



# Epidemiology of HIV infection in Ontario: Update to 2009

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## Background



- HIV epidemic in Ontario remains unstable and dynamic
- Critical to monitor trends in HIV transmission to:
  - evaluate effectiveness of prevention efforts and burden of HIV infection (incidence)
  - quantify the need for health care and support services (prevalence)



## Methods: Data sources

- HIV serodiagnostic data: First-time HIV positive diagnoses at HIV Laboratory, Ontario Ministry of Health and Long-Term Care (MOHLTC), 1985-2009
- Reported AIDS cases: Cases diagnosed to December 2008 and reported to Public Health Division, MOHLTC by November 2009
- Laboratory Enhancement Program (LEP): Data used to adjust HIV diagnoses for unknown risk factors and previous HIV testing and to obtain estimates of HIV incidence (detuned assay)



## Methods: Data sources

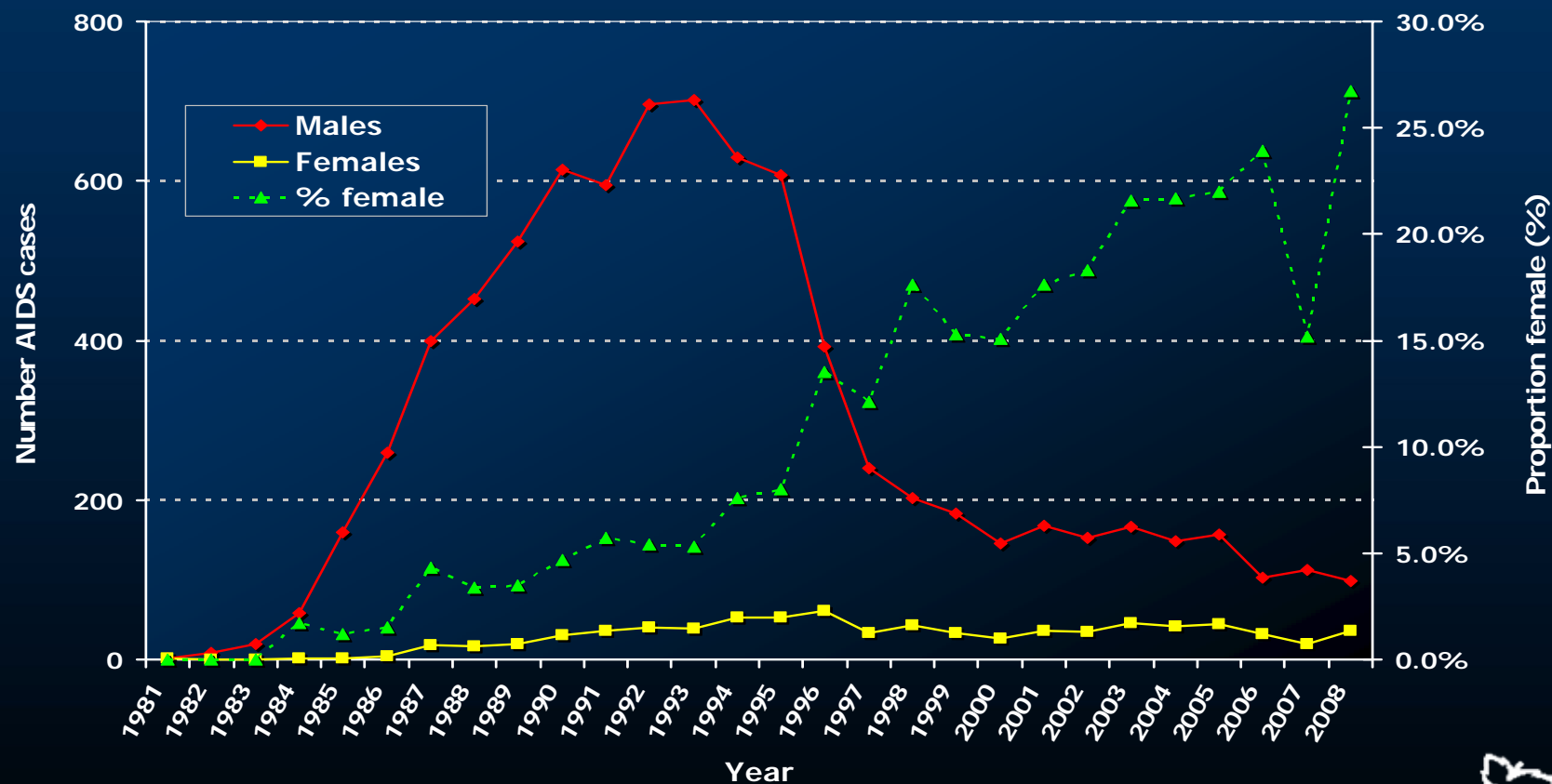
- Populations at risk (MSM, MSM-IDU, IDU): Numbers estimated based on population in each health region, proportion 18+ years and proportion male. Proportion MSM and IDU based on published studies and triangulation



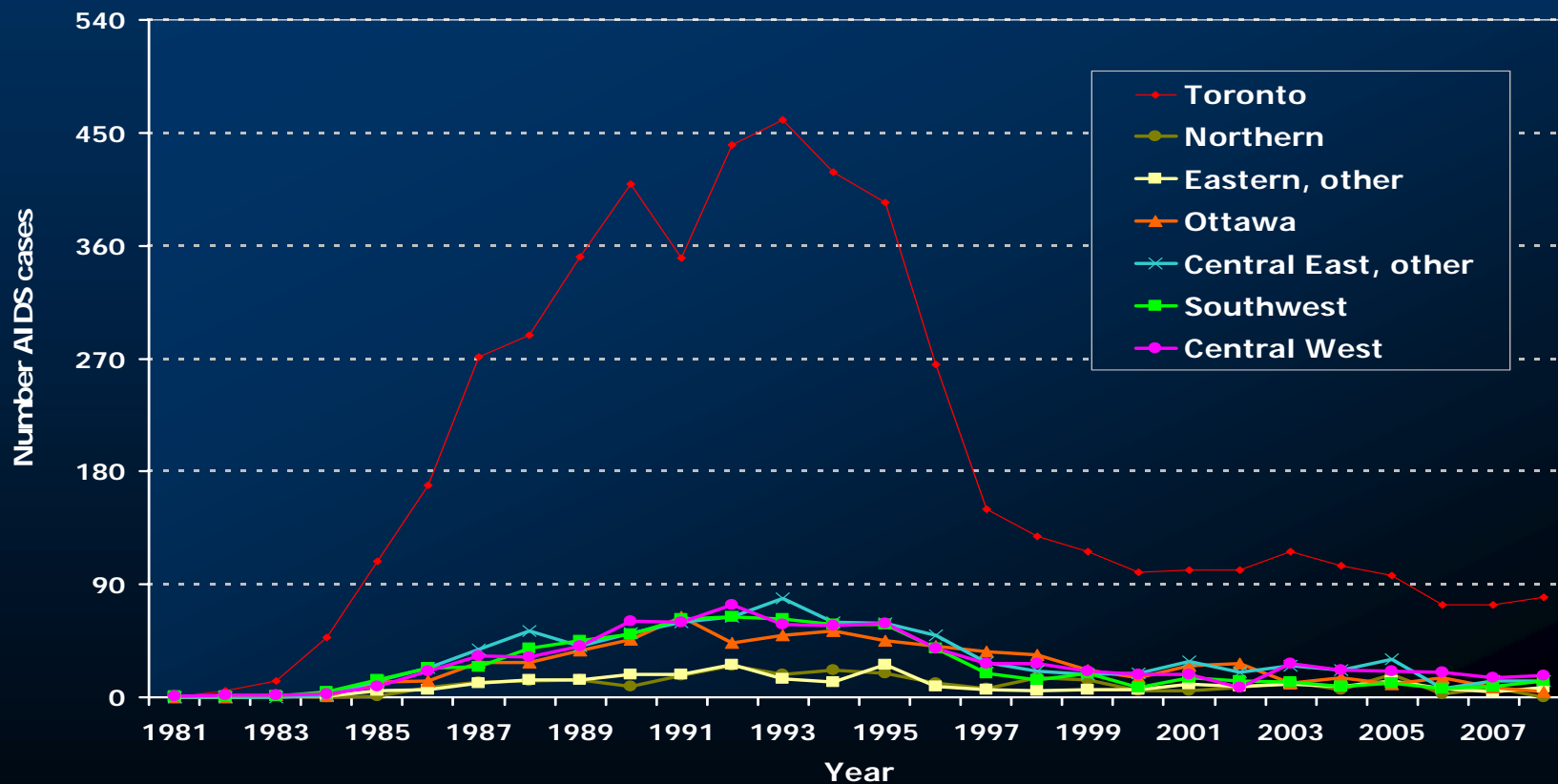
## Methods: Data analysis

- HIV incidence: From detuned assay by exposure category, year and health region, 2001-2008, repeat tester analyses, studies in Ontario and elsewhere
- Modelled HIV infection 2008: Based on LEP, HIV diagnoses, reported AIDS cases and HIV-related deaths

