HIV and Non-Communicable Diseases: Strengthening Systems to Provide Integrated Chronic Care Services in Low-Resource Settings

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Associate Professor of Medicine & Epidemiology
Columbia University Mailman School of Public Health
HIV and NCDs

• Making the HIV-NCD connection
  – convergence, co-morbidity and chronicity

• Integration of NCD services into HIV programs
  – feasibility, acceptability, challenges

• Strengthening health systems for chronic care
  – 21st century primary health care
HIV and NCDs

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• Strengthening health systems for chronic care
  – 21st century primary health care
Defining “NCD”

- A diverse collection of health challenges
- Often, the focus is on four main NCDs:
  - Cardiovascular disease
  - Cancers
  - Chronic respiratory diseases
  - Diabetes
Making the HIV-NCD Connection:

Convergence

Four Major Categories of NCDs

- Cardiovascular Diseases
- Diabetes
- Chronic Respiratory Diseases
- Cancer

Co-located Epidemics

Probability of dying prematurely from non-communicable diseases

Probability of dying from the four main NCDs* between the ages of 30 and 70 in 2012, %

- <15
- 15–19
- 20–24
- ≥ 25
- No data

Source: WHO

*Non-communicable diseases: cardiovascular diseases, cancer, chronic respiratory diseases and diabetes
NCD Myth: Diseases of Affluence

- 80% of chronic disease deaths are in lower-income countries
- In all but the lowest-income countries, chronic diseases are more prevalent among the poor
- In all countries, the poor are more likely to die as a result of chronic diseases than the rich
NCD Myth: Diseases of the Elderly

- 50% of global chronic disease burden is among those under 70 years of age
- 25% of all deaths attributed to NCDs occur before the age of 60, and 90% of these “premature” deaths occur in LMIC

Burden of Disease (DALYs) in SSA
HIV and NCDs: Co-Located Epidemics

Global Burden of CVD (DALYs)
Percentage Change in Premature Cardiovascular Mortality from 2013-2025 if Risk Factors Continue Current Trend

- 50 to 75%
- 25 to 50%
- 0.1 to 25%
- -0.1 to -25%
- -25 to -50%
- -50 to -75%
- Uncertainty Interval for Change in Premature Mortality Crosses Zero
Changing Cause of Death in Ethiopia

What causes the most deaths?

<table>
<thead>
<tr>
<th>2005 ranking</th>
<th>2015 ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV/AIDS</td>
<td>Lower respiratory infect</td>
</tr>
<tr>
<td>Lower respiratory infect</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>Diarrheal diseases</td>
<td>Diarrheal diseases</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>Cerebrovascular disease</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>Malaria</td>
<td>Congenital defects</td>
</tr>
<tr>
<td>Meningitis</td>
<td>Neonatal encephalopathy</td>
</tr>
<tr>
<td>Protein-energy malnutrition</td>
<td>Meningitis</td>
</tr>
<tr>
<td>Neonatal preterm birth</td>
<td>Neonatal preterm birth</td>
</tr>
<tr>
<td>Congenital defects</td>
<td>Protein-energy malnutrition</td>
</tr>
<tr>
<td>Neonatal encephalopathy</td>
<td>Malaria</td>
</tr>
</tbody>
</table>

Top 10 causes of death by rate in 2015 and percent change, 2005-2015
Changing Cause of Death in Swaziland

What causes the most deaths?

2005 ranking
1. HIV/AIDS
2. Lower respiratory infect
3. Diarrheal diseases
4. Tuberculosis
5. Ischemic heart disease
6. Cerebrovascular disease
7. Road injuries
8. Diabetes
9. COPD
10. Hypertensive heart disease
11. Self-harm

2015 ranking
1. HIV/AIDS
2. Lower respiratory infect
3. Ischemic heart disease
4. Cerebrovascular disease
5. Tuberculosis
6. Diabetes
7. Diarrheal diseases
8. Road injuries
9. COPD
10. Self-harm
11. Hypertensive heart disease

Top 10 causes of death by rate in 2015 and percent change, 2005-2015
Cause of Death in Swaziland

Proportional mortality (% of total deaths, all ages, both sexes)*

- Cardiovascular diseases: 11%
- Cancers: 3%
- Chronic respiratory diseases: 3%
- Diabetes: 3%
- Other NCDs: 8%
- Communicable, maternal, perinatal and nutritional conditions: 63%

