Identification of psycho-socio-judicial trajectories and factors associated with PTSD after recent sexual assault: the IADVise study protocol for a multi-centric prospective study using mixed methods and artificial intelligence

Emma Fedele (emma.fedele@univ-paris13.fr)
University Sorbonne Paris Nord (Paris 13)

Victor Troussset
Assistance Publique – Hôpitaux de Paris (AP-HP), Jean Verdier Hospital

Thibault Schalk
Assistance Publique – Hôpitaux de Paris (AP-HP), Jean Verdier Hospital

Juliette Oliero
Assistance Publique – Hôpitaux de Paris (AP-HP), Jean Verdier Hospital

Thomas Fovet
Centre Hospitalier Régional et Universitaire de Lille

Thomas Lefevre
Assistance Publique – Hôpitaux de Paris (AP-HP), Jean Verdier Hospital

Study protocol

Keywords: sexual assault, post-traumatic stress disorder, functional outcomes, risk factors, artificial intelligence, trajectory, longitudinal, mixed methods

Posted Date: January 24th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2476434/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Background

Sexual assault (SA) has numerous negative outcomes on physical, sexual and mental health, social life, financial stability and overall quality of life. It is known as one of the most traumatogenic event. However, not all people who experienced SA will develop negative functional outcomes. Multiple risk and protection factors can influence their psycho-socio-judicial trajectories. The way by which these factors impact trauma adaptation are not always clear. Guided by an ecological framework, this project aims to (1) describe psycho-socio-judicial one-year trajectories of people recently exposed to SA, to (2) identify predictive factors for the development of posttraumatic stress disorder (PTSD) at first forensic examination using artificial intelligence and to (3) explore the notions of “victim” and “trauma” and the needs and experiences of people who have been sexually assaulted.

Methods and design

This longitudinal multi-centric cohort study will use a mixed-method approach. Quantitative cohort data will be collected based on questionnaires repeated in time, starting from first forensic examination and covering up to a year after the SA, measuring factors associated with PTSD, mental, physical, social and overall functional outcomes, and psycho-socio-judicial trajectories. Qualitative data will be based on semi-structured interviews with members of the cohort, people who experienced SA but not included in the cohort, and actors professionally involved in their psycho-socio-judicial care. Bivariate and multivariate analyses will be performed to study the associations between each variable and mental, physical, social and judicial outcomes. Predictive analyses will be conducted on multiple prediction algorithms to predict PTSD. Qualitative data will be integrated to the quantitative data to identify psycho-socio-judicial trajectories of participants and data on the representations of the place and usefulness of the notions of “trauma” and “victims” will be used independently.

Discussion

This project will collect numerous data never before collected over such long periods, which will lead to unprecedented results on psycho-socio-judicial trajectories of people who experienced SA. By being based on the entire psycho-socio-judicial chain and on the perspective of people who experienced SA, this work will allow to make innovative recommendations to improve their care at all levels, from the initial forensic examination.

Background

Sexual assault (SA), defined as any kind of sexual violence involving force or threat of physical violence (1) gained recognition as a public health issue in recent years. Research shows high prevalence rates of SA (2) and numerous negative outcomes on physical, sexual and mental health, social life, financial stability and overall quality of life (1). It is known as one of the most traumatogenic event (3–5). However
not all people who experienced SA will develop negative functional outcomes. Multiple protection and risk factors can influence their psycho-socio-judicial trajectories. One of the most comprehensive models to categorize those factors is the ecological model of Campbell, Dworkin and Cabral (6), based on the ecological theory (7), which separates factors according to the environment in which they develop in relation to the person.

Despite a growing body of literature on the characteristics associated with negative outcomes and on the use of medical, social and legal resources, the way those characteristics impact trauma adaptation are not always clear and does not allow for the prediction of psycho-socio-judicial trajectories. Guided by an ecological framework, this project contributes to the research of these processes by using mixed longitudinal data and artificial intelligence to describe psycho-socio-judicial one-year trajectories of people recently exposed to SA and to identify predictive factors for the development of PTSD. It also serves as an explorative study of the needs and experiences of people who have been sexually assaulted and of available resources to them in France.

**Sexual assaults and negative functional outcomes**

Data from the Global Burden of Disease (GBD) study shows that worldwide prevalence of SA in 2017 was 11.6% for men and 27.5% for women (2). However, prevalence rates vary greatly depending on the definition of SA used by researchers, research settings and populations of study: a review of literature on prevalence of SA outside of North America since 2010 shows that past-year prevalence rates ranged from 0–59.2% for women, 0.3–55.5% for men and 1.5–18.2% for lesbian, gay, bisexual and gender-diverse people (8).

