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Research performance and trends in child sexual abuse research: a Science Citation Index Expanded-based analysis

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Abstract
Child sexual abuse (CSA) is a serious public health problem (Gilbert et al. in Lancet 373(9658):167–180, 2009a. https://doi.org/10.1016/S0140-6736(08)61707-9; Singh et al. in J Fam Med Prim Care 3(4):430–435, 2014. https://doi.org/10.4103/2249-4863.148139; Veenema et al. in Int J Nurs Stud 52(4):864–881, 2015. https://doi.org/10.1016/j.ijnurstu.2014.10.017) and a risk factor for child development (Barth et al. in Int J Public Health 58(3):469–483, 2013. https://doi.org/10.1007/s00038-012-0426-1). The present bibliometric analysis evaluated research performance and trends of CSA research from 1991 to 2017. The analysis was based on data extracted from Science Citation Index Expanded. The results revealed a progressive increase in the volume of indexed articles that sharply grows between 2009 and 2017. The majority of the papers analyzed were in the area of psychiatry. In total, these articles were published mostly in English and in 777 journals, the largest volume of articles were in the field of pediatrics. The journal authors come from 105 countries, with the United States ranking on the top in all bibliometrics indicators assessed, including number of articles produced by institution. Three thousand seven hundred and fourteen articles (3714) articles on CSA were utilized to calculate the *Y*-index for authors. From the authors, J.D. Bremner and G. Hornor have the highest contributions with a *Y*-index of 24 (0.7854). Other findings indicated that the peak of citations per publication occured in the 5th year. The most frequently cited and most impactful article was from Felitti et al. (Am J Prev Med 14(4):245–258, 1998. https://doi.org/10.1016/S0749-3797(98)00017-8). Six of the ten highly cited papers maintained their impact according to the 2017 citations. Data also revealed that research trends in the field of CSA can be clustered into 11 categories, with violence being the one that concentrates the greatest number of terms used in the papers. The three main hotspots are sexual abuse, maltreatment and sexual development. Lastly, this article discusses the type of research that contributes to the body of knowledge about CSA and the challenges this poses for the projection of future studies.

Keywords Child sexual abuse · Psychosocial factors · Bibliometric · Clarivate analytics · Web of Science core collection · *Y*-index

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Introduction

Child sexual abuse (CSA) is a global issue that represents a challenge to public health (Gilbert et al. 2009a; Singh et al. 2014; Veenema et al. 2015) with world-wide prevalence rates ranging from 3 to 17% for boys and 8–31% for girls (Barth et al. 2013). CSA is also considered a risk factor for child development since it may impact behavioural, psychological, and social development (Dube et al. 2005) as part of an adaptive response to adversity (Teicher and Samson 2016). Furthermore, CSA has been linked to poor mental health and medical disorders (Gilbert et al. 2009a; Jackson and Deye 2015; Marwaha and Bebbington 2015; Nemeroff 2016).

Historical data of CSA suggest that it first references dated from the 19th century (Tardieu 1959) and during the 1970s it was positioned as a topic of growing interest for research (Mathews and Collin-Vézina 2017) due to its recognition as a frequent phenomenon (Whittier 2009). Even though CSA has been widely studied, a concesus regarding how to define this construct has not been achieved (Haugaard 2000) demanding the commitment of both the professional and academic community (Kempe 1978; Finkelhor 1979). In this regard, research has been fundamental in dimensioning (Barth et al. 2013; Bolen and Scannapieco 1999), explaining (Finkelhor 1986), and preventing CSA (Roche et al. 1999). Similarly, the role of researchers as agents of change has been highlighted in the face of social discourses that questioned the seriousness of the CSA (Smart 1999).

Currently, the large body of research related to the CSA (Stoltenborgh et al. 2015) has been enriched thanks to a diversity of studies (Putnam 2003) and systematic reviews (Amado et al. 2015; Seto et al. 2015; Domhardt et al. 2015; Popović 2018a), which have been conducted in several countries including Japan (Tanaka et al. 2017), India (Choudhry et al. 2018), and Croatia (Popović 2018b). Furthermore, a systematic review of reviews was conducted by Maniglio (2009) and most recently, some meta-analytic studies were conducted focusing on topics such as the prevalence of CSA on a variety of samples (Pereda et al. 2009; Stoltenborgh et al. 2011; Barth et al. 2013; Walsh et al. 2018).

When examining the number of articles that have employed the use of systematic reviews and meta-analysis, there is a limited number of articles that have emloyed bibliometric research to analyze the articles that constitute the main referents in the area as well as the tendencies in CSA research and its projections. As a research methodology, bibliometrics allow to describe (Pritchard 1969) and evaluate (Narin 1976) scientific production; identify the most cited articles that mark the physiognomy of a field (Garfield 1977); as well as understand how research has evolved in a scientific domain (Garfield 1994). This is relevant both at a theoretical and a research level, as bibliometrics assist in identifying current trends, understanding the subject under study, as well as guiding the development of research that combines the knowledge and experience of the field.

Among the bibliometric analyses published in the area of CSA are the trend analysis of child maltreatment from Behl et al. (2003), and the bibliometric analysis of Aprile et al. (2009). Behl et al. (2003) found that the majority of documents analyzed for his study corresponded to CSA, suggesting that the increased public concern about the occurrence of CSA could explain the scientific interest in the area and also corresponded to a moment in the maturation pattern of scientific development. On the other side, Aprile et al. (2009) identified a possible decrease in interest on the subject and the following literature trends: (a) studies on infant genital anatomy; (b) recommendations for diagnostic guidelines; (c) psychological research on interviews and tests with children: (d) memory and recall of episodes; (e) psychological consequences in adulthood; and (f) recovery. However, the

analyses conducted were based on the common bibliometric indicators at the time of publication and a wide spectrum of documents (i.e., scientific articles, books, practice guidelines, etc.); thus, only words could be extracted from the title and abstract.

Most recently, Tran et al. (2018) published a bibliometric analysis which include sexual abuse in conjunction with other forms of maltreatment but it does not include an in-depth analysis of the trends of CSA research. Tran et al. studied a broad and complex subject based on the World Health Organization's definition of maltreatment and complement it with other types of violence directed at children. Although this is an international benchmark, CSA is defined differently by organizations and countries around the world, making it difficult to grasp its multiple meanings. In addition, Tran et al. only analyzed keywords, which can be sources of bias. In the present study, CSA articles published in the Science Citation Index Expanded from 1991 to 2017 were screened to characterize general trends in field domain; assess publication characteristics related to first author number; identify highly cited articles and corresponding author; and evaluate research trends and possible future courses in the CSA domain.

