The Global Impact of Dementia

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No conflicts of interest

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Agenda

• Background
  – Global Action against Dementia
  – Why low and middle income countries matter
  – What have we achieved so far?

• Is dementia on the decline?
  – Some relevant epidemiological concepts
  – Prevalence, incidence, survival with dementia, numbers

• What does the current evidence suggest?

• Where do we go from here?
Original (2009 WAR) and updated (2015 WAR) age-standardised prevalence of dementia by region.
Numbers of people with dementia by world region (2015-2050)

<table>
<thead>
<tr>
<th>Region</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>4.7</td>
<td>11.7</td>
<td>14.3</td>
<td>15.8</td>
<td>3.0</td>
<td>58.3</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>14.8</td>
<td>18.1</td>
<td>14.3</td>
<td>58.3</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Africa and the Middle East</td>
<td>14.3</td>
<td>15.8</td>
<td>3.0</td>
<td>58.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia (high income)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa and the Middle East</td>
<td>58.3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>46.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Global Distribution of Incident Dementia (9.9 million new cases every year)

One new case every 3.2 seconds!

World Alzheimer Report 2015
Projected increases in Global Societal Economic Cost (2015-2030)

Global costs of dementia (US$)

Year


One trillion $

Two trillion $
How is the impact of dementia distributed

Older people

Dementia cases

Increases 2015-2050

Costs
The global impact of dementia

Around the world, there will be 9.9 million new cases of dementia in 2015, one every 3 seconds.

46.8 million people worldwide are living with dementia in 2015. This number will almost double every 20 years.

68% in 2050

Much of the increase will take place in low and middle-income countries (LMICs): in 2015, 58% of all people with dementia live in LMICs, rising to 63% in 2030 and 68% in 2050.

46.8 million
2015

74.7 million
2030

131.5 million
2050

The total estimated worldwide cost of dementia in 2015 is US$ 818 billion. By 2018, dementia will become a trillion dollar disease, rising to US$ 2 trillion by 2030.

If global dementia care were a country, it would be the 18th largest economy in the world exceeding the market values of companies such as Apple and Google.

Apple $742 billion
Google $368 billion

Dementia $818 billion
(source: Forbes 2016 ranking).

This map shows the estimated number of people living with dementia in each world region in 2015.

Europe 10.5 million
The Americas 9.4 million
Africa 4.0 million
Asia 22.9 million

We must now involve more countries and regions in the global action on dementia.

The World Alzheimer Report 2015 was independently researched by King's College London and supported by Eupa.
What has been achieved?

- Everyone is using our figures
- A shift in tone
  - An explicit acknowledgement that most of the burden is in low and middle income countries
  - Care now, if we must wait for cure later
  - A public health approach to treatment and care
  - A recognition of the importance of brain health promotion and dementia risk reduction
- New priorities for research
What has been achieved?

- A ‘call for action’
- 80 countries at WHO ministerial conference
- No commitments but...
- A World Health Assembly resolution?
- A Global Observatory
And yet...

- Increased interest in potential for brain health promotion and dementia prevention
- Recent evidence suggesting declining prevalence and incidence in high income countries

“The projections of the ADI report for 2050 are alarming, but it is important to bear in mind that they are just that – projections....The opportunity is here to ensure that the grim outlook for dementia in 2050, especially in low-income and middle-income countries, becomes nothing more than a work of fiction.”
Lancet Editorial, 2015
Temporal Trends

Dementia in western Europe: epidemiological evidence and implications for policy making

Yu-Tzu Wu, Laura Fratigioni, Fiona E Matthews, Antonio Lobo, Monique M B Breteler, Ingmar Skoog, Carol Brayne

Lancet Neurol 2015
A contradiction?

*Figure 1: CFAS I and CFAS II age-specific dementia prevalence. CFAS = Cognitive Function and Ageing Study.*
Population Ageing – the increasing denominator
Two key epidemiological concepts

