Dementia in an Ageing World

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GLOBAL SUSTAINABLE DEVELOPMENT GOALS IN A MEDIATIZED WORLD
APRIL 4 – 5, 2019
AUSTRIAN ACADEMY OF SCIENCES
World population stabilization unlikely this century

Patrick Gerland,† Adrian E. Raftery,† Hana Ševčíková, Nan Li, Danan Gu, Thomas Spoorenberg, Leontine Alkema, Bailey K. Fosdick, Jennifer Chunn, Nevena Lalic, Guiomar Bay, Thomas Buettner, Gerhard K. Heilig, John Wilmoth

Fig. 1. (A) UN 2012 world population projection (solid red line), with 80% prediction interval (dark shaded area), 95% prediction interval (light shaded area), and the traditional UN high and low variants (dashed blue lines). (B) UN 2012 population projections by continent.

Science (2014)
Alzheimer’s disease (AD) is the most common form of dementia, accounting for 50–70% of cases.

Doblhammer et al. 2017
Winbladt et al. 2016
The size of a normal brain compared to one with Alzheimer's Disease

GM: Grey Matter

WM: White Matter

ICV: Intracranial Volume

Number of people with dementia in Europe & ranking of causes of death

<table>
<thead>
<tr>
<th>Rank</th>
<th>WHO 2015, 70+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICD-10 code</td>
</tr>
<tr>
<td>1</td>
<td>I20-I25</td>
</tr>
<tr>
<td>2</td>
<td>I60-I69</td>
</tr>
<tr>
<td>3</td>
<td>F01-F03, G30-G31</td>
</tr>
<tr>
<td>4</td>
<td>J40-J44</td>
</tr>
<tr>
<td>5</td>
<td>C33-C34</td>
</tr>
</tbody>
</table>

Figure 1: Number of people with dementia in 28 European countries in 2013. Estimates of the total number of people with dementia in each of 28 European countries were obtained from Alzheimer Europe.

Winbladt et al 2016
The prevalence of dementia worldwide

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

We must now involve more countries and regions in the global action on dementia.
Age-specific prevalence of dementia worldwide

Figure 3: Age-specific prevalence of dementia by world region and in major countries
Patterns of age-specific prevalence of dementia are similar across worldwide regions, but vary substantially among the oldest old (age ≥ 90 years)."
Dementia and life expectancy

Winblad et al 2016
A life-course approach to the risk of dementia

Müller M et al. 2014
Education and Dementia
Meta-Analysis: Effect of low education on the risk of dementia

Education increases cognitive reserve ->

People with higher educational achievement, can tolerate more of the pathologic brain changes than others and maintain function.

Tucker & Stern (2011)

