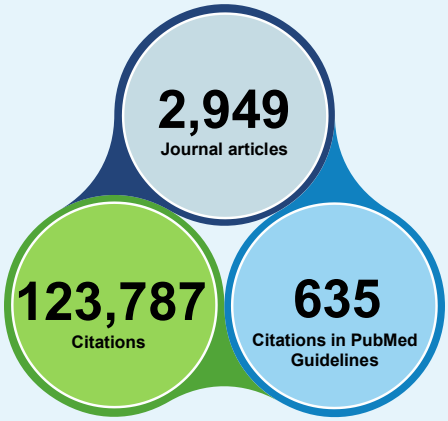
Kaiser Permanente Research Brief

Aging

This brief summarizes the contributions of Kaiser Permanente Research since 2007 on the topic of aging. Although this topic encompasses a wide variety of health issues, this brief will focus on geriatric syndromes (for example, frailty, falls), cognitive illnesses, the management of multiple chronic conditions, and end-of-life care.

For much of the past century, average life expectancy in the United States has increased dramatically. That, combined with the aging of the baby boom generation, accounts for a growing number of older Americans, who now make up an unprecedented percentage of the population. Today, there are nearly 56 million people in the United States age 65 and older,[1] and by 2030, these older adults are expected to comprise 20% of the U.S. population.[2] Additionally, there are more than 6 million people age 85 and older in the United States, who represent the fastest-growing segment of the population.[1] Of Americans age 65 and older, 2 out of every 3 have multiple chronic health problems.[3]

Kaiser Permanente publications related to aging since 2007



Source: Kaiser Permanente Publications Library and Scite metrics, as of October 8, 2024.

The health of older adults is complicated by common, multifactorial health problems known as geriatric syndromes. Frailty — a condition defined by fatigue and decreased strength, mobility, and activity — affects approximately 15% of older adults, with higher prevalence among women, members of racial and ethnic minorities, and lower-income individuals.[4] According to the Centers for Disease Control and Prevention, 36 million falls occur each year among American adults age 65 and older; these accidents are implicated in 32,000 deaths.[5] Roughly half of older adults also suffer from urinary or bowel incontinence.[6] Moreover, many adults experience declines in cognitive ability as they age; for many, these changes progress to dementia, a condition characterized by personality changes and impairments in memory and reasoning ability that limit their ability to live independently. The most common form of dementia, Alzheimer's disease, affects 1 in 9 Americans over the age of 65 and is associated with death and disability, significant burdens for paid and unpaid caregivers, and $360 billion in annual health care costs.[7] Finally, the last months of life are frequently characterized by high medical costs[8] and the challenge of balancing appropriate treatment and the patient's wishes. Although most patients with terminal illness prefer to die at home, recent data indicate that this only happens in 30% of cases.[9]

Aging is an active area of study for Kaiser Permanente Research. Scientists across the organization have used our rich, comprehensive, longitudinal data to advance knowledge in the areas of understanding risk, improving patient outcomes, and translating research findings into policy and practice. We have published more than 2,900 articles related to aging since 2007;[10] together, these articles have been cited nearly

This brief summarizes a selection of the publications contained within the Kaiser Permanente Publications Library, which indexes journal articles and other publications authored by individuals affiliated with Kaiser Permanente. The work described in this brief originated from across Kaiser Permanente's 8 regions and was supported by a wide range of funding sources including internal research support as well as both governmental and nongovernmental extramural funding.

124,000 times. These articles are the product of observational studies, randomized controlled trials, meta-analyses, and other studies led by Kaiser Permanente scientists. Our unique environment — a fully integrated care and coverage model in which our research scientists, clinicians, medical groups and health plan leaders collaborate — enables us to contribute generalizable knowledge on aging, and many other research topics.

Understanding risk

What are the unique health risks associated with aging?

Kaiser Permanente researchers have conducted extensive research on the unique health risks faced by older patients. Common illnesses such as osteoporosis,[11; 12] chronic obstructive pulmonary disease,[13; 14] and congestive heart failure[15; 16] are more severe and have poorer prognoses at later ages. The challenge of managing these conditions is often increased in older patients, for whom the benefits of many medications must be weighed against heightened risks,[17-22] and who are often underrepresented in clinical trials.[23] For example, many widely prescribed medications are associated with heightened risks for falls,[24-29] as well as declines in cognition[30-32] and functional status[31] in older patients.