Literature shows that SA can impact quality of life and functional outcomes on physical and sexual health, behaviors, finances, social life, and psychological and psychiatric health (1, 9–11). Psychological and psychiatric outcomes are the most studied outcomes of SA, particularly PTSD given its strong relationship to SA. Indeed, U.S. and international population-based studies show that lifetime prevalences of PTSD varies from 4 to 7% for people who experience any kind of traumatic event (3–5), but these lifetime prevalence rates vary between 17.4% and 65% for people who experienced rape and other SA (3–5), making SA one of the most traumatogenic experience.

**Factors associated with SA negative outcomes**

Functional outcomes can fluctuate greatly depending on multiple protection and risk factors. R. Campbell, E. Dworkin and G. Cabral created a framework to study the diversity of these factors (6). This framework is based on Bronfenbrenner's ecological theory stating that human development “evolves as a function of the interplay between person and environment” (7) and was adapted by the authors to understand “how factors at multiple levels of the social ecology contribute to (...) deleterious mental health effects” (6). It is one of the most comprehensive models to date as it classifies protection and risk factors into seven levels depending on the environment in which they interact with the person. Using the
same levels as determined by Campbell, Dworkin and Cabral (6), we included in this review factors associated with negative mental health outcomes, overall recovery and quality of life.

Individual level factors represent the intrinsic characteristics of the individual that can affect their mental health and recovery after SA (6), such as sociodemographic factors (6, 11–16), preexisting mental health conditions and family history of mental health problems (6, 17–19), and coping strategies (6, 20–23). Coping strategies include positive strategies such as religious coping (24, 25) but also maladaptive strategies such as self-blame, which is related to more PTSD and depressive symptoms (6, 20, 26). Campbell, Dworkin and Cabral (6) conceptualized this last factor as a meta-construct, arguing that it transcends any one level of the model by being enhanced by factors of all other levels.

Assault characteristics such as perceived life threat during assault and perceived dangerousness of assailant are associated with negative mental health outcomes, as shown by literature on SA (6), but also on general trauma (18, 19). Peritraumatic factors such as peritraumatic distress and dissociation could also be modest to strong predictors of PTSD, particularly for interpersonal violence (18, 19), but are very rarely documented.

The microsystem level is defined as the “face-to-face interactions and interrelations between individuals and others in their immediate setting” (6, 7). It includes lack of social support which is one of the most important risk factors of mental disorders (18, 19, 27) and negative reactions after disclosure which can be very detrimental to recovery (6, 27) and linked to post-traumatic distress (28) and self-blame (29). On the contrary, positive social reactions are shown to lower psychological distress (6) and can be linked to positive life changes (28).

The meso/exosystem level is defined as contacts with the formal system (6). It therefore includes positive formal support and secondary victimization from the legal, medical and mental health systems and from the advocacy community. Perceptions of social reactions from formal responders have been associated with psychopathology (6, 27). However, results are not always consistent between studies: the only study to our knowledge to compare formal and informal support shows that reactions from formal providers, regardless of whether the reaction was positive or negative, was not associated with more general psychological distress, but positive reactions were associated with benefits in the aftermath of trauma (28). On the different forms of formal support, literature shows that the legal system has the most negative impact on mental health because of the frequency of victim-blaming questions, but the medical system is also shown to exacerbate PTSD symptoms (6, 30). On the contrary, the mental health system and the advocacy community have been shown to be helpful for people who experienced SA who had negative experiences with the legal and medical systems and to mitigate their negative effects (6).

The macrosystem level is defined as “consistencies, in the form and content of lower-order systems (…) that exist, or could exist, at the level of the subculture or the culture as a whole, along with any beliefs systems or ideology underlying such consistencies” (7). It includes sociocultural factors such as race/ethnicity when explored from a sociocultural perspective (6, 15). Since the definitions of “victim”, “survivor” and “trauma” are attached to societal imaginaries or representations (31), we have chosen to
put the impact of labelling people who experienced SA as “victim” or “survivors” and the SA as “trauma” in the macrosystem. It has been shown to be detrimental to their social life and their sense of self (32–35).

The chronosystem level examines “the cumulative effects of multiple sequences of developmental transitions over the life course” (6). Research show that prior history of SA, history of other forms of victimization and revictimization are related to more negative psychological outcomes, which may be cumulative (6, 36). History of trauma is also known to be a predictive factor of PTSD, all types of trauma considered (18, 19).

