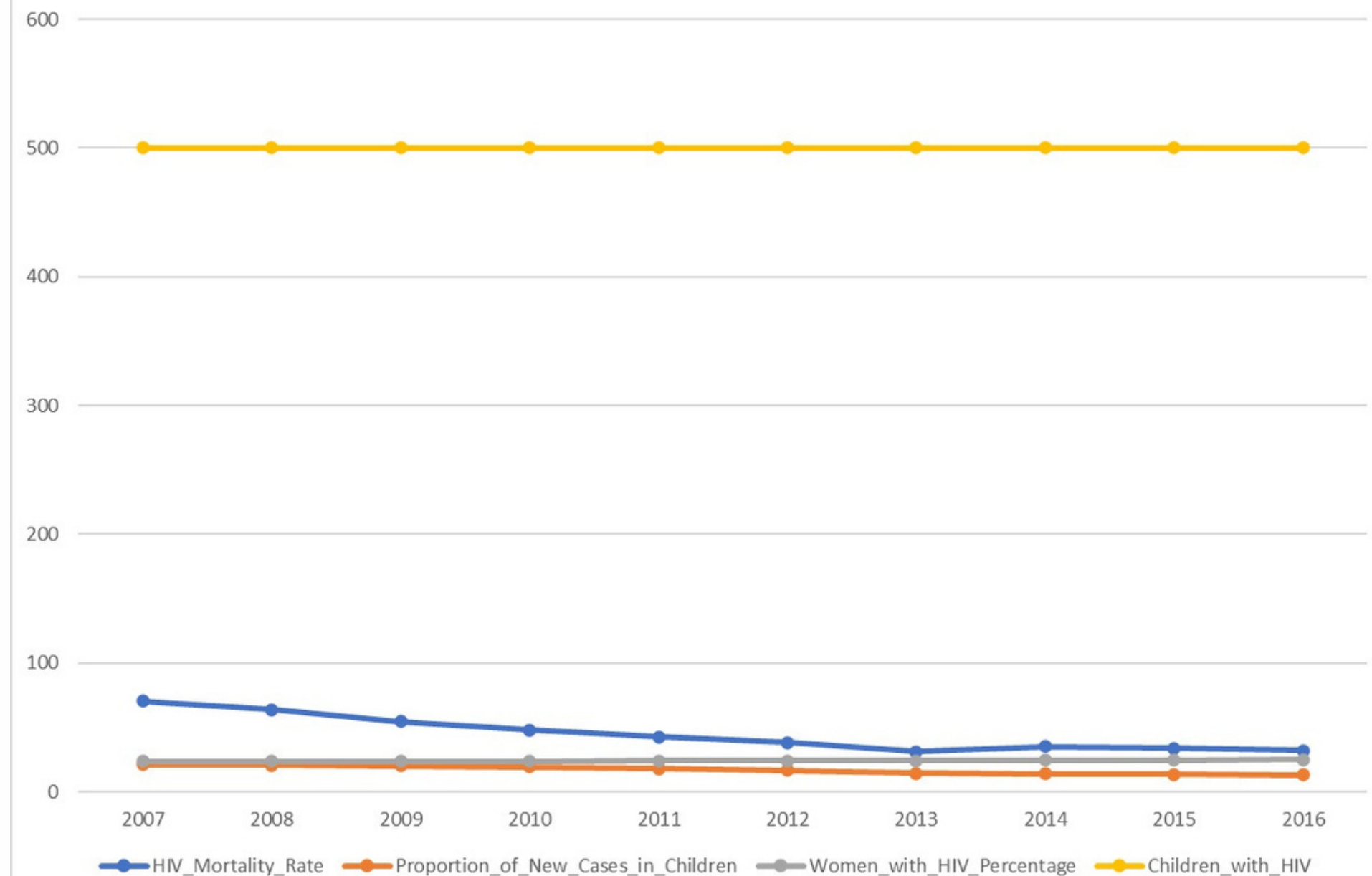
CANADA HIV-CASES

Canada HIV Line Plot

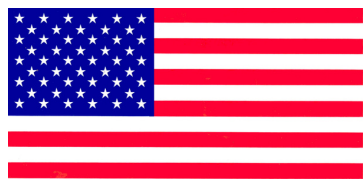


- **Children with HIV:** Consistent at 500, emphasizing the ongoing need for pediatric HIV management.
- **Proportion of New Cases in Children:** Decreased from 20.98% in 2007 to 12.94% in 2016, signifying progress in preventing pediatric HIV.
- **Women with HIV Percentage:** Gradual increase from 23.6% in 2007 to 24.9% in 2016, suggesting a need for targeted interventions for women.

