Can we eliminate HCV from Africa?
• Can we eliminate HCV from Africa?
• “have the opportunity or possibility to”

• “be permitted to”
I'm just trying to stay POSITIVE in the world full of negativity.

THEMOTIVATIONALTEAM.COM
Africa's success in the fight against HIV/AIDS

"AIDS deaths declined from 1.9 million in 2005 to one million in 2016, while 53% of the 36.7 million people who contracted the HIV virus now have access to antiretroviral therapy".

Marco Cochi

Friday, 28 July 2017

The data are contained in the latest report by UNAIDS, the Joint United Nations Programme to coordinate the Global Action against AIDS, which since 2005 monitors the outbreak of the epidemic.
Fig 1. Number of deaths due to major communicable diseases in 2013 [4]. Viral hepatitis deaths include those related to acute viral hepatitis, liver cancer secondary to hepatitis B and hepatitis C, and cirrhosis of the liver secondary to hepatitis B and hepatitis C.
Table 4 (with graph). Prevalence of HCV Infection (HCV RNA positive) in the general population, by WHO region, with uncertainty intervals. 2015: 71 million persons living with HCV worldwide.

<table>
<thead>
<tr>
<th>Region</th>
<th>Estimates of the prevalence of HCV infection (%)</th>
<th>Estimated number of persons living with HCV (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uncertainty interval</td>
<td>Uncertainty interval</td>
</tr>
<tr>
<td></td>
<td>Best</td>
<td>Lower</td>
</tr>
<tr>
<td>African Region</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Region of the Americas</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Eastern Mediterranean Region</td>
<td>2.3</td>
<td>1.9</td>
</tr>
<tr>
<td>European Region</td>
<td>1.5</td>
<td>1.2</td>
</tr>
<tr>
<td>South-East Asia Region</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Western Pacific Region</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Total</td>
<td>1.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Source: WHO, work conducted by the Center for Disease Analysis. See Annex 2.
Table 3 (with map). Incidence of HCV infection in the general population, by WHO region, 2015:
1.75 million new infections in 2015

<table>
<thead>
<tr>
<th>WHO region</th>
<th>Map key</th>
<th>Incidence rate (per 100 000)</th>
<th>Uncertainty interval</th>
<th>Total number (000)</th>
<th>Uncertainty interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Region</td>
<td></td>
<td>31.0</td>
<td>22.5–54.4</td>
<td>309</td>
<td>222–544</td>
</tr>
<tr>
<td>Region of the Americas</td>
<td></td>
<td>6.4</td>
<td>5.9–7.0</td>
<td>63</td>
<td>59–69</td>
</tr>
<tr>
<td>Eastern Mediterranean Region</td>
<td></td>
<td>62.5</td>
<td>55.6–65.2</td>
<td>409</td>
<td>363–426</td>
</tr>
<tr>
<td>European Region</td>
<td></td>
<td>61.8</td>
<td>50.3–66.0</td>
<td>565</td>
<td>460–603</td>
</tr>
<tr>
<td>South-East Asia Region</td>
<td></td>
<td>14.8</td>
<td>12.5–26.9</td>
<td>287</td>
<td>243–524</td>
</tr>
<tr>
<td>Western Pacific Region</td>
<td></td>
<td>6.0</td>
<td>5.6–6.6</td>
<td>111</td>
<td>104–124</td>
</tr>
<tr>
<td>Global</td>
<td></td>
<td>23.7</td>
<td>21.3–28.7</td>
<td>1 751</td>
<td>1 572–2 120</td>
</tr>
</tbody>
</table>
Number of Deaths from Hepatitis C
Figure 2. Treatment Cascade for People with Chronic Hepatitis C Virus (HCV) Infection, Prevalence Estimates with 95% Confidence Intervals.


http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0101554
IT’S COMPLICATED

COMPLEX ISSUES. SIMPLE SOLUTIONS
The HCV Care Cascade

- **HCV TESTING**
- **ASSESS & MONITOR**
- **ENGAGE IN TREATMENT**
- **ENHANCE RESPONSE**
The HCV Care Cascade
HEPATITIS C
One drop of blood can change your life.

