



Prevention of mental illness within public health: An analysis of progress via systematic literature review and a pathway forward

Randall Waechter^{a,b,c,1,*}, Cassandra Gallant^{a,1}, Kristen De Wilde^a, Gabrielle Arens^a, Taylor Brady^a, Jasmin Custodio^a, Yusuke Wakita^a, Barbara Landon^{b,c}, Yvonne Boateng^a, Nadeem Parthab^a, Anjali Bhagat^a

^a School of Medicine, St. George's University, Grenada

^b Windward Islands Research and Education Foundation, Grenada

^c School of Graduate Studies, St. George's University, Grenada

ARTICLE INFO

Keywords:

Public health
Prevention
Mental health
Mental illness
Maternal-child health

ABSTRACT

Primary prevention is the cornerstone of public health. Prevention is especially important for chronic diseases of significant burden such as mental illnesses because many of them have limited treatment options, an onset in childhood or in adolescence, and are linked to adverse childhood experiences requiring a focus on early childhood and maternal-child health (MCH). Despite this need, there appears to be a paucity of research into prevention of mental illnesses within public health. To confirm this, we performed a systematic literature review to quantify the proportion of articles in public health that focus on prevention of mental illness versus intervention for these illnesses after their onset, and the proportion of published articles within MCH that focus on mental health. Between November 2019 and August 2021, we reviewed 211,794 published articles from 147 Scimago-ranked English public health journals with no limit on year of publication. As hypothesized, a very small portion (2.2%) of mental health articles included primary prevention and a small portion of MCH articles (7.8%) included mental health. These results are consistent with the existence of a research gap in mental illness prevention within the public health field. Given the early onset of mental illness, the importance of early childhood experiences in the later development of mental illness, and the importance of the social-emotional connection between mother and child for building resilience, public health professionals must incorporate evidence from the field of MCH to develop and assess more primary prevention programs for mental illness.

1. Introduction

Primary prevention—the avoidance of biological, social, and environmental factors that cause illness and disease (Winslow, 1920)—is the foundation of public health (Waechter, 2021a) and can be traced back at least to medical writings from the 2nd century CE (Rosen, 1974). It has delivered significant social benefits such as improved hygiene, reduced deaths from motor vehicle accidents, and reduced illness from vaccinations. Yet, as James Macalister Mackintosh noted in 1953: “Everyone says that prevention is better than cure, and hardly anyone acts as if he believes it...Palliatives nearly always take precedence over prevention, and our health services today are too heavily loaded with salvage.

Treatment—the attempt to heal the sick—is more tangible, more exciting, and more immediately rewarding, than prevention.” (Mackintosh, 1953a). Consistent with this view, primary prevention has received historically lower focus and funding than intervention after illness onset despite its higher returns on investment (Rosen, 1974; Trust for America's Health, 2023a; Waechter, 2021b; McDaid et al., 2019). This reduced focus is due to a number of reasons, but primary among them is that prevention requires complex interdisciplinary collaboration across key stakeholders such as legislators, physicians, public health professionals, economists, and educators (Waechter, 2021b; McDaid et al., 2019; Auerbach, 2019; Romano, 2020). Increased calls for development of prevention guidelines have been made by large professional

Abbreviations: MCH, maternal and child health; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, fifth edition; ICS-10, International Classification of Diseases (ICD-10) Chapter V.

* Corresponding author at: St. George's University, WINDREF Building, True Blue, Grenada.

E-mail address: rwachte@sgu.edu (R. Waechter).

¹ Co-first authors.

<https://doi.org/10.1016/j.pmedr.2023.102249>

Received 26 September 2022; Received in revised form 10 April 2023; Accepted 15 May 2023

Available online 18 May 2023

2211-3355/© 2023 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

organizations, including the US Preventive Services Task Force, the US Center for Disease Control and Prevention, Trust for America's Health, the American Academy of Family Physicians, and the American College of Obstetricians and Gynecologists (Waddell et al., 2007). Continuous research and modification of primary prevention programs is necessary to ensure effective application of the guidelines published by these organizations. However, there are few studies that quantify total publications on primary prevention programs to understand the status of primary prevention research within public health (Romano, 2020; Kieling et al., 2011; Andrews et al., 2004). The purpose of the current study was to address this gap.

Mental illness is an important target in primary prevention due to its heavy socioeconomic burden, low number of effective treatments, and potential for intergenerational transmission. The COVID-19 pandemic and its associated increase in reported mental illness raised the impetus among public health officials to explore primary prevention of this class of diseases (Goetzl, 2009; Trust for America's Health., 2022), though the burden of mental illness in the US was growing prior to the pandemic. Between 2008 and 2018, the prevalence of major depressive episodes among 12–17-year-olds alone grew from 8.3% to 14.4% (Iati, 2021). On mental illness more broadly, the Institute for Health Metrics and Evaluation estimated that 1 in 6 Americans (53 million people) experienced mental illness, with an incidence of about 22 million in 2019 (Office of Disease Prevention and Health Promotion, 2020). The impact of mental illness extends beyond the primary symptoms. The World Health Organization (WHO) associates mental illness with lost employment, reduced productivity, family stress, stigma, discrimination, and potential lost opportunity costs to individuals and families (Results Tool, 2021). Socioeconomically, the global cost of mental health conditions in 2010 was estimated to be \$2.5 trillion, with projected cost increase to \$6 trillion by 2030. Approximately one third of this cost is associated with diagnosis, treatment, and care, while the remaining two thirds are associated with loss of productivity, debt, and the cost of pain and suffering (Hosman et al., 2004). The COVID-19 pandemic is expected to accelerate the social and economic cost, requiring urgent innovative approaches by public health officials and policymakers to prevent the onset of mental illness in order to alter its predicted trajectory over the coming decade (Bloom et al., 2011).

A well-established pathway to promote primary prevention of mental illness is via the mitigation of adverse childhood experiences (ACEs), which increase the risk of developing mental illness (Fofana et al., 2020; Sciaraffa et al., 2018). This mitigation can occur through an enhanced social-emotional connection between mother and child (Herzog and Schmahl, 2018; Prado et al., 2021; Dunn et al., 2013; Morris et al., 2007; Prado et al., 2017) particularly in the first 1000 days of life (World Health Organization, 2018). Mental illness is unique in that its onset can be influenced by modifiable maternal factors (Morris et al., 2007; Entringer et al., 2015; Arroyo-Borrell et al., 2017) before the patient is even born, can present at any age, and persist for a lifetime despite guideline-directed treatment (Hellerstedt, 2021; Kessler et al., 2005). A 2005 Lifetime study showed a median onset age of 14 years-old (Arroyo-Borrell et al., 2017), and some studies find the onset as early as age one (Izett et al., 2021). With its high social and individual burden of disease, varying onset, and lack of predictability, tailoring treatment is a challenge. Emerging evidence also suggests that current treatments may not be as effective as once thought (Arroyo-Borrell et al., 2017; Singh et al., 2022). That leaves primary prevention as the most effective option to drive down the burden of mental illness.

The first aim of this study was to quantify the proportion of journal articles in public health focused on primary prevention of mental illness. We hypothesized that less than 20% of the mental health literature in public health would focus on prevention, rather than intervention. Given the importance of early childhood experiences on the development of mental illness, the second aim of this study was to quantify the proportion of published studies within Maternal Child Health (MCH) that focus on mental health versus physical health. We hypothesized

that fewer than 20% of the MCH literature within the field of public health would focus on mental health. Quantifying the literature in this way within public health provides critical insight into progress toward reducing the burden of mental illness for future generations by preventing its onset. To our knowledge, this is the first comprehensive systematic literature review to examine these aims.

2. Methods

We conducted a two-part systematic literature review. In the first part, we quantified the number of published articles in public health that focused on mental health. Then, of those mental health articles, we quantified the number which focused on primary prevention of mental illness. In the second part, we identified the number of published articles in public health focused on MCH. Then, of those MCH articles, we quantified the number which focused on mental health. Mental illness was the problem under examination, the investigation was a systematic review of the public health literature, the comparison was primary prevention versus other public health programs to address mental illness, and the outcome was the proportion of primary prevention articles among all published mental health articles/the proportion of mental health articles among all MCH articles (PICO framework).

