Costs and cost-effectiveness of interventions for chronic diseases of older adults

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Overview

- **Costs** (economic / financial burden to health system and beyond)
  - costs to whom? - private households, public services
  - scope / range of costs? - health, welfare
  - implications for government (future budgets)

- **Cost-effectiveness** (efficiency of different care & prevention strategies)
  - Identifying best buys for key contributors to disease burden in older adults
  - Comparative intervention cost-effectiveness (across diseases and age groups)
  - efficiency : equity trade-offs (ethical considerations)
### What are the economic consequences of ill-health as we age?

### Who do the costs fall on?

<table>
<thead>
<tr>
<th></th>
<th><strong>Care costs</strong></th>
<th><strong>Productivity costs</strong></th>
<th><strong>Other costs</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient</strong></td>
<td>Treatment &amp; service payments</td>
<td>Work disability</td>
<td>Pain &amp; suffering</td>
</tr>
<tr>
<td></td>
<td>Lost earnings</td>
<td></td>
<td>Side-effects</td>
</tr>
<tr>
<td><strong>Family</strong></td>
<td>Informal caregiving</td>
<td>Time off work</td>
<td>Carer burden</td>
</tr>
<tr>
<td><strong>Employers</strong></td>
<td>Contributions to treatment &amp; care</td>
<td>Reduced productivity</td>
<td>-</td>
</tr>
<tr>
<td><strong>Society</strong></td>
<td>Health / welfare services (tax / insurance)</td>
<td>Reduced productivity</td>
<td>Stigma?</td>
</tr>
</tbody>
</table>
Cost-effectiveness analysis

**Costs**

**Programme-level:**
- administrative staffing
- training
- drug supply / distribution

**Individual-level:**
- treatment (drugs, therapy)
- inpatient care
- outpatient & primary care
- ancillary care

**Consequences**

**Programme-level / intermediate:**
- detection
- referral
- treatment rates / quality

**Intervention populations:**
(enhanced care or new treatment)

**Non-intervention populations:**
(usual care or no treatment)

**Individual-level / final:**
- morbidity
- mortality
- QALY, DALY (composite indices)
Approaches to cost-effectiveness analysis

- **Alongside (long-term) prospective studies**
  - observational
  - experimental

- **Modelling**
  - decision analytic methods (e.g. 5-year cohort incidence model)
  - population-based disease modelling (e.g. WHO-CHOICE)
CHOosing Interventions that are Cost-Effective
(www.who.int/choice)

- CHOICE is WHO's work programme on cost-effectiveness
- Use of a common set of tools and methods
  - enhances comparability between diseases / risk factors
- Sectoral, population-level CEA
  - **effectiveness**: healthy years gained over the lifetime of a population, with / without intervention
  - **resource costs**: patient + programme level (intl $ or local units)
- Results summarised in WHO regional C-E databases
  - available for country-level adaptation / analysis

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World Health Organization
Application of WHO-CHOICE

- By disease / risk factor:
  - Communicable diseases: HIV, TB, malaria, childhood diseases
  - Non-communicable diseases: cancer, cardiovascular disease, diabetes, respiratory disorders, mental disorders, sensory loss disorders
  - Risk factors: alcohol and tobacco use, unsafe water, unsafe sex, under-nutrition etc.

- By geographical setting
  - Regional assessments: 14 epidemiologically-defined WHO sub-regions
  - Country applications: Argentina, Chile, Estonia, Ghana, Guatemala, India, Kyrgyzstan, Mexico, Spain, Sri Lanka, Thailand, Viet Nam
Top 10 causes of DALYs, 60+ years

- Osteoarthritis
- Cataracts
- Hearing loss
- Diabetes mellitus
- Refractive errors
- Dementia
- COPD
- Stroke
- Cancer
- IHD

Global DALYs, millions (60+ years):

% DALYs among 60+ years:
Disease areas for which policy makers could use some economic evidence

- Cancers
  - Breast, liver, lung, prostate, stomach etc.

