

Mental Health of Older People Living with HIV: A Visualization Analysis via CiteSpace

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Abstract

Objective: To analyse the current status and hotspots of research on the mental health of OPLWH, and to provide reference for research in related fields. **Methods:** Literature in the field of mental health of OPLWH included in Web of Science database from 2009 to April 1, 2024 was searched, and keywords, authors, countries and institutions were analysed using CiteSpace software. **Results:** With 1409 final publications included, the number of publications on mental health of OPLWH is generally on the rise, with rapid growth after 2019. Authors Woods, StevenPaul (n = 12) ranked first in the number of articles published. The United States was the country with the most publications (n = 711). University California San Diego (n = 63) and University California San Francisco (n = 63) were both listed as the research institutions with the most articles. Keyword clustering showed that the top three were Mental health, Hearing aids, and Cognitive impairment. High frequency keywords that co-occurred were Prevalence (n = 232), health (n = 170), quality of life (n = 148), depression (n = 146 articles), and risk (n = 140 articles). **Conclusion:** This article summarises the progress of research on the mental health of OPLWH and reveals the background, trends and trending topics in the mental health of OPLWH through statistical analyses and network visualisations. Depression, dementia, substanceuse, alzheimers disease, cognitive impairment, anxiety are the research components of mental health of OPLWH. Also, this paper finds significant research potential in areas such as alcohol use and loneliness. This paper can provide basic reference and directional guidance for future research in this area.

Keywords

HIV, Older People Living With HIV, Mental Health, Citespace, Bibliometric

1. Introduction

Acquired Immunodeficiency Syndrome (AIDS) is a malignant infectious disease caused by the Human Immunodeficiency Virus (HIV), which is one of the prominent public health problems globally due to its rapid spread and high mortality rate. According to the 2022, The Joint United Nations Programme on HIV/AIDS (UNAIDS) report, by 2021, approximately 38.4 million people will be living with HIV globally, and the number of people receiving antiretroviral therapy in 2021 will grow at a slower rate than in the past decade (WHO, 2022).

Internationally, people aged 65 years and older are categorised as being in the old age stage, while in the field of AIDS research, ≥ 50 years is generally used as the classification threshold for the older population, referred to as Older People Living With HIV (OPLWH), in order to differentiate it from the sexually active population (15 - 49 years) (Autenrieth et al., 2018). In recent years, the demographic profile of people living with HIV/AIDS has changed in the context of an ageing population, and the number of reports of OPLWH has shown an increasing trend. With the application of highly effective antiretroviral therapy (ART) greatly prolonging the survival time of patients with AIDS, it has enabled many young adults infected with HIV to survive into old age. This is coupled with the increasing number of new HIV infections in the elderly. Some data show that there will be approximately 6.9 million OPLWH worldwide in 2020, and the number continues to rise globally (Zhang et al., 2020). Relevant studies show that the median age of HIV-infected patients receiving ART was 43.9 years in 2010, and the median age of HIV-infected patients will increase to 56.6 years by 2030, and the number of people over 50 years old will increase from 28% to 73% (Smit et al., 2015), which alerts us to the fact that the increasingly large group of OPLWH needs to receive more attention from us.

At present, the society discriminates against HIV-infected people, and there is no effective cure, HIV-infected people usually have a large psychological burden, and the vast majority of infected people will have different degrees of anxiety, depression or panic symptoms (Sanaz et al., 2017), which further causes HIV-infected people to have a lower quality of life, poor health, etc. The rapid growth of the OPLWH group has attracted more and more people's attention. OPLWH suffer from phenomena such as being unable to gain people's understanding and sympathy, being discriminated against by society and even by their children, and thus marginalising themselves, resulting in negative emotions and more complex psychological problems. Compared to young adults, OPLWH may face more complex physical health and psychosocial challenges due to the double whammy of ageing and AIDS (Brown & Adeagbo, 2021). Studies have found that the prevalence of depression among OALWH in sub-Saharan Africa ranges from 6% - 59% (Mwangala et al., 2021), compared to 26% among their HIV-negative peers, which is significantly lower than among OALWH (Bedaso et al., 2022). Female OPLWH in the United States are at a higher risk for depression (Yu et al., 2023). Research (Liu et al., 2014) found that depression was more common among OPLWH than among young and middle-aged HIV/AIDS patients, and

that OPLWH may experience more psychological burden and stress in their lives and have reduced access to medical and social services due to societal discrimination against AIDS (Heckman et al., 2002). In addition to early detection and diagnosis of OPLWH infected patients and rationalisation of antiretroviral therapy according to the complexity of the patient's condition, the mental health status of this population should also be taken into account.

