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Review Paper

Impacts of Population Ageing on the Functions of the Health System: A Systematic Review

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ABSTRACT

Objectives Considering the rapid growth of the aged population and given that older people are the main consumers of health services, it is important to address the effects of population ageing on the health system function. Therefore, this study aims to review the evidence related to the impacts of population ageing on various functions of the health system, including stewardship, financing, resource development, and service provision.

Methods & Materials This is a systematic review study. The data were collected through searching in PubMed, Web of Science, ProQuest and Google Scholar for articles published from 2000 to 2022, using the related keywords. Quality assessment of selected articles was done using the STROBE checklist. To analyze the extracted data, the World Health Organization's health system performance assessment framework was used.

Results Of 1954 identified articles, 23 were finally selected based on inclusion and exclusion criteria. In the function of stewardship, the impacts were related to the managerial and policy aspects and the increased need to respond to the growing health needs of the elderly. In the function of financing, the impacts included the increase of financial burden on the health system and the need to provide financial resources. In the resource generation function, the impacts were categorized into human, information and physical resources. In the function of service provision, the impacts were on the demand for services, the complexity of service provision, and the method of service provision to elderly.

Conclusion The impacts of population ageing on the functions of the health system, especially the financing function, are inevitable. The increase in the aged population is associated with the increase in health costs. Policy makers and managers of the health system should use practical strategies to strengthen the health system against the effects of population ageing.

Keywords Population ageing, Health system, Stewardship, Financing, Resources, Services

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Extended Abstract

Introduction

The main goal of this study was to review the evidence related to the effect of population ageing on various functions of the health system, including stewardship, financing, resource generation, and service provision.

Methods

This study is a systematic review. The related articles were searched in PubMed, ProQuest, Web of Science, and Google Scholar from 2000 to 2022 using the related keywords. Original and review articles that had examined the effects of population aging on at least one of the functions of the health system were included in this study. Quality evaluation of selected articles was done with strengthening the reporting of observational studies in epidemiology (STROBE) checklist. To analyze the extracted data, the World Health Organization's (WHO) health system performance assessment framework was used, which includes the four functions of stewardship, financing, resource generation, and service provision. All steps of this systematic review were done independently by two authors and disagreements were resolved with the discussion and participation of the third author. From the 1954 identified articles, 203 were removed due to being duplicates and 1751 remained for screening. After reviewing the title and abstract of the remaining articles, 94 articles were screened by full text. Finally, 23 articles met the entry criteria and selected for the review.

Results

There was a upward growth trend in the studies from 2002 to 2021. Among the selected articles, four articles studied with the effects of population aging on stewardship function of the health system. Most of the studied was related to financing function (n=18). Three articles were related to the function of resource development, and nine articles were related to the function of health service provision. A summary of findings is provided in Table 1.

Conclusion

The effects of population aging on all the functions of the health system, especially the function of financing, are very noticeable. The findings of this study can provide appropriate information to health care providers so that, by proper and timely planning and management, they can improve the performance of the health system in the face of the negative consequences of population aging, which can ultimately improve the health of society and help meet expectations and fair financing in the health system.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran (Code: IR.TUMS.SPH.REC.1401.044).

Funding

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Authors' contributions

All authors equally contributed to preparing this article.

Conflicts of interest

The authors declared no conflict of interest.

Table 1. The results of synthesis in review study

Function	Main Themes and Sub-themes	
Stewardship	1- Effects on managerial and policy aspects	Strengthening the national health insurance program for the elderly; Improving interdisciplinary care models; Increasing the need to train experts and specialists in the field of geriatrics; Need for retirement support programs; Increasing participation of the elderly in policy making; Need for an age-friendly health system;
	2- Increasing the need to respond to the growing health needs of the elderly	Increase in mental and physical illnesses; Increasing demand for health services; Greater dependence of the elderly on public sector services; Increasing the need for appropriate policies in the field of geriatrics.
Financing	1- Increase of financial burden on the health system	Increasing the costs of healthcare services; Increasing the national expenses allocated to the aged population; Increasing the amount of out-of-pocket payments among the elderly; Increasing costs of non-acute diseases among the elderly; Reducing the financial independence of the elderly in receiving health services.
	2- Need to provide financial resources	Incoordination in collecting resources; Inefficiency of financing funds; Instability of financing for the costs of geriatric services; Inappropriateness of purchasing health services for the elderly.
Resource generation	1- Human resources	Need to train specialists in geriatric medicine, gerontology, geriatric nursing, etc.; Increasing the workload of health system employees; Need for interdepartmental cooperation; Need for high performance geriatric care teams.
	2- Information resources	Need for research in the field of aging; Increased need for better databases; Decreasing the proper implementation of guidelines for providing services to the elderly.
	3- Physical resources	Increase in the price of medical and auxiliary equipment; Need to increase the adaptability of hospitals to the needs of the elderly; Need to solve problems in the field of drug production and supply; Need to establish age-friendly health centers; Increasing injustice in the technology used.
Health service provision	1- Impacts on demand for services	Increasing demand for health services; Increasing the days of hospitalization; Increasing the need for screening programs; Need to improve the access of the elderly to health consultations; Increasing demand for long-term care.
	2- Complexity of service provision	Reducing the number of manpower; Increasing chronic diseases among the elderly; Increasing number of elderly people with comorbid diseases; Increasing the average percentage of diagnostic tests; Increasing the number of admissions and length of hospital stay.
	3- Impacts on the method of service provision	Need to reorganize hospital departments; Need to increase professional care at home; Need to use an integrated approach in service delivery; Need to use successful global models.

مقاله مروری

تأثیرات سالمندی جمعیت بر کارکردهای نظام سلامت: یک مرور نظام‌مند

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چکیده

اهداف باتوجه‌به رشد سریع نسبت سالمندان در جوامع و ازآنجاکه سالمندان، مصرف‌کنندگان اصلی خدمات سلامت و مشتریان عمده نظام سلامت هستند، پرداختن به تأثیرات سالمندی جمعیت بر نظام سلامت حائز اهمیت است. هدف اصلی این پژوهش، مرور شواهد مربوط به تأثیرات سالمندی جمعیت بر کارکردهای مختلف نظام سلامت شامل تولیت، تأمین مالی، تولید منابع و ارائه خدمات سلامت بود.

مواد و روش‌ها پژوهش حاضر از نوع مرور نظام‌مند بود که در آن پایگاه‌های داده‌ای وب‌آوساینس، پابمد، پرو کوئست و موتور جست‌وجوی گوگل‌اسکالر از بازه زمانی سال ۲۰۰۰ تا انتهای ۲۰۲۲ میلادی جست‌وجو شدند. در این جست‌وجو از ترکیب کلیدواژه‌های مرتبط برای شناسایی مقالات استفاده شد. ارزیابی کیفیت مقالات انتخاب‌شده با چک‌لیست STROBE انجام شد. برای تحلیل داده‌های استخراج‌شده از روش تحلیل چارچوب براساس مدل نظام سلامت ارائه‌شده توسط سازمان جهانی سلامت استفاده شد.

یافته‌ها از بین ۱۹۵۴ مقاله شناسایی‌شده در ابتدا، ۲۳ مقاله پس از طی فرایند غربالگری براساس معیارهای ورود و خروج انتخاب شدند. در کارکرد تولیت، تأثیرات، مرتبط با جنبه‌های مدیریتی و سیاست‌گذاری و افزایش نیاز به پاسخ‌گویی به نیازهای فزاینده سلامت سالمندان بود. تأثیرات سالمندی در کارکرد تأمین مالی شامل افزایش بار مالی و نیاز به تأمین منابع مالی بود. در کارکرد تولید منابع، تأثیرات سالمندی در دسته‌های مربوط به بُعد منابع انسانی، اطلاعاتی و فیزیکی دسته‌بندی شدند. تأثیرات بر تقاضا، پیچیده شدن ارائه خدمات سلامت و نحوه ارائه آن‌ها به سالمندان، درون‌مایه‌های اصلی کارکرد ارائه خدمات سلامت را تشکیل داد.

نتیجه‌گیری تأثیرات پدیده سالمندی جمعیت بر تمامی کارکردهای نظام سلامت، به‌ویژه کارکرد تأمین مالی اجتناب‌ناپذیر است، به‌طوری‌که افزایش سالمندی جمعیت با افزایش هزینه‌های سلامت همراه است. سیاست‌گذاران و مدیران نظام سلامت باید از راهکارهای عملی برای تقویت نظام سلامت در برابر تأثیرات سالمندی جمعیت استفاده کنند.

کلیدواژه‌ها سالمندی جمعیت، نظام سلامت، تولیت، تأمین مالی، تولید منابع

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مقدمه

طبق برآوردهای جمعیت‌شناسی پیش‌بینی می‌شود که شمار سالمندان ایرانی در فاصله سال‌های ۱۳۹۵ تا ۱۴۱۰، ۲ برابر می‌شود که براساس این روند، جمعیت سالمندان کشور در سال ۱۴۲۹ تقریبا ۲۴ درصد از جمعیت کل کشور را تشکیل خواهد داد [۱]. بررسی آهنگ سریع رشد سالمندی در ایران بسیار مهم است، زیرا تبیین‌گر این است که ایران نسبت به سایر کشورهای دیگر فرصت کمتری برای آمادگی و مقابله با عواقب پدیده سالمندی جمعیت دارد [۲].

افزایش روزافزون جمعیت سالمند، ازجمله متغیرهای اصلی در برنامه‌ریزی‌های هر کشور است که در صورت عدم مدیریت و برنامه‌ریزی صحیح می‌تواند تهدیدی برای جامعه محسوب شود [۳]. پدیده سالمندی جمعیت از جنبه‌های مختلفی بر وضعیت کشورها تأثیر می‌گذارد که در بخش سلامت این پدیده معمولاً همراه با افزایش ناتوانی و بیماری در جامعه است و هزینه‌های خدمات سلامت را به‌طور چشمگیری افزایش می‌دهد [۴]. با ورود به مرحله سالمندی، هزینه‌های درمانی روند تصاعدی داشته و گاه هزینه‌های درمانی ۲ سال آخر عمر با هزینه مابقی دوران زندگی برابری می‌کند [۵]. بنابراین وجود جمعیت سالمند در جوامع ازطریق افزایش نیاز و تقاضا برای خدمات سلامت و کاهش نیروی کار تأثیر مستقیم خود را بر رشد مخارج بخش بهداشت و درمان می‌گذارد و باعث کاهش رشد ناخالص داخلی می‌شود [۶].

اهمیت تغییرات جمعیتی اخیر تا حدی است که از سالمندی جمعیت به‌عنوان یک فوریت جهانی[1] نام برده می‌شود. افزایش جمعیت سالمند به‌خودی‌خود مهم نبوده، بلکه تبعات آن در ابعاد مختلف بخش سلامت اهمیت توجه به آن را زیاد کرده است [۷]. از مسائل دیگر مربوط به تغییرات جمعیتی در نظام سلامت، مسئله نگهداری و مراقبت از سالمندان، تغییرات الگوی همه‌گیرشناختی بیماری‌ها و محدودیت در منابع است [۸].

از دیدگاه سازمان بهداشت جهانی[2]، نظام سلامت شامل تمامی افراد، سازمان‌ها و فعالیت‌هایی است که هدف اولیه آن حفظ و ارتقای سلامت است [۹]. این سازمان در گزارش سال ۲۰۰۰ میلادی، کارکردهای نظام سلامت را تولیت[3]، تأمین مالی[4]، تولید منابع[5] و ارائه خدمات سلامت[6] تعریف کرده است که ۳ هدف اصلی آن ارتقا و حفظ سلامتی مردم جامعه، پاسخ‌گویی به انتظارات و حمایت مالی از مردم در مقابله با هزینه‌های خدمات سلامت است [۱۰].