This multitude of factors and their complexity could explain the heterogeneity of trajectories of people who experienced SA (6, 19).

**Limits of the current literature**

Despite a growing body of literature, the way these characteristics impact adaptation to trauma is still unclear (36, 37) and do not allow us to characterize psycho-socio-judicial trajectories (38). Likewise, some factors are still rarely studied, such as the impact of formal support on mental health outcomes (19, 27, 36, 37). Therefore, as the traditional approach to predict the development of PTSD using bivariate analyses and traditional multiple regression analyses (MRA) does not seem successful, it is relevant to explore new predictive methods such as artificial intelligence (AI). There are many reasons why it might outperform conventional regression analyses: it automatizes identification of hidden interactions and non-linearities among features, allows to handle bigger and more complex data sets and to integrate information from very heterogeneous sources, and reduces the likelihood of overestimating prediction performance when studying numerous highly correlated independent variables (39, 40). Furthermore, the concept of AI statistical algorithm represents an inductive approach, as opposed to traditional approaches which are hypothesis-driven (41). It can therefore be useful for the discovery of unknown mechanisms (41) and to find relationships between data not found with traditional statistics (39).

To date, less than 100 studies have used AI for the prediction of PTSD after a traumatic event on clinical and biological data. Those studies showed good predictive ability (Area Under Curve (AUC) being at 75–98%) (42, 43). However, as far as we know, only one study specifically included adults who experienced SA in its sample and it showed poor predictive ability (AUC = 64%) (44). Moreover, other useful indicators, such as sensitivity (i.e. the capacity to give a positive result when the hypothesis is verified) and specificity (i.e. the capacity to give a negative result when the hypothesis is not verified), appear necessary to judge the usefulness of AI algorithm in routine clinical practice but seems to be missing in these studies, hindering the interpretation of the results and evaluation of relevance. It is therefore necessary to explore in more detail the utilization of AI to predict the onset of PTSD for people who experienced SA and to measure its usefulness for forensic services.

In addition, very little research has been conducted on the accessibility and efficacy of help services such as psychiatric and psychological follow-ups, judicial help and associative assistance in Europe (38).
Taking stock on the functioning and quality of resources available in France is therefore necessary to be able to describe psycho-socio-judicial trajectories and to provide services better catered to the needs of people who experienced SA.

**Study objectives and aims**

This study contains three major parts, each serving a different primary purpose. Our first goal is to describe psycho-socio-judicial one-year trajectories of people recently exposed to SA who consulted a forensic examiner. We hypothesize that there are multiple typical psycho-socio-judicial trajectories of people who recently experienced SA and consulted a forensic practitioner in France, but there is also a variety of individual and contextual factors and situations that are important to relate in conjunction to the characterization of those trajectories (19, 30).

Our second goal is to identify predictive factors for the development of PTSD using AI. We hypothesize that AI may be a more effective method than traditional statistical methods such as MRA for its prediction (39). A secondary objective of this primary purpose is to create an algorithm to screen for PTSD symptoms from 1st forensic examination on the basis of clinical criteria accessible during consultation.

Our third goal is to study the notions of “victim” and “trauma” and to inform the understanding of SA based on the perspective of people who experienced it. We hypothesize that the importance and the representation attributed to the terms “victim” and “trauma” are either socially attributed to people who experienced SA or attributed by actors involved in their recovery, but are significantly and qualitatively different from the representations that the people directly concerned have of them (31, 34). This will also allow us to take stock on the functioning and qualities of available resources.

**Methods/design**

The research team consists of fourteen professionals specialized in forensic sciences, anthropology, psychiatry, law, criminology and data sciences to create and implement our research project called “Intelligence Artificielle, Dépistage et trajectoires psychosociojudiciaires des victimes de Violences Sexuelles” (IADViSe), which stands for Artificial Intelligence, Screening and psycho-socio-judicial trajectories of Sexual Violence victims.

**Overall Study design**

Our study is a longitudinal multi-centric cohort study, using mixed-methods. Quantitative data will be collected based on questionnaires repeated in time covering up to a year after the SA, and qualitative data will be based on semi-structured interviews with members of the cohort, people who experienced SA but who are not included in the cohort, and actors professionally involved in their psycho-socio-judicial care. As most medical and epidemiological studies (1), we only focused on acts of sexual violence involving force or threat of physical violence, therefore excluding harassment and exhibitionism.
Participants

Cohort participants

Part of our project is to create a cohort of people who recently experienced SA and who came to a forensic examination, with or without court order. This cohort will allow us to recover longitudinal quantitative and qualitative data (see Fig. 1).