Materials and methods

Data used in this ex post-facto historiographical study were retrieved from the Clarivate Analytics Web of Science Core Collection, the online version of the Science Citation Index Expanded (SCI-EXPANDED). According to the Journal Citation Report (JCR), the SCI-EXPANDED database indexes 9015 journals in 178 categories of the Web of Science in 2017 (Clarivate Analytics 2019). The SCI-EXPANDED is also the most important and widely used database of scientific production and is widely utilized by researchers in almost every area of study (Baltussen and Kindler 2004; Rehn et al. 2007; Fu et al. 2013).

The search was conducted on the basis of the agreement adopted by the Interagency Working Group for the understanding and use of the different terms and concepts related to CSA (Greijer and Doek 2016). The database was searched under the following terms and Boolean operators: ("child" or "children" or "childhood" or "infancy" or "boys" or "girls") and [("sexual" and "abuse") or "incest" or "rape" or "molestation" or ("sexual" and "touching") or ("sexual" and "harassment") or ("online" and "sexual" and "abuse")]. The publication period reviewed was between 1991 and 2017. The final filter was the "front page" in which only the articles having the search keywords in their "front page" including article title, abstract, and author keywords were retained (Fu et al. 2012).

Four types of analysis were conducted. First, the authors characterized general trends in field domain using Microsoft Excel 2016 to reorganize the records (Li and Ho 2008; Ho and Fu 2016). As part of this process the authors identified (1) the volume of publications; (2) languages; (3) average number of citations per publication (CPP) defined as total number of citations over the total number of publications (Hsieh et al. 2004); (4) paper life; (5) main journals in which the papers were published; (6) countries of the authors; and (7) type of collaboration. Affiliations in England, Scotland, Northern Ireland, and Wales were reclassified as being from the United Kingdom (UK) (Chiu and Ho 2007). Affiliations in Hong Kong before 1997 were included with China (Fu et al. 2012). Affiliations in the USSR were checked and reclassified as being from Russia (Ho et al. 2016). Affiliations in the Neth Antilles (Netherlands Antilles) were reclassified as being from Netherlands. Affiliations in the French Guiana were reclassified as being from France. Lastly, affiliations in the Zaire were reclassified as being from Dem Rep Congo (Democratic Republic of the

Congo) (Pouris and Ho 2016). The impact factor of a journal was based on the Journal Citation Report 2017 (IF_{2017}).

Secondly, the authors identified highly cited papers. Ho (2012, 2013) proposed a relationship between total number of articles (TP) in a year and their citations per publication ($CPP_{year} = TC_{year}/TP$) by the decades and years to understand publication and their impact trends in a research field. The number of citations of an article from Web of Science Core Collection in a single year, for example 2017, was referred to as the C_{2017} (Ho 2012), and the total number of citations since publication to the end of 2017 was referred to as the TC_{2017} (Chuang et al. 2011; Wang et al. 2011).

Third, the authors applied the *Y*-index (Ho 2014a, b) to characterize the quantity and quality of authorship contributions, in this case, having regard to first author publications (FP) and the corresponding author publications (*RP*). The *Y*-index combines two parameters (j, h), to assess both the publication potential and the characteristics of the contribution as a single index. This indicator has been used in following years to compare highly cited authors (Fu and Ho 2014; Chen and Ho 2015; Ivanović and Ho 2016; Elango and Ho 2017; Mo et al. 2018). The *Y*-index is defined as:

$$j = \mathrm{FP} + \mathrm{RP} \tag{1}$$

$$h = \tan^{-1}\left(\frac{\mathrm{RP}}{\mathrm{FP}}\right) \tag{2}$$

where j is the publication potential which is a constant related to publication quantity, and h is publication characteristics which can describe the proportion of RP to FP (Ho 2012, 2014a; Ho and Hartley 2016). The greater the value of j, the more the contribution of the first author and corresponding author publications. Different values of h represent different proportions of corresponding author publications from first author publications.

$h > 0.7854$ indicates more corresponding author publications;
$h = 0.7854$ indicates the same number of first author and corresponding author publication; and
$h < 0.7854$ indicates more first author publications.

When $h = 0$, j is the number of first author publications and $h = \pi/2$, j is the number of corresponding author publications.

In the SCI-EXPANDED database, the corresponding author was designated as the "reprint author"; instead of using the term "corresponding author" (Chiu and Ho 2007). In a single author article where authorship was unspecified, the single author was both first author and corresponding author (Lin and Ho 2015). Only the first corresponding author was considered in this study.

Finally, the authors used Word Cluster Analysis (WCA) to examine trends in research topics and possible future courses in the CSA domain. WCA was conducted in four steps. The first step consisted of extracting the words in the titles of the articles and the abstract, the author keywords, and *KeyWords Plus* (Mao et al. 2010; Wang and Ho 2016). Researchers then defined clusters of words, grouping together the same words, those that are synonyms, and congeners. For this step, three of the authors of this paper conducted the analysis in parallel using their specialized knowledge, to then contrast the results, settle differences, and reach consensus on the groupings. Subsequently, different supporting words were distinguished in the cluster and, finally, trends were identified by analyzing the number of publications containing the supporting words of the clusters through the three

sub-periods (1991–1999, 2000–2008, and 2009–2017) that concentrate the production in order to obtain the general vision of the trend.

Results

General trends in child sexual abuse publications

Data revealed that a total of 3889 CSA articles were published mostly in English ($n=3616$, 93%; $CPP_{2017}=37$). The remaining of the articles were written in 13 non-English languages including: German ($n=80$; 6.0); French ($n=78$, 2.1); Turkish ($n=38$, 2.5); Spanish ($n=35$, 2.9); Portuguese ($n=19$, 4.9); Polish ($n=8$, 3.0); Hungarian ($n=3$, 0.33); Italian ($n=3$, 0.67); Russian ($n=3$, 0.33); Dutch ($n=2$, 0.50); Icelandic ($n=2$, 0); Korean ($n=1$, 3.0); and Serbian ($n=1$, 0).