Canada HIV Line Plot

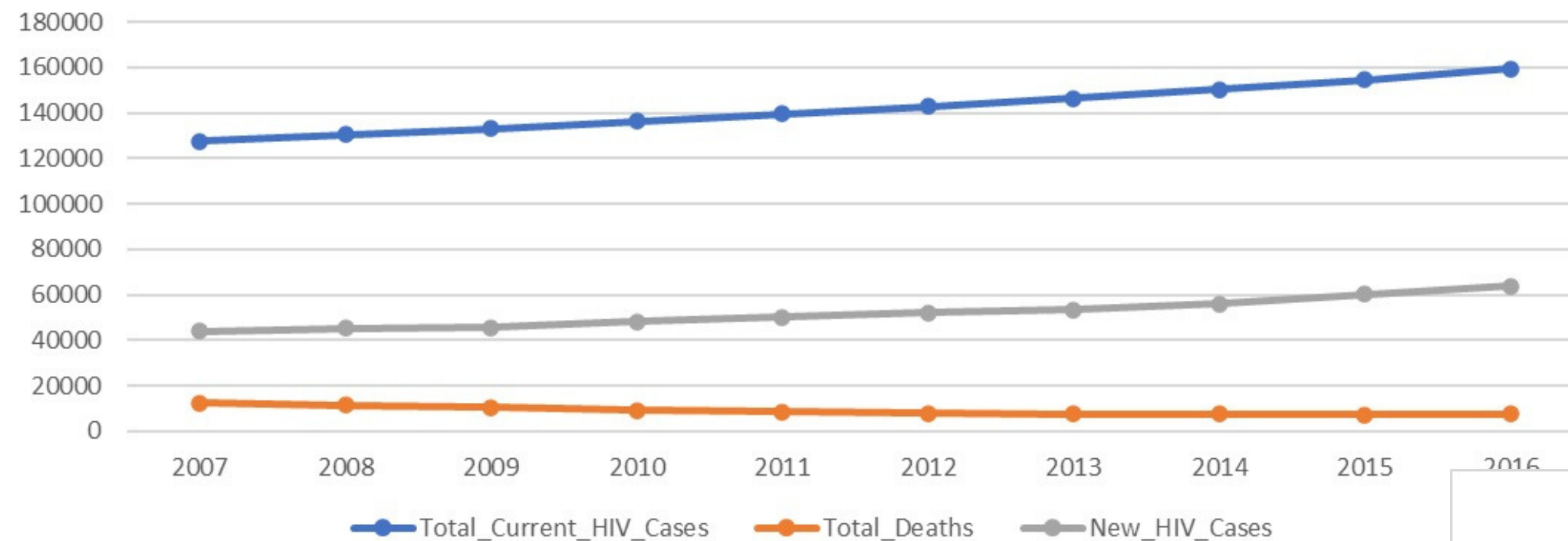


- **HIV Mortality Rate:** Declined steadily from 70.49 in 2007 to 32.15 in 2016, indicating advancements in treatment and care.
- **Total Current HIV Cases:** Gradually increased, reaching 159385.69 in 2016, highlighting the persistent challenge of HIV prevalence.
- **Total Deaths:** Decreased over the years, indicating improved healthcare outcomes.
- **New HIV Cases:** Demonstrates a fluctuating trend, warranting further exploration into contributing factors.