One area of significant work at Kaiser Permanente concerns the challenges of managing multiple chronic conditions,[33] particularly with respect to encouraging adherence to multiple medications among patients with cognitive impairment,[34] and minimizing the burden of inappropriate care.[35] Use of multiple medications, known as polypharmacy, is common in patients with multiple chronic conditions, and is also associated with an increased risk of falls[27] and other adverse outcomes.[36; 37] Sources of these risks include drug interactions[38-40] and inadequate communication among multiple prescribing clinicians.[41] Polypharmacy and use of high-risk medications are also frequent causes of hospital-acquired delirium,[42] and many Kaiser Permanente medical centers have implemented early detection programs for delirium.[43] Finally, treatment of multiple health problems often requires frequent medical imaging, which may lead to distress associated with incidental detection of new lesions.[44]

Food insecurity

Nearly 6% of elderly Kaiser Permanente members in Colorado said that they did not always have enough money to buy food.[108]

Less likely to experience food insecurity

- Age 85 and older
- Living at home with a friend or relative
- Heavy alcohol use
- Recent stay in a skilled nursing facility
- Someone to call for help

More likely to experience food insecurity

- Black Americans
- Medicaid or Special Needs Plan Insurance
- Fair or poor quality of life
- Dental or mouth problems
- Financial problems
- Zero daily serving of fruits or vegetables

Geriatric syndromes such as frailty, falls, and declines in functional ability are a focus of research at Kaiser Permanente. Studies conducted by our scientists have found that vitamin D deficiency,[45; 46] disturbed sleep patterns,[47] vision impairment,[48] kidney disease,[49] low blood pressure,[50] blood lipid characteristics,[51] surviving cancer,[52] hypoglycemia associated with overuse of antidiabetic medications[53; 54] and poor nutrition,[55] and metabolic illnesses[56; 57] are associated with increased risks of falls and frailty. One study in patients with diabetes found that differences in rates of geriatric syndromes between ethnic groups were small, and often favored minority groups, suggesting progress in reducing health disparities.[58] Functional status limitations, including disability and impaired mobility, are linked to disrupted sleep behaviors,[59] other geriatric syndromes,[60-62] and increased risks of falls,[63-65] cognitive impairment,[66] hospitalization,[67] bleeding risk,[68] and

mortality.[69] Our scientists participated in a large, community-based study that found that lower walking speed and decreased physical activity were associated with chronic disability, long-term nursing home stays, and an increased risk of death.[70] We have also explored various risk factors associated with age-related cognitive decline and dementia, including race or ethnicity,[71-73] obesity,[74; 75] physical inactivity,[76; 77] poor pulmonary function,[78] sleep disturbances,[79; 80] social isolation,[81] life stress,[71] brain characteristics,[82-84] genetic factors,[85-87] environmental factors,[88-90] and illnesses such as hypertension,[91-93] diabetes,[94-98] kidney disease,[99] and psychiatric disorders.[100-103] Our scientists contributed to the Lancet Commission's life-course model for reducing dementia risks, which emphasizes early interventions to target modifiable risk factors.[104; 105] This model was based in part on findings from the long-running Adult Changes in Thought study, conducted by Kaiser Permanente researchers in Washington.[106]

Which subgroups of older adults are at particularly high risk for health problems?

Social needs are one domain of risk factors that impact older adults. Kaiser Permanente scientists have studied social determinants of health in older people.[107] A survey of Kaiser Permanente members in Colorado age 65 and older found that approximately 6% did not have enough money for food. Black members and members with Medicaid insurance, lower self-reported quality of life, dental problems, poor diet, or inadequate social support were at particularly high risk.[108] For older people, food insecurity is associated with poor diabetes control, hypoglycemia,[55] and higher rates of falls, hospitalizations, emergency department visits, and deaths.[109-111] Financial constraints and poverty are also linked to poor health outcomes in older people, according to research conducted by our scientists.[112-115] Kaiser Permanente studies also show that social isolation is associated with a lower quality of life in older people[116] and with the development of cognitive illness[81; 117; 118] and cardiovascular disease.[119] These challenges have become particularly acute in recent years, as older people have faced unprecedented isolation and limitations on physical activity during the COVID-19 pandemic.[120] Our scientists have evaluated various methods for proactively screening our members for unmet social needs,[121] and have found greater health care utilization in members with greater unmet needs.[121; 122] Our researchers have also found that high-risk opioid prescribing in older patients is a common problem[123; 124] and is associated with greater risks of fractures[125] and overdoses.[126]

Improving Patient Outcomes

What prevention or early intervention strategies are effective in mitigating the health risks of aging?

