Do we really know the economic burden of multimorbidity?: A view from an indirect cost perspective

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Background
Multimorbidity

• Multimorbidity = “co-occurrence of >2 chronic conditions within one person, where one is not necessarily central than the others”

• Care management challenging
  o Substantial costs (66% of total health care spending in the US)
  o Requires to move beyond the traditional focus of care

• Leads to
  o Poorer health outcomes
  o Worsened functional status and quality of life
  o Limitations in employment, and reduced income
Prevalence of Multimorbidity

- 25% of US adults in 2014
- Expected to grow to 81 million by 2020

Indirect Costs

• Indirect costs = “individuals’ loss of production of goods and services due to their disease”

• Four potential sources:
  o **Absenteeism** - voluntary or involuntary absence from work
  o **Presenteeism** - reduced productivity despite being at work
  o **Disability** - lost productivity due to disability
  o **Premature mortality** - present value of future earnings lost due to mortality

• Lost productivity of caregivers - important but often overlooked
Multimorbidity and Indirect Costs

• Majority of the multimorbid conditions affect working age population

• Important to health services researchers
  o Magnitude of the disease/condition
  o Justify intervention programs
  o Research fund allocation (NIH, the Congress, NIA, NINR, NHLBI, VA, NCI)
  o Inform decision making and health policy

• A systematic review by Wang et al (2018) – no studies estimated indirect costs

• Indirect costs- immense value for cost-of-illness studies from a societal perspective
Hypotheses

1) The indirect costs associated with multimorbidity are unexplored
2) Studies underestimate indirect costs associated with multimorbidity
Methods
Exclusion Criteria (A priori)

• Focused on an index disease and comorbidities
• Did not include a population with multimorbidity
• Did not evaluate indirect costs associated with multimorbidity
• Non-US studies
**Data Sources- HSRProj Excel Database**

- Downloaded HSRProj Database Excel file
- Imported file in Python
- Title, Abstract, Keywordlist, and MeSHwordlist fields searched
- Accuracy checked manually using conditional formatting and custom sort in Excel and online database search

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Keywords</th>
<th>MeSH Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimorbidity</td>
<td>multimorbidity, multi-morbidity, comorbidity, co-morbidity, multiple</td>
<td>comorbidity</td>
</tr>
<tr>
<td></td>
<td>chronic conditions/illness/diseases, multiple long-term/long term</td>
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<tr>
<td>Lost Productivity</td>
<td>absenteeism, sick leave*, sickness absen*, illness day*, absence day*,</td>
<td>absenteeism,</td>
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<tr>
<td></td>
<td>productivity loss*, work abilit*, work disabilit*, early retirement*,</td>
<td>employment,</td>
</tr>
<tr>
<td></td>
<td>premature mortal*, workplace*, labor*, occupation*, job*</td>
<td>premature mortality</td>
</tr>
<tr>
<td>Costs/Expenditures</td>
<td>spending, cost-of-illness, cost of illness, indirect cost/burden/expenditure, cost/s</td>
<td>forecasting, health expenditures, costs and cost analysis, cost of illness</td>
</tr>
</tbody>
</table>
Additional Data Sources

• To identify a gap in the published literature:
  • Systematic search of three other online databases with the help of a librarian at WVU HSC
    o PubMed
    o Ovid Medline
    o Web of Science
  • Studies combined and duplicates removed using a reference management software (confirmed using another software)
  • Titles and abstracts screened by two independent reviewers
  • Full-text articles retrieved, if necessary

A detailed list of key words and MeSH terms used to search each database is provided at the end of this presentation
Results
Research Gap in HSRProj Database

- HSRProj Excel Database
- 658 projects identified
- None of the identified projects evaluated indirect costs associated with multimorbidity
- Reasons for exclusion of studies
  - Did not include multimorbid population (n=271)
  - Did not evaluate indirect costs associated with multimorbidity (n= 387)
Research Gap in Published Literature

Figure 3. Study Selection Flow Chart from Additional Data Sources

- PubMed Inception-Feb 2019: 1344 Citation(s)
- Web of Science Inception-Feb 2019: 1340 Citation(s)
- Ovid Medline Inception-Feb 2019: 1950 Citation(s)

