Treatment as Prevention
The Key to Eliminate AIDS & HIV

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UNAIDS Special Advisor on HIV Therapeutics

Placing Adherence within the Continuum of Care Context
IAPAC – Miami, June 9th 2014
Increasing HAART Coverage within Evolving Guidelines in BC

Montaner et al, Lancet, 2010
BC: All Cause Mortality (#)

> 90% Decrease in All Cause Mortality among HIV Infected Individuals in BC since 1996

Montaner et al, PLOS One, Feb 12th 2014
Baseline CD4 count by year in BC

Modified from Montaner et al, PLOS One, Feb 12th 2014
HAART stops HIV replication

↓

HIV load falls to undetectable levels in plasma

as well as in sexual fluids

↓

Sharp reduction in HIV transmission
VERTICAL TRANSMISSION - BC

HIV+ Birth

Annual Report 2012

Dx at/after delivery
Dx before delivery, no HAART
Dx before delivery, HAART

<table>
<thead>
<tr>
<th>Year</th>
<th>Dx at/after delivery</th>
<th>Dx before delivery, no HAART</th>
<th>Dx before delivery, HAART</th>
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<td>3</td>
<td>2</td>
<td>21</td>
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<td>0</td>
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</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
<td>24</td>
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</table>

Dx before delivery, no HAART - diagnosed before delivery, did not receive antenatal HAART
Dx before delivery, HAART - diagnosed before delivery, received antenatal HAART
HIV new Diagnoses
British Columbia, 1996 - 2012

Number of new cases and new diagnoses

New HIV Diagnoses (All)
New HIV Diagnoses (Ever IDU)

<table>
<thead>
<tr>
<th>Year</th>
<th>New HIV Diagnoses</th>
<th>New HIV Diagnoses (Ever IDU)</th>
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<tbody>
<tr>
<td>1996</td>
<td>702</td>
<td>352</td>
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<tr>
<td>1997</td>
<td>519</td>
<td>215</td>
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<td>1998</td>
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<td>2006</td>
<td>361</td>
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<td>2007</td>
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<td>65</td>
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<td>2008</td>
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<td>2009</td>
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<td>34</td>
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<tr>
<td>2011</td>
<td>289</td>
<td>29</td>
</tr>
<tr>
<td>2012</td>
<td>238</td>
<td>29</td>
</tr>
</tbody>
</table>

Modified from Montaner et al, PLOS One, Feb 12th 2014
Syphilis and neurosyphilis increase to historic levels in BC
R Lester, M Morshed, and M Gilbert, BCMJ, May 4th 2013

Infectious syphilis cases by exposure category in British Columbia

- Men who have sex with men
- Street-involved or sex trade worker
- Heterosexual
HIV Transmission According to Sexual Behavior Reported by HIV-Negative Partner


Rate of Couple Transmission
(per 100 Couple-Years Follow-Up)

- **Heterosexual (Male)**
  - Vaginal sex with ejaculation (192 CYFU)

- **Heterosexual (Female)**
  - Vaginal sex (272 CYFU)

- **MSM**
  - Receptive anal sex:
    - With ejaculation (93 CYFU)
    - Without ejaculation (157 CYFU)
  - Insertive anal sex (262 CYFU)

Overall risk = Zero through condomless sex with a partner on ART (HIV RNA <200 copies/mL)
High Coverage of ART Associated with Decline in Risk of HIV Acquisition in Rural KwaZulu-Natal, South Africa

Frank Tanser, Till Bärnighausen, Erofili Grapsa, Jaffer Zaidi, Marie-Louise Newell

SCIENCE VOL 339 22 FEBRUARY 2013

HIV Prevalence 2005 to 2011

ART Coverage 2005 to 2011
A clear correlation between HIV treatment and incidence

1.1% (0.8%-1.4%) reduction in HIV incidence, for each 1.0% increase in treatment coverage.