# Number of reported AIDS cases by sex and proportion female, 1981-2008

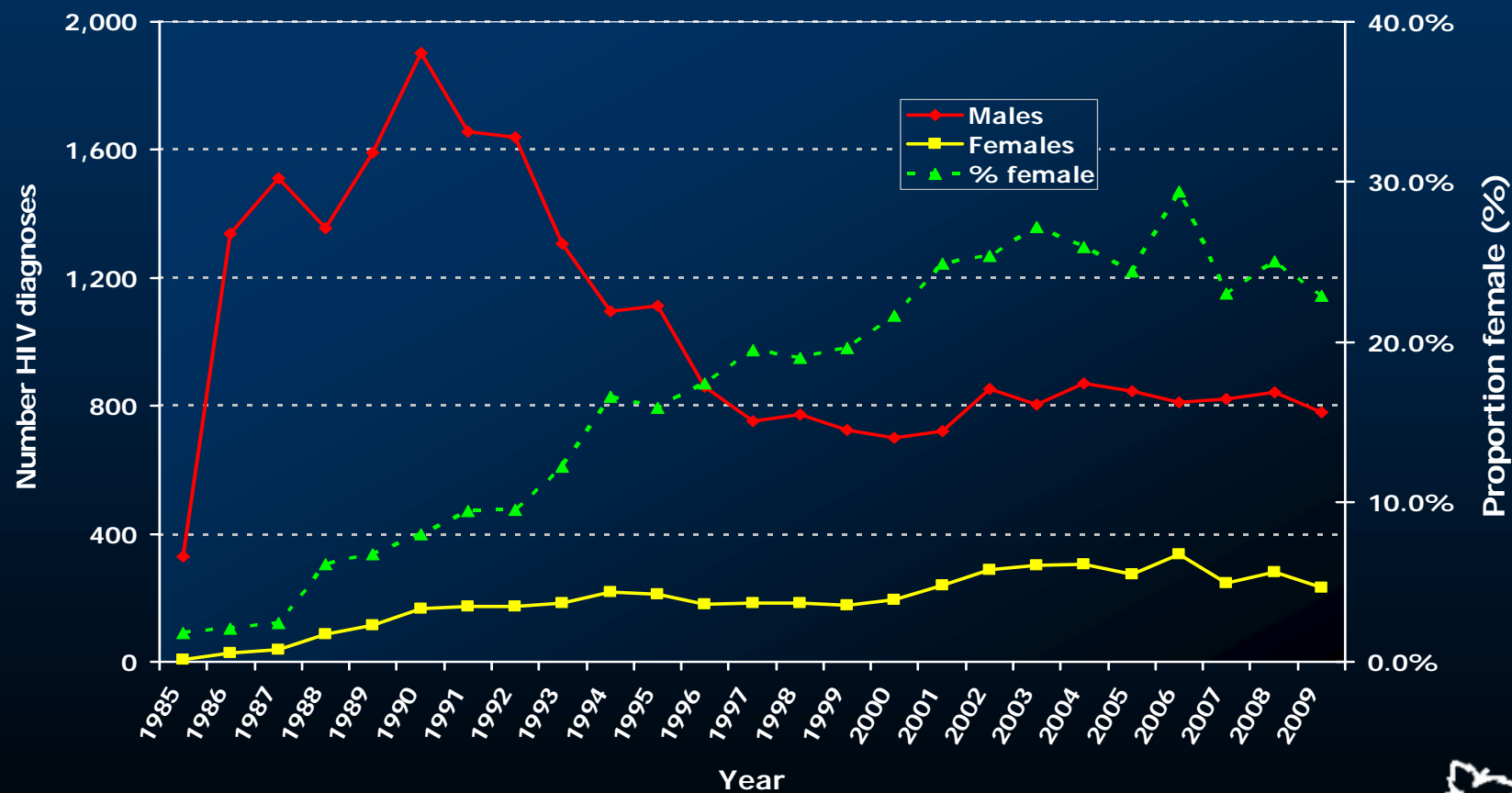


# Reported AIDS cases by health region Ontario, 1985-2009



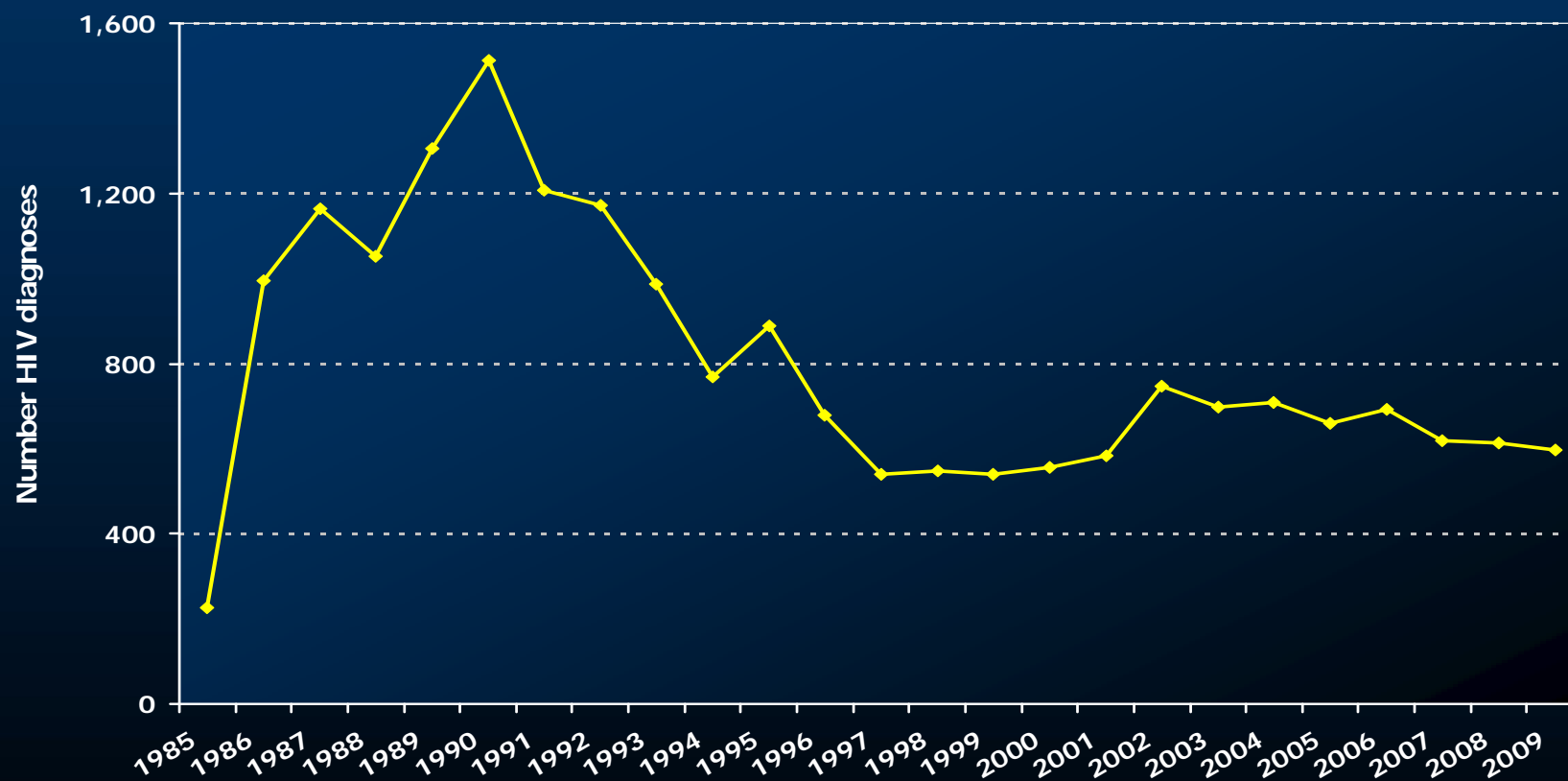
\* Adjusted for unknown sex and health region

