Perspectives

A Visualization Analysis of Medical and Prevention Fusion Research in China via CiteSpace

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Since the 1990s, the acceleration of population aging has led to an increased prevalence of chronic diseases and enhanced public health awareness. Numerous countries have proposed healthcare reforms, with a focus on creating an "integrated care" model that aims to improve the quality of medical services and reduce costs (*1*–*2*). In 2008, the World Health Organization (WHO) put forward the concept of Integrated Delivery Systems (IDS), advocating for continuous, timely and integrated medical services. In 2016, the WHO introduced the people-centered and integrated healthcare (PCIC) global health strategy model, which is highly compatible with the core concept of "shifting from disease treatment to overall health promotion" in the "Healthy China" strategy. Medical prevention fusion (MPF) represents the practical application of PCIC in China and serves as a significant goal for the country's ongoing healthcare system reform. Furthermore, MPF is a crucial initiative for implementing the Healthy China Strategy.

Following China's reform and opening up, the economic system shift led to an increased focus on the market within public health. The public healthcare system experienced challenges while the orientation of public health work transitioned from "prevention" to "treatment". This separation between prevention and medical treatment has made it difficult for China's public healthcare system to address the increasingly complex public health issues and meet the rising health care demands of the general population (*3*). Consequently, the Chinese government has successively proposed strategies including medical prevention combination (MPCom), medical prevention integration (MPI), medical prevention collaboration (MPCol), and MPF. Analyzing the hotspots and trends in MPF may help clarify its conceptual connotations and related theoretical research.

The data for this study were collected from three major Chinese databases: China National Knowledge Infrastructure (CNKI), Wanfang, and VIP. A comprehensive search was conducted using the keywords "MPCom," "MPI," "MPCol," and "MPF" in order to identify relevant studies published between January 1, 2000, and December 31, 2022. Data from the three databases were imported into NoteExpress (version V3.7; Beijing, China), a literature management software, to ensure the completeness of relevant literature and remove duplicates. The final dataset was then exported from NoteExpress in Refworks-CiteSpace format to CiteSpace for formal data analysis. The detailed screening process is depicted in Figure 1.

CiteSpace (version 6.1.R6; Drexel University, Philadelphia, PA, USA) is a tool utilized for examining current research hotspots and this analysis allows for a comprehensive understanding of the research directions within focal areas (*4*–*5*). In our study, we employed CiteSpace to analyze the co-occurrence and clustering of authors, institutions, and keywords, which we subsequently represented in the form of knowledge graphs. Within the network diagram, distinct nodes symbolize the analyzed elements. The size of these nodes reflects the number or frequency of publications (*6*). The connecting lines between nodes signify mutual relationships, including collaboration, co-occurrence, or co-citation (*7*).

The number of studies published annually serves as an indicator of the activity within a specific research area (*8*). Supplementary Figure S1 (available in https://weekly.chinacdc.cn/) illustrates the temporal distribution of annual publications in the field of MPF. During these two decades, research on MPF can be divided into two distinct phases. Prior to 2016, fewer than twelve articles were published annually, suggesting that the field was in its nascent stage. However, following the WHO's call for PCIC in 2016, China has progressively acknowledged the significance of MPF. Consequently, this phase has exhibited a consistent upward trend in the number of publications.

The visual analysis map of the author collaboration network can be found in Supplementary Figure S2 (available in https://weekly.chinacdc.cn/). The map