Total deaths: 14,000
NCDs are estimated to account for 28% of total deaths.
Convergence in Swaziland
DALYs amongst Adults (50-69 years)
Comorbidity

PLHIV may be at higher risk for some NCDs

- Baseline NCD risk factors
- Metabolic complications of HIV
- Some ARVs cause dyslipidemia, glucose intolerance, other metabolic side effects

Non-AIDS morbidity and mortality
Prevalence of NCDs amongst PLHIV in LMIC

• Data are limited
  – Surveillance and community-based surveys lacking

• Systematic reviews
  – HTN prevalence: 8.7 – 45.9% in LMIC
  – Metabolic syndrome: 30% mean prevalence in SSA
  – DM prevalence: < 5% in most studies

• Facility-based studies
  – HTN rates at or above those of general population

Nguyen KA et al. *AIDS Reviews* 2015
Sivaraj et al. *AIDS Pat Care STDs* 2017
NCD amongst PLWH

Illustrative studies (there are many more!):

- Mwangemi et al. 2010 (VCT platform in Kenya): 38% of 4,307 newly-diagnosed PLWH had HTN
- Dave et al. 2011 (HIV clinic in South Africa): 26% of 406 ART-naïve patients had dysglycemia
- Gwarzo et al. 2012 (HIV clinic in Nigeria): 15% of 1,033 patients had HTN; 22% had elevated BMI
- Divala et al. 2016 (2 HIV clinics in Malawi): DM prevalence 4.1%, HTN prevalence 23.7%
CVDRF amongst PLHIV ≥ 40 years on ART in Swaziland (N=1,826)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total, n (%)</th>
<th>Total</th>
<th>Age (years)</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1,826 (100%)</td>
<td>1,121 (61%)</td>
<td>462 (25%)</td>
</tr>
<tr>
<td>At least 1 CVD risk factor</td>
<td>39%</td>
<td>32%</td>
<td>47%</td>
<td>55%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>25%</td>
<td>19%</td>
<td>31%</td>
<td>42%</td>
</tr>
<tr>
<td>(BP &gt; 140/90 mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>8%</td>
<td>6%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>(non-fasting TC &gt; 6.2 mmol/L, POC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>5%</td>
<td>3%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>(HbA1c &gt; 6.5%, POC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking in past year</td>
<td>9%</td>
<td>9%</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>(self-report)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Rabkin et al. CROI 2017, abstract #637
HTN prevalence amongst PLHIV in Malawi

Neuhann et al. IAS 2017 # WEPEBO551
Chronicity

Defining “Chronic Disease”:

• Long duration
  – Requires self-management

• Slow progression
  – Early engagement in care is key

• Often preventable
  – Primary vs. secondary prevention

• Risk factors may cluster in families/households
  – Genetic, behavioral, and/or environmental
# Illustrative Chronic Diseases & Conditions

<table>
<thead>
<tr>
<th>Non-communicable conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease (e.g., ischemic heart disease, stroke)</td>
</tr>
<tr>
<td>Cardiovascular disease risk factors (e.g., hypertension, high cholesterol)</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Chronic respiratory diseases (e.g., asthma, COPD)</td>
</tr>
<tr>
<td>Cancers</td>
</tr>
<tr>
<td><strong>Infectious conditions</strong></td>
</tr>
<tr>
<td>Hepatitis B</td>
</tr>
<tr>
<td>HIV/AIDS</td>
</tr>
<tr>
<td><strong>Neuropsychiatric conditions</strong></td>
</tr>
<tr>
<td>Epilepsy</td>
</tr>
<tr>
<td>Depression</td>
</tr>
<tr>
<td>Substance addiction</td>
</tr>
</tbody>
</table>
## Characteristics/priorities of chronic disease from the perspective of the health system

