EE479

Economic Burden and Cost Patterns of Cardio-Renal-Metabolic (CRM) Multimorbidity in German Statutory Health Insurance Claims Data

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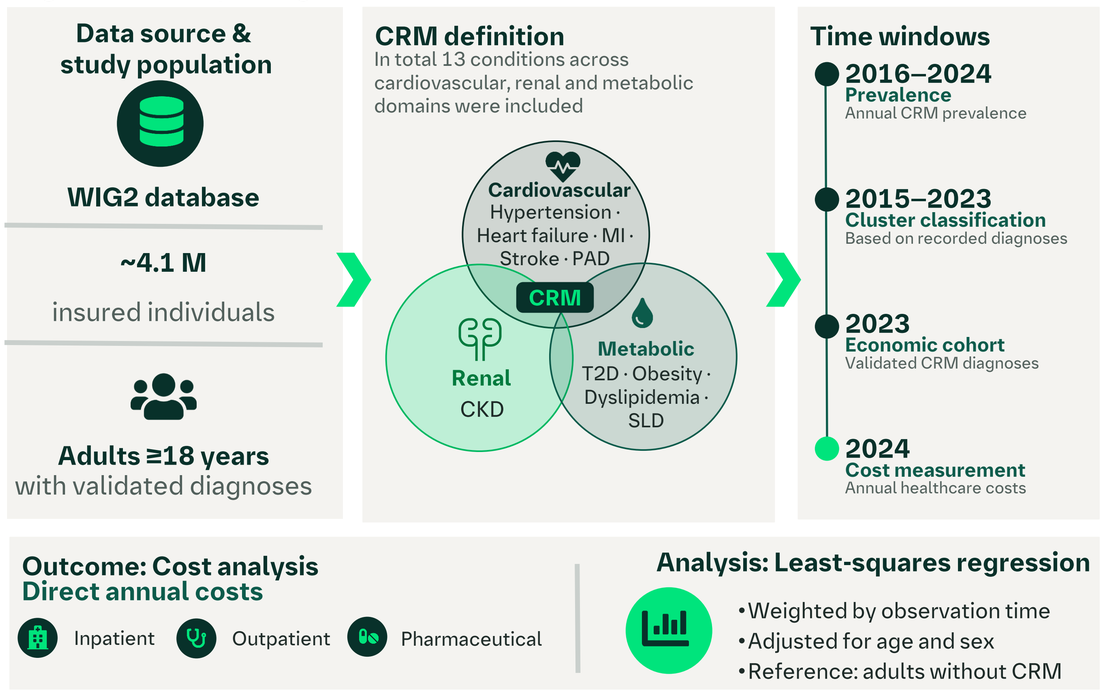
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OBJECTIVE

To quantify the economic burden of cardio-renal-metabolic (CRM) morbidity in Germany and assess cost gradients across single-, dual-, and triple-disease clusters, with a focus on whether multimorbidity is associated with superadditive cost patterns.