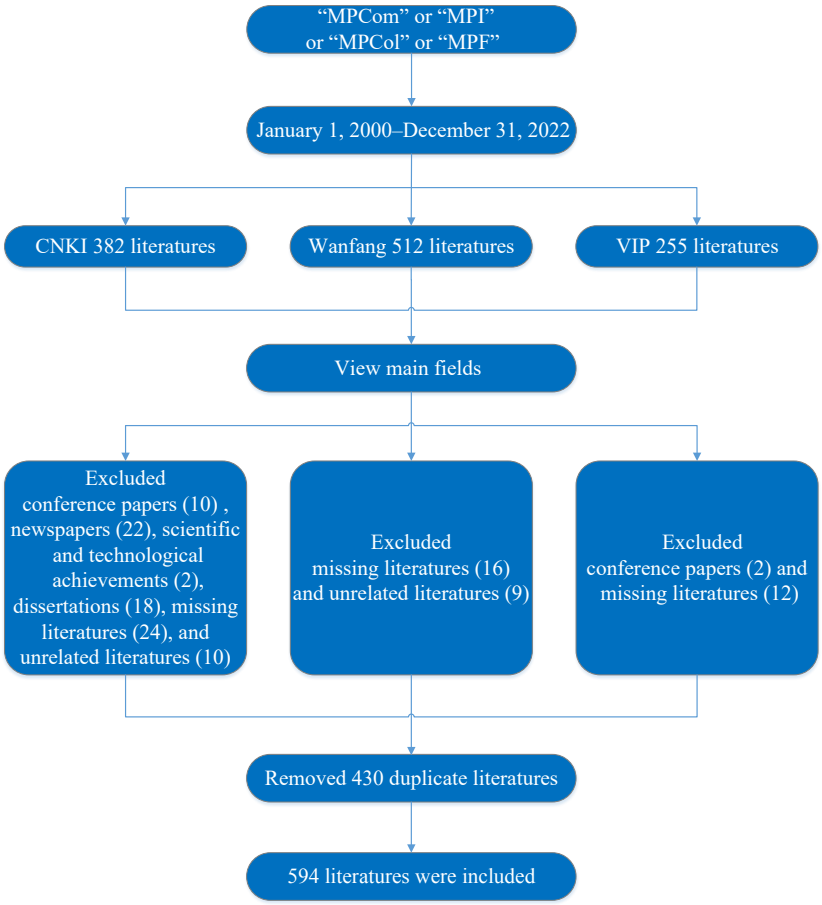

FIGURE 1. The flow chart of search strategy.
Abbreviation: MPCom=medical prevention combination; MPI=medical prevention integration; MPCol=medical prevention collaboration; MPF=medical prevention fusion; CNKI=China National Knowledge Infrastructure.

features 343 nodes and 553 lines, with a network density of 0.0094. Each dot represents an individual author. Larger circles indicate authors with more published articles. Lines represent collaboration between authors, with thicker lines signifying closer collaboration (*5*). One major team is based at the Peking University China Center for Health Development Studies, which includes notable authors such as Menggen Yu and Beibei Yuan, etc. This team primarily investigates influencing factors and cognitive evaluations of MPF in primary care institutions (*9–11*).

Supplementary Figure S3 (available in https://weekly.chinacdc.cn/) presents a diagram illustrating research-issuing institutions, which comprises 181 nodes and 63 connecting lines, resulting in a density of 0.0039. The Chinese Center for Disease Control and Prevention holds the top position with eleven publications. Another notable institution, the Center for Health Policy Research and Evaluation at Renmin University of China, has eight publications and is connected to the Sanming Municipal Health Commission. Sanming serves as a national example of China's deepening medical reform and is a representative case of MPF, commonly referred to as the Sanming Model.

Keywords effectively convey the central concept of an article, providing a succinct summary and distillation of the primary content under investigation (*12*). A visualization of keywords is depicted in Figure 2, which includes 279 nodes and 550 research links, with a network density of 0.0142. MPF is a term specific to our country that has gained significant attention within the healthcare field. Over the past two years, it has sparked the research interests of numerous scholars. The term MPF was first officially mentioned in the document titled "The General Office of the National Health Commission on Doing a Good Job of Family Doctor Contracting Services" in 2018 (GuoWeiBan grassroots letter [2018] No. 209). This document emphasized the responsibility of family doctor teams in meeting the requirements of