# HIV diagnoses by sex and proportion female Ontario, 1985-2009



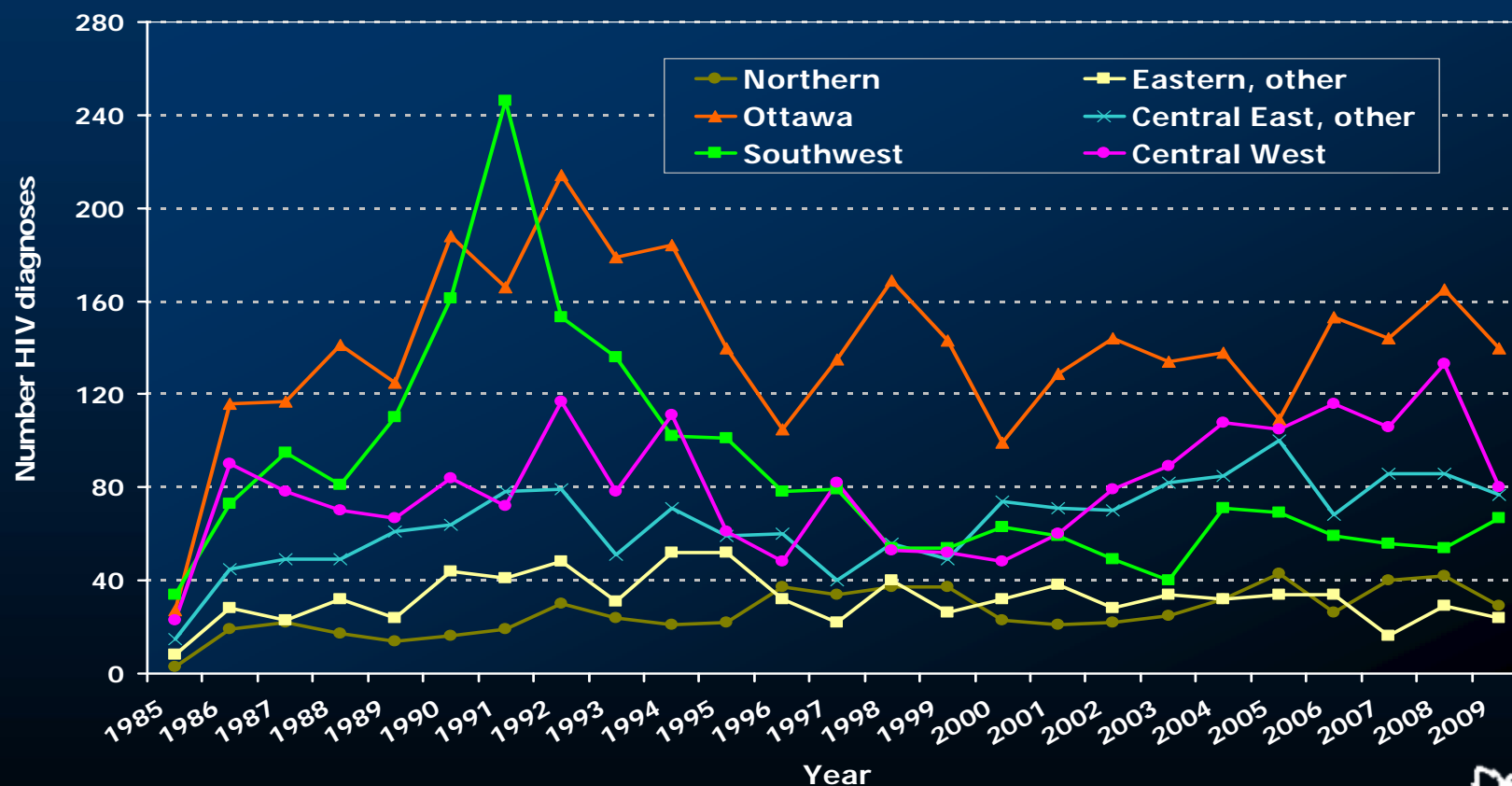
\* Adjusted for unknown sex

# HIV diagnoses, Toronto Ontario, 1985-2009



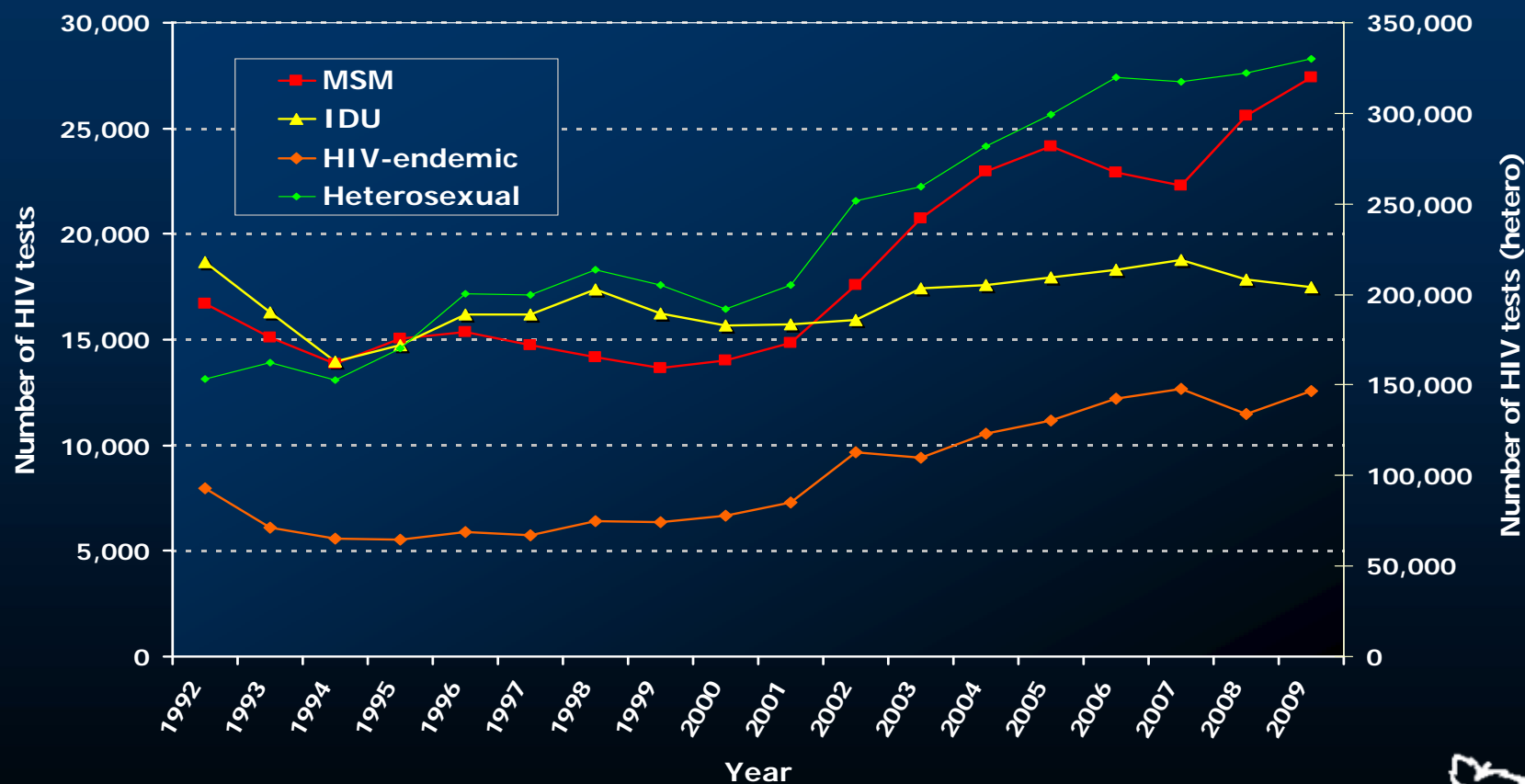
\* Adjusted for unknown sex and health region Year

# HIV diagnoses, selected health regions Ontario, 1985-2009



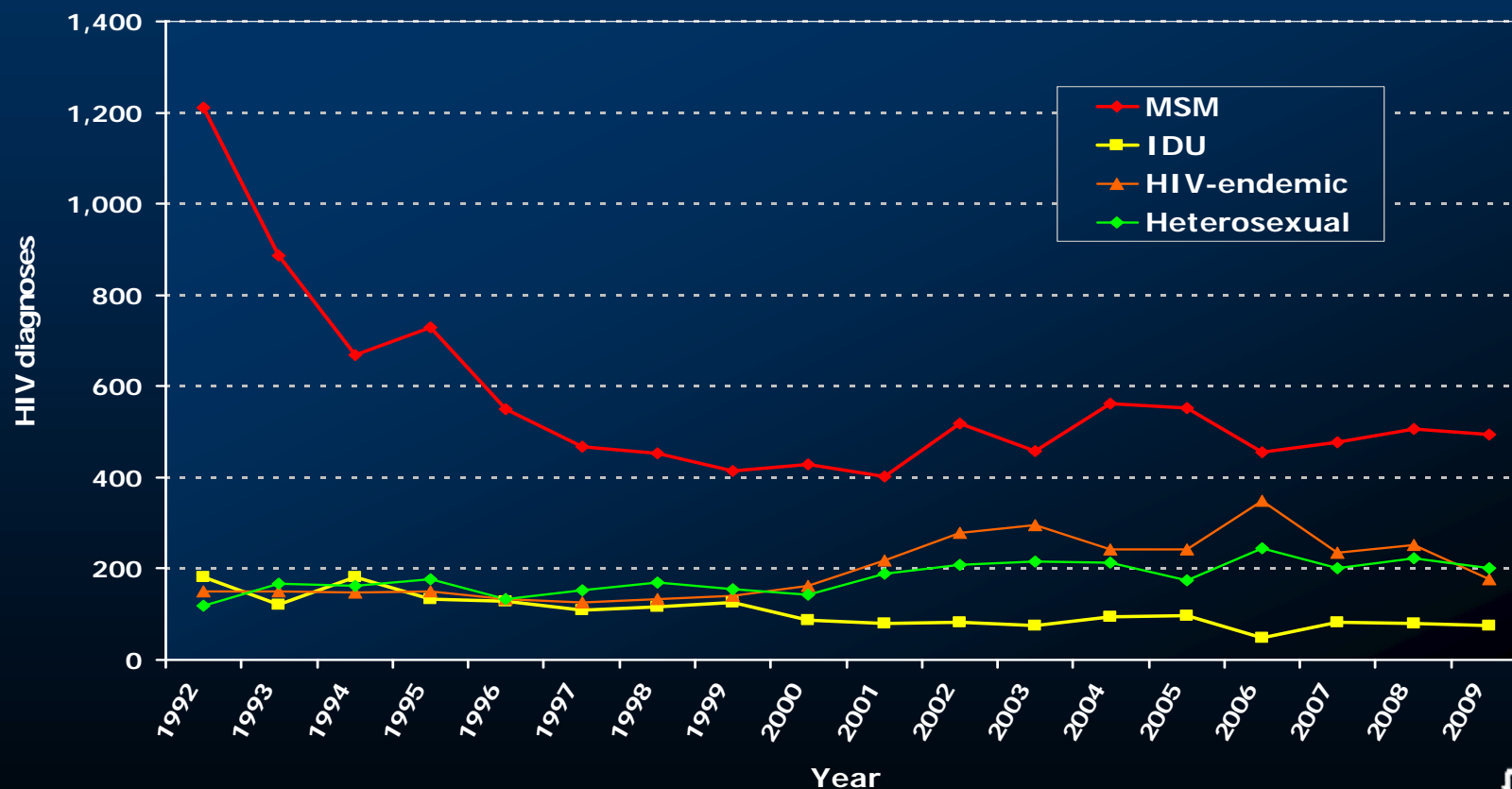
\* Adjusted for unknown sex and health region