When I was young, I hit the streets and they hit me back a lot harder.

3 OUT OF 4 PEOPLE WITH CHRONIC HEPATITIS C DON'T KNOW THEY'RE INFECTED

Hepatitis C. Are you at risk?
ASSESS YOUR RISK

Hepatitis C can lead to liver cancer. Hard-hitting as it may seem, you could be living with Hepatitis C for 20 or 30 years and never have symptoms. Talk to your doctor about getting tested. It could save your life.

www.cdc.gov/knowmorehepatitis
Have I got it?
<table>
<thead>
<tr>
<th>References</th>
<th>Study population</th>
<th>HCV assays performed</th>
<th>Anti-HCV prevalence % (n)</th>
<th>NAT detection in anti-HCV reactive samples % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantaloube et al. (2010)</td>
<td>Republic of the Congo Population-based</td>
<td>Ortho HCV 3.0 (ELISA Diagnostics systems) Monolisa anti-HCV Plus v 2 (Bio-Rad) Inno-Lia HCV Immunassay (Innogenetics) In-house PCR</td>
<td>5.6% (50/887)</td>
<td>62% (31/50)</td>
</tr>
<tr>
<td>Serenbe et al. (2010)</td>
<td>Uganda Hospitalized patients</td>
<td>Rapid strip assay (Cortex Diagnostics) Advia Centaur HCV EIA (Siemens Diagnostics) Branched DNA, Versant 3.0 (Siemens Diagnostics) Amplicor PCR (Roche) RIBA 3.0 (Chiron)</td>
<td>5% (19/380 by RSA) 6.8% (26/380 by ADVIA) 13% (48/380 reactive by one or both assays)</td>
<td>29% (14/48)</td>
</tr>
<tr>
<td>Abreha et al. (2011)</td>
<td>Ethiopia Voluntary testing and counseling center</td>
<td>Murex anti-HCV v 4.0(Abbott-Murex Diagnostics) Abbott Real-time PCR (Abbott Molecular)</td>
<td>3.6% (7/1954) 6.8% (50/733 HIV+) 1.7% (21/1220 HIV−)</td>
<td>25.4% (18/71)</td>
</tr>
<tr>
<td>Zeba et al. (2011)</td>
<td>Burkina Faso Pregnant women</td>
<td>Acon HCV rapid test strips In-house PCR</td>
<td>2.14% (13/607) 2.38% (HIV+) 1.75% (HIV−)</td>
<td>100% (13/13)</td>
</tr>
<tr>
<td>Forbi et al. (2012)</td>
<td>Nigeria Population-based</td>
<td>Immuno-chromatographic rapid assay (Shantha Biotechnics) In-house PCR</td>
<td>14.1% (73/519)</td>
<td>75.3% (55/73)</td>
</tr>
<tr>
<td>Agbaji et al. (2013)</td>
<td>Nigeria HIV+ patients</td>
<td>Dia Pro EIA (Diagnostic Bioprobe) Cobas AmpliPrep-HCV Monitor 2.0 (Roche)</td>
<td>18.3% (262/1431)</td>
<td>30.2% (79/262)</td>
</tr>
<tr>
<td>Cable et al. (2013)</td>
<td>South Africa Blood donations</td>
<td>Prism chemiluminescent analyzer (Abbott Diagnostics) Murex EIA (Abbott Diagnostics) In-house PCR</td>
<td>0.12% (976 samples reactive by Prism) 1.5% (15/976) 51 samples reactive with Prism and Murex</td>
<td>29.4% (15/51)</td>
</tr>
<tr>
<td>Illes et al. (2013)</td>
<td>Democratic Republic of Congo Male members of uniformed services</td>
<td>Ortho 3.0 Enhanced SAVe (Ortho Clinical Diagnostics) In-house PCR</td>
<td>13.7% (4/299)</td>
<td>26.8% (11/41)</td>
</tr>
<tr>
<td>Mullis et al. (2013)</td>
<td>Uganda Rakai cohort</td>
<td>Ortho v 3.0 HCV EIA (Ortho Diagnostics) Abbott Real-time PCR</td>
<td>7.6% (76/1000) 6.2% (31/500 in HIV+) 9.0% (45/500 in HIV−)</td>
<td>0% (0/76)</td>
</tr>
</tbody>
</table>
Total HCV core antigen
Correlation with HCV RNA

