A Bibliometric Analysis of Female Criminality: Scientific Trends and Insights from the Scopus Database

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ABSTRACT

This study concerns the scientific output of Female criminality. The scholarly works published in the Scopus database from 1935 to 2023 were utilized for the quantitative analysis, and the Bibliometrics R Package and its web app Biblioshiny were employed further. The objectives were to analyze the evolution of scientific literature on female criminality from 1935 to 2023, determine relevant sources, identify popular keywords, most influential authors, and their research productivity, explore prominent affiliations and countries contributing to the field, and assess future research directions in female criminality. Research on female criminality, spanning from 1935 to 2023 with 1214 papers in Scopus, has shown significant growth, peaking from 2017 to 2019, indicating increased scholarly interest. Early works laid the foundations; forensic medicine peaked in the late 1970s, and middle-age studies surged in the early 1980s. Themes shifted to broader perspectives by 2023, addressing drug abuse, etc. Specialized journals like Acta Psychiatrica Scandinavica and Criminal Behavior and Mental Health focus on psychiatric and substance abuse aspects. Feminist Criminology gained prominence. Research clusters around psychological aspects, substance abuse, and criminal justice interactions. 2014 indicates a peak, with influential work from researchers like Lichtenstein, P., continuing the legacy of earlier scholars like Bohman, M and Ellis, L. indicating ongoing evolution. The research gap highlights the need for interdisciplinary studies that integrate psychological factors with longitudinal research, focusing on how gender and age influence substance abuse and criminal behavior among women and children. Recommendations include interdisciplinary studies, longitudinal research, exploring intersectional factors, bridging the research-policy gap, and emphasizing tailored prevention and intervention programs for women involved in crime.

1. Introduction

This present work has aimed to emphasize the dramatic synthesis of the literature concerning female criminality. The social sciences have, with special weight, considered gender, especially criminology, in which the gender-crime relation has been a matter of scholars' attention for a very long time. The male-female dichotomy in criminal conduct is dynamic and socially constructed. Thus, it calls for a more concrete conception of female experiences of crime that is, from its outset, able to suggest policies, practices, and scholarship. Being known as social science, criminology studies both the social and individual aspects that might explain a given act of crime considered as an interaction. Concerned with crime, criminologists tend to study crimes or kinds of crimes and of societal responses thereto to design evidence-based strategies for crime reduction. By way of research design and analytic frameworks, different kinds of criminological narratives may be formulated by identifying trends and patterns of criminal conduct from which such knowledge may be used to design actual responses to crime in societal terms. Proponents of *Feminist Criminology* argue that "traditional" criminology has focused excessively on male criminality and failed to consider the realities of women's criminal behaviour and the factors influencing women's criminal behavior (Carlen, 1988; Chesney-Lind & Pasko, 2004). Feminist criminologists point to men committing more crimes than women, which is cited as one of the few accepted "facts of criminology" (Lauritsen et al., 2009). The participation of women in criminal behaviour has been a strongly under-researched area (Leonard, 1982; Smart, 1976; Heidensohn and Marisa, 2012).

The discussion about female criminality started taking prominence with the rise of the second wave of feminism in the 1970s, after which several issues related to women and crime came to be considered (Davies et al., 2007; Naffine, 1997). Perhaps heretically, one can say that early crimes of female violence, analyzed by Cesare Lombroso (1835–1909), stemmed from the theory of atavism among women criminals, meaning that such ancient and savage features would not allow women an adequate term of evolution, in Lombroso's view (Lombroso, 1980). Lombroso believed they had physical strength above the average male criminal. Keller (1900) supported this perspective about women in study of female criminals and non-criminals and reported that women criminals were often consumed with physical characteristics Lombroso would describe as immature or primitive.

It is important to mention that social and cultural, including environmental influences which had previously strengthened the biological reasons of criminality in females have now been subjected to challenges. To take the example of Chicago urbanism in the 20th century, the planners adopted sociological perspectives including the assertions of the Chicago School theorists, such as Burgess (1925) that the changes in the environment and the process of urbanism might eventually influence the crime level; it was the starting point of this idea development in the U.S after the World War II. A good example of this category of social learning theories was Differential Association by Sutherland and Creasy in 1960 which inferred that crime and deviance were based on the impact of social interactions. The Strain Theory analyzes the concept that differences between wishes and the ability to fulfill these wishes may make people engage in crime (Scott & Turner, 1965). On the same note, according to Labeling Theory, the perception of labeling a person's deviation has effects on the likelihood of the person engaging in criminal acts (Becker, 1963).

Though criminological theory has advanced appreciably, feminist criminologists claim the situational complexity of female criminality cannot be disentangled from traditional models. Essentially, they believe that

traditional criminology, in its efforts to isolate males as offenders, neglects both women's specific experiences and how their victimization is rooted in crime (Carlen, 1988; Chesney-Lind & Pasko, 2004). Feminist criminology, therefore, establishes possibilities for a more exhaustive and intersectional representation of female criminality, considering the conditions that play a primary or secondary role in women's movement into criminal arenas. In recent decades, both criminologists and criminal historians have begun to investigate female criminality, and their work is growing in scope and depth (Van der Heijden, 2017). Paradoxically, scholars suggest that female criminals tend to be undervalued because of the multifaceted elements motivating their criminal behavior. The scholarship discloses that the biological and psychosocial or slightly physical differences between females and males of the species are misinterpreted as only sociological differences (sociological differences also seem to reinforce the idea that they directly lack the normal or transitory, forms of physical, mental, and social power demonstrated by males).

For many years, female offending was largely considered to be related to sexual and child crimes, whereas lots of changes have occurred in the types of crimes women have engaged in during recent decades. This change can be traced back to when many Western nations adopted neoliberal economic principles in the 1970s. This had a profound effect on many facets of everyday life, one of which was increased drug use. As women have started to integrate into the workforce and give up their assigned social roles in the family unit, criminality has become more consistent with the types endorsed by men. This cultural change has added to the rise in drug use by women in modern culture. There have been many studies on women's criminality from qualitative and quantitative perspectives examining different subject concepts at the micro and macro levels, such as, women and

drugs (Yeater et al., 2022; Mnguni and Thobane, 2022; Brunton and Dryer, 2022), women and financial crime (Gottschalk, 2013; Dearden & Gottschalk, 2021; Gottschalk & Smith, 2015; Galvin, 2020), women and violent crime (Batchelor, 2005; Pollock et al., 2006), and women and sexual crime (Ma & Loke, 2019; Gerassi et al., 2021).

To provide a thorough understanding of the existing literature surrounding women and crime, a bibliometric analysis was used. Bibliometric analysis is a systematic analytic method to analyze an extensive amount of scientific data; researchers can look at the relationships between relevant research, timescales where research is published, the intellectual relationships of authors, and identify gaps in literature (Donthu et al., 2021; Verma & Gustafsson, 2020; Donthu et al., 2020). This method can be well-suited to investigate the intellectual structure of a field in literature. Using bibliometric methods to inform gender and crime can help us to understand the breadth of research available in many fields. For example, İyildirim and Ergüt (2016) published a bibliometric analysis of "Violence Against Women" as part of a literature review of relevant research using the Web of Science database, whereas Brilhante (2016) conducted a bibliometric study of gender violence with a focus on publications published between 1982 and 2012. Paloma et al. (2017) provided a bibliometric analysis on the topic of "Women, Peace, and Security" by providing an overview of the state of the art in the social sciences using the SCOPUS database.

Although much has been written about women and crime, there is a notable absence of bibliometric studies examining female criminality. This omission probably resulted from studies that were explicitly bound to a certain database (such as Scopus) and/or limited to a specific language (for instance, English or Spanish). This study, therefore, aims to examine female criminality through a bibliometric analysis, ultimately contributing

to a more detailed and comprehensive understanding of an important area of study. The aim of the current study involves conducting a comprehensive bibliometric analysis of the scientific literature on female criminality from 1935-2023. The research is guided by five key objectives to provide clarity in understanding the evolution of, and current body of, literature on the aspect of female criminality. The precise objectives and associated research questions are as follows:

Research Question: How has the scientific literature on female criminality evolved from 1935 to 2023?
Objective 1: To analyze the evolution of the scientific literature on female criminality over time.

Research Question: How do the most relevant sources impact the field of female criminality?

Research Question: Who are the most influential authors in the field of female criminality, and how productive are they in their research?

Objective 2: To identify the most relevant sources and influential authors in the field of female criminality.

Research Question: How are the most popular keywords associated with research on female criminality?

Objective 3: To determine the most popular keywords and thematic trends in the literature on female criminality.

Research Question: Which affiliations and countries are the most prominent in contributing to the study of female criminality?

Objective 4: To assess the contributions of various affiliations and countries to the study of female criminality.

Research Question: What are the future research directions in the study of female criminality?