Bibliometrics is the use of collected data from objective literature to analyse and explore the basic overview of research, the number of important elements and connections, and hotspots (Zhao et al., 2022). In recent years, CiteSpace has been widely used in various fields, and in this study, CiteSpace was used to visualise the current status of the content, research priorities, and hotspots of OPLWH mental health research, to provide a holistic view of the field of research in the care of OPLWH in order to provide suggestions and reflections to promote more effective psychological care for OPLWH.

2. Materials and Methods

2.1. Data Sources and Methods

Web of Science (WOS) is one of the most commonly used sources of academic databases, and in order to ensure the comprehensiveness, accuracy, and high reliability of the original data, we selected the literature through the Science Citation Index-Expanded version (SCIE) of the Web of Science Core Collection (WoSCC). In this study, WoSCC was used as the search database to retrieve the dataset on "OPLWH mental health". WoSCC is one of the databases that provides a comprehensive range of study types and immediate data updates, and it is widely used for bibliometric analyses. The data retrieval period was from 2009 to April 1, 2024, and a total of 1634 documents were retrieved with the following data retrieval strategy:

#1: TS = (senile OR gray-headed OR gerontal OR geratic OR elderly OR old)

#2: TS = (Mental Health OR Mental Disorder* OR Mental Disease* OR Psychiatric Health OR Psychiatric Disorder* OR Psychiatric Disease*)

#3: TS = (HIV OR HIV infect* OR HIV patient OR human immunodeficiency virus OR Acquired Immunodeficiency Syndrome OR AIDS)

#4: #1 AND #2 AND #3

The retrieved documents were further screened by the following inclusion criteria: 1) the document type was "article"; 2) the language was "English". The data were exported from WoSCC as "Full Record and Cited References" in "plain text file" format. After de-duplication in CiteSpace, 1409 documents were finally included.

2.2. Data Analysis Method

CiteSpace software is an information visualisation software developed by applying Java language, developed by Chen in 2004 (Chen, 2004), it is an information visualisation software based on the theory of co-citation analysis and path-finding

network algorithms to measure the literature in a specific field, which performs bibliometrics and visualisation analysis. It can be used to measure the collection of literature in a specific field, and present the information on the knowledge structure, distribution, and development pattern of scientific literature in the form of a visual knowledge map, in order to explore the key paths of the evolution of the subject area, and to form an analysis of the evolution of the discipline and the frontiers of the discipline's development through the visualisation map.

The parameters setting of CiteSpace: In this study, CiteSpace 6.1.6 software was used to visualise and analyse the basic information of the retrieved literature, such as research authors, research institutes, annual publications, countries, keyword distributions, citations, and so on. The “timeslicing” of the retrieved literature was set to 2009-2024, and the length of a single timeslice was set to “1”. The cut mode is selected according to the need, and the other parameters use the default values.

3. Result

3.1. Publication Year Analysis

The annual number of publications is an important value that can illustrate the development of research in the field. The number of publications increased year by year from 2009 to 2018, and the number of publications started to show a rapid growth trend from 2019 and stabilised, with the number of publications of 156 articles in 2022 in the first place. Since only four months of literature were retrieved in 2024, and the complete data for the whole year were not included, there was a cliff drop in the number of publications in 2024 in the figure, which is shown in **Figure 1**.

3.2. Author Analysis

The node type selects “Author” to generate a visualisation of the author's

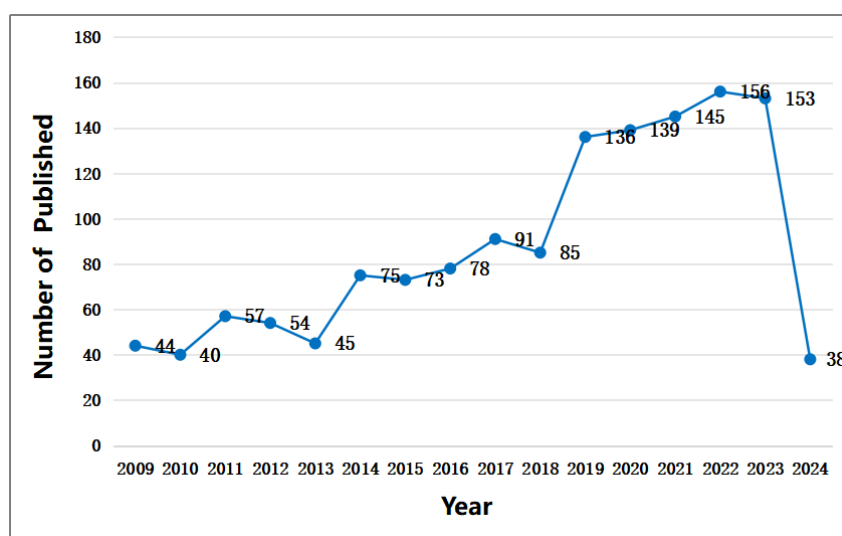


Figure 1. Annual trend chart of publications.