I. Scope of public health journal search

The focus of this systematic review was specifically on the public health literature. To identify relevant journals, we input the search term "Public Health journal" into the Scimago journal, Scopus, and Google scholar websites between November 2019 and June 2020. This returned a total of $n = 1,017$ journals (see Fig. 1). After removing duplicates, $n = 647$ journals remained. We refined the list by searching for keywords "preventative medicine" or "public health" in the description and/or title and/or aim of the journal. This resulted in the inclusion of $n = 240$ journals, which were then screened for predatory journal status using the list found at the following site as of June 2020: <https://predatoryjournals.com/journals/>. This resulted in the removal of seven journals, leaving $n = 233$ public health journals. These journals were then ranked based on the Scimago scientific journal ranking system, which is based on sources of citations with a larger journal database when compared to impact factor scores (Falagas et al., 2008). Any journal that was not in the English language and/or did not have a Scimago ranking score was excluded, leaving a final count of $n = 147$ ranked English Public Health journals (see Appendix A).

Subsequently, two different keyword searches were carried out within the $n = 147$ selected public health journals to identify the number of published articles within the fields of mental health and MCH. These searches were implemented via the keyword search function within each specific journal website. If the journal site was not available or did not have a keyword search function, the keyword search was carried out via the journal publisher site (e.g., SAGE, Elsevier, BMC) using the journal name as a search filter along with the target keywords. If the journal publisher site did not have a keyword search function or the keyword search function did not work, the keyword search was carried out via PubMed. This search sequence was followed to include the highest possible number of articles. An analysis of this search protocol confirmed that a keyword search on the journal site and/or publisher site identified more articles than the same keyword search on PubMed 91% of the time.

II. Keyword Search Within the Selected $n = 147$ Public Health Journals

PART ONE: Mental Health Publications within Public Health Search.

The first article search was in the subfield of mental health, using the following keywords: (Mental health) OR (Behavioral health) OR (Substance abuse) OR (Self-harm) OR (delinquency). These keywords were selected to encompass all mental health diagnoses within the Diagnostic

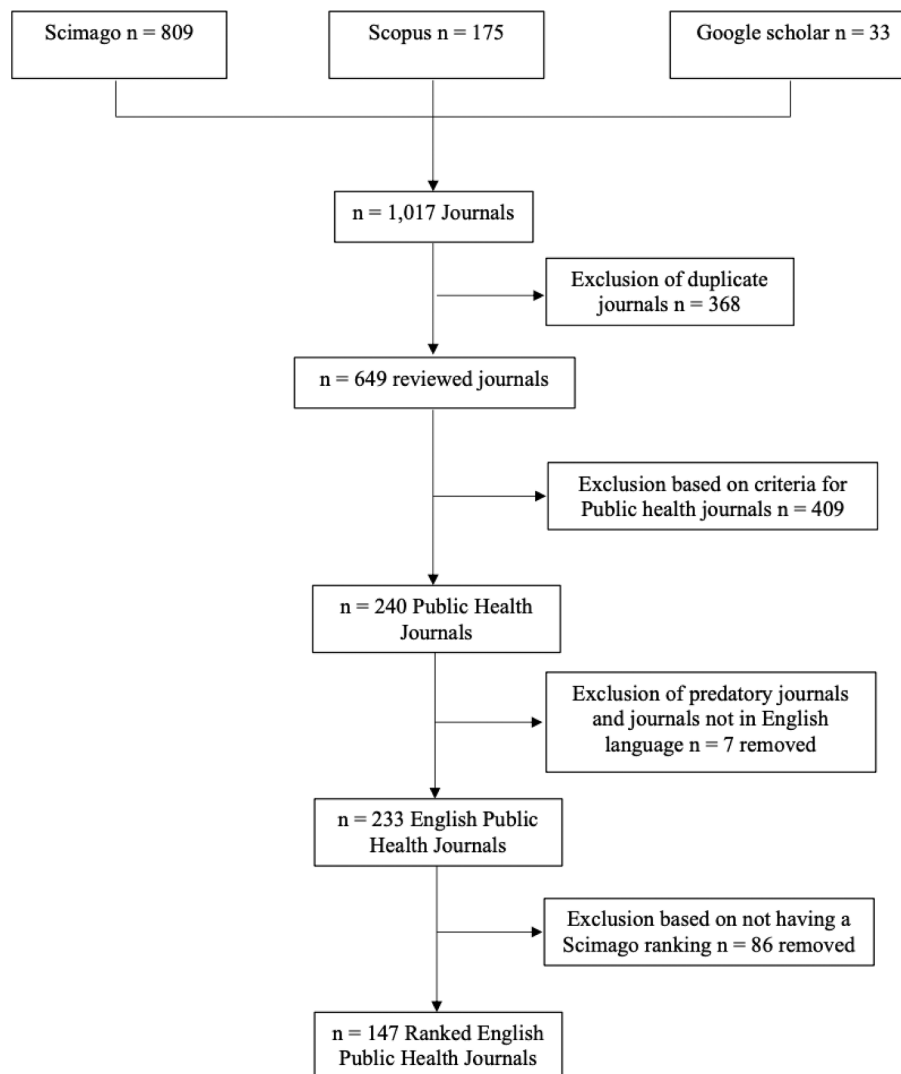


Fig. 1. Selection of public health journals.

and Statistical Manual of Mental Disorders, fifth edition (DSM-V) or International Classification of Diseases (ICD-10) Chapter V. Mental health inclusion and exclusion criteria can be seen in Fig. 2.

Inclusion Criteria for Mental Health

Mental health is defined as a state of well-being within an individual who can cope and contribute to society (American Public Health Association, 2022). Mental illness is a condition of emotion, thinking, or behavior that causes distress and impaired functioning to be able to contribute to society. Any article that discussed any DSM-V or ICD-10 diagnoses (mental disorders) was included. Any article that discussed behavioral disorders such as externalising behaviors (Liu, 2004), internalising behaviors (Liu et al., 2011; Arslan et al., 2021), and impulsivity (Shin et al., 2018) all of which can be expressions of child mental illness were included. Any article that discussed self-esteem, social-emotional development, social cognition, emotional regulation, helplessness, quality of life, resilience, and/or well-being was also included. Articles that discussed physiological challenges that can develop into a mental illness (e.g., stress, inflammation, chronic mental illness) were also included. Articles were included regardless of age, demographic, or gender of the participants. All these specific and associated mental health topics were selected for inclusion to ensure the widest possible range of mental health articles within public health (see Fig. 2). All

inclusion criteria were established before carrying out any keyword or article searches.

Exclusion Criteria for Mental Health

Any article that discussed the reduction of violence without any connection to mental health was excluded. Any article that discussed victims of intimate partner violence was excluded unless there was an explicit connection to a DSM-V or ICD-10 diagnosis or chronic pathology that may have stemmed from this violent experience (e.g., the development of post-traumatic stress disorder following intimate partner violence). Any article that was an editorial or case study was excluded. All exclusion criteria were established before carrying out any keyword or article searches.

Primary Prevention of Mental Health Publications within Public Health Search

All articles included in the mental health search were assessed for discussion of primary prevention via further inclusion/exclusion criterion (see Fig. 2). Primary prevention for the purpose of this article is defined as any program that reduces risk factors associated with the initial onset of a mental illness (World Health Organization, 2018).