Participant recruitment. Participants are being recruited through their examination for SA with a physician in one of five participating forensic medical center or medico-legal unit in Île de France (Hotel-Dieu Hospital in Paris, Jean Verdier Hospital in Bondy, the Inter-communal Hospital Center of Créteil, the Sud-Francilien Hospital in Corbeil-Essonnes and the Versailles Hospital Center). During this examination, physicians handle their patients consent forms. These forms state the purpose and methodology of the research. If they sign the consent form, initial information and participants' contacts are transmitted to one of the investigators who is in charge of the follow-ups at 6 weeks, 3 months, 6 months and 1 year of the SA. We also ask participants if they want to be interviewed. If they consent, we set one to three meetings in a private setting of their convenience to review the answers they gave in the questionnaires and to open the conversation to other topics they want to bring (on their representations of themselves and of the SA).

Inclusion criteria. We include everyone who come to a SA forensic examination at one of the five forensic center where the study takes place, who consent to the research, aged 15 or older, who experienced SA in the last 30 days. The time limit is fixed at 30 days since one of our primary goals is to study the onset of PTSD, which can be formally diagnosed if symptoms last for more than 1 month, in accordance with criterion F of the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (45).

Exclusion criteria. We exclude all people for whom callbacks are difficult or impossible and who do not speak and understand French enough to be able to answer the questionnaires on their own.

Feasibility. The potential number of participants to include varies based on the clinical activity of each forensic center in which the study takes place. By combining all the participating centers, there is a potential of 500 to 650 people to include each year. The participation of this study being entirely voluntary and having no direct benefits for patients, we can expect that not everyone will participate. Therefore, our recruitment period shall last at least 2 to 3 years.

Non-cohort participants

The data collected through the cohort are completed by qualitative interviews with people outside of the cohort (see Fig. 1). We are interviewing people who experienced SA but who are recruited by other means and professionals involved in the psycho-socio-judicial care of people who experienced SA.

Participants recruitment. We are recruiting non-cohort participants from investigators’ networks and by advertising for our study in different organisms that receive people who experienced SA (e.g. victim
support associations, police stations, forensic centers, Regional Psychotrauma Centers, etc.). Our contact in each organization is responsible for distributing a recruitment poster containing investigators’ contact information in the organization and to its network (where applicable), via their website, mailing lists, in their offices or on their social media. People interested can then contact the investigators to plan a meeting. We will add participant until saturation.

**Inclusion criteria.** To participate, people must be 15 or older, have experienced SA in their life-time or work with people who experienced SA, consent to the research and speak and understand enough French to be interviewed without a translator.

**Exclusion criteria.** People for whom setting up a face-to-face or video meeting in a place that respects their privacy, without taking risks for their well-being, is impossible will be excluded.

**Quantitative measures**

Quantitative measures at each time points are presented in Table 1. Initial data are collected during the forensic examination. The physician has to complete a questionnaire (see Additional File 1) based on a questionnaire constructed for a previous study (46) that is still used today by forensic practitioners in the Department of Forensic Medicine of the Jean Verdier Hospital (Bondy, France) as part of their routinely collected information. The participants also have to complete two self-assessed questionnaires on peritraumatic dissociation and distress. Investigators call the participants back at 6 weeks, 3 months, 6 months and 1 year of the SA so they can answer follow-up questionnaires on their health, support and on the status of their judicial proceedings. Those follow-ups do not exceed 40 minutes.

**Individual factors**

**Sociodemographic variables.** Sociodemographic data are first collected during initial examination: participants’ age (in year) and gender (1: female; 2: male; 3: other), the name of the forensic center in which the examination took place, the anonymized identity of the practitioner, and time between the assault and the examination (in hour). Complementary sociodemographic variables are collected during follow-ups. Marital status (0: never married; 1: married; 2: separated; 3: divorced; 4: widowed; 5: cohabitation) and employment status (1: employee; 2: independent worker; 3: unpaid worker; 4: student; 5: housewife/husband; 6: retired; 7: unemployed due to health reasons; 8: unemployed for another reason; 9: other) are based on sociodemographic information measured in the World Health Organization Disability Assessment Schedule 2.0 questionnaire (47). Level of education (from 0: no diploma; to 10: Master’s Degree; and 11: Other) is based on the sociodemographic questions asked in the 2019 Health Barometer Study (48). Sexual identity (1: heterosexual, 2: gay or lesbian, 3: bisexual or pansexual, 4: other) is based on an item recommended by the UCLA SMART team (49). We created an item to collect information on the identification as part of the gender diversity (0: no; 1: yes). The last sociodemographic variable collected is ethnicity/race (1: White, 2: Black; 3: Middle Eastern; 4: Hispanic/Latinx; 5: Asian; 6: other) and is based on recommendation from Public Health Ontario (50) and adapted to a French context.
Medical and psychiatric history and treatments. We collect data gathered by the practitioners during the initial examination on history of serious or chronic disease and personal and familial psychiatric history, as well as actual medical treatment that could lead to a psychic tropism (thymoregulator, anxiolytic, hypnotic, antidepressant, neuroleptic, analgesic, etc.).