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosis and enrollment</strong></td>
<td>Identification of risk factors, early diagnosis, opportunistic case-finding, point-of-service diagnostics, standardized diagnostic protocols</td>
</tr>
<tr>
<td><strong>Retention and adherence</strong></td>
<td>Appointment systems, defaulter tracking, patient counseling, expert patients, secure medication supply chains, pharmacy support</td>
</tr>
<tr>
<td><strong>Multidisciplinary family-focused care</strong></td>
<td>A multidisciplinary team of healthcare providers and community members delivers care in partnership with the patient</td>
</tr>
<tr>
<td><strong>Longitudinal monitoring</strong></td>
<td>Health information systems have standardized and easily retrievable data</td>
</tr>
<tr>
<td><strong>Linkages and referrals</strong></td>
<td>Links within the health facility (to lab, pharmacy, others), between facilities, and between facility &amp; community</td>
</tr>
<tr>
<td><strong>Self management</strong></td>
<td>An informed, motivated patient is an effective manager of his/her own health</td>
</tr>
<tr>
<td><strong>Community linkages and partnerships</strong></td>
<td>Need functional partnerships between health facility-based providers and community-based groups that facilitate access to services across the care continuum</td>
</tr>
</tbody>
</table>
### Common Health System Barriers

<table>
<thead>
<tr>
<th></th>
<th>HIV/AIDS</th>
<th>Diabetes</th>
<th>CVD</th>
<th>Chronic Lung Disease</th>
<th>Cancers</th>
<th>Mental Health</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demand-side barriers</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Inequitable availability</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Health worker shortages</strong></td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td><strong>Lack of adherence support</strong></td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Inadequate infrastructure and equipment</strong></td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td><strong>Inconstant supplies of drugs and diagnostics</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Missing linkage and referral systems</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Need for client and community engagement</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Stigma and discrimination</strong></td>
<td>++</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>
Positive policy environment

- Strengthen partnerships
- Support legislative frameworks

- Integrate policies
- Provide leadership and advocacy

- Promote consistent financing
- Develop and allocate human resources

Community

- Raise awareness and reduce stigma
- Encourage better outcomes through leadership and support
- Mobilise and coordinate resources
- Provide complementary services

Health-care organisation

- Promote continuity and coordination
- Encourage quality through leadership and incentives
- Organise and equip health-care teams
- Use information systems
- Support self-management and prevention

Links

- Community partners
  - Informed
- Health-care team
  - Motivated
- Patients and families

Better outcomes for chronic disorders

Beaglehole et al. 2008
HIV Care Continuum

1. General, KP, PP
   - Test

2. HIV-Positive
   - Initiate ART

3. Retain, Counsel, Monitor & Support

4. Adherence Support
   - Undetectable Viral Load
The Hypertension Cascade

- Measure BP
- Identify Patients with Hypertension
- Link to Care
- Retain, Counsel, Monitor & Support
- Adhere to Tx
- Monitor & Prevent Complications

% of Patients:
- Adult Population
- Adults Screened
- High BP
- Linked to Care
- Receiving Tx
- BP Controlled at 3 mo
- BP Controlled at 12 mo
Noncommunicable diseases account for 67% of deaths in low- and middle-income countries but only 1% of health funding addresses them.

- 67% of deaths in low- and middle-income countries in 2015
- 39% of total health funding in 2015 including government, philanthropy, and international organizations
HIV and NCDs

• Making the HIV-NCD connection
  – convergence, co-morbidity and chronicity

• Integration of NCD services into HIV programs
  – feasibility, acceptability, challenges

• Strengthening health systems for chronic care
  – 21st century primary health care
Integration of NCD services into HIV programs

“As with many passionately debated subjects, data on risks and benefits of integration are scarcer than might be expected.”

– Schuchat & De Cock 2012

What are the tradeoffs? What is the impact on:

• Coverage?
• Quality?
• Equity?
• Efficiency?
Integration of NCD services into HIV programs

• Feasibility
  – HCW cadre
  – Time
  – Cost

• Acceptability
  – To patients
  – To clinicians

• Impact
  – On coverage and quality of HIV services
  – On health outcomes
  – On patient satisfaction
What is the optimal model for integrated HIV-NCD services?
Scenario 1: Parallel Services

Scenario 2: Coordinated Services

Scenario 3: Integrated Services

From: Rabkin, Kruk and El-Sadr, AIDS 2012
Policy options highlighted:

1. Integrate HTN screening and management into HIV clinics
2. HTN screening within HIV clinics with referral for management
3. Development of a comprehensive chronic care clinic (CCC) model
Piloting NCD models in Zimbabwe

• MSF and MOHCC are piloting nurse-led care for HIV, TB, HTN, DM and asthma at 11 health facilities in Chipenge Districts