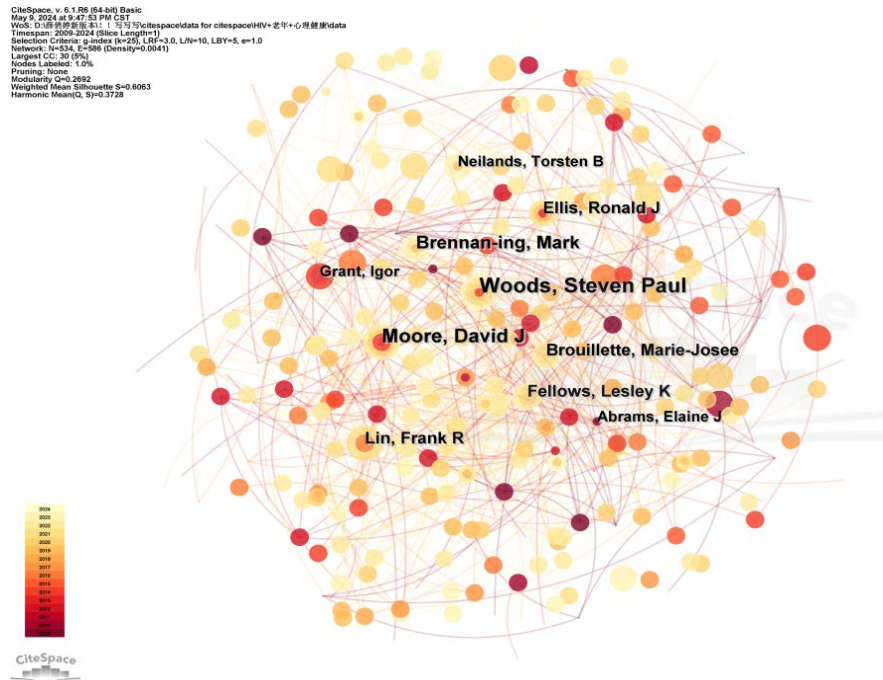


Figure 2. The network of authors.

publications. Based on the number of authors' publications, it is possible to understand the main researchers in the field and to identify high-impact authors of research related to "OPLWH mental health". As shown in the authors' co-occurrence analysis graph (**Figure 2**), there are 534 nodes and 586 links, with a density of 0.0041, which is small and indicates that authors do not work closely with each other. The size of a circle represents how many authors have published literature, and **Table 1** lists the top 10 core authors in terms of the number of publications. The top authors in terms of publications are Woods, Steven Paul ($n = 12$), followed by Moore, David J ($n = 9$), and Brennan-ing, Mark ($n = 7$). The line connecting the nodes represents that there is collaboration between the two authors, and the thicker the line, the higher the frequency of co-occurrence, indicating that their research relationship is closer and there is more collaboration between the researchers. However, the author visualisation mapping of this study shows that there is not a strong collaboration between individual authors, which suggests that in the field of OPLWH mental health research, individual research teams are more likely to carry out research on their own, with relatively few opportunities for collaboration.

According to Price's theory $M_p = 0.749$, where M_p is the minimum number of publications of core authors in the study sample, N_{pmax} is the maximum number of papers published by authors in the study sample (Ding, 1992), Woods, Steven Paul has the largest number of publications, and the number of articles it contributes to is 12, i.e., $N_{pmax} = 12$, which is calculated to be $M_p \approx 2.595$, in accordance with the principle of rounding, i.e., authors who publish Authors with 3 or more publications can be considered as core authors in the

Table 1. The top 10 most productive authors.

Rank	Author	Count of articles	Year
1	Woods, Steven Paul	12	2014
2	Moore, David J	9	2013
3	Brennan-ing, Mark	7	2019
4	Ellis, Ronald J	6	2013
5	Brouillette, Marie-Josée	6	2020
6	Lin, Frank R	6	2016
7	Fellows, Lesley K	6	2020
8	Grant, Igor	5	2013
9	Neilands, Torsten B	5	2019
10	Abrams, Elaine J	5	2009

field. As a result, there are 33 core authors in the field of OPLWH mental health research, and the core authors have published a total of 146 articles, which only accounts for 10.36% of the total relevant literature, which is a relatively low percentage of the number of papers published by the core authors group compared with the 50% of Price's law, indicating that a strong core author group has not yet been formed in the field of OPLWH mental health research.

