


Violence against children and adolescents in Manaus, Amazonas State, Brazil: a descriptive study of cases and evaluation of notification sheet completeness, 2009-2016*

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Abstract

Objective: to describe cases of violence against children and adolescents and completeness of notification forms registered on the Notifiable Health Conditions Information System (Sinan), Manaus, Amazonas, Brazil, 2009-2016. **Methods:** this was a descriptive study based on 38 fields of the notification form held on the information system; analysis of completeness was based on the criteria proposed by the Ministry of Health. **Results:** 69.3% of the 10,333 reported cases occurred among female children, and parents and step-parents were the perpetrators in 43.0% of cases; among adolescents, about ¼ (24.9%) of cases were committed by friends/acquaintances; sexual violence was the most reported type of violence in both groups; field completeness ranged from 15.1% (occupation) to 100.0% (several fields). **Conclusion:** in contrast to the national scenario, sexual violence was the most reported form of violence in Manaus, indicating that other types of violence are underestimated; data quality points to the need for Sinan improvement in Manaus.

Keywords: Disease Notification; Violence; Child; Adolescent; Epidemiology, Descriptive.

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Introduction

Violence occurs in great magnitude all over the world and accounts for 1.3 million deaths every year.¹ Globally, it is the fourth leading cause of death in the general population and the leading cause of death among people aged 15–44.² In Brazil, in 2016, around 100,000 cases of violence against children and adolescents were reported. Despite probable underreporting, 2,200 of these cases were notified in the state of Amazonas, while Manaus, the state capital, had a violence rate of 149.1 reported cases per 100,000 children and adolescents.³

In Brazil, notifying the authorities of violence against children and adolescents has been compulsory ever since the advent of the Statute of the Child and Adolescent (ECA) in 1990.

Monitoring and analysis of mortality from violent causes is extremely important. Notwithstanding, non-lethal violence occurring in relationships between parents and children cannot be ignored, nor when it involves other family members or acquaintances, among others. These forms of violence have physical, sexual, reproductive, psychological and behavioral consequences highly harmful to the health and well-being of those involved. They also have repercussions in society in general, resulting in intergenerational transmission of violence and delinquency in adolescence.⁴

In Brazil, notifying the authorities of violence against children and adolescents has been compulsory ever since the advent of the Statute of the Child and Adolescent (ECA) in 1990. Suspected and confirmed cases of violence must be reported to the local Child and Adolescent Protection Council.

Some time later, based on mapping of suspected and/or confirmed cases as one of the first steps in preparing actions to address violence, the Ministry of Health implanted its Violence and Accidence Surveillance system (VIVA) within the Brazilian National Health System (SUS). With effect from the creation of the Violence Module as part of the Notifiable Health Conditions Information System (Sinan) in 2011, as per Ministerial Ordinance GM/MS No. 104, published on January 25th of the same year, violence was included on the list of compulsorily notifiable health conditions.⁵

Conducting sporadic studies in sentinel health services and monitoring epidemiological indicators generated by Sinan enable analysis of the profile of victims of violence, the places where it occurs most frequently and its trends in time and space.⁶ In order for the information generated to be useful for planning and implementing effective policies to address violence, it is fundamental for data to be valid, reliable, timely, up to date and to have high coverage.

Following VIVA recommendations, Manaus incorporated violence surveillance into Sinan in 2009. The information generated must be analyzed and publicized so that its relevance among the population can be estimated and so that the effectiveness of control measures can be evaluated. The success of this analysis depends on the quality of the system as a whole, right from case identification through to notification. The number of studies using VIVA data on the country's Northern region is scarce and little is known about the quality of notification in this region of the country.

This study aims to describe cases of violence against children and adolescents and completeness of notification forms recorded on Sinan in relation to Manaus, AM, between 2009 and 2016.

Methods

This was a descriptive study of data from notification forms of interpersonal/self-inflicted violence held on Sinan in relation to Manaus for the period January 2009 to December 2016. Manaus is the capital of the state of Amazonas. It is located in Brazil's Northern region and occupies a geographic area of 11,401.092km². According to the 2010 Demographic Census, its population was comprised of 2,145,444 inhabitants, 683,656 of whom were children and adolescents.⁷

Cases of violence against this age group are defined as: (i) violence against children, involving individuals aged 0 to 9 years old, and (ii) violence against adolescents, involving individuals aged 10 to 19 years old, whether suspected or confirmed, involving situations of domestic, sexual and self-inflicted violence, human trafficking, slave labor, child labor, legal intervention and homophobic violence, regardless of the victim's sex.⁸

The variables listed below were studied in order to obtain a profile of the cases. It should be noted that these variables did not alter when the Sinan notification form was updated in June 2015. Variables characterizing

victims (age, sex, race/skin color, schooling and presence of disability/disorder); variables characterizing the incident (notification source, type of violence, place, time of day, first time or recurrence, self-inflicted injury or interpersonal violence, and type of aggression); and variables characterizing the perpetrator (sex, relationship with the victim, suspected use of alcohol and number of people involved).