The annual number of child sexual abuse-related articles in SCI-EXPANDED and their CPP_{2017} were counted and displayed in Fig. 1. In the first period (1991–2001), the annual number of CSA articles fluctuated from 66 in 1991 to 102 in 2001. In the second

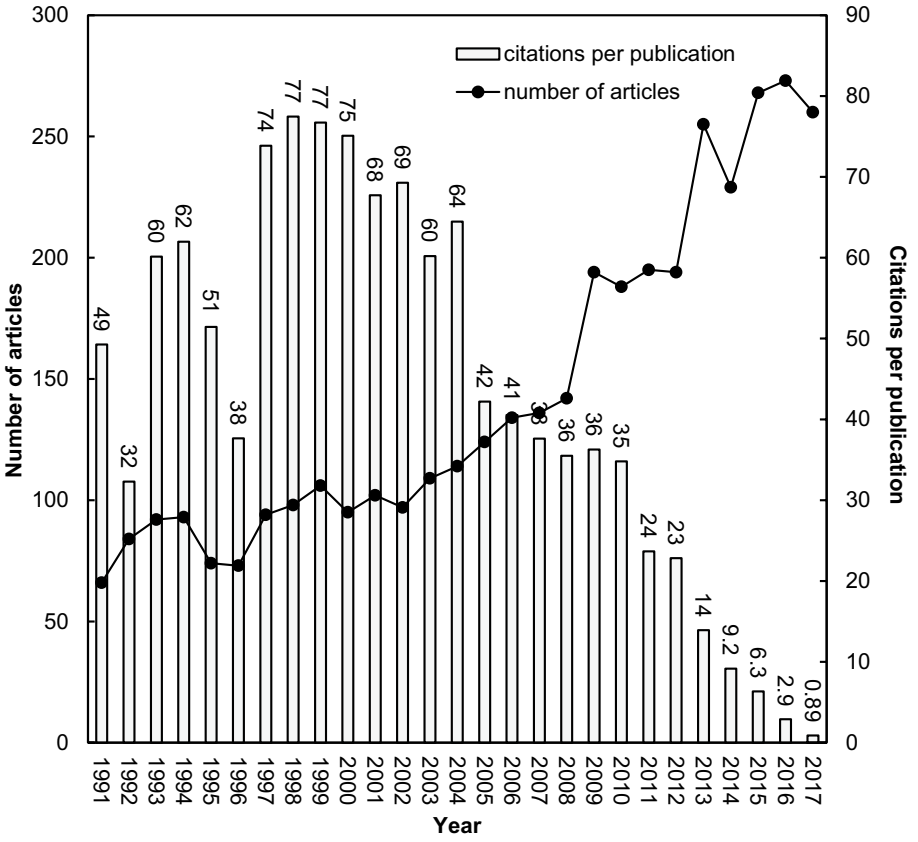

Fig. 1 Trends of child sexual abuse articles in SCI-EXPANDED and citations per publication from 1991 to 2017

period (2002–2008), articles increased from 97 in 2002 to 142 in 2008. In the last period (2009–2017), a sharp increase was observed from 194 in 2009 to 273 in 2016 and 260 in 2017. The higher CPP_{2017} was found in the period between 1997 and 2000.

Distributions of Web of Science categories and journals are basic components of bibliometric analyses (Chiu and Ho 2005). CSA articles were published in journals that were distributed in 86 Web of Science categories in SCI-EXPANDED. The top ten productive Web of Science categories with at least 300 articles are shown on Table 1. 55% of all articles were published in the two leading categories, psychiatry with 1549 articles (40% of 3889 articles) and pediatrics with 694 (18%) articles. It should also be noticed that journals could be classified in two or more categories in Web of Science (Ho 2014a), for instance *Journal of Adolescent Health* was listed in categories of 'developmental psychology', 'public, environmental and occupational health' and 'pediatrics', thus the sum of percentages was higher than 100%. Figure 2 shows publication trends for the top five Web of Science categories. Furthermore, an increasing trend of publication was found in category of psychiatry since 2008. In addition, data revealed that more articles were published in the categories of public, environmental, and occupational health and pediatrics in the last decade.

In addition, CSA articles were published in 777 journals. The top 10 most productive journals are listed on Table 2. Six of the top ten productive journals were in the category of psychiatry and three in pediatrics. In the category of pediatrics, *Pediatrics* ($IF_{2017}=5.515$) published the most CSA articles (121 articles; 3.1%) whereas the *American Journal of Psychiatry* ($IF_{2017}=13.391$) published the most articles in category of psychiatry (88 articles; 2.3%). In addition, when examining journal impact factor, *Lancet* has the highest IF_{2017} of 53.254 with 12 articles; followed by *JAMA-Journal of the American Medical Association* ($IF_{2017}=47.661$) with 17 articles; *Science* ($IF_{2017}=41.058$) with one article; and *World Psychiatry* ($IF_{2017}=30.000$) with two articles.

The contributions by countries were estimated by the affiliation of at least one author of CSA articles. The 3872 articles were published by authors from 105 countries. 3188 (82%) were independent publications by authors from 78 countries, and 663 (17%) were international collaborations involving authors from 94 countries. Six bibliometric indicators such as the total (TP), independent (IP), collaborative (CP), first author (FP), corresponding author (RP), and single author (SP) articles were employed to examine the research productivity by country (Ho and Kahn 2014). Table 3 shows the list of the top 10 most

Table 1 Top ten active Web of Science categories

Web of Science category	TP	%	*J*
Psychiatry	1549	40	142
Pediatrics	694	18	124
Public, environmental and occupational health	496	13	180
General and internal medicine	378	10	154
Psychology	327	8.4	78
Clinical neurology	286	7.4	197
Obstetrics and gynecology	217	5.6	82
Nursing	167	4.3	118
Substance abuse	162	4.2	19
Neurosciences	153	3.9	261