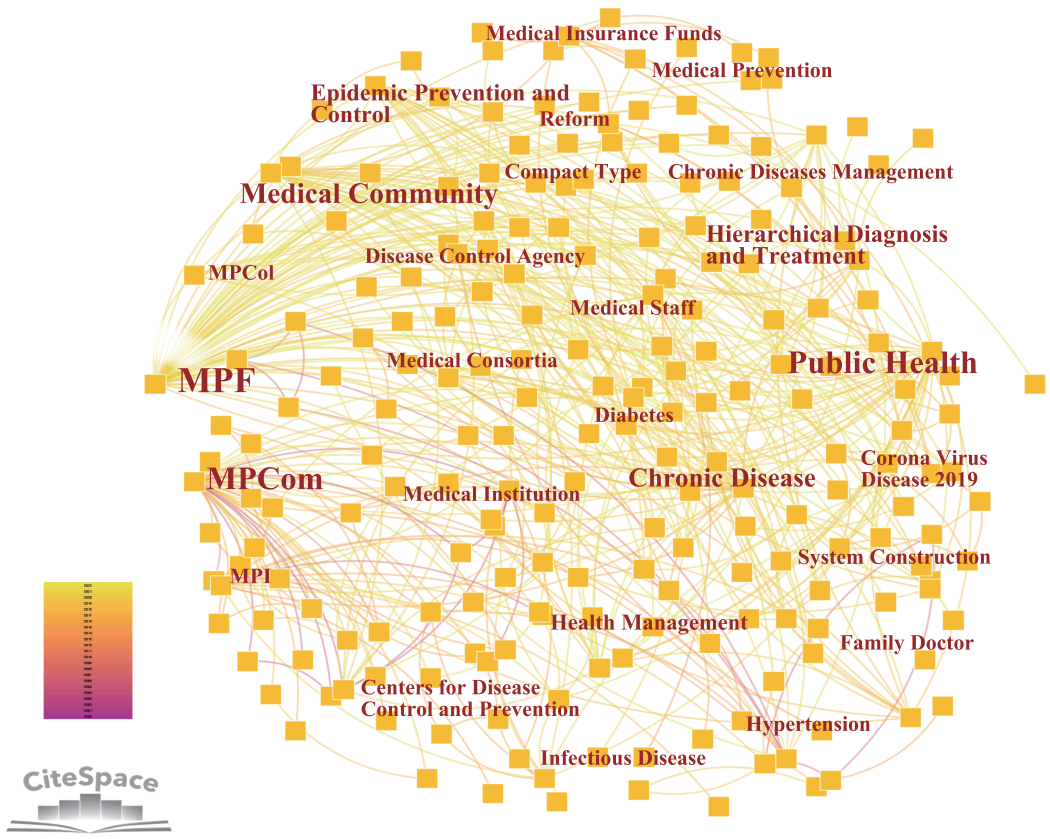

FIGURE 2. The network of keywords.
Abbreviation: MPCom=medical prevention combination; MPI=medical prevention integration; MPCol=medical prevention collaboration; MPF=medical prevention fusion.

contracted residents and providing continuous MPF services. Liu et al. (*2*) proposed that MPF could be interpreted as the integration of medical services and public health services, with a focus on combining and effectively connecting these services during the process. Jie et al. (*13*) viewed MPF as a complex disease management model. In summary, MPF can be described as a combination of services, models, or programs.

Table 1 presents the primary keywords associated with the most significant citation bursts. These keywords were identified based on the increased frequency of publications, independent of their overall usage (*14*). As illustrated in Supplementary Figure S4 (available in https://weekly.chinacdc.cn/), the progression from combination to integration and collaboration to fusion represents a gradual developmental process. When examining the development of MPF, it is essential to consider the stage of separation. Following China's economic reform and opening, the public health sector became increasingly market-driven, resulting in a substantial impact on the public health system. Consequently, the focus of public health work shifted from "prevention" to "medical treatment" (*3*).