تولیت بخشی از کارکرد یک حکومت است که مسئول تندرستی و رفاه جامعه بوده و به میزان اعتماد و مشروعیتی که شهروندان برای فعالیت‌های حکومت قائل هستند، اشاره می‌کند [۱۰]. رویکردهای مرتبط با به جریان انداختن، تجهیز و بسیج اعتبارات برای مراقبت سلامت، مفهوم کارکرد تأمین مالی مراقبت‌های سلامت است که ۳ وظیفه فرعی آن شامل جمع‌آوری درآمد، انباشت سرمایه و خرید خدمات سلامت است [۱۱]. در کارکرد تولید منابع، نظام‌های سلامت علاوه‌بر مؤسسات تأمین مالی، شامل گروه‌های مختلفی از سازمان‌هایی هستند که تولید داده به‌ویژه منابع انسانی، مالی و فیزیکی (مانند تسهیلات، تجهیزات و دانش) برای خدمات سلامت را برعهده دارند [۱۲]. کارکرد ارائه خدمات سلامت نیازمند برنامه‌ریزی هوشمندانه است تا با داشتن تعداد کافی پزشکان و سایر ارائه‌دهندگان، خدمات مناسب در زمان مناسب به جمعیت ارائه شود [۱۳].

هدف اصلی این مطالعه، مرور شواهد مربوط به تأثیرات پدیده سالمندی جمعیت بر کارکردهای مختلف نظام سلامت شامل تولیت، تأمین مالی، تولید منابع و ارائه خدمات سلامت براساس مدل ارائه‌شده سازمان بهداشت جهانی بود [۹]. هرساله با برجسته‌تر شدن پدیده سالمندی جمعیت در کشورهای دنیا، به مطالعات این حوزه اضافه می‌شود و این افزایش مطالعات راه را برای محققان علاقه‌مند در جهت بررسی این موضوع هموارتر می‌کند. بنابراین نیاز بود که شواهد منتشرشده در این زمینه مرور و خلاصه‌سازی شود تا بهتر بتوان به شکاف‌های دانشی در این زمینه واقف شد. پژوهش حاضر موجب تقویت دانش موجود و زمینه‌سازی برای مطالعات بیشتر درزمینه ارتباط سالمندی جمعیت و کارکردهای نظام سلامت خواهد شد[7]. بنابراین این پژوهش می‌تواند مشارکت مؤثری در گسترش مرزهای دانش داشته باشد. همچنین مدیران و سیاست‌گذاران نظام سلامت ازطریق نتایج مطالعه مروری حاضر قادر به پاسخ‌گویی بهتر به تغییرات سریع آینده در حوزه سلامت و سالمندی خواهند بود که بیانگر نقش این پژوهش در عمل[8] است.

روش مطالعه

در پژوهش حاضر، از روش مرور نظام‌مند[9] استفاده شد. باتوجه‌به اهداف پژوهش و نتایج مطالعات نهایی، مضامین اصلی و فرعی از مطالعات یافت‌شده استخراج و به‌صورت کیفی دسته‌بندی و گزارش شدند.

1. Global Emergency
2. World Health Organization (WHO)
3. Stewardship
4. Financing
5. Creating resources
6. Delivering services
7. Contribution to theory
8. Contribution to practice
9. Systematic Review

راهبرد جست‌وجو

پایگاه‌های داده‌ای وب‌آوساینس[10]، پروکوئست[11]، پابمد[12] و موتور جست‌وجوی گوگل‌اسکالر[13] به‌عنوان منابع اولیه و اصلی این مطالعه مورد جست‌وجو قرار گرفتند. جست‌وجوی دستی[14] و جست‌وجوی رفرنس‌های مقالات مرتبط[15] نیز مورد بررسی قرار گرفت تا تمامی موارد مرتبط شناسایی و بررسی شوند. کلیدواژه‌ها و ترکیب آن‌ها در پایگاه پابمد در جدول شماره ۱ و در پایگاه‌های دیگر نیز معادل‌سازی انجام گرفت. در پیوست شماره ۱ راهبرد جست‌وجو در تمامی پایگاه‌های انگلیسی‌زبان ارائه شده است.

معیارهای ورود و خروج

معیارهای ورود: ۱. مقالات اصیل و مروری که تأثیرات سالمندی جمعیت بر حداقل یکی از کارکردهای نظام سلامت را بررسی کرده بودند. ۲. مقالاتی که به زبان انگلیسی و در مجلات مرور همسان به چاپ رسیده بودند.

معیارهای خروج: مقالات ارائه‌شده در کنفرانس‌ها، موردی و نامه به سردبیر. تمرکز اصلی این مرور نظام‌مند بر پژوهش‌های چاپ‌شده در مجلات معتبر بود و اسناد دیگر مانند کتب و گزارشات سازمان‌ها خارج شدند.

انتخاب مقالات

مقالات شناسایی‌شده وارد نرم‌افزار EndNote (نسخه X8) شد. ابتدا مقالات تکراری حذف شد و مقالات باقی‌مانده براساس عنوان، چکیده و متن کامل غربالگری شدند. در موارد عدم دسترسی به متن مقالات، ازطریق تماس با نویسنده مسئول مقاله، متن کامل مقالات درخواست شد. تمام مراحل این مرور نظام‌مند توسط ۲ نفر از نویسندگان به‌صورت مستقل انجام شد و اختلاف‌نظرها با بحث و مشارکت نفر سوم حل شد.

10. Web Of Science (WoS)
11. ProQuest
12. PubMed
13. Google Scholar
14. Manual search
15. Reference by Reference

جدول ۱. راهبرد جست‌وجو در پایگاه داده‌ای مدلاین از درگاه پابمد

((((((Effect[Title]) OR (Consequence[Title])) OR (Association[Title])) OR (Relation*[Title])) OR (Impact[Title])) OR (role[Title])) OR (Affect[Title]) AND ((((((((((Old*[Title]) OR (Elderly[Title])) OR (Aging[Title])) OR (Ageing[Title])) OR (Senior[Title])) OR ("Population aging"[Title])) OR ("Population ageing"[Title])) OR ("ageing Society"[Title])) OR ("aging Society"[Title])) OR ("old society"[Title])) OR ("older adult*"[Title]) AND (((((((("Health system"[Title]) OR ("Healthcare"[Title])) OR ("Health care"[Title])) OR ("Health service*"[Title])) OR ("Health delivery"[Title])) OR ("Health sector"[Title])) OR ("Health financ*"[Title])) OR ("Health cost"[Title])) OR ("Health resource*"[Title]) OR ("Medic*"[Title])

ارزیابی کیفیت مقالات

برای ارزیابی کیفیت مقالات از ابزارهای نقادی متناسب با نوع مقاله استفاده شد. برای نقد مقالات از چک‌لیست STROBE به‌صورت تعدیل‌شده استفاده شد. مقالات انتخاب‌شده به لحاظ کیفیت به ۳ دسته خوب، متوسط و ضعیف تقسیم شدند که نمره‌دهی به‌صورت زیر بود:

علامت+نشان‌دهنده شفافیت کامل آیتم است، علامت±نشان‌دهنده مبهم بودن آیتم بود و علامت–نشان‌دهنده فقدان وجود آیتم بود. اگر مقاله‌ای کمتر از ۳۰ درصد نمره چک‌لیست را دریافت می‌کرد به‌عنوان مقاله ضعیف و اگر بین ۳۰ تا ۷۰ درصد نمره را کسب می‌کرد به‌عنوان مقاله متوسط و اگر بیش از ۷۰ درصد نمره را کسب می‌کرد، به‌عنوان مقاله خوب دسته‌بندی می‌شد. مقالاتی که نمره ضعیف کسب کردند در این مرحله حذف شده و وارد تحلیل داده نشدند.

استخراج داده‌ها

استخراج داده‌ها توسط نویسنده اول و با بررسی و تأیید نویسنده دیگر با جدول استخراج داده انجام شد. جدول استخراج داده شامل اسامی نویسندگان، سال انتشار مقاله، کشور، اهداف، نوع مطالعه، اطلاعات مرتبط با روش انجام پژوهش، کارکرد(های) موردبررسی، نتایج مطالعه و نمره ارزیابی کیفیت بود.

تحلیل داده‌ها

برای تحلیل داده‌ها، از روش تحلیل چارچوب استفاده شد. چارچوب پایه مورداستفاده در این مطالعه مروری، چارچوب مفهومی ارائه‌شده توسط سازمان بهداشت جهانی در سال ۲۰۰۰ بود [۱۰]. در این مرحله، مقالات نهایی توسط پژوهشگران بارها خوانده شد تا مضامین اصلی و فرعی آن‌ها مشخص شود. سپس یافته‌های حاصل از مقالات ترجمه‌شده و مضامین هر مقاله شناسایی شد و در طبقه‌های مربوط به خود دسته‌بندی شدند. در مرحله بعد محققان عوامل شناسایی‌شده را در کنار هم قرار دادند و هریک از عوامل را تفسیر کردند. درنهایت، مضامین اصلی و فرعی دسته‌بندی‌شده به ۴ کارکرد اصلی نظام سلامت براساس مدل پایه ارتباط داده شدند [۱۰].

یافته‌ها

شناسایی مقالات

از ۱۹۵۴ مقاله شناسایی‌شده، ۲۰۳ مقاله به دلیل تکراری بودن حذف شدند که پس از حذف این مقالات تکراری، ۱۷۵۱ مقاله برای غربالگری باقی ماندند. پس از بررسی عنوان و چکیده مقالات باقیمانده، ۹۴ مقاله مورد مطالعه کامل قرار گرفتند و درنهایت ۲۳ مقاله برای مرحله ارزیابی کیفیت باقی ماندند که معیارهای ورود برای انجام تحلیل را کسب کردند (تصویر شماره ۱). نتایج ارزیابی کیفیت نشان داد ۱۹ (۸۳ درصد) مقاله دارای کیفیت خوب بودند، ۴ (۱۷ درصد) مقاله کیفیت متوسطی داشتند و درنهایت هیچ مقاله‌ای از کیفیت ضعیفی برخوردار نبود (پیوست شماره ۲). خلاصه اطلاعات مقالات یافته‌شده در پیوست شماره ۳ ارائه شده است.

مشخصات توصیفی مقالات واردشده

بیشترین تعداد مطالعات انجام‌شده در کشور چین (۳ مورد) بود. همچنین یک مطالعه به‌صورت مشترک در بین ۴۵ کشور جهان و ۲ مطالعه نیز به‌صورت مشترک در بین کشورهای اتحادیه اروپا انجام شده بود. یک مطالعه دیگر نیز به‌صورت مشترک در بین ۱۶۵ کشور دنیا انجام شده بود. بیشترین نوع طراحی مطالعه مربوط به تحلیل ثانویه داده و مدل‌سازی برای انجام پیش‌بینی‌های لازم بود (۱۲ مطالعه). مقالات یافته‌شده بین سال‌های ۲۰۰۲ تا ۲۰۲۱ نوشته شده بودند که به‌طورکلی، نتایج نشان‌دهنده صعودی بودن انتشار مقالات در سال‌های موردبررسی است.

تأثیرات سالمندی جمعیت بر کارکردهای نظام سلامت

مقالات یافت‌شده به‌طور ضمنی به حداقل یکی از کارکردهای نظام سلامت و تأثیرات سالمندی جمعیت بر آن اشاره کرده بودند. اکثر مقالات درمورد تأثیرات سالمندی جمعیت بر هزینه‌های نظام سلامت نوشته شده بودند (کارکرد تأمین مالی). فراوانی مقالات در ارتباط با تقسیم‌بندی انجام‌شده برای تأثیرات سالمندی جمعیت بر کارکردهای نظام سلامت به این صورت بود که ۱۸، ۹، ۴ و ۳ مقاله به ترتیب مرتبط با کارکردهای تأمین مالی، ارائه خدمات سلامت، تولیت و تولید منابع بودند. علت تفاوت بین مجموع مقالات یافت‌شده با تعداد کارکردهای اشاره‌شده آن است که برخی از مقالات به چندین کارکرد به‌صورت هم‌زمان پرداخته بودند.