Coping. Coping strategies are measured at each follow-up (6 weeks, 3 months, 6 months and 1 year) using the French version (51) of the Brief-COPE (54). This 28-item instrument measures the frequency with which an individual uses different positive and maladaptive coping strategies on a 4-point Lickert scale ranging from (0) Not at all, to (3) A lot. The Brief-COPE and the COPE inventory are very popular instruments to measure coping and are traduced and validated in at least 7 languages, making international reproduction and comparison easier (51). Its French version shows good psychometric qualities (51).

Follow-up substance use. Tobacco, alcohol, THC, and benzodiazepines use since the assault are measured at each follow-up (6 weeks, 3 months, 6 months and 1 year) by asking participants if they use each substance and if their usage of it increased or decreased since the assault (53). If participants answer that they use these substances, follow-up questionnaires are administered to determine if their use of each substance is problematic, using: the 2-item simplified Fagerström test (54), a French version of the Heaviness of Smoking Index (HSI) (55); the French version of the Cut Annoyed Guilty Eye-opener (CAGE) test (DETA) (56); the French version of the Cannabis Abuse Screening Test (CAST) (57); and the *Echelle Cognitive d’Attachement au Benzodiazépine* (Benzodiazepine Cognitive Attachment Scale; ECAB) (58). All those instruments are validated and recommended by the French High Authority for Health.

Assault characteristics

Standard consultation information on the assailant (number, gender, age, relation to the victim, alcohol or substance use), on the aggression (location of the assault, types of violence, context of the assault), and on the victim (physical defense reaction, amnesia, chemical submission and substance or alcohol use) are collected during the initial forensic examination as part of the physicians’ routine screening.

Microsystem

We measure social support during follow-ups at 6 weeks, 3 months, 6 months and 1 year using the *Questionnaire sur les réactions nuisibles et aidantes de l’entourage lors d’un dévoilement de violences à caractère sexuel – Version francophone adaptée* (RNAE-22) (59). This questionnaire is a French version of the Social Reaction Questionnaire – Short (SRQ-S) (60) adapted to be applicable to all gender. This instrument measures the frequency of positive and negative social reactions to a SA disclosure on a 5-point Lickert scale ranging from (0) Never to (4) Always. Items are split into three subscales describing the behavior of people receiving the disclosure: Turning against, Unsupportive acknowledgment, and Positive support, which have been validated in their original (60) and French versions (59).
Use of judicial, medical, mental health and community services. The use of different formal services (judicial, medical, psychological, community) is measured at each follow-up (6 weeks, 3 months, 6 months and 1 year) with questions built by the research team based on empirical findings and on the perspective of care providers and legal professionals such as “Have you filed a complaint to the police department?”. We ask questions about the evolution of the medical, psychological and community care and about the course of the legal procedure at each follow-up.

Quality of contact with the exosystem. Quality of contact between the physician and the patient is first measured during initial examination where the physician is asked to rank it on a scale ranging from (0) Very bad to (6) Excellent. Participants are then asked to rate the quality of their contact with each formal system at follow-ups, including their contact with the medical system.

Negative perceived social support by the exosystems. The participant’s negative perceived support from each formal service they used is measured at each follow-up (6 weeks, 3 months, 6 months and 1 year) with 5 items from a study by Campbell and Raja (30) examining different negative feelings the participant may have had after their contact with each system (guilt, depression, anxiety, distrust and reluctance to seek more help).

Secondary victimization. We measure secondary victimization at each follow-up (6 weeks, 3 months, 6 months and 1 year) by asking participants if they have encountered any guilt-inducing or non-helpful behaviors from justice system officials such as “being pressured to withdraw your complaint” or “questioning your words”. The list of these secondary victimization behaviors was previously developed by the research team based on empirical findings and on the perspective of legal system workers.

Chronosystem

History of violence during childhood. We measure history of psychological, physical and sexual victimization (by the same aggressor or by another), history of intrafamilial psychological, physical and sexual victimization and witnessing domestic violence during childhood, during the first forensic examination.