TP number of total articles, *J* number of journals in a category

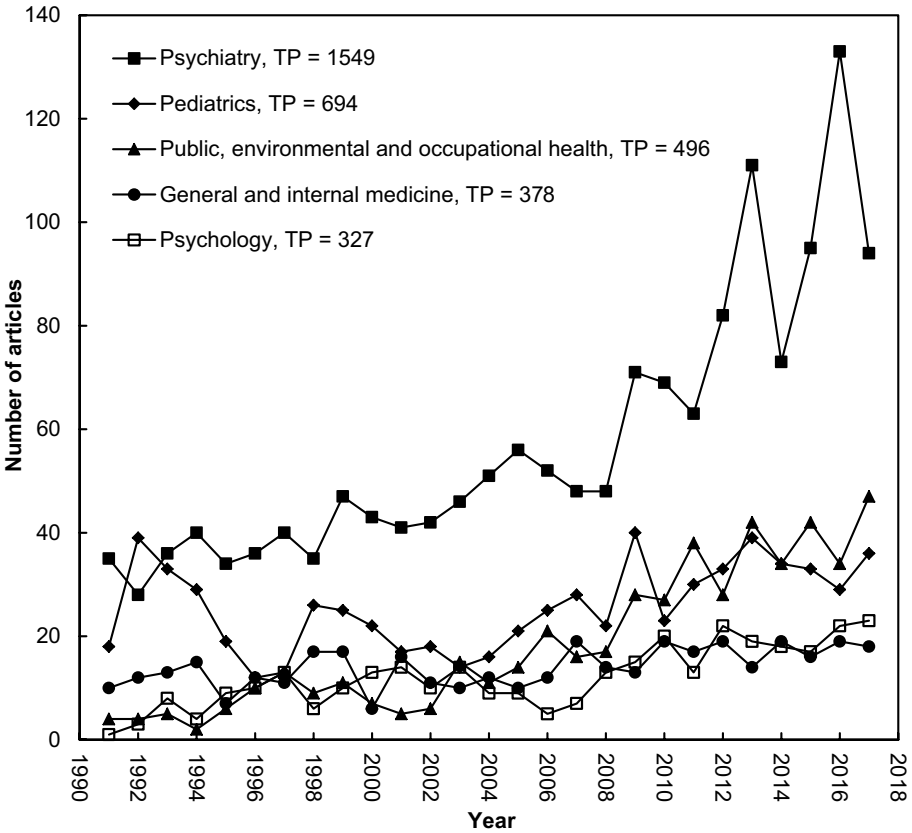

Fig. 2 Development trends of the top five Web of Science categories (TP > 300)

productive countries. The top ten countries included two American countries (USA and Canada); five European countries (UK, Germany, Netherlands, France, and Sweden), and one in Asia (Turkey), Africa (South Africa), and Oceania (Australia) respectively. Only five out of the seven major industrialized countries of the world (G7) such as USA, the UK, Canada, Germany, and France were ranked in the top ten but Italy (58 articles; ranked 17th) and Japan (26 articles; ranked 24th) were not icluded in the top. The United States ranked first in the six indicators mentioned above, followed by the United Kingdom.

Publications by institutions

Six indicators were utilized to compare publications among different institutions (Ho and Kahn 2014). Of the 3851 articles with author affiliations in SCI-EXPANDED, 1244 (32% of the 3851 articles) were single institution articles and 2607 (68%) articles were inter-institutional collaborations. The top 10 institutions were ranked by the number of total articles as shown in Table 4. Among the ten institutions, eight were in United States and the remaining two were in the United Kingdom and Canada respectively. The university with the highest number of articles was Harvard University, in the USA with 177 articles (4.6% of 3851 articles), including 164 inter-institutionally collaborative

Table 2 Top ten productive journals on child sexual abuse research

Journal	TP (%)	IF_{2017}	Web of Science category
Pediatrics	121 (3.1)	5.515	Pediatrics
American Journal of Psychiatry	88 (2.3)	13.391	Psychiatry
Journal of Adolescent Health	79 (2.0)	4.098	Developmental psychology Public, environmental and Occupational health pediatrics
Journal of Nervous and Mental Disease	75 (1.9)	1.940	Clinical neurology Psychiatry
Psychological Medicine	74 (1.9)	5.475	Clinical psychology Psychiatry Psychology
Journal of the American Academy of Child and Adolescent Psychiatry	69 (1.8)	6.250	Developmental psychology Pediatrics Psychiatry
PLoS One	64 (1.6)	2.766	Multidisciplinary sciences
Journal of Affective Disorders	57 (1.5)	3.786	Clinical neurology Psychiatry
Comprehensive Psychiatry	56 (1.4)	2.128	Psychiatry
American Journal of Public Health	48 (1.2)	4.380	Public, environmental and occupational health

TP number of total articles, IF_{2017} impact factor in 2017

Table 3 Top ten countries with TP ≥ 90

Country	TP	TPR (%)	IPR (%)	CPR (%)	FPR (%)	RPR (%)	SPR (%)
USA	1934	1 (50)	1 (49)	1 (57)	1 (45)	1 (45)	1 (49)
UK	423	2 (11)	2 (8.0)	2 (25)	2 (8.4)	2 (8.3)	2 (12)
Canada	292	3 (7.5)	3 (5.4)	3 (18)	3 (6.1)	3 (6.1)	5 (4.3)
Germany	210	4 (5.4)	4 (4.5)	6 (10)	4 (4.4)	4 (4.5)	6 (3.7)
Australia	189	5 (4.9)	6 (3.2)	4 (13)	5 (3.3)	5 (3.4)	4 (4.9)
Netherlands	132	6 (3.4)	8 (1.9)	5 (11)	8 (2.2)	8 (2.2)	14 (0.62)
Turkey	129	7 (3.3)	5 (3.7)	26 (1.7)	6 (3.3)	6 (3.3)	21 (0.31)
France	107	8 (2.8)	7 (2.3)	11 (5)	7 (2.3)	7 (2.3)	3 (5.2)
Sweden	93	9 (2.4)	9 (1.5)	9 (6.8)	9 (1.7)	9 (1.8)	21 (0.31)
South Africa	90	10 (2.3)	13 (1.3)	7 (7.5)	11 (1.5)	11 (1.5)	7 (2.5)

TP total number of articles; *TPR* (%), *IPR* (%), *CPR* (%), *FPR* (%), *RPR* (%), and *SPR* (%): the rank and percentage of total articles, country independent articles, internationally collaborative articles, first author articles, corresponding author articles, and single author articles among their total articles, respectively

articles (6.3% of 2607 articles), 49 first author articles (1.3% of 3851 articles), and 48 corresponding author articles (1.3% of 3753 articles). The University of Washington, also in the USA had the most institutional independent articles with 19 (1.5%, 1244 articles). In addition, Nationwide Children's Hospital in the USA authored 14 articles (ranked 90th) including the most single author articles with 9 (2.8% of 325 articles).

