

Adverse Mental Health of Juvenile Delinquency and Suicide: A Bibliometrics Study and Visualization Analysis via CiteSpace

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Abstract

Juvenile delinquency and suicide have been growing worldwide, behind which mental health issues cannot be ignored. Research status, hotspots, and frontiers in this field were mined in this study. 4681 related publications from 2000 to 2022 were extracted from the Web of Science Core Collection, based on which collaboration, hotspots, and frontiers of the topic were revealed via CiteSpace. There is a continuous growth of relevant research, especially in the last five years. Alan Apter from Israel published the most (49) articles in the field. The USA and the University of California System were the leading country and institution with 2603 and 222 articles cited 88964 and 7891 times, respectively. There was active collaboration between institutions, countries, and authors on conducting research on the issues. Hot topics focused on mental health, behavior, depression, prevalence, ideation, suicide, substance use, psychiatric disorder, reliability, intervention, and risk factors. Frontiers research includes adverse childhood experience, gay, and stigma. Healthy family dynamics (harmonious marital relationship, stable family structure, and correct parenting style) is the first layer of defense against juvenile delinquency and suicide. And the second layer is positive social determinants (neighbor influence, social support, stigma, and minority stress).

Keywords: juvenile delinquency, suicide, LGBT, adolescents, adverse childhood experiences, CiteSpace, visualization analysis

1. Introduction

Adolescence is a transitional phase of growth and development between childhood and adulthood. "Adolescence", "youth", and "young people" are defined as 10-19, 15-24, and 10-24 years old, respectively. Teenage is defined as 13-17 years old. Adolescents who are most in need of mental health care are reluctant to seek help, since they often experience many troubles, rejections or barriers (Aguirre et al., 2019). Children's mental health is associated with prospective delinquent outcomes. Childhood behavioral problems are highly prevalent among school-aged children.

Delinquency and delinquent behavior are defined as criminal offences of offending behavior with the following different offence types: violent conduct, threatening behavior, property destruction, drug offence, theft, sexual offence, fraud, motoring offence, and murder (Allen et al., 2018). The amount of juvenile delinquency is on the increase. The development of the Internet has accelerated the process. Increasing exposure to internet pornography among young people has led to the rise in the number of juvenile delinquents. In recent years, declining ages of delinquents and more deteriorative modus operandi have become the trend of juvenile delinquency. White paper on juvenile prosecutorial work in China (2021) reported that in 2021 the number of people accepted for examination and arrest, and the number of people accepted for examination and prosecution increased by 30.6% and 24.2% respectively compared with that in 2017. Decrease in age of juvenile delinquents has become a trend: The number of juvenile criminal suspects aged from 14 to 16, who accepted, reviewed, and prosecuted by prosecutorial organs, increased by 57.4% in 2021 compared with that in 2017. The number of minors involved in telecommunication network crimes increased rapidly. The number of prosecutions in 2021 sextupled compared with that in 2020. In addition, the rate of conditional non-prosecution of juvenile delinquency has risen sharply: from 2017 to 2021, the number of conditional non-prosecution of juvenile suspect by prosecutorial organs was 5681, 6624, 7463, 11376, and 19783 respectively, and the rate of conditional non-prosecution in the same period was 10.06%, 12.15%, 12.51%, 20.87%, and 29.7% respectively.

On the other hand, suicide is a self-injurious behavior to take one's own life and is a serious public health problem (Stone, 2017). Center for Disease Control and Prevention reported that suicide rate among people aged 10-24 had statistically increased by 57.4% between 2007 and 2018 (Curtin, 2020); meanwhile, the death rate for suicide between the ages of 10 and 19 increased by 56% between 2007 and 2016 (Curtin et al., 2018). Suicide was the second leading cause of death in girls aged 15-19 and the third leading cause of death in boys (WHO, 2019). Juvenile delinquency is a risky behavior; adolescents involved in juvenile justice or child welfare system have higher risks to commit suicides (Suk et al. 2009, Farand et al., 2004, Thompson et al., 2006, Corneau et al., 2010, Catherine et al., 2006).

Causes of juvenile delinquency and suicide vary widely. Particularities of adolescents change the subjective element of an important psychological conditions of juvenile delinquency or suicide. Bibliometrics quantifies publications with statistics to analyze their utilization and management (Yi et al., 2022). CiteSpace is a useful tool for visualizing and analyzing trends and patterns in scientific literature. The objective of the study was to investigate previous and current studies on adverse mental health of juvenile delinquency and suicide, and to find out hotspot and frontier researches through CiteSpace. It could also provide an early warning for adolescents and their neighbors to prevent juvenile crimes or suicides.

2. Methods

2.1 Retrieval of Source Documents

This study retrieved current literatures on mental issue of juvenile delinquency and suicide through the Science Citation Index-Expanded version of the Web of Science Core Collection (WoSCC). All search results were acquired on July 19th, 2022. Only articles were included; and the language was restricted to English only. After reviewing the titles and abstracts, 4681 publications remained.