# HIV tests for selected exposure categories\* Ontario, 1992-2009



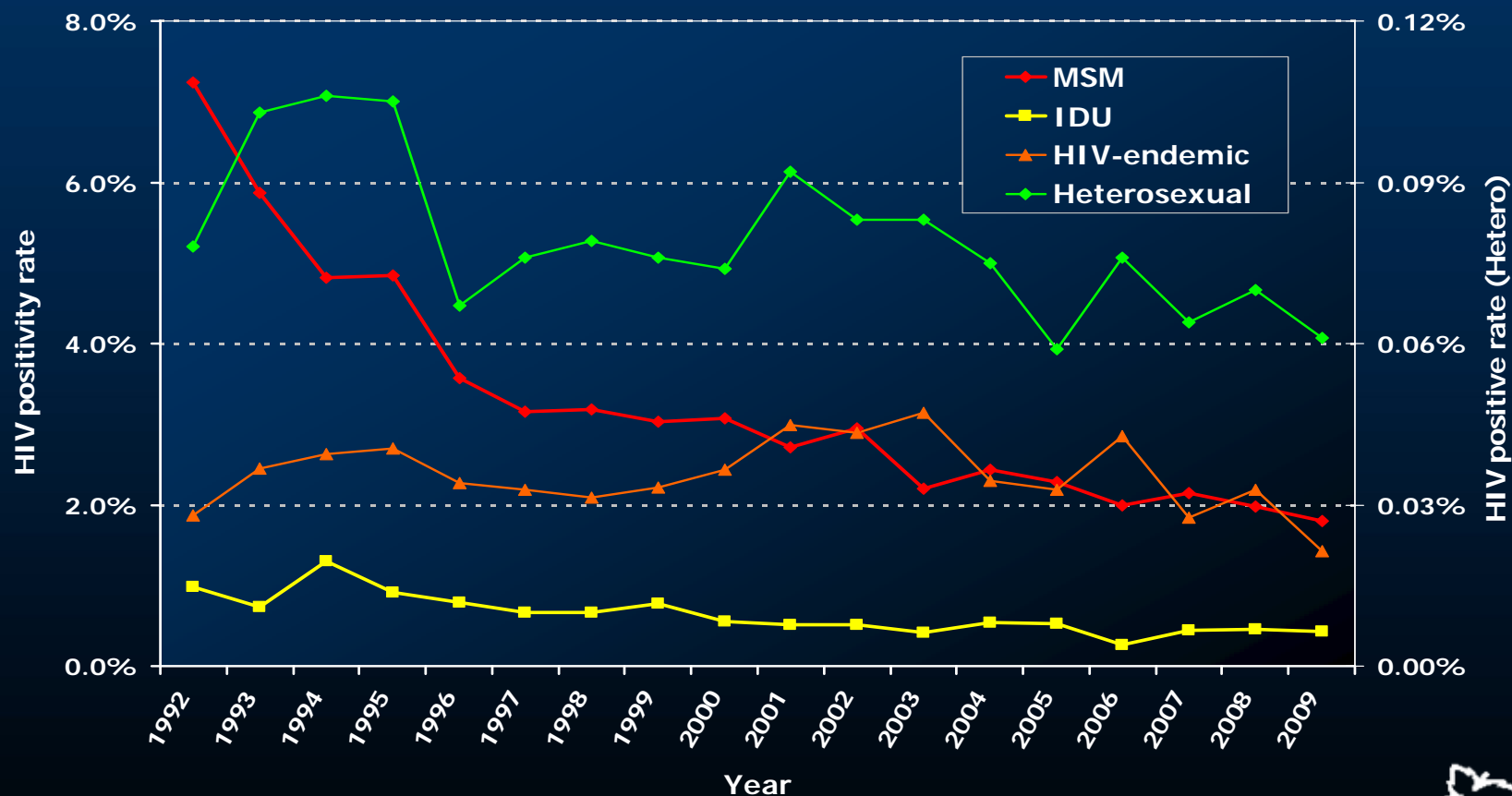
\* Adjusted for unknown sex, health region and exposure category

# HIV diagnoses for selected exposure categories\* Ontario 1992-2009



\* Adjusted for unknown sex, health region and exposure category

# HIV positivity rates for selected exposure categories\*, Ontario 1992-2009



\* Adjusted for unknown sex, health region and exposure category

# Modeled HIV prevalence and diagnosed by exposure category, Ontario, 2008



	HIV prevalence	HIV-infected persons diagnosed	Proportion diagnosed	Number HIV undiagnosed	Proportion Ontario undiagnosed
MSM	15,073	10,626	70.5%	4,447	48.2%
MSM-IDU	617	491	79.6%	125	1.4%
IDU	1,988	1,323	66.5%	666	7.2%
HIV-endemic	4,878	2,633	54.0%	2,245	24.3%
Hetero	3,920	2,185	55.7%	1,735	18.8%
Clotting	123	119	96.8%	4	0.04%
Transfusion	28	28	97.5%	1	0.01%
<b>Total</b>	<b>26,628</b>	<b>17,405</b>	<b>65.4%</b>	<b>9,223</b>	<b>100%</b>

# Proportion of modeled HIV prevalence in each exposure category by health region, Ontario, 2008



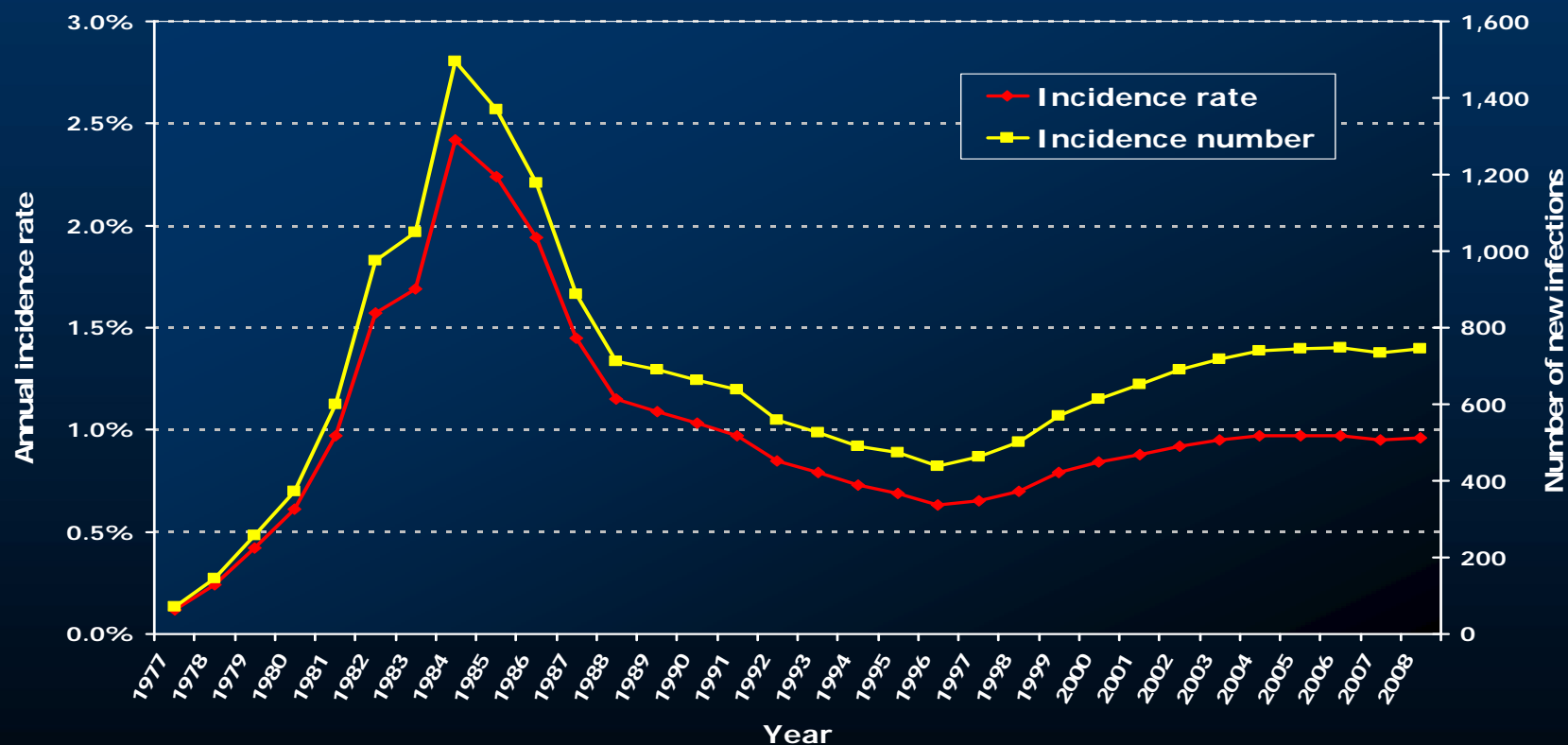
	MSM	MSM-IDU	IDU	HIV-endemic	Hetero	Clotting	Transfusion	Total
Toronto	71.2%	53.3%	34.4%	58.5%	50.3%	60.0%	80.0%	62.5%
Ottawa	7.9%	13.9%	24.6%	18.6%	12.2%	8.0%	20.0%	11.9%
Central East, other	5.6%	6.6%	5.8%	8.0%	11.2%	8.0%	0.0%	6.9%
Eastern, other	1.7%	4.9%	8.0%	1.9%	2.8%	4.0%	0.0%	2.5%
Central West	6.6%	9.8%	11.1%	7.5%	8.9%	8.0%	0.0%	7.5%
Southwest	5.9%	5.7%	5.8%	4.8%	9.2%	8.0%	0.0%	6.2%
Northern	1.2%	5.7%	10.3%	0.61%	5.4%	4.0%	0.0%	2.5%
Total	100%	100%	100%	100%	100%	100%	100%	100%