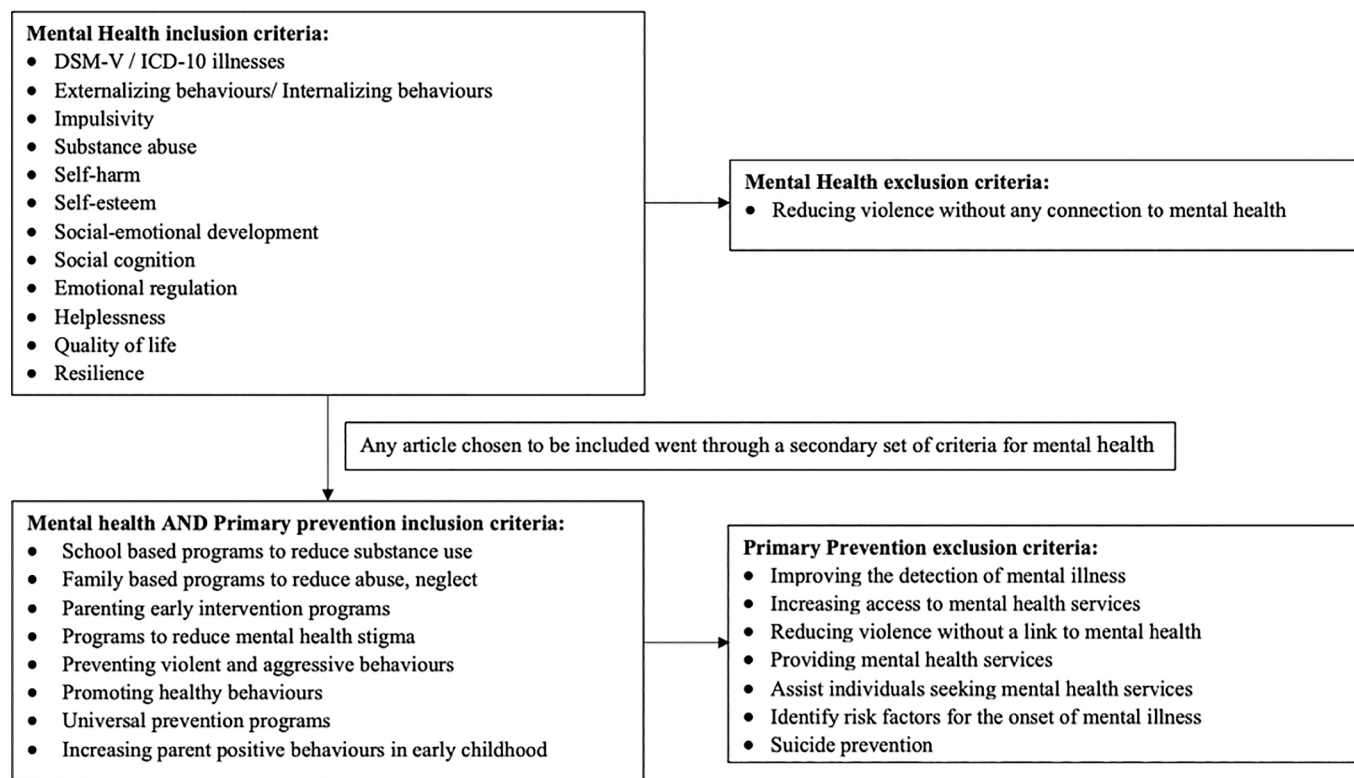


Fig. 2. Mental Health inclusion and exclusive criteria.

Inclusion Criteria for Primary Prevention Within Mental Health Publications

Any article discussing primary prevention programs, which are designed to reduce future incidence of mental illness in populations with no previous history of such an illness, or efforts directed at the promotion of mental health, were included. Examples include school-based programs to prevent substance use among students, family-based programs to prevent abuse or neglect among all families in an area, and education programs to reduce mental health stigma among all students. Any article that discussed ways to increase resilience and coping mechanisms in a population was included. All these programs were selected for inclusion to capture the widest possible range of primary prevention of mental illness articles within the mental health field. All inclusion criteria were established prior to carrying out any keyword or article searches.

Exclusion Criteria for Primary Prevention Within Mental Health Publications

Any article that discussed ways to improve the detection of mental illness, increase access to mental health services, reduce violence without a link to mental health, provide mental health services, assist individuals seeking mental health services, or identify risk factors for the onset of mental illness was excluded. Any article that discussed suicide prevention was excluded because if an individual is sick enough to contemplate suicide this is no longer considered primary prevention, though not all suicides meet the criteria for mental illness (Bachmann, 2018). Any article that discussed primary prevention in addition to any of the secondary prevention or intervention programs mentioned above was included. Any article that was an editorial or a case study was excluded. All exclusion criteria were established prior to carrying out any keyword or article searches.

PART TWO: Maternal and Child Health Publications within Public Health Search.

Part two of the systematic literature review was to search the subfield of maternal child health (MCH), using the following keywords: (Maternal health) AND (Child Health) OR (Child development) OR (Pregnancy) OR (Prenatal) OR (Postnatal) OR (Post-Partum). These keywords were selected to encompass all maternal health publications discussing pregnancy through birth as well as infant/child health. MCH inclusion and exclusion criteria can be seen in Fig. 3.

Inclusion Criteria for Maternal and Child Health

Maternal-child Health (MCH) is defined as a public health field that focuses on a specific population (mothers and children) to protect the individuals who are vulnerable to mortality, morbidity, or social conditions and as an advocacy for care to vulnerable populations (Arroyo-Borrell et al., 2017; Kessler et al., 2005). To increase the chance of capturing as many articles as possible, any article that discussed maternal health throughout pregnancy and the postpartum period was included. Any article that discussed infant through child health and development was included. (i.e., childhood nutrition, living environment, mortality, education, childhood services, etc.). Any article that discussed teratogens, birth defects, developmental problems in children, vaccination status, and breastfeeding were also included. Any article reporting original research data or advancing clinical knowledge of MCH was included (see Fig. 3). All inclusion criteria were determined a priori, before carrying out any keyword or article searches.

Exclusion Criteria for Maternal and Child Health

Any article that discussed only women's health prior to pregnancy (e.g., reproductive health, fertility, any gynecological services) without any discussion of child health was excluded. Any article that discussed only contraception and abortion without a discussion of child health was also excluded. Case studies, case reports, and systematic reviews were excluded. Using the American Psychological Association (APA) definition of adolescence as any child above the age of 12 (American

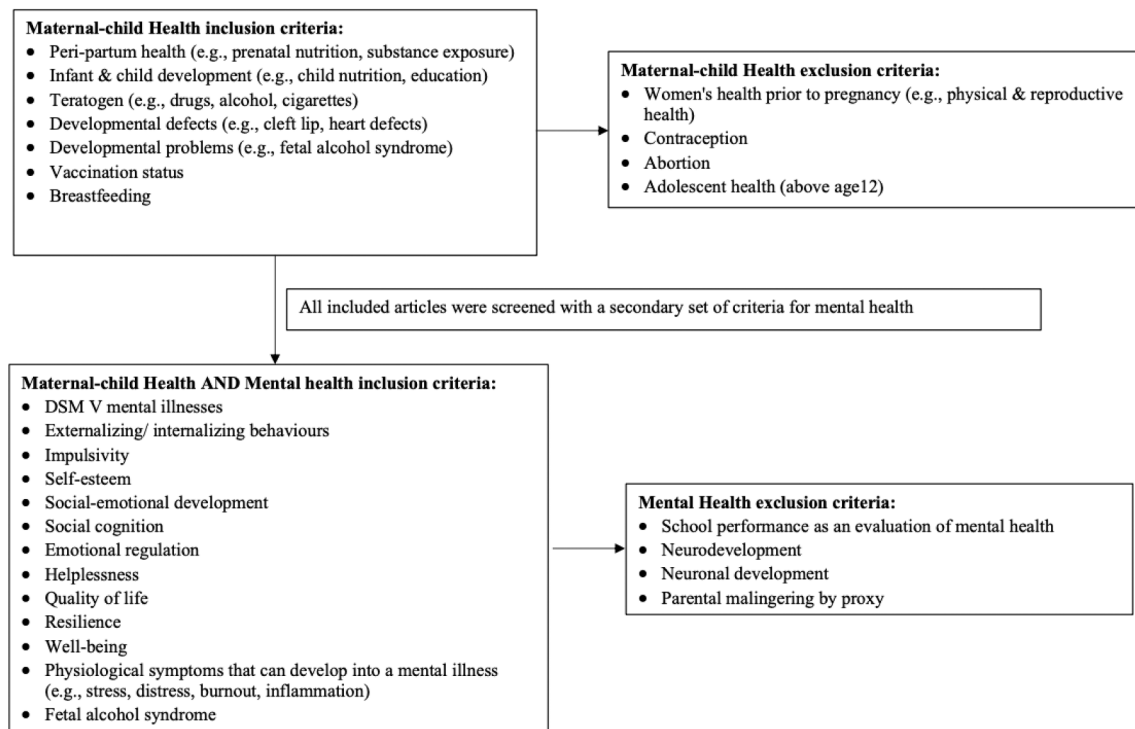


Fig. 3. Maternal and child health inclusion and exclusion criteria.