Table 4 Top ten productive institutions

Institute	TP	TPR (%)	IPR (%)	CPR (%)	FPR (%)	RPR (%)	SPR (%)
Harvard University, USA	177	1 (4.6)	3 (1.0)	1 (6.3)	1 (1.3)	1 (1.3)	2 (0.92)
Columbia University, USA	95	2 (2.5)	20 (0.56)	2 (3.4)	11 (0.70)	11 (0.67)	36 (0.31)
University of Washington, USA	87	3 (2.3)	1 (1.5)	5 (2.6)	3 (1.0)	3 (1.0)	2 (0.92)
Yale University, USA	84	4 (2.2)	6 (1.0)	3 (2.8)	8 (0.75)	13 (0.64)	36 (0.31)
Emory University, USA	77	5 (2.0)	18 (0.64)	4 (2.6)	5 (0.88)	6 (0.83)	36 (0.31)
King's College London, UK	71	6 (1.8)	25 (0.48)	6 (2.5)	7 (0.80)	6 (0.83)	36 (0.31)
University of Toronto, Canada	63	7 (1.6)	6 (1.0)	8 (2.0)	14 (0.65)	13 (0.64)	9 (0.62)
University of North Carolina, USA	61	8 (1.6)	3 (1.0)	10 (1.8)	13 (0.68)	11 (0.67)	36 (0.31)
Centers for Disease Control and Prevention, USA	58	9 (1.5)	10 (0.80)	10 (1.8)	2 (1.1)	2 (1.0)	N/A
Boston University, USA	57	10 (1.5)	104 (0.16)	7 (2.1)	22 (0.47)	20 (0.48)	N/A

TP total number of articles; *TPR* (%), *IPR* (%), *CPR* (%), *FPR* (%), *RPR* (%), *SPR* (%): the rank and percentage of total articles, single-institution articles, inter-institutionally collaborative articles, first-author articles, corresponding-author articles, and single author articles among their total articles, respectively; *N/A* not available

Author's performance

In total, 3714 CSA articles (97% of 3889 articles) with both first and corresponding author information in the SCI-EXPANDED (12,000 authors) were used to calculate the *Y*-index for authors (Ho 2014a). Altogether 2383 authors (20% of 12,000 authors) had both first and corresponding author articles with $1.326 \geq h \geq 0.2450$; while 2915 (24%) authors had first author articles; and 2807 (23%) authors had corresponding author articles. Particularly, 8661 (70%) authors had no first and corresponding author with *Y*-index = (0, 0); 529 (4.4%) authors had $h > 0.7854$ including 424 (3.5%) authors that had no first author articles with $h = \pi/2$; 564 (4.7%) authors had $h < 0.7854$ including 532 (4.4%) authors that had no corresponding author articles with $h = 0$; and 2236 (19%) authors had the same numbers of first author and corresponding author articles ($h = 0.7854$).

Figure 3 shows distribution of the *Y*-index (j, h) of the top 43 authors with $j \geq 10$. Each dot represents one value that could be one author or many authors. j is publication intensity constant, an author with a higher j indicates more articles as first or corresponding authors and with leadership role in more articles (Ho 2014a). J.D. Bremner and G. Hornor had the same publication potential and characteristics of contributions with a *Y*-index = (24, 0.7854) followed by T.O. Afifi and D. Finkelhor who also had the same *Y*-index (23, 0.8288). The *Y*-index is helpful to distinguish the different performance of authors especially when j of authors is the same (Ho 2014b). In addition, data revealed that M.H. Teicher (18, 1.004), N.L. Talbot (18, 0.8961), and R.A. Sansone (18, 0.7854) had the same value of j. These authors have the same publication potential but the characteristics of their publications are different. Teicher had greater proportion of corresponding author articles to first author articles (11 and 7 articles). Sansone published the same numbers of first author articles and corresponding author articles (9 articles). Similarly, M. Aas (11, 0.8761), J. Read (11, 0.8761), and R.F. Anda (11, 0.6947) had the same h of 11. Aas and Read published more corresponding author articles than first author articles with h of 0.8761. However, Anda published more first author articles with h of 0.6947.

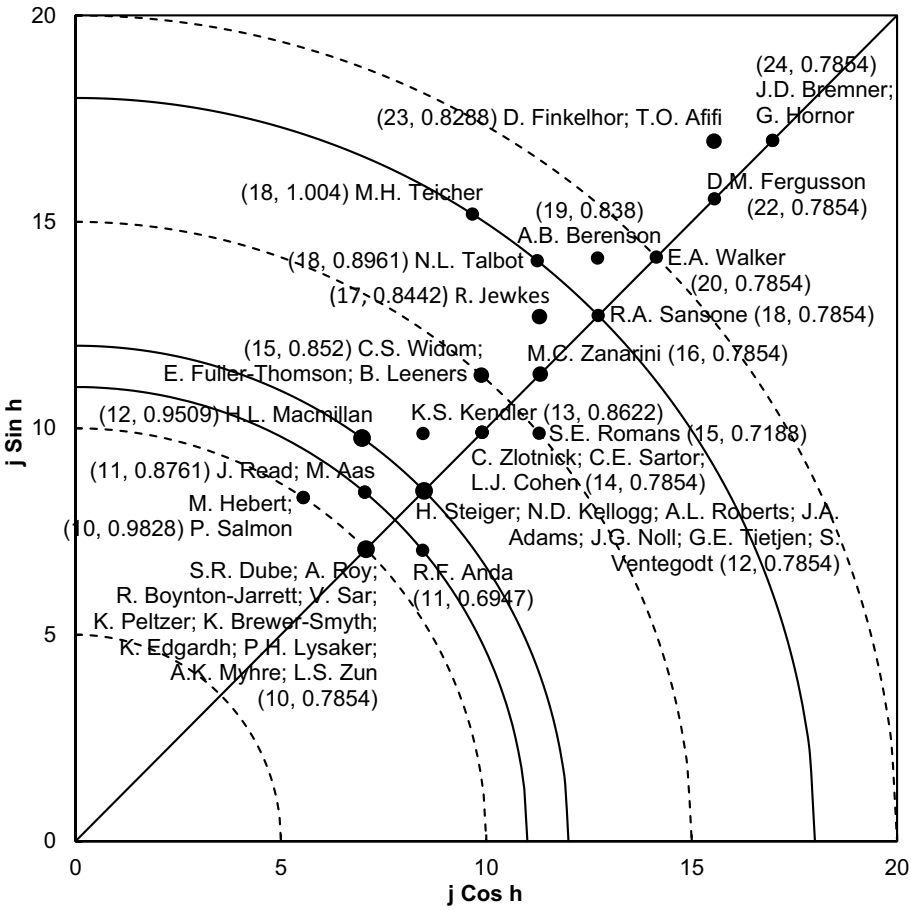

Fig. 3 Distribution of the top 43 authors with their *Y*-index (j, h) values ($j \geq 10$). *Note* $h > 0.7854$: more corresponding author publication; $h = 0.7854$: same corresponding and first author publication; $h < 0.7854$: more first author publication

These findings suggest that Anda is more active on research performance but Aas and Read supervise more researchers as corresponding authors. Furthermore, within these 43 authors in (Fig. 3), 15 authors had an $h > 0.7854$; 26 had an $h = 0.7854$; and only S.E. Romans and R.F. Anda had an $h < 0.7854$.