3.3. Country Analysis

The number of published literature can reflect the scientific research capacity, level and influence of a country as a whole. The node type selection of "country" generates a visualisation map of the country/region's publication status, where the circle size of the node represents the amount of publications in that country, and the node-to-node connectivity represents the closeness of cooperation between countries (Chen, 2015). **Figure 3** shows the country co-occurrence map for OPLWH mental health, generating a visualisation map with 97 node counts and 572 connectivity counts and a density of 0.1229. **Table 2** shows the top 10 countries in terms of the number of publications, with the United States topping the list with 711 publications. They are followed by countries such as the UK (n = 158), Canada (n = 103), China (n = 93), and Australia (n = 90). And based on the multiple connecting lines shown in the figure, it can be further concluded that there is relatively close co-operation between countries.

3.4. Institution Analysis

The node type selection "Institution" generates a visualisation map of the institution's issuing status. **Figure 4** plots the co-occurrence graph of OPLWH mental health's issuing institutions, with 472 nodes, 1374 connecting lines, and a density of 0.0124. The English literature of 472 research institutions was included in this study, of which the top 10 institutions in terms of the number of

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 Network: g=0.9727, m=0.1574, L=1.0, Q=0.9727, N=10, LB=0.6, e=1.0
 Modularity Q: 0.9727
 Mean Silhouette S: 0.9727
 Weighted Mean Silhouette: 0.9727
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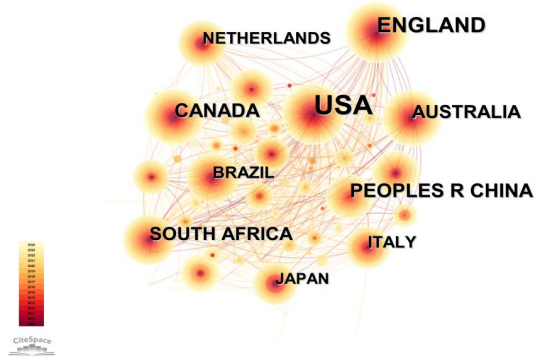


Figure 3. The network of countries.

Table 2. The top 10 countries.

Rank	Country	Count
1	USA	711
2	ENGLAND	158
3	CANADA	103
4	PEOPLESRCHINA	93
5	AUSTRALIA	90
6	SOUTHAFRICA	84
7	BRAZIL	49
8	NETHERLANDS	47
9	ITALY	46
10	JAPAN	42

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 Network: g=0.9727, m=0.1574, L=1.0, Q=0.9727, N=10, LB=0.6, e=1.0
 Modularity Q: 0.9727
 Mean Silhouette S: 0.9727
 Weighted Mean Silhouette: 0.9727
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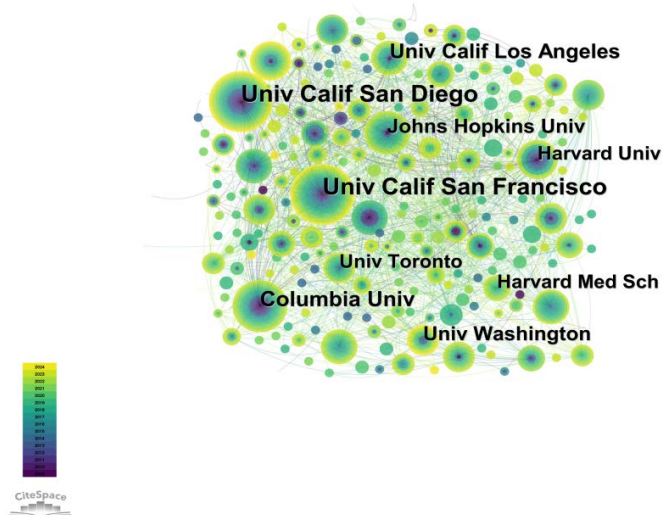


Figure 4. The network of institutions.

Table 3. The top 10 most productive institutions.

Rank	Institution	Count	Centrality
1	University California San Diego	63	0.16
2	University California San Francisco	63	0.07
3	Columbia University	44	0.07
4	University Calif Los Angeles	36	0.04
5	University Washington	33	0.06
6	Johns Hopkins University	32	0.06
7	Harvard Medical School	28	0.04
8	University Toronto	27	0.05
9	Harvard University	27	0.06
10	NYU	26	0.09

articles issued published a total of 379 papers, which accounted for 26.9% of the total number of articles included. The size of the node represents the amount of publications of the institution, the larger the node the more publications, and vice versa the less. As can be seen in **Table 3**, University California San Diego ($n = 63$) and University California San Francisco ($n = 63$) tied for first place, followed by Columbia University ($n = 44$), University Calif Los Angeles ($n = 36$), and University Washington ($n = 33$). This shows that the majority of the top ten issuing institutions are located in the United States. In terms of centrality, University California San Diego has the highest centrality (0.16) among the top ten issuing institutions. Overall, the institutions are not closely related to each other.