Psychological Association, 2022), any article that discussed only children above the age of 12, or that only used the word adolescent, was excluded (see Fig. 3). Any article that was an editorial or a case study was excluded. All exclusion criteria were determined prior to carrying out any keyword or article searches.

Mental Health within Maternal Child Health Publications in Public Health Search

Articles included in the MCH search were then assessed for discussion of mental health in children via further inclusion/exclusion criterion.

Inclusion Criteria for Child Mental Health Within Maternal Child Health Publications

Any article that discussed behavioral disorders such as externalising behaviors (Liu, 2004), internalising behaviors (Liu et al., 2011; Arslan et al., 2021), and impulsivity (Shin et al., 2018) all of which can be expressions of child mental illness were included. Any article that discussed self-esteem, social-emotional development, social cognition, emotional regulation, helplessness, quality of life, resilience, and well-being was included in the mental health criteria. Any article that discussed physiological challenges that can develop into a mental illness (e.g., stress, inflammation, chronic mental illness) was also included. Any article that discussed fetal alcohol syndrome was also included. All these specific and associated mental health topics were selected for inclusion to ensure the widest possible range of mental health articles within the MCH field (see Fig. 3). All inclusion criteria were established prior to carrying out any keyword or article searches.

Exclusion Criteria for Child Mental Health Within Maternal Child Health Publications

Any article that discussed only school performance as a measure of mental health or cognitive impairment as well as neuronal development

and neurodevelopmental disorders was also excluded. Finally, any article that only examined parents malingering by proxy through their children was excluded. Any article that was an editorial or a case study was excluded. All exclusion criteria established prior to carrying out any keyword or article searches.

III. Procedure

Identifying and ranking Public Health journals was carried out from November 2019 through March 2020 by one of the co-authors (CG). A team of $n = 8$ co-authors (CG, KD, TB, GA, JC, YW, YB, NP) carried out the second step of searching for journal articles within mental health and MCH using the pre-selected keywords. Between June 2020 and July 2022, the team read through $n = 165,437$ mental health articles and $n = 46,357$ MCH articles that were identified using the pre-selected inclusion and exclusion criteria within these two categories. Each team member was assigned specific journals to read by the team lead (CG). The team met weekly to discuss any questions regarding inclusion/exclusion criteria, and discussion continued until team consensus was achieved regarding article categorization. Inter-rater reliability (IRR) was assessed by two investigators independently reviewing articles for inclusion under the mental health categorization ($n = 644$, IRR = 0.949) and the mental health AND primary prevention categorization ($n = 86$, IRR = 0.987). Two different investigators reviewed articles for inclusion under the MCH categorization ($n = 860$, IRR = 0.956) and the MCH AND mental health categorization ($n = 212$, IRR = 0.971).

3. Results

The first search of mental health within the $n = 147$ public health journals included $n = 165,437$ articles (see Fig. 4a). Applying pre-selected inclusion and exclusion criteria to these articles resulted in the selection of $n = 25,861$ articles. A secondary search for primary prevention within the $n = 25,861$ selected mental health articles resulted in $n = 561$ articles. Thus, 2.2% ($561/25,861$) of the selected mental health articles included primary prevention of mental health.

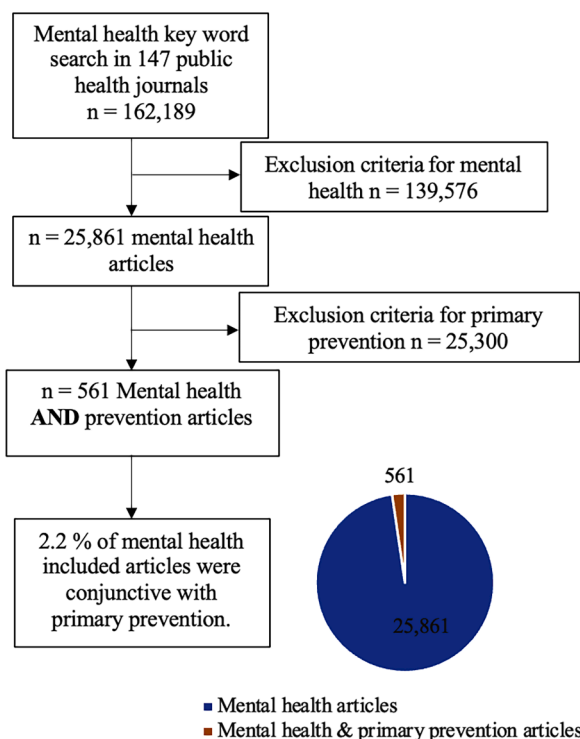


Fig. 4a. Selection of mental health articles that included primary prevention.

The second search of MCH within the n = 147 included public health journals included n = 46,357 articles (see Fig. 4b). Applying pre-selected inclusion and exclusion criteria to these articles resulted in the selection of n = 11,971 articles. A secondary search for mental health articles within the n = 11,971 selected MCH articles resulted in n = 939 articles. Thus, 7.8% (939/11,971) of the selected MCH articles included mental health.

A post-hoc categorical analysis of the n = 561 mental health primary prevention articles was carried out to gain insight into the type of studies

reported and the evidence base, if any, reported in those articles that implemented a primary prevention program. We define evidence based articles as any article describing a program with rigorous testing to show the program is effective (Mary Ann Pentz, 2003). Additional analysis examined the target population of the program (i.e., infants up to age 3 vs. children aged 4–11 vs. teenagers aged 12–19 vs. adults aged 20–65 vs. elderly aged 66+) and the focus of the program (i.e., non-substance-related mental illness vs. substance use). Categorization criteria were established prior to onset of article review. Based on independent categorization by two members of the research team (CG, KW) across all 561 articles, IRR of this post-hoc assessment was 0.94. The post-hoc categorical analysis revealed that only 2% (11/561) (insert Fig. 5) of the primary prevention articles focused on infant population. This analysis also revealed that only 17% (95/561) (insert Fig. 6) of the primary prevention programs were evidence based. Of all the primary prevention programs found in this literature search, 57% (320/561) (insert Fig. 7) focused on the prevention of non-substance related mental illnesses.

A post-hoc analysis of the n = 939 MCH mental health articles was also carried out to gain insight into the target populations of the included studies (i.e mental health of child only vs. mental health of caregiver(s) only vs. both child and caregiver(s) mental health). Categorization criteria were established prior to onset of article review. Based on independent categorization by two members of the research team (CG, KW) across all 939 articles, the IRR of this post-hoc assessment was 0.91. The secondary post-hoc analysis revealed that 51% (479/939) of the MCH articles focused on the mental health of only the child, while 25% (235/939) of the MCH mental health articles focused on the dynamic between caregiver(s) and child (see Fig. 8).

4. Discussion

The current study examined the public health literature to quantify the proportion of mental health publications that focus on primary prevention as well as the proportion of publications within MCH that focus on mental health as a proxy to understand the current state of primary prevention of mental health research within the field of public health. A comprehensive literature review of 211,794 articles from 147 public health journals revealed that only 2.2% of mental health articles included primary prevention and only 7.8% of MCH articles included mental health. These results confirm our hypotheses that less than 20% of the mental health literature in public health would focus on

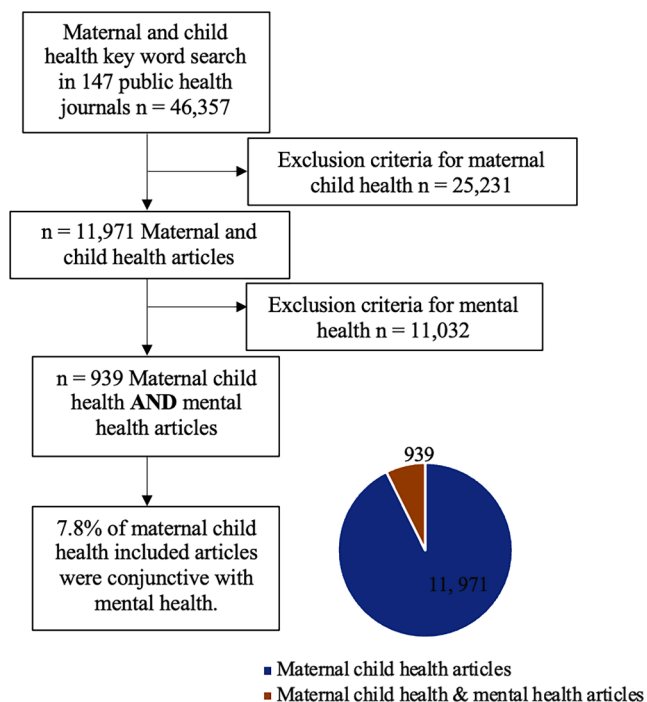


Fig. 4b. Selection of MCH articles that included mental health.