The retrieval period is from Jan. 1st, 2000 to July 19th, 2022. The retrieval strategy is as follows: title= (youth or teenage or adolescent or juvenile or nonage or minors or junior high school student or senior high school or middle school student) and title, keyword or abstract= (mental health or psycholog* or anxiety or panic attack or depression or autism or social phobia or obsession or irritability or bigotry or psychosis or somniphathy or sleep disorders or anorexia or somatization or obsessive compulsive or interpersonal sensitivity or hostility or phobic anxiety or paranoid ideation or psychoticism) and title, keyword or abstract= (juvenile crim* or teenage crim* or adolescent crim* or juvenile delinquent or juvenile offender or delinquent juvenile or young offender or rapist or Affray or drug addict or prostitution or manslayer or murder* or homicide or suicide or arsonist or arson or poisoning or poisoner or robbery or explosion or human trafficking or drug trafficking or crime or criminal).

2.2 Visualization Analysis

CiteSpace was used to figure out the advances in adverse mental health of juvenile delinquency and suicide. The analysis focused on the dynamic of the annual number of publications and growth, exploring collaboration networks between authors/institutions/countries, identifying co-cited references, as well as capturing keywords with strong citation bursts over time, identifying productive authors/institutions/countries, and publishing periodicals. A CiteSpace visualization knowledge graph has different nodes and links, and the nodes with high centrality usually refer to hotspots or turning points in the domain. The complete records with references retrieved via WoSCC were imported into CiteSpace for bibliometric and visual analysis in plain text format. Core topics could be extracted through cluster analysis of co-occurrence keywords.

3. Results

3.1 Bibliometric Analysis on Publication Year

The search identified a total of 4681 publications via WoSCC database, whose titles and abstracts were all checked. Figure 1 shows the publication number increased rapidly from 34 articles in 2000 to 483 articles in 2021, and the year of 2022 will keep the similar level.

In Particularly, there was a rapid growth in the 2010s. The result indicates that this field received increasing attention in the past five years. There is a trend of continuous growth in the coming years.

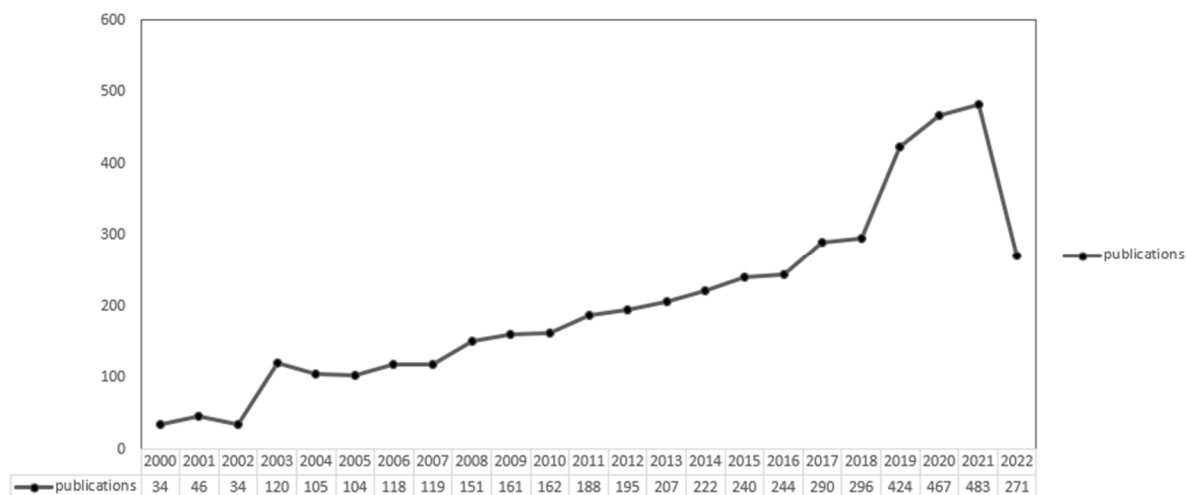


Figure 1. Distribution of annual total number of publications

3.2 Bibliometric Analysis on Country and Institution

The top 10 countries and institutions by the number of publications contributed 4468 articles (95.4%) and 1527 articles (32.6%), respectively (Table 1 and Table 2).

Table 1. Top 10 countries by number of publications

NO.	1	2	3	4	5	6	7	8	9	10
Country	USA	Canada	UK	Australia	China	South Korea	Germany	Netherlands	Sweden	Spain
Publications	2603	354	303	299	238	179	124	119	132	117
Times Cited	88964	9579	10949	8961	3240	2310	3445	3549	3452	2144

Table 2. Top 10 Institutions by number of publications

NO.	Institution	Country	Publications	Times Cited	Time Span	h-index
1	University of California System	USA	222	7891	2000-2022	42
2	Pennsylvania Commonwealth System of Higher Education	USA	188	10833	2000-2022	51
3	Columbia University	USA	176	11777	2000-2022	51
4	State University System of Florida	USA	167	5350	2000-2022	34
5	University of Texas System	USA	161	4730	2000-2022	38
6	Harvard University	USA	154	7138	2002-2022	42
7	University of Pittsburgh	USA	134	8730	2000-2022	45
8	University of London	UK	110	4392	2001-2021	33
9	Brown University	USA	109	4600	2002-2022	33
10	University of Toronto	Canada	106	2483	2002-2020	27

