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Decision analysis in referrals of children and adolescent victims of violence: An ANP approach

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ABSTRACT

The information on violence against children and adolescents in institutions is limited to varying degrees, resulting in inadequate reporting and referrals to safety nets. This paper therefore aims to develop a care protocol that helps institutions in the *Brazilian cities of Uberaba, Minas Gerais, and Bauru, São Paulo*, to manage reports of violence against children and adolescents. The research used the Analytic Network Process Method (ANP) to improve the flow of victim referrals, making decisions according to the right violated and the type of violence involved. A survey showed that, from a general point of view, the health sector should be a priority point of referral for victims. In the specific cases of neglect and physical violence, social care and Child Protective Services are the priority sectors, respectively. The health sector is the priority for cases of psychological violence and sexual violence.

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Violence; analytic network process; decisions support systems

1. Introduction

The current situation and the history of violence against children and adolescents in Brazil highlights a paradox in the country: legislation is very advanced in terms of protection and prevention of violence, but social indicators show that many children and adolescents live in precarious conditions and are commonly exposed to violence (Brasil, 2013; Rizzini & Pilotti, 2011).

According to the World Health Organization (WHO) violence can be defined as the intentional use of physical force or power, threaten or actual, against oneself, another person, or against a group or community, which either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002). Violence against children and adolescents is characterised by any physical, sexual, or psychological damage caused by parents, relatives, or other members of society (Minayo, 2001). Despite implementing the Children and Adolescents Statute (Estatuto da Criança e Adolescente – ECA) in 1990, the number of cases of violence against children and adolescents is increasing in Brazil (Waiselfisz, 2012). The statute established the rights held by children and adolescents and the tripartite responsibility of the family, society, and the government in combating violence, however, violence is still

characterised as a problem of individual and collective vulnerability (Ayres, Junior, Calazans, & Filho, 2003).

With the enactment of the statute, Child Protective Services were institutionalised in Brazilian municipalities with the purpose of ensuring accountability for acts of violence committed against children and adolescents, defending their rights, and providing care under a wide range of demands. The statute also required the adoption of safety nets involving professionals from various sectors such as health, social care, education, the legal system, and non-governmental organisations, among others (Aragão, 2011). These safety nets provide Child Protective Services with a centralised space for referred cases of violence, but often lead to an overload of work and decisions, isolating Child Protective Services from other sectors and hindering the referrals' flow. This overload ends up causing setbacks in Protective Services referrals, often individualising the problem and not identifying the causal connection between the violence committed and the right violated. This type of problem can cause an incorrect reporting flow, which is essential to the continuity of actions within the safety net, affecting cases directly (Aragão, 2011; Apostólico, Nóbrega, Guedes, Fonseca, & Egry, 2012; Bannwart & Brino, 2011; Lima & Deslandes, 2015; Njaine, 1997).

The objective of this study is to develop a protocol to assist institutions in the Rights Assurance System

(from two municipalities) to manage reports of violence against children and adolescents using the Analytic Network Process Method (ANP). This model aims to correlate rights, types of violence, and care sectors in order to improve the referral of reports to safety nets. The research was conducted in the cities of Bauru, SP, and Uberaba, MG. Over the last year, Bauru has seen numerous cases of domestic violence, sexual violence, and other violent acts against children and adolescents, according to data from DATASUS, while Uberaba has one of the highest rates of reported cases of physical and sexual violence in Brazil (Waiselfisz, 2012).

The key task in seeking to improve the referral of individuals within the safety net is to correlate the classifications of violence developed and used by Child Protective Services with the fundamental rights described in ECA and with the correct referral of reports to the care network. The ANP is a mathematical tool capable of creating complex relations between various elements in order to improve referrals. One of the broadest decision-making methodologies in the literature is Multiple Criteria Decision-Making. It is used in studies across a wide range of fields such as energy and the environment, business, economics, production, etc., and its approaches provide understanding and quality in decision-making processes by using efficient techniques that rationally explain all the ways of obtaining better alternatives (Mardani et al., 2015). ANP is one of the *Multi Criteria Decision Making* (MCDM) methods introduced by Thomas L. Saaty in 1993, and is used to derive judgment priorities for decision-makers. The method is structured as a network composed of goals, criteria, and alternatives allocated in clusters, where internal and external comparisons are made between clusters and between all the related elements, analytically determining the decision-making process (Saaty, 2009, 2013).