3.5. Main Research Hot Spots

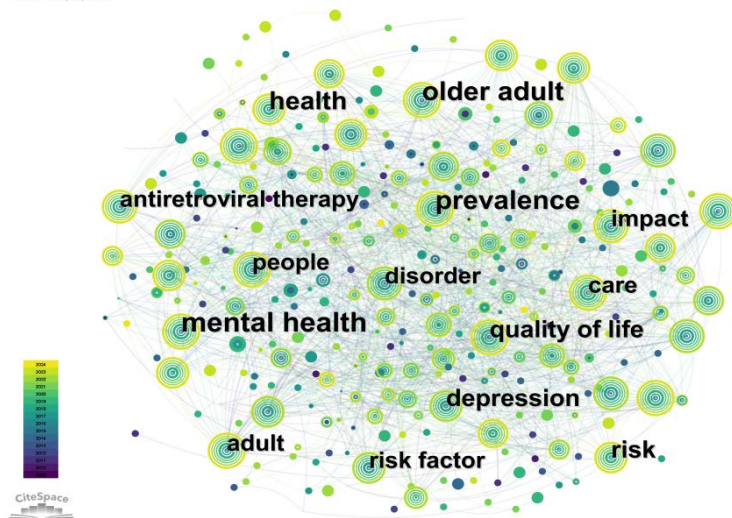
3.5.1. Keyword Co-Occurrence Analysis

Keywords are a condensation of the content and concerns of the article, which can intuitively reflect the interaction between hotspots. The analysis of high-frequency keywords can better control the research hotspots and directions. The higher the frequency of keywords, the higher the research hotspot (Chen, 2004). In this study, there are 450 keywords in 1409 documents, and the keyword co-occurrence graph is shown in **Figure 5**. There are 450 nodes in the keyword co-occurrence graph, with 2247 links, and the density of the network is 0.0222. In addition to the search terms “mental health” and “older adult”, the top 5 keywords were “prevalence” ($n = 232$), “health” ($n = 170$), “quality of life” ($n = 148$), depression” ($n = 146$), “risk” ($n = 140$) (**Table 4**). These keywords have high frequency, which can be seen that they are all important pivotal nodes, reflecting the research hotspots in this field. Among them, prevalence has the highest centrality of 0.07. After classifying and summarising the other high-frequency keywords, it can be summarised that in the field of mental health, there are “depression”, “dementia”, “alzheimers disease”, “cognitive impairment”, “anxiety” and other keywords.

Table 4. The top 5 high-frequency keywords.

Rank	Keywords	Count	Centrality
1	prevalence	232	0.07
2	health	170	0.02
3	Quality of life	148	0.03
4	depression	146	0.03
5	risk	140	0.03

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 Network: 436, 2241 (Density=0.2622)
 Largest CC: 48 (89%)
 Nodes Labeled: 1 (0%)
 Pruning: Pathfinder
 Modularity Q=0.3281
 Weighted Mean Silhouette S=0.6679
 Harmonic Mean(Q, S)=0.4378

**Figure 5.** The network of keywords.

3.5.2. Cluster Map Analysis

Cluster analysis of the obtained data on the basis of co-occurrence aims to discover the research content of OPLWH mental health and further explore the knowledge structure of OPLWH mental health research hotspots. The keyword clustering mapping focuses on modularity Q and mean Silhouette S, two indicators that can reflect the clustering effect (Chen et al., 2015). Modularity Q (Q value) can be used to measure the stability of the generated clustering network, and it is generally believed that a Q value greater than 0.3 indicates that the clustering structure is significant and the effect is better. Mean Silhouette (S-value) can be used to measure the degree of similarity of the nodes within the clusters, and it is generally believed that an S-value of more than 0.5 indicates a high degree of matching within the clusters, and the clustering is reasonable. The results of keyword clustering in this study are shown in **Figure 6**, the Q value is $0.7387 > 0.5$; the S value is $0.8794 > 0.7$. Overall, the results of keyword clustering are significant and reasonable, and the modularity of the clusters is good. Eventually, 20 clusters were obtained in this study, and after screening, we chose to keep the first 10 clusters, and their S-values were all above 0.8, indicating that

the results were credible (Table 5). As shown in Figure 6 shown, each colour block in the figure corresponds to a cluster, and each cluster contains multiple closely linked keywords, and the smaller the cluster number represents the higher number of keywords contained. The colour blocks of the keyword clusters in this study have a large overlap, indicating that the different clusters are closely related.