Objective 5: To identify future research directions and emerging trends in the field of female criminality.

In achieving these aims and objectives systematically, the study will provide a thorough and well-informed overview of the field of female criminality research to identify patterns, influential actors, and potential areas of inquiry to further develop scholarly understanding into this fledgling field of research to facilitate even greater thinking and inquiry into this area of the women's crime context.

2. Materials and Methods

2.1. Data Source

This study demonstrates a bibliometric analysis of the literature on female criminality and applies a cross-sectional approach through the Scopus database as its primary data source. The study selected the Scopus database as it provides the largest array of material and available resources; hence, it will be useful for the overall process of analyzing the literature comprehensively. The Scopus database consists of over 76 million records from over 5,000 publishers across numerous disciplines and fields of study. The database offers over 1.8 billion cited references that date back to 1970 and will assist a deep bibliometric analysis, which is often described as a comprehensive source of bibliometric papers (Elsevier, 2022). The Scopus database has an extensive author profile database, which contains more than 17.6 million authors described (Elsevier, 2022). The breadth of the author database means our study should be able to locate appropriate articles on female criminality in the field.

The study will run every dimension of bibliometric analysis to have the best understanding of what the current literature looks like and the implications for future trends. With the results of the analysis, we will aim to understand directions for future research that may assist and inform future evidence-based behaviors and policy while aiming to improve future individual and community safety (Elsevier, 2022).

2.2. Research Method

A complete search was performed for relevant scholarly papers on female criminality on the Scopus database using the search line " TITLE-ABS-KEY (female AND criminality) AND (LIMIT-TO (LANGUAGE, "English"))". The search was able to locate 1,389 documents published from 1935 to 2023.
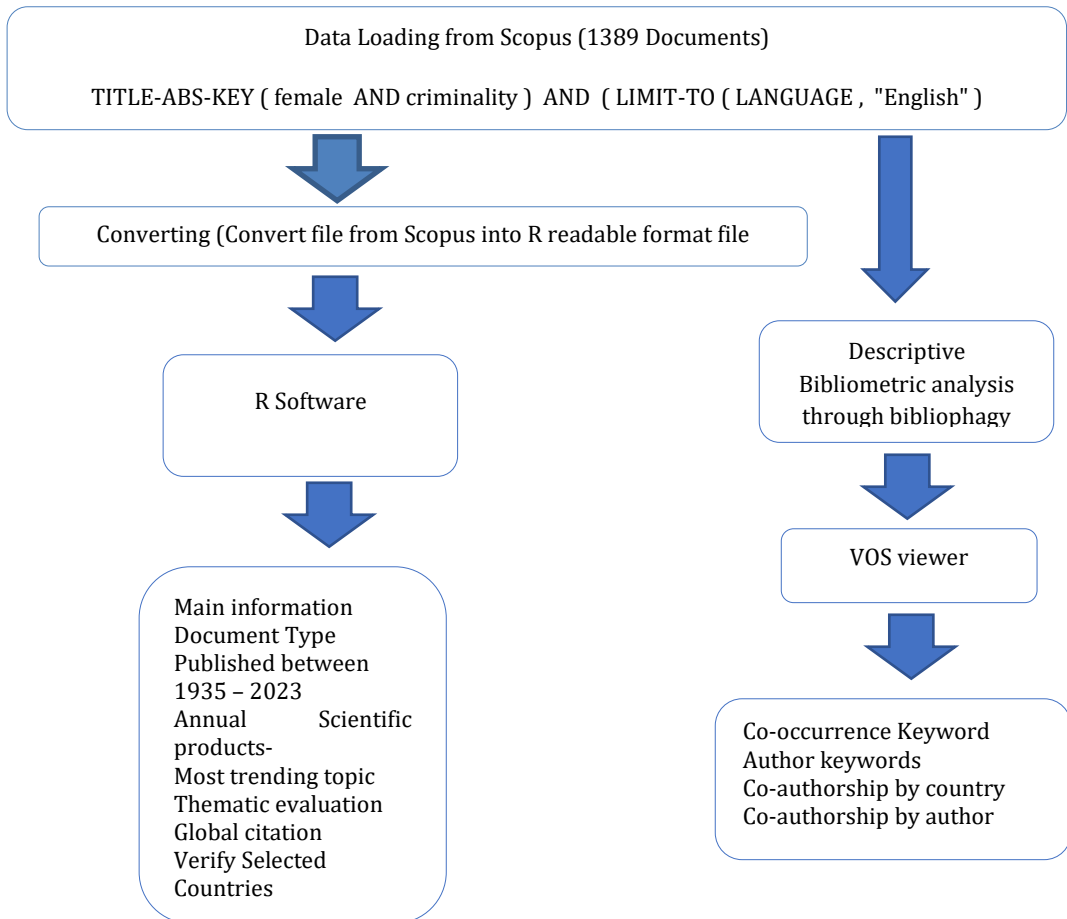
Figure 1. Scientific Workflow

The bibliometric analysis was done using the R programming language in the R Studio interface and using Bibliometrics and Biblioshiny web applications. This allowed for an in-depth viewing of the dataset, which allowed for consultation on trends, patterns, and key metrics of the literature on female

criminality. The VOS viewer software was used for data visualizations, to visualize multiple features of the space of research areas and particular research areas. Authors' Density Visualization was used to visualize the locations of authors in the field, Citation per Author was used to map citation patterns

and key literature and authors. Bibliographical Coupling was used to visualize the relationship between documents as related by bibliography. Co-occurrence Network: To visualize the relationships and co-occurrences of keywords and topics within literature. These visualizations provided valuable insights into author contributions, citation dynamics, and the thematic interconnectedness of the research on female criminality, offering a comprehensive understanding of the field's development and current state.

2. Results and Discussion

To analyze the evolution of the scientific literature on female criminality over time, the paper will refer to the following information such as the main information on the Scientific studies on female criminality.

Further Annual Scientific Products, the Most Trending Topic, and Thematic evaluation will answer the scientific literature on how female criminality evolved from 1935 to 2023.

Table 1. Documents published between 1935 - 2023.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1935:2023
Sources (Journals, Books, etc.)	643
Documents	1389
Annual Growth Rate %	0
Document Average Age	17.1
Average citations per doc	33.05
References	1
DOCUMENT CONTENTS	
Keywords Plus (ID)	3374
Author's Keywords (DE)	2312
AUTHORS	
Authors	3302
Authors of single-authored docs	305
AUTHORS COLLABORATION	
Single-authored docs	353
Co-Authors per Doc	3.14
International co-authorships %	14.54
DOCUMENT TYPES	
article	1214
article in press	1
book	21
book chapter	36
conference paper	17
editorial	4
letter	6
note	4
review	81
short survey	5

Source – Bibliometric analysis, Scopus Database

3.1. Main information

The analysis of the first dataset (1,389 documents) covering the period from 1935 to 2023 constituted the core focus of this study. This dataset was selected because the literature spans nearly nine decades, offering both historical depth and sustained scholarly engagement with the topic. Its longevity indicates that the subject has held continuous academic significance over time. The dataset was comprised of journal articles, books, and various publications, identifying 1,389 documents presenting an extensive and extensive record of *scholarly work. The average age of the documents cited in the dataset was 17.1, which provided evidence of the age and length of time scholarship has occurred on the given topic of interest. On average, documents in the dataset were cited 33.05 times, demonstrating great scholarly impact or recognition in research.

In considering the substance of the articles, we are provided with another dataset of keywords. Our dataset of keywords includes a total of 3,374 Keywords Plus (ID) and 2,312 Author's Keywords (DE) and indicates the expansiveness of terms addressing female criminality. The dataset also addresses 3,302 authors, with only 305 documents being single-authored. While collaboration is an important aspect, note also that the average number of co-authors per document is 3.14, suggesting that the movement in the field is to co-author documents. Also, consider that the extent of collaboration on an international basis is 14.54% of co-authorships, indicating that there is also an international stance on the study of female criminality.

Table 1 illustrates the depth, breadth, and collaborative nature of research about female criminality. This breadth is evidenced by the 2978 documents spanning nearly 90 years, characterizing this subject area as an ongoing line of research, as well as showing the date of the documents which depicts a long-standing interest in female criminal behavior. The average document age also indicates sustained scholarship in exploring female criminal behavior. The vast number of times the documents were cited indicates an institutional investment and regard for scholarship in this area. The keywords indicate the complex and diverse continuum of terms that researchers have established, suggesting the complexity of female criminality. The number of authors, especially between various countries and collaborations, is indicative of both global scholarship on the topic and the collaborative nature of the research about the topic, and the authors learning together. The overall percentages of multi-authored documents indicate a return to the collective nature of scholarship and knowledge building by the academic community.