# Proportion of modeled HIV prevalence in each health region by exposure category, Ontario, 2008

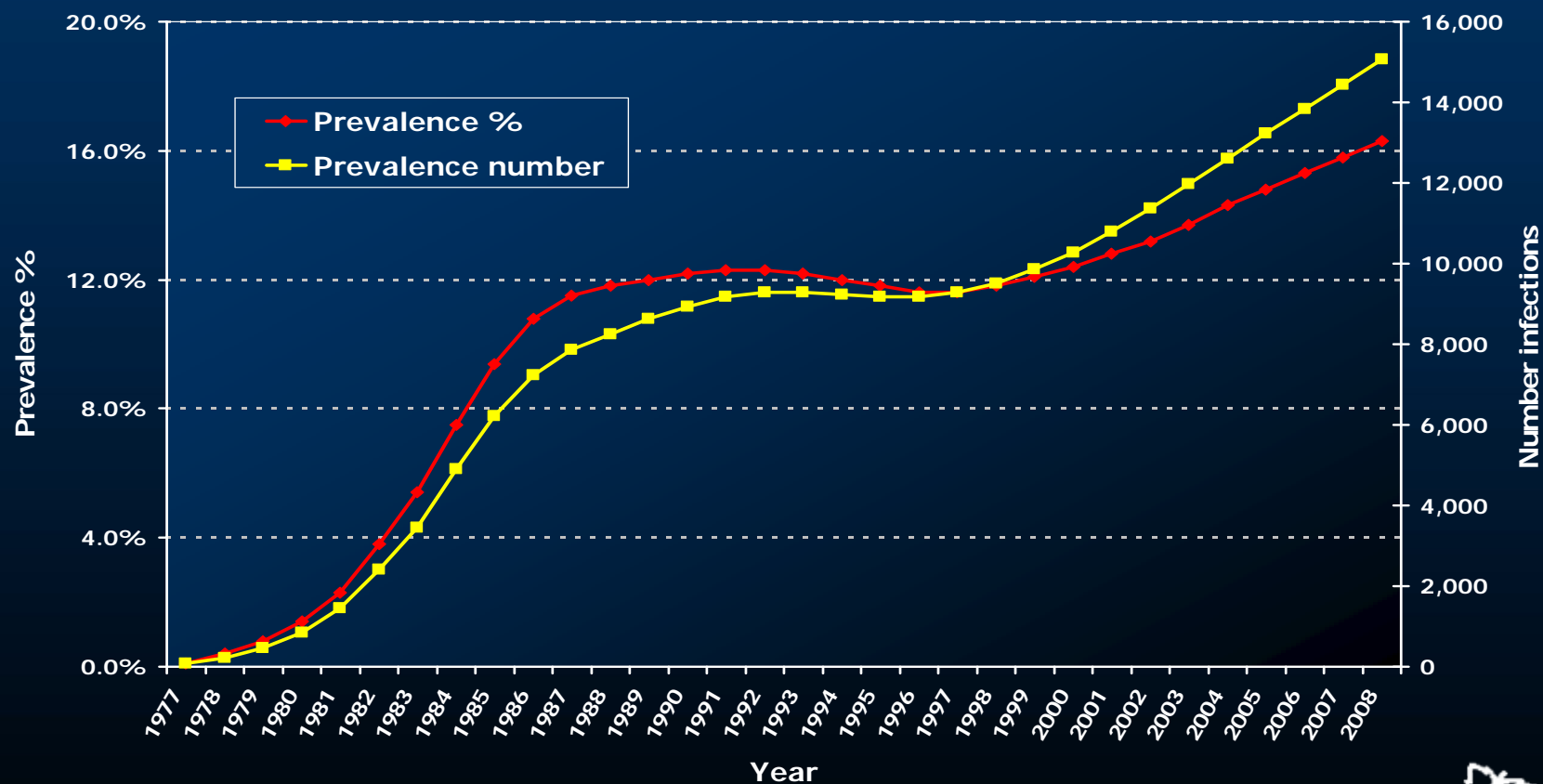


	MSM	MSM- IDU	IDU	HIV- endemic	Hetero	Clotting	Trans- fusion	Total
Toronto	64.4%	2.0%	4.1%	17.2%	11.8%	0.45%	0.12%	100%
Ottawa	37.5%	2.7%	15.5%	28.7%	15.1%	0.32%	0.16%	100%
Central East, other	45.8%	2.2%	6.3%	21.3%	24.0%	0.54%	0.0%	100%
Eastern, other	39.4%	4.5%	24.2%	14.4%	16.7%	0.76%	0.0%	100%
Central West	49.6%	3.0%	11.0%	18.3%	17.5%	0.50%	0.0%	100%
Southwest	54.1%	2.1%	7.0%	14.3%	21.9%	0.61%	0.0%	100%
Northern	27.1%	5.3%	30.8%	4.5%	31.6%	0.75%	0.0%	100%
<b>Total</b>	<b>56.6%</b>	<b>2.3%</b>	<b>7.5%</b>	<b>18.3%</b>	<b>14.7%</b>	<b>0.47%</b>	<b>0.11%</b>	<b>100%</b>

# Modeled HIV incidence MSM Ontario, 1977-2008



# Modeled HIV prevalence MSM Ontario, 1977-2008



# Modeled MSM population, HIV prevalence and incidence by health region, Ontario, 2008



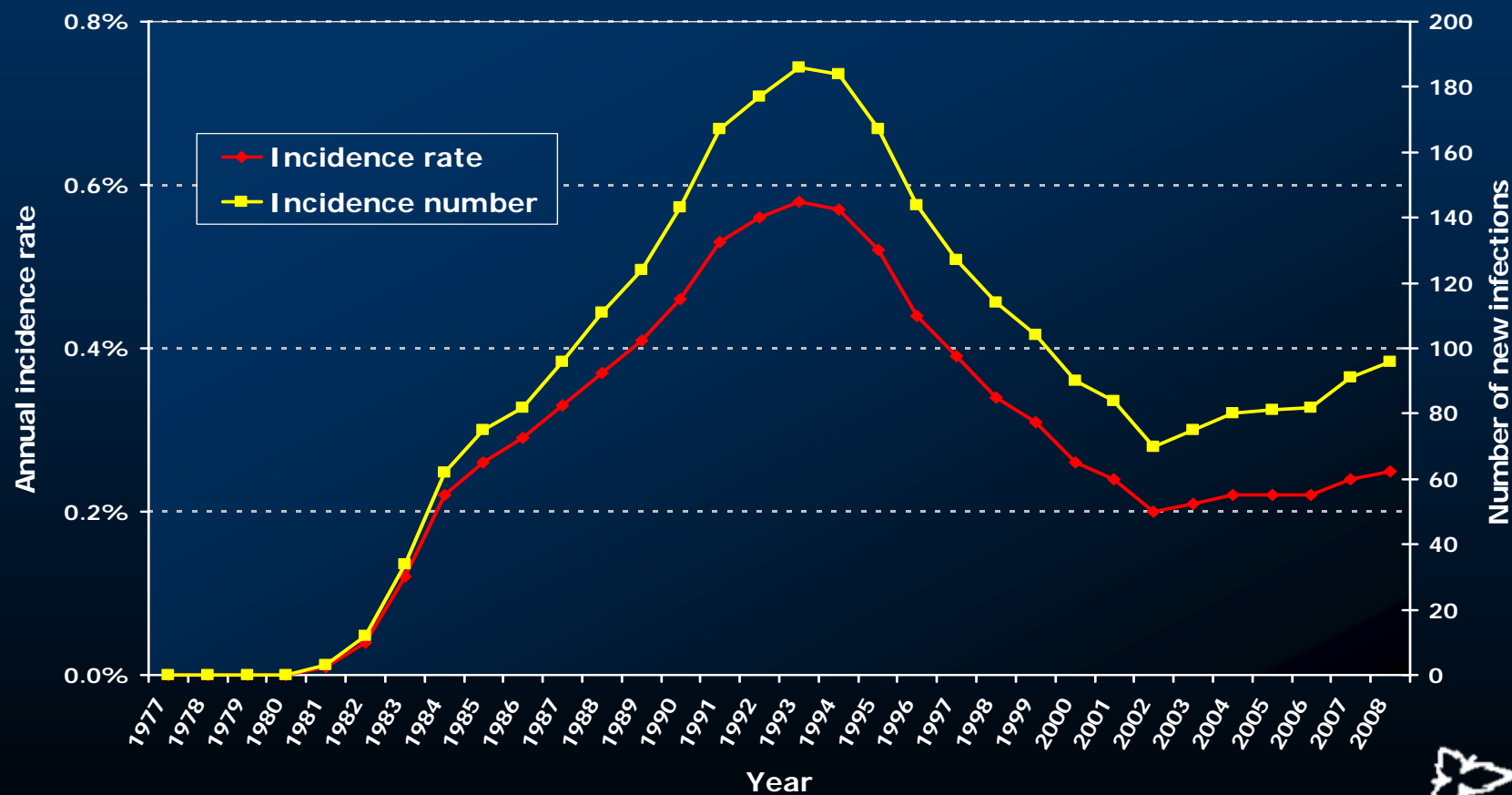
Health region	Population at risk	HIV prevalent number	HIV prevalence rate (%)	Annual HIV incident number	Annual HIV incidence rate (%)	Proportion MSM tested in 2008
Toronto	48,960	10,730	21.9%	520	1.4%	26.7%
Ottawa	10,600	1,190	11.2%	80	0.85%	36.3%
Central East, other	12,330	840	6.8%	35	0.30%	20.3%
Eastern, other	2,730	260	9.5%	15	0.61%	33.8%
Central West	8,150	990	12.1%	45	0.63%	21.7%
Southwest	6,610	890	13.5%	40	0.70%	39.6%
Northern	3,020	180	6.0%	10	0.35%	22.7%
<b>Ontario, total</b>	<b>92,400</b>	<b>15,070</b>	<b>16.3%</b>	<b>745</b>	<b>0.96%</b>	<b>27.5%</b>