In order to estimate notification magnitude over the years selected, we calculated the notification rate for violence against children and violence against adolescents (per 100,000 inhabitants) by dividing the number of cases per type of violence each year by the population aged 0-9 years old (children) and 10-19 years old (adolescents), as estimated by the Brazilian Institute of Geography and Statistics (IBGE) for the respective years under analysis. In addition to the notification rate, we also analyzed distribution of absolute and relative frequencies of notifications per year, considering the variables described above, for children and for adolescents. In order to analyze distribution of notification sources by healthcare level, we used the identification numbers of health service listed on the National Health Establishment Registry (CNES).

Analysis of completeness was done year by year, initially based on percentage completion of each field on the notification form, and then based on percentage completion of the form as a whole. In order to evaluate this latter aspect, we calculated the percentage of 'unknown/blank' fields in relation to the total number of fields on the notification form. With regard to compliance with Health Ministry guidelines, field completeness was considered to be: good, when 75.1% of forms had a given field filled in; regular, when between 50.1% and 75.0% were filled in; low, when 25.1% to 50.0% were filled in; and very low when 25% or less were filled in.⁹ The same cut-off points were used to assess form completeness as a whole. In the case of incidents with multiple choice variables, 'unknown/blank' data were defined as situations in which no reply options were given. The percentage of missing data per violence type was also assessed. The data were analyzed using version 3.2.2 of the R application.¹⁰

The study project was not submitted to a Research Ethics Committee because public domain secondary data were used, as provided by the Health Ministry's Health Surveillance Secretariat (SVS/MS) in January 2018. The data did not disclose any information enabling case identification.

Results

During the period 2009-2016, 10,333 cases of violence involving children and adolescents were notified, divided between 4,638 children and 5,695 adolescents. There was a 51.9% increase in notifications involving children between the first and the last years analyzed. There was a 73.7% increase among adolescents in the same period.

Figure 1 shows notification rates according to the different types of violence against children and adolescents over the years. Sexual violence was the most reported type of violence against children, reaching a peak in 2013 with a rate corresponding to 135.3 cases per 100,000 children; the same occurred with adolescents, reaching a rate of 194.2 cases/100,000 adolescents in the same year.

Table 1 describes cases involving children, by year of notification. Taking these notifications as a whole, in almost half the cases the victim was between 1 and 5 years old. The percentage of cases of children under 1 year old was found to have doubled in the period studied, comparing 2009 with 2016. More than 2/3 of recorded cases of violence affected female children. Almost 70.0% of cases were of brown race/skin color. The majority of affected children did not attend school. Out of total cases of violence notified, 2.1% involved children diagnosed as having a disability or disorder.

The main sources of notification were high complexity healthcare services, divided between maternity hospitals (57.7%), general hospitals (39.7%) and accident and emergency services (2.6%). With effect from 2012, cases reported by other sectors, such as the Coroner's Office (IML) and public schools, were also relevant sources of notification. The majority of violent episodes took place at the victim's home. Although oscillations were observed over the years selected, a decrease was found in the number of records involving other places where violence occurred, taking the period as a whole. In more than 1/4 of cases, violence occurred more than once during the child's lifetime. Some 85.0% of situations were not self-inflicted.

A significant part of cases (30.3%) involved use of physical force/beating or threats as the type of aggression. The use of blunt, sharp or hot objects was also relevant in the final years of the study. With regard to the characteristics of the probable perpetrator, 57.2% were male. In 43.3% of notifications, the perpetrator