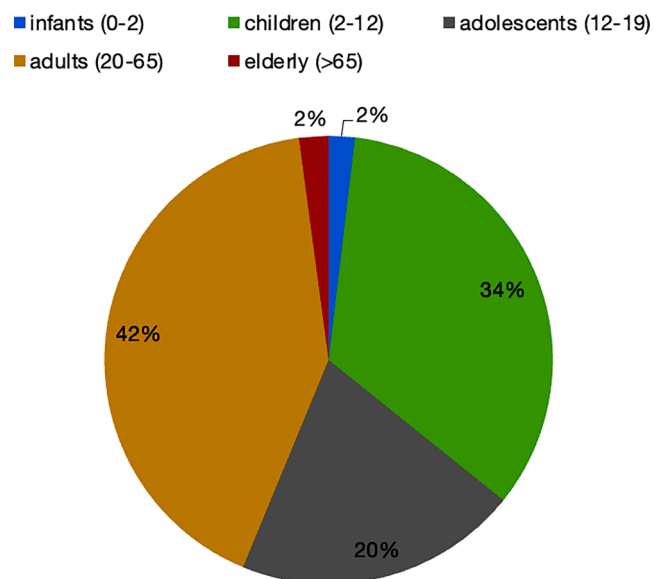


Fig. 5. populations of primary prevention mental programs.

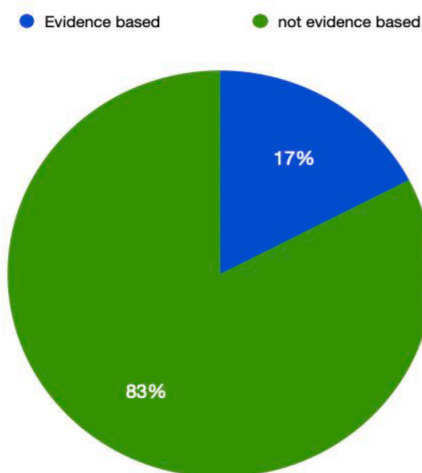


Fig. 6. Evidence-based primary prevention programs.

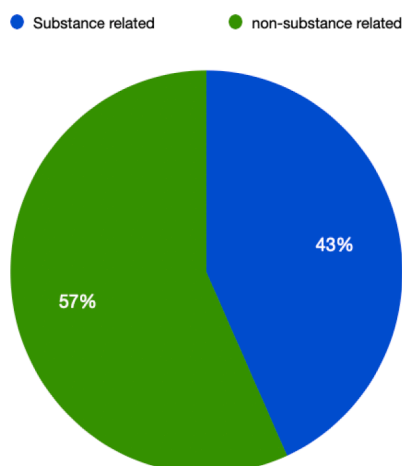


Fig. 7. Substance vs. non-substance related primary prevention programs.

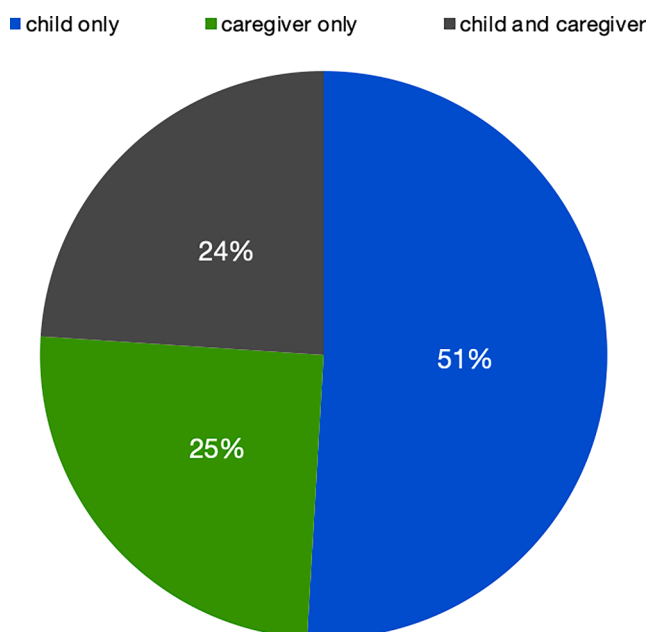


Fig. 8. MCH categorization of mental health articles.

prevention rather than intervention and that less than 20% of the MCH literature within the field of public health would focus on mental health.

A well-established pathway to promote primary prevention of mental illness is via the mitigation of adverse childhood experiences (ACEs), which are a known risk factor for increasing the development of mental illness (Fofana et al., 2020; Sciaraffa et al., 2018). Thus, it is important for primary prevention efforts in public health to focus on young children and their caregivers and that these efforts have a sound evidence base to increase the probability of positive impact. Unfortunately, post-hoc analyses of published articles within primary prevention of mental health demonstrated that just 2% of the studies focused on infant populations and only 17% of the studies were evidence-based programs. Most of the published articles (57%) did focus on prevention of non-substance related mental illnesses. These results indicate that, given the evidence base for primary prevention of future mental illnesses through support of the social-emotional connection between mother and child during the first 1000 days there is much work left to do in this field (Herzog and Schmahl, 2018; World Health Organization, 2018; Innocenti, 2013; Entringer et al., 2015). The fact that most primary prevention programs lacked an evidence base indicates that much work remains to assess the effectiveness of the programs being implemented. Further post-hoc analysis within the published MCH and mental health literature showed that the majority of the articles targeted the child’s mental health alone (51%) or in conjunction with the caregiver (s) mental health (25%). While a relatively small proportion of maternal child health articles focus on mental health, it is encouraging that the majority of those included articles focused on the mental health of the child or the dynamic between the mother and child. Given the importance of this dynamic for both maternal and child mental health (Herzog and Schmahl, 2018; Dunn et al., 2013; Innocenti, 2013; Entringer et al., 2015), more studies within this specific field would be welcomed.

It is important to consider the limitations to this study. First, our search was restricted to only published literature that appeared in Scimago-ranked public health journals. As a result, we excluded all grey literature such as theses, dissertations, and pending publications, which may have since been published. Also, we chose to focus solely on public health journals given the importance of primary prevention within the field and the insights we sought from the public health field specifically. We acknowledge that it is not the only field that examines primary prevention—additional articles may exist in other fields such as Obstetrics and Gynecology, Family Practice, or Pediatrics. Another limitation relates to consistency of article inclusion across reviewers. To assure maximum concordance, the review team met weekly to discuss discrepancies. The reviewers also favored a more sensitive versus specific approach to article selection, erring on the side of inclusion, which increased the total number of included primary prevention articles. Because of this method, it’s more likely our results *overestimated* rather than underestimated the proportion of primary prevention articles in public health. It’s also important to note that the literature search extended for 17 months and into the COVID-19 pandemic (to August 2021). We presume that COVID-19 dominated the public health literature during these months and potentially reduced the total number of published articles on mental health and MCH. However, we believe the impact of this potential shift in the public health literature is minimal given the 211,794 articles included in this review.

If the proportion of publications on primary prevention of mental health reflects its social priority in the public health sphere, the results of the present analysis indicate a concerning lack of priority. At approximately 1 in every 50 published mental health articles within the field of public health, primary prevention does not currently have the research base that is needed to implement, improve upon, and justify public health policy to address one of the most burdensome disease categories in the USA and globally (Iati, 2021; Office of Disease Prevention and Health Promotion, 2020). While burden of disease does not always drive research into treatment and/or prevention of that disease (American

Psychological Association, 2022), increases in mental illness following the COVID-19 pandemic (Goetzl, 2009; Trust for America's Health, 2022) and recognition of the impact of mental illness by the public since the pandemic make this a potentially opportune time for policymakers, researchers, and public health professionals to increase the number of evidence-based primary prevention programs for mental illness.