• Multiple models under development
  – Integration of NCD services into OPD for all
  – Integration of NCD services into HIV clinic for PLHIV and into OPD for HIV-negative patients

• Data are pending, but uptake of NCD services appears to be robust
Multi-disease community health campaigns

- SEARCH study offered screening and linkages for HTN, DM, HIV, TB, malaria, urgent care and men’s health in the context of CHCs in Uganda
- Uptake of both NCD and HIV testing was high
- Non-HIV services reduced stigma and attracted individuals previously reluctant to access HIV testing

Sang et al. IAS 2017, #MOPED1115
HEART Study in Swaziland

Phase 1: Screening
- Screening for HTN, DM, high cholesterol and tobacco smoking integrated into a large urban HIV clinic for patients > 40 years on ART
- Data will include:
  - Prevalence
  - Time-motion studies
  - Patient exit interviews
  - Provider KII
  - Costing

Phase 2: Management
- Patients with HTN and/or ten-year CVD risk > 10% randomized to management in HIV clinic or referral to OPD
- Data will include:
  - Linkage to NCD care
  - Retention in NCD and HIV care
  - Time motion studies
  - 6-month outcomes
  - Patient and provider KII
  - Costing
Screening time-motion data: Swaziland

### Time-motion data collection form

**Task** | **Start 1** | **End 1** | **Start 2** | **End 2**
--- | --- | --- | --- | ---
1. BP measurement (including sensitization) | | | | |
2. Interview (including smoking question) | | | | |
3. Point-of-care test – Fingerstick for TC/HbA1c | | | | |
4. Point-of-care test – Waiting/processing | | | | |
5. Post-test counseling (including disclosure and provision of written materials) | | | | |
6. Documenting results (completing CVD Risk Stratification Form) | | | | |
7. Regular HIV consultation (including follow-up for care, labs, medication refill) | | | | |

**Time spent on HIV and CVDRF screening services**

<table>
<thead>
<tr>
<th>Service provided</th>
<th>No. minutes spent (n)</th>
<th>Wilcoxon rank-sum p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not screened</td>
<td>Screened</td>
<td></td>
</tr>
<tr>
<td>Total visit length</td>
<td>4 (2-11)</td>
<td>15 (9-30)</td>
</tr>
<tr>
<td>HIV services</td>
<td>4 (2-10)</td>
<td>4 (2-11)</td>
</tr>
</tbody>
</table>

Palma et al. AIDS 2016
Abstract #: WEPEE530
Risk Stratification: South Africa

- 37.7% of participants had high BP, 10.4% had high total cholesterol, 15.4% reported current tobacco smoking, 4.1% had diabetes.
- 3.6% had a ten-year CVD risk of > 10%

Differentiated Chronic Care

- Testing and linkage to care
- Pre-ART care
- ART initiation/refills
- Clinical monitoring
- Adherence support
- Laboratory tests
- OI treatment
- Psychosocial support

Service Frequency:
- Monthly
- Bi-monthly
- Every 3 months
- Every 6 months

Service Intensity

Service Location
- HIV clinic/hospital
- Primary care clinic
- Other clinic
- Community
- Home

Health Worker Cadre
- Physician
- Clinical Officer
- Nurse
- Pharmacist
- Community Health Worker
- Patient/peer/family
NIH PEPFAR NCD Project

Research to guide practice: Enhancing HIV/AIDS platforms to address NCDs in low-resource settings

The NIH project focuses on integration of HIV and NCD care

For millions of patients, HIV has been transformed into a highly treatable, chronic condition thanks to the development and distribution of increasingly sophisticated combination therapies. These advances have come with another unanticipated outcome, though. Researchers and health workers now worry they may lose patients they have saved from AIDS-related illnesses to non-communicable diseases (NCDs), including cardiovascular disease, cervical from PEPFAR. The project also includes policy makers, health and government officials, and researchers from 11 other NIH centres and institutes.

“As the prevalence of NCDs among HIV patients seems to be increasing, it seems natural to attempt to combine services for both diseases...”

It started in 2014, following "reports increasing, it seems natural to attempt to combine services for both diseases, researchers said. This integration becomes easier as HIV transitions into a chronic disease for many patients, requiring less frequent visits to clinics and freeing health workers to expand their services.”