The country that contributes the most in the field is the USA with 2603 articles (55.6%), followed by Canada (7.56%), the UK (6.47%), Australia (6.39%), and China (5.08%). The top 10 institutions are the University of California system, Pennsylvania Commonwealth System of Higher Education, Columbia University, State University System of Florida, University of Texas System, Harvard University, University of Pittsburgh, University of London, Brown University, and University of Toronto. Eight of the top 10 institutes are from the USA, one is from the UK, and one is from Canada. Top 5 institutes by times cited are Columbia University, Pennsylvania Commonwealth System of Higher Education, University of Pittsburgh, the University of California

System, and Harvard University. Top 5 institutes by h-index are Pennsylvania Commonwealth System of Higher Education, Columbia University, University of Pittsburgh, Harvard University, and the University of California System.

The results have shown an active collaboration among countries (Figure 2) and institutions (Figure 3).

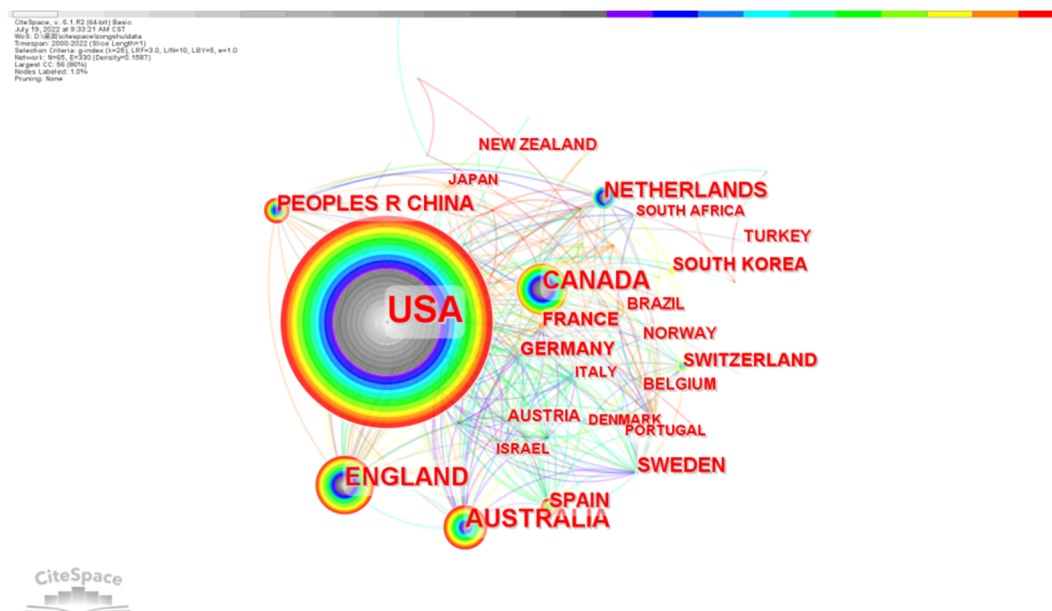


Figure 2. Knowledge mapping for National distribution network

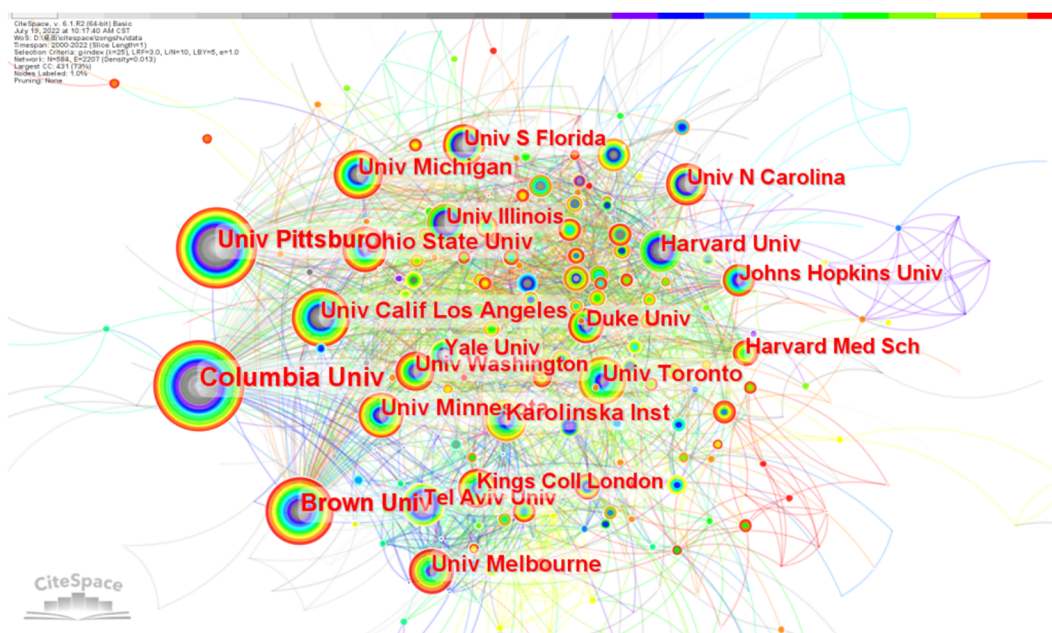


Figure 3. Knowledge mapping for Institution distribution network

In the distribution network of researches in the field, nodes represent countries or institutions, and the node size represents the publication number of each country or institution. Larger nodes mean more publications. The thicker the line between different nodes, the more collaborations between those collaboration parties are.