Leading papers in 2017

A relationship between percentage of cited papers and paper life has been documented (Chiu and Ho 2005). In order to understand publication and their citation trends, a relationship between citations per publication (CPP_{2017}) and article life was further proposed (Chuang et al. 2007). After publication year, CPP_{2017} of articles sharply increased to a peak of 4.2 in the 5th year and decreased after that (Fig. 4). Five of the top ten highly cited papers were published in the period between 1997 and 2000, including the most frequently

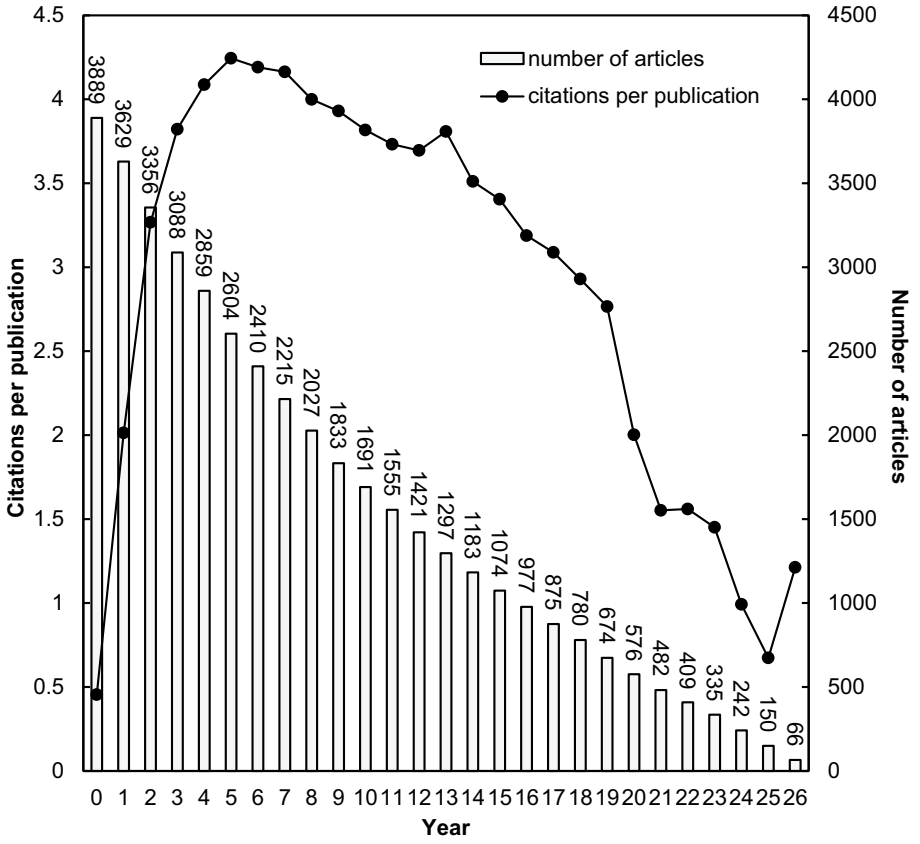

Fig. 4 Citations per publication by article age

cited by Felitti et al. (1998). Furthermore, six of the top 10 highly cited articles in CSA still have a high impact in the most recent years with $C_{2017} > 55$ (ranked top 10) (Fig. 5).

The article ranked 1st with a C_{2017} (reaching 562 citations) and TC_{2017} (with 3186 citations) was "Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study" (Felitti et al. 1998). This paper used a sample of more than 13,000 participants to establish the relationship between children's exposure to different types of abuse, including CSA, and dysfunction in the home, health behaviors, and illnesses that constitute risk factors for several the leading causes of death in adults. The importance of these findings is that they led the World Health Organization (WHO) to pilot a questionnaire for the international evaluation of the Adverse Childhood Experiences (ACEs) (World Health Organization 2011), which has been widely utilized in research around the world (Almuneef et al. 2014; Bokhari et al. 2015; Goodman et al. 2017). Lastly, this paper is considered the seminal article that opens the research field of the ACEs (Vega-Arce and Núñez-Ulloa 2018).

The article "Child maltreatment 1. Burden and consequences of child maltreatment in high-income countries" by Gilbert et al. (2009a), ranked 2nd according to C_{2017} (188) and 5th, according to TC_{2017} (1032). This article presents a systematic review of the literature on the topic of child maltreatment including definitions, its determinants, number of

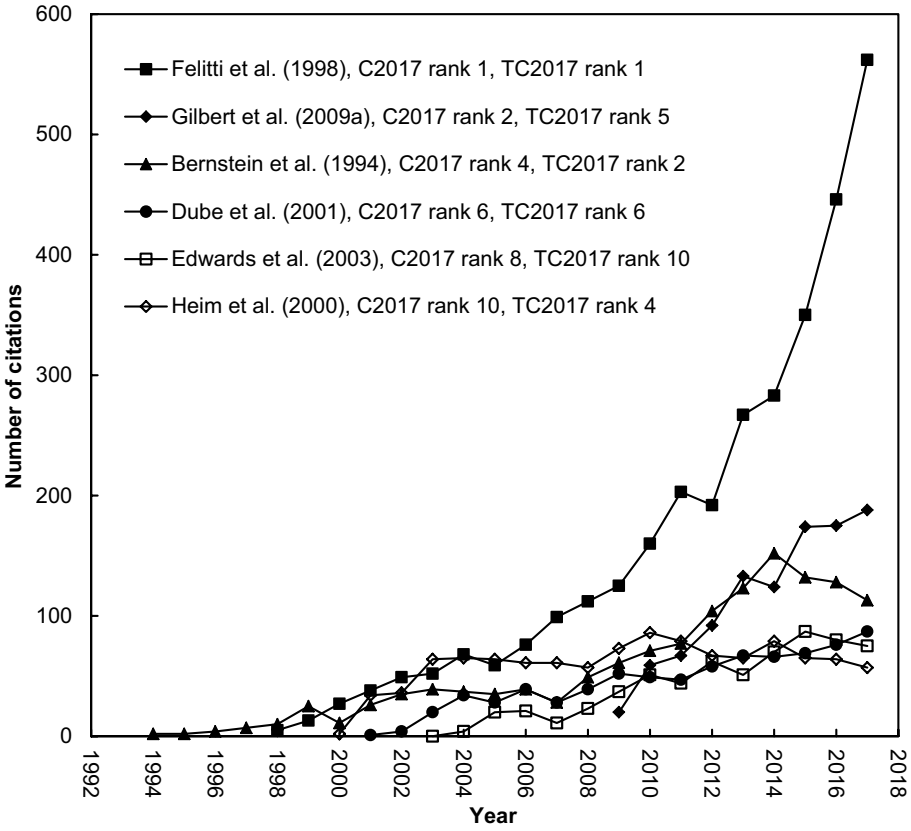

Fig. 5 The citation histories of the articles ranked top ten in both C_{2017} and TC_{2017}

associated deaths, long-term consequences, and projections of the research. This paper was part of a series of four articles that critically evaluate the evidence around child abuse. The other three articles addressed the recognition and response level of professional organizations to child maltreatment (Gilbert et al. 2009b); its prevention (MacMillan et al. 2009); and how the incorporation of children's rights strengthens public health and child protection (Reading et al. 2009).