ANP allows to relate several decision criteria (dependent on each other) to a given phenomenon in a network, in this case, care for victims of violence. Therefore, to relate and analyse the rights of children and adolescents to a typology of violence exposes the consequences of this violence on the integral development of the victim over time. Adoption of the ANP will allow for decision-makers to refer those victims to the SGDCA institutions in a consistent manner. There are dependences between rights and violence. For example, a person who suffers sexual violence has great possibilities to suffer psychological disorders and relationship problems. A person who suffers any violence typology can have some violated rights in the same time. These comparisons don't be possible in a hierarchical structure, this complex problem can be better explored in a network structure with a complete mapping of the decisions criteria.

Studies that use a quantitative approach are more often found in research into the most frequent types of

violence, the profile of the offenders, the frequency of violence, and the adolescents victimised, using descriptive statistics (Apostólico et al., 2012; Franzin et al., 2014; Ju & Lee, 2010; Veronese, Castiglioni, Barola, & Said, 2012), logistic regression analysis (Hamilton & Worthen, 2010), and correlation analyses (Meinck, Cluver, Boyes, & Mhlongo, 2015). It is important to emphasise that no studies into violence using multi-criteria analysis were found in the literature to date. The state of the art demonstrates that the contribution of the Multicriteria Analysis Method to the analysis of social issues allows for a comprehensive look at the referrals of the victims of violence and this study presents a great contribution to literature.

The ANP method has been widely used in the literature. Applications include Balanced Scorecard perspectives (BSC) (Yüksel & Dağdeviren, 2010); Research and Development project selection (Meade & Presley, 2002); application with SWOT analysis (Sevklı et al., 2012; Yüksel & Dagdeviren, 2007); use in conjunction with fuzzy techniques for supplier selection (Gencer & Gürpınar, 2007; Vinodh, Anesh, & Gautham, 2011); selection of the best risk assessment technique for maintenance professionals (Chemweno, Pintelon, Van Horenbeek & Muchiri, 2015); and applications in the *green supply chain* (Lin, Tseng, Chiu, & Wang, 2014; Wu & Barnes, 2016). These are just some examples of the wide applicability of the method, demonstrating the characteristics of a powerful decision-making tool used for very complex problems.

2. Methodology

2.1. Formulation of the problem and development of the ANP network

The first step in formulating the ANP network is to identify the most important decision-making elements (Saaty & Vargas, 2006). In this case, the network's goal was to improve performance in referring victims of violence. Although foreseen in ECA, the System of Guarantee of Rights of the cities studied has peculiarities and similarities. They are the existence of public facilities acting in isolation, without the agreement of common protocols of violence notification, the emergency action that prevents the creation of strategies to prevent violence. Thus, the creation of an attendance/referencing protocol with ANP for each type of violence, which considers the type of right violated, can allow greater speed in the activation of the care sectors.

Figure 1 shows the established reference model. Three clusters were created to analyse the problem: rights violated, types of violence, and care sectors. The rights violated were determined according to the ECA: Right to Life and Health (R1); Right to Freedom, Respect, and Dignity (R2); Right to Family (R3); Right to Education, Culture, Sport, and Recreation (R4); and Right to Professionalism and Protection at Work (R5). The types