3.3 Bibliometric Analysis on Co-author

The top 10 authors contributed 286 papers (6.11%) (Table 3).

Table 3. Top 10 authors by number of publications

NO.	Author	Country	Institution	Publications	Time Span	h-index
1	Apter, Alan	Israel	Tel Aviv University	49	2001-2022	25
2	Spirito, Anita	Italy	University of IRCCS Casa Sollievo Della Sofferenza	39	2000-2022	20
3	Kaess, Michael	Switzerland	University of Bern	30	2011-2022	16
4	Brent, David	USA	University of Pittsburgh	29	2000-2022	21
5	King, Cheryl A.	USA	University of Michigan	28	2007-2022	21
6	Bridge, Jeffrey A.	USA	Ohio State University	24	2005-2022	13
7	Brunner, Romuald	Germany	Ruprecht Karls University Heidelberg	24	2011-2022	16
8	Birmaher, B.	USA	Pennsylvania Commonwealth System of Higher Education	21	2000-2021	15
9	Cauffman, Elizabeth E.	USA	University of California Irvine	21	2001-2022	14
10	Wasserman, Danuta	Italy	Natl Inst Hlth Migrat & Poverty	21	2012-2020	15

The most prolific authors are Apter, Alan from Tel Aviv University of Israel (49 papers), followed by Spirito, Anita from University of IRCCS Casa Sollievo Della Sofferenza of Italy (39 papers) and Kaess, Michael from University of Bern of Switzerland (30 papers).

The network of co-author was produced by CiteSpace, as shown in Figure 4.

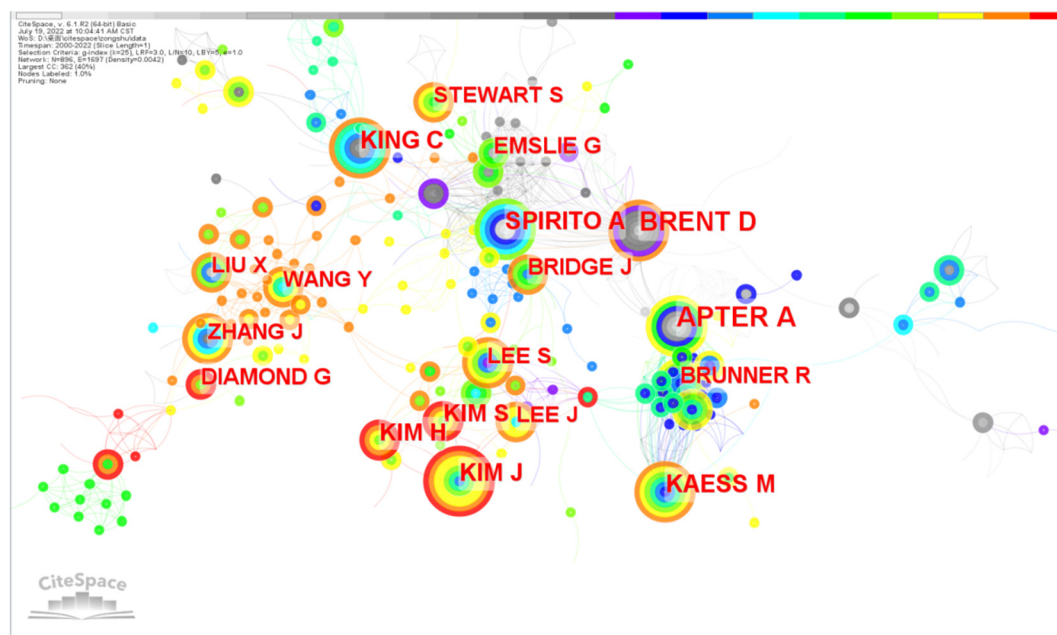


Figure 4. Knowledge mapping for author distribution network

Each node represents one author, and the size of the node represents its publication number. The thickness of the line between different circles shows the level of collaboration between authors. Productive authors usually had stable collaborations with other authors.

3.4 Bibliometric Analysis on high-frequency Keywords and Cluster

The status and impact of a certain research content in the field is reflected by its high central keywords, while high-frequency keywords may develop the hot topics. The top 30 high-frequency keywords in the field of adverse mental health of juvenile delinquency and suicide are shown in Table 4, which cover the following research

respects: behavior, depression, risk, prevalence, ideation, suicide attempt, suicide, suicidal ideation, substance use, psychiatric disorder, predictor, reliability, intervention, et al.