تأثیرات سالمندی جمعیت بر روی کارکرد تولیت نظام سلامت

در بین مقالات یافت‌شده، ۴ مقاله به تأثیرات سالمندی جمعیت بر روی کارکرد تولیت اشاره کرد بود [۱۴-۱۷]. سنتز این مقالات درارتباط‌با تولیت نظام سلامت و تأثیرات سالمندی بر آن در جدول شماره ۲ به‌صورت دسته‌بندی‌شده ارائه شده است.

تأثیرات سالمندی جمیت در ارتباط با کارکرد تأمین مالی نظام سلامت

در تفکیک مقالات یافت‌شده، کارکرد تأمین مالی بیشترین تعداد مقاله را به خود اختصاص داده بود (۱۸ مقاله) که اکثر مقالات این کارکرد، در ارتباط با هزینه‌های خدمات سلامت سالمندان بود [۱۴-۳۰]. سنتز نتایج مقالات این کارکرد در جدول شماره ۳ ارائه شده است.

تأثیرات سالمندی جمعیت درارتباطبا کارکرد تولید منابع نظام سلامت

درارتباطبا کارکرد تولید منابع، ۳ مقاله مورد تحلیل قرار گرفت [۱۶، ۱۸، ۳۰] که نتایج تأثیرات پدیده سالمندی جمعیت بر این کارکرد در جدول شماره ۴ ارائه شده است.

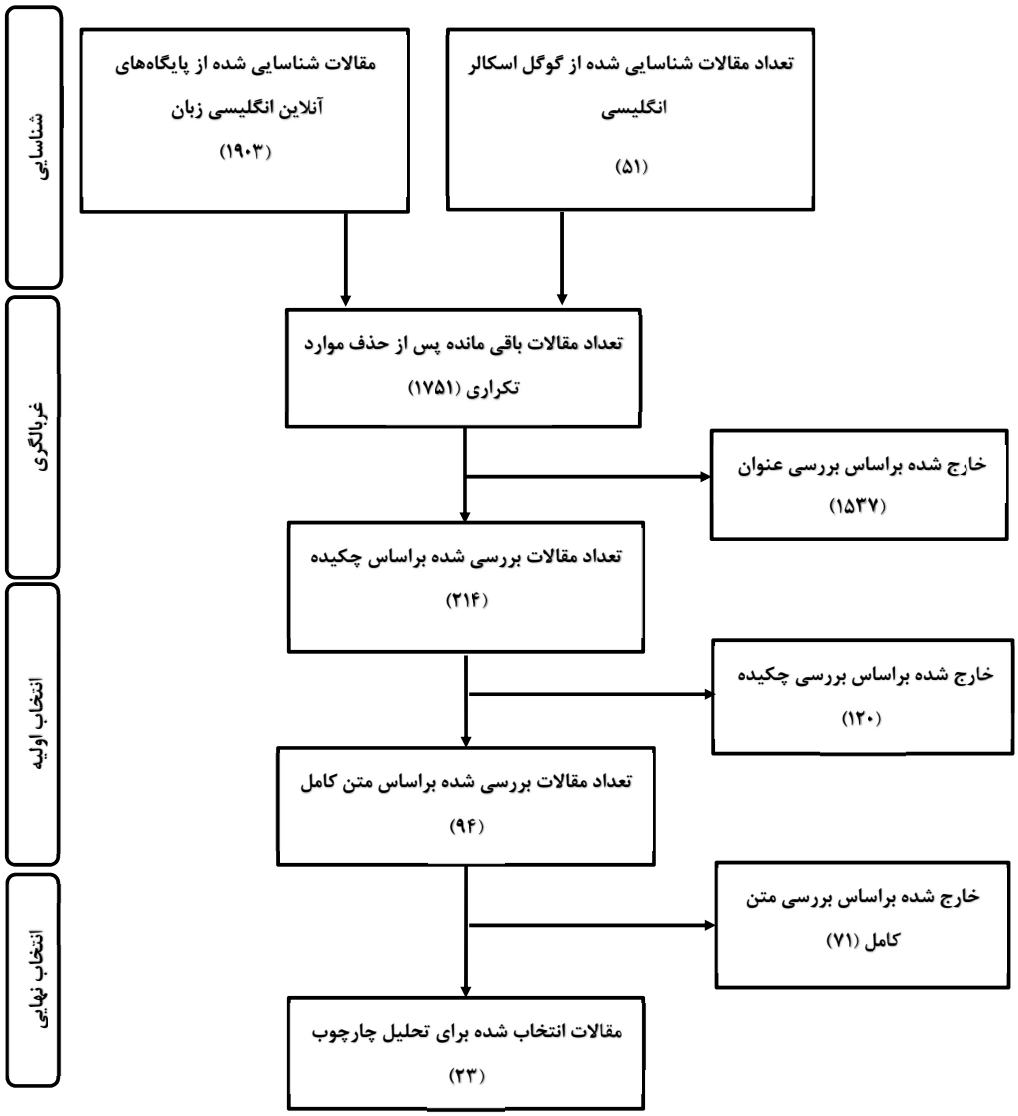
تأثیرات سالمندی جمیت درارتباطبا کارکرد ارائه خدمات سلامت نظام سلامت

براساس نتایج، ۹ مقاله به تأثیرات سالمندی جمعیت بر ارائه خدمات سلامت به این گروه سنی اشاره کرده بود [۱۴، ۱۵، ۲۵، ۳۰-۳۵] که تحلیل نتایج این مقالات در جدول شماره ۵ نشان داده شده است.

بحث

هدف از مرور نظام‌مند حاضر خلاصه‌سازی و ترکیب شواهد مربوط به تأثیرات پدیده سالمندی جمعیت بر کارکردهای مختلف نظام سلامت بود. نتایج حاصل از تحلیل ۲۳ مقاله واردشده منجر به دسته‌بندی تأثیرات سالمندی در ۴ کارکرد اصلی نظام سلامت شامل تولیت، تأمین مالی، تولید منابع و ارائه خدمات براساس مدل ارائه‌شده در سال ۲۰۰۰ میلادی سازمان بهداشت جهانی شد [۱۰].

تولیت از کارکردهای اصلی نظام سلامت است که بر ۳ کارکرد دیگر و همچنین پاسخ‌گویی به انتظارات مردم تأثیرگذار است. تأثیرات بر جنبه‌های مدیریتی و سیاست‌گذاری نظام سلامت و افزایش نیاز به پاسخ‌گویی به نیازهای فزاینده سلامت سالمندان مضامین اصلی مربوط به کارکرد تولیت بود. بیمه سلامت دسترسی به خدمات با کیفیت را در بین سالمندان افزایش می‌دهد که در این راستا نتایج پژوهشی در سال ۲۰۱۰ نشان داد برای مقابله با افزایش سریع جمعیت سالمندان و نیازهای مراقبت درازمدت، یک بیمه ملی مراقبت طولانی‌مدت در سال ۲۰۱۲ در کشور تایوان راه‌اندازی شد تا مراقبت‌های یکپارچه برای سالمندان، از مراقبت‌های بهداشتی گرفته تا رفاه اجتماعی را ارائه دهد [۱۵]. برای مدیریت بهتر سالمندی در جامعه، حاکمیت نقش کلیدی دارد که با یک خط‌مشی بهداشتی و درمانی اختصاصی در سطح



سالمند

تصویر ۱. نمودار PRISMA در این مرور نظام‌مند

کلان برای سالمندان می‌تواند با به حداقل رساندن هزینه‌های مراقبت‌های سلامت، مانند آموزش پزشکان مراقبت‌های اولیه در سالمندان و ارائه مراقبت‌های خانگی کمک‌کننده باشد [۳۶،۱۷].

براساس نتایج این مطالعه، تأثیرات پدیده سالمندی بر بعد تأمین مالی شامل افزایش بار مالی ناشی از سالمندی جمعیت و تأثیرات بر نیاز به گردآوری منابع مالی بود. تأمین مالی پایدار ارتباط عمیقی با ارائه خدمات سلامت و تولید منابع دارد می‌تواند موجب محافظت مالی سالمندان در برابر هزینه‌های سلامت شود. تأثیرات سالمندی جمعیت بر میزان هزینه‌ها مسئله اساسی است که نتایج پژوهشی نشان داد نسبت هزینه‌های ملی اختصاص‌یافته به جمعیت ۶۵ ساله و بالاتر در همه کشورهای موردمطالعه روند صعودی دارد، به‌طوری‌که از ۳۶ تا ۴۶ درصد در ژاپن، ۳۴ تا ۳۹ درصد در کانادا و ۲۰ تا ۲۵ درصد در استرالیا افزایش یافته است [۱۸]. همچنین نتایج پژوهشی در سال ۲۰۲۱ بیان کرد اثر بار سلامت سالمندان بر صندوق‌های سلامت به‌طور معنی‌داری مثبت و اثر صندوق‌های بهداشت و درمان بر تراز مالی به‌طور معنی‌داری منفی است که نشان می‌دهد افزایش بار سلامتی جمعیت سالمندان باعث افزایش هزینه‌های سلامت و درنتیجه کاهش تراز مالی می‌شود [۲۷].

عوامل متعددی بر افزایش هزینه‌های نظام سلامت با شیوع سالمندی در کشورها نقش دارند که در این راستا نتایج پژوهشی در کشور ایتالیا در سال ۲۰۱۷ بیان کرد هزینه مراقبت‌های سلامت با افزایش سن و امید به زندگی[16] افزایش می‌یابد [۱۶]. نتایج پژوهشی دیگر بیانگر تفاوت بین هزینه‌های گروه‌های

16. Life Expectancy (LE)

جدول ۲. سنتز مقالات در ارتباط با تأثیرات سالمندی جمعیت بر کارکرد تولید منابع نظام سلامت

مضامین اصلی	مضامین فرعی
تأثیرات بر بعد منابع انسانی	افزایش نیاز به تربیت متخصصان طب سالمندی، سالمندشناسی، پرستاری سالمندان و غیره
	افزایش بار کاری کارکنان نظام سلامت
	ضرورت افزایش همکاری‌های بین بخشی در بعد منابع انسانی
	افزایش نیاز به تیم‌های مراقبتی سالمندی با عملکرد بالا
تأثیرات بر بعد منابع اطلاعاتی	افزایش نیاز به تحقیقات در حوزه سالمندی
	لزوم توجه به تحقیق، توسعه سیاست و برنامه‌ریزی برای رسیدگی به چالش‌ها
	افزایش نیاز به داده‌های بهتر برای مدیریت بهتر حوزه سالمندی
	کاهش اجرای مناسب دستورالعمل‌های ارائه خدمات به سالمندان
تأثیرات بر بعد منابع فیزیکی	کاهش تجهیزات پزشکی در دسترس برای ارائه خدمات سلامت
	پایین بودن دسترسی سالمندان به تجهیزات کمکی
	افزایش قیمت تجهیزات پزشکی در حوزه سالمندی
	نیاز به افزایش سازگاری بیمارستان‌ها با نیازهای سالمندان
	لزوم حل مشکلات درزمینه تولید و عرضه دارو
	نیاز به ایجاد مراکز بهداشتی و درمانی دوستدار سالمند
	افزایش ناعدالتی در تکنولوژی مورد استفاده در بین سالمندان

سنی و جنسیت بود، به‌طوری‌که تفاوت معنی‌داری را در هزینه مراقبت‌های سلامت برای تمام مراحل زندگی انسان مشاهده شد. در این پژوهش (۲۰۱۴)، بیشترین هزینه سلامت درمورد مردان (۶۹/۷ دلار آمریکا) با سن ۶۵ تا ۶۹ سال و درمورد زنان (۲۳/۴ دلار آمریکا) با سن ۷۵ تا ۷۹ سال مشاهده شد. هزینه بستری شدن در بیمارستان به‌طور قابل‌توجهی (۲۳/۷ دلار آمریکا) برای زنان بیشتر از مردان (۲۱/۱ دلار آمریکا) بود. نتایج این پژوهش آشکار کرد میانگین هزینه مراقبت‌های سلامت در مردان بیشتر از زنان و جمعیت سالمندان بیشتر از جوانان است [۲۱].