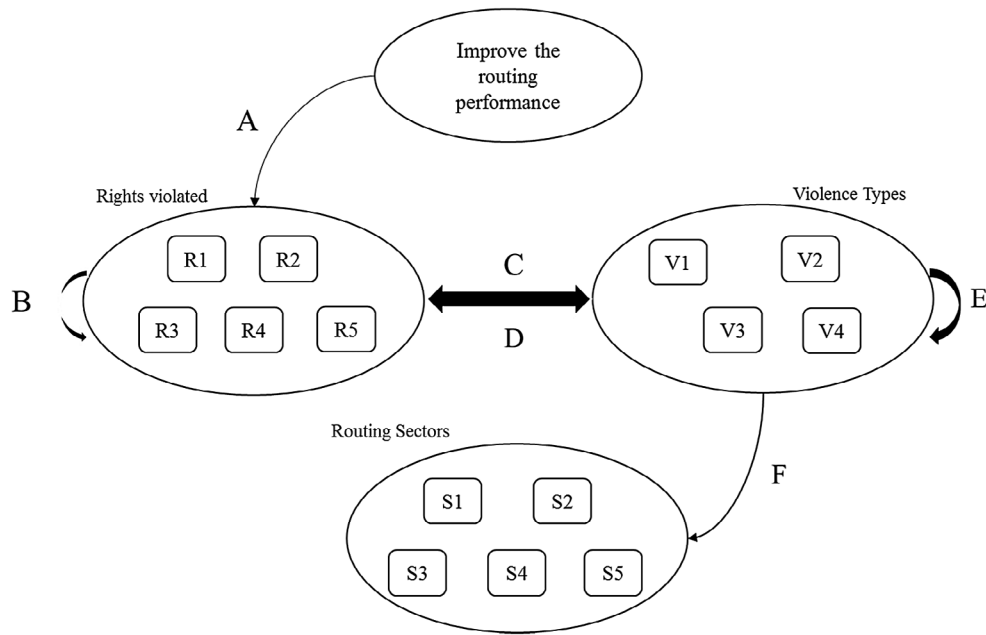


Figure 1. ANP reference model.

of violence were: Family Neglect (V1); Physical Violence (V2); Psychological Violence (V3); and Sexual Violence (V4). The typologies of violence are described in Table 1. Finally, the cluster representing the referral alternatives, comprising the main sectors where children and adolescents receive care, were: Social Care (S1); Education and Culture (S2); Health (S3); the Legal System (S4); and Child Protective Services (S5). Connections A, B, C, D, E, and F show the relations between the clusters.

2.2. Paired comparisons and consistency analysis

All the related elements are paired and compared according to Saaty's Fundamental Scale, presented in Table 2. A response consistency ratio is calculated for each question. The ANP method considers 0.10 as the maximum inconsistency level (Saaty, 1990). Only consistent questions were considered for analysis. The following equations are used to calculate the consistency ratio:

$$CI = (\lambda_{\max} - n) / (n - 1) \quad (1)$$

$$CR = CI / RI \quad (2)$$

The *Consistency Index* (CI) is calculated based on the value of each matrix, represented by λ_{\max} . Element

n represents the order of the decision matrix. The Consistency Ratio (CR) is calculated by dividing the CI by the Random Index (RI), which determines a random index according to the order of the matrix, as shown in Table 3.

2.3. Aggregation of priorities

The *Aggregation of Individual Priorities* method (AIP) was used to aggregate the priorities for each consistent question. AIP is used when individuals act individually in their own right, where there is a need to obtain priorities for each decision-maker in order to analyse the problem. The aggregation is determined by the geometric mean of each decision-maker's priorities (Altazurra, Moreno-Jiménez, & Salvador, 2007; Forman & Peniwati, 1998). The aggregations were performed only for the questions identified as consistent in the analysis.

2.4. Construction of the supermatrix

The supermatrix is a specific element of the ANP (Saaty, 2009). Matrices A, B, C, D, E, and F from Figure 1 were weighted according to the weight of each decision cluster and allocated to a supermatrix which was multiplied n times, until all the elements in each row had the same

Table 1. Types and characteristics of violence.

Violence types	Description
Physical violence	Use of physical force that may cause harm, injuries, disabilities, or any other physical damage as a result of various agents, and can be found in a range of contexts across society (Assis & Deslandes, 2006; Minayo, 2001)
Sexual violence	One of the most serious manifestations of violence often perpetrated by people close to the victim, within their own homes, or even by strangers in public, and most represented in the form of rape. Such violence is characterised by sexual abuse and exploitation (Costa et al., 2007; Felizardo et al., 2006)
Psychological violence	Psychological abuse exercised by adults against children, damaging their self-esteem and making it difficult for them to reach their potential, worsening psychological and social problems (Assis & Avanci, 2006)
Neglect	Neglect is characterised as abandonment or lack of family care regarding issues such as health, education, clothing, or food. In other words, anything that the family fails to provide in order to care for the physical, social, and emotional needs of the child (Minayo, 2001)

Table 2. Saaty fundamental scale.