3.2. Annual Scientific products

The annual production related to female criminality plays a crucial role in identifying the growth and patterns of studies. The current study is focused on identifying growth patterns and key periods of increased research activity. Figure 3 illustrates that the research period with the highest yield of articles was between 2015 and 2023, and the highest number of papers reached between 60 and 80 articles. It appears that the highest peak of scholarly work occurred during 2017-2019, with the second highest peak shown between the years 2013-2015. Annual Scientific products relating to female criminality have dramatically developed since the year 1935. At the beginning of 1935, the title *Criminality in Twins* was published in the *Journal of Heredity* (DOI number 10.1093/oxfordjournals.jhered.a104053). In 1941, the article titled "Review of the Literature" was published in *Acta Pædiatrica* (10.1111/j.1651-2227 1941.tb05818.x). Respectively, in 1946 (2 articles), 1951 (1 article), 1957 (2 articles), 1966 (1 article), 1967 (4 articles), and 1969 (2 articles), and in their 48th the year 2022.

By analyzing Figure 2 relevant to the theoretical perspectives, Early Period (1935-

1960s) criminological theories were predominantly male-centric. Theories like Lombroso's biological determinism and classical criminology did not adequately address female criminality. But in the 1970s-1980s, feminist criminologists began to critique the male-centric bias in criminological theories and advocated for the inclusion of women's experiences. Key works, such as those by Carol Smart and Freda Adler, contributed to this shift. However, the recent decades, due to the Development of Science and Technology, scholars have

interconnected beyond country boundaries and are conducting collaborative works concerning female Criminality.

3.3. Most trending topic

Following the research objective, the study aims to identify the most trending research topics in the scientific literature over 1935 - 2023, which aligns with the evolution of scientific literature in a specific time duration.
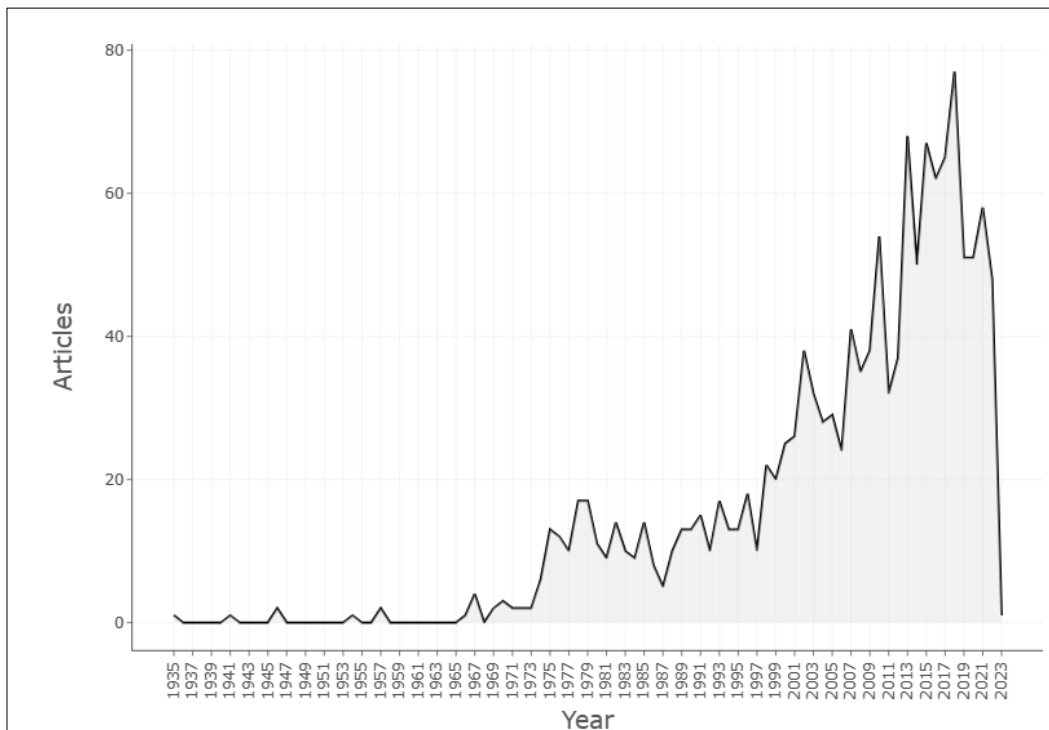
Figure 2. Annual Scientific products

The Presented data offers insight into the bibliometric characteristics of selected terms, shedding light on their frequency of occurrence and temporal distribution across different years. Each term corresponds to a unique field of study or concept, and the analysis spans from the median publication

year (year_med) to the first quartile (year_q1) and the third quartile (year_q3).
Forensic Medicine- With the highest frequency of 53, forensic medicine research is prolific and spans from 1977 to 1982. The temporal distribution is concentrated around the median year of 1979, suggesting a

significant surge in publications during the late 1970s. **Central nervous system -** representing research related to the central nervous system, appeared in publications with a median publication year of 1982. The earliest quarter of publications dates to 1980, while the latest quarter extends to 1985. **Middle age -** Publications related to the concept of middle age occurred with a median publication year of 1983. The earliest quarter of publications dates to 1978, while the latest quarter extends to 1989. **adoption -** Research on adoption, represented by this item, showed a median publication year of 1986. Publications span from as early as 1982 (Q1)

to as late as 2001 (Q3), indicating a broader temporal distribution compared to the other items.

3.4. Thematic evaluation

To gain a comprehensive understanding of academic literature, the thematic evaluation will investigate the most trending research topics in scientific literature over the last decade. The following figure presents the main themes of research in the field of female criminality, aiming to contribute constructively to the existing body of knowledge.

Table 2. Trending topics

| Item	freq	year_q1	year_med	year_q3
jurisprudence	13	1969	1974	1983
electroencephalography	7	1972	1974	1995
testosterone	7	1973	1976	2009
enuresis	5	1976	1976	2001
epilepsy	7	1975	1977	2011
genetics, behavioral	8	1976	1978	1988
drug therapy	6	1970	1978	1980
forensic medicine	53	1977	1979	1982
English abstract	18	1976	1980	1988
etiology	16	1976	1980	1985
incest	13	1980	1980	1985
politics	6	1975	1981	2001
central nervous system	48	1980	1982	1985
therapy	22	1979	1982	1985
sex	12	1977	1982	1991
middle age	44	1978	1983	1989
short survey	16	1979	1984	1991
diagnosis	14	1978	1984	1985
social control, formal	12	1977	1984	2002
Research	6	1978	1985	1999
adoption	30	1982	1986	2001
Support, u.s. gov't, p.h.s.	24	1982	1986	1989
sociopathy	12	1976	1986	2000
heredity	20	1982	1988	2009
fatality	10	1985	1988	1991
neurosis	6	1979	1988	1999
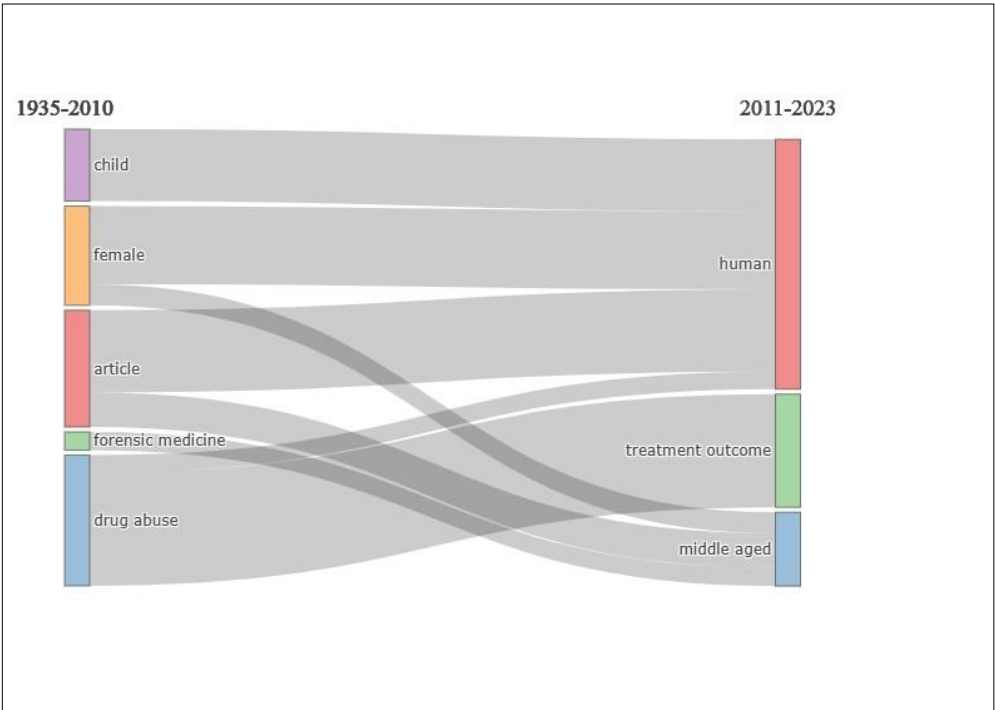
Figure 3. Thematic Transition of Female Criminality Research (1935–2010 vs. 2011–2023)
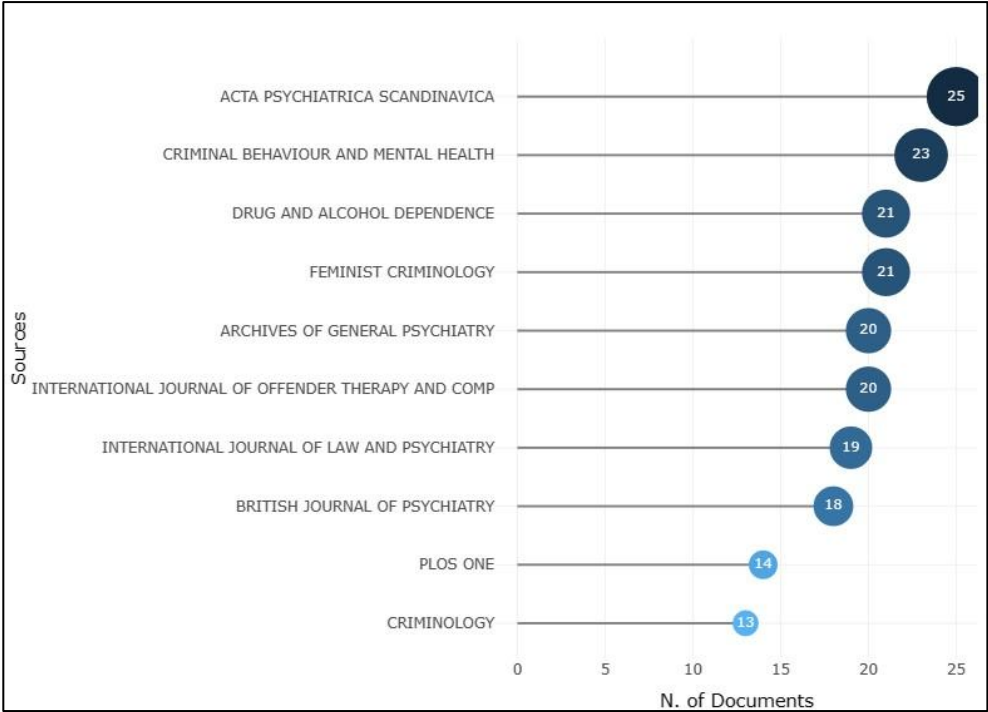

