<table>
<thead>
<tr>
<th>Speaker Name</th>
<th>Statement</th>
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<tbody>
<tr>
<td>Sara Croxford</td>
<td>Nothing to disclose</td>
</tr>
</tbody>
</table>

| Date | April 2016 |
Non-AIDS mortality among people diagnosed with HIV in the era of HAART compared to the general population: England and Wales, 1997-2012

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Since the introduction of highly-active antiretroviral therapy (HAART) in the mid-1990s, there has been a shift in causes of death among people with HIV from AIDS to non-AIDS conditions.

In the UK, all-cause deaths among the national cohort of people with HIV are captured through:

- Direct reporting to Public Health England (PHE) by clinicians (routine surveillance and annual death audits)
- Linkage to the national mortality register held at the Office for National Statistics (ONS)
Surveillance of HIV in the UK

HARS/SOPHID reports

Laboratory and clinician reports of new HIV diagnosis

HIV Diagnosis

Clinician report of AIDS diagnosis

Clinician report and/or ONS death report

Patients accessing care and starting treatment

First AIDS-defining illness

Death

Non-AIDS mortality among people diagnosed with HIV in the era of HAART compared to the general population: England and Wales, 1997-2012
Aim

We examine non-AIDS mortality in England & Wales (E&W) among people diagnosed with HIV in the era of HAART and compare to the mortality of the general population.
Methods (1)

Data sources:

1) National HIV surveillance data reported to PHE linked to death data from the ONS

2) ONS population data by sex, five-year age bands and cause of death

Population: Cohort of adults (aged ≥15 years) diagnosed with HIV between 1997 and 2012 in E&W, with at least one follow up clinical report from an HIV outpatient clinic, and/or a death report by the end of 2012
Methods (2)

Death categorisation: Deaths to the end of 2012 were categorised using a modified CoDe protocol\(^1\) into AIDS and non-AIDS-related causes.

Statistical analysis:

- Cumulative mortality was examined using Kaplan-Meier, with censoring at death or date last seen.
- To compare cohort mortality to the general population, standardised mortality ratios were calculated, stratifying by sex and five-year age bands, using ONS population denominator data.

Results

88,994 people newly diagnosed with HIV

83,276 people included in analysis

- At least one attendance at an HIV specialist service OR death reported by the end of 2012
- Contributing 443,818 person-years (pys)

5,302 died (6.4%)

- Age-adjusted all-cause mortality rate 116/10,000 pys
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Death categorisation

All Deaths

5,302 (6.4%)

Excluded: Cause of death unknown

494 (9.3%)

AIDS Related

2,791 (58%)

Non-AIDS Related

2,017 (42%)

Non-AIDS defining infections

358 (18%)

Non-AIDS malignancies

388 (19%)

Liver disease (including liver cancer)

234 (12%)

Cardiovascular disease and stroke

378 (19%)

Accident or Suicide

190 (9.4%)

Substance abuse

121 (6.0%)

Other causes

348 (17%)
### Characteristics of people who died by cause

<table>
<thead>
<tr>
<th></th>
<th>All-cause mortality</th>
<th>AIDS</th>
<th>Non-AIDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,302</td>
<td>58%</td>
<td>2,791</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>3,727</td>
<td>70%</td>
<td>1,905</td>
</tr>
<tr>
<td>Women</td>
<td>1,575</td>
<td>30%</td>
<td>886</td>
</tr>
<tr>
<td><strong>Median age at diagnosis [IQR]</strong></td>
<td>40 [33-50]</td>
<td>40 [33-50]</td>
<td>40 [33-50]</td>
</tr>
<tr>
<td><strong>Region of birth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>1,830</td>
<td>46%</td>
<td>860</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>1,596</td>
<td>40%</td>
<td>917</td>
</tr>
<tr>
<td>Other</td>
<td>560</td>
<td>14%</td>
<td>281</td>
</tr>
<tr>
<td><strong>Infection route</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex between men</td>
<td>1,710</td>
<td>36%</td>
<td>803</td>
</tr>
<tr>
<td>Heterosexual contact</td>
<td>2,648</td>
<td>56%</td>
<td>1,486</td>
</tr>
<tr>
<td>Injecting drug use</td>
<td>328</td>
<td>6.7%</td>
<td>115</td>
</tr>
<tr>
<td>Other</td>
<td>71</td>
<td>1.5%</td>
<td>36</td>
</tr>
<tr>
<td><strong>Late diagnosis</strong></td>
<td>1,916</td>
<td>75%</td>
<td>1,014</td>
</tr>
<tr>
<td><strong>Linkage to care</strong></td>
<td>4,060</td>
<td>77%</td>
<td>1,995</td>
</tr>
</tbody>
</table>