Table 4. List of high frequency keywords

Rank	Keyword	Frequency	Rank	Keyword	Frequency	Rank	Keyword	Frequency
1	Mental health	1137	11	Suicide attempt	439	21	Predictor	238
2	Behavior	1022	12	Suicide	419	22	Validity	231
3	Children	910	13	Youth	416	23	Gender difference	220
4	Depression	866	14	Substance use	374	24	Reliability	213
5	Risk	758	15	Psychiatric disorder	308	25	Crime	190
6	Prevalence	729	16	Suicidal ideation	304	26	Meta analysis	185
7	Risk Factor	719	17	Association	296	27	United States	185
8	Ideation	539	18	Symptom	278	28	Intervention	183
9	Adolescent	527	19	Childhood	276	29	Victimization	178
10	Disorder	521	20	Health	252	30	Population	177

The keywords network is shown as figure 5. There are many intersections among research topics.

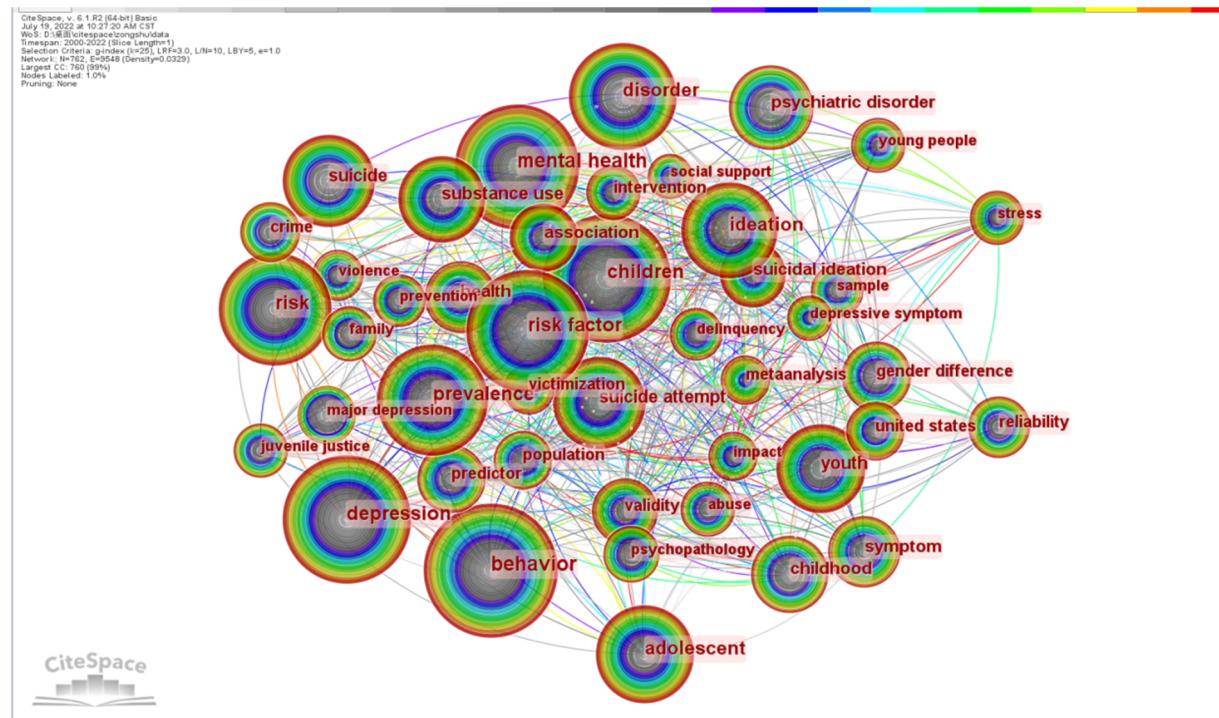


Figure 5. Knowledge mapping of the occurrence of keywords in publications

Table 5 shows top 6 key co-citation clusters based on frequency, which are prevention, juvenile justice, substance use, suicidal ideation, major depression, and trauma. The silhouette value of each cluster is above 0.5, showing the results' high credibility. As for the cluster "Trauma", relative keywords of which include mental health, substance use, adverse child events, parents, and emotional abuse.

Table5. Top 6 key co-citation clusters based on frequency

Cluster ID	Size	Silhouette	Mean	Label (LLR)	Relative keywords
0	145	0.539	2012	prevention	mental health; nominated support; depression education; adolescent depression; school-based interventions
1	141	0.678	2008	juvenile justice	juvenile justice; mental health; of-home treatment; emotional abuse
2	141	0.648	2011	substance use	mental health; adolescent; behavior; victimization; bisexual youth
3	120	0.672	2008	suicidal ideation	suicidal ideation; suicide attempts; state anhedonia; trait anhedonia; care
4	109	0.700	2008	major depression	suicide; children; major depression; risk factor; predictor
5	104	0.628	2013	trauma	mental health; substance use; adverse child events; parent; emotional abuse

The co-citation network is shown in Figure 6.