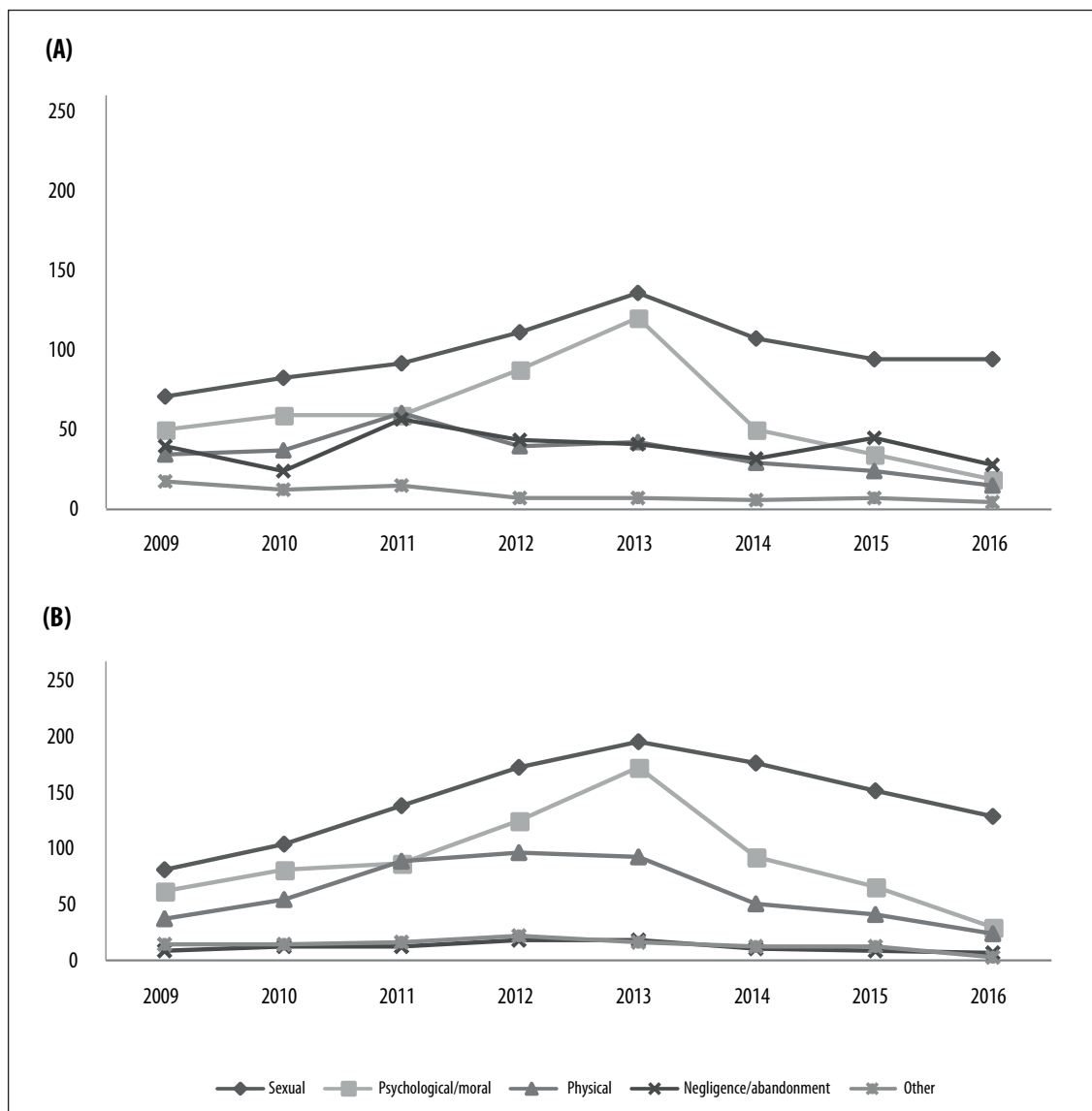


Figure 1 – Notification rates (per 100,000 individuals) by type of violence in children (A) and adolescents (B), Manaus, Amazonas, 2009-2016

was a parent of the victim. Finally, in 2/3 of the cases the perpetrators acted alone.

Table 2 shows the characteristics of notified cases of violence against adolescents. The most affected age range was that comprising 10-14 year-olds (70.7%). The female sex accounted for 87.4% of cases. The majority of these adolescents were of brown race/skin color (70.2%). Adolescent schooling level in around 2/3 of cases was incomplete elementary education. No form of disability or disorder was found in almost 3/4

of notifications. The main sources of notification were maternity hospitals (69.1%), general hospitals (23.0%) and accident and emergency services (7.9%). Primary healthcare accounted for only 2.0% of notifications. The victim's home was the main place of occurrence (60.1%). Self-inflicted harm appeared in less than 4.0% of cases. Physical force and/or beating (29.7%) and threats (23.8%) were the most used types of aggression. Among adolescents a constantly increasing trend was also found in the use of other forms of aggression,

including blunt and sharp objects, hot substances/objects and also poisoning/intoxication. Males were the main perpetrators throughout the entire period, accounting for 80.0% of cases. Despite a high percentage being characterized as 'other', a considerable part of the situations of violence were committed by friends or acquaintances. As with the group of children, in the majority of cases involving adolescents the perpetrators also acted alone (73.0%).