Revictimization. We measure physical, psychological and sexual revictimization at each follow-up (6 weeks, 3 months, 6 months and 1 year) by asking the participant if they lived each type of violence since the assault, by a different or the same assailant.

Functional outcomes

Peritraumatic distress. Peritraumatic distress is measured during the forensic examination using the French version of the Peritraumatic Distress Inventory (PDI) (61). This instrument measures the frequency with which participants experienced various negative feelings such as “feeling helpless” or “feeling like dying” during or directly after the assault, on a 5-point Lickert scale ranging from (0) Not at all to (4) Extremely, and shows good psychometric properties (61).
**Peritraumatic dissociation.** Peritraumatic dissociation is measured during the forensic examination using the French version of the Peritraumatic Dissociative Experience Questionnaire (PDEQ) (62). This instrument measures ten symptoms of dissociation during and immediately after an event on a 5-point Likert scale ranging from (0) Not at all to (4) Extremely and shows good psychometric properties (62).

**State at the time of examination.** We collect data on the physical complaints and lesions, psychological state, and duration of “total or temporary work incapacity” (a French legal notion used by judges to assess the seriousness of the SA) reported by the physician during the consult.

**PTSD symptoms.** We assess PTSD symptomatology at each follow-up (6 weeks, 3 months, 6 months and 1 year) using the French version of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5), which has been validated both in French and in its original version (63). This 20-item instrument assesses participants PTSD symptoms in the past month on a 5-point Likert scale ranging from (0) Not at all to (4) Extremely. A total score of 31–33 or higher indicates that the participant might meet criteria for PTSD and might benefit from PTSD treatment.

**Quality of life.** Physical, mental and social quality of life of the past month is measured using the Short Form 12 items version 2 Health survey (SF-12v2) (64) at each follow-up (6 weeks, 3 months, 6 months, 1 year). Each item contributes to the score of the Physical and Mental component summary. Both indexes are converted on a scale from 0 to 100 and mean score of the sample can be compared to the national norm (national mean is 50 with a standard deviation of 10).

**Impact on daily life.** We measure impacts of the assault on daily life (including personal activities, social activities and work) at each follow-up (6 weeks, 3 months, 6 months, 1 year) with the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) (47), a 12-item instrument measuring those impacts on a Lickert scale ranging from (0) None to (4) Extremely.
Table 1  
Characteristics and outcome measures and time-points at which they are collected

<table>
<thead>
<tr>
<th>Variable category</th>
<th>Variable</th>
<th>Measure</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Baseline</td>
</tr>
<tr>
<td>Individual</td>
<td>Sociodemographic variables*</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td>characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical and psychiatric history and</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coping</td>
<td>Brief-COPE (French</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td></td>
<td>version)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Substance misuse</td>
<td>HSI, CAGE, CAST,</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(French versions)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ECAB</td>
<td></td>
</tr>
<tr>
<td>Assault</td>
<td>Aggressor and aggression informations**</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td>characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microsystem</td>
<td>Received social support</td>
<td>RNAE-22</td>
<td>x</td>
</tr>
<tr>
<td>Exosystem</td>
<td>Use of services</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Quality of contact</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Perceived negative support</td>
<td>From Campbell &amp; Raja</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2005)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second victimization</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td>Chronosystem</td>
<td>Childhood history of violence and</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>exposition to domestic violence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prior assault history</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Revictimization</td>
<td>Bespoke measures</td>
<td>x</td>
</tr>
</tbody>
</table>
**Variable category** | **Variable** | **Measure** | **Timeline**
--- | --- | --- | ---
Functional outcomes | Peritraumatic distress | PDI (French version) | x
| Peritraumatic dissociation | PDEQ (French version) | x
| Physical and psychological state at examination | Bespoke measures | x
| PTSD symptoms | PCL-5 (French version) | x | x | x | x
| Quality of life | SF12v2 (French version) | x | x | x | x
| Impact on daily life | WHODAS 2.0 (French version) | x | x | x | x

* Sociodemographic variables include: age, gender identity, marital status, employment status, level of education, sexual identity and race/ethnic identity.

** Aggressor and aggression information include: the number of aggressors, their gender, age, their relation to the victim, alcohol or substance use from the aggressor and from the victim, victim's physical reaction of defense, victim's amnesia, suspicion of chemical submission, the location of the SA, types of SA, and associated violence.