<table>
<thead>
<tr>
<th>Study ID</th>
<th>ES (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bickel 1994</td>
<td>1.47 (0.60, 3.45)</td>
<td>1.55</td>
</tr>
<tr>
<td>Stern 1994</td>
<td>2.00 (1.33, 3.03)</td>
<td>3.64</td>
</tr>
<tr>
<td>Cobb 1995</td>
<td>1.32 (0.90, 1.52)</td>
<td>3.75</td>
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<tr>
<td>Yoshitake 1995</td>
<td>1.18 (0.51, 2.27)</td>
<td>2.26</td>
</tr>
<tr>
<td>Evans 1997</td>
<td>1.28 (1.12, 1.45)</td>
<td>5.30</td>
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<tr>
<td>Schmand 1997a</td>
<td>1.76 (0.48, 6.36)</td>
<td>0.83</td>
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<tr>
<td>Schmand 1997b</td>
<td>1.16 (0.76, 1.75)</td>
<td>3.51</td>
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<tr>
<td>Liu 1998</td>
<td>1.59 (0.85, 2.64)</td>
<td>2.42</td>
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<tr>
<td>Zhang 1988</td>
<td>2.42 (1.56, 4.20)</td>
<td>3.04</td>
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<tr>
<td>Launer 1999</td>
<td>1.63 (1.17, 2.68)</td>
<td>3.30</td>
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<tr>
<td>Letenneur 1999</td>
<td>1.82 (1.36, 2.42)</td>
<td>4.36</td>
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<tr>
<td>Ott 1999</td>
<td>2.08 (1.10, 3.65)</td>
<td>2.39</td>
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<tr>
<td>Ganguli 2000</td>
<td>1.54 (1.15, 2.04)</td>
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<td>Qiu 2001</td>
<td>2.08 (1.30, 3.45)</td>
<td>3.08</td>
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<tr>
<td>Scarneelas 2001</td>
<td>1.23 (0.89, 1.72)</td>
<td>4.08</td>
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<tr>
<td>Antila 2002</td>
<td>1.18 (1.06, 1.30)</td>
<td>5.40</td>
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<tr>
<td>Kukull 2002</td>
<td>1.56 (1.00, 2.50)</td>
<td>3.26</td>
</tr>
<tr>
<td>Lindsay 2002</td>
<td>1.60 (1.25, 2.60)</td>
<td>3.49</td>
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<tr>
<td>Kuller 2003</td>
<td>1.70 (1.16, 2.41)</td>
<td>3.84</td>
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<tr>
<td>Tuokko 2003</td>
<td>1.11 (1.04, 1.18)</td>
<td>5.52</td>
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<tr>
<td>Karp 2004</td>
<td>2.40 (1.90, 4.40)</td>
<td>2.46</td>
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<tr>
<td>Ravaglia 2005</td>
<td>2.20 (1.07, 4.53)</td>
<td>2.01</td>
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<tr>
<td>Shadlen 2006 [white]</td>
<td>1.80 (1.39, 2.23)</td>
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<td>Shadlen 2006 [black]</td>
<td>4.60 (3.13, 6.62)</td>
<td>3.69</td>
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<td>McDowell 2007</td>
<td>2.60 (2.02, 3.28)</td>
<td>4.66</td>
</tr>
<tr>
<td>Ngandu 2007</td>
<td>5.00 (2.13, 10.08)</td>
<td>1.83</td>
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<tr>
<td>Peters 2009</td>
<td>1.82 (1.33, 2.44)</td>
<td>4.26</td>
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<tr>
<td>Chen 2011</td>
<td>2.12 (1.03, 4.28)</td>
<td>2.00</td>
</tr>
<tr>
<td>Prince 2012</td>
<td>1.43 (1.22, 1.72)</td>
<td>5.08</td>
</tr>
<tr>
<td>Overall (I-squared = 82.8%, p = 0.000)</td>
<td>1.72 (1.52, 1.86)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis
South Korea: Educational Expansion 1970-2000

Lutz, Cuaresma, Sanderson; Science 2008
Reference year: 2009=100

Age-specific trends for ages 65-74, 75-84, 85-100+

<table>
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<tr>
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<tbody>
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<td>65-74</td>
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<tr>
<td>2007</td>
<td>104</td>
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<td>101</td>
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<tr>
<td>2008</td>
<td>102</td>
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<tr>
<td>2009</td>
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<td>85-100+</td>
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<td>2007</td>
<td>99</td>
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<td>2009</td>
<td>100</td>
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</tbody>
</table>

* in person-years; ** variance bootstrapped with 1000 replications; NB regression: age modelled by a third degree polynomial; Data source: AOK claims data, own calculations

Doblhammer et al. (2014)
DZNE e. V. – Bonn & Rostock
### Trends in Dementia Occurrence Germany 2006/7-2009/10

Incidence, Mortality of the Non-Demented and the Demented

<table>
<thead>
<tr>
<th></th>
<th>Females Rate Indexed to 2009/10=100</th>
<th>Sign.</th>
<th>Males Rate Indexed to 2009/10=100</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dementia Incidence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2006/2007</td>
<td>111</td>
<td>***</td>
<td>113</td>
<td>***</td>
</tr>
<tr>
<td>2009/2010</td>
<td>100</td>
<td></td>
<td>100</td>
<td></td>
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<tr>
<td><strong>Mortality without dementia</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2006/2007</td>
<td>100</td>
<td></td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>2009/2010</td>
<td>100</td>
<td></td>
<td>100</td>
<td></td>
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<tr>
<td><strong>Mortality with dementia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006/2007</td>
<td>89</td>
<td>***</td>
<td>98</td>
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</tr>
<tr>
<td>2009/2010</td>
<td>100</td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Reference period 2009/10 = 100