- Cardiovascular and respiratory disorders / risk factors
  - IHD, stroke, COPD, diabetes

- Sensory disorders
  - Cataract, refractive error, hearing loss

- Musculoskeletal
  - Osteoarthritis

- Neurological
  - Alzheimers' and other dementias
**Attributable vs avertable disease burden**

- Not avertable with existing interventions
- Already averted with current mix of interventions & population coverage
- Avertable via scaling-up of cost-effective interventions
- Avertable, but only with less effective or more costly interventions
## WHO-CHOICE evidence for prioritised NCDs and risk factors

<table>
<thead>
<tr>
<th>Disease / risk factor</th>
<th>Analysis undertaken</th>
<th>Interventions assessed</th>
<th>Regional results</th>
<th>Country analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>Tx of diabetes I &amp; II, plus complications</td>
<td>Glycaemic control, retin- / neur-opathy screening</td>
<td>Upcoming WHO-CHOICE series</td>
<td>None</td>
</tr>
<tr>
<td>CVD (prevention)</td>
<td>Prevention of high BP &amp; cholesterol</td>
<td>Salt / chol reduction, single/multi-drug Tx</td>
<td>Murray et al, 2003</td>
<td>Argentina, China, Kyrgyzstan</td>
</tr>
<tr>
<td>CVD (treatment)</td>
<td>Tx of IHD and stroke</td>
<td>Drug Tx for acute / long-term AMI, stroke, CHF</td>
<td>Upcoming WHO-CHOICE series</td>
<td>Kyrgyzstan</td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>Management of asthma and COPD</td>
<td>Tx with bronchodilators, corticosteroids,</td>
<td>Upcoming WHO-CHOICE series</td>
<td>None</td>
</tr>
<tr>
<td>Risk factors</td>
<td></td>
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<tr>
<td>Harmful use of alcohol</td>
<td>Prevention &amp; Tx of hazardous alcohol use</td>
<td>Excise tax, ad bans, brief advice, breath-testing,</td>
<td>Chisholm et al, 2004 Anderson et al, 2009</td>
<td>Estonia, Chile, Mexico, Thailand</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>Prevention &amp; Tx of tobacco use</td>
<td>Excise tax, ad bans, clean air laws, NRT</td>
<td>Shibuya et al, 2003</td>
<td>Estonia, Thailand</td>
</tr>
<tr>
<td>Unhealthy diets</td>
<td>Policies to address unhealthy diet &amp; physical inactivity</td>
<td>Mass media, school- &amp; work-based strategies, regulation, fiscal measures, counselling</td>
<td>Sassi et al, 2009 (also new Lancet NCD series, 2010)</td>
<td>Brazil, Russia, India, China, S Africa (ongoing)</td>
</tr>
</tbody>
</table>
COPD treatment options for persons aged 50+ years
(WHO sub-region WprB; e.g China)

- **Smoking cessation**: $12,924
- **Influenza vaccine**: $2,309
- **Inhaled bronchodilator - salbutamol + tiotropium (stage II)**: $72,903
- **Inhaled bronchodilator and corticosteroid (stage III and IV)**: $26,380
- **Treatment of severe exacerbations**: $39,869
- **Oxygen therapy in addition to medication for severe disease (stage IV)**: $35,267

Average cost per DALY averted (I$, 2005)
## Economic evidence for LAMI countries for other NCDs

<table>
<thead>
<tr>
<th>Disease</th>
<th>Interventions assessed</th>
<th>Regional results</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensory disorders</strong></td>
<td></td>
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<tr>
<td>Cataract</td>
<td>Cataract extraction</td>
<td>Baltussen et al, <em>WHO Bulletin</em> 2005</td>
<td>Highly cost-effective</td>
</tr>
<tr>
<td>Refractive error</td>
<td>Screening (<em>school children only</em>)</td>
<td>Baltussen et al, <em>Health Policy</em> 2008</td>
<td>Highly cost-effective</td>
</tr>
<tr>
<td>Hearing loss</td>
<td>Screening &amp; provision of hearing aids; topical antibiotics for chronic otitis media; Tx of meningitis with ceftriazone</td>
<td>Baltussen &amp; Smith, <em>WHO Bulletin</em> 2008</td>
<td>Cost-effective</td>
</tr>
<tr>
<td><strong>Osteoarthritis</strong></td>
<td>NSAIDs; COXIBs</td>
<td>N/A</td>
<td>Cost-effective (more or less)</td>
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<tr>
<td><strong>Dementia</strong></td>
<td>Acetyl cholinesterase inhibitors</td>
<td>Chandra et al, <em>DCP2</em> 2006</td>
<td>Not cost-effective in reducing caregiver time (other benefits not considered) (N.B. NICE evidence for UK)</td>
</tr>
</tbody>
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Costs and cost-effectiveness - key points

- Health & social welfare costs of ageing populations
  - already large and growing rapidly
  - a major challenge for public health and for government policy
  - economic or financial impact studies can help make the investment case

- Economic evidence for policies concerning ageing and health
  - Paucity of studies in low- and middle-income countries
  - Over-reliance on modelling, with attendant uncertainties (e.g. effect sizes, RRs)
  - Comorbidity - more the norm than the exception, and can significantly push up costs
  - Largely a vertical disease approach (vs more horizontal, health platform approach)