3.5.3. Keywords with Citation Bursts

The trend of research frontiers refers to the hotspots that best represent the future development of a certain research field, through the mutation rate detection, we can understand the more active related literature in a certain period, and track the future direction of the research based on the trend of the literature.

Table 5. Keyword cluster analysis.

Cluster ID	Size	Sihouette	Label (LSI)	Mean (year)
#0	34	0.855	Mental health	2014
#1	33	0.849	Hearing aids	2014
#2	29	0.87	Cognitive impairment	2014
#3	29	0.935	Perinatal hiv infection	2013
#4	27	0.869	health-related quality	2015
#5	27	0.843	Child protection	2018
#6	25	0.874	Antiretroviral therapy	2013
#7	25	0.901	Sensory loss	2014
#8	24	0.858	Substance use	2014
#9	22	0.862	women	2014

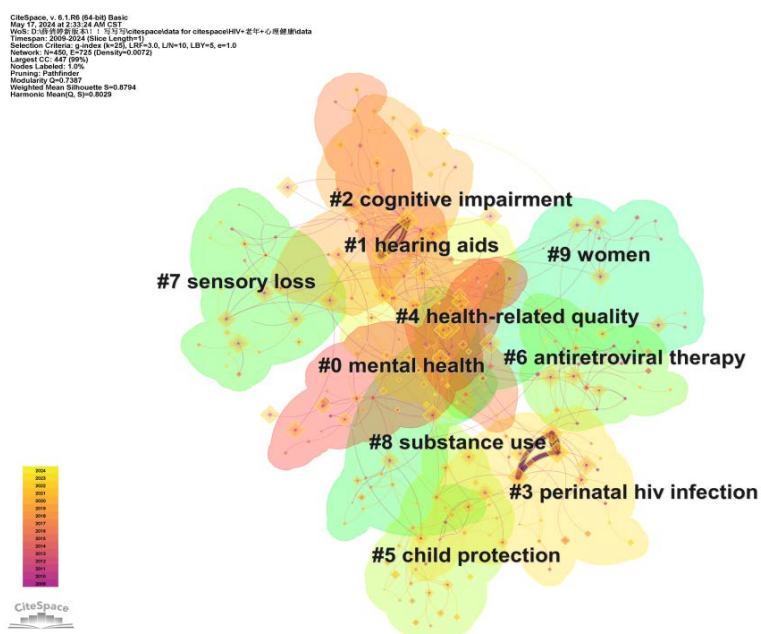


Figure 6. Cluster visualization based on the reference cocitation network.

The hotspots of research and the future development trend of the mental health of OPLWH can be reflected by the keyword mutation situation (Huang et al., 2022). After analysing the keywords by CiteSpace software, there are 47 emergent terms from 2009 to 2024, and the top 40 keywords are shown in **Figure 7**. The keywords that will continue to be emergent until 2024 are “alcohol use”, “index “, and “loneliness”. Among them, “index” is not relevant to the analysis of this study, so it was excluded. The intensity of keyword breakthrough indicates the degree of interest in the study, and the keywords with high breakthrough intensity are “pattern” (5.75), “adolescent” (5.55), “active antiretroviral therapy” (5.34), “older” (5.32).

4. Discussion

4.1. Status of OPLWH Mental Health Research

Since 2009, the mental health of OPLWH has been gaining international attention day by day, and with the ageing population era, the mental health of OPLWH

