

Online Supplementary Material

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Supplemental Table 1. Index of Studies With Demonstrated Associations Between Patient Sociodemographic Characteristics and Multimorbidity or Morbidity Burden Using Different Measures

Outcome and Anticipated Association	Measure						
	Self-Reported Disease Counts	Clinician-Rated Disease Counts	CDS/RxRisk	Charlson Index	ACG	CIRS	DUSOI
Age							
Increased multimorbidity with increasing age	Age ¹⁻³ Age (not associated) ⁴	Age ⁵⁻¹²	–	Age ¹³	Age ^{7,14-16}	Age ^{7,17-20}	Age ²¹
Sex							
Increased multimorbidity in females	Female sex ^{3,22-24} Sex (not associated) ²⁴	Female sex ^{12,25} Sex (not associated) ^{26,27}	–	–	Female sex ^{14,28}	Female sex ²⁰ Association with sex unclear ¹⁸	Female sex ²¹
Deprivation							
Increased multimorbidity with less affluence, less education, lower social class	Household income ²² Deprivation ²⁹ Socioeconomic status ¹ Education, social class ^{2,30}	Deprivation ^{4,8} Public rather than private health insurance ²⁵ Education ^{10,25} Occupation ³¹	–	–	–	Household income ²⁰ Unemployment ²⁰ Education ²⁰	– –
Living arrangements							
Increased multimorbidity in those living alone or in institution	Living alone or in an institution ^{1,3} Marital status (not associated) ³²	Living alone or in an institution ^{25,33} Living as a couple/family ³⁴ Having a large social network ^{31,34}	–	–	–	–	–
Note: In each case, studies have demonstrated associations between the measure and the outcome in the anticipated direction, except where specified.							

Supplemental Table 2. Index of Studies Which Have Demonstrated Relationships Between Multimorbidity or Morbidity Burden and Cost or Process of Care Using Different Measures

Outcome and Anticipated Relationship	Measure						
	Self-Reported Disease Counts	Clinician-Rated Disease Counts	CDS/RxRisk	Charlson Index	ACG	CIRS	DUSOI
Costs of providing care							
Increased costs with increased multimorbidity	–	Medication costs ^{35,36} Annual costs ¹⁰ Meeting treatment targets (pay for performance) ³⁷	Health costs ³⁸⁻⁴⁰	Annual costs in ambulatory care ⁴¹⁻⁴² Total costs ³⁸	Physician costs ³² Total costs ^{40,43,44} Primary care costs ^{45,46} Medication costs ^{18,47} Polypharmacy ⁴⁸	–	Total costs ^{43,49} Health care charges (not related) ²¹
Patient costs							
Increased costs with increased multimorbidity	–	Out of pocket expenses ¹⁸	–	–	Health plan expenditure ^{14,16} Patient costs ^{28,32,50-52}	–	–
Process measures							
Increased health care utilization with increased multimorbidity	Number of ambulatory visits ⁵³⁻⁵⁶ Health care utilization ⁵⁷ Number of prescriptions ^{54,56} Number of tests ⁵⁴	Number of ambulatory visits ^{38,58,59-61} Number of prescriptions ⁶¹ Number of specialists referrals/visits ⁶ 1	Health care utilization ^{39,62} Hospitalization ^{39,63-65} Institutionalization ⁶³ Ambulatory visits ^{38,62} Number of prescriptions ⁶²	Number of ambulatory visits ^{38,62} Hospital admission rates ^{62,63,66,67} Number of prescriptions ^{62,68} Institutionalization ⁶³ Screening rates for cancer ^{69,70} Fecal occult blood testing (not related) ^{71,3}	Hospital admission rates ^{14,16,72} Number of home visits ⁷³ Number of specialist referrals/visits ^{6,74,75} Number of referrals in and between practices ⁷⁶ Number of ambulatory visits ^{44,50,72,74,75,77} Number of prescriptions ⁷² Number of tests ⁷²	–	–
Quality of care measures							
	–	Quality of care ^{78,79} Co-ordination of care (CPCI) ^{80,81}	–	Quality of care ⁸² Odds of reaching targets of uric acid ⁸²	–	–	–

In each case, studies have demonstrated relationships between the measure and the outcome in the anticipated direction, except where specified.