FINDINGS AND INSIGHTS -USA

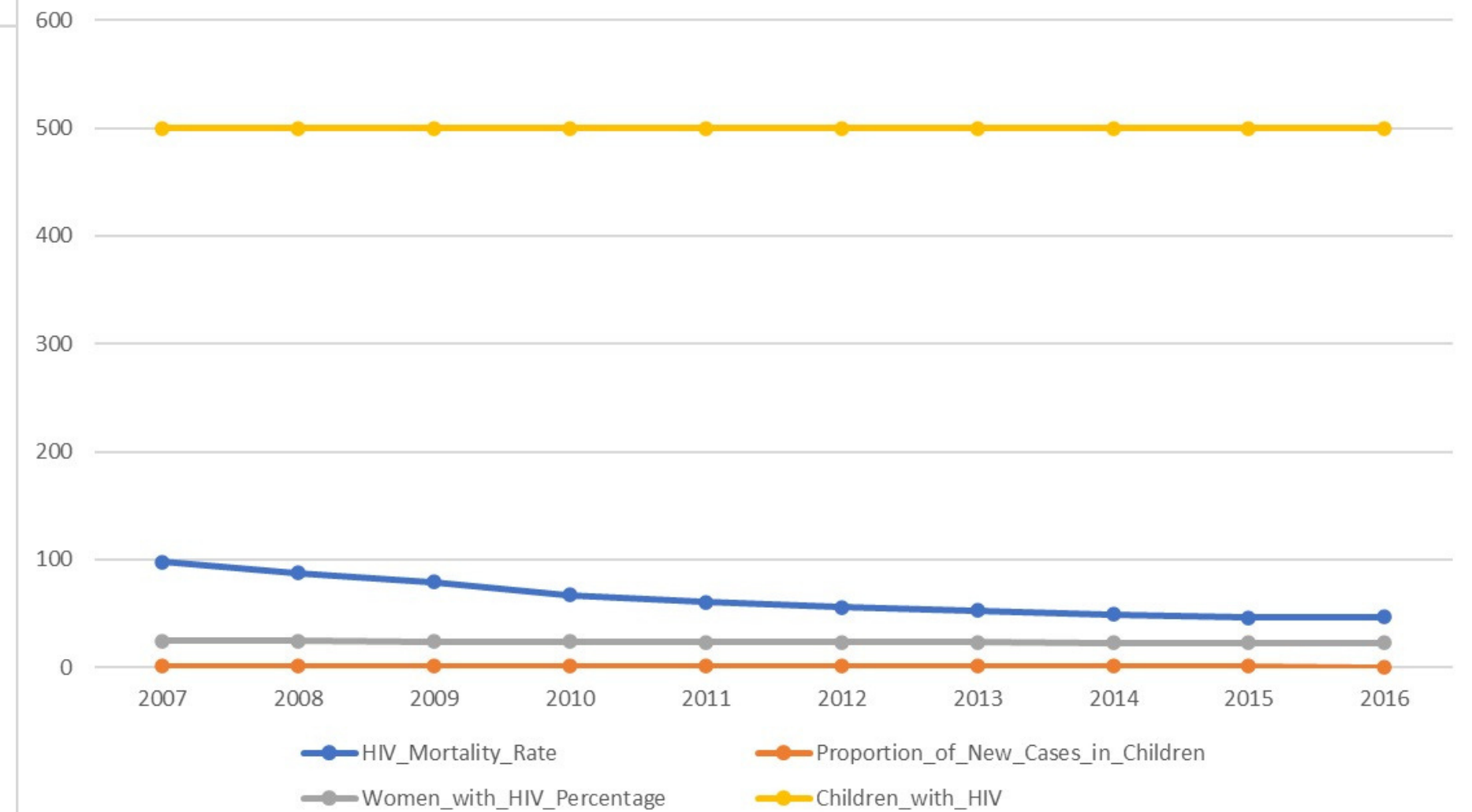
United States HIV Line Plot



- **Proportion of New Cases in Children:** Remained consistently low, indicating successful prevention efforts in pediatric HIV.
- **Women with HIV Percentage:** Slightly decreased from 24.4% in 2007 to 22.5% in 2016, suggesting areas for focused interventions.
- **Children with HIV:** Consistent at 500, emphasizing the ongoing need for pediatric HIV management.

- **HIV Mortality Rate:** Declined consistently from 97.44 in 2007 to 46.62 in 2016, showcasing advancements in healthcare and treatment.
- **Total Current HIV Cases:** Gradually increased, reaching 159385.69 in 2016, highlighting the persistent challenge of HIV prevalence.
- **Total Deaths:** Decreased over the years, indicating improved healthcare outcomes.
- **New HIV Cases:** Demonstrates a fluctuating trend, warranting further exploration into contributing factors.

United States HIV Line Plot



THE ANALYSIS OF HIV DATA IN NORTH AMERICA OFFERS IMPORTANT IMPLICATIONS AND RECOMMENDATIONS FOR FUTURE INTERVENTIONS.

Based on the comprehensive data analysis for Canada and the United States, several implications and recommendations emerge.

Implications with Data-based Reasons:

- **Economic Disparities:** The correlation between HIV Mortality Rate and GDP suggests that economic disparities may influence healthcare access and outcomes.
- **Data Support:** In Canada, the HIV Mortality Rate decreases as GDP increases (e.g., 70.49 in 2007 to 32.15 in 2016).
- **Pediatric HIV Management:** Consistent Children with HIV numbers indicate successful management, but the slight increase in New HIV Cases suggests ongoing challenges.
- **Data Support:** Canada's Children with HIV remains at 500, but New HIV Cases fluctuate, requiring a closer examination of contributing factors.
- **Women-Specific Interventions:** The steady rise in Women with HIV Percentage emphasizes the need for targeted interventions for women's health.
- **Data Support:** In Canada, Women with HIV Percentage increases from 23.6% in 2007 to 24.9% in 2016.