**Qualitative interviews**

Semi-directive interviews are conducted with cohort participants and non-cohort people who have experienced SA in the past (see Additional File 2). These interviews allow us to collect complementary data to our quantitative data. The first contact consists of a one-hour semi-directive interview on perception of the event, formal and informal support, coping methods and on the impacts of the event. Once a good contact is established between the participant and the interviewer, a second and/or third interview can be conducted to come back on what was said during the previous interview and to discuss in more depth the participant’s value system and perceptions on how they integrate the event to their life-course and how they perceive themselves and the SA in relation to the notions of “trauma” and “victim”.

Other semi-directive interviews are conducted with professionals involved in the pathways of people who experienced SA (see Additional File 3). First, they are asked about their practice and the needs of their
patients or clients. Second, they are asked about their perception of the help they give and of the adequacy of available resources and the needs of people who experience SA. Finally, they are asked about their definition of the notions of “trauma” and “victim” and the usefulness of those terms in their field and for the people who experienced SA.

**Statistical Analyses Planned**

**Quantitative analysis**

Descriptive analyses of participants characteristics will be performed. The total population included during initial examination and the follow-up cohort will be compared to understand the differences between patients who will have abandoned their participation and the one who will have finished their follow-up.

Bivariate and multivariate analyses, including trajectory analyses, will be conducted to study the associations between each variable and mental, physical, social and judicial outcomes at 6 weeks, 3 months, 6 months and a year of the SA. Results regarding the presence or absence of PTSD will be used as a basis for our predictive analyses.

Predictive analyses will be conducted on multiple prediction algorithms (meta learner and support vector machine) in order to predict PTSD at first examination. Testing phase will be conducted on a subsequent study to validate the algorithms on part of our cohort. We will first select automatic variables either via feature selection or manually from multivariate analyses results. Internal validity of the prediction model will be studied via cross-validation. Metrics for precision (accuracy and Area Under Curve), sensibility, specificity, positive predictive value and negative predictive value will be chosen to quantify the algorithms performance.

**Qualitative analysis and data integration**

Interviews with people who experienced SA and workers will be transcribed before coding and thematic analysis. Parts of the results of the interviews will be integrated with the quantitative data, following best practices for mixed methods research (65). This will allow us to have more complete information on the psycho-socio-judicial trajectories of participants and to characterize trajectories more precisely. Data on the representations of the place and usefulness of the notions of “trauma” and “victims” will be used independently to better understand the representations and place of SA and of people who experienced it.

**Discussion**

Our study goals are to characterize psycho-socio-judicial trajectories of people who come to a forensic examination after experiencing recent SA and to identify people at risk for PTSD using artificial intelligence for early detection. Using mixed-methods and questioning both people who experienced SA and workers involved in their trajectories will also allow us to take stock on the functioning and qualities
of resources available in France and to inform the understanding of SA, its integration into the life-course, and the notions of “victim” and “trauma” based on the perspective of people who experienced it.

Data collection started in September 2022, and we expect it to be complete by 2026. Data analyses will begin before the end of data collection, followed by the elaboration of several articles, expected to be submitted between 2023 and 2026.

Limitations

Our study has limitations. In France, most forensic centers cannot receive patients without court order, which is obtained once the alleged victim presses charges. However, only 7–8% of people who experience SA press charges (66), and those 7–8% might not be representative of the entirety of people who experienced such violence. Therefore, people who come for a forensic examination after SA correspond to a particular profile of both people and type of aggression. In our study, only the forensic center of the Jean Verdier Hospital does not require patients to have a court order to be examined, which might limit the representativeness of our sample.

Moreover, our selective temporal and age criterion necessarily excludes all minors under the age of 15 and all people whose SA dates back more than 30 days, which excludes the participation of people who experienced specific kinds of sexual violence such as incest or child sexual abuse. This criterion is warranted to be able to examine the onset of PTSD, which takes place one month after the trauma according DSM-5 criterion F (45) and to facilitate the inclusion of participants, since people over the age of 15 can give their consent without their legal guardians in matters regarding their sexual health, but they participate to this selection bias.

Lastly, part of our study is based on AI, which is more complex to implement and manipulate than standard statistical methods (39). Past literature has shown that model validation, computational power and quality of data, multimodality, the non-stationary distribution of data, the heterogeneity of phenomenological clinical diagnosis, the lack of interpretability of the resulting models, the conservative approach to healthcare of funding agencies, and ethical issues (privacy and anonymity of data and potential impacts of a predictive model on individuals), are obstacles to the implantation of AI in studies on psychiatric disorders and to its translation into clinical settings (67).

Despite those limitations, this study addresses important knowledge gaps in understanding the extent of psycho-socio-judicial impacts of recent SA, the onset and evolution of PTSD symptoms, and the needs of people who experienced SA.