Prevalence = Incidence x Duration

Denominator > population at risk
INCLUSION CRITERIA

1. Sampling
2. Dementia ascertainment
3. Methodologies held constant between successive prevalence or incidence waves

Prince et al, Alzheimer’s Research and Therapy, in press
## Prevalence

<table>
<thead>
<tr>
<th>Study, setting, age range</th>
<th>Outcome/s</th>
<th>Period</th>
<th>Interval (y)</th>
<th>Relative change (%) per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK, MRC CFAS, 65 years and over [27]</td>
<td>Dementia (GMS/AGECAT)</td>
<td>1993-2011</td>
<td>18 years</td>
<td>Reduction -1.7%</td>
</tr>
<tr>
<td>Spain, Zaragoza, 65 years and over [28]</td>
<td>Dementia (DSM-IV)</td>
<td>1988-1995</td>
<td>7 years</td>
<td>Reduction -3.6% (Non-significant)</td>
</tr>
<tr>
<td>HRS. Nationally representative. 70 years and over [21]</td>
<td>Mod/ sev cognitive impairment (probable)</td>
<td>1993-2002</td>
<td>9 years</td>
<td>Reduction -3.2%</td>
</tr>
<tr>
<td>USA, Indianapolis African Americans, 65 years and over [31]</td>
<td></td>
<td></td>
<td></td>
<td>Stable</td>
</tr>
<tr>
<td>Stockholm, Sweden, 75 years and over [29]</td>
<td></td>
<td></td>
<td></td>
<td>Stable</td>
</tr>
<tr>
<td>Germany, insurance claim data, age 65 and over [32]</td>
<td></td>
<td>2007-2009</td>
<td></td>
<td>Stable</td>
</tr>
<tr>
<td>Umea, Sweden 85 years and over [33]</td>
<td>Dementia (DSM-IV)</td>
<td>2001-2006</td>
<td>5 years</td>
<td>Increase +8.0%</td>
</tr>
<tr>
<td>Japan, Hisayama, aged 65 years and over [34]</td>
<td>Dementia, AD</td>
<td>1985-2005</td>
<td>20 years</td>
<td>Increase +1.9% (dementia) +12.8% (AD)</td>
</tr>
</tbody>
</table>

PREVALENCE
- 9 studies
- Inconsistent findings

Prince et al, Alzheimer’s Research and Therapy, in press
### Results of Incidence Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Outcome/s</th>
<th>Period</th>
<th>Interval (y)</th>
<th>Relative change (%) per year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USA, Indianapolis</strong>&lt;br&gt;African Americans, 65 years and over [36]</td>
<td>Dementia (DSM-III-R) AD</td>
<td>1991-2002</td>
<td>11</td>
<td>Reduction&lt;br&gt;Dementia -5.5% AD -4.4% [Biggest reduction in youngest age groups]</td>
</tr>
<tr>
<td><strong>USA, Framingham, 60 years and over [37]</strong></td>
<td>Dementia DSM-IV AD (NINCDS-ADRDA); VaD (NINDS-AIREN)</td>
<td>1980-2006</td>
<td>26</td>
<td>Reduction&lt;br&gt;Dementia -1.7%; AD -1.2%; VaD -2.1% [Biggest reduction in youngest age groups. No reduction among the least educated]</td>
</tr>
<tr>
<td><strong>France, Bordeaux, 65 years and over [38]</strong></td>
<td>MMSE + IADL or DSM-IIIR/DSM-V</td>
<td>1988-2000</td>
<td>12</td>
<td>Reduction&lt;br&gt;Overall -3.5%; Women -3.8%</td>
</tr>
<tr>
<td><strong>Germany, insurance claims data, age 65 and over [40]</strong></td>
<td>Using donepezil or memantine</td>
<td>2004-2007 / 2007-2010</td>
<td>3</td>
<td>Reduction&lt;br&gt;-3.0%</td>
</tr>
<tr>
<td><strong>USA, Chicago [31]</strong></td>
<td>AD</td>
<td>1997-2008</td>
<td>11</td>
<td>Stable</td>
</tr>
<tr>
<td><strong>Nigeria, Ibadan [51]</strong></td>
<td>Dementia (DSM-III-R) AD</td>
<td>1991-2002</td>
<td>11</td>
<td>Stable</td>
</tr>
<tr>
<td><strong>Stockholm, Sweden, 75 years and over [29]</strong></td>
<td>Dementia (DSM-III-R)</td>
<td>1988-2002</td>
<td>14</td>
<td>Reduced incidence inferred from stable prevalence but increased survival with dementia</td>
</tr>
</tbody>
</table>

**INCIDENCE**

- **8 studies**
- **Consistent-ish reduction**

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Prince et al, Alzheimer’s Research and Therapy, in press
<table>
<thead>
<tr>
<th>Study</th>
<th>Outcome/s</th>
<th>Period</th>
<th>Change in mortality and/ or mortality hazard ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA, HRS [21]</td>
<td>Mortality hazard ratio</td>
<td>1993-2002</td>
<td><strong>Stable</strong> Non-significant increase, from HR 2.53 to 3.11, p=0.09.</td>
</tr>
</tbody>
</table>
| Stockholm, Sweden [29]                    | Mortality hazard ratio   | 1988-2002    | **Stable** HR – 2.42 (2.03-2.87) vs. 2.47 (2.03-3.00)  
29% reduction in mortality (HR 0.71, 95% CI 0.57-0.88) adjusted for age, sex, education and MMSE score. |
| Germany, insurance claims data, age 65 and over | Mortality rate           | 2004-2007    | **20% Increase** in mortality among **women** with dementia (p<0.0001); Non-significant in men with dementia (p=0.75) |
| USA, Indianapolis, African Americans, 65 years and over [31,36] | Dementia duration       | 1991-2002    | **Reduction** in mortality (i.e. longer survival with dementia inferred from stable prevalence of dementia [31], but 55% fall in incidence [36]) |