سنتز مقالات تحلیل‌شده در ارتباط با کارکرد تولید منابع منجر به شناسایی اثرات سالمندی جمعیت بر بعد منابع انسانی، منابع اطلاعاتی و منابع فیزیکی موردنیاز شد. در بعد منابع انسانی، نتایج پژوهشی در ۴۵ کشور در سال ۲۰۲۱ نشان داد بار سلامتی جمعیت سالمندان تأثیر مثبت و معناداری بر کار مراقبت‌های سلامت دارد. درحالی‌که نتایج نشان‌دهنده اثر منفی قابل‌توجه کار مراقبت‌های سلامت بر تراز مالی است که نشان می‌دهد افزایش بار سلامت سالمندان مستلزم افزایش کار کارکنان مراقبت‌های سلامت و درنتیجه کاهش تراز مالی است [۲۷]. تأمین منابع اطلاعاتی به‌موقع و کافی نیازمند برنامه‌ریزی و دوراندیشی است. مشکلات در تأمین هزینه‌های تحقیقاتی در حوزه سالمندان تقریباً جهانی است. در این زمینه نتایج پژوهشی در کشور تایوان بیان کرد چالش اصلی برای متخصصان سالمندی در این کشور توجه ناکافی به تحقیقات است و نیاز به افزایش فعالیت‌های تحقیقاتی برای اطمینان از آینده طب سالمندی وجود دارد [۱۵].

در بعد منابع اطلاعاتی برای مدیریت بهتر چالش‌های سالمندی، کشورها به داده‌های معتبر، همکاری‌های بین‌بخشی، آموزش بهتر کارکنان سلامت و به‌رسمیت‌شناختن افراد سالمند در چارچوب سیاست‌های بین بخشی نیاز دارند [۲۵]. همچنین کمبود تجهیزات پزشکی موردنیاز، دسترسی پایین سالمندان به این تجهیزات، بالا بودن قیمت تجهیزات، سازگاری پایین بیمارستان‌ها با نیازهای سالمندان، اختلال در تولید و عرضه دارو از مهم‌ترین تأثیرات سالمند شدن جامعه بر بعد فیزیکی منابع بود که باید موردتوجه قرار گیرد. سازمان جهانی بهداشت بر ایجاد مراکز سلامت دوستدار سالمند در راستای ارتقای سلامت همه‌جانبه سالمندان تأکید کرده است که در این راستا حرکت به سمت نظام سلامت دوستدار سالمند برای رفع نیازهای این افراد حائز اهمیت است [۳۷].

تأثیرات سالمندی جمعیت بر تقاضای خدمات، پیچیده شدن ارائه خدمات و نحوه ارائه خدمات سلامت به این گروه سنی از نتایج اصلی مرور نظام‌مند حاضر در ارتباط با کارکرد ارائه خدمات سلامت بود. نتایج پژوهشی در سال ۲۰۱۹ نشان داد سالمندی

جدول ۳. سنتز مقالات یافت‌شده در ارتباط با تأثیرات سالمندی جمعیت بر روی کارکرد تولیت نظام سلامت

مضامین اصلی	مضامین فرعی
تأثیرات بر جنبه‌های مدیریتی و سیاست‌گذاری نظام سلامت	افزایش نیاز به تأسیس برنامه بیمه ملی سلامت برای پاسخ‌گویی به نیازهای سالمندان
	افزایش نیاز به سیستم ملی اعتباربخشی مراکز بلندمدت برای اطمینان از کیفیت مراقبت‌ها
	افزایش نیاز به بهبود مدل مراقبت بین‌رشته‌ای در میان تخصص‌ها و محیط‌های بالینی
	افزایش نیاز به توسعه برنامه‌های آموزشی حوزه سالمندی
	نیاز به تقویت سیستم‌های مراقبت اولیه سلامت
	لزوم استفاده از برنامه‌های بازنشستگی برای حمایت از سالمندان
	افزایش نیاز به ایجاد یکپارچگی گسترده بین تخصص‌های پزشکی
	نیاز به مشارکت سالمندان در سیاست‌گذاری سلامت
	لزوم توجه به افراد مسن در چارچوب سیاست‌ها و برنامه‌های سلامت
	کاهش اعتماد جامعه نسبت به تولیت سلامت
	افزایش نیاز به بسترسازی برای دوستدار سالمند شدن نظام سلامت
افزایش نیاز به پاسخ‌گویی به نیازهای فزآینده سلامت سالمندان	بدتر شدن وضعیت روحی و جسمی سالمندان (افزایش بیماری)
	مواجهه با کمبود امکانات مراقبت‌های سلامت
	افزایش وابستگی سالمندان به خدمات بخش دولتی سلامت
	افزایش مدت‌زمان ناتوانی و ضعف سالمندان
	افزایش تقاضا برای خدمات سلامت
	افزایش نیاز به تدوین سیاست‌های مناسب در پاسخ‌گویی به تقاضاهای فزاینده
	کاهش درآمد مالیاتی دولت با افزایش سالمندی
	کاهش مشارکت افراد مسن در نیروی کار سلامت
	کاهش ایمنی محیط زندگی سالمندان
	افزایش ناهماهنگی در بین سازمان‌های مرتبط با سالمند

سالمند

جمعیت کشور آفریقای جنوبی خطر ابتلا به بیماری‌های مزمن و چندگانه را افزایش می‌دهد و این احتمالاً تأثیر قابل‌توجهی بر نیازهای سیستم مراقبت‌های سلامت دارد [۲۵]. از تأثیرات مهم دیگر پدیده سالمندی بر بُعد ارائه خدمات سلامت می‌توان به افزایش بستری شدن در بیمارستان، مدت اقامت در بیمارستان، افزایش استفاده از مراقبت‌های طولانی‌مدت و استفاده بیشتر از مراقبت‌های سرپایی اشاره کرد [۳۱].

در سال ۲۰۲۰ در ایران نتایج پژوهشی نشان داد مهم‌ترین علت عدم تمایل به بستری شدن در بیمارستان در بین سالمندان مربوط به هزینه بالای خدمات و عدم پوشش بیمه درمانی است که باید سالمندان و افراد بدون بیمه در سیاست‌گذاری و برنامه‌ریزی استفاده از خدمات سلامت، در اولویت قرار گیرند [۳۸]. لزوم استفاده از پزشکان مراقبت‌های اولیه، استفاده از رویکرد یکپارچه در ارائه خدمات، سازماندهی مجدد و تجدید ساختار بخش‌های بیمارستانی و نیاز به افزایش مراقبت‌های حرفه‌ای در منزل از نتایج این مطالعه درزمینه تأثیرات پدیده سالمندی جمعیت بر کارکرد ارائه خدمات سلامت است [۱۶، ۳۵].

استفاده از راهبرد جست‌وجوی گسترده، براساس جست‌وجوی مقالات منتشرشده و استفاده از نظرات کارشناسان در این زمینه از نقاط قوت پژوهش حاضر است. تمامی مراحل این پژوهش از جمله جست‌وجو، غربالگری، ارزیابی کیفیت، استخراج و تحلیل داده توسط حداقل ۲ نفر از پژوهشگران به‌صورت مستقل انجام شد.

جدول ۴. سنتز مقالات یافته‌شده در ارتباط با تأثیرات سالمندی جمعیت بر کارکرد تأمین مالی نظام سلامت

مضامین اصلی	مضامین فرعی
افزایش بار مالی نظام سلامت ناشی از سالمندی جمعیت	بالا رفتن هزینه‌های سرانه بیمارستانی و خدمات بهداشتی سالمندان
	افزایش هزینه سرانه برای گروه سنی ۶۵ سال و بالاتر
	افزایش نسبت هزینه‌های ملی اختصاص یافته به جمعیت ۶۵ ساله و بالاتر در اکثر کشورها
	سه برابر شدن هزینه سلامت گروه سنی ۶۵ سال و بالاتر در مقایسه با گروه سنی ۴ تا ۶۵ سال
	افزایش میزان پرداخت از جیب در بین سالمندان بالای ۶۰ سال
	بیشتر شدن میانگین هزینه‌های مراقبت‌های سلامت در جمعیت مردان سالمند
	افزایشی بودن روند هزینه‌های غیرحاد بیماری در بین سالمندان
	کاهش استقلال مالی سالمندان در دریافت خدمات سلامت
	افزایش هزینه‌های خدمات پرستاری
نیاز به گردآوری منابع مالی	افزایش ناهماهنگی در گردآوری منابع در جهت پاسخ‌گویی به نیازهای سالمندان
	ناکارامدی فعالیت صندوق‌های تأمین مالی
	ناپایداری تأمین مالی برای هزینه‌های خدمات سلامت سالمندان
	نامناسب بودن خرید خدمات سلامت برای سالمندان

سالمند

از محدودیت‌های پژوهش حاضر، عدم دسترسی به پایگاه داده‌ای اسکوپوس[17] در زمان انجام جست‌وجو بود. همچنین متن کامل برخی از مقالات نیز در دسترس نبود که از تحلیل خارج شدند. باتوجه‌به اینکه در برخی از مقالات، روش انجام مقاله شفاف نبود، روش کار آن‌ها توسط تیم تحقیق بررسی و جمع‌بندی و توافق در این زمینه حاصل شد.

نتیجه‌گیری نهایی

تأثیرات پدیده سالمندی جمعیت بر تمامی کارکردهای نظام سلامت به‌خصوص کارکرد تأمین مالی امری اجتناب‌ناپذیر است، به‌طوری‌که افزایش سالمندی موجب بالا رفتن هزینه‌های خدمات سلامت شده است. در مدل سازمان جهانی بهداشت ارتباط بین کارکردها و اهداف بیان شده است که این اجزا باهم در ارتباط بوده و از هم تأثیر می‌پذیرند. براساس نتایج پژوهش حاضر، این تأثیرات در زمینه‌های مدیریتی و سیاست‌گذاری، افزایش نیاز به پاسخ‌گویی به نیازهای فزاینده سلامت سالمندان، افزایش بار مالی، گردآوری منابع مالی و ابعاد منابع انسانی، اطلاعاتی و فیزیکی نظام‌های سلامت است. در کارکرد ارائه خدمات سلامت، سالمندی جمعیت بر میزان تقاضا، پیچیده شدن ارائه خدمات و نحوه ارائه خدمات سلامت مؤثر است. یافته‌های پژوهش حاضر می‌تواند اطلاعات مناسبی را در اختیار متولیان سلامت قرار دهد تا ازطریق مدیریت بهتر موجب بهبود عملکرد نظام سلامت در مواجهه با سالمندی جمعیت شوند و همچنین با دستیابی به سلامت بهتر، پاسخ‌گویی به انتظارات و مشارکت مالی عادلانه برای سالمندان در نظام سلامت را تسهیل کنند.

نیاز است پژوهشی درزمینه پیش‌بینی وضعیت آینده ازنظر منابع موردنیاز انجام شود تا برنامه‌ریزی‌های لازم برای مقابله با مخاطرات سالمندی جمعیت صورت پذیرد. همچنین به محققان حوزه سالمندی پیشنهاد می‌شود که در تحقیقات آتی از رویکرد آینده‌پژوهی استفاده کنند تا با ترسیم سناریوها و مدل‌های مختلف به فهم آسان تبعات سالمندی و مدیریت بهتر آن در نظام‌های سلامت کمک کنند.