Top 40 Keywords with the Strongest Citation Bursts

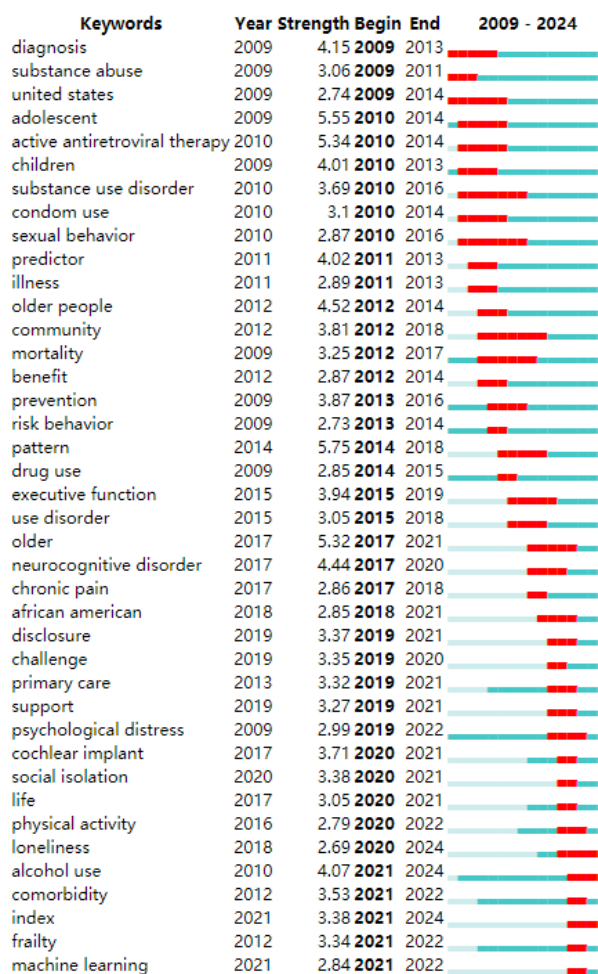


Figure 7. The top 40 reference with the strongest citation bursts.

has continued to gain international attention since 2019, and its research fervour continues to this day. From the number of publications, centrality, and institutional cooperation network of each country, it can be deduced that the United States, the United Kingdom, and Canada are the main countries of mental health research in OPLWH, and are in a key position in international research, of which the United States is far ahead with 711 publications, more than half of the total number of publications, and the U.S. publishing institutions occupy nine of the top ten institutions, which is enough to see the leading position of the United States in this field. It may be related to the fact that Europe and the United States have entered the aging society earlier, and it may also be related to the development of HIV, the level of economic development, and the lifestyle in the local area. Secondly, Europe and the United States are native English speakers, and the published literature is more likely to be accepted by databases such as WOS, so the literature on OPLWH mental health research published in Europe and the United States, represented by the United States, is predominant.

4.2. OPLW Mental Health Research Hotspots

Research hotspots are the topics that researchers have paid extensive attention to in a particular field during a certain period of time, and keywords highly summarise the thematic content of the article, and high centrality or high frequency keywords can represent the research hotspots in the field to a certain extent. The frequency and centrality of keywords were analysed by CiteSpace software for OPLWH mental health related research, and the OPLWH mental health research hotspots include depression, dementia, alzheimers disease, cognitive impairment, and anxiety.

Milanini B's study (Milanini et al., 2017) mentions that neuropsychiatric symptoms are common in the older AIDS population, including depression, cognitive impairment and substance abuse. A systematic review (Mwangala et al., 2021) of 15 sub-Saharan African countries showed that 6% - 59% of PLWH exhibited varying degrees of depression. Between 4% - 61% of the study population exhibited cognitive impairment. Depressive symptoms not only affect the physical and mental health of OPLWH, but also contribute to antiretroviral treatment adherence as well as quality of life, thus falling into a vicious cycle of depression-reduced treatment adherence-decreased physical condition-decreased quality of life-even more depression. Studies have shown that women with HIV/AIDS are more likely than men to experience mood problems such as depression (Li et al., 2017). This may be related to the fact that female OPLWH have poorer neurocognitive and physical functioning compared to men, and that they are emotionally delicate and sensitive, with poorer psychological tolerance and are more likely to adopt negative coping styles.

Studies have shown (Asher et al., 2016) that OPLWH are more likely to develop complications and have a worse prognosis than younger people. Among the various complications caused by AIDS, HIV-associated neurocognitive

disorders (HAND) are the most common. These include HIV associated dementia (HAD) and mild cognitive impairment (MCI), which is a transitional state between normal aging and dementia, and is the preclinical stage of dementia. The majority of OPLWH have progressed to the AIDS stage, and the neurological system is often involved, such as HIV-associated dementia syndrome. AIDS dementia syndrome may not be easily distinguished from other neurological disorders commonly seen in the elderly such as dementia and Alzheimer's disease in terms of clinical symptoms, and are therefore easily missed and misdiagnosed. Research (Feng & Zeng, 2018) found that the probability of cognitive impairment in elderly AIDS patients was 23%. In contrast, 49% of elderly AIDS patients in Puerto Rico had cognitive impairment and 29% of AIDS patients had dementia.

The physical condition and physiological characteristics of the elderly make them more susceptible to co-infections. The worse the physical condition and the more serious the disease, the more the patient's worry and anxiety will gradually increase, which leads to a further increase in the psychological burden of OPLWH, aggravating their anxiety (Liu et al., 2023).

4.3. OPLWH Frontiers in Mental Health Research

Mutant words are words that appear more or are used more frequently in a specific period of time, which can predict the trend of research and mine hotspots, and the greater the intensity of the mutation, the more obvious the trend of the research frontier around the keyword to carry out the theme. By analysing the keyword mutation words of OPLWH mental health related research through CiteSpace software, the research frontiers in recent years are mainly as follows: "alcohol use" and "loneliness".