On the other hand, the paper by Bernstein et al. (1994) "Initial reliability and validity of a new retrospective measure of child-abuse and neglect" with C_{2017} (113) ranked 4th and TC_{2017} (1310) ranked 2nd; discuss the development and validation of the Childhood Trauma Questionnaire, a retrospective screening tool for abuse. This instrument was subsequently validated in different countries and languages (Bernstein et al. 1994, 1997, 2003).

Similar to Felitti et al. (1998), two additional articles, Dube et al. (2001) "Childhood abuse, household dysfunction, and the risk of suicide attempt throughout the life span—Findings from the adverse childhood experiences study" and Edwards et al. (2003) "Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: Results from the Adverse Childhood Experiences study" are the product of the ACE Study. The article by Dube et al. (2001) explored the relationship between Adverse Experiences in Childhood (ACEs) and suicide attempts. Its main finding

suggest that high ACE scores were strongly correlated to suicide attempts during childhood, adolescence and adulthood; partially mediated by alcoholism, depressed affect, and illicit drug use, which are also strongly associated with ACEs. The number of citations place this paper in 6th place regarding C_{2017} (87) and TC_{2017} (764). On the other hand, the paper by Edwards et al. (2003), ranked 8th in C_{2017} (75) and 10th in TC_{2017} (636) and reported a dose–response between the number of types of abuse and mental health scores through a prevalence study. In particular, physical maltreatment, CSA, as well as witnessing maternal battering, were common experiences among participating adults.

Finally, "Pituitary-adrenal and autonomic responses to stress in women after sexual and physical abuse in childhood" by Heim et al. (2000) ranked 10th in C_{2017} (57) and 4th in TC_{2017} (1079). This study suggested that the experience of severe stress in childhood was associated with the hypothalamic–pituitary–adrenal axis and autonomic nervous system hyperreactivity as a persistent consequence of childhood abuse, increasing the risk of presenting psychopathological conditions during adulthood.

Research trends in child sexual abuse

Data from this study revealed that research on CSA is concentrated around 11 categories that group together the 152 words studied. The eleven categories were:

1. Violence, which integrates terms such as "violence" and other types of violence such as "child maltreatment", "intimate partner violence" and "sexual abuse". This cluster concentrates the greatest number of terms frequently used in the papers, such as "abuse", the word most frequently used in the titles and the second most frequently used in the abstracts from 1991 to 2017; "sexual abuse" and "child abuse" respectively were the most used and the second most used author keyword in the three sub-periods studied; and "sexual-abuse" was the third most used *Keywords Plus* between all studied years, and the most used in 2009–2017 sub-period. Its relevance is consistent with the positioning of violence as a topic of study with different interconnected edges, as well as with the research on life trajectories with consecutive exposures to one or more types of violence and the integrational transmission of experiences of violence.
2. Life cycle refers to different periods throughout life. Its supporting words include terms such as "childhood", "children", "adolescents", and "adult", among which "childhood" is the third most used word in the titles and abstracts, and the most used in the titles in 2009–2017. This may be related to the fact that in recent years authors are directing their research on CSA to aspects related to childhood.
3. Female whose supporting words are "woman", "girls", and "female". Among these terms, "woman" is the *Keywords Plus* most used in the 1991–2017 period, and the third most used between 2009 and 2017, which suggests that although CSA can also impact men, the body of research has notably emphasize issues surrounding women.
4. Developmental areas including "emotional," "sexual", and "physical". Specifically, "sexual" is the term most frequently used in the abstracts in the period 1991–2017 and in the three sub-periods studied. In addition, it is the third most used word in article titles in 2009–2017.
5. Epidemiology, has only the word "prevalence" as supporting word and corresponds to the second most frequent term among *Keywords Plus*. It is in itself a cluster because it refers to one of the main study themes in the area of CSA that continues to represent a challenge in various regions and countries.

6. Impact whose supporting words "trauma", "stress", "depression", and "substance use" among others, are distributed in the four types of extracted words (words on the title, abstract, authors' keywords and *Keywords Plus*) highligthing the interest in examining the impact of CSA.
7. Health, includes words like "health", "mental health", and "patients" among others. Although none of the terms corresponded to those most frequently used, the cluster accounts for one of the emphases given to research in CSA, the implications of which range from public health to clinical care.
8. Risk factors, with terms such as "risk", "risk factors", and "household dysfunction", in all types of words used. Their use may be related to both abuse and risk factor, such as the *KeyWords Plus* assigned by using Felitti et al. (1998) among the references.
9. Method, a cluster made up of several words such as "sample", "questionnaire", and "regression" among others. None of the terms is part of the author's keywords, which suggest the articles typically discuss aspects of the methodology but it is not considered a focus of the study.
10. Experiences, with "experiences" and "history" as supporting words associated with words in the title and abstract, in addition to *KeyWords Plus*. This construct refers mainly to life experiences or the biographical trajectory.
11. Group, with the supporting words "relationship", "family", "role", and "group" used in titles and abstracts. Its function is to position CSA within the framework of the child's relationships.

Hotspots in child sexual abuse research

Throughout the period under review (1991–2017), the top three hotspots in CSA research have been sexual abuse, maltreatment, and sexual development. The study of sexual abuse as a phenomenon that can impact people of different age groups has maintained a steady increase over the years, leading the hotspots in the area. Sexual abuse includes modalities that affect children, such as incest and others that may occur regardless of age, such as rape. The investigation of sexual abuse as a unique category, but also distinguishing its subtypes, reveals an interest in deepening its foci and the complexity of knowledge around the subject. Secondly, maltreatment is reffered as a category of interpersonal violence directed at children, involving a person in a role of authority that actively (e.g., through emotional abuse) or passively (e.g., through neglect) abuses a child. This hotspot maintains a progressive increase over the years and may project a series of studies in which CSA is integrated as a type of maltreatment or which emphasize the co-occurrence of different types of maltreatment.