Figure 4. Most Relevant Sources

The discourse surrounding female criminality has undergone significant changes over two different periods, namely, between 1935 and 2010 and 2011 and 2023. During this time, themes such as children and females have transformed into more inclusive terminologies, such as humans by 2023. Furthermore, the focus on females, which had previously been limited to middle-aged women, has shifted to encompass specific issues such as drug abuse and treatment outcomes. These changes reflect the evolving nature of the study of female criminality and the need for more comprehensive and inclusive approaches to this subject matter.

3.5. Most Relevant Sources

Most relevant sources and influential authors in the field of female criminality will depict the significance and prominent sources of the field. The following figure clearly emphasizes this information.

Figure 4 illustrates the most specific sources that published female criminality-related works. Publications such as *Acta Psychiatrica Scandinavica* and *Criminal Behaviour and Mental Health* are specifically oriented towards psychiatric and mental health aspects of behavior, particularly as they relate to criminality. This provides them with natural platforms for research endeavors aimed at delving into the psychological dimensions of female criminality. Journals like *Drug and Alcohol Dependence* delve into topics at the nexus of substance abuse and criminal behavior, thereby reflecting the well-established correlation between substance abuse and crime, particularly among women. Given its explicit emphasis on gender and crime, it is probable that *Feminist Criminology* extensively publishes about female criminality. This focus provides a forum for research that analyses the distinct social, economic, and cultural factors that impact women's participation in criminal activities. Over the years, there has been an increasing recognition of the necessity to study women's criminality separately from men's, acknowledging gender-specific pathways into and out of crime.

3.6. Author keywords

To identify the most frequently used keywords and observe thematic trends in the literature on female criminality, Figure 5 presents the dominant author-selected keywords, which reflect the primary research directions scholars have taken in this field.

The prominence of the keyword "Criminality" (148 occurrences) suggests that the primary concern of the research is understanding the nature, causes, and consequences of criminal behavior. This indicates a broad interest in the general phenomenon of criminality as it pertains to women. Violence" (63 occurrences) and "Crime" (59 occurrences) are also highly frequent keywords, signifying that many studies specifically focus on violent behaviors and criminal acts. This reflects a significant interest in understanding the types of crimes women commit, with a particular emphasis on violent offenses. The keywords "Women" (37 occurrences), "Gender" (40 occurrences), and "Female Criminality" (38 occurrences) highlight that a substantial portion of the research is dedicated to exploring gender-specific aspects of criminal behavior. This includes examining how women's experiences and pathways into criminality differ from men's, and how gender roles and expectations influence these behaviors. The ordering and frequency of these keywords suggest current research trends and priorities. The high occurrence of keywords related to criminal acts and mental health points to an interdisciplinary approach that combines criminology, psychology, and psychiatry.
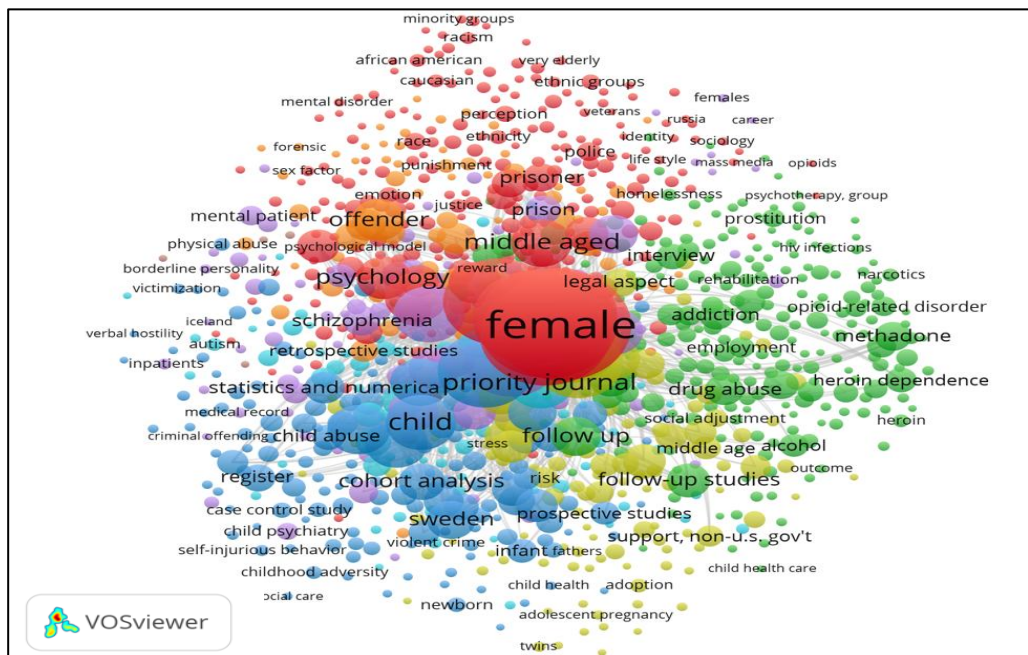
3.7. Co-occurrence Keyword

Co-occurrence keywords relate to the research of female criminality and refer to the

analysis of how frequently pairs or groups of keywords appear together within the selected database. This can be used to identify relationships and patterns in the content of the literature.
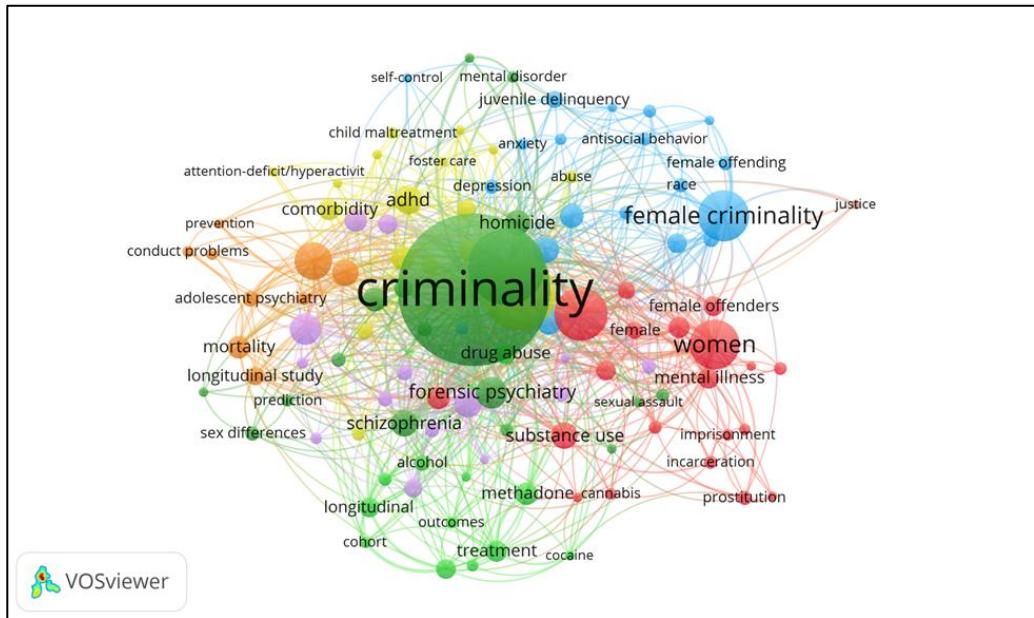
Figure. 5 Author keyword