Longitudinal adherence to HAART, by refill compliance, in BC

Modified from Montaner et al, PLOS One, Feb 12th 2014
Plasma HIV-RNA levels in BC
(all HIV + individuals)

Modified from Montaner et al, PLOS One, Feb 12th 2014
ARV Drug Resistance in BC

Modified from Montaner et al, PLOS One, Feb 12th 2014
# Interventions to Improve Adherence to ART

## A Rapid Systematic Review

KH Chaiyachati, O Ogbuoji, M Price, AB Suthar, EK Negussie, T Barnighausen

<table>
<thead>
<tr>
<th>Intervention Component</th>
<th>Number of Studies</th>
<th>% with Positive Results for ≥ 1 Outcome</th>
<th>% with Positive Results for ≥ 1 Biological AND 1 Adherence Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Behavioral Therapy</td>
<td>60</td>
<td>67</td>
<td>20</td>
</tr>
<tr>
<td>Education</td>
<td>28</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>Treatment Supporter</td>
<td>26</td>
<td>62</td>
<td>19</td>
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<tr>
<td>Directly Observed Rx</td>
<td>20</td>
<td>85</td>
<td>30</td>
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<tr>
<td>Active Reminder Device</td>
<td>20</td>
<td>75</td>
<td>25</td>
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<tr>
<td>Structural</td>
<td>10</td>
<td>70</td>
<td>10</td>
</tr>
<tr>
<td>Counseling</td>
<td>8</td>
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<td>63</td>
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<tr>
<td>Nutrition Support</td>
<td>7</td>
<td>71</td>
<td>43</td>
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<tr>
<td>Drug Use Treatment</td>
<td>5</td>
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<td>40</td>
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<td>Passive Reminder Device</td>
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<td>60</td>
<td>0</td>
</tr>
<tr>
<td>Financial Incentives</td>
<td>5</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>Depression Treatment</td>
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<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Modified from AIDS 2014, 28 (Suppl 2): S187-S204
Programmatic Compliance Score

- Assesses the impact of non-compliance with HIV treatment guidelines on all-cause mortality

- PCS components include:
  - Baseline CD4 > 200/mm3
  - Three CD4 in 1st year
  - Three VL in 1st year
  - Baseline resistance
  - Recommended HAART
  - Undetectable pVL at 9 months

- Failure to meet a given component add one to the score

- PCS predicts **mortality**

<table>
<thead>
<tr>
<th>Programmatic Compliance Score</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>Type III P-value</th>
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<tbody>
<tr>
<td>0</td>
<td>1 (-)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>1</td>
<td>3.81 (1.73–8.42)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7.97 (3.70–17.18)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>11.51 (5.28–25.08)</td>
<td></td>
</tr>
<tr>
<td>4 or more</td>
<td>22.37 (10.46–47.84)</td>
<td></td>
</tr>
</tbody>
</table>

PCS in BC 2000 to 2011

The role of antiretroviral treatment in stopping new infections and how it can be effectively used as part of combination HIV prevention approaches must be further explored, as shown by Dr Julio Montaner, President of the International AIDS Society.
When to start: Potential scenarios

Estimated millions of people eligible for ART in lower & middle-income countries in 2011

11 15 23 >25 32

1  CD4 ≤ 200
   Recommended Since 2002

2  CD4 ≤ 350 +

3  CD4 ≤ 350 +
   Expanded CD4 independent conditions

4  CD4 ≤ 500
   ART regardless of CD4s for:
   • HIV-SD couples
   • TB/HIV
   • HBV/HIV
   • Pregnant women
   • Children ≤ 5yo

5  Test & Treat
   All HIV+

Modified from Meg Doherty, et al. 3rd International TasP Workshop, Vancouver 2013
Expanding ART for Treatment and Prevention of HIV in South Africa: Estimated Cost and Cost-Effectiveness 2011-2050

Lives Saved (x 1,000)

US$A Billions

Granich et al
Treatment as Prevention

February 2010: UNAIDS
February 2011: China
Dec 2011: USA
July 2013: WHO
October 2013: France
October 2013: Brazil
February 2014: Spain
February 2014: Panama
March 2014: Sierra Leone
Supported by the BC-MoH, plus research grants, including $5M 10 year Award (2008-2018) from the National Institute for Drug Abuse (NIDA) at the NIH, $5M from Genome Canada/BC and from Pharmaceutical Industry, including Merck, Gilead, ViiV and BMS.