Several reasons may explain the ongoing public health literature gap on primary prevention of mental health. It could be due to public health's narrow focus on physical health, emphasis on short term treatment (Mary Ann Pentz, 2003; Waechter and Ma, 2015), or lack of integration of findings from other fields (Andrews et al., 2004; Goetzl, 2009). For example, it has only been approximately 60 years since child abuse was first recognized within the medical community (Holmes et al., 2020) and approximately 25 years since the lifetime impact of ACEs has been elucidated (Vitale et al., 2015; Kempe et al., 1962). Yet these findings have not been fully integrated into public health primary prevention programs, despite evidence that one of the most effective ways to prevent mental illness is by focusing on the "golden window" of neurodevelopment in the first few years of life (World Health Organization, 2018; Kessler et al., 2005). Another reason for the low numbers could be that it is difficult to concretely illuminate the impact of untreated mental illness to justify the cost of primary prevention programs or studies. When considering public health policy, quantifying, and publicising the socioeconomic impact is important to gain momentum needed to justify changes in policy. Conducting a longitudinal study that begins in the perinatal period is difficult for many reasons: It requires multidisciplinary collaboration across OB/GYN, Pediatrics, Psychiatry, and/or Public Health; a lack of a clear "academic home" can make it difficult to secure funding, create, maintain, and enforce guidelines, and develop programs or studies. Further, it can be difficult for policymakers and their constituents to see and invest in long-term primary prevention programs despite proven economic benefit when more urgent issues require funding and the impact can be seen more clearly and sooner (Johnson et al., 1999). The reactive global approach to COVID-19 provides an example of this decision-making despite a historic call for proactive approaches to controlling zoonotic viruses (Luca et al., 2020). Public health policy is often a reflection of the public's political perspective rather than the impact of the illness (Rosen, 1974).

Given the critical importance of primary prevention and the burden of mental illness on society, the field of public health must do more to encourage research on primary prevention of these illnesses. While the etiology of many mental illnesses is complex and includes varying levels of genetic, epigenetic, cognitive, family, social, and environmental factors, one variable that has been shown to account for significant variance in the risk of experiencing some of the most burdensome mental illnesses such as anxiety/depression is ACEs (Romano, 2020; Fofana et al., 2020; Sciaraffa et al., 2018; Herzog and Schmahl, 2018). This may be an ideal place to focus primary prevention efforts. Evidence of successful primary prevention programs that focus on early childhood and MCH exists in schools, (Mackintosh, 1953b; Roche et al., 2020) universal home visiting and family check-ups, (Meyer et al., 2004) universal

parental support and education, (Hiscock et al., 2012) and social-emotional learning programs, (Meyer et al., 2004; Hiscock et al., 2012; Calhoun et al., 2020; Waddell et al., 2007) and can be used to justify further funding to scale-up and assess these programs. Additionally, it is necessary to identify and adapt any existing successful programs to ensure they reach children in infancy (World Health Organization, 2018; Holmes et al., 2020). While interdisciplinary studies can be challenging and primary prevention of mental health may lack a home discipline, the evidence of MCH and prevention of ACEs for improved resilience to future mental illness requires action. We suggest that public health, with its focus on primary prevention, is the ideal home discipline for the primary prevention of mental illness. This will require public health professionals to collaborate across numerous disciplines while also convincing policymakers of the potential return associated with investing in primary prevention programs. Once there is public support to make change in mental illness, the value of primary prevention programs to reduce that burden and the associated costs of mental illness on society may become more palatable (Waechter, 2021b).

To date we are not aware of any other study that has conducted a systematic public health literature review on primary prevention of mental illness, nor mental illness through the lens of MCH. We believe our results will help illuminate public health's focus on primary prevention of mental health by quantifying the current literature. Prevention of mental illness is an important target for public health, and this study presents a wake-up call for the opportunity to do more.

CRediT authorship contribution statement

Randall Waechter: Conceptualization, Writing – original draft, Writing – review & editing. **Cassandra Gallant:** Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing – original draft, Writing – review & editing. **Kristen De Wilde:** Data curation, Validation, Writing – original draft. **Gabrielle Arens:** Data curation, Validation, Writing – original draft, Writing – review & editing. **Taylor Brady:** Data curation, Validation, Writing – original draft. **Jasmin Custodio:** Data curation, Writing – original draft. **Yusuke Wakita:** Data curation, Writing – original draft. **Barbara Landon:** Writing – original draft, Writing – review & editing. **Yvonne Boateng:** Data curation. **Nadeem Parthab:** Data curation. **Anjali Bhagat:** Data curation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Final journal list – 147 public health journals

Morbidity and Mortality Weekly Report	7.695
Annual review of public health	6.416
The lancet public health	5.493
Journal of occupational health psychology	3.280
American Journal of Preventive Medicine	2.680
Bulletin of the World Health Organization	2.652
American journal of public health	2.509
Journal of epidemiology and community health	2.028
Preventive Medicine (Elsevier)	1.962
One health	1.859
Journal of health and social behaviour	1.790

(continued on next page)

(continued)

Youth violence and juvenile justice	1.675
Conflict and health	1.637
Health policy and planning	1.610
Tropical medicine and international health	1.505
Child abuse and neglect	1.501
Scandinavian journal of work environment & health	1.488
Accident analysis and prevention	1.481
Qualitative health research	1.437
Preventing chronic disease	1.427
BMC public health	1.382
Child maltreatment	1.351
Youth and society	1.307
European journal of public health	1.299
International journal for equity in health	1.256
Globalization and health	1.237
pathogens and global health	1.217
Public health nutrition	1.186
Public health reports	1.186
Maternal and child health journal	1.167
Journal of urban health	1.165
Evolution medicine and public health	1.105
Health education and behaviour	1.061
Journal of aging and health	1.054
International journal of public health	1.024
Zoonoses and public health	1.010
Journal of health communication	1.007
Global health action	0.996
Public health action	0.976
Global public health	0.910
Violence against women	0.903
Womens health issues	0.900
Journal of infection and public health	0.899
BMC women's health	0.887
Health promotion international	0.883
Journal of preventative medicine	0.870
Australian and New Zealand journal of public health	0.858
Journal of public health	0.853
International Journal of Medical Science and Public Health	0.834
Health promotion and chronic disease prevention in Canada	0.829
International journal of environmental research and public health	0.818
Journal of public health management and practice	0.814
Public health reviews	0.792
Journal of immigrant and minority health	0.788
Chronic Diseases and injuries in Canada	0.769
Global advances in health and medicine	0.762
Public health genomics	0.756
Annals of global health	0.746
Ethnicity and health	0.741
Disability and health journal	0.738
Games for health journal	0.735
Public health ethics	0.725
Asia-pacific journal of public health	0.724
Community mental health journal	0.708
Noise and health	0.703
Journal of public health policy	0.672
Scandinavian Journal of Public Health	0.665
Epidemiology and health	0.637
Frontiers in public health	0.629
Journal of American College health	0.621
Communicable diseases intelligence	0.620
Journal of environmental science and public health	0.610
Journal of public health Dentistry	0.603
Health Psychology	0.593
Health promotion practice	0.583
Canadian Journal of public health	0.581
American journal of mens health	0.559
WHO South-East Asia journal of public health	0.551
Perspectives in public health	0.538
Psychopharmacology Bulletin	0.525
Public health nursing	0.514
The Journal of Midwifery & Women's Health	0.508
International journal of sexual health	0.508
Epidemiologic methods	0.506
Disaster medicine and public health preparedness	0.498
Health and Human Rights	0.494
Health and justice	0.488
African journal of primary health care and family medicine	0.483

(continued on next page)

(continued)