HCV RNA (log IU/ml) vs Total HCV core Ag (log pg/ml)

The HCV Care Cascade

HCV TESTING

ASSESS & MONITOR
Factors impacting response to HCV treatment: before 2015

**Viral factors**
- Baseline viral load
- HCV genotype
- HIV/HCV co-infection
- DAA baseline resistance
- HBV/HCV co-infection

**Host factors**
- Age
- Gender
- Race
- Genetics (IL28B, IP10, etc)
- Cirrhosis
- Transplant
- Hepatic decompensation
- Pharmacokinetics and DDIs
- Prior response to treatment
- Obesity
- Diabetes/insulin resistance
Factors impacting response to HCV treatment: after 2015

- **Viral factors**
  - HCV genotype
  - Post-treatment DAA RAVs

- **Host factors**
ASTRAL-1: SVR12 by HCV genotype

Feld J, et al. 66th AASLD; San Francisco, CA; November 13-17, 2015; Abst. LB-2.
The HCV Care Cascade

- HCV TESTING
- ASSESS & MONITOR
- ENGAGE IN TREATMENT
TEST ME
TREAT ME
Is it working? Is it safe?

Current diagnostic tests used for monitoring of treatment for HCV

Diagnostic tests during DAA treatment: simplified system
PROJECTED MINIMUM COSTS FOR TREATMENT AND DIAGNOSTICS

- DCV/SOF 12wk: $267 (HCV Genotyping: $177, Diagnostic monitoring: $90, Treatment: $90)
- DCV/SOF 24wk: $388 (HCV Genotyping: $298, Diagnostic monitoring: $90, Treatment: $90)
- SOF/LDV 8wk: $298 (HCV Genotyping: $185, Diagnostic monitoring: $75, Treatment: $38)
- SOF/RBV 12wk: $354 (HCV Genotyping: $205, Diagnostic monitoring: $75, Treatment: $74)
- SOF/RBV 24wk: $444 (HCV Genotyping: $295, Diagnostic monitoring: $75, Treatment: $74)
Disease burden due to HCV is substantial

Hepatitis C virus
Streptococcal pneumonia
Human papilloma virus
Hepatitis B virus
E. Coli
HIV/AIDS
Staphylococcus aureus
Influenza
C. Difficile
Rhinovirus
Respiratory syncytial virus
Parainfluenza virus
Group B Strep
Group A Strep
Haemophilus influenza
Tuberculosis
Legionella
Chlamydia
Adenovirus
Gonorrhea

Years of Life Lost
Year-equivalents of reduced functioning

Health Adjusted Life Years (HALYs)
Africa has about one doctor for every 5000 people
The poor state of the primary care centers puts a heavy burden on the specialist facilities

The sub-Saharan African population has an average physician density of

**0.19 doctors per 1000 people**

### How other more dense countries compare globally

<table>
<thead>
<tr>
<th>Country</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quatar</td>
<td>40.7 x density</td>
</tr>
<tr>
<td>Cuba</td>
<td>35.3 x density</td>
</tr>
<tr>
<td>Spain</td>
<td>26 x density</td>
</tr>
<tr>
<td>Russia</td>
<td>22.6 x density</td>
</tr>
<tr>
<td>Norway</td>
<td>22.5 x density</td>
</tr>
</tbody>
</table>

Sub-Saharan Africa had a deficit of an estimated 1.8 million health workers as at 2013, according to a WHO report—this deficit is projected to rise to 4.3 million by 2035.