**MORTALITY**
- 4 studies *(too few?)*
- Inconsistent findings

Prince et al, Alzheimer’s Research and Therapy, in press
Interpretation

1. No evidence to displace the constant age-specific dementia prevalence assumption
2. Evidence for declining age-specific incidence is more consistent but still patchy
3. Evidence on ‘duration’ (i.e. survival with dementia) is too limited to reach a conclusion
4. Most current models suggest declining incidence balanced by increasing survival
5. Potential for increasing prevalence in LMIC, in the absence of progress on control of CVRF
6. Population ageing is the main driver of the epidemic, and this is inexorable
## Global CVD trends

<table>
<thead>
<tr>
<th>HIC</th>
<th>LMIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IHD mortality halved in USA (1980-2000)</strong></td>
<td><strong>In Beijing, China IHD mortality increased by 50% in men and 27% in women</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Prevalence of IHD increase from 2% to 5% in rural India and 7%-11% in urban India</strong></td>
</tr>
<tr>
<td><strong>Stroke incidence fell by 42% (1978-2002)</strong></td>
<td><strong>Stroke incidence doubled overall and quadrupled in people aged 75 and over (1978-2002)</strong></td>
</tr>
<tr>
<td><strong>Stroke case fatality fell from 35.9% to 19.8% (-1.0%/ year) (1970s to 2000s)</strong></td>
<td><strong>Stroke case fatality fell from 35.2% to 26.6% (-0.6%/ year) (1970s to 2000s)</strong></td>
</tr>
</tbody>
</table>

Prince et al, Lancet 2015
China: Trends in the overweight and obesity prevalence among school children (northern coastal cities)

- Boys: 2.8, 6.7, 11.8, 14.5, 19.3
- Girls: 2.4, 4.6, 7.5, 9.3, 10.8

Based on Chinese BMI cutoff points (Ji and Cheng, Int J Cardiol, 2008)

Cigarette consumption in China

Source: Tobacco Control and the Future of China
Graphic by Zhang Jiawei / chinadaily.com.cn
Monitoring progress

• Cardiovascular health is improving in many developed countries
  – Less smoking, declining BP and cholesterol
  – Increased physical activity
  – Prevalence of obesity and diabetes is increasing
  – Falling incidence of heart disease and stroke

• Better education

• Natural experiment
  – Track change in risk factor profile
  – Predicted vs. observed change in dementia incidence
  – Attribute change in incidence to individual risk factors
  – Few studies have attempted to do this … those that have suggest minimal role for CVRF
Mean population height by year and world region, from historical records (Baten et al, 2012)

Fig. 1 - Height development by world region (no interpolations, weighted by population size).
Leg length and risk of incident 10/66 Dementia

<table>
<thead>
<tr>
<th>Study</th>
<th>ES (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>1.17 (0.74, 1.87)</td>
<td>17.17</td>
</tr>
<tr>
<td>DR</td>
<td>0.65 (0.40, 1.08)</td>
<td>14.82</td>
</tr>
<tr>
<td>Peru U</td>
<td>0.89 (0.38, 2.10)</td>
<td>5.04</td>
</tr>
<tr>
<td>Peru R</td>
<td>0.45 (0.10, 2.01)</td>
<td>1.68</td>
</tr>
<tr>
<td>Venezuela</td>
<td>0.75 (0.43, 1.30)</td>
<td>12.35</td>
</tr>
<tr>
<td>Mexico U</td>
<td>0.72 (0.32, 1.63)</td>
<td>5.64</td>
</tr>
<tr>
<td>Mexico R</td>
<td>0.86 (0.46, 1.62)</td>
<td>9.40</td>
</tr>
<tr>
<td>China U</td>
<td>0.66 (0.38, 1.15)</td>
<td>11.98</td>
</tr>
<tr>
<td>China R</td>
<td>0.65 (0.35, 1.18)</td>
<td>10.20</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>0.90 (0.51, 1.58)</td>
<td>11.72</td>
</tr>
<tr>
<td>Overall (I-squared = 0.0%, p = 0.827)</td>
<td>0.80 (0.66, 0.96)</td>
<td>100.00</td>
</tr>
</tbody>
</table>
What are the changes, over 10 years, in prevalence and social-patterning of NCDs and underlying risk factors?

Is the coverage, effectiveness and equity of healthcare for older people improving? Has this translated into health improvements?

Is morbidity compressing or expanding, and are these trends equitably distributed with regard to gender, education and socioeconomic position?
What next

- A focus on priorities
- A WHO Dementia Action Plan
- A WHO Observatory to monitor progress
- Implementation and evaluation of evidence-based, scaleable, packages of care in resource poor settings

- Are we ‘resource poor’ in HIC too?
- Models of care too reliant on specialist services?
- More of a role for primary care services?
  - Diagnosis
  - Continuing care
  - Integrated and holistic care (WHO I-COPE?)
  - Care coordination