*Country of birth was reported for 75% of individuals that died (N=3,986); infection route: 90% (N=4,757)

**CD4<350 cells/mm³ within 3 months of diagnosis

†Among those for whom a CD4 count at diagnosis was available (N=2,535; 48%)
Comparison to the general population

Standardised Mortality Ratio (SMR) = \frac{\text{Observed deaths (cohort data)}}{\text{Expected deaths (ONS population data*)}}

* Matched by age and sex

An SMR of 1.0 indicates that, after adjusting for the effect of differences in age and sex structure, the mortality of the HIV cohort is the same as that of the general population.
Mortality of HIV-positive cohort compared to the general population:

- **All-cause mortality**
- **Non-AIDS deaths**
- **Non-AIDS infections**
- **Non-AIDS malignancies**
- **CVD and stroke**
- **Liver disease**
- **Accident and suicide**
- **Substance misuse**
- **Other causes**

### Standardised Mortality Ratio (SMR)

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>All</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality</td>
<td>5.7</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Non-AIDS deaths</td>
<td>2.2</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Non-AIDS infections</td>
<td>11.0</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>Non-AIDS malignancies</td>
<td>1.3</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>CVD and stroke</td>
<td>1.7</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Liver disease</td>
<td>3.4</td>
<td>3.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Accident and suicide</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance misuse</td>
<td>2.6</td>
<td>2.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Other causes</td>
<td>2.5</td>
<td>2.5</td>
<td>2.2</td>
</tr>
</tbody>
</table>

**Non-AIDS mortality among people diagnosed with HIV in the era of HAART compared to the general population: England and Wales, 1997-2012**
Limitations

1. Potential of misclassification of deaths
   - Poor reporting of cause of death on death certificates
   - Clinical markers also taken into consideration when classifying death as AIDS vs. non-AIDS infections (within 3 months / 1 year of death)

2. Potential underestimation of cohort mortality
   - Reliance on linking PHE and ONS datasets
   - ONS population data 1999-2012
   - Underestimation of non-AIDS deaths – reports of non-AIDS death among those ≥65 only come from clinicians, not ONS
Strengths

• Large cohort with inclusion from time of HIV diagnosis – able to capture people that present late or never link to care

• First study in the UK to categorise HIV patient deaths at a national level using the CoDe Protocol and to compare mortality to the general population

• Comprehensive, detailed death reporting through linkage with the national mortality register
Conclusions (1)

- Mortality among people diagnosed with HIV in the era of HAART remains significantly higher than that of the general population of similar age and sex.
- Even after AIDS deaths are excluded, mortality from non-AIDS conditions, such as cardiovascular disease, non-AIDS infections and liver disease, is elevated among HIV-positive people compared to the general population.
Conclusions (2)

- AIDS continues to account for a large number of deaths in the UK, despite the availability of free care and treatment through the National Heath Service (NHS).

- Interventions aimed at increasing prompt diagnosis, reducing lifestyle risk factors and managing co-morbidities as part of holistic care would reduce excess deaths.

- These analyses have been used to inform regional death audits on avoidable mortality (e.g. London, West Midlands).
We gratefully acknowledge all the patients living with HIV as well as clinicians, health advisors, nurses, microbiologists, public health practitioners, data managers and other colleagues who contribute to the surveillance of HIV and STIs in the UK.