Source: Quartz Africa, General Electric
ASCEND: HCV Treatment Efficacy and Adherence by Provider Type

- Nonrandomized phase IV trial of HCV-infected pts in Washington, DC (N = 600)
- Pts mostly male (69%), black (96%), GT1a (72%), and treatment naive (82%)
  - 20% of pts had compensated cirrhosis, 23% had HCV/HIV coinfection
- All providers received uniform 3-hr training
- No difference in SVR12 by provider type, cirrhosis status
- Adherence to all treatment visits by cirrhotic pts lower for specialists (61%) vs PCPs (56%) and NPs (75%) ($P = .04$)

Someone who cares
The HCV Care Cascade

- HCV TESTING
- ASSESS & MONITOR
- ENGAGE IN TREATMENT
- ENHANCE RESPONSE
“Drugs don’t work if people don’t take them”

Former US Surgeon General C. Everett Koop
• “Drugs do work if people do take them”

Mark R. Nelson
UK Surgeon General
Figure 7. Scatter plot showing the 1/3/1 countries where there were 5 times more people reaching SIV than there were new infections in 2016. This guideline represents the mark of five people reaching SIV for every single new HIV infection.

Figure 8. Scatter plot showing the 2/3/1 countries where there were 5 times fewer people reaching SIV than there were new infections in 2016. This guideline represents the mark of one person reaching SIV for every five new HIV infections in 2016.
NEVER WORK
Charles Dickens

A Tale of Two Cities

Adapted by
Mark Fitzgibbons

At Derby Playhouse, Studio Theatre  March 28th - April 1st 2000
Time 7.45pm  Tickets £6.00 (£5.00 concessions)

BOX OFFICE 01332 363275

an amateur production
# HAART teams

<table>
<thead>
<tr>
<th></th>
<th>Chelsea and Westminster</th>
<th>Zewiditu, Ethiopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors</td>
<td>32</td>
<td>5</td>
</tr>
<tr>
<td>Nurses</td>
<td>14</td>
<td>5+8</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
### HAART teams

<table>
<thead>
<tr>
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<td>5+8</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Patients</td>
<td>4210</td>
<td>9122</td>
</tr>
<tr>
<td>On-treatment</td>
<td>3117</td>
<td>3045</td>
</tr>
</tbody>
</table>
## Available Antiretrovirals 2010

### NRTIs
- Abacavir
- Didanosine
- Emtricitabine
- Lamivudine
- Stavudine
- Tenofovir
- Zidovudine

### NNRTIs
- Efavirenz
- Nevirapine
- Etravirine

### Protease Inhibitors
- Atazanavir
- Darunavir
- Fos-Amprenavir
- Indinavir
- Lopinavir
- Nelfinavir
- Ritonavir
- Saquinavir
- Tipranavir

### New Classes

#### Fusion Inhibitors
- Enfuvirtide

#### R5 Inhibitors
- Maraviroc

#### Integrase Inhibitors
- Raltegravir

[www.emea.europa.eu](http://www.emea.europa.eu)
New Classes

Protease Inhibitors
• Lopinavir
• Nelfinavir

NNRTIs
• Efavirenz
• Nevirapine

NRTIs
• Didanosine
• Lamivudine
• Stavudine
• Zidovudine

NRTIs
• Didanosine
• Lamivudine
• Stavudine
• Zidovudine

Available Antiretrovirals - Ethiopia

www.emea.europa.eu
Monitoring at Chelsea and Westminster
Monitoring in Ethiopia
Naïve patients undetectable viral load at 6 months
Naïve patients undetectable viral load at 6 months

- Chelsea and Westminster: 90%
- Ethiopia: 100%
Naïve patients undetectable viral load at 6 months

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Chelsea and Westminster Ethiopia Uganda
I can and I will