METHODS

Figure 1. Study design, CRM definition and time windows



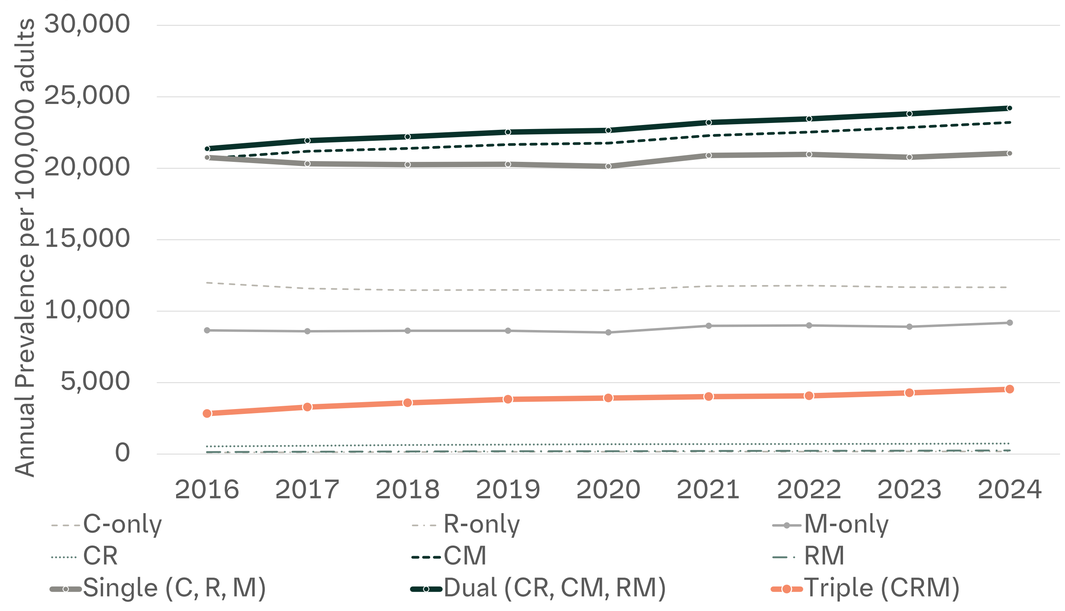
RESULTS: Prevalence

The Prevalence per 100,000 adults in 2024:

- 21,044 Single-domain condition - C, R or M only
- 24,203 Dual-domain condition - CR, CM or RM
- 4,534 Triple-domain condition - CRM

- Dual-domain morbidity is almost entirely cardio-metabolic (23,207 per 100,000; 96%)
- Triple-domain prevalence rose from 2,832 to 4,534 (2016–2024)

Figure 2. Annual CRM prevalence per 100,000 adults by domain cluster, 2016-2024



RESULTS: Economic burden

Annual costs increased with CRM complexity.
Mean total costs:

€3,168–5,801
Single-disease clusters

€5,460–9,895
Dual-disease clusters

€11,418
Triple CRM patients

3.6×
Triple combi vs. lowest single-disease cluster

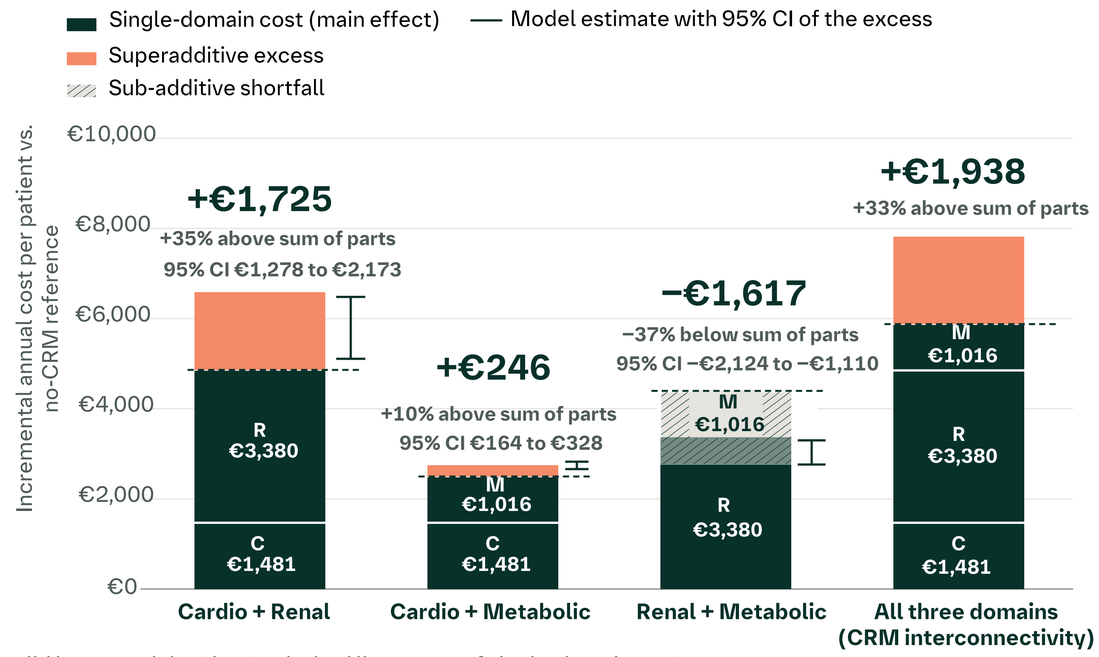
RESULTS: Superadditivity

Each domain carried a substantial independent cost (cardiovascular +€1,481, renal +€3,380, metabolic +€1,016). The cardio-renal (+€1,725) and cardio-metabolic (+€246) interactions were positive, the renal-metabolic interaction negative (−€1,617), and the three-way interaction positive (+€1,583), yielding net super-additive costs in which most domain combinations exceeded the sum of the individual domains.