	Definition	Explanation
1	Equal importance	Two activities contribute equally to the goal
3	Moderate	Experience and judgement slightly favour one activity over another
5	Strong	Experience and judgement strongly favour one activity over another
7	Very strong	One activity is favoured very strongly over another and its dominance is demonstrated in practice
9	Extreme	The evidence favouring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values	Used to represent a compromise between the preferences listed above
Reciprocity	If activity <i>i</i> is assigned one of the above non-zero numbers when compared to activity <i>j</i> , then <i>j</i> has a reciprocal value when compared to <i>i</i>	

Table 3. Random index.

<i>n</i>	1	2	3	4	5	6	7	8	9	10
Random index	0	0	.52	.89	1.11	1.25	1.35	1.40	1.45	1.49

value, known as the limit supermatrix. The supermatrix applied in this study can be seen below. After obtaining the limit supermatrix, the weights were normalised and further weights were extracted for the criteria and the final priorities of each care sector.

	Goal	Criteria	Subcriteria	Alternatives
Goal	0	0	0	0
Criteria	A	B	D	0
Subcriteria	0	C	E	0
Alternatives	0	0	F	0

2.5. Sensitivity analysis

Sensitivity analysis is the last stage of the ANP methodology, and its function is to classify the alternatives according to the variation or exclusion of certain criteria. The weights of the alternatives are highly dependent on certain criteria, so alternative scenarios can be created by varying the criteria that affect the problem resolution the most. Normally, the criterion with the greatest weight is used as the analysis variant (Chang, Wu, Lin, & Chen, 2007; Ishizaka & Labib, 2011).

3. Case study

3.1. General analysis

The first step in analysing the questionnaires in the ANP method is to calculate the consistency of the responses. The 13 (thirteen) questionnaires were subjected to this calculation and inconsistent questions were excluded from the analysis. Experts from the cities considered in the study, were surveyed to identify the best sectors. The decision-support group composed of professionals from the legal system, such as a Children and Youth prosecutor and judge, social workers, professionals from the Social Care Reference Centre (SCRC) and the Specialist Social Care Reference Centre (SSCRC), members of non-governmental organisations (NGOs), and health professionals. In total, 13 (thirteen) ANP questionnaires were used to research safety nets in the two cities.

After this procedure, the remaining steps of the method were applied: aggregation of the consistent questions, formulation of the decision matrices, allocation of the matrices in the supermatrix, weighting of the supermatrix, calculation of the limit matrix, and normalisation of the results. The weights of the rights violated, the acts of violence, and the care sectors were then extracted from the limit matrix. Table 4 shows the results of the study's general analysis (considering all types of violence).

Based on the above results, considering all types of violence, the health sector is identified as the priority sector for the care of children and adolescents, followed by Child Protective Services and Social Care. This result, health sector as a priority, may also be related to the weights of the types of violence and rights violated given by the analysis. In this analysis, Family Neglect (O1) was the type of violence with the highest weight, so this classification may be linked to this hypothesis. To verify this result, a sensitivity analysis was performed. The weight assigned to Family Neglect was varied from 0.1 to 0.9 while observing the behaviour of the alternatives, showing some alternative scenarios in the ranking of priorities. The differences found can be seen in Table 5.

Table 4. General analysis results.

Rights violated	Weights
Right to life and health	0.2514
Right to freedom, respect, and dignity	0.2868
Right to family	0.2028
Right to education, culture, sport, and recreation	0.1464
Right to professionalisation and protection at work	0.1126
Types of violence	Weights
Family neglect	0.3070
Physical violence	0.1898
Psychological violence	0.2265
Sexual violence	0.2767
Sectors	Weights
Social care	0.1919
Education and culture	0.1736
Health	0.2427
Legal system	0.1822
Child protective services	0.2096

Note: The bold values are the most relevant weights in analysis.

Table 5. Results based on varying weight of neglect.

Sectors	Varying weight of neglect				
	0.1	0.3	0.5	0.7	0.9
Social care	0.169	0.191	0.213	0.236	0.258
Education and culture	0.179	0.174	0.171	0.169	0.166
Health	0.270	0.244	0.217	0.190	0.163
Legal system	0.183	0.182	0.181	0.180	0.179
Child protective services	0.202	0.209	0.217	0.225	0.233

Note: The bold values represents the most relevant weights when the neglect weight varies between 0.1 and 0.9.

Table 6. Priorities for cases of neglect.