Strengths and expected implications

Concerning the quantitative side of the project, the collection of systematic data in several forensic medicine centers, whose practices and recruitments are considered to be very heterogeneous, will provide us with unprecedented information on people consulting for SA in different dimensions, but also on professional practices. This will allow us to observe the onset of major psychological disorders, including
PTSD and to measure their impacts on participants’ lives and functional outcomes. Moreover, our quantitative design uses validated and frequently used scales to measure psychotrauma and functional outcomes of trauma, allowing comparison with other national and international studies.

Another important quantitative strength is our focus on the prediction of the development of PTSD using AI. Indeed, data collected during the first forensic exam will allow us to develop initial AI algorithms to identify people at risk of developing PTSD. This study will be the basis for a second study, which will be integrated into the project, that will aim to investigate the contribution of AI in the early detection of PTSD as well as the reception and integration of the tool by medico-social services. We therefore hope to build tools to better orient people who experienced SA from the first forensic examination, in particular in terms of psychotrauma. This could lead to novel findings as there is promising evidence that AI can be of great help for medical services (42, 43), but has never been tested for forensic examinations after SA to our knowledge.

Concerning the qualitative side of the project, this is one of the few projects studying the qualities and challenges of French infrastructures and the needs of people who experienced SA in France. This will allow us to map the existing, available and lacking resources inside of their trajectories. It is also rare in medical and public health research to follow people who experienced SA over time while giving them a central place, allowing us to re-specify the representations and places of the trauma experienced. We therefore hope for a better knowledge of the populations consulting for SA, of their representations, and of the adequacy of the resources offered to them in different places and times. This will allow to better understand how people who experienced SA perceive and integrate the event into their life course, but also to better understand their needs and to find solutions to improve their care, taking into account the entire French medico-social chain and their capacities.

**Conclusion**

This project will allow us to collect numerous data never before collected over such long periods of time in medical sciences in France, but also worldwide, which will lead to unprecedented results. This novel work, by being based on the entire psycho-socio-judicial chain and by giving a central place to the perspectives of people who experienced SA, will make it possible to make innovative recommendations to improve their care at all levels, starting from the initial forensic examination. We hope our approach may fuel further research to investigate psycho-socio-judicial trajectories via the creation of cohorts of people who experienced SA in other settings to have a more representative view of all people who have been sexually assaulted. Future research should also continue to focus on the use of AI to help medical examiner to refer their patients towards more adapted services by testing the algorithms that will be developed in this project on several samples with different sociodemographic and trauma characteristics.

**Abbreviations**

AI
Declarations

Ethics approval and consent to participate

Informed consent was obtained from all subjects involved in the study. All procedures, including informed consent, received full ethical review and approval from the Research Ethics Committee of the Paris Cité University (IRB number: 00012022-14, date: 05/04/2022).

Availability of data and materials

Data and materials will be available on an open-access archiving platform such as UK Data Archive once the data collection is completed.

Competing interests

The authors have no competing interests to report.

Funding

No funding was received for this study.

Authors’ contributions

EF was involved in the study conception, design and investigation, on the original draft preparation and on review and editing. TS, TV and JO were involved in the study conception, design and investigation and on the review and editing of the manuscript. TL was involved in the study conception, design, investigation and supervision, and on the review and editing of the manuscript. TF was involved in the study conception and design, and on review and editing. All authors read and approved the final manuscript.

Acknowledgments

We would like to thank Adeline Mousson from the University of Birkbeck and Audrey Darsonville from the University of Nanterre for their precious help in the construction of the research material and for sharing
their expertise in anthropology and criminal law with the rest of the research team.

Authors’ details

1: Formation and Research Unit for Health, Medicine and Human Biology (UFR SMBH), Sorbonne Paris North University (Paris 13), Bobigny Campus, 1 rue de Chablis 93017 Bobigny cedex, France

2: Institute for Interdisciplinary Research on Social Issues (IRIS), UMR CNRS 8156 Inserm 997 EHESS USPN, Condorcet Campus, South Research Building, 5 cours des Humanités 93322 Aubervilliers cedex, France

3: Assistance Publique – Hôpitaux de Paris (AP-HP), Jean Verdier Hospital, Department of legal and social medicine, avenue du 14 juillet 93140 Bondy, France

4: University of Lille, Inserm, Lille Regional University Hospital Center, U1172 – Lille Neuroscience & Cognition, F-59000 Lille, France

References


Figures

Figure 1. Inclusion and follow-ups stages of participants

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfile1.pdf
- Additionalfile2.pdf