Supplemental Table 3. Index of Studies Which Have Demonstrated Relationships Between Multimorbidity or Morbidity Burden and Patient Health Outcomes Using Different Measures

Outcome and Anticipated Relationship	Measure						
	Self-Reported Disease Counts	Clinician-Rated Disease Counts	CDS/RxRisk	Charlson Index	ACG	CIRS	DUSOI
Mortality							
Increased mortality with increased multimorbidity	Mortality ^{25,83-85}	Mortality ^{38,58,86-88}	Mortality ^{38,39,63,86,87,89}	Mortality ^{38,63,67,71,86,87,90-93}	—	—	—
Physical functioning							
Reduced physical function with increased multimorbidity	Disability severity ^{23,68,94-96} Development of disability ⁹⁷ Number of disability days ⁹⁸ Physical /functional abilities ^{23,99,100} Daily functioning ^{30,101} Fitness (ability to do exercise) ¹⁰² Fragility ¹⁰³ More falls ^{104,105} Dizziness ¹⁰⁵ Pain ¹⁰⁶ Increased BMI, waist circumference ¹⁰⁷ Visual impairment ¹⁰⁸	Disability ^{86,108,110} Obesity ⁸ Previous alcohol and tobacco use ⁸ Previous hospitalization ⁸	Incident disability ^{86,111} Disease severity ⁶⁴ Disability status ⁶⁴	Incident disability ⁸⁶	—	GI symptoms (depression patients) ²⁰ Disability ¹¹²	—
Psychological functioning							
Reduced psychological functioning with increased multimorbidity	Decreased cognition (older people) ¹¹³ Dementia/cognitive impairment ¹¹⁴ Depression ¹¹⁵⁻¹¹⁸ Anxiety, (lack of) mastery ¹¹⁹ Depressive symptoms (not related) ^{120,121} Psychological distress ^{1,120,122} Use of psychotropic medication ¹²² Emotional contentment and happiness (positive affect) ⁹⁹ Dissatisfaction, unhappiness, feeling terrible ¹ Self-rated sleep quality & risk of sleep disorders ¹²³	Bipolar disorder ¹²⁴ Psychological distress (not related) ¹²⁵ Response to a depression program ¹²⁶	Presence of dementia ¹²⁷ Depression ¹¹⁵ Depression & anxiety (not related) ⁶⁴ Psychiatric illness ¹¹¹	Depression ^{119,128} Somatization ^{129,130} Presence of Alzheimer's disease ¹³¹	Depression ¹³²	Depression ¹ Duration of depression ⁿ²¹ Somatic symptoms (depression patients) ⁸⁶	Depression ^{11,21,134}

Supplemental Table 3, continued

Outcome and Anticipated Relationship	Measure						
	Self-Reported Disease Counts	Clinician-Rated Disease Counts	CDS/RxRisk	Charlson Index	ACG	CIRS	DUSOI
HRQoL / health status							
Reduced HRQoL with increased multimorbidity	HRQoL (SF36) ^{3,30,120,135-144} HRQoL (self-assessed) ¹⁴⁵ HRQoL with cancer (EORTC) ¹⁴⁶ Psychological wellbeing ¹⁴⁶ Health Utility Index ¹⁴⁷ Perceived health status ^{22,148-150} Self-rated health ¹	HRQoL PCS (SF-12 or SF-36) ^{58,80,81,125,151-153} HRQoL-MCS (SF-12 or 36) ^{67,80} HRQoL MCS (SF-36) (not related) ¹²⁵ HRQoL (NHP) ²⁷ Perceived health status ¹⁵⁴ Health status ¹⁵⁵	HRQoL ^{135,137} Self-rated health ^{64,148} Health status ^{64,149}	HRQoL as measured by SF-36 PCS & MCS ^{13,135,138,149,156,157} Daily living QoL in breast cancer patients ¹⁵⁸ SF-36-PCS but not MCS ¹⁸ Self-rated health ^{13,159} Self-care behavior ¹⁶⁰	–	HRQoL (SF-36) PCS & MCS ¹²⁵	HRQoL SF-36 PCS & MCS ¹¹
Other patient-related outcomes							
Lower patient's self-management/ self-care behaviors ^{160,161} Increased worries about health ²² Increased prevalence of smoking ²	Increased health care hassles ⁸¹ Communication (not related) ⁸⁰ Increased preference for own health provider ^{80,81} Increased willingness to see non-physician provider ⁸⁰ Lower self-management skills ⁸⁰ Low internal locus of belief ³⁴ Increased use of complementary & alternative therapies ¹⁶² Absence of positive life events ³¹ Poor social support ¹⁶³ Absence of active coping style ³¹	Not related to response to depression treatment ¹²⁶	Increased self-reported/ occurrence of adverse events ^{164,165} Lower functional health literacy ¹⁵⁶	Decreased patient satisfaction ¹⁵	Inadequate social support ¹⁶³	–	

BMI = body mass Index; CPCI = components of primary care Index; EORTC = European Organization for Research and Treatment of Cancer; GI = gastrointestinal; HRQL = health-related quality of life; SF-12/36 = 12-item and 36-item short form; PCS = physical component score; MCS = mental component score; NHP = Nottingham Health Profile.

Note: In each case, studies have demonstrated relationships between the measure and the outcome in the anticipated direction, except where specified.

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