When considering the notification forms for the period 2009-2016, an increase was found in the percentage of unknown or blank information, above all in 2014 and 2015, for the fields referring to race/skin color, place of incident, recurrence, self-inflicted injury, sex of the perpetrator and number of people involved in the incident. When tabulating the percentage of missing data relating to these variables and types of violence, we found that the greater part of this missing information occurred in situations of sexual violence. In addition, more than 40.0% of notifications provided no information about the time of day of the incident or whether the perpetrator was suspected of alcohol use.

When analyzing notification form completeness as a whole, we found that completeness of 81.4% and 85.3% of notifications of violence against children and adolescents was good, 10.3% and 7.0% were classified as regular, 5.0% and 5.9% had low information recording, and 3.3% and 1.8% had very low completeness, respectively.

Table 3 shows completeness of notification forms of violence against children according to percentage completeness of each of the fields. Completeness was good for around 79.0% of fields analyzed. We found that required fields were fully filled in. Completeness was good in the first years of analysis but only regular in the following years for the fields recording victim's race/skin color and diagnosis of victim having disability/disorder. When the form was initially implanted, victim's occupation had low completeness, but in 2016 completeness was very low. With regard to characterization of the incident, we found that time, recurrence and circumstances of injury had very low completeness initially, increasing to regular in the final years analyzed. Completeness of the field for recording suspected alcohol use was regular for most of the period.

With regard to notifications involving adolescents (Table 4), completeness classification was good for 82.0% of fields over the entire analysis period. However,

completeness of some fields, such as pregnant victim and victim diagnosed as having disability/disorder, for instance, was classified as regular in 2013 and 2014, respectively, and completeness of fields relating to occupation and recurrence was regular in 2015. On the other hand, completeness improved for the field recording the time of incident, which started as low and became regular with effect from 2013, while completeness of the injury circumstances field started as low and became good in the last year analyzed.

Discussion

This study pointed to an increase in the number of notified cases of violence against children and adolescents in Manaus between 2009 and 2013. The number of cases of violence involving children was lower than that involving adolescents. Sexual violence was the most notified type of violence. Variables comprising characterization of incident of violence and its probable perpetrator had the highest proportions of incompleteness.

The increase in the number of notified cases is related to evolution of the VIVA implantation process in Manaus, where initially only specialized and referral services integrated the system; while with effect from official publication of Ministerial Ordinance No. 104/2011,⁵ violence became a compulsorily notifiable condition at all levels of healthcare. In addition to greater coverage, according to the Manaus Public Health Department Sector for Preventing Risks to Health from External Causes, increased notification in 2013 coincides with the year in which the greatest number of training courses on violence surveillance institutionalization were held in Manaus. Notwithstanding, notification rates were found to have decreased with effect from 2015. It is possible that this reduction may be due to changes in instructions for filling in the notification form with effect from that year, when the recommendation was given to only record the main type of violence, so that other less relevant types at the time of notification were not included.

Sexual violence was the most frequently notified type among children and adolescents in Manaus during the study period. This result diverges from the majority of studies conducted in Brazil's different regions,¹¹⁻²² which are conclusive as to negligence and physical violence being the most notified types of violence in childhood. Notwithstanding, a study conducted in Belém, capital