Kaiser Permanente scientists have studied various programs for primary prevention among older members. One component of these efforts includes the promotion of general wellness. A recent randomized trial conducted among our members found that an intervention targeting risk factors including hypertension, diabetes, smoking, inactivity, depression, and poor sleep was associated with improved cognitive functioning among high-risk older adults.[127] Kaiser Permanente research has supported the implementation of exercise and physical fitness programs, such as Silver Sneakers and the use of wearable fitness trackers, among older members.[128-130] Exercise programs in older patients are effective in preventing falls,[131-135] and may also reduce the risk of dementia[77; 136-138] and reduce health care costs.[139] Our scientists have incorporated social supports into programs for older patients to limit the impact of social isolation,[140; 141] and they have studied programs for early identification of depression.[142] The COVID-19 pandemic led to a rapid shift toward digital health tools, and our scientists have discussed the needs and challenges that older patients may experience in using these technologies effectively.[143-146] Recently, Kaiser Permanente researchers were involved in the evaluation of a nurse case management program for patients with Parkinson's disease.[147; 148]

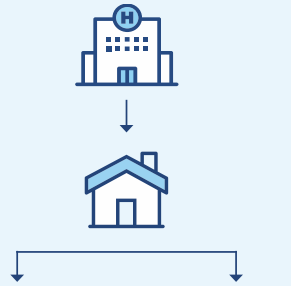
Researchers at Kaiser Permanente have explored efforts to expand advance care planning to ensure that patient preferences are honored at the end of life. A study of the Advanced Steps program, which allows patients to discuss their end-of-life priorities with a health care agent and a planning facilitator, found a strong association with high rates of preference-concordant care, and demonstrated that preferences may evolve over time.[149] Other Kaiser Permanente scientists have studied the effect of incorporating advance care planning prompts into patients' electronic medical records.[150] Our researchers have explored ways to identify unrecognized dementia using medical record data,[151-153] and have developed various methods for predicting the risk of future dementia[94; 154-156] and other risks in patients with dementia.[157] A randomized trial is currently underway to evaluate whether advance care planning can increase the safety of glucose-lowering medications in older Kaiser members with type 2 diabetes.[158]

What are the key factors in effective care for older adults?

The effectiveness and safety of medical care for older patients are significant areas of research at Kaiser Permanente. One component of effective care involves discontinuing or reducing the intensity of care for older members, as appropriate. For example, Kaiser Permanente research demonstrated that preventive breast,[159-161] cervical,[162] and colorectal[163] cancer screenings have limited benefits in older patients. These findings have led to recommendations to curtail routine screenings at later ages to protect these patients from unnecessary tests and risks.

Our scientists have also studied medication safety efforts aimed at deprescribing treatments[164-173] that are associated with greater risks at older ages, including antidiabetic drugs,[19; 174; 175] statins,[176] anticoagulants,[177] and sedatives,[178; 179] as well as the implementation of deprescribing efforts in hospice settings.[180] The quality of communication between physicians and patients is critical for successful deprescribing.[171; 175; 181-184] Kaiser Permanente researchers have also studied programs for reconciliation of medications among multiple clinicians. These programs ensure that older patients do not receive duplicative treatments.[185-188] Our research has emphasized the importance of shared decision-making and goal setting in the care of these patients. Kaiser Permanente scientists have also explored barriers to use of nonpharmacologic pain treatments in older members, in lieu of prescription opioids.[189]

Pharmacist-led medication reconciliation for older patients discharged from skilled nursing facilities was associated with a significantly lower risk of dying, but not with lower utilization.[185]



In the Medication Reconciliation program:

- **73%** had dosages adjusted
- **48%** had a prescribed therapy dropped
- **19%** had a duplicate treatment eliminated
- **6%** had adherence problems identified
- **6%** had contraindications identified

Mortality after discharge
Risk Reduction=0.22 (0.06-0.88)

Utilization and risk reduction:
Emergency Dept Visits 0.71 (0.36-1.39)
Ambulatory Visits 1.17 (0.99-1.37)
Rehospitalizations 1.39 (0.77-2.52)