“We need to find a way of bringing both of them together”, said Harriet Akello, the senior clinical officer at Zomba Central Hospital HIV.
HIV and NCDs

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Leveraging HIV programs to enhance NCD services for all

Why reinvent the wheel? Leveraging the lessons of HIV scale-up to confront non-communicable diseases
Miriam Rabkin\textsuperscript{a,b,*} and Wafaa M. El-Sadr\textsuperscript{a,b}

Scale-up of HIV care and treatment: can it transform healthcare services in resource-limited settings?
Wafaa M. El-Sadr and Elaine J. Abrams

HIV, aging and continuity care: strengthening health systems to support services for noncommunicable diseases in low-income countries
Miriam Rabkin\textsuperscript{a}, Margaret E. Kruk\textsuperscript{b} and Wafaa M. El-Sadr\textsuperscript{a}

Scaling Up Chronic Care Systems: Leveraging HIV Programs to Support Noncommunicable Disease Services
Miriam Rabkin, MD, MPH* and Sania Nishtar, SI, FRCP, PhD†
Integrated Chronic Care for HIV and NCDs

Offering integrated care for HIV/AIDS, diabetes and hypertension within chronic disease clinics in Cambodia

B Janssens, W Van Damme, B Raleigh, J Gupta, S Khem, K Soy Ty, MC Vun, N Ford & R Zachariah

**Problem** In Cambodia, care for people with HIV/AIDS (prevalence 1.9%) is expanding, but care for people with type II diabetes (prevalence 5–10%), arterial hypertension and other treatable chronic diseases remains very limited.

**Approach** We describe the experience and outcomes of offering integrated care for HIV/AIDS, diabetes and hypertension within the setting of chronic disease clinics.

**Local setting** Chronic disease clinics were set up in the provincial referral hospitals of Siem Reap and Takeo, 2 provincial capitals in Cambodia.

**Relevant changes** At 24 months of care, 87.7% of all HIV/AIDS patients were alive and in active follow-up. For diabetes patients, this proportion was 71%. Of the HIV/AIDS patients, 9.3% had died and 3% were lost to follow-up, while for diabetes this included 3 (0.1%) deaths and 28.9% lost to follow-up. Of all diabetes patients, 3.4% were still in follow-up at 24 months.

**Lessons learned** Over the first three years, the chronic disease clinics have successfully integrated care for HIV/AIDS with non-communicable chronic diseases in Cambodia, resulting in good outcomes. Services were well accepted by patients. This experience shows how care for HIV/AIDS patients can act as a platform for other chronic conditions.
HIV and NCD care in Kibera, Kenya

NCD and HIV care integrated into primary care clinics in the informal settlement of Kibera, Kenya

- HTN and DM services provided for both HIV negative and HIV positive pts
- Analysis of routinely collected data for 2,206 pts with DM and/or HTN:
  - 9.5% were PLHIV; median age was younger for this group (43 vs. 49 years)
  - Outcomes similar for both groups

Edwards et al 2015
Ayah et al 2013
Integrated medication adherence clubs for stable adults with HIV and/or NCDs

"They just come, pick and go." The Acceptability of Integrated Medication Adherence Clubs for HIV and Non Communicable Disease (NCD) Patients in Kibera, Kenya

Emilie Venables1,2*, Jeffrey K. Edwards3, Saar Baert1, William Etienne3, Kelly Khabala4, Helen Bygrave1

1 Médecins Sans Frontières Southern Africa Medical Unit, Cape Town, South Africa, 2 Division of Social and Behavioural Sciences, School of Public Health and Family Medicine, University of Cape Town, Cape Town, South Africa, 3 Medical Department, Operational Centre Brussels, Médecins Sans Frontières Belgium, Brussels, Belgium, 4 Médecins Sans Frontières, Nairobi, Kenya

* emilie.venables@brussels.msf.org
21st Century Primary Health Care

• As we differentiate and decentralize HIV care, we run the risk of re-creating “vertical” programs at the community level
• Instead, can we re-imagine and redesign primary health care services to include continuity care for chronic diseases?
• What would it take?
Acknowledgements

• Wafaa El-Sadr, Linda Kupfer, Eric Goosby
• Tom Heller, Alexandra Vandenbulcke, Daniela Belen Garone
• ICAP colleagues and co-investigators
• NIH, CDC, Bill & Melinda Gates Foundation
• The communities, health workers and clients we support around the world
Questions? Comments?