MPCom has been in place since 2004. In response to the severe acute respiratory syndrome (SARS) outbreak in 2003, China intensified its focus on public healthcare system development, emphasizing interdisciplinary collaboration among researchers from related academic fields. The MPCom represents the collaboration between medical and public health service personnel or institutions. Generally, the implementation of MPCom has effectively bridged the gap between medical treatment and prevention, both in terms of awareness and practical outcomes (*2*).

The concept of integration was initially introduced by the British philosopher Herbert Spencer and has since been extensively employed in the disciplines of sociology, economics, and political science (*15*). Integration emphasizes the consolidation of assets and ownership as a unifying connection (*16*). In China, the emergence of MPI began in 2006. Domestic scholars have conducted extensive theoretical research and

developed unique approaches or academic perspectives for system construction. MPI seeks to deliver prevention, medical treatment, health education, and health promotion services to the population by combining medical and health resources (*17*).

Since the emergence of the coronavirus disease 2019 (COVID-19) pandemic, the awareness of the significance of prevention measures has grown, with increasing attention given to their role alongside medical treatment. The concept of MPCol gained prominence in policy recommendations from 2021 onwards. Although the term collaboration has its origins in Western contexts, the focus of MPCol is to establish a coordinated approach and division of labor between disease control agencies and medical institutions.

In the current state of normalized epidemic prevention and control measures, the role of MPCol is not sufficient. It is essential to create a comprehensive and cohesive framework that merges both medical treatment and prevention strategies. In this context, MPF has emerged as a more effective approach to addressing the present challenges. As compared to terms like "combination", "integration", and "synergy", MPF signifies the highest level of convergence between medical and preventative aspects (*2*).

In order to further investigate research topics within the field of MPF, we conducted a cluster analysis of keywords. This analysis facilitated the identification

TABLE 1. Top keywords with the strongest citation bursts.

Keywords	Year	Strength	Begin	End
Medical prevention combination	2004	2.46	2020	2020
Integration	2006	0.68	2006	2006
Medical prevention integration	2006	3.25	2006	2019
Hierarchical diagnosis and treatment	2016	1.57	2021	2022
Prevention	2018	1.07	2018	2018
Epidemic Prevention and Control	2020	2.80	2020	2020
Medical prevention collaboration	2021	1.13	2021	2022
Fusion	2021	0.79	2021	2022