Lastly, sexual development refers to understanding sexuality as a human dimension that is studied by various disciplines that investigate aspects such as sexual conduct and sexual coercion, where CSA is conceptually located. Like the two previous hotspots, this topic shows an increase in the number of papers published over the years. Other topics of interest but with a smaller volume of articles were: childhood, method, health, group, female, and physical development. Figure 6 report the trends in productivity associated with each topic along with the general trend of CSA. It is important to highlight that each of these topics have great potential for interdisciplinary research.

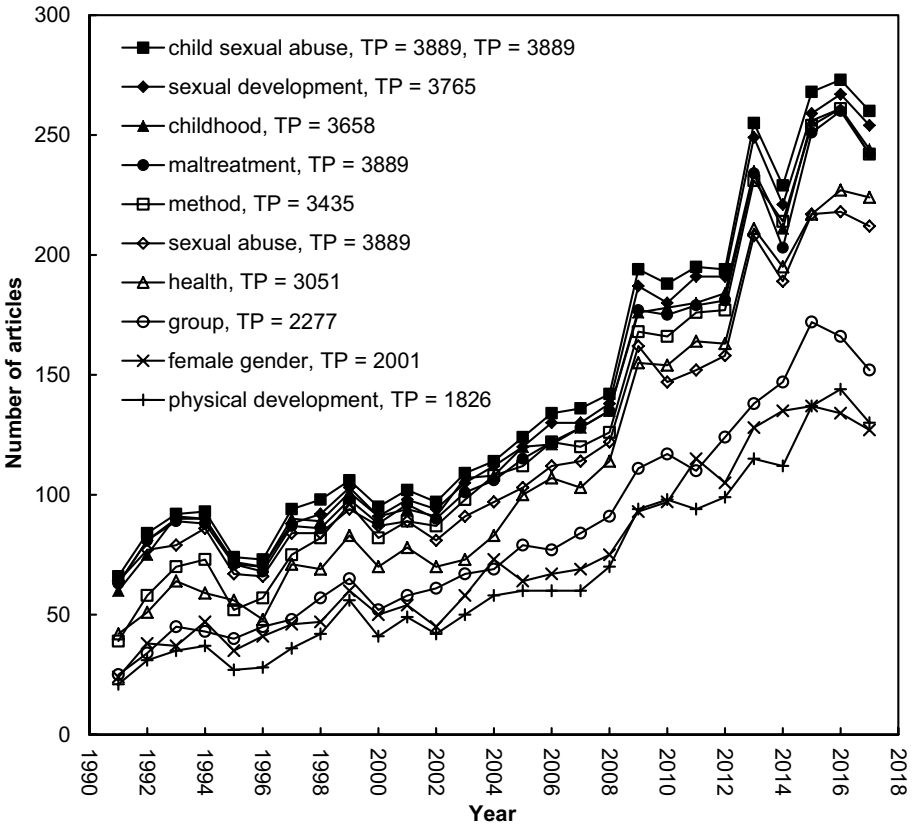

Fig. 6 Growth trends of main focuses in child sexual abuse research during 1991–2017

Discussion

The analysis conducted in this study allowed us to explore trends in CSA research with more specificity than previously reported in the literature. As part of the study, papers were characterized in relation to the language in which they are written; their volume; category in SCI-EXPANDED; journals published; authors' countries; production by institution; *Y*-index for authors; citation trends of the most cited articles and papers that maintain their impact in the last year studied; as well as identifying research trends and main hotspots in the area. Similar to Tran et al's. (2018) findings this study confirm that CSA research has received a strong influence from the United States and other highly industrialized countries based on the volume of articles produced and the impact of these articles.

Similarly, the authors observed that the marked increase in productivity in the area is consistent with Behl et al. (2003) and Stoltenborgh et al. (2015) findings, highlighting the approach to issues already mentioned by Aprile et al. (2009), such as the impact of CSA, as well as the continuous interest in the study of CSA effects in women, reported by Browne and Finkelhor (1986). Similarly, the evolution of the observed themes and hotspots seem to account for a domain of knowledge that deepened and expanded due to interdiciplinary contributions without having yet addressed issues of theoretical relevance pointed out

more than 30 years ago, as is the case of the male victims of CSA reported by Browne and Finkelhor (1986). This leads us to assume that CSA has direct relations with the area of maltreatment and possibly violence, although with a different specificity and dynamisms, which makes it complex. It will be important to study again the trends when the current advances in production and collaboration (United Nations 2015) make it possible to narrow the gaps detected between the different regions and nations.

Conclusions

The findings of this study suggest that CSA research included in Science Citation Index Expanded is relatively recent and have attracted a growing interest among researchers worldwide, especially from 2009 to 2017. However, the results indicate a clear tendency to first, produce articles in English; and secondly, to publish in journals focusing on psychiatry and pediatrics, with Pediatrics producing the largest number of papers. Data also indicates that most articles come from upper-middle income or higher countries, being the four most productive ones among the seven major industrialized countries of the world (G7). Similarly, the 10 most productive institutions correspond to G7 countries, with Harvard University concentrating the largest number of indexed articles.

Findings also revealed that the peak of citations per publication occurs in the 5th year and that the most frequently cited and impactful article was "Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study" from Felitti et al. (1998). In addition, eleven categories that group together research trends in CSA were identified, the one that concentrates the greatest number of terms used in the papers was violence, followed by life cycle, female gender, developmental areas, epidemiology, impact, health, risk factors, method, experiences, and group. The three main hotspots were sexual abuse, maltreatment and sexual development; themes that have great potential for interdisciplinary work. Lastly, it is expected that some topics of great theoretical and applied relevance, such as CSA directed at men will become relevant in the coming years as well as the production of research on CSA in low- and middle-income countries.

Limitations of the analysis

The analysis presents some limitations associated with subject of study, others inherent to bibliometrics, and some specific to the design of this study. First, difficulties in defining CSA over time may have impacted the way in which the issue has been addressed, affecting the extraction of papers. Secondly, bibliometric analysis do not contextualize the production of articles historically nor politically which can assist in explaining the observed direction as well as the lack of studies prior to 1991. Finally, the choice of the database may geographically bias the results obtained (Mongeon and Paul-Hus 2016). This may have limited the research included in regional databases that could contain the production of researchers from countries whose main language is different from English. Furthermore, the choice of index excludes those journals belonging to the Social Sciences Citation Index, which marginalizes relevant journals in the area (e.g. Child Abuse & Neglect). Also, there is a time limitation which does not consider the production of 2018 given the date in which the data was collected; and lastly, the type of document reviewed was restricted to papers, therefore, meeting abstracts and reviews were not integrated which could have

account for recent advances in research as well as the conclusions resulting from the analysis of secondary sources.

Compliance with ethical standards

Conflict of interest No potential conflict of interest was reported by the authors.

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