ملاحظات اخلاقی

پیروی از اصول اخلاق پژوهش

از معاونت پژوهشی دانشکده بهداشت دانشگاه علوم‌پزشکی تهران کد اخلاق به شماره IR.TUMS.SPH.REC.1401.044 اخذ شد.

17. Scopus

جدول ۵. سنتز مقالات مربوط به تأثیرات سالمندی جمعیت بر کارکرد ارائه خدمات سلامت نظام سلامت

مضامین اصلی	مضامین فرعی
تأثیرات بر تقاضا برای خدمات سلامت	افزایش تقاضا برای خدمات سلامت
	افزایش میزان بیماری و درخواست خدمات در بین سالمندان
	نیاز به جراحی بیشتر در بین سالمندان نسبت به گروه‌های سنی دیگر
	افزایش روزهای بستری در بیمارستان
	افزایش تعداد میانگین نسخه‌های دارویی برای سالمندان
	افزایش نیاز به برنامه‌های غربالگری در بین سالمندان
	لزوم بهبود دسترسی سالمندان به مشاوره‌های سلامت
	افزایش تقاضا برای مراقبت‌های طولانی‌مدت
	افزایش سرانه ویزیت متخصصان بعد از ۶۰ سالگی
پیچیده شدن ارائه خدمات سلامت به سالمندان	کاهش منابع مالی در اکثر نظام‌های سلامت
	کاهش تعداد نیروی انسانی در ارائه خدمات سلامت
	افزایش بیماری‌های مزمن در بین سالمندان
	افزایش تعداد سالمندان دارای چند بیماری به‌طور هم‌زمان
	بالا رفتن میانگین درصد تست‌های آزمایشگاهی و تشخیصی
	افزایش تعداد بستری و مدت اقامت در بیمارستان
	کاهش سبک زندگی سالم در بین اکثریت سالمندان
	کاهش فرهنگ خودمراقبتی در بین سالمندان
	کاهش ایمنی خدمات سلامت ارائه شده
تأثیرات بر چگونگی ارائه خدمات سلامت به سالمندان	پایین آمدن مشارکت زنان در ارائه خدمات سلامت
	افزایش نیاز به سازماندهی مجدد بخش‌های بیمارستانی
	نیاز به افزایش مراقبت‌های حرفه‌ای در منزل
	نیاز به افزایش انطباق سالمندان در پذیرش نوآوری‌های بخش سلامت
	نیاز به استفاده از رویکرد یکپارچه در ارائه خدمات
	نیاز به مراکز مراقبت تسکینی برای پوشش چندین بیماری غیرسرطانی در مرحله پایانی
	لزوم توجه به توسعه طب سالمندان
	افزایش نیاز به گسترش مراکز مراقبت‌های بهداشتی اولیه
	نیاز به ادغام خدمات بهداشتی، درمانی و اجتماعی در یکدیگر
	افزایش نیاز به مراقبت‌های جامع و خدمات عمومی
	افزایش نیاز به استفاده از پزشکان مراقبت‌های اولیه
	لزوم استفاده از الگوهای موفق جهانی در ارائه خدمات سلامت

حامی مالی

پژوهش حاضر توسط دانشکده بهداشت دانشگاه علوم‌پزشکی تهران تأمین مالی شده است. این مقاله بخشی از رساله دکتری رشته مدیریت خدمات بهداشتی و درمانی دانشگاه علوم‌پزشکی تهران است (کد پایان‌نامه: ۹۹۲۱۳۸۳۰۰۴).

مشارکت نویسندگان

تمامی نویسندگان در طراحی مطالعه، روش کار و نگارش همه بخش‌های پژوهش حاضر مشارکت داشته‌اند.

تعارض منافع

بنا به اظهار نویسندگان این مقاله تعارض منافع ندارد.

پیوست ۱. جدول استخراج داده (منابع در انتهای مقاله موجود است.)

Row	Study Identification	Summary of The Most Important Findings
1	Author. Date: Seshamani & Gray. 2002 [18] Goal of study: To examine detailed national age-specific expenditure trends for England and Wales, comparing findings with Canada, Japan, and Australia. Country: UK Design of study: Secondary and comparative analysis Descriptive information of the research: Review of 7 age groups (data from 1980 to 1999) Function that is affected: Financing	Financing The old and the young were higher cost patients than the middle age groups, particularly for Hospital and community health services (HCHS) per capita costs. Per capita costs for the 65 and over age group rose by 8% in England and Wales—a rate slower than that of the middle age groups—per capita cost increases in Japan, Canada, and Australia were larger in the 65 and over age group, at 12%, 20%, and 56% respectively. The proportion of national expenditures devoted to the population aged 65 and over increased in all of these countries, from 36–46% in Japan, 34–39% in Canada, and 20–25% in Australia. In England and Wales, the population aged 65 and over have per capita health expenditures that are three times higher than expenditures for the population aged 5–64. Finding of England and Wales, directly contrasts with similar data in Canada, Japan, and Australia—where the older populations have had the most rapid rises in health care costs—indicating possible differences in patient management and access to care for older patients across these countries. Per capita health expenditures in England and Wales increased by 8% for ages 65 and over, compared to 31% for ages 5–64. Hence the proportion of total expenditures allocated to the population aged 65 and over decreased from 40% to 35%, a trend most noticeable for non-acute hospital costs.
2	Author. Date: Sapelli, 2003 [14] Goal of study: To analyze the relationship between age and health services utilization in Chile, using the CASEN survey of 1994. Country: Chile Design of study: survey study Descriptive information of the research: Participation of families with elderly and use of Regression analysis Function that is affected: Financing, services delivering and stewardship	Financing Due to the structure of demands, average expenditure for those that demand at least one service does not differ much by age (it is only 10% higher for those 71 and older than for those 18-34 years old). Delivering services This study find that utilization is unrelated to income and that the only major influence on utilization is age. Hence old people are not only more likely to become sick, but also if they do, it is more probable that they will seek help. In the whole population, the percentage of persons of old age having a hospital stay or surgery is higher (three times higher) than for the other age groups. The unconditional probability of requiring surgery is higher for older persons; however, the probability conditional on being ill/having an accident and seeking care is higher for younger people. Old people are more likely to be sick and more likely to seek care if sick. Expected utilization is more than three times higher for older persons than for persons 18-34 years old. People in the wealthiest 20 percent of the population, married people, women, and people in urban areas are also more likely to seek care when sick. Stewardship Most old people currently are affiliates of the public health system. Hence the aging of the population could be expected to be mainly a problem for the public sector. This would imply the need for adjusting infrastructure, etc. Getting sick about one third of people aged 71 and older, a quarter of people aged 60 to 70 get sick, one fifth of people aged 45 to 59 get sick with increasing age, the probability of getting sick also increases (mediating mechanism). Married people are more likely to get sick. Women get sick more.

Row	Study Identification	Summary of The Most Important Findings
3	Author. Date: Schulz et al. 2004 [35] Goal of study: To analyses the effect of population ageing on utilization in two key sectors of the health care system, namely hospital care and long-term care in Germany, up to 2020 with an outlook to 2050. Country: Germany Design of study: Observational study (based on population scenarios) Descriptive information of the research: Two population scenarios, one with constant, one with increasing life expectancy, were combined with constant age and gender specific utilization rates of hospital and long-term care. Function that is affected: Delivering services	Delivering services Population ageing was found to cause a moderate increase in hospital days, but was associated with substantial changes in the disease and age structure. The number of persons receiving long-term care will increase strongly, associated with a shift to more severe disability and institutional care. Changes in the composition of private households and the increasing labour participation of women will lead to additional demand for professional caregivers at home and in institutions. Changes in the number and disease structure of hospital days due to population ageing will require reorganisation and restructuring of hospital departments. In the case of long-term care, a high increase in professional home care and institutional care will be required. Health policy has to take into account these developments in order to adequately deal with future demand for these services. Due to the lack of financial and, in particular, human resources, it is an especially difficult task to increase the supply of long-term care in line with the growth in demand expected.
4	Author. Date: Meng, & Yeo 2005 [30] Goal of study: We are interested in knowing the extent to which ageing induces an increase in health expenditure to the aged and whether the elderly can afford such an expenditure. Country: China Design of study: Survey study Descriptive information of the research: The data used in this study are from the urban income distribution survey 2002, which was conducted in 2003 by the Institute of Economics, Chinese Academy of Social Sciences. Function that is affected: Financing and delivering services	Financing An increase in age increases health expenditure and the relationship is almost linear with a very slight increase in the rate of change with age. Note that without including health variable in the regression the effect of age on health expenditure is much higher (one year increase in age increases health expenditure by 31 yuan rather than 21 yuan) than the current specification and it is statistically significant at the 1 per cent rather than 10 per cent levels. A 60 years old individual on average spend 50 to 100 per cent more on health than a 40 years old individual. This ratio further increases to 97 to 170 per cent if comparison is between an individual age 80 and one aged 40. the out-of-pocket health expenditure for the group aged between 30 to 39 accounted for around 5 to 9 per cent of their average income, this ratio increases to 14 to 18 per cent for the age group aged 60 to 69, and further increases to 21 to 26 per cent for those who are age 80 and above. Obviously out-of-pocket health expenditure is a large financial burden to the elderly, accountant for as much as one fifth to one fourth of their average income. The burden is much heavier for women than for men. At their 60th, the out-of pocket health expenditure accounted for around 18 to 22 per cent of women's average income. Delivering services The older an individual is the less likely he/she is healthy. At the mean age (45 years) each additional year of age reduces the probability of being healthy by around 2 per cent. Men tend to rate their health condition better than women. Both years of schooling and income contribute positively to the rating of own health. A highly educated individual is perceived to be of higher in ability according to human capital theory. As such, they may be able to absorb and respond to existing healthcare innovations quicker and more efficiently.

Row	Study Identification	Summary of The Most Important Findings
5	Author. Date: Martini et al. 2007 [19] Goal of study: To project the impact of population aging on total U.S. health care per capita costs from 2000 to 2050 and for the range of clinical areas defined by MPCs. Country: USA Design of study: Secondary data analysis Descriptive information of the research: We calculate MPC-specific age and gender per capita cost rates using cross-sectional data for 2002–2003 and project U.S. changes by MPC due to aging from 2000 to 2050. Function that is affected: Financing	Financing Overall, we project those per capita costs due to aging will increase from $2,993 in 2000 to $3,543 in 2050, an 18 percent increase overall (0.3 percent annually). 80 percent of the increase in total cost per capita will occur in just seven major practice categories (MPCs): Heart and vascular conditions, orthopedic and arthritic conditions, gastric and intestinal conditions, lung conditions, neurologic disorders, endocrine conditions, and urologic conditions. The model projects it will have the highest cost per capita relative to all other MPCs in 2050 ($568). The orthopedic and arthritic conditions MPC is the second highest contributor to the absolute per capita cost change due to aging, comprising 12 percent of the total increase, as an expensive per capita MPC whose impact by population aging is moderate (119 percent). The kidney disorders MPC has the largest percentage change in cost per capita (155 percent), it is a much smaller contributor to the relative share of absolute per capita change due to aging from 2000 to 2050 (14 percent), due to its comparatively low cost per capita in 2000 ($44). Understanding the differential impact of aging on costs at clinically specific levels is important for resource planning, to effectively address future medical needs of the aging U.S. population.