2581 Non-Duplicate Citations Screened

Inclusion/Exclusion Criteria Applied

2496 Articles Excluded After Title/Abstract Screen

85 Articles Retrieved

Full-text Reviewed

74 Articles Excluded After Full Text Screen

8 Articles Excluded During Data Extraction

3 Articles Included
## Research Gap in Published Literature

<table>
<thead>
<tr>
<th>Study</th>
<th>Method Used to Measure Indirect Costs</th>
<th>Health Conditions Studied</th>
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</thead>
<tbody>
<tr>
<td>Patrick et al 2007</td>
<td>Absenteeism</td>
<td>Obesity with 2 or more of the following conditions: hyperlipidemia, hypertension, and diabetes</td>
</tr>
<tr>
<td>Guy et al 2017</td>
<td>Absenteeism, Lost Productivity Due to Disability</td>
<td>Cancer with any other physical or mental chronic health condition</td>
</tr>
<tr>
<td>Druss 2000</td>
<td>Absenteeism, Lost Productivity Due to Disability</td>
<td>Depression with any other physical or mental chronic health condition</td>
</tr>
</tbody>
</table>

- Indirect costs associated with presenteeism, premature mortality, caregiver burden - not evaluated
- Indirect costs of most common multimorbid conditions not assessed:
  - physical (hypertension, high cholesterol, and diabetes)
  - mental (depression and anxiety)
  - Physical and mental (arthritis, osteoporosis, depression, anxiety)
Significance of the Research Gap
What is the Real Economic Burden of Multimorbidity?

• Knowledge of indirect costs along with direct costs is required
  o Identify the magnitude of the problem
  o Optimal allocation of resources

• Healthcare providers, policy makers, patients, and payers can benefit
  o Justify collaborative care
  o Improve preventive and treatment efforts
  o Reduce future direct and indirect costs

• Employees and employers
  o Wellness programs

• Government
  o Efforts to improve labor force participation and tax revenue
Proposed Solutions
Potential Solutions

• Identify indirect costs associated with the most common clusters of physical and/or mental health conditions
  o Compare indirect costs of concordant and discordant multimorbid conditions

• Use publicly available datasets like Medical Expenditure Panel Survey and National Health Interview Survey

• Create data linkages between existing registries, insurance claims, medical records, and surveys to estimate indirect costs

• Evaluate caregiver burden as part of indirect economic burden assessment

• Adopt the established definition of multimorbidity for uniformity in findings (WHO, AMS)
Acknowledgements

• Dr. Usha Sambamoorthi (Advisor, Professor, WVU HSC)
• Ms. Anna Crawford (Associate University Librarian, WVU HSC)
References


Boyd CM, Fortin M. Future of multimorbidity research: How should understanding of multimorbidity inform health system design? Public Health Rev. 0112.
References


Microsoft Excel for Office 365. Available at: https://products.office.com/en-us/excel

PRISMA Flow Diagram Generator. Available at http://prisma.thetacollaborative.ca/
Thank you!
List of Abbreviations

US: United States
NIH: National Institutes of Health
NIA: National Institute on Aging
NINR: National Institute of Nursing Research
NHLBI: National Heart, Lung, and Blood Institute
VA: US Department of Veterans Affairs
NCI: National Cancer Institute
MeSH: Medical Subject Heading
WVU: West Virginia University
HSC: Health Sciences Center
WHO: The World Health Organization
AMS: The Academy of Medical Sciences
## Appendix - Search Strategy

### Online HSRProj Database

| (((multimorbidity) OR (multi-morbidity) OR (comorbidity[MeSH]) OR (co-morbidity) OR ((multiple) AND (chronic OR long-term OR "long term") AND (illness* OR disease* OR condition*))) | AND | ("Sick Leave"[Mesh]) OR (Sick Leave*) OR (Sickness Absen*) OR (Sick Absen*) OR (Sick Day*) OR (Work Absen*) OR (Work Leave*) OR (Illness Day*) OR (Illness absen*) OR ("Absenteeism"[Mesh]) OR (Absenteeism) OR (Absence Day*) OR (Absent Day*) OR (Presenteeism) OR (Work Productivit*) OR (Productivity Loss*) OR (Work Abilit*) OR (Work Disabilit*) OR (Disability Pension*) OR (Early Retirement*) OR ("Mortality, Premature"[Mesh]) OR (Premature Mortal*) OR (Premature Death*) OR ("Employment"[Mesh]) OR (Employment*) OR (Employee*) OR (Workloss*) OR (Workplace*) OR (Workday*) OR (Worker*) OR (Labour*) OR (Labor*) OR (Occupation*) OR (Job*)) | AND | (forecasting[MeSH]) OR (health expenditures[MeSH]) OR (spending) OR (costs and cost analysis[MeSH]) OR (cost of illness) OR (cost of illness) OR (indirect cost) OR (indirect burden) OR (absenteeism[MeSH]) OR (Cost OR Costs OR Economic* OR Indirect Expenditure* OR Indirect Expense* OR "Cost of Illness"[Mesh] OR "Costs and Cost Analysis"[Mesh]) |
### Appendix- Search Strategy