Doblhammer et al. (2015)
AOK health claims data

***: p<=0.001
Between 2006/7 and 2009/10 in Germany

Men  gained 1.9 healthy months
     lost 0.5 months with dementia

Women gained 1.5 healthy months
       lost 1.5 months with dementia

Increase in healthy life years
Compression of years with dementia
## New Insights into the Dementia Epidemic

Eric B. Larson, M.D., M.P.H., Kristine Yaffe, M.D., and Kenneth M. Langa, M.D., Ph.D.

### Selected Recent Studies of the Dementia Epidemic.

<table>
<thead>
<tr>
<th>Study</th>
<th>Outcome</th>
<th>Data Source</th>
<th>Key Findings</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manton et al. (United States)¹</td>
<td>Prevalence of severe cognitive impairment</td>
<td>National long-term care survey interviews, 1982–1999</td>
<td>Decline in dementia prevalence among people ≥65 yr of age (5.7% to 2.9%)</td>
<td>Higher educational level, decline in stroke incidence</td>
</tr>
<tr>
<td>Langa et al. (United States)²</td>
<td>Prevalence of cognitive impairment</td>
<td>Ongoing population-based survey of people ≥51 yr of age</td>
<td>Prevalence of cognitive impairment among people ≥70 yr of age (12.2% in 1993 vs. 8.7% in 2002)</td>
<td>Higher educational level; combination of medical, lifestyle, demographic, and social factors</td>
</tr>
<tr>
<td>Schrijvers et al. (Rotterdam)³</td>
<td>Incidence of dementia</td>
<td>Population-based cohort ≥55 yr of age in 1990, extended in 2000</td>
<td>Incidence rate ratios (6.56 per 1000 person-yr in 1990 vs. 4.92 per 1000 person-yr in 2000)</td>
<td>Higher educational level, reduction in vascular risk, decline in stroke incidence</td>
</tr>
<tr>
<td>Qiu et al. (Stockholm)⁴</td>
<td>Prevalence of DSM-III-R dementia*</td>
<td>Cross-sectional survey of people ≥75 yr of age, 1987–1989 and 2001–2004</td>
<td>Age- and sex-standardized dementia prevalence (17.5% in 1987–1989 vs. 17.9% in 2001–2004); lower hazard ratio for death in later cohort suggests decreased dementia incidence</td>
<td>Favorable changes in risk factors, especially vascular risk; healthier lifestyles</td>
</tr>
<tr>
<td>Matthews et al. (England)⁵†</td>
<td>Prevalence of dementia in 3 regions</td>
<td>Survey interviews of people ≥65 yr of age, 1989–1994 (in CFAS I) and 2008–2011 (in CFAS II)</td>
<td>Dementia prevalence (8.3% in CFAS I vs. 6.5% in CFAS II)</td>
<td>Higher educational level, better prevention of vascular disease</td>
</tr>
</tbody>
</table>

¹ In the study by Qiu et al., dementia was diagnosed according to the criteria provided in the *Diagnostic and Statistical Manual of Mental Disorders*, third edition, revised (DSM-III-R).

† CFAS denotes Cognitive Function and Ageing Study.
Mid-Life Risk Factors and Dementia
Regional Distribution in Germany
Prevalence Ages 65+

Dementia*

Cardio-Vascular Risk Factors

Blood Pressure*
Diabetes Mellitus*
Hypercholesterolemia*

Data Source: AOK 2007, own calculations
*age standardized

Regional Correlation with Dementia
0.38***

Gabriele Dobrhammer (Ed.)
Health Among the Elderly in Germany
New Evidence on Disease, Disability and Care Need
Dobrhammer et al. 2015

DZNE e. V. – Bonn & Rostock
Worldwide Diabetes Prevalence

Data Source: WHO 2002
Dementia Projections

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.
Thank you!