Row	Study Identification	Summary of The Most Important Findings
6	Author. Date: Lin et al. 2010 [15] Goal of study: To focus on the strategies that Taipei has developed to meet the challenges of population aging, with the aim of providing information for policy and service decisions appropriate for other Chinese societies .in the future Country: Taipei Design of study: longitudinal Observational study - :Descriptive information of the research Function that is affected: Financing, delivering services, creating resources and stewardship	Financing The statistics analysis of medical care institution's status & hospital's utilization, generally speaking, people aged over 65 spend over one-3rd of the annual National Health Insurance (NHI) expenditures in Taiwan. delivering services Older people usually need a holistic approach, integrated services and an emphasis on functional improvement; all great challenges to the current health-care system. Across all forms of long-term care services, home-care services may be the earliest model developed in Taiwan. Develop the hospice and palliative care services to cover several other non-cancer end-stage diseases, including acquired immunodeficiency syndrome, dementia, severely disabling stroke, congestive heart failure, liver cirrhosis, chronic lung. A major challenge for long-term care services in Taipei is the integration with health-care services. In the future, the development of geriatrics in Taiwan will focus on extending clinical services and integrating more care resources to promote seamless care across the health-care settings. Creating resources In addition to research and education, geriatricians in Taiwan play important roles in intermediate care and long-term care services. The main challenge for geriatricians in Taipei is research development. Difficulties in obtaining research grants for geriatrics are almost universal worldwide; however, more research activities must be developed to ensure the future of geriatrics in Taiwan. Stewardship To cope with the rapidly increasing elderly population and long-term care needs, a National Long-Term Care Insurance will be launched in 2012 to provide seamless care for older people, from health-care to social welfare. There is a national long-term care facility accreditation system to ensure the quality of care for older. Despite achievements thus far, challenges still include creating a more extensive integration between medical specialties, promotion of an interdisciplinary care model across specialties and health-care settings, and integration of health and social care services. These strategies include an emphasis on general medical care and a holistic approach in all specialties, development of a geriatric's specialty training program, development of post-acute services, and strengthening of linkages between health and social care services.

Row	Study Identification	Summary of The Most Important Findings
7	Author. Date: Bech et al. 2011 [29] Goal of study: To investigate the relationship between ageing and the evolution of health care expenditure per capita in the EU-15 countries. Country: EU-15 countries Design of study: Secendery data analysis and modeling Descriptive information of the research: The study applies a co-integrated panel data regression approach to derive short-run relationships and furthermore reports long-run relationships between health care expenditure and the explanatory variables. Function that is affected: Financing	Financing The level of total health expenditure per capita is increasing in the present level of the proportion of the population aged 65–74 and similarly so for the proportion of the population aged 75? The past levels of these proportions (AGE65-74(-1); AGE75? (-1)) exert a negative influence which is of a magnitude approximately equal to the positive influence of their present levels. This implies that a high proportion of elderly people is not in itself a driver of health care expenditure. Rather, it is a shift in the proportion of the population being elderly which causes a shift in the health care expenditure. For the case of life expectancy, the short-run effect is approximately zero. However, the positive lagged effect implies a positive long run effect. In other words, a linear increase in life expectancy is associated with a more than proportional trend, i.e. an exponential growth in health care expenditure. As with the share of elderly people in the population, in our restricted model, we are able to accept the hypothesis that there is no long-run influence of mortality on health spending per capita. As expected, GDP/capita has a strong impact on health care expenditures/capita with an elasticity slightly below 1. This suggests that affordability is an important determinant of health care expenditure per capita. Neither the age structure of the population nor mortality has an influence on health spending, although average life expectancy plainly does. With respect to the effect of ageing, the results suggest that there is a positive correlation between shifts in ageing and shifts in health care expenditure. However, the effect of ageing arises only in the short run; in the long run, we can accept the hypothesis that there is no effect. We were able to accept restrictions that of these variables, only life expectancy at age 65 has a long-run bearing on health expenditure, thus confirming our second hypothesis that the age structure of the population has no net effect.
8	Author. Date: Dall et al. 2013 [34] Goal of study: We projected future prevalence of selected diseases and health risk factors to model future demand for health care services for each person in a representative sample of the current and projected future population. Country: USA Design of study: Secondary data analysis and modeling Descriptive information of the research: The health care demand microsimulation model used for this analysis simulates disease prevalence and use of health care services by medical specialty and care delivery setting for each person in a representative sample of the current and projected future population. Function that is affected: Delivering services	Delivering services The growth and aging of the elderly population will be accompanied by increased prevalence of the chronic diseases and medical .conditions included as predictors of health care use in our model The portion of the population with cardiovascular disease and the portion with a history of stroke or heart attack are projected to increase by close to 27 percent between 2013 and 2025. The population with diagnosed diabetes is projected to grow by 21 percent. At the national level, the total number of office visits, outpatient visits, and ED visits is projected to increase by approximately 8–12 percent between 2013 and 2025. Total hospital inpatient days are projected to increase by approximately 19 percent during this period, reflecting the more complex health care needs of the growing elderly population and the higher rates of surgery and hospitalization among this population. taking into account the expected effects of both changing demographics and expanded medical coverage, between 2013 and 2025 the projected growth in specialty service demand is substantial. For example, the number of both cardiology and rheumatology office visits is projected to increase by 18 percent. Urology and neurology visits are projected to increase 17 percent, and dermatology visits by 16 percent. In comparison, adult primary care office visits are projected to increase by 14 percent. If patterns of use and delivery of care remained relatively unchanged, between 2013 and 2025 the demand for primary care physicians (including geriatricians) to serve the adult population would grow by approximately 14 percent. Vascular surgery has the highest projected demand growth, at 31 percent, followed by cardiology, at 20 percent.

Row	Study Identification	Summary of The Most Important Findings
9	Author. Date: Gregersen. 2014 [20] Goal of study: Survey on that health care expenditures for older people are growing faster than for the rest of the population. Country: Norway Design of study: Cross sectional study Descriptive information of the research: For this study, we have repeated cross-sectional data (pseudo-panel) for all hospital admissions in Norway from 1998 until 2009. The data comes from the Norwegian patient registry (NPR). Function that is affected: Financing	Financing The share of the per capita health care expenditures used by the elderly (65+) does not increase over time (1998–2009). In summary, our results clearly do not reject steepening in per capita health care expenditures over time for the 50+ age group, with the exception of 0-year-olds. Mortality-related expenditures also increase over time, and the effect of steepening is reduced when this effect is taken into account.
10	Author. Date: Sarker et al. 2014 [21] Goal of study: To examine the impact of age and sex of the population on overall healthcare expenditure of households in Bangladesh. Country: Bangladesh Design of study: Survey study Descriptive information of the research: The present study derived from Household Income and Expenditure Survey-2010. A total of 10,705 populations who spent for receiving any healthcare services were analyzed and thus .who didn't spend on healthcare services was excluded Function that is affected: Financing	Financing The highest health expenditure was observed in case of male (US$ 69.7) with 65–69 years of age and in case of female (US$ 23.4) with 75–79 years of age. The average healthcare expenditure was higher for male at the senior aged (US$ 34.9) followed by old senior age (US$ 30.6). Healthcare expenditure is significantly associated with age, which means that healthcare expenditures were clearly age dependent; an aging population will imply increasing total healthcare expenditures. However, no such relation was established considering sex. The two major findings of the study are that, the average healthcare expenditure is higher in male than female and elderly population expend more than younger people. The highest health expenditure was observed in male (US$ 69.7) of age 65–69 years and in female (US$ 23.4) of age 75–79 years. The cost for hospitalization was significantly higher (US $23.7) for female than male (US$ 21.1). Healthcare expenditure was higher (US$ 14.1) in female than man (US$ 11.7) in the reproductive period. Considering the under-five age group, healthcare spending was significantly higher in male child (US$7.5) compared to female (US$ 5.7). The overall health care expenditure of male (US$ 11.5) was consistently higher than female (US$ 11.2). ANOVA result showed significant difference health care expenditures for all the human life stages.

Row	Study Identification	Summary of The Most Important Findings
11	Author. Date: Lopreite & Mauro. 2017 [16] Goal of study: This paper contributes to the discussion on the societal consequences of population ageing by using Bayesian VAR estimations based on EUROSTAT and OECD datasets which collect aggregate information on health care expenditure, economic growth, ageing index and life expectancy in Italy during the years 1990–2013. Country: Italy Design of study: Secondary data analysis and modeling Descriptive information of the research: Starting from this point, we use a B-VAR model and Eurostat data to investigate over the period 1990–2013 the impact of demographic changes on health expenditure in Italy. Function that is affected: Stewardship and financing	Stewardship The increasing share of older people in the population will be characterized by poorer health (chronic-degenerative diseases, self-reported health, mental and physical illness) because the period of time that people lived with disability or morbidity will increase which in turn will change the demand for health services. Moreover, the much lower labour participation rate of elderly persons implies a lower tax base for government revenue; thus, population ageing can result in a double whammy in public finance: Increased health expenditures coupled with a reduction in tax revenue. This evidence will have a significant impact in the short term as well as in the long term, and shows the need for a redesign of the health system through an intensive promotion of the public health system. Strengthening the role of primary care as a point of access to the integrated system of care, (both health and social) will improve the system's ability to respond to the complex needs of fragile population in the future. Improving the quality of primary care will reduce the overall fragility of the population. A safe environment with low levels of pollution is another key factor to reduce the fragility of the ageing population. The policy actions should include improvements in public health, such as retirement plans that support elderly individuals with age-specific risk factors and that help them not to become poor (i.e. improving health-insurance coverage, household income, informal care supply) or intervention plans oriented towards young people for primary and preventive services. Financing The increasing demand for health and social care services, such as long term care (LTC), will have an inevitable impact on the cost of the national health system (NHS). The growth of the health costs related to the ageing population raises doubts about the capability of the National Health System to provide adequate funding for its healthcare delivery. The analysis shows a great increase in health care spending as age increases with a reduction for the "oldest old" people (over age 89). This paper contributes to the discussion on the societal consequences of population ageing by using Bayesian VAR estimations based on EUROSTAT and OECD datasets which collect aggregate information on health care expenditure, economic growth, ageing index and life expectancy in Italy during the years 1990–2013. In particular, we learned that per capita health care expenditure is more influenced by ageing index than by per capita GDP and life expectancy in the short-run. Conversely, changes in health spending have a scarce impact on ageing index, life expectancy and per capita GDP. Our study shows that health care expenditures increase with age and life expectancy; therefore, – advances in longevity will increase the lifetime health care expenditures per person.

Row	Study Identification	Summary of The Most Important Findings
12	Author. Date: Kocot 2018 [22] Goal of study: To check the possible impact of aging on health expenditure (HE) regarding different types of health care and to evaluate whether this impact is significant for all analyzed areas. Country: Poland Design of study: Cohort based project Descriptive information of the research: To show a relationship between age and HE a special indicator (old-age sensitivity) was defined, showing a difference between the standardized value of HE per capita in the age group 65+ and in the group 20 to 64 (defined as the reference group). Function that is affected: Financing	Financing In general health expenditure (HE) per capita has an increasing trend with age for both sexes, although in the oldest groups (for men over 85, for women over 100) HE decreases again. A group of relatively high HE per capita comprises youngest children: 0 to 4 years. The lowest value of HE is connected with the male age group 20 to 24, the highest with the male group 80 to 84. The trend of changes of expenditures is totally different, especially in the oldest age groups: Cure expenditures are reducing (decreasing trend), but spending on procedures of a typical care character is growing. The most common pattern of HE per capita by age group is as follows: Values below average in the youngest and medium group and above average in the oldest. Prevention programs and psychiatric care are the only ones for which average spending per capita is lower for older people, so the old-age sensitivity indicator is negative and the lowest for these types of care. The highest increase in health expenditures in elderly can be observed for nursing services —the spending is twice high in 2050 as in 2014 and the difference to the next largest growth rate (for palliative care) is as high as 38 percentage points. The highest decrease is observed for preventive programs and psychiatric care and is equal to −20% and −12.5%, respectively. The relatively high expenditure on the youngest group (0-4) is caused by many preventive activities provided during this period of life, early childhood diseases, and high spending on specialized neonatal procedures. Then there is the period of the lowest expenditure in the lifespan, with higher spending on women in the age group 20 to 40, because of the pregnancy and child-delivery period. This period of relatively stable expenditures is followed by an increase of them after 45 to 50, connected with natural age-related health deterioration. This increase is much more intensive for men than for women, and after 55 the spending on men clearly exceeds the spending on women.