## MSM: Epidemiologic highlights

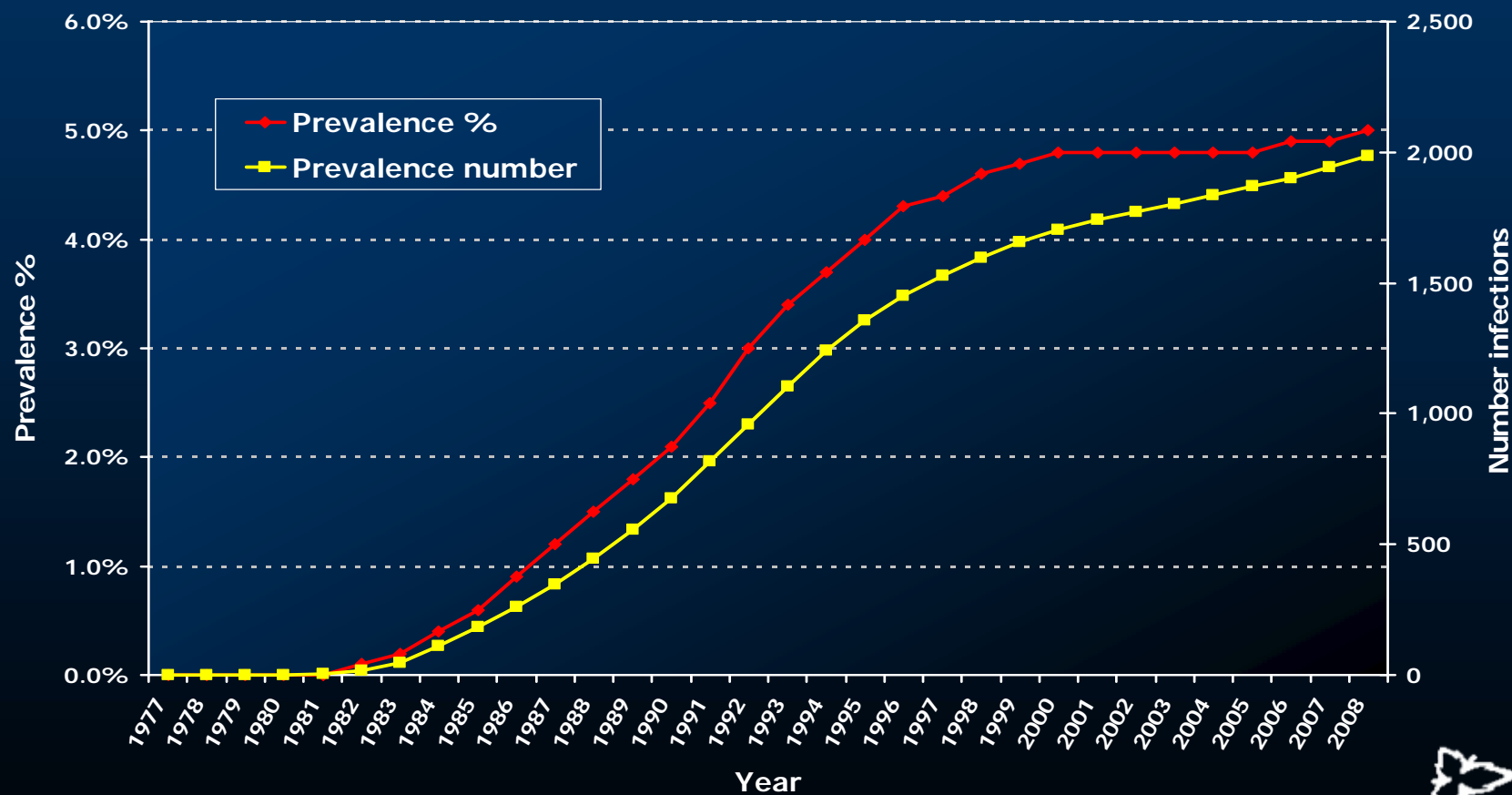


- As of December 2008:
  - 15,070 infected, of whom 70% diagnosed
  - New HIV diagnoses in 2008 up 10.7% over 2003
  - HIV prevalence 16.3%: Toronto 21.9%, Ottawa 11.2% and other regions 6-13%
  - HIV prevalence up 26% 2003 to 2008, annual increase 4.7%
  - 745 incident HIV infections in 2008
  - HIV incidence 0.96%: Toronto 1.4%, Ottawa 0.85% and other regions 0.30-0.70%
- Compared to 2008, new HIV diagnoses in 2009 down 2.5%

# Modeled HIV incidence IDU Ontario, 1977-2008



# Modeled HIV prevalence IDU Ontario, 1977-2008



# Modeled IDU population, HIV prevalence and incidence by health region, Ontario, 2008



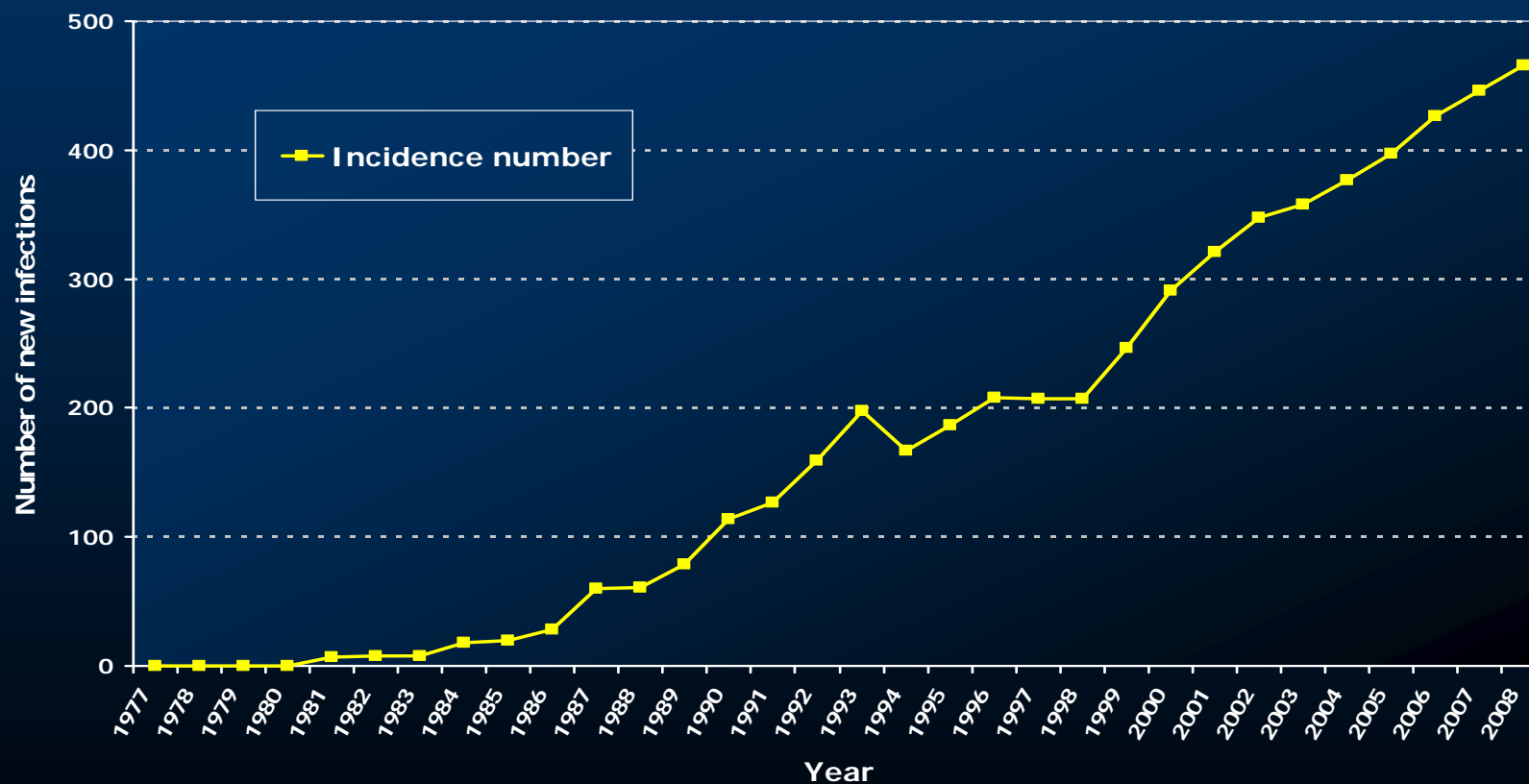
Health region	Population at risk	HIV prevalent number	HIV prevalence rate (%)	Annual HIV incident number	Annual HIV incidence rate (%)	Proportion IDU tested in 2008
Toronto	16,280	685	4.2%	35	0.22%	35.1%
Ottawa	3,420	490	14.3%	25	0.85%	47.5%
Central East, other	6,585	115	1.7%	5	0.08%	36.5%
Eastern, other	2,350	160	6.8%	10	0.46%	62.3%
Central West	4,870	220	4.5%	10	0.22%	43.9%
Southwest	3,985	115	2.9%	5	0.13%	48.8%
Northern	2,350	205	8.7%	10	0.47%	79.5%
<b>Ontario, total</b>	<b>39,840</b>	<b>1,990</b>	<b>5.0%</b>	<b>95</b>	<b>0.25%</b>	<b>43.1%</b>