Combined CRM domains cost more than the sum of their parts:
+€1,938 per triple-domain patient per year.

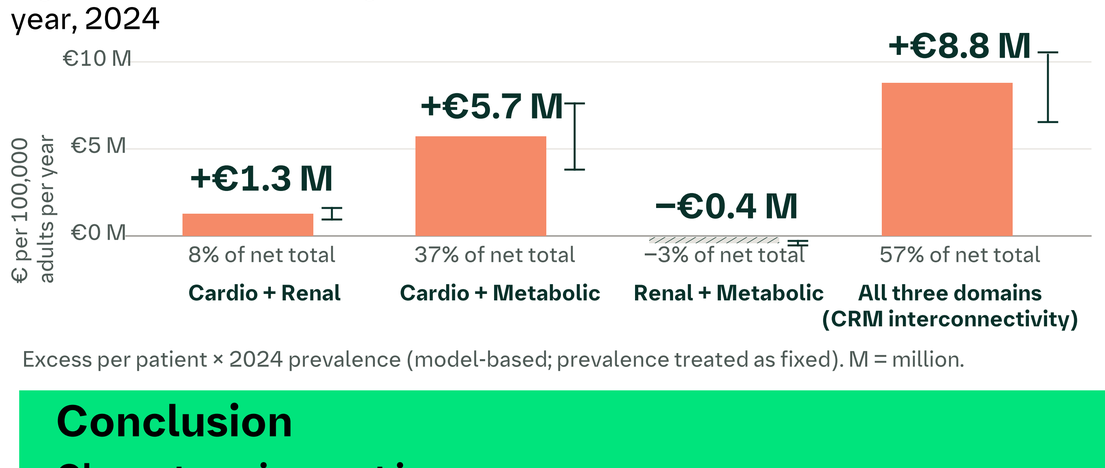
Weighted by prevalence, cardio-metabolic and triple-domain patients account for 94% of the estimated €15.4 M net superadditive excess per 100,000 adults.

Figure 3. Model-estimated annual direct costs per patient vs. sum of single-domain costs, 2024



solid bar = model estimate; dashed line = sum of single-domain costs
Least-squares regression weighted by observation time, adjusted for sex-age groups; reference = adults without CRM.
Superadditive excess = model-estimated cost of a domain combination minus the sum of its single-domain costs (main effects), i.e. the sum of all interaction terms involved (dyads: one term; triad: CR + CM + RM + CRM = +€1,725 + €246 − €1,617 + €1,583 = +€1,938); Whiskers show the 95% CI of the excess.

Figure 4. Prevalence-weighted superadditive excess per 100,000 adults per year, 2024



Excess per patient × 2024 prevalence (model-based; prevalence treated as fixed). M = million.

Conclusion

Clear stepwise cost increase

- CRM multimorbidity is associated with a clear stepwise increase in healthcare costs in Germany, with most domain combinations showing superadditive costs.

Superadditive costs → strengthen secondary prevention

- As the predominant cardio-metabolic population progresses to the costliest triple-domain state, these findings highlight the importance of strengthening secondary prevention to reduce progression to CRM multimorbidity and the associated burden on healthcare systems.
- The superadditive cost pattern reflects the interconnectivity of CRM conditions and supports holistic care over single-disease management.

Disclosures: MZ, LD, NL and JW are employees of Boehringer Ingelheim; MZ is additionally affiliated with Karolinska Institutet. NKb is an employee of ZEG, which received funding from Boehringer Ingelheim (BI) to conduct this study. NKo and KW are employees of WIG2 Institute, which was contracted by ZEG for the conduct of this study. BI was given the opportunity to review the poster.
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Abbreviations: C = Cardiovascular, M = Metabolic, R = Renal, CRM = Cardio-Renal-Metabolic, PAD = Peripheral Arterial Disease, SLD = Steatotic Liver Disease, CI = confidence interval; M = million.

Life forward