Figure 6. Co-occurrence Keyword

The study has identified eight main categories, namely Cluster 01 in Red (comprising 247 keywords), Cluster 02 in green (233 keywords), Cluster 03 blue (156 keywords), Cluster 04 in dark yellow (120 keywords), Cluster 05 in purple (84 keywords), Cluster 06 in light blue (80 keywords), Cluster 07 in orange (71 keywords), and Cluster 08 in brown color (9 keywords). The diagram showcases these clusters in distinctive colors. In total, 1000 keywords have been identified across these clusters. It is worth noting that the most frequently mentioned keywords in the research papers are "Female" (998 occurrences), "human" (990 occurrences), "male" (881 occurrences), "article" (730 occurrences), "adult" (718 occurrences), "humans" (621 occurrences), "criminal behavior" (598 occurrences), "adolescent" (468 occurrences), and "major clinical study"(440 occurrences). Conversely, the least reported keywords to include "Social network" (4 occurrences), "induced abortion", "evaluation" (5 occurrences), "refugee", "ethnic or racial aspects", "delivery of health care" (4 occurrences), "victimization" (9 occurrences), and "psychopathic traits" (5 occurrences).

The figure highlights how attention-grabbing keywords have been identified through research papers on women's criminality. As a central theme, the keyword "female" is the most prominent, indicating that the research heavily focuses on women-specific issues. Surrounding the word "female," several key themes are identified, such as Psychology, indicating a strong focus on the psychological aspects of women's criminality. Keywords like "addiction," "drug abuse," "methadone," "heroin dependence," and "opioid-related disorder" suggest a significant emphasis on substance abuse issues. Keywords such as "schizophrenia," "mental patient," "mental disorder," and "autism" indicate a substantial focus on mental health conditions and their link to criminal behavior. Terms like "child," "child abuse," "child health," "childhood

adversity," and "child psychiatry" reflect an interest in the impact of early life experiences on women's later criminality. Keywords such as "ethnic groups," "race," "minority groups," "African American," and "Caucasian" highlight the consideration of racial and ethnic factors. Terms like "middle-aged," "very elderly," and "age" indicate the study of different age groups within female criminality research. Keywords such as "prison," "prisoner," "legal aspect," "punishment," "police," and "justice" point to the exploration of how women interact with the criminal justice system. Further, it can be identified that methodological approaches, social and economic factors, intersection with health, specific criminal behaviors, and broader social issues as the main research perspectives that were focused on during the period.

3.8. Most influential authors and their research productivity in the field of female criminality.

To recognize the most influential authors and their products within the field of female criminality, the following sections will be determined through the current study. Thus, this section will identify the most relevant authors, author productivity, and co-authorship by author.

Lichtenstein P stands out with 25 publications, suggesting a leading role and significant influence in the field. This author may have contributed to foundational or highly cited work that has shaped current research directions and priorities.

The number of publications can also reflect broader trends in the field. An increase in publications by top authors over time could indicate growing interest and funding in women's criminality research, possibly driven by societal recognition of the need to address gender-specific issues in crime and justice.
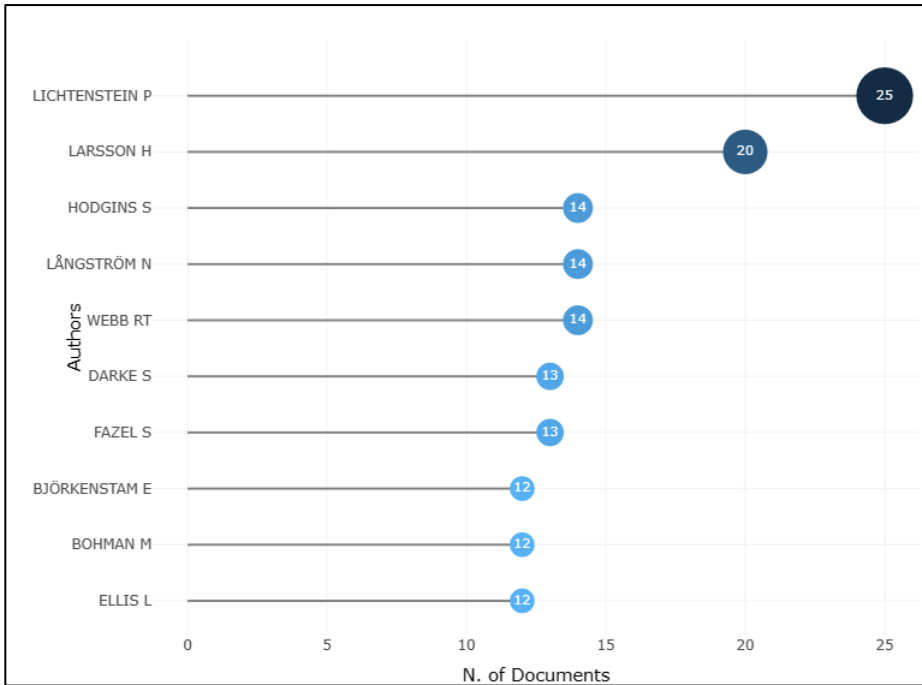
Figure 7. Most relevant authors
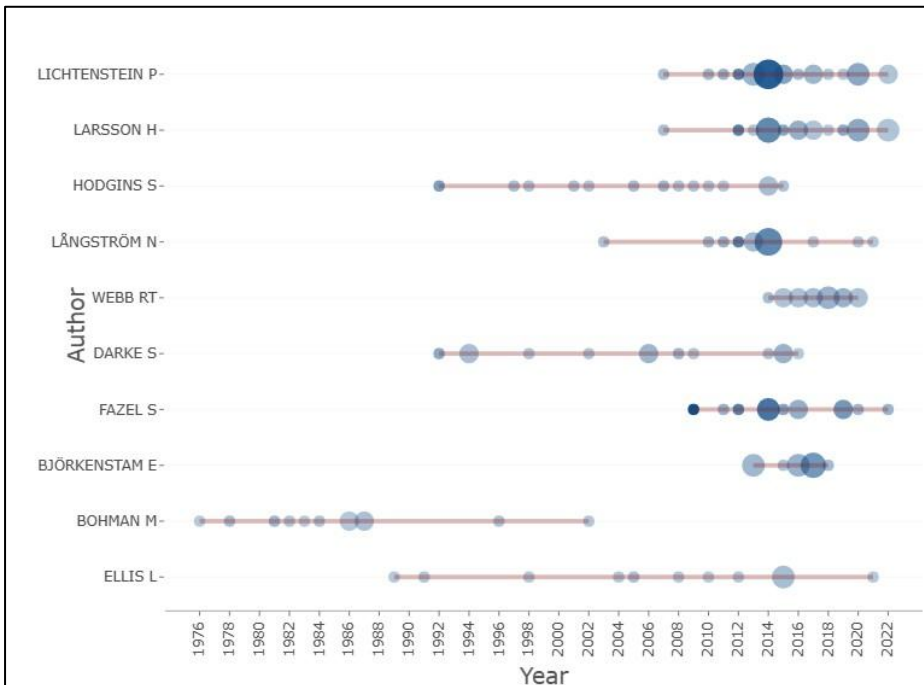
Figure 8. Author's Productivity over Time

3.9. Author Productive overtime

According to the figures, the year 2014 stands out as a particularly impactful year for research on women's criminality. Multiple researchers, including P. Lichtenstein, H. Larsson, and N. Langstrom, published high-impact articles during this year. This suggests a peak in research interest or a convergence of significant findings in the field during this period. P. Lichtenstein's Prominence: P. Lichtenstein's sustained research activity from 2008 to 2022, along with particularly high-impact work in 2014, indicates his prominent role in the field. The high citation rate (39.09 citations per year) for his 2014

publications highlights his influence and the relevance of his research findings. Researchers like M. Bohman and L. Ellis have lengthy publication histories; Bohman had research conducted between 1976 and 2002, while Ellis had research completed from 1999 to 2002. Their (Bohman's and Ellis's) fundamentals may have offered insights into future studies and may have built the research area for a length of time.