Row	Study Identification	Summary of The Most Important Findings
13	Author. Date: Wang et al. 2018 [23] Goal of study: This study shed light on the amount and structure of utilization and medical expenses in Shanghai permanent residents based on big data, constructed using hypothetical "lifetime" medical expenses through a combination of life table model and cross-sectional medical expenses data, and explored the dynamic pattern of aging on medical expenses. Country: China Design of study: Secondary data analysis and modeling Descriptive information of the research: Data of this study was collected from the entitlement of use of the Health Information Web of Shanghai Municipal Health and Family Planning Commission Information Center. Take 5 years as the class interval, gather the medical services utilization and medical expenses information for all ages of Shanghai permanent residents in 2015. Simulate lifetime medical expenses by using current life table and cross-section medical expenses data. Function that is affected: Financing	Financing As age increases, the population shrinks, while the medical expense is distinctly increasing in general. The elderly population as 19.5% total population accounted for 63.2% of outpatient and emergency expenses, and 52.8% hospitalization expenses. In outpatient and emergency, as age increases, the per capita expenses of both overall population and deaths roughly increased, whilst the per capita expected cost of both overall population and the survivors declined, however the per capita outpatient and emergency expenses distinctly fell in the group aged 90 and over. The per capita total medical expenses went up with increasing age, and was below the per capita total medical expenses of deaths. After age 60, the per capita visits boosted remarkably, with per capita visits 1.6 times/month, and reached the highest value when at the group aged 80- 84, with per capita visits 3.8 times/month, then slightly dropped. The per capita visits of the children, youth and adult and elderly group in 2015 were 6.0, 5.4 and 24.5 times, respectively. The number of the elderly group was 4.1 and 4.5 times higher than the children, youth and adult group. After age 60, it was notable that the per capita outpatient and emergency visits increased fast, and kept dropping after age 80. The per capita hospitalization of childhood, youth and adult and elderly groups in 2015 were 0.07, 0.06 and 0.21 times, respectively. The number of the elderly group was 3.0 and 3.5 times higher than the children, youth and adult groups.

Row	Study Identification	Summary of The Most Important Findings
14	Author. Date: Agustin & Chou 2019 [24] Goal of study: This study hypothesized that the greying population in Taiwan is the main reason that devours a vast health care expenditure. Country: Taiwan Design of study: cohort study Descriptive information of the research: The study uses the National Health Insurance Research Database (NHIRD) as data sources that contain around 1,000,000 sample data of beneficiaries or 5% of all enrollees, which is randomly selected as study cohort from National Health Insurance (NHI) data. Function that is affected: Financing	Financing Patient cohort at an age interval between 51 to 60 years old needs a constant high expenditure cost. From the interval age of 61 to 80 years old, the cost expenditure was soaring significantly. Expenditure for people sixty-five years old and older has the possibility of becoming two to eight times more than those for the working-age population and steadily increases with age. This pattern has commonly happened in which the cost per capita for people 85 years old above is less than the older people with age 85 years old below. The highest cost of health expenditure has resulted from the people in the age interval above 65 years old. The increase of older people will increase NCD cases for them. Demographic analysis is utilized by dividing the sample of NHI members into four age interval categories to measure the cost dimensions and dynamics of populations. The interval for each category is 20 years, starting at 11 years old. The biggest proportion is 32.16% in the interval 51-70 years old that accommodate only 18,21% of the population. The contribution of change in demographic structure was 56.19 per cent in 2002 to 2011, and 63.92 per cent in 2005 to 2011, which shows that population ageing became a more influential factor in medical expenditure increases. By comparing the health care expenditure data in 2002, the 10th quantiles and the median of this statistic, people above 50 years old spend 3.25 times higher than people under 20 years old. Meanwhile, in 2011, people above 50 years old will spend 3.75 times higher than people under 20 years old.
15	Author. Date: Atella et al. 2019 [33] Goal of study: To determine the effect of aging on the prevalence and trends of age-associated chronic diseases and related healthcare costs using population data. Country: Italy Design of study: Longitudinal observation study Descriptive information of the research: This is a longitudinal observational data set containing computer-based patient records collected by Italian general practitioners (GP) and up-to-date healthcare expenditures data from the SiSSI project. The analysis is based on data collected by 900 GP on an unbalanced sample of more than 1 million patients aged 35+, observed in different time periods between 2005 and 2014 Function that is affected: Delivering services	Delivering services From 2005 to 2014 hypertension prevalence strongly increased with age, from 9.5% in the 35–50 age group to 59.7% in the 80+ age group. Similarly, prevalence of diabetes increased eightfold from 1.8% in the 35–50 age group to 15.2% in 80+ age group. This age gradient was similar for cancer and much stronger for COPD and all the cardiovascular diseases. The average number of prescriptions was more than eight times higher in the 81+ age group compared with the youngest group. The average prescription duration was more than three times longer for the oldest group, while doctor visits and prescription of laboratory and diagnostic tests were almost three times more frequent for the oldest group. All the chronic diseases examined showed an increasing trend throughout the study period. Large differences in comorbidity levels exist among age groups. More than 75% of males aged 35–50 had no pathologies in 2005. This proportion dropped with age to 20% for the 80+ group. Between 2005 and 2014, the prevalence of “no comorbidities” patients (having none or only one disease) decreased for all age groups in both male and female patients. While the decrease was the sharpest, with almost 60% drop for patients aged 80+, it was relatively important also in the youngest patients (−7%). Interestingly, we observed a sharp increase in the prevalence of patients with four or more comorbidities for all age groups, with both the 66–80 and 80+ groups exhibiting more than a twofold increase. The average number of prescriptions increased by 26.4% and laboratory tests and diagnostic by 27%.

Row	Study Identification	Summary of The Most Important Findings
16	Author. Date: Daviaud et al. 2019 [25] Goal of study: This study surveys key issues, research, and policies related to care of older adults (aged 60 years and over) in South Africa, and uses Stats SA population .forecasts to assess ageing trends Country: South Africa Design of study: Secondary data analysis and modeling Descriptive information of the research: Statistics and forecasts provided by Statistics South Africa (Stats SA) in the mid-year 2018 population estimates report were used to assess ageing trends for the South African population. Function that is affected: Delivering services, financing and creating resources	Delivering services Two patterns are clearly evident from the analysis: With increasing age there is an overall increase in the proportion of individuals with chronic conditions and an increasing proportion of individuals with co-morbidities, i.e. more than one chronic condition. Older adults are more than twice as likely as under-60s to develop one chronic condition, 7.6 times more likely to develop multiple chronic conditions, and overall, nearly five times more likely to develop a chronic condition. Ageing of the South African population will increase the risk of the development of chronic and multiple chronic conditions and that this is likely to have a significant impact on the demands placed on the healthcare system. Financing From 2002 to 2022, the population is expected to increase by 33.8% (1.47% per annum). Over the same period, the relative expected expenditure is expected to increase by 41.7% (1.76% per annum). The impact of ageing on expected expenditure over the period is therefore 7.9% (0.29% per annum). The average expenditure for over-60s with no Chronic Disease Lists (CDL) is almost double that for under-60s, possibly reflecting the fact that many diseases (e.g. dementias, musculoskeletal disorders and frailty) affecting older adults are not recognized as CDLs. Creating resources There is thus an urgent need for research, policy development and planning to address the challenges posed by an ageing population. We need better data, improved inter-sectoral collaboration, better training of health and social workers, and recognition of older adults in the health policy framework. Governance To promote ageing in community settings, more detailed policies need to be developed and more resources need to be directed both to the community and at household level to support provision of quality health, social services and care.
17	Author. Date: Costa-Font & Vilaplana-Prieto 2020 [31] Goal of study: We study the effect of ageing, defined as an extra year of life, on health care utilization. Country: Europe countries Design of study: Longitudinal study Descriptive information of the research: We used data from Survey of Health, Ageing, and Retirement in Europe (SHARE) corresponding to waves 1, 2, 4, 5, 6, and 7. Function that is affected: Delivering services	Delivering services Additional year of life has a positive effect on the length of hospital stay (+2.3%) and on the number of medications consumed (+3.9%). This effect is six and ten times lower respectively, than the effect of an additional comorbidity. We estimate that an additional year of life decreases the length of stay in nursing homes by 13%. The largest impact of age corresponds to the frequency of home-based assistance for personal care because each additional year increases the probability of receiving one more hour by 13.6%. The probability of medicine consumption is greater than 50% for all age cohorts (80% after the age of 75). Ageing does not increase the utilization of outpatient care. Proximity to death increases hospitalizations, length of hospital stays, LTC use (home and nursing home care), and outpatient care use

Row	Study Identification	Summary of The Most Important Findings
18	Author. Date: Holecki, et al. 2020 [32] Goal of study: To provide perspective for future development of current trends that concern health care systems, as well as its consequence for health systems globally. Country: Poland Design of study: Secondary data analysis Descriptive information of the research: We analyzed raw, existing, and previously archived data, which were collected by the Organization for Economic Cooperation and Development (OECD). Function that is affected: Delivering services	Delivering services One of the crucial reasons for this is their physical inability and mobility limitation. It is necessary to implement measures boosting its positive impact on the national economies, while seeking ways to minimize the occurring negative effects, especially by making preparations in terms of health care system infrastructure, or seeking for new cost-effective ways of delivering health services under conditions of increased demographic burden. These risks, as well as seniors' multimorbidity and their greater susceptibility to infection, should also be taken into consideration when adjusting health systems to the new reality determined by migration processes.
19	Author. Date: Li et al. 2020 [26] Goal of study: To analyze the HE of different age groups .and the effect of age on HE among different age groups Country: China Design of study: Secondary data analysis and modeling Descriptive information of the research: Combining population aging (PA) and healthcare expenditure (HE) data, this study used the fixed effect model and parameter estimation method to evaluate the influence of different age groups on HE from 2008 to 2014. Function that is affected: Financing	Financing With increasing age, the impact of age on HE is significant. It is also found that the HE per capita for those aged 60 years or over is 1.96 times as much as those younger than 60 years. The age effect of healthcare expenditure (HE) for the population aged 65 or over was the most significant among the different age groups. Based on population aging and HE data, HE per capita of the age group 65 years or over is 7.25 times as much as the population aged < 25 years, 1.61 times as much as the population aged 25~59 years, and 3.47 times as much as the population aged 60~64 years. There is a positive correlation between the HE per capita and the age groups. The increase in age significantly drives HE increase, and the increase range is greatest among those aged 65 years old or over. HE per capita in the age group of 65 years or over is 2,538.88 Yuan (CNY) (USD $362.7), 11.63 times as much as that of the age group <25 years.

Row	Study Identification	Summary of The Most Important Findings
20	Author. Date: Lorenz et al. 2020 [28] Goal of study: To employs non-parametric methods to estimate age-expenditure profiles (as well as agespecific growth rates) for the following types of expenditures: those for medical care (HCE), for long-term care (LTCE), and total expenditures (TE), the sum of expenditures for medical care and long-term care. On the basis of these results and estimates of the time trend in expenditures we simulate the development of these expenditure types over the next three decades. Country: Germany Design of study: Secondary data analysis and modeling Descriptive information of the research: The data used in this study is from the Statutory Health Insurance Sample AOK Hesse/KV Hesse, which was collected and provided by the PMV research group.3 It is a random sample of 18.75% of all persons who were insured with this sickness fund on January 1, 1998, or entered this sickness fund after that date. The sample comprises the time period 2001 to 2015. 29,968 men and 34,447 women died in this 15-year observation period. Function that is affected: Financing	Financing In the 14 years between 2001 and 2015, age-adjusted per-capita health care expenditures (HCE) and long-term care expenditures (LTCE) grew by 44.53 and 54.18 percent. In higher age groups HCE of men are on average higher than those of women because in these age groups there are more decedents among men than among women. Finally, HCE decline significantly from about age 85 for both genders. In the last four years of life, expenditures for women are noticeably higher than those for men. The age gradient of medical spending in the last two years of life is negative for women beyond age 40 and for men beyond age 70. Over a 35-year period from 2015 to 2050, HCE per capita are predicted to rise by 6.8 per cent for purely demographic reasons. Medical progress raises health care expenditures more than 5 times as fast as does the demographic change that will occur in Germany.