Osong Public Health and Research Perspectives	0.480
Archives of environmental and occupational health	0.472
Archives of environmental & occupational health	0.472
Journal of mental health policy and economics	0.462
Progress in community health partnerships-research education and action	0.413
Indian journal of public health	0.404
Communicable disease and public health	0.403
Journal of public health research	0.400
Public health research	0.400
Arts and health	0.389
eastern mediterranean health journal	0.383
Archives of Public Health	0.373
Developments in health economics and public policy	0.371
Iranian journal of public health	0.368
Health education journal	0.365
American journal of health education	0.360
African journal of reproductive health	0.331
Journal of public health in Africa	0.324
Global health promotion	0.317
The southeast Asian journal of tropical medicine and public health	0.315
Social work in public health	0.309
Journal of infection prevention	0.304
Central European journal of public health	0.301
Journal of mid-life health	0.299
Infection, disease & health	0.293
International Conference on Environmental Pollution and Public Health	0.292
Epidemiology biostatistics and public health	0.280
Journal of public mental health	0.275
Healthcare management forum	0.272
Hispanic health care international	0.266
Clinical epidemiology and global health	0.235
Hawaii journal of medicine and public health	0.226
Ethiopian journal of health development	0.215
Ethiopian journal of public health	0.215
ethiopian journal of health development	0.215
Health information management journal	0.191
The journal of Egyptian public health association	0.190
East African Journal of public health	0.170
Ethics, Medicine and public health	0.164
Malaysian Journal of public health medicine	0.164
Journal of international oral health	0.151
Qatar Medical Journal	0.146
Annals of tropical medicine and public health	0.135
Taiwan journal of public health	0.134
public health journal	0.133
Public health forum	0.131
International Journal of Food Safety, Nutrition and Public Health	0.126
New Zealand Public Health Surveillance Report	0.124
Preventive Medicine Bulletin	0.119
Hygiea Internationalis	0.118
The internet journal of mental health	0.111
Internet journal of mental health	0.111
Evidence based healthcare and public health	0.106
International journal of collaborative research on internal medicine and public health	0.105
Indian journal of public health research and development	0.105
New Zealand public health reports	0.104
Indian journal of maternal and child health	0.104
Public health medicine	0.103
International journal of community medicine and public health	0.102

References

- American Psychological Association. Just-world hypothesis. In *APA dictionary of psychology*.://dictionary.apa.org/just-world-hypothesis Accessed January 18, 2022.
- American Public Health Association. Mental Health. <https://www.apha.org/topics-and-issues/mental-health> Accessed January 15, 2022.
- Andrews, G., Issakidis, C., Sanderson, K., Corry, J., Lapsley, H., 2004. Utilising survey data to inform public policy: Comparison of the cost-effectiveness of treatment of ten mental disorders. *British Journal of Psychiatry* 184 (6), 526–533. <https://doi.org/10.1192/bjp.184.6.526>.
- Arroyo-Borrell, E, Renart, G, Saurina, C. et al. Influence maternal background has on children's mental health. *Int J Equity Health* 2017;16, 63 10.1186/s12939-017-0559-.
- Arslan, İ.B., Lucassen, N., van Lier, P.A.C., de Haan, A.D., Prinzie, P., Early childhood Arslan, İ.B., Lucassen, N., van Lier, PAC, et al., 2021. Early childhood internalizing problems, externalizing problems and their co-occurrence and (mal)adaptive functioning in emerging adulthood: a 16-year follow-up study. *Soc Psychiatry Psychiatr Epidemiol.* 56 (2), 193–206. <https://doi.org/10.1007/s00127-020-01959-w>.
- Auerbach, J., 2019. The Promise of and Lessons From the Prevention and Public Health Fund. *American journal of public health* 109 (4), 533–534. <https://doi.org/10.2105/AJPH.2019.304974>.
- Bachmann S. Epidemiology of Suicide and the Psychiatric Perspective. *Int J Environ Res Public Health.* 2018;15(7):1425. Published 2018 Jul 6. 10.3390/ijerph15071425.
- Bloom, DE, Cafiero, ET, Jané-Llopis, E, et al. The Global Economic Burden of Noncommunicable Diseases. Geneva: World Economic Forum. 2011. http://www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf Accessed December 11, 2021.
- Calhoun, B., Williams, J., Greenberg, M., Domitrovich, C., Russell, M.A., Fishbein, D.H., 2020. Social Emotional Learning Program Boosts Early Social and Behavioral Skills in Low-Income Urban Children. *Front Psychol.* 11, 561196 <https://doi.org/10.3389/fpsyg.2020.561196>. . Published 2020 Nov 4.