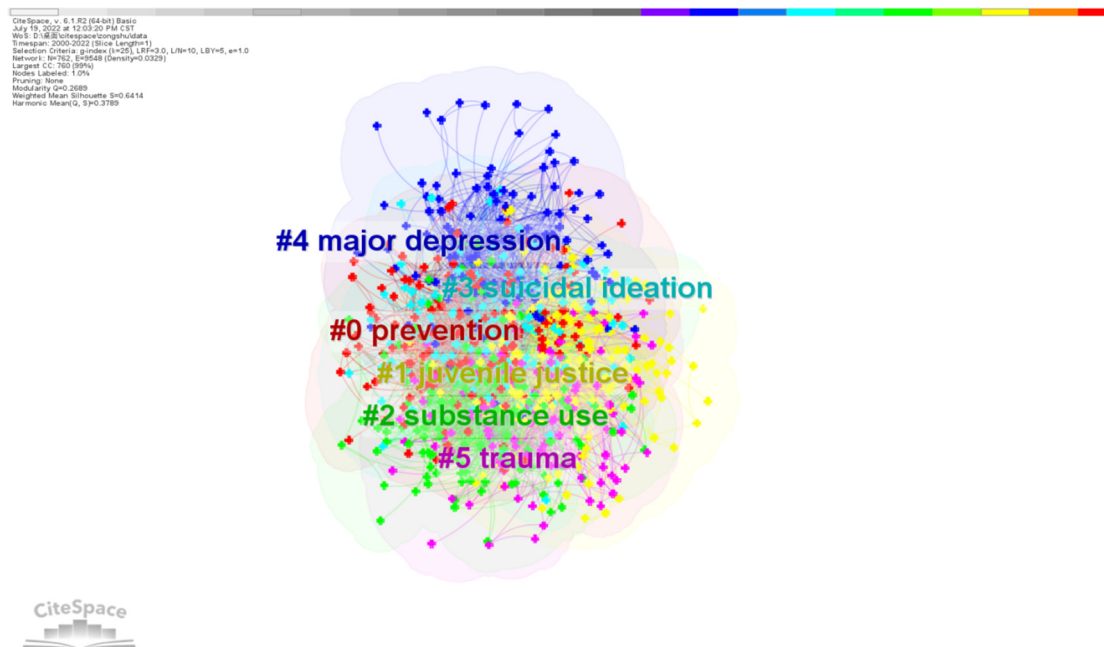


Figure 6. Cluster visualization based on the document co-citation network

Different research clusters of adverse mental health of juvenile delinquency and suicide are not independent of each other; they intersect with other research topics.

3.5 Bibliometric Analysis on Keywords with Citation Bursts

Figure 7 describes the frontier research and shows the top 20 keywords with the strongest citation.

The red line represents the period of the keyword burst, and the green one indicates its time interval. The top 20 keywords appeared in early 2000s are double blind, placebo-controlled trial, diagnostic interview schedule, efficacy, family, psychopathology, fluoxetine, and youth suicide. In addition, several keywords (adverse childhood experience, gay, stigma) persisted till 2022, indicating such frontier research is continuing.

3.6 Bibliometric Analysis on Journals

Top 12 journals according to frequency of publications in the field are shown in Table 6, five of which are from the USA, two from Netherlands, one from Switzerland, one from Germany, and one from the UK.

The cumulative percentage of related articles (822 publications) published in these 12 journals reaches 17.561% of the total. Top 1 is the US Journal "Suicide and Life-Threatening Behavior" (124 publications), followed by Dutch journal "Journal of Affective Disorders" (110 publications), US Journal "Journal of Adolescent Health" (100

publications), and Dutch journal “Journal of The American Academy of Child And Adolescent Psychiatry” (92 publications). According to the impact factor, top 1 journal is “Journal of The American Academy of Child and Adolescent Psychiatry” (IF=13.113), followed by “Pediatrics” (9.703) and “Journal of Adolescent Health” (7.83).