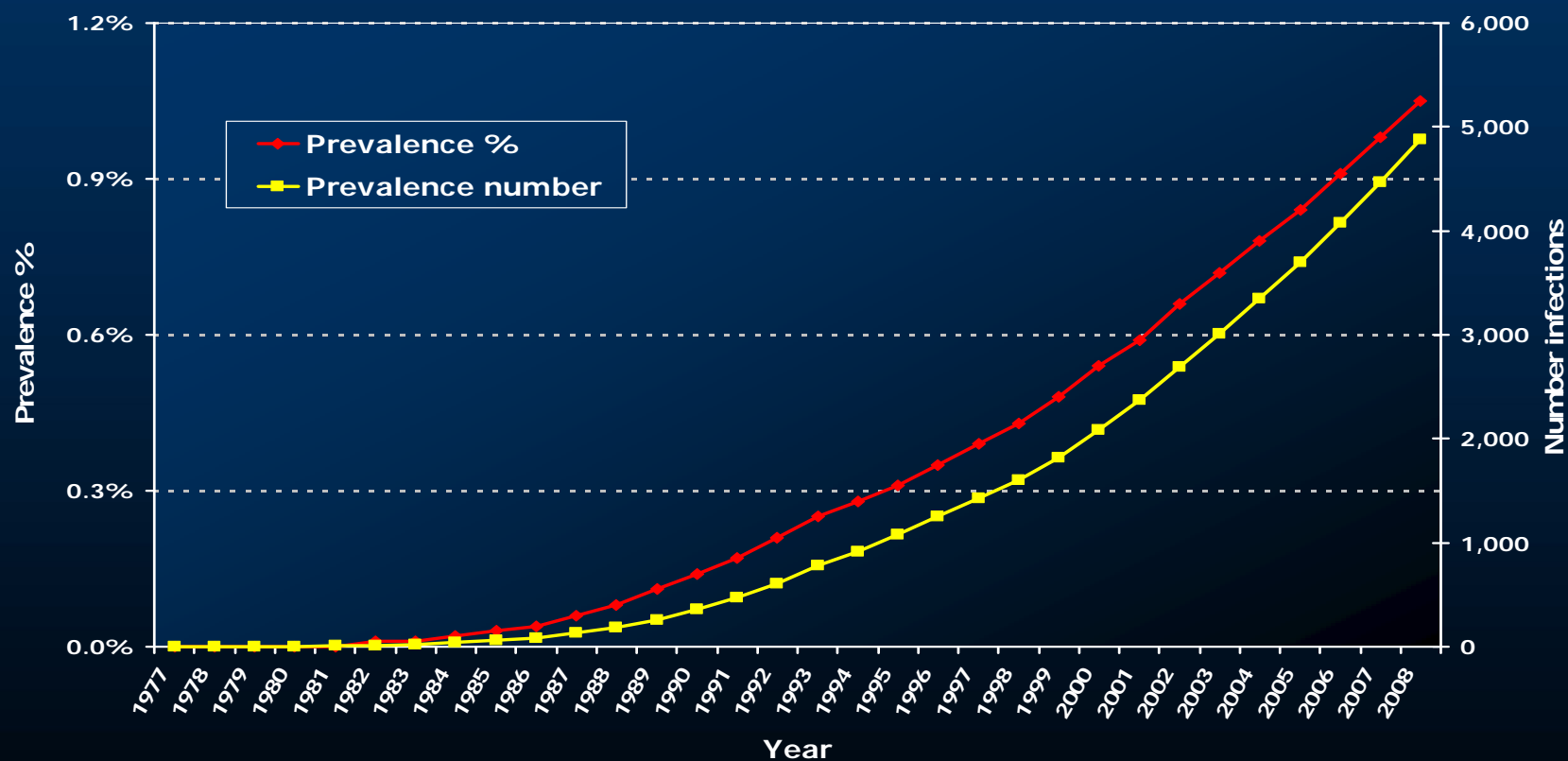
## IDU: Epidemiologic highlights

- As of December 2008:
  - 1,990 infected, of whom 66.5% diagnosed
  - New HIV diagnoses in 2008, up 10.1% over 2003
  - HIV prevalence 5.0%: Toronto 4.2%, Ottawa 14.3% and other regions 2-9%
  - HIV prevalence up 10% 2003 to 2008, annual increase 2.0%
  - 95 new HIV infections in 2008
  - HIV incidence 0.25%: Toronto 0.22%, Ottawa 0.85% and other regions 0.08~0.47%
- Compared to 2008, new HIV diagnoses in 2009 down 6.7%

# Modeled HIV incidence HIV-endemic Ontario, 1977-2008



# Modeled HIV prevalence HIV-endemic Ontario, 1977-2008



# Modeled HIV-endemic population, HIV prevalence and incidence by health region, Ontario, 2008



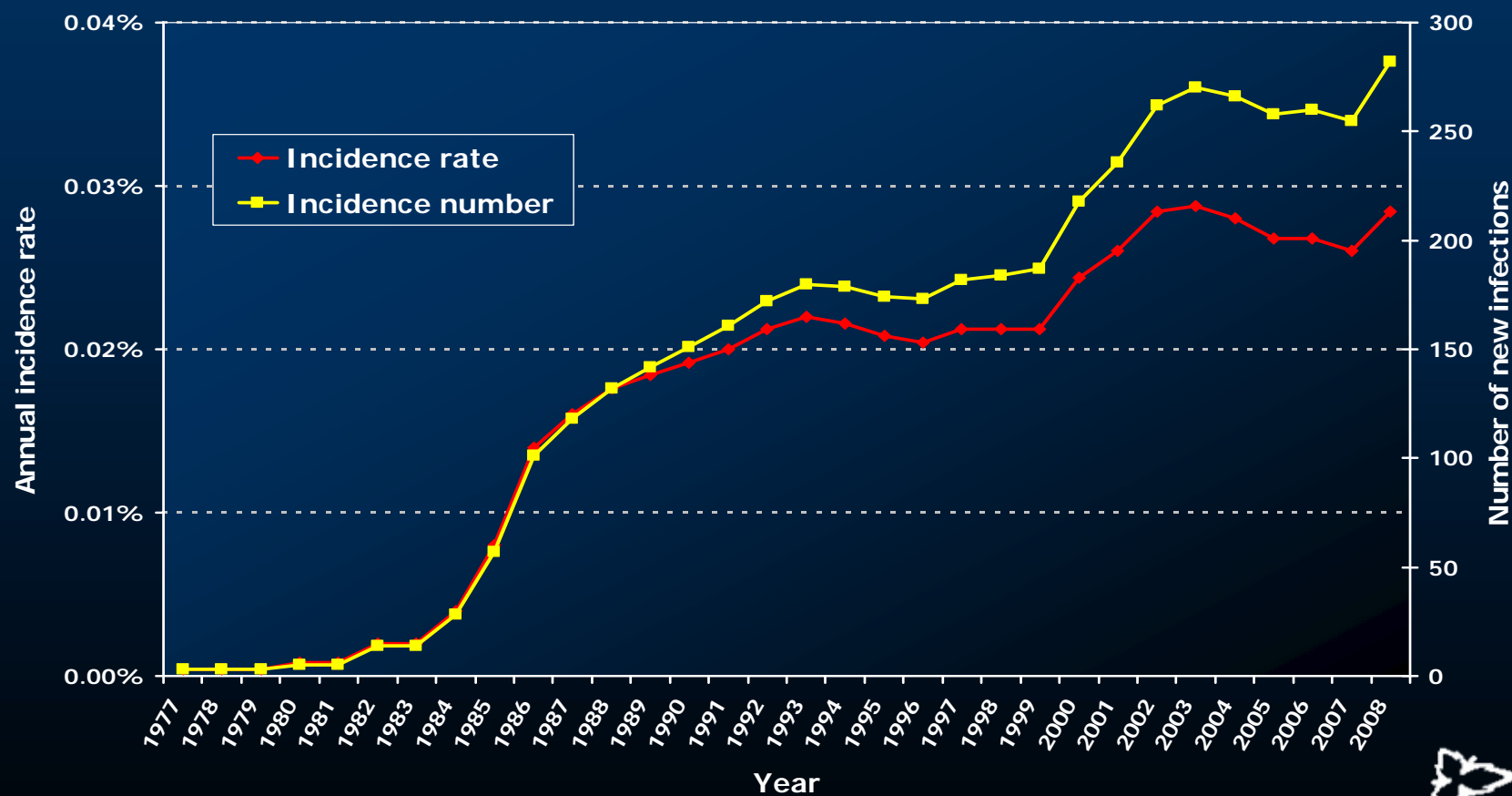
Health region	Population at risk	HIV prevalent number	HIV prevalence rate (%)	Annual HIV incident number	Annual HIV incidence rate (%)	Proportion HIV-endemic population tested in 2008
Toronto	205,900	2,860	1.4%	280	0.14%	3.1%
Ottawa	29,440	910	3.1%	90	0.32%	5.5%
Central East, other	170,540	390	0.23%	25	0.01%	1.0%
Eastern, other	3,300	95	2.9%	5	0.16%	17.7%
Central West	40,620	365	0.90%	35	0.09%	1.5%
Southwest	13,290	235	1.8%	25	0.19%	4.9%
Northern	1,910	30	1.6%	5	0.27%	7.9%
<b>Ontario, total</b>	<b>465,000</b>	<b>4,880</b>	<b>1.0%</b>	<b>465</b>	<b>0.10%</b>	<b>2.5%</b>