	Priorities	Classification
Social care	0.2694	1st
Education and culture	0.1653	4th
Health	0.1501	5th
Legal system	0.1786	3rd
Child protective services	0.2366	2nd

When the weight of Family Neglect was between 0.1 and 0.4, the health sector remained the highest care priority. When the weight was 0.5, Child Protective Services presented the same weight as the health sector (21.7%), followed by social care (21.3%). From 0.7 and up, social care becomes the priority sector in the analysis and thus takes priority until the upper limit of the range, as shown in Table 5. The priority of the health sector decreases as the weight assigned to Family Neglect increases, and when that weight is 0.9, the health sector is the lowest priority sector for care. The results of this general analysis demonstrate the need to verify the priority sectors for each type of violence. The classifications can change dramatically depending solely on the type of violence. Another relevant point highlighted by this analysis is the establishment of care protocols for each type of violence, since each one requires different care demands.

The results in Table 4 show the relevance in analysing the types of violence on a sectorised basis. So, the overall ANP analysis resulted in several individual analyses, as can be seen in the following section.

3.2. Analysis by type of violence and care protocol

3.2.1. Family neglect

The ANP method analysis identified social care, followed by Child Protective Services and the legal system, as the priority sectors for referring victims of this type of violence. In this analysis, legal experts, social workers, and health professionals established their priorities, since they were the sectors whose answers were consistent with the ANP method. Table 6 presents the priorities and the classification of the sectors.

The health sector appears as the last priority for referral. Those who report cases of neglect do not consider the health sector as competent enough to provide the care needed (Nunes & Sales, 2016). This result, with the health sector as the lowest priority, reinforces the outcome of the sensitivity analysis conducted for the general classification (Table 4). As shown, the greater the weight assigned to neglect, the lower the priority of the health sector. Thus, the individual analysis of neglect corroborates the alternative scenarios determined in the sensitivity analysis, showing that the social care and Child Protective Services are the sectors most suitable for treating cases of this type of violence. Figure 2 shows the care protocol developed for victims of family neglect.

3.2.2. Physical violence

Child Protective Services was designated the highest priority for referrals in cases of physical violence

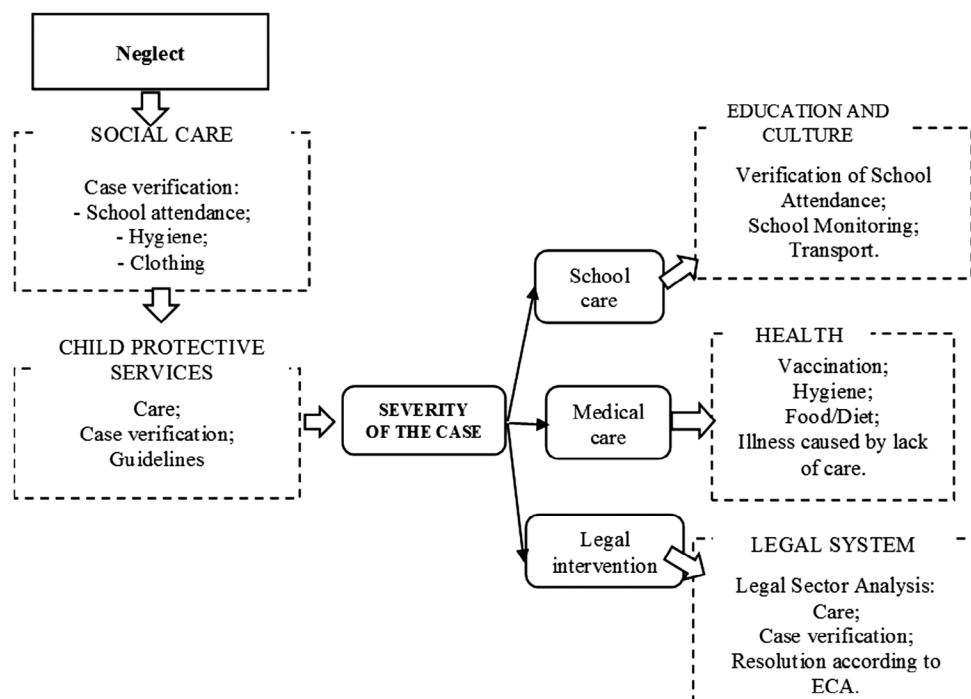
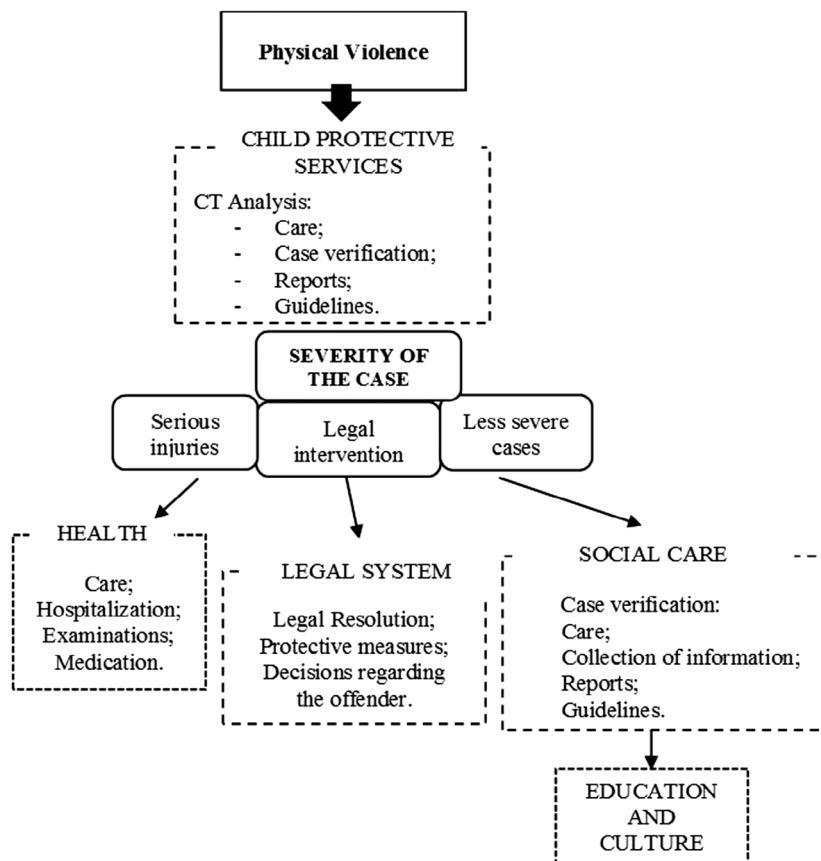
**Figure 2.** Referrals flow for victims of family neglect.