3.10. Co-authorship by author

The research contributions of the researchers and their research papers and the citations obtained for them can be listed as follows.

Table 3. Co-authorship by author

Author	Document	Citations	Total link strength
webb r.t.	14	251	47
Lichtenstein p.	25	1470	44
mok p. l. h.	12	179	44
Antonsen s.	11	157	40
Pedersen c. b.	11	174	42
larsson h.	20	1061	40
Carr M. j.	7	117	29
fazel s.	13	1888	27
bjorkenstam e.	12	348	23

Lichtenstein, P. (1470 citations) and Larsson, H. (1061 citations) have citation counts in the upper echelon of academic research with significant and valuable influence, suggesting they disseminated knowledge that may have been essential and foundational knowledge in the area of interest. Citations are widely accepted to be a proxy for the relevance and impact of academic research findings, so Lichtenstein, P., and Larsson, H. undoubtedly had a significant and valuable influence that reached the academic community. The indicators of productivity of research authorship are reflected by the citation counts of 25 and 20 documents produced, respectively. The number of documents reflects long-term research activity, which is evidence of some amount of dedication to the

work of participating in advancing the area of interest. The productivity measure also reflects the relative degree of connectivity and collaboration with other researchers. Webb, R. T. (47), Mok, P. L. H (44), and Pedersen, C. L. (42) have individual score values of connectivity of respective author scores of total link strength, which simply suggest varying degrees of collaboration and integration into the larger research community. The established networks between Webb, R. T., Mok, P. L. H, and Pedersen, C. B. facilitate support to and from other research authors. Accountable collaborative expectations, establish research definition, facilitate the exchange of ideas, promote collaborative resource sharing, and arguably, better academic knowledge

through research innovation. This purpose relates to collaborative research by supporting knowledge and advances in scholarship. The total strength values of Webb, R.T., Mok C. L., and Pedersen C. B. reflect some trend in collaborative authorship as these authors are both individually productive and engaged in collaborative research projects as authors within their area of collaboration.

This enhances their visibility and influence within the academic community and can lead to more interdisciplinary and comprehensive research outcomes. The data suggests that these authors contribute to key theoretical areas within women's criminality research, such as the psychological, sociological, and criminological aspects. Their work likely influences theoretical models, guiding principles, and intervention strategies. Following Table 3, it is understood that the scholarly productivity, impact, and collaborative networks of specific authors highlight their contributions to the advancement of knowledge in various fields.

3.11. Affiliation

Most Contributed Affiliation, Affiliation Production over time, Co-authorship by country, Co-authorship by country, and Most Influent Countries will help to assess the Contributions of Various Affiliations and Countries to the Study of Female Criminality.

According to Figure 9, the Karolinska Institute is undoubtedly a prominent contributor, consolidating its position as a central hub for research on women's criminality. This strong influence indicates a dedicated focus and expertise in this area, likely supported by specialized research centers, funding, and resources. The involvement of institutions such as the University of New South Wales (Australia), University of OULU (Finland), Aarhus University (Denmark), University of California (USA), Lund University (Sweden), and the Institute of Psychiatry (UK) reflects a

broad geographical reach. This diversity undeniably signifies global interest and collaboration in the study of women's criminality, enriching the field with a wide range of perspectives and approaches. Institutions like the Institute of Psychiatry and Karolinska Institute are unquestionably renowned for their expertise in mental health research, indicating a strong focus on the intersection of mental health and women's criminality. Furthermore, the substantial number of publications demonstrates the research capacity and resources available at these institutions. High publication counts not only indicate robust research infrastructures and access to funding but also a steadfast commitment to this area of research. The data not only highlights the volume of research contributions but also emphasizes the dominance of specific institutions, the importance of international collaboration, and the diverse and interdisciplinary nature of research on women's criminality.

3.12. Affiliation Production overtime

When it comes to discussing Affiliation production, it can be identified that the literature on the topic of Female Criminality has witnessed a substantial output of papers since 1967, but the authorship of these papers remains unidentified. Several influential institutions have emerged as key contributors to this field, including Karolinska Institute, the University of New South Wales, the University of Oulu, and Aarhus University, with each having produced impactful papers that have contributed to the existing body of knowledge. It is important to acknowledge the work of these institutions, as their contributions have helped to shape the discourse surrounding the topic of Female Criminality. Since 1946, there has been limited academic attention to female criminality. Few scholarly publications specifically focused on women offenders, and Affiliation production primarily centered around traditional criminological institutions

with a focus on male offenders. From 1967-1980s, an emergence of feminist perspectives and advocacy for gender-specific research is to be seen increasing recognition of the unique factors influencing female criminal behavior. Affiliation production starts to expand, with institutions like the Karolinska Institute and the University of New South Wales beginning to publish pioneering research on female criminality. From1990s-2000s, a significant growth in research output related to female criminality is seen. Institutions like the University of Oulu and Aarhus University become more prominent contributors, adding diverse perspectives from European contexts. Collaboration networks started forming between institutions, leading to interdisciplinary research efforts combining criminology, psychology, sociology, and gender studies. 2010s-Present continued expansion of research output, fueled by advancements in technology and globalization. Affiliation production becomes more decentralized, with contributions from institutions worldwide. Greater emphasis was on interdisciplinary collaboration and holistic approaches to understanding female criminality.
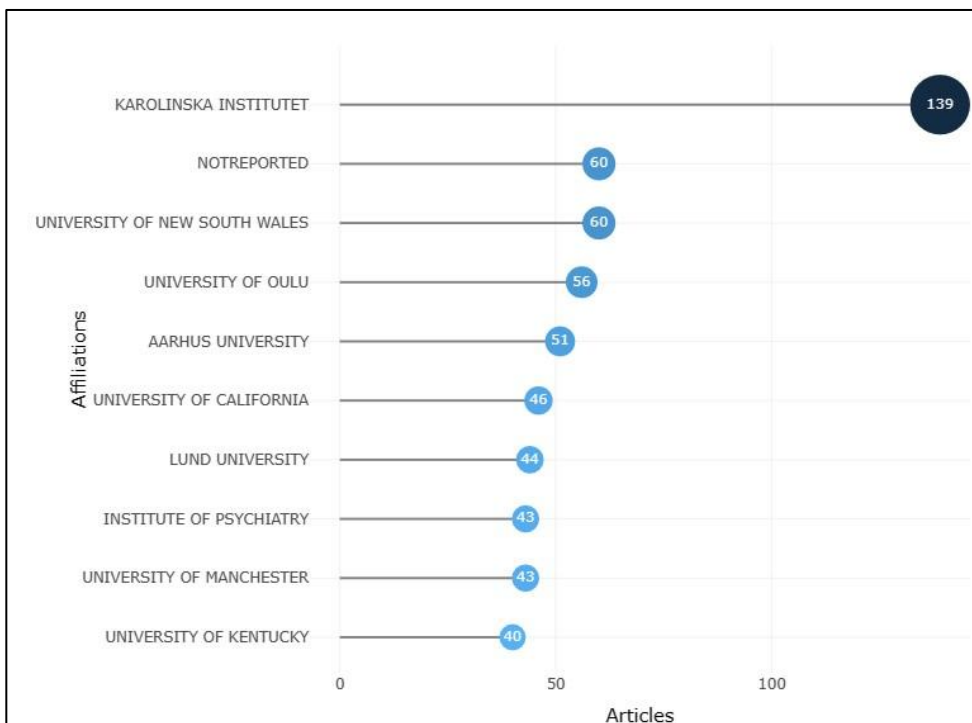

Figure 9. Distribution of research papers with the contributing university

The co-authorship statistics established eight global clusters according to the collaborative studies in female criminality. Cluster 1 comprised Germany, Mexico, Nigeria, South Africa, and Switzerland, which is a sign of various cross-regional collaborations. Cluster 2 included Australia, Brazil, Chile, Colombia, and Spain, the sign of a high level of cooperation between Southern Europe and South America. The others were Canada, Finland, Israel, and the Russian Federation (Cluster 3), France, India, and Ireland (Cluster