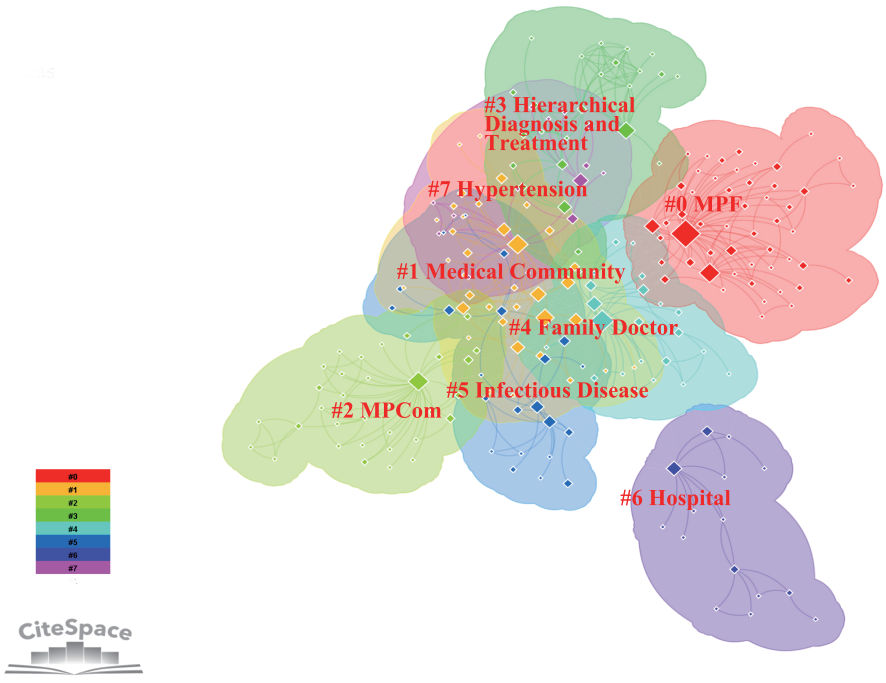

FIGURE 3. Keywords cluster analysis.
Abbreviation: MPCom=medical prevention combination; MPF=medical prevention fusion.

and differentiation of various research topics by generating a keyword clustering map (Figure 3). To evaluate these clusters, the modularity Q value and silhouette value were utilized, with a Q value of 0.6424 and a silhouette value of 0.9085, indicating an efficient and convincing cluster (*18*). A total of eight clusters emerged, including: "#0 MPF", "#1 Medical community", "#2 MPCom", "#3 Hierarchical diagnosis and treatment", "#4 Family doctor", "#5 Infectious disease", "#6 Hospital", "#7 Hypertension".

The medical community (MC) serves as a crucial foundation for the development of the MPF, a distinctive model of IDS specific to China. The MC facilitates effective vertical integration of medical resources through a hierarchical medical model that is guided by tertiary hospitals and collaborates with secondary and community hospitals within a given region (*19*). This integrated operational approach within MCs offers a conducive environment for the implementation of the MPF.

Hierarchical diagnosis and treatment (HDT) is an effective approach to ensuring the optimal implementation of the MPF system. HDT contributes to increased efficiency in the allocation of medical resources and the reduction of healthcare costs (*20*). The core principles of HDT encompass grassroots first consultation, two-way referral, acute and chronic diseases treatment, and linkage between upper and lower levels, thus fostering the advancement of the MPF system (*21*).

Epidemic prevention and control (EPC) imposes new demands on MPF. The emergence of the COVID-19 pandemic has underscored the increasing significance of MPF. Evidenced by its repeated success in EPC, MPF is a crucial concept in mitigating infectious diseases. To bolster our capacity to address emerging and imported infections, it is vital to continually deepen the integration and collaboration between medical treatment and disease prevention (*22*).

Current researches on MPF predominantly emphasize Western medicine, while traditional Chinese medicine (TCM) receives considerably less attention. Historically, TCM has facilitated a comprehensive approach to healthcare, encompassing prevention, treatment, and rehabilitation. MPF and TCM share similar objectives, and exploring the integration of both approaches to enhance chronic disease management presents a significant direction for future academic research.

To the best of our knowledge, this is the first systematic and comprehensive study examining the progress and trends of MPF research in China. This study offers invaluable insights for scholars in this domain, assisting them to explore the future direction of MPF. However, the study inevitably has some limitations. Firstly, lack of access to English databases may lead to incomplete analysis. Secondly, the presence of synonyms makes some data overlap in the keyword clustering process, leading to potentially biased analysis outcomes.