Table 7. Priorities for cases of physical violence.

	Priorities	Classification
Social care	0.2219	2nd
Education and culture	0.1953	3rd
Health	0.1801	4th
Legal system	0.1647	5th
Child protective services	0.2379	1st

3.2.3. Psychological violence

The health sector was identified as the highest priority for victims of psychological violence, followed by education and culture, and then social care. It is noticed in this typology that Child Protective Services and the legal system, Sectors with high frequency of care, did not receive a high priority for referrals. This classification can be interpreted

**Figure 3.** Referrals flow for victims of physical violence.

against children and adolescents, followed by social care. Education and culture was the last of the three key sectors for referral in these cases (Table 7). Even with the classification of the sectors by the ANP, the seriousness of the case should be taken into consideration, and this can directly affect the right referral flow. For example, when children or adolescents have suffered very serious physical injuries, they should be referred to health care services. Establishing the severity classification is an important care process, because it creates urgency criteria for each type of case and gives a structure to care flowcharts and protocols (Pfeiffer, Rosário, & Cat, 2011).

Education and culture was the third referral priority for victims of physical violence. This result may be associated with the implementation of long-term measures, such as cultural projects and reintegration of victims into the school environment. Figure 3 shows the care protocol for cases of physical violence.

as follows: the professionals who answered the question regarding psychological violence understand that health and education represent the main opportunities for detecting these cases. For example, teachers who constantly work with this group often notice signs of psychological violence (Table 8). Skin abnormalities, difficulties with speech, behaviour, and diseases such as obesity are some examples of indicators of this type of violence (Assis, 1994).

Despite the high priority given to the health and education sectors, the level of identification and reporting

Table 8. Priorities for cases of psychological violence.

	Priorities	Classification
Social care	0.1717	3rd
Education and culture	0.2556	2nd
Health	0.2794	1st
Legal system	0.1234	5th
Child protective services	0.1699	4th

Note: The bold word represent the most relevant sector in analysis.