4), and the UK and Hungary, and Japan (Cluster 6) with mixed regional research relationships. America-U.S. was found in Cluster 7 with China and Malaysia, which signified transpacific cooperation. These groupings point to the disseminated worldwide character of the research into female criminality and also to the growing tendency of international and interdisciplinary research collaboration in this context.
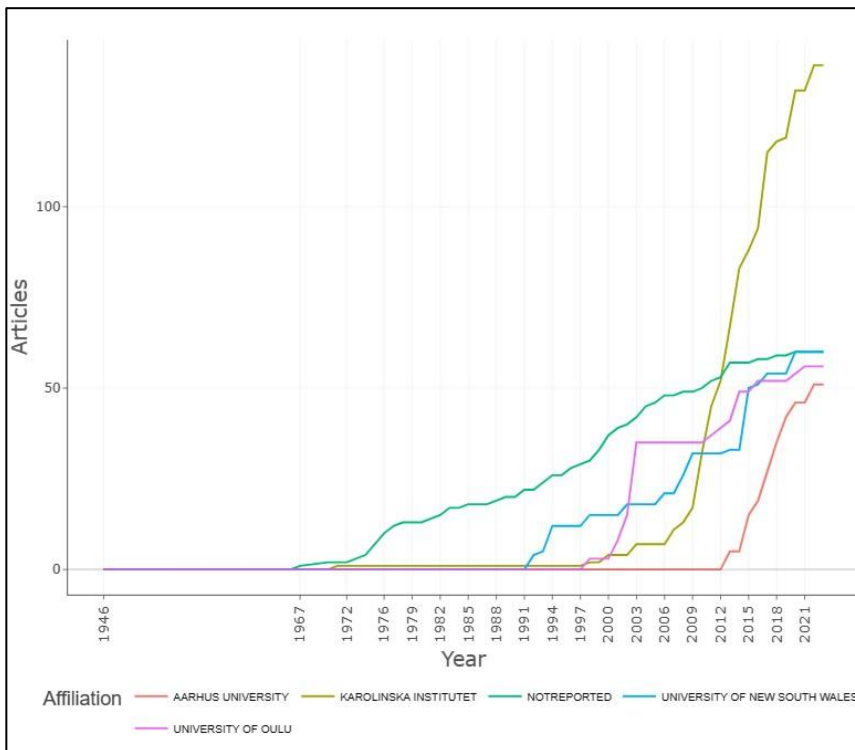
Figure 10. Affiliation Production over

Table 4. Co-authorship by country

Cluster	Item	Countries
1	5	Germany, Mexico, Nigeria, South Africa, Switzerland
2	5	Australia, Brazil, Chile, Colombia, Spain
3	4	Canada, Finland, Israel, Russian Federal
4	3	France, India, Ireland
5	3	Belgium, Netherlands, Sweden
6	3	Hungary, Japan, United Kingdom
7	3	China, Malaysia, United States
8	2	Denmark, Italy

-

Table 5: Scholarly output and impact of research originating from different countries.

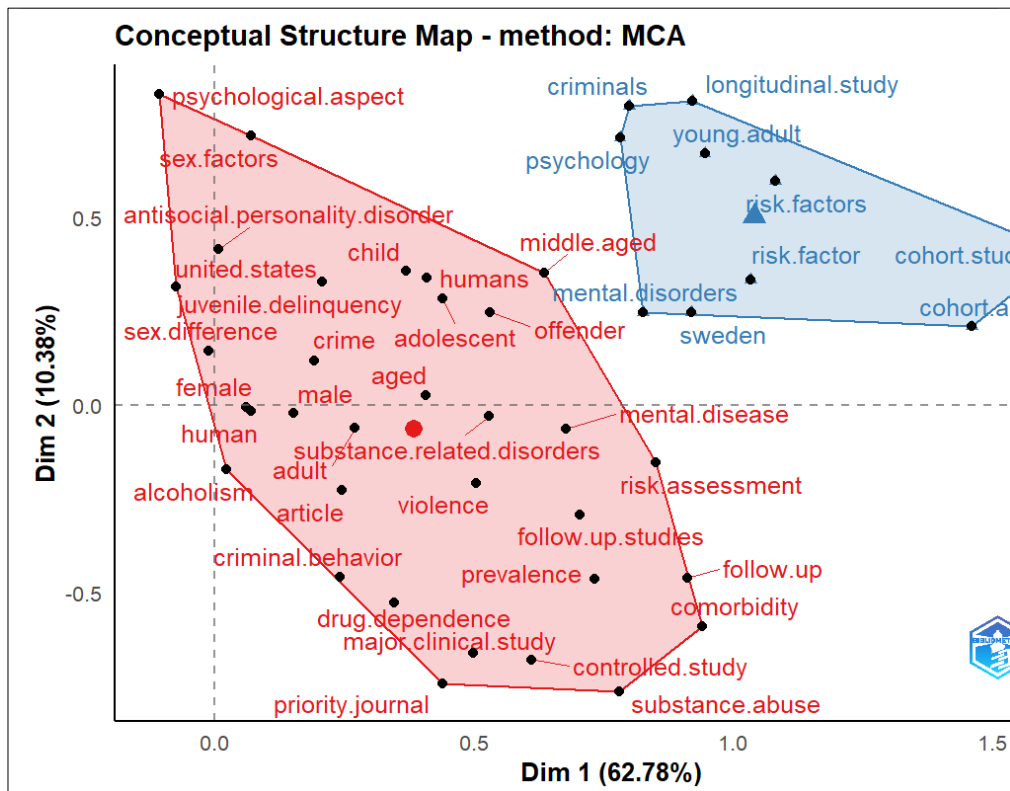| Country	Document	Citations	Total link strength
United States	507	23064	123
United Kingdom	196	9328	102
Sweden	175	6566	93
Canada	83	3270	54
Denmark	49	1780	34
Germany	40	571	25

Figure 11. Multiple correspondence analysis (MCA) of high-frequency keywords

3.14. Most Influent Countries

The provided data offers bibliometric insights into the scholarly output and impact of research originating from different countries. It includes information on the number of documents produced, total citations received, and the total link strength, which represents the collaborative connections between documents. With 507 documents and 23,064 citations, research from the United States dominates the dataset in terms of both quantity and impact. The substantial total link strength of 123 indicates a robust network of collaborations and connections within the scholarly community. The United Kingdom follows closely behind, with 196 documents and 9,328 citations.

Despite a smaller output compared to the United States, research from the UK demonstrates significant impact, as evidenced by a total link strength of 102, indicating strong collaborative ties and influence within the academic landscape. Sweden ranks third in terms of both document output and citation impact, with 175 documents and 6,566 citations. The country's total link strength of 93 suggests a well-established network of collaborations and contributions to the global research community.

3.15. The research gap in Female Criminality research

To identify future research directions and emerging trends in the field of female criminality is the most significant objective in the current study. The following figure will identify the research gap in this area.

Utilizing the conceptual structure-function approach, multiple correspondence analysis (MCA) was employed to delineate the field's conceptual structure. MCA, a widely utilized sociological method, condenses extensive data with multiple variables into a low-dimensional space, facilitating the creation of an intuitive two-dimensional (or three-dimensional) graph. This graph employs plane distance to reflect the similarity between keywords (Xie et al., 2020).

The resulting figure reveals two primary clusters within the conceptual structural model. The red cluster predominantly centers on themes aligned with psychological aspects and substance use, indicating that female criminality is predominantly rooted in psychological factors. As depicted in Figure 12, a significant portion of the conceptual structure encompasses psychological aspects, sex factors, antisocial personality disorder, United States, child, human, middle-aged, juvenile delinquency, sex difference, crime, adolescent, offender, female, male, substance-related disorders, alcoholism, article, violence, mental disease, risk assessment, criminal behavior, prevalence, and controlled study, among others.

The blue cluster, identified as criminals, risk factors, and mental disorders, exhibits more limited coverage compared to the first cluster. Notably, drug use emerges as a primary area of focus in women's criminality. While traditional societies may highlight sexual crimes as prevalent among women (Woodhouse and Staines, 2021), contemporary attention has shifted towards drug use (Hakansson et al., 2011; Walters, 2014). Additionally, studies addressing the correlation between female criminality and mental illness are discernible (Hakansson et al., 2011; Nee and Witt, 2013).

Intersection Between Clusters: The red and blue clusters do not seem to overlap significantly, indicating a gap between psychological aspects and the broader longitudinal studies focused on risk factors and mental disorders. Specifically, there appears to be a gap in research connecting psychological aspects with longitudinal analysis, particularly in populations other than those typically studied (e.g., beyond young adults or specific regions like Sweden).

The analysis underscores the multidimensional nature of female criminality, with psychological aspects and substance use playing pivotal roles. The evolving focus on drug use and mental illness in the study of female criminality reflects shifting societal priorities and research emphases in the modern era. According to the figure, keywords closest to the origin (where Dim 1 and Dim 2 intersect) are the most researched themes. This is because their central position indicates they are common across many documents and studies. "Human," "adult," "substance-related disorders," and "mental disorders" are near the origin, suggesting these are widely researched themes. Keywords that are farthest from the origin are less researched or more specialized themes. Their distance signifies they are distinct and associated with specific subsets of the data. "Psychological.