Row	Study Identification	Summary of The Most Important Findings
21	Author. Date: Shakoor et al. 2021 [21] Goal of study: Analyzed the effects of ageing population on health care expenditures in Pakistan using a time-series data from period 1995 to 2014. Country: Pakistan Design of study: Secondary data analysis and modeling Descriptive information of the research: Bayesian VAR approach was applied to evaluate the impacts of population ageing on health care expenditures Function that is affected: Financing and stewardship	Financing Ageing Index and health care expenditures per capita shows positive trend throughout the 19 years, except 2001 where Health care expenditure per capita slightly deviates from Ageing Index. This increasing trend also reflects the increase in number of people in-group above 60, lower birth rates and improved health care overtime. In 2000, per capita health care expenditure was only $16, which has risen to $36 in 2014 and Ageing Index was 4 points in 2000, which has increased to 13 in 2016. Our results indicate that the effects of ageing population on health care expenditures are highly significant. There exists a positive relationship between aging population and health care expenditures. Population aging brought about 2.6 percent increase in health care expenditures and are expected to rise to 17.2 percent in tenth year when compared to the base year. Life expectancy also brought an increase in healthcare expenditure; bringing about 3.6 percent increase in health care expenditures per capita and 14.2 percent increase in tenth year. Increase in ageing population increases demand for medical care ultimately increasing healthcare expenditures. Stewardship The mental and physical conditions start to deteriorate when people get older. Ageing population is also vulnerable to chronic diseases that require costly treatments. A macro level dedicated health policy for elderly people could help to minimize the health care expenditures such as, training of primary care doctors in geriatrics and provision of domiciliary care.
22	Author. Date: Tang & Li 2021 [27] Goal of study: To empirically identify the fiscal effect and mechanisms of the elderly health burden using the panel .data from 45 countries from 2000 to 2019 Country: 45 countries Design of study: Secondary data analysis and modeling Descriptive information of the research: This study is based on a two-period intergenerational overlap model, assuming that the population in society has only two life cycles, young and old, representing the young-age working population and the old-age retired population, respectively, according to the general model. Function that is affected: Financing, creating resources and stewardship	Financing The effect of the elderly health burden on health funds was significantly positive, while the effect of healthcare funds on the fiscal balance was significantly negative, indicating that a rise in the elderly health burden increases the health expenditure and, thus, reduces the fiscal balance. Creating resources Results reveals a significant positive effect of the elderly health burden on healthcare labor, while results reveal a significant negative effect of healthcare labor on the fiscal balance, demonstrating that an increase in the elderly health burden necessitates increased healthcare labor, thus reducing the fiscal balance. Stewardship Increase in the elderly health burden necessitates increased healthcare facilities for support, which decreases the fiscal balance.

Row	Study Identification	Summary of The Most Important Findings
23	Author. Date: Ghaemi Asl & Mirzaei Abbasabadi. 2021 [39] Goal of study: We study age-specific effects of population on health expenditures across 165 countries, with reference to their income statuses, from 1995 to 2014. Country: 165 countries Design of study: Secondary data analysis Descriptive information of the research: After preparing the data for a valid estimation through principal component analysis, we utilized the Generalized Method of Moments estimation to investigate the age effects. Function that is affected: Financing	Financing The results indicate that the age-specific effects of population on health expenditures are significant as well as other effects stimulating health expenditures: country's overall economic condition, health system and technology, and urbanization effects. We have found that the "old age" fraction of the country's population, which in this study is considered 45 years or above (as a new definition of "old" in terms of health expenditures), is the most effective group which affects health expenditures in a positive way with point estimated semi-elasticity of 0.19 to 0.31.

پیوست ۲. نتایج ارزیابی کیفیت مقالات

ردیف	نویسنده (گان) و سال انتشار	مقدمه		مواد و روش								نتایج						بحث و نتیجه‌گیری						نمره			
		عنوان و چکیده	مقدمه	روش مطالعه	محیط انجام	مشارکت‌کنندگان	متغیرها	منبع داده‌ها و روش نمونه‌گیری	سوگیری	حجم نمونه‌ها	متغیرهای کمی	روش‌های تحلیل آماری	داده‌های توصیفی	گزارش مشارکت‌کنندگان	گزارش داده‌های اصلی	نتایج اصلی مطالعه	سایر تحلیل‌ها	گزارش نتایج کلیدی	محدودیت‌ها	تفسیر نتایج	عمومی‌سازی	بودجه و حمایت مالی	+	±	−	سطح کیفیت
۱	Seshamani & Gray 2002 [۱۸]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	±	+	−	+	+	−	۱۷	۱	۳	خوب
۲	Sapelli 2003 [۱۴]	+	+	+	+	+	+	+	±	+	+	±	±	±	+	+	±	+	−	−	−	−	۱۲	۵	۴	متوسط
۴	Meng & Yeo. 2005 [۳۰]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−	+	−	+	+	−	۱۷	۰	۴	خوب
۵	Martini et al. 2007 [۱۹]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	±	+	+	+	+	+	۱۹	۱	۱	خوب
۶	Lin et al. 2010 [۱۵]	+	+	+	−	−	−	±	±	±	±	±	+	−	+	+	+	+	−	+	+	+	۱۱	۵	۵	متوسط
۷	Bech et al. 2011 [۲۹]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	−	+	+	+	۱۹	۰	۲	خوب
۸	Dall et al. 2013 [۳۴]	+	+	+	+	+	+	+	−	−	+	+	+	±	+	+	±	+	+	+	+	±	۱۵	۳	۳	خوب
۹	Gregersen 2014 [۲۰]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	±	+	−	+	+	+	۱۹	۱	۱	خوب
۱۰	Sarker et al. 2014 [۲۱]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	−	۱۸	۰	۳	خوب
۱۱	Lopreite & Mauro. 2017 [۱۶]	+	+	+	+	+	+	+	−	±	+	+	+	+	+	+	±	+	−	±	±	−	۱۴	۴	۳	خوب
۱۲	Kocot 2018 [۲۲]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	±	+	+	+	+	+	۱۹	۱	۱	خوب
۱۳	Wang et al. 2018 [۲۳]	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	±	+	−	+	±	+	۱۶	۲	۳	خوب

ردیف	نویسنده (گان) و سال انتشار	مقدمه				مواد و روش									نتایج						بحث و نتیجه‌گیری							نمره			
		عنوان و چکیده	مقدمه	روش مطالعه	محیط انجام	مشارکت‌کنندگان	متغیرها	منبع داده‌ها و روش نمونه‌گیری	سوگیری	حجم نمونه‌ها	متغیرهای کمی	روش‌های تحلیل آماری	داده‌های توصیفی	گزارش مشارکت‌کنندگان	گزارش داده‌های اصلی	نتایج اصلی مطالعه	سایر تحلیل‌ها	گزارش نتایج کلیدی	محدودیت‌ها	تفسیر نتایج	عمومی‌سازی	بودجه و حمایت مالی	+	±	−	سطح کیفیت
۱۴	Agustin & Chou 2019 [۲۴]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	±	+	−	+	+	−	۱۷	۱	۳	خوب
۱۵	Atella et al. 2019 [۳۳]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	+	۱۹	۰	۲	خوب
۱۶	Daviaud et al. 2019 [۲۵]	+	+	+	±	±	+	+	−	+	+	+	+	±	+	+	±	−	−	+	±	−	۱۲	۵	۴	متوسط
۱۷	Costa-Font & Vilaplana-Prieto 2020 [۳۱]	+	+	+	+	+	+	±	−	+	+	+	+	+	+	+	−	+	−	+	+	+	۱۷	۱	۳	خوب
۱۸	Li et al. 2020 [۲۶]	+	+	+	+	+	+	+	±	+	+	+	+	+	+	+	±	+	+	+	+	−	۱۸	۲	۱	خوب
۱۹	Lorenz et al. 2020 [۲۸]	+	+	+	+	+	±	−	−	+	+	+	+	±	+	+	±	+	−	+	±	−	۱۴	۳	۴	خوب
۲۰	Holecki, et al. 2020 [۳۲]	+	+	+	±	±	+	+	−	+	+	+	+	±	+	+	±	−	−	+	±	−	۱۲	۵	۴	متوسط
۲۱	Ghaemi Asl & Mirzaei Abbasabadi 2021 [۳۹]	+	+	+	+	+	+	+	−	−	+	+	+	+	+	+	±	+	−	+	±	+	۱۶	۲	۳	خوب
۲۲	Shakoor et al. 2021 [۱۷]	+	+	+	+	+	±	+	−	+	+	+	+	+	+	+	−	+	−	+	+	−	۱۶	۱	۴	خوب
۲۳	Tang & Li 2021 [۲۷]	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	۱۹	۰	۱	خوب

پیوست ۳. راهبرد جست‌وجو در پایگاه‌های انگلیسی زبان

		Results
#1.	((((((Effect[Title]) OR (consequence[Title])) OR (association[Title])) OR (relation*[Title])) OR (impact[Title])) OR (role[Title])) OR (affect[Title])	۲,۵۹۱,۸۰۸
*2.	((((((((((Old*[Title]) OR (elderly[Title])) OR (aging[Title])) OR (ageing[Title])) OR (senior[Title])) OR (“population aging”[Title])) OR (“population ageing”[Title])) OR (“ageing society”[Title])) OR (“aging society”[Title])) OR (“old society”[Title])) OR (“older adult*”[Title])	۳۸۶,۱۹۸
#3.	(((((((“Health system”[Title]) OR (“healthcare”[Title])) OR (“health care”[Title])) OR (“health service*”[Title])) OR (“health delivery”[Title])) OR (“health sector”[Title])) OR (“health financ*”[Title])) OR (“health cost”[Title])) OR (“health resource*”[Title]) OR (“medic*”[Title])	۸۷۱,۴۵۷
#4	#1 AND #2 AND #3	۸۵۸
	PubMed filters: 2000-2022 AND published in English language Date of Search: 7 October 2022 (1401.7.15)	
	Web of Science	Results
#1.	TI=(effect OR consequence OR association OR relation* OR impact OR role OR affect)	۶,۸۶۳,۶۶۶
*2.	TI=(Old* OR Elderly OR Aging OR Ageing OR Senior OR “Population aging” OR “Population ageing” OR “ageing Society” OR “aging Society” OR “old society” OR “older adult*”)	۱,۰۰۶,۵۰۷
#3.	TI=(“health system” OR “healthcare” OR “health care” OR “health service*” OR “health delivery” OR “health sector” OR “health financ*” OR “health cost” OR “health resource*” OR “Medic *”)	۱۹۳,۴۶۹
#4.	#1 AND #2 AND #3	۸۲۵
	Web of Science filters: 2000-2022 AND published in English language Date of Search: 7 October 2022 (1401.7.15)	
	ProQuest	Results
#1.	TI=(effect OR consequence OR association OR relation* OR impact OR role OR affect)	۶,۸۶۳,۶۶۶
*2.	TI=(old* OR elderly OR aging OR ageing OR senior OR “population aging” OR “population ageing” OR “ageing Society” OR “aging Society” OR “old society” OR “older adult*”)	۳۲۳,۳۸۹
#3.	TI=(“health system” OR “healthcare” OR “health care” OR “health service*” OR “health delivery” OR “health sector” OR “health financ*” OR “health cost” OR “health resource*” OR “Medic *”)	۲۹۴,۲۴۷
#4	#1 AND #2 AND #3	۲۲۰
	Web of Science filters: 2000-2022 AND published in English language Date of search: 7 October 2022 (1401.7.15)	

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