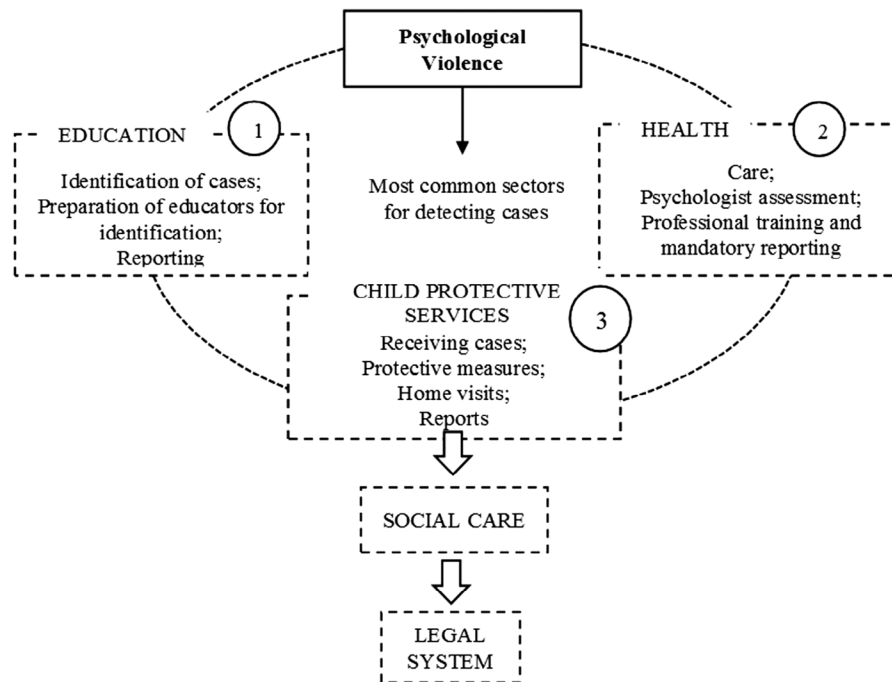


Figure 4. Referrals flow for victims of psychological violence.

by professionals in these sectors with respect to psychological violence is questionable (Faraj, Siqueira, & Arpini, 2016; Silva, Lunardi, Lunard, Algeri, & Souza, 2016; Silveira et al., 2016). Social care, the third priority sector in the analysis, is a sector that involves interdisciplinary teams that are better able to solve psychological problems. Training professionals to identify and report cases is the first step to addressing this problem (Figure 4).

3.2.4. Sexual violence

Among the various paths to the provision of immediate care in cases of sexual violence, the health sector received the greatest weight in the analysis, followed by the legal system and Child Protective Services, respectively. This classification is shown in Table 9 and demonstrates the importance of immediate care at health services, especially when the victims have suffered sexual abuse. There is often a fragile link between the social sectors and health sectors, leading to a lack of involvement in the allocation of strategies to address this type of violence (Paixão & Deslandes, 2010).

As illustrated in the classification, the legal system and Child Protective Services are the priority sectors after treatment of victims by health services. The legal system was likely determined as the second priority sector in the analysis due to the need for justice, since sexual abuse is considered one of the most serious forms of violence (Felizardo, Zurcher, & Melo, 2006).

Child Protective Services was identified as the third referral priority for victims, even being a sector that concentrates most of the care actions from across the

range of types of violence presented (Aragão, 2011). There is a lack of cooperation between Child Protective Services and the health and education sectors that hinders the fight against sexual violence and deserves greater attention, because these sectors are considered pillars of public policy (Deslandes & Campos, 2015). The care protocol for victims of sexual violence is shown in Figure 5.

After the results obtained with the ANP, they were reported to the participants of the study, so that they could validate the relevance of the results in relation to what is experienced in the daily care service in the care sectors. All protocols were validated by the participants.