Top 20 Keywords with the Strongest Citation Bursts

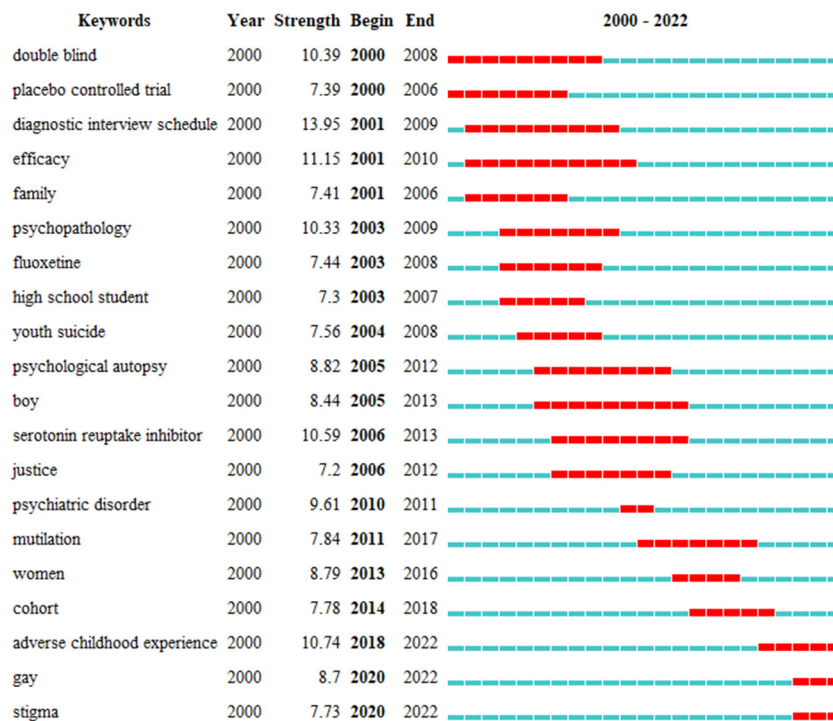


Figure 7. Top 20 Keywords with the Strongest Citation Bursts

Table 6. Top 10 journals according to frequency

NO.	Journals	Frequency	Percentage (%)	Cumulative Percentage (%)	Impact Factor	Time Span	Country
1	Suicide and Life-Threatening Behavior	124	2.649	2.649	4.532	2003-2022	USA
2	Journal of Affective Disorders	110	2.350	4.999	6.533	2003-2022	Netherlands
3	Journal of Adolescent Health	100	2.136	7.135	7.830	2000-2022	USA
4	Journal of the American Academy of Child and Adolescent Psychiatry	92	1.965	9.100	13.113	2000-2021	Netherlands
5	Children and Youth Services Review	87	1.859	10.959	2.519	2004-2022	USA
6	International Journal of Environmental Research and Public Health	77	1.645	12.604	4.614	2012-2022	Switzerland
7	European Child & Adolescent Psychiatry	66	1.410	14.014	5.349	2003-2022	Germany
8	Archives of Suicide Research	57	1.218	15.232	2.833	2008-2022	UK
9	Journal of Youth and Adolescence	55	1.175	16.407	5.625	2005-2022	USA
10	Pediatrics	54	1.154	17.561	9.703	2000-2021	USA

4. Discussion

4.1 Basic Summary

This work analyzed the research status of adverse mental health of juvenile delinquency and suicide through CiteSpace, extracted hotspot and frontier researches. 4681 related publications were acquired via WoSCC, from

January 1st, 2000 to July 19th, 2022. There has been a continuous and rapid growth in the past five years. The top 10 countries involved in the field contributed 4468 articles, accounting for 95.4% of the total. The USA contributed 2603 articles accounting for 55.6% of the total, followed by Canada, which contributed 354 articles. The USA is leading in the study of the field.

Top 10 institutions contributed 1527 high impact publications, accounting for 32.62% of all articles, with the average citation frequency of 44.48 times per paper. Eight of the top 10 institutions are from the USA, one from the UK, and one from Canada. Institutions with strong scientific research strength are mainly concentrated in the USA; Columbia University contributed 176 articles with 11777 times cited. According to the average citation frequency, top 1 is Columbia University, which reached almost 67 times per article, followed by University of Pittsburgh (134 publications, 65 times per article), Pennsylvania Commonwealth System of Higher Education (188 publications, 58 times per article), Harvard University (154 publications, 46 times per article), and Brown University (109 publications, 42 times per article). The US institutions rank first for the absolute contribution and relative influence. If other research institutions want to produce high level research results, they can consider taking the development route of cooperation with strong institutions.

The top 10 authors contributed 286 papers, accounting for 6.11% of all. Alan Apter was the most prolific author (49 articles) with the highest h-index of 25. The collaboration network among authors shows that academic collaboration can improve research results. People interested in researching in this field can consider collaborating with authors and join an academic team to promote the progress of this research field, strengthening research outcome.

4.2 Hot Research Issues

Keywords of a publication showcase relevant topics and methods within the field. Frequently used keywords are adopted to determine largely debated issues in associated bodies of literature. The results of co-occurrence keywords and cluster analysis indicated that main current research focused on adverse childhood experience, gay or stigma.

4.2.1 Adverse Childhood Experiences

The adverse childhood experiences (ACEs) score was first used in 1998 in a seminal medical study to examine the relationship between childhood abuse, trauma, and the leading causes of death in adults (Felitti et al., 1998). The original 10 ACEs include abuse (physical, emotional sexual), neglect (physical, emotional), and household challenges (divorce, incarceration, substance use, domestic violence, and mental illness). The ACEs burden children and adolescents worldwide with prevalence rates of 14-55 % for physical abuse, 11-47% for emotional abuse, 6-22% for sexual abuse, 7-19% for physical neglect, and 15-40% for emotional neglect (Stoltenborgh et al., 2015). The ACEs, especially maltreatment, are regarded as significant risk factors for the development of antisocial behaviors in adolescence. These experiences lead to a host of negative outcomes, including greater criminal involvement and the development of mental health disorders.