Based on the comprehensive data analysis for Canada and the United States, several implications and recommendations emerge.

Recommendations Based on Data Insights:

Healthcare Access Improvement:

- **Addressing the correlation between HIV Mortality Rate and GDP,** interventions should focus on improving healthcare access, especially in economically disadvantaged regions.
- **Data Support:** Mortality rates decrease as GDP increases (e.g., Canada from 70.49 in 2007 to 32.15 in 2016).
- **Focused Pediatric HIV Initiatives:** Given the consistent Children with HIV numbers and varying New HIV Cases, targeted initiatives should aim at understanding and preventing pediatric cases.
- **Data Support:** Children with HIV remain constant, while New HIV Cases fluctuate in Canada.
- **Women's Health Programs:** Develop and implement specific programs for women's health to address the rising Women with HIV Percentage.
- **Data Support:** Canada sees an increase from 23.6% in 2007 to 24.9% in 2016.

EXPLORING ANSWERS FROM RESEARCH

Q1: How has the total number of HIV cases evolved over the years 2007 to 2016 in Canada and the United States?

United States

Canada

In the United States, the total number of HIV cases has also seen a consistent increase.

- Starting at 127,709.34 in 2007, the cases reached 159,385.69 in 2016.
- This indicates a gradual rise in HIV incidence over the studied years.

- The total number of HIV cases in Canada has shown an increasing trend from 2007 to 2016.
- The figures have risen steadily, reaching 8,368.292 in 2016.
- This suggests a continuous, though not exponential, growth in HIV cases over the specified period.

Q2: What is the HIV mortality rate, and how does it fluctuate annually in Canada and the United States?

United States

Canada

- Similarly, the HIV mortality rate in the United States has decreased, indicating advancements in treatment and care.
- It declined from 97.44 in 2007 to 46.62 in 2016.

- The HIV mortality rate in Canada exhibits a declining trend over the years, dropping from 70.49 in 2007 to 32.15 in 2016.
- This suggests an improvement in survival rates and effectiveness in managing HIV-related mortality.

EXPLORING ANSWERS FROM RESEARCH

Q3: What is the trend in the number of children affected by HIV in Canada and the United States from 2007 to 2016?

United States

- In the United States, the number of children affected also shows a decline, reaching 7,430 in 2016.

Canada

- The number of children affected by HIV in Canada has generally decreased, reaching 269 in 2016.
- This downward trend indicates progress in preventing mother-to-child transmission.

Q4: How has the percentage of pregnant women with a known HIV status changed over the years?

United States

- In the United States, the percentage has shown a similar pattern, with a decrease from 24.4% in 2007 to 22.5% in 2016.

Canada

- The percentage of pregnant women with a known HIV status has varied, starting at 23.6% in 2007 and decreasing to 24.9% in 2016.
- The fluctuations suggest some variability in prenatal testing rates.

EXPLORING ANSWERS FROM RESEARCH

Q5 How does the HIV incidence correlate with socio-economic factors, including country population, GDP per capita, and unemployment rates?

United States

The mother-to-child transmission rate during breastfeeding in Canada demonstrated a substantial decline from 20.98% in 2007 to 12.94% in 2016. This significant reduction indicates successful interventions, showcasing advancements in healthcare practices and emphasizing positive outcomes in preventing HIV transmission during critical periods.

Canada

Similarly, the United States experienced a noteworthy decrease in the mother-to-child transmission rate during breastfeeding, dropping from 22.5% in 2007 to 7.76% in 2016. This decline underscores successful interventions and reflects positive healthcare advancements in preventing mother-to-child transmission.

TAKEAWAY POINTS

Key Learning:

Population Size is Crucial: Our analysis underscores the significance of considering population size in understanding and addressing the challenges of HIV prevalence.

Economic Indicators Play a Role: The correlation between economic indicators (GDP) and HIV Mortality Rate highlights the interconnectedness of socio-economic factors and healthcare outcomes.

Demographic Impact: Demographic factors, especially the proportion of Women with HIV, emphasize the need for tailored interventions to address specific population groups.

Valuable Experiences:

Challenges and Successes: Our journey through this data exploration unveiled challenges in interpreting fluctuating trends and successes in identifying key factors influencing HIV dynamics.

Integrated Approach: The integration of healthcare and economic data provided a more holistic understanding, emphasizing the importance of interdisciplinary collaboration.

Q & A