4. Conclusion

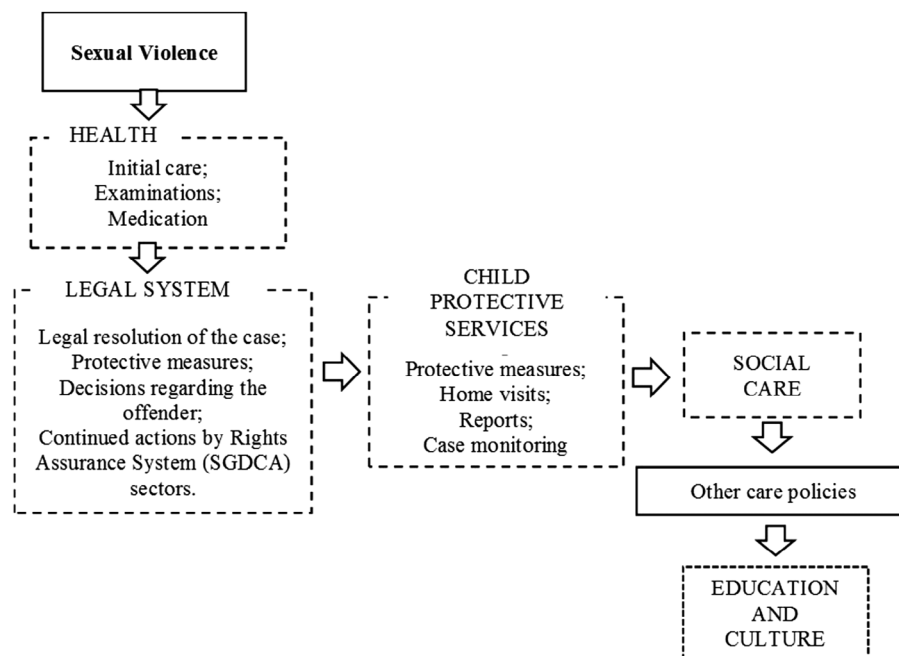
The main objective of this research was to develop a protocol to assist institutions in the Rights Assurance System in the municipalities of Uberaba, MG, and Bauru, SP, to manage reports of violence against children and adolescents. The Analytic Network Process method was used to develop the protocols, determining priorities according to each type of violence committed, obtained by working with experts from various sectors that comprise the safety net in both cities. The following results were achieved:

- The health sector was considered the priority care sector for all types of violence, as neglect was identified as the main type of violence in the cases, but the sensitivity analysis showed that the priorities were subject to change depending on the weight assigned to neglect.

Table 9. Priorities for cases of sexual violence.

	Priorities	Classification
Social care	0.1018	4th
Education and culture	0.1007	5th
Health	0.3581	1st
Legal system	0.2465	2nd
Child protective services	0.1929	3rd

Note: The bold word represent the most relevant sector in analysis.

**Figure 5.** Referrals flow for victims of sexual violence.

- Social care and Child Protective Services were the priority sectors for victims of neglect and physical violence, respectively. The health sector was given the greatest weight psychological and sexual violence.
- These classifications are used as the basis for establishing the care protocols, supported by mathematical tools and aiming to provide a scientific approach to decisions that safety net managers make based on personal feelings and the case. The referral flows developed are able to assist these professionals when receiving reports of cases of violence.
- The study highlights guidelines for the care sectors and identifies indicators to advance public protection policy.
- The study faced serious intersectoral problems with the safety nets, including a lack of communication and systematisation of the cases presented in a database that is used to improve the reporting and referrals processes, particularly in the health and education sectors, corroborating the findings from the literature.

As noted throughout this paper, intersectoral cooperation between safety net organisations depends on the effectiveness of the reporting procedure. Many sectors are not reporting properly, especially the health and education sectors (Faraj et al., 2016; Silva et al., 2016; Silveira et al., 2016), and these institutions should therefore be studied in further detail, to identify the reasons for

the flaws in the reporting process and for the low level of cases reported. Application of Analytic Hierarchy Process (AHP) to identify the main barriers to reporting is a possible option, as well as the study of specific cases.

A limitation of the study was observed in the city of Bauru, because the low participation of the professionals integrating the Rights Guarantee System is a reflection of the little institutional stimulus for a reticular performance. We also observed the difficulties in interpreting the ANP instrument when comparing the analysis criteria. These three limitations corroborate the excessive fragmentation of the city's protection net, which restricted a broader analysis among the sectors involved.

Applications of this analytical structure in other contexts could consider the types of violence and rights, relating them to each other, observing the classifications for cities with higher violence statistics than the ones studied, comparing the priority referral results for each type of violence. Another possibility for future research would be to apply the same model only to Child Protective Services, as a sector that is overburdened with actions and decisions (Aragão, 2011) and has a central

role in the safety net, asking professionals about the referrals needed and the difficulties communicating and cooperating with other sectors.

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No potential conflict of interest was reported by the authors.

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