<table>
<thead>
<tr>
<th>PubMed</th>
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<th>PubMed</th>
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| (((multimorbidity[Title/Abstract]) OR (multimorbidity[Title/Abstract]) OR (comorbidity[MeSH]) OR (comorbidity[Title/Abstract]) OR (multiple[Title/Abstract]) AND (chronic[Title/Abstract] OR long-term[Title/Abstract] OR "long term"[Title/Abstract]) AND (illness*[Title/Abstract] OR disease*[Title/Abstract] OR condition*[Title/Abstract]))) | AND | (("Sick Leave"[Mesh]) OR (Sick Leave*[Title/Abstract]) OR (Sickness Absent*[Title/Abstract]) OR (Sick Absent*[Title/Abstract]) OR (Sick Day*[Title/Abstract]) OR (Work Absent*[Title/Abstract]) OR (Work Leave* [Title/Abstract]) OR (Illness Day*[Title/Abstract]) OR (Illness absent*[Title/Abstract]) OR ("Absenteeism"[Mesh]) OR (Absenteeism[Title/Abstract]) OR (Absence Day*[Title/Abstract]) OR (Absent Day*[Title/Abstract]) OR (Presenteeism*[Title/Abstract]) OR (Work Productivity*[Title/Abstract]) OR (Productivity Loss*[Title/Abstract]) OR (Work Ability*[Title/Abstract]) OR (Work Disability*[Title/Abstract]) OR (Disability Pension*[Title/Abstract]) OR (Early Retirement*[Title/Abstract]) OR ("Mortality, Premature"[Mesh]) OR (Premature Mortal*[Title/Abstract]) OR (Premature Death*[Title/Abstract]) OR ("Employment"[Mesh]) OR (Employment*[Title/Abstract]) OR (Employee*[Title/Abstract]) OR (Workloss*[Title/Abstract]) OR (Workplace*[Title/Abstract]) OR (Workday*[Title/Abstract]) OR (Worker*[Title/Abstract]) OR (Labour*[Title/Abstract]) OR (Labor*[Title/Abstract]) OR (Occupation*[Title/Abstract]) OR (Job*[Title/Abstract]))) | AND | ((forecasting[MeSH]) OR (health expenditures[MeSH]) OR (spending[Title/Abstract]) OR (costs and cost analysis[MeSH]) OR (cost-of-illness[Title/Abstract]) OR (cost of illness[Title/Abstract]) OR (indirect cost[Title/Abstract]) OR (indirect burden[Title/Abstract]) OR (absenteeism[MeSH]) OR (Cost[Title/Abstract]) OR (Costs[Title/Abstract]) OR (Economic*[Title/Abstract]) OR (Indirect Expenditure*[Title/Abstract]) OR (Indirect Expense*[Title/Abstract]) OR ("Cost of Illness"[Mesh]) OR ("Costs and Cost Analysis"[Mesh])))
## Appendix - Search Strategy

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<th>Web of Science (Using Search Terms as Topics)</th>
<th>Ovid Medline (Using multi-field search)</th>
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<tbody>
<tr>
<td>(&quot;multimorbidity&quot; OR &quot;multi-morbidity&quot; OR &quot;comorbidity&quot; OR &quot;co-morbidity&quot; OR (&quot;multiple&quot; AND (&quot;chronic&quot; OR &quot;long-term&quot; OR &quot;long term&quot;)) AND (&quot;illness*&quot; OR &quot;disease*&quot; OR &quot;condition*&quot;))</td>
<td>AND (&quot;Sick Leave&quot; OR &quot;Sick Leave*&quot; OR &quot;Sickness Absen*&quot; OR &quot;Sick Absen*&quot; OR &quot;Sick Day*&quot; OR &quot;Work Absen*&quot; OR &quot;Work Leave*&quot; OR &quot;Illness Day*&quot; OR &quot;Illness absen*&quot; OR &quot;Absenteeism&quot; OR &quot;Absenteism&quot; OR &quot;Absence Day*&quot; OR &quot;Absent Day*&quot; OR &quot;Preseenteism&quot; OR &quot;Work Productivit*&quot; OR &quot;Productivity Loss*&quot; OR &quot;Work Abilit*&quot; OR &quot;Work Disabilit*&quot; OR &quot;Disability Pension*&quot; OR &quot;Early Retirement*&quot; OR &quot;Premature Mortal*&quot; OR &quot;Premature Death*&quot; OR &quot;Employment&quot; OR &quot;Employee*&quot; OR &quot;Workloss*&quot; OR &quot;Workplace*&quot; OR &quot;Workday*&quot; OR &quot;Worker*&quot; OR &quot;Labour*&quot; OR &quot;Labor*&quot; OR &quot;Occupation*&quot; OR &quot;Job*&quot;)</td>
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