## HIV-endemic: Epidemiologic highlights

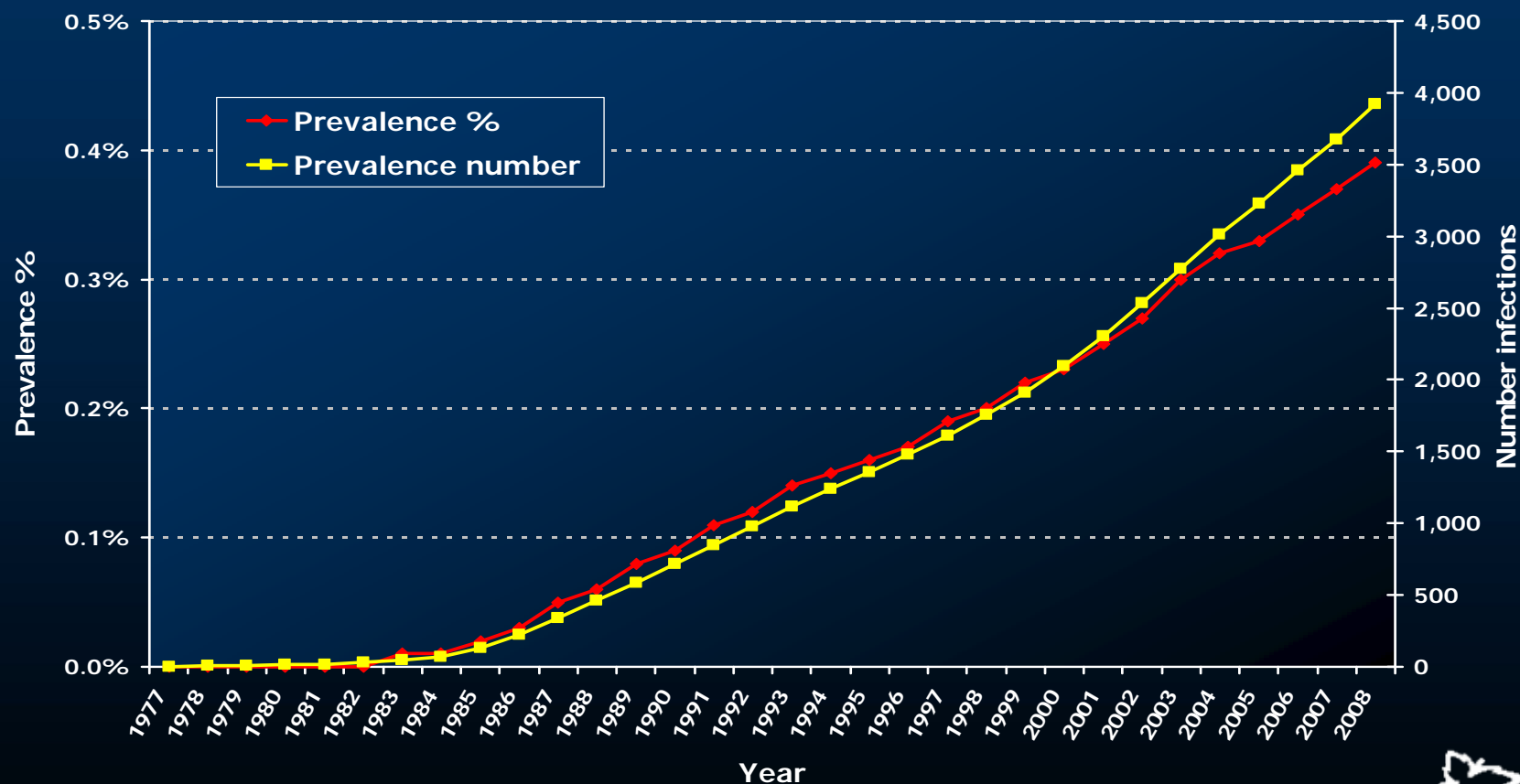


- As of December 2008:
  - 4,880 infected, of whom 54% diagnosed
  - New HIV diagnoses in 2008, down 15.3% over 2003
  - HIV prevalence 1.0%: Toronto 1.4%, Ottawa 3.1% and other regions 0.2-2.9%
  - HIV prevalence up 62% 2003 to 2008, annual increase 10.1%
  - 465 new HIV infections in 2008
    - includes imported infections and those acquired in Canada
  - HIV incidence 0.10%: Toronto 0.14%, Ottawa 0.32% and other regions 0.01-0.27%
- Compared to 2008, new HIV diagnoses in 2009 down 29.2%

# Modeled HIV incidence Heterosexual Ontario, 1977-2008



# Modeled HIV prevalence Heterosexual Ontario, 1977-2008



# Modeled heterosexual population, HIV prevalence and incidence by health region, Ontario, 2008



Health region	Population at risk	HIV prevalent number	HIV prevalence rate (%)	Annual HIV incident number	Annual HIV incidence rate (%)	Proportion heterosexual population tested in 2008
Toronto	1,819,000	1,970	0.108%	140	0.0077%	7.2%
Ottawa	632,000	480	0.076%	35	0.0055%	4.8%
Central East, other	2,699,000	440	0.016%	30	0.0011%	2.5%
Eastern, other	627,000	110	0.018%	10	0.0016%	2.5%
Central West	1,867,000	350	0.019%	30	0.0016%	2.1%
Southwest	1,207,000	360	0.030%	25	0.0021%	2.2%
Northern	617,000	210	0.034%	10	0.0016%	1.8%
<b>Ontario, total</b>	<b>9,468,000</b>	<b>3,920</b>	<b>0.041%</b>	<b>280</b>	<b>0.0030%</b>	<b>3.4%</b>

## Heterosexual: Epidemiologic highlights



- As of December 2008:
  - 3,920 infected, of whom 56% diagnosed
  - New HIV diagnoses in 2008 up 4.0% over 2003
  - HIV prevalence 0.041%: Toronto 0.11%, Ottawa 0.076% and other regions 0.016-0.034%
  - HIV prevalence up 41% 2003 to 2008, annual increase 7.1%
  - 280 new HIV infections in 2008
  - HIV incidence 0.0030%: Toronto 0.0077%, Ottawa 0.0055% and other regions 0.0011-0.0021%
- Compared to 2008, new HIV diagnoses in 2009 down 10.6%



## HIV diagnoses highlights: 2009

- 1,013 new HIV diagnoses in 2009
- Decrease of 9.6% (108 cases) compared to 2008, with 17.8% (49 cases) decrease among females, 7.7% (64 cases) decrease among males
- Compared to 2008
  - Decreased: HIV-endemic 29% (73 cases), HR hetero 33% (20 cases), MSM 2.5% (13 cases)
  - Decreased: Central West 40% (53 cases), Ottawa 15% (25 cases), Toronto 2.6% (16 cases), Northern 30% (13 cases), Central East, other 11% (9 cases), Eastern, other 17% (5 cases),
  - Increased: Southwest 24% (13 cases)



## Methodologic limitations

- Populations at risk (especially MSM, IDU) not well characterized (size, behavioural patterns, regional variations)
- Adjustments for HIV diagnoses, AIDS cases and HIV-related mortality subject to uncertainty
- Limited data on HIV incidence and available data biased
  - Taken into account in HIV model
- Despite challenges, with triangulation, we obtained plausible estimates for HIV incidence and prevalence



## Conclusions (1)

- HIV epidemic in Ontario is not yet under control
- Good news:
  - AIDS incidence and mortality decreasing
  - HIV infection among IDUs relatively stable
- However . . . . .
- Overall, HIV prevalence increased by 31% (20,260 to 26,630) from 2003 to 2008
- HIV prevalence increased markedly in HIV-endemic and other heterosexual exposure categories

## Conclusions (2)



- From 2004 to 2009:
  - Number of HIV tests increased by 14%, mainly in MSM, HIV-endemic and heterosexual
  - HIV positivity rates decreased in MSM, HIV-endemic and heterosexual
- In 2008, proportion of population tested: MSM 27%, IDU 43%, HIV-endemic 2%, and heterosexual 3%;
  - proportion varied by health region
- In 2008, proportion of HIV infections diagnosed: MSM 74%, IDU 66%, HIV-endemic 56% and heterosexual 56%

## Conclusions (3)



- HIV incidence among MSM doubled since 1996, though may have stabilized at higher rate in recent years
- HIV-endemic: need for innovative and effective prevention programs
- Increase among others infected heterosexually requires further elucidation
- Preventive interventions need to be systematically reviewed and reinforced

## Acknowledgements



- Frank McGee, Coordinator, AIDS Bureau, Ontario Ministry of Health and Long Term Care (MOHLTC)
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- OHEMU web site: [www.phs.utoronto.ca/ohemu](http://www.phs.utoronto.ca/ohemu)