The ACEs presage the likelihood for criminal involvement and development of mental health symptoms for justice-involved youth. Such ACEs as childhood maltreatment and household disfunctions are common. Among traumatized juveniles, male offenders also had higher scores on the control scale of idealization compared to non-convicted females (Protic et al., 2020). Traumatic and adverse developmental experiences increase the risk of criminality. Those who commit the greatest number and the most violent offenses are referred as serious, violent, and chronic (SVC) offenders. SVCs are disproportionately victims of trauma, abuse, neglect, and maltreatment during childhood, as compared to the less severe or non-offending juvenile population (Protic et al., 2013; Fox et al., 2014; Loeber et al., 2000). The accumulation of risk factors is a major factor for recidivism and the key role is played by the contexts and emotional environments in which children and adolescents grow up (Guarnaccia et al., 2020). Emotional dysregulation resulting from cumulated ACEs may be characterized by symptoms of irritability. The ACEs increase the risk of youth recidivism and reoffending (Yohros, 2022). Childhood trauma, abuse, neglect, criminal behavior, and other criminological risk factors for offending among 22,575 delinquent youth were analyzed, indicating that each additional adverse experience increased the risk of becoming a serious, violent, and chronic juvenile offender by 35, when controlling for other risk factors for criminal behavior (Fox et al., 2015). The cumulative effects of the ACEs impact youth recidivism or reoffending outcomes.

Since young offenders are victims of the ACEs as well as perpetrators of delinquent acts, interventions must encompass both their personal characteristics and their family circumstances. Such a result indicates that trauma leads to tremendous changes in behaviors among adolescents. Some people need a lifetime to heal their childhood; some people never get out of the hurt from childhood. Positive parental relationship, stable family structure, and healthy parental rearing patterns are the fundamental guarantees for kids to stay away from childhood trauma.

4.2.2 Gay

According to the data from WHO, more than 800,000 people worldwide die of suicide every year, and more people are trying to commit suicide. Suicide is a leading cause of death. Millions of people experience or are affected by the bereavement caused by suicide every year. Youth and young adults ages 10–24 years account for 14% of all suicides. Suicide was the second leading cause of death for people ages 10-14 and 25-34 (Centers for Disease Control and Prevention). Some population groups are at a greater risk for suicidal behaviors (e.g., suicidal ideation and suicide attempts). Sexual minority adolescents experience a high rate of suicide attempts. Lesbian, gay, bisexual, and transgender (LGBT) youth seem to be such a risk group. Today's LGBT youth come out younger ages, and public support for LGBT issues has dramatically increased. But they continue to be at high risk of compromised mental health (Russell & Fish, 2016). Non-binary trans youth have challenges in accessing needed gender-affirming healthcare (Clark, 2018).

The proportion of homosexual and bisexual youth seeking suicide is five times higher than that of heterosexual youth (Hatzenbuehler et al., 2011). The Interpersonal-Psychological Theory of Suicide (IPTs) considers that suicide ideation is caused by the interaction of perceived burdensomeness and thwarted belongingness. Feeling like a burden to "people in their lives" is a critical mechanism in explaining higher levels of depression and suicidal ideation among Lesbian, Gay, and Bisexual (LGB) youth (Baams et al., 2015). General and LGBT-specific risk factors both uniquely contribute to likelihood of suicidal ideation and self-harm in LGBT youth, which may, in part, account for the higher risk of these phenomena observed in this population (Liu et al., 2012). Transgender youth is a vulnerable population at risk of negative mental health including depression, anxiety, self-harm, and suicidality. Transgender youth had a twofold to threefold increased risk of depression, anxiety disorder, suicidal ideation, suicide attempt, self-harm without lethal intent, and both inpatient and outpatient mental health treatment (all $p < .05$) (Zaslow et al., 2015). The whole society's acceptance of LGBT youth, correct cognitive therapy and timely psychological counseling are important means to avoid their suicide.

4.2.3 Stigma

Adolescents involved in the juvenile justice system are reported to have higher rates of STI/HIV infections. A limited number of epidemiological studies show that social-ecological factors at the peer, family, school, and policy levels are significantly related to unsafe sexual behaviors (Hong et al., 2015). The stigmatization of people with obesity, LGBT and, STI/HIV-related is widespread and causes harm (Hatzenbuehler et al., 2011). Many adolescents suffer from stigma for their sexual identities. Consequently, they are reluctant to seek help of mental health care. Stigma and minority stress are social determinants to good health among LGBT youth. Stigma occurs to affect their health at structural, interpersonal, and individual levels. Stigma disrupts cognitive (eg, vigilance), affective (eg, rumination), interpersonal (eg, isolation), and physiologic (eg, stress reactivity) processes. These stigma-inducing mechanisms can be targeted with both clinical and public health interventions to reduce LGBT health disparities among youth. Multicomponent interventions are likely to be most effective in reducing the negative health consequences of exposure to stigma among this population (Hatzenbuehler, 2016).

5. Conclusion

Through CiteSpace analysis, active cooperation among countries, institutions, and authors was figured out. Adverse mental health of juvenile delinquency and suicide have received more and more attention from researchers, especially in the past five years. Interests in such an issue has a trend of continuous increase. Current research interests include adverse childhood experience, gay, and stigma. Thus, more attention should be paid to the family circumstances (marital status of parents, stability of family structure, parenting style), social determinants (influence of neighbors or environments, stigma, minority stress), childhood experiences (trauma, adverse childhood experiences, abuse, neglect, violence, stigma), individual genetic traits, and LGBT youth to prevent juvenile delinquency or suicide. Meanwhile, encouraging to seek help should come with the increased availability in mental health support for all adolescents in need, but this is still a major challenge for child and adolescent mental health services. Moreover, the betterment of the issue requires a collective action by multiple institutions in the society, including families, schools, and individuals.

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