- Dunn, E.C., McLaughlin, K.A., Slopen, N., Rosand, J., Smoller, J.W., 2013. Developmental timing of child maltreatment and symptoms of depression and suicidal ideation in young adulthood: results from the National Longitudinal Study of Adolescent Health. *Depress Anxiety*. n/a–n/a.
- Entringer, S., Buss, C., Wadhwa, P.D., 2015. Prenatal stress, development, health and disease risk: A psychobiological perspective-2015 Curt Richter Award Paper. *Psychoneuroendocrinology*. 62, 366–375. <https://doi.org/10.1016/j.psyneuen.2015.08.019>.
- Falagas, M.E., Kouranos, V.D., Arencibia-Jorge, R., Karageorgopoulos, D.E., 2008. Comparison of SCLMago journal rank indicator with journal impact factor. *FASEB J*. 22 (8), 2623–2628. <https://doi.org/10.1096/fj.08-107938>.
- Fofana, N.K., Latif, F., Sarfraz, S., Bilal, Bashir, M.F., Komal, B., 2020. Fear and agony of the pandemic leading to stress and mental illness: An emerging crisis in the novel coronavirus (COVID-19) outbreak. *Psychiatry research* 291, 113230.
- Goetzal, R., 2009. Do Prevention Or Treatment Services Save Money? The Wrong Debate. *Health Affairs*. 28 (1), 37–41. <https://doi.org/10.1377/hlthaff.28.1.37>. Retrieved March, 8 2022.
- Hellerstedt, W., 2021. What is Maternal and Child Health? Leadership Education in Maternal & Child Public Health. Leadership Education in Maternal & Child [online] Accessed December 10, 2021 Public Health. <https://mch.umn.edu/what-is-mch/>.
- Herzog JI, Schmahl C. Adverse Childhood Experiences and the Consequences on Neurobiological, Psychosocial, and Somatic Conditions Across the Lifespan. *Front Psychiatry*. 2018; 9:420. Published 2018 Sep 4. 10.3389/fpsy.2018.00420.
- Hiscock, H., Bayer, J.K., Lycett, K., et al., 2012. Preventing mental health problems in children: the *Families in Mind* population-based cluster randomised controlled trial. *BMC Public Health* 12, 420. <https://doi.org/10.1186/1471-2458-12-420>.
- Holmes, E.A., O'Connor, R.C., Perry, V.H., et al., 2020. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *Lancet Psychiatry*. 7 (6), 547–560. [https://doi.org/10.1016/S2215-0366\(20\)30168-1](https://doi.org/10.1016/S2215-0366(20)30168-1).
- Hosman CMH, Llopias EJ, Saxena S, World Health Organization. Department Of Mental Health and Substance Abuse and Prevention Research Centre (Netherlands) (2004). Prevention of mental disorders: effective interventions and policy options: summary report. Geneva: World Health Organization.
- Iati, M., 2021. December 24). *The pandemic has caused nearly two years of collective trauma. Many people are near a breaking point*. Washington Post.
- Innocenti, U. The first 1,000 days of life: The brain's window of opportunity. [online] UNICEF-IRC. 2013 <https://www.unicef-irc.org/article/958-the-first-1000-days-of-life-the-brains-window-of-opportunity.html>. Accessed January 21, 2021.
- Izett E, Rooney R, Prescott SL, et al. Prevention of Mental Health Difficulties for Children Aged 0-3 Years: A Review. *Front Psychol*. 2021; 11:500361. Published 2021 Sep 29. 10.3389/fpsyg.2020.500361.
- Johnson, J.G., Cohen, P., Brown, J., Smiles, E.M., Bernstein, D.P., 1999. Childhood maltreatment increases risk for personality disorders during early adulthood. *Arch Gen Psychiatry*. 56 (7), 600–606. <https://doi.org/10.1001/archpsyc.56.7.600>.
- Kempe, C.H., Silverman, F.N., Steele, B.F., Droegemueller, W., Silver, H.K., 1962. The Battered-Child Syndrome. *JAMA*. 181 (1), 17–24. <https://doi.org/10.1001/jama.1962.03050270019004>. Retrieved March 8, 2022.
- Kessler, R., Berglund, P., Demler, O., et al., 2005. Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication [online] Accessed March 30, 2021 Arch Gen Psychiatry. <https://jamanetwork.com/journals/jamapsychiatry/fullarticle/208678>.
- Kieling, C., Baker-Henningham, H., Belfer, M., Conti, G., Ertem, I., Omigbodun, O., Rohde, L.A., Srinath, S., Ulkuer, N., Rahman, A., 2011. Child and adolescent mental health worldwide: evidence for action. *Lancet* (London, England) 378 (9801), 1515–1525. [https://doi.org/10.1016/S0140-6736\(11\)60827-1](https://doi.org/10.1016/S0140-6736(11)60827-1).
- Liu J, Chen X, Lewis G. Childhood internalizing behaviour: analysis and implications. *J Psychiatr Ment Health Nurs*. 2011 Dec;18(10):884-94. 10.1111/j.1365-2850.2011.01743.x. Epub 2011 May 20. PMID: 22070805; PMCID: PMC5675073.
- Liu J. Childhood externalizing behavior: theory and implications. *J Child Adolesc Psychiatr Nurs*. 2004 Jul-Sep. 17(3). 93-103. 10.1111/j.1744-6171.2004.tb00003.x. PMID: 15535385; PMCID: PMC1617081.
- Luca, D.L., Margiotta, C., Staatz, C., Garlow, E., Christensen, A., Zivin, K., 2020. Financial Toll of Untreated Perinatal Mood and Anxiety Disorders Among 2017 Births in the United States. *Am J Public Health*. 110 (6), 888–896. <https://doi.org/10.2105/AJPH.2020.305619>.
- Mackintosh, J.M., 1953a. Trends of Opinion about the Public Health 1901–1951. Oxford University Press. p, London, p. 5.
- Mackintosh, J. M. [1953]. *Trends of Opinion about the Public Health 1901-1951*. London, Oxford University Press. p. 5).
- Mary Ann Pentz, 2003. Evidence-Based Prevention: Characteristics, Impact, and Future Direction. *Journal of Psychoactive Drugs* 35 (sup1), 143–152. <https://doi.org/10.1080/02791072.2003.10400509>.
- McDaid, D., Park, A.L., Wahlbeck, K., 2019. The Economic Case for the Prevention of Mental Illness. *Annu Rev Public Health*. 40, 373–389. <https://doi.org/10.1146/annurev-pubhealth-040617-013629>.
- Meyer, A.L., Allison, K.W., Reese, L.E., Gay, F.N., 2004. Multisite Violence Prevention Project. Choosing to be violence free in middle school: the student component of the GREAT Schools and Families Universal Program. *Am J Prev Med*. 26 (1 Suppl), 20–28. <https://doi.org/10.1016/j.amepre.2003.09.014>.
- Morris, A.S., Silk, J.S., Steinberg, L., Myers, S.S., Robinson, L.R., 2007. The Role of the Family Context in the Development of Emotion Regulation. *Soc Dev*. 16 (2), 361–388.
- Office of Disease Prevention and Health Promotion. Mental Health and Mental Disorders. healthypeople.gov. 2020. <https://www.healthypeople.gov/2020/data-search/Search-the-Data#objid=4813>. Accessed March 30, 2021.
- Prado, E.L., Sebayang, S.K., Aprianti, M., Adawiyah, S.R., Hidayati, N., Islamiyah, A., Siddiq, S., Harefa, B., Lum, J., Alcock, K.J., Ullman, M.T., Muadz, H., Shankar, A.H., 2017. Maternal multiple micronutrient supplementation and other biomedical and socioenvironmental influences on children's cognition at age 9–12 years in Indonesia: follow-up of the SUMMIT randomised trial. *Lancet Glob Health*. 5 (2), e217 e218.
- Prado, E.L., Sebayang, S.K., Adawiyah, S.R., Alcock, K.J., Ullman, M.T., Muadz, H., Shankar, A.H., 2021. Maternal depression is the predominant persistent risk for child cognitive and social-emotional problems from early childhood to pre-adolescence: A longitudinal cohort study. *Soc Sci Med*. 289, 114396.
- GBD Results Tool | GHDx. 2021. <http://ghdx.healthdata.org/gbd-results-tool>. Accessed August 15, 2021.
- Roche, B., Garchitorena, A., Guégan, J.-F., Arnal, A., Roiz, D., Morand, S., Zambrana-Torrel, C., Suzán, G., Daszak, P., 2020. Was the COVID-19 pandemic avoidable? A call for a "solution-oriented" approach in pathogen evolutionary ecology to prevent future outbreaks. *Ecol Lett* 23, 1557–1560. <https://doi.org/10.1111/ele.13586>.
- Romano, J.L., 2020. Politics of Prevention: Reflections From the COVID-19 Pandemic. *Journal of Prevention and Health Promotion* 1 (1), 34–57. <https://doi.org/10.1177/2632077020938360>.
- Rosen, G. [1974]. *Historical Evolution of Primary Prevention*. Presented in the Prevention: The State of Knowledge Panel at the Annual Health Conference of the New York Academy of Medicine).
- Sciaraffa, M.A., Zeanah, P.D., Zeanah, C.H., 2018. Understanding and Promoting Resilience in the Context of Adverse Childhood Experiences. *Early Childhood Educ J* 46 (3), 343–353.
- Shin, S.H., McDonald, S.E., Conley, D., 2018. Profiles of adverse childhood experiences and impulsivity. *Child Abuse Negl*. 85, 118–126. <https://doi.org/10.1016/j.chiabu.2018.07.028>.
- Singh, V., Kumar, A., Gupta, S., 2022. Mental Health Prevention and Promotion-A Narrative Review. *Front Psychiatry*. 26 (13), 898009 <https://doi.org/10.3389/fpsy.2022.898009>. PMID: 35958637; PMCID: PMC9360426.
- Trust for America's Health. (2022, May 24). *Pain in the Nation 2022: U.S. Experienced Highest Ever Combined Rates of Deaths Due to Alcohol, Drugs, and Suicide During the First Year of the COVID-19 Pandemic - TFAH*. TFAH. <https://www.tfah.org/report-details/pain-in-the-nation-2022/>.
- Trust for America's Health. (2023a, March 7). *The Impact of Chronic Underfunding on America's Public Health System: Trends, Risks, and Recommendations, 2022 - TFAH*. TFAH. <https://www.tfah.org/report-details/funding-report-2022/>.
- Vitale, A., Mannix-McNamara, P., Cullinan, V., 2015. Promoting mental health through multidisciplinary care: Experience of health professionals working in community mental health teams in Ireland. *International Journal of Mental Health Promotion* 17 (4), 188–200. <https://doi.org/10.1080/14623730.2015.1023660>.
- Waddell, C., McEwan, K., Peters, R.D., Hua, J.M., Garland, O., 2007. Preventing mental disorders in children: a public health priority. *Can J Public Health*. 98 (3), 174–178.
- Waddell, C., Hua, J.M., Garland, O.M., et al., 2007. Preventing mental disorders in children: a systematic review to inform policy-making. *Can J Public Health*. 98 (3), 166–173. <https://doi.org/10.1007/BF03403706>.
- Waechter, R., 2021a. Prevention of sexual violence in America: where do we stand? *Am J Public Health*. 111 (3), 339–341.
- Waechter, R., Ma, V., 2015. Sexual Violence in America: Public Funding and Social Priority. *American journal of public health* 105 (12), 2430–2437. <https://doi.org/10.2105/AJPH.2015.302860>.
- Waechter, R. Chapter 15: The value of cures. In Waechter [Ed.] *The Economics of Diseases and Cures*. Hauppauge, NY: Nova Science Publishers; 2021: Pp. 333-362.
- Winslow, C.E., 1920. The Untilled Fields Of Public Health. *Science*. 51 (1306), 23–33. <https://doi.org/10.1126/science.51.1306.23>.
- World Health Organization, 2018. *Injury: Nurturing Care for Early Childhood Development*. World Health Organization, Geneva, Switzerland.