4.3.1. Alcohol Use

A study (Williams et al., 2014) found that 57% of OPLWH had a history of alcohol use in the past year, with 7% falling into the category of severe unhealthy drinking, and that the prevalence of unhealthy drinking among OPLWH is broadly in line with estimates from younger samples. Alcohol use disorder (AUD) is often considered a psychological problem or a common mental disorder. Alcohol use disorders and depressive disorders have a co-morbidity rate of up to 43% to 48% (Pettinati et al., 2013; Huang et al., 2020). Psychological problems such as anxiety and depression may be one of the triggers of AUD, and AUD itself may exacerbate psychological problems. As a serious infectious disease, AIDS imposes long-term physical and psychological burdens on patients. Patients may need to undergo treatment for a long period of time and endure the pain and discomfort of the disease, and these stresses may lead them to seek the help of alcohol to alleviate emotional problems such as anxiety and depression. In addition, social support is a protective factor against alcohol consumption in older age groups (Casale et al., 2015), and social prejudice and discrimination against HIV may also cause patients to feel isolated and excluded, further

increasing the likelihood that they will seek comfort through alcohol consumption. Finally, OPLWH may be more susceptible to the negative effects of alcohol use and more prone to problems with alcohol use disorders because their physical functioning has gradually declined, they are less able to metabolise alcohol as they age, and interactions with prescription medications may affect the effectiveness of the medication or exacerbate the side-effects, making them more susceptible to problems such as alcohol intoxication (Armstrong et al., 2018).

Therefore, the problem of alcohol use disorder among OPLWH needs to be given sufficient attention and concern. Medical institutions and social organisations should provide these patients with appropriate support and assistance, including psychological counselling, rehabilitation treatment and so on, in order to help them get rid of alcohol and improve their quality of life. There is also a need to strengthen health education for the elderly to enhance their health awareness and self-care ability to prevent the occurrence of problems such as alcohol use disorder.

4.3.2. Loneliness

Research (Greene et al., 2018) found that 58% of OPLWH had symptoms of loneliness. OPLWH have higher levels of loneliness than older adults without HIV. Loneliness is a complex phenomenon that is intertwined with substance use, social networks, and other mental health issues such as depression. OPLWH with symptoms of loneliness may be smokers or at risk for alcohol and/or substance use problems (Stanton et al., 2015). As AIDS is a serious infectious disease, patients have to deal with the disease and the stress of treatment for a long period of time, and this physical burden may make them feel mentally exhausted and find it difficult to have the energy to engage in social activities, which increases the feeling of loneliness. In addition, the social perception and attitude towards AIDS may also have an impact on the psychology of OPLWH. And OPLWH may face the problem of insufficient family and social support. Due to ageing and illness, they may have lost their original social contacts and intimate relationships (Vance, 2013), and family members may not be able to provide sufficient support and care for various reasons, which may also make them feel lonely and helpless (Yoo-Jeong et al., 2020). OPLWH's own psychological state can also affect their feelings of loneliness. They may feel despair and frustration about their condition, lose confidence in the future, and develop negative emotions such as depression that will make it more difficult for them to integrate into society and enjoy normal interpersonal interactions and life (Spitzer et al., 2019).

Therefore, as far as OPLWH are concerned, we need to give them more care and support, help them build up a positive mindset, encourage them to participate in social activities, enhance their social ties and alleviate their sense of isolation. At the same time, we also need to raise the community's awareness and understanding of AIDS, eliminate prejudice and discrimination, and create a more friendly and inclusive social environment for OPLWH.

4.4. Limitation

However, this study also has limitations. One is that the data used in this study were included in the literature downloaded from WoSCC, which makes the data less comprehensive and the analyses may not be complete. The second is that the version of CiteSpace software used in this study is not the latest version, and there may be bias in data processing, and the graphs and charts are still unsatisfactory despite the fact that the data were processed several times in this study.

5. Conclusion

CiteSpace is a widely used knowledge graph analysis tool to visualise the distribution of authors, countries, keywords, references, etc. for a particular research area. Since 2009, significant progress has been made in the major knowledge areas of OPLWH mental health research. With the arrival of the ageing era, the mental health of elderly patients has gradually gained attention and concern, and the number of studies in this field has rapidly increased and maintained a certain degree of heat after 2019. Currently, the hotspots of OPLWH mental health research focus on “prevalence”, “health”, “quality of life”, “depression” and “risk”. Future research trends are likely to move towards “alcohol use”, and “loneliness”. As a healthcare professional, we should not only pay attention to the physical symptoms of OPLWH, but also pay attention to the neuropsychological condition, and provide comprehensive treatment and care to OPLWH.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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