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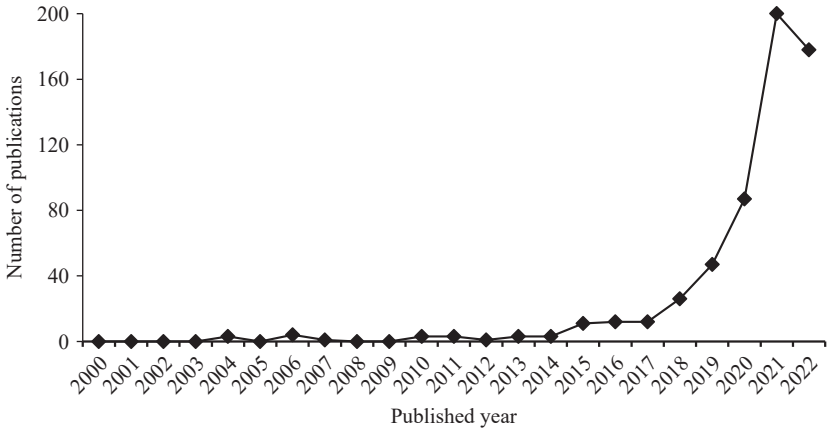
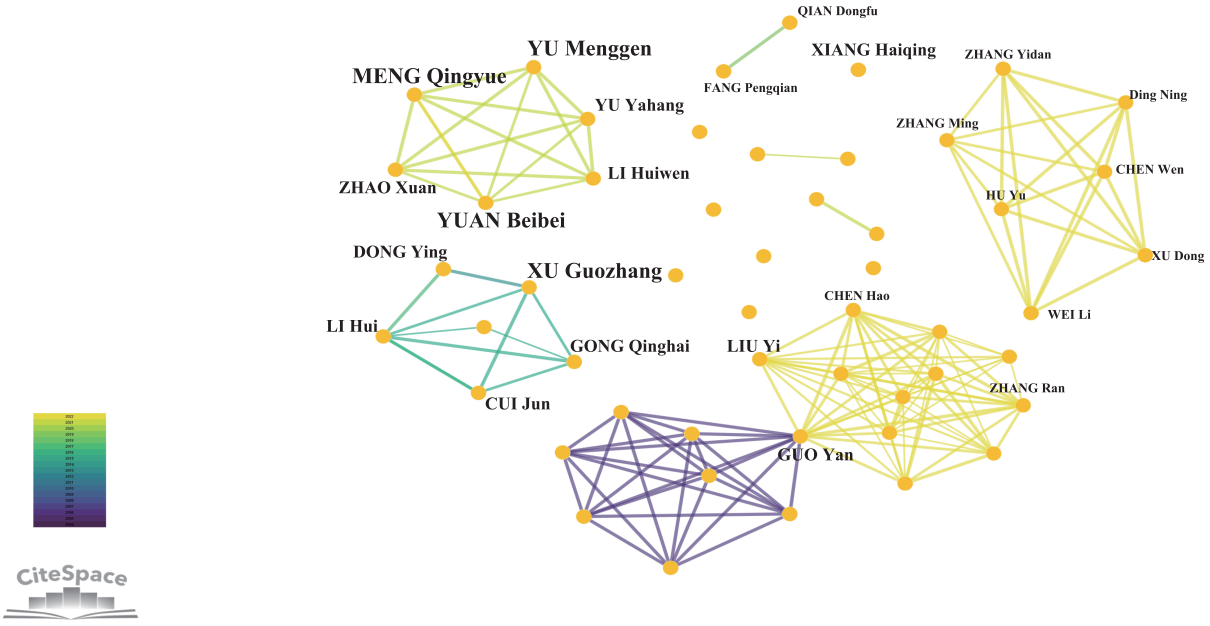
SUPPLEMENTARY MATERIAL

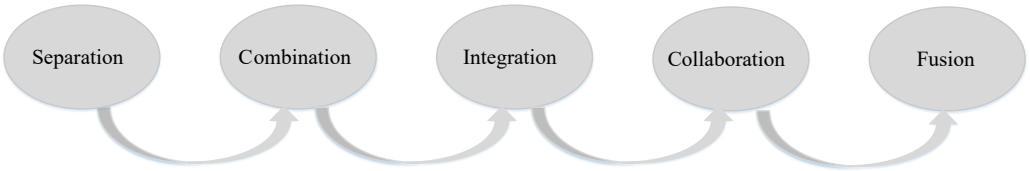


SUPPLEMENTARY FIGURE S1. Temporal distribution of the publications.



SUPPLEMENTARY FIGURE S2. Author cooperation visualization map.

SUPPLEMENTARY FIGURE S3. Institution cooperation visualization map.



SUPPLEMENTARY FIGURE S4. The words development chart.