Finally, Kaiser Permanente researchers have studied the use of advance health care directives and other plans in end-of-life care. In one study, ordering palliative care consultations by default for older patients hospitalized with serious illnesses was associated with improvements in end-of-life care after discharge.[190] Our scientists have also studied the role of caregivers and surrogate decision-makers in the care of older patients with dementia.[191] Studies conducted among our members in California

have found that care delivered at the end of life is nearly always concordant with the preferences patients have expressed in their Physician Orders for Life-Sustaining Treatment forms. This research has also drawn attention to how preferences may change over time.[149; 192] While advance directives are consistently associated with less frequent delivery of intensive care services and a lower likelihood of dying in a hospital,[193; 194] these directives are often not completed. Kaiser Permanente scientists have also explored virtual methods for training family caregivers in the management of psychological and behavioral symptoms of dementia.[195]

Translating Research Findings Into Policy and Practice

Kaiser Permanente is a learning health care system that works to systematically use research to inform and improve practice. Our research, clinical, and operational partners have tested a range of interventions to reduce risks and improve outcomes for older patients.[196] Scientists in Kaiser Permanente have studied the use of electronic patient portals to support both patients and caregivers at the end of life.[197-200] Our researchers were heavily involved in the development of Primary Care Plus, a program combining palliative care with pharmacy, social, and behavioral health services to holistically care for older patients with complex needs.[201] This program was successfully implemented in Colorado[202] and is being expanded to other geographic areas within Kaiser Permanente.[203] Our scientists also led the Family Care Study, a randomized study that evaluated a preparedness, skill, enrichment, and predictability intervention for family caregivers of frail older adults.[204; 205]

Insights from Kaiser Permanente Research on Advance Care Planning

- Advance care plans have been associated with less frequent hospitalization, fewer in-hospital deaths, and greater use of hospice services.[192-194]
- Embedding a Care Directives tab into the electronic health record, or conducting a consultation with trained facilitators, can increase documentation of patients' preferences for end-of-life care.[149;150;192]

Our researchers also led the development and implementation of a nurse-led program for increasing palliative care engagement among patients with non-small cell lung cancer,[206; 207] pharmacist-led medication deprescribing efforts,[179; 185; 208; 209] closer integration of medical and dental care,[210] and intensive care unit-based assessments of delirium.[43] Kaiser Permanente researchers are also developing innovative methods for studying health problems in older patients. These include artificial intelligence models that have identified subgroups of older patients with consistent clusters of multiple chronic health problems[211] and extensive survey studies of barriers to patient self-care.[113] Similar models have been developed to identify patients with undiagnosed dementia using electronic health record data,[212] and to identify patients with limited life expectancies who may be candidates for medication deprescribing.[213] Our scientists have also developed an algorithm for predicting hypoglycemic events among older patients with type 2 diabetes and identifying candidates for deprescribing; this tool is now integrated into the electronic health record system in Northern California.[214; 215] Finally, Kaiser Permanente researchers in Southern California developed an index that uses electronic medical records to improve the identification of older patients with chronic kidney disease who have health conditions that complicate the treatment of their kidney disease.[216]

Kaiser Permanente research contributes to policy and practice change within our care delivery system, and has also advanced the national understanding of aging. Kaiser Permanente's research on aging since 2007 has been cited 635 times within recent consensus statements and clinical practice guidelines published by a wide range of entities, including the American Geriatrics Society.[217] In addition, Kaiser Permanente researchers and clinician scientists have directly contributed as authors of guidelines created for the U.S. Preventive Services Task Force,[131; 132; 142; 218; 219] as well as a statement on palliative care from the American Thoracic Society and numerous partner organizations.[220] Our scientists have shown leadership in the broader field of research on aging. Their work includes extensive research on epidemiology, risk factors for development of dementia,[71; 72; 74; 94; 102; 154; 155; 221-223] and health care in older patients with multiple chronic conditions.[41; 113; 224-227] Kaiser Permanente researchers also have leading roles in the U.S. Deprescribing Research Network, a National Institute on Aging initiative aimed at producing and disseminating high-quality research regarding medication deprescribing in American adults.[223; 228] Our scientists are involved in the national Creating Age-Friendly Health Systems initiative,[229] and in an international effort to develop guidance for organizing multidisciplinary teams caring for patients with Parkinson's disease.[230] A Kaiser Permanente scientist was also a lead author on a report on dementia caregiving published by the National Academies of Sciences, Engineering, and Medicine.[231] Our researchers also participated in an expert panel convened by the Journal of the American College of Cardiology, which made risk assessment recommendations around percutaneous coronary interventions in older patients.[232]

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