Aspect, "sex. Factors, "antisocial personality disorder," and "longitudinal study" are located farther from the origin, indicating they are less commonly researched themes. Further, Red Cluster: Includes keywords like "female" and "juvenile. Delinquency, "violence," and "criminal behavior," which might indicate themes related to gender differences in criminal behavior and related disorders. Blue Cluster includes keywords like "longitudinal. Study, "young adult," cohort. Study," and "Sweden," indicating a focus on longitudinal cohort studies in specific populations or regions.
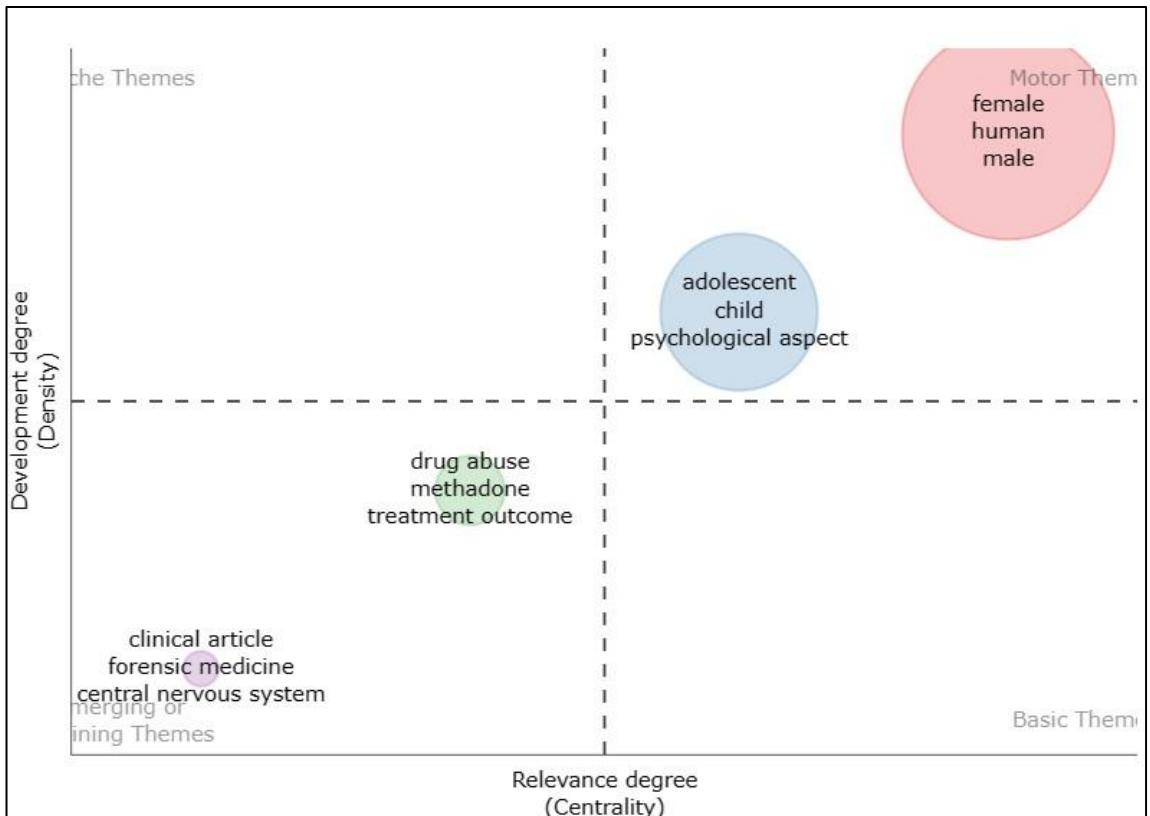
Figure 12. The Thematic map related to Female Criminality

3.16. Thematic map related to Female Criminality

This figure offers a comprehensive analysis of established themes, clearly distinguishing between prominent and evolving or diminishing topics. Notably, it does not cover niche or fundamental themes. Motor themes include female, human, and male, as well as adolescent, child, and psychological aspects.

These themes could be the recognition of various dimensions and stages of human development and behavior within the context of female criminality. Such as gender dynamics: female, male, and human: Highlighting the significance of gender in understanding criminal behavior, including differences in crime prevalence, types of offenses, and responses from the criminal justice system between males and females.

Adolescents and children recognize the importance of developmental stages, particularly adolescence and childhood, in shaping criminal trajectories and interventions. This includes studying risk factors, protective factors, and interventions tailored to different age groups. Psychological Aspects acknowledge the role of individual psychology, including factors such as personality traits, cognitive processes, emotional regulation, and mental health conditions, in influencing criminal behavior among females. Merging them can be identified as drug abuse, methadone, treatment outcome, clinical article, forensic medicine, and the central nervous system. These could be the recognition of the intricate connections between substance abuse, medical interventions, legal considerations, and neurobiological factors in the context of female criminality.

Motor vs. Basic Themes: While the themes related to gender (female, male) are well-developed, the psychological aspects related to adolescents and children are identified as basic themes, suggesting a need for further research and development. Specifically, the gap may exist in bridging gender-related themes with in-depth psychological studies in younger populations.

Emerging Themes: The underdeveloped themes like "drug abuse" and "methadone" indicate gaps in integrating these aspects with the broader study of women, children, and psychological factors.

4. Conclusion and Recommendations

The primary conclusion can be drawn as follows. The evolution of the scientific literature on female criminality over time was taken as the main objective and according to the information of the research stream, there are 1,214 research papers published through the Scopus database in the period between 1935 and 2023. Academics at different stages

have contributed to research on female criminality in different ways. Research on female criminality has experienced significant growth, particularly between 2015 and 2023, peaking from 2017 to 2019, indicating increased scholarly interest. Early works from 1935 laid the foundations for later development. Forensic medicine peaked in the late 1970s, while middle-age studies surged in the early 1980s. Adoption studies spanned into the early 2000s, showing sustained interest. Themes shifted from focusing on children to broader human-centric perspectives by 2023, addressing issues like drug abuse and treatment outcomes. Publications such as *Acta Psychiatrica Scandinavica and Criminal Behaviour and Mental Health* are specifically oriented towards psychiatric and mental health aspects of behavior, particularly as they relate to criminality. The most relevant author is Lichtenstein P, who stands out with 25 publications, suggesting a leading role and significant influence in the field. The study has identified eight main categories, namely Cluster 01 in Red (comprising 247 keywords), Cluster 02 in green (233 keywords), Cluster 03 blue (156 keywords), Cluster 04 in dark yellow (120 keywords), Cluster 05 purple (84 keywords), Cluster 06 in light blue (80 keywords), Cluster 07 in orange (71 keywords), and Cluster 08 in brown color (9 keywords.

Specialized journals like *Acta Psychiatrica Scandivavica* and *Criminal Behaviour and Mental Health* focus on psychiatric aspects, while *Drug and Alcohol Dependence* explore substance abuse and crime. *Feminist Criminology* gained prominence, emphasizing gender-specific analysis. Keywords like "Criminality," "Violence," and gender-specific terms indicate an interdisciplinary focus on

understanding female criminal behavior, especially violent offenses. Research clusters around psychological aspects, substance abuse, mental health, early experiences, and criminal justice interactions. 2014 saw a peak, with influential work from researchers like P. Lichtenstein, continuing the legacy of earlier scholars like M. Bohman and L. Ellis, indicating ongoing evolution in understanding female criminality. The Karolinska Institute is undoubtedly a prominent contributor, consolidating its position as a central hub for research on women's criminality. This strong influence indicates a dedicated focus and expertise in this area, likely supported by specialized research centers, funding, and resources. The involvement of institutions such as the University of New South Wales (Australia), University of OULU (Finland), Aarhus University (Denmark), University of California (USA), Lund University (Sweden), and the Institute of Psychiatry (UK) reflects a broad geographical reach.

The research gap in female criminality research can be illustrated by considering the thematic map related to female criminality. Mainly following the bibliometric analysis, it reveals that women and drugs, female criminality and psychological factors, and women's cruelty toward children are the most prominent research spaces within this field, and it is recommended to explore such emerging themes. This could involve interdisciplinary studies to gain deeper insights into these areas. It is essential to conduct longitudinal studies to monitor changes and trends in female criminality over time. This will enable a better understanding of evolving patterns, influences, and interventions, encourage studies that delve into intersectional factors such as race,

ethnicity, socioeconomic status, and cultural backgrounds to understand how these intersect with gender in shaping female criminal behavior, and bridge the gap between research and policy by translating findings into practical recommendations for policymakers, law enforcement agencies, and social service providers to better address female criminality issues. It would also emphasize research aimed at identifying effective prevention strategies and intervention programs tailored to address the specific needs of women involved in crime, including mental health support, rehabilitation, and reintegration into society, and focus on research aimed at identifying effective prevention strategies and intervention programs tailored to address the specific needs of women involved in crime, including mental health support, rehabilitation, and reintegration into society.

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