Table 1 – Distribution of number and percentage of notifications of interpersonal/self-inflicted violence in children by year of notification, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Characterization of the victim																		
Age range (in years)																		
<1	61	13.9	47	12.1	96	17.2	64	11.8	66	9.0	71	12.1	94	13.0	193	29.0	692	14.9
1-5	216	49.2	177	45.6	239	42.8	264	48.7	355	48.3	281	47.8	359	49.8	261	39.1	2.152	46.4
6-9	162	36.9	164	42.3	223	40.0	214	39.5	314	42.7	236	40.1	268	37.2	213	31.9	1.794	38.7
Sex																		
Female	280	63.8	275	70.9	359	64.3	371	68.5	496	67.5	409	69.6	511	70.9	515	77.2	3.216	69.3
Male	159	36.2	113	29.1	199	35.7	171	31.5	239	32.5	179	30.4	210	29.1	152	22.8	1.422	30.7
Race/skin color																		
Brown	317	72.2	273	70.4	403	72.2	412	76.0	529	72.0	478	81.3	456	63.2	362	54.3	3.230	69.6
White	89	20.3	78	20.1	77	13.8	86	15.9	127	17.3	63	10.7	70	9.7	55	8.2	645	13.9
Black	4	0.9	7	1.8	5	0.9	5	0.9	14	1.9	9	1.5	6	0.8	6	0.9	56	1.2
Indigenous	3	0.7	–	–	7	1.3	1	0.2	4	0.5	–	–	–	–	4	0.6	19	0.5
Yellow	3	0.7	2	0.5	4	0.7	5	0.9	9	1.2	–	–	4	0.6	6	0.9	33	0.7
Unknown/blank	23	5.2	28	7.2	62	11.1	33	6.1	52	7.1	38	6.5	185	25.7	234	35.1	655	14.1
Schooling																		
Illiterate	2	0.5	3	0.8	–	–	5	1.0	7	1.0	3	0.5	5	0.7	3	0.5	28	0.6
Incomplete elementary education	106	24.1	105	27.0	135	24.2	142	26.2	217	29.5	143	24.3	159	22.0	140	21.0	1.147	24.7
Does not apply	315	71.8	263	67.8	390	69.9	372	68.6	482	65.6	414	70.4	519	72.0	495	74.2	3.250	70.1
Unknown/blank	16	3.6	17	4.4	33	5.9	23	4.2	29	3.9	28	4.8	38	5.3	29	4.3	213	4.6
Disability/disorder																		
Yes	15	3.4	7	1.8	18	3.2	16	3.0	14	1.9	15	2.6	9	1.2	4	0.6	98	2.1
No	305	69.5	302	77.8	391	70.1	443	81.7	525	71.4	284	48.3	386	53.5	412	61.8	3.048	65.7
Unknown/blank	119	27.1	79	20.4	149	26.7	83	15.3	196	26.7	289	49.1	326	45.2	251	37.6	1.492	32.2

To be continue

Continuation

Table 1 – Distribution of number and percentage of notifications of interpersonal/self-inflicted violence in children by year of notification, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Characterization of incident																		
Notifying sources																		
Primary care	4	0.9	8	2.1	5	0.9	9	1.7	17	2.3	15	2.5	10	1.4	15	2.2	83	1.8
Medium complexity	8	1.8	11	2.8	8	1.4	12	2.2	18	2.5	13	2.2	10	1.4	3	0.5	83	1.8
High complexity	424	96.6	311	80.2	483	86.6	431	79.5	533	72.5	425	72.3	588	81.5	521	78.1	3,716	80.1
Other	3	0.7	58	14.9	62	11.1	90	16.6	167	22.7	135	23.0	113	15.7	128	19.2	756	16.3
Place of incident																		
Residence	212	48.3	246	63.4	314	56.3	356	65.7	495	67.3	408	69.4	400	55.5	343	51.5	2,774	59.8
Street	7	1.6	4	1.0	10	1.8	11	2.0	10	1.4	19	3.2	8	1.1	8	1.2	77	1.7
Public thoroughfare	3	0.7	18	4.6	19	3.4	13	2.4	17	2.3	10	1.7	15	2.1	6	0.9	101	2.2
Other	150	34.2	83	21.4	156	27.9	114	21.0	139	18.9	100	17.0	116	16.1	83	12.4	941	20.3
Unknown/blank	67	15.2	37	9.5	59	10.6	48	8.9	74	10.1	51	8.7	182	25.2	227	34.0	745	16.0
Time of day of incident																		
Morning (6 a.m. – 11.59 a.m.)	32	7.3	37	9.6	44	7.9	53	9.8	81	11.0	71	12.1	93	12.9	72	10.8	483	10.4
Afternoon (12 p.m. – 5.59 p.m.)	40	9.1	57	14.7	70	12.5	86	15.9	137	18.6	101	17.2	145	20.1	109	16.3	745	16.1
Night (6 p.m. – 11.59 p.m.)	26	5.9	23	5.9	50	9.0	78	14.4	116	15.8	81	13.8	61	8.5	73	10.9	508	11.0
Early morning (0.00 a.m. – 5.59 a.m.)	6	1.4	6	1.5	8	1.4	15	2.7	35	4.8	29	4.9	12	1.6	18	2.8	129	2.8
Unknown/blank	335	76.3	265	68.3	386	69.2	310	57.2	366	49.8	306	52.0	410	56.9	395	59.2	2,773	59.8
Recurrence																		
Yes	126	28.7	148	38.1	170	30.5	186	34.3	251	34.1	218	37.1	116	16.1	63	9.4	1,278	27.6
No	91	20.7	95	24.5	142	25.4	200	36.9	232	31.6	192	32.7	272	37.7	275	41.2	1,499	32.3
Unknown/blank	222	50.6	145	37.4	246	44.1	156	28.8	252	34.3	178	30.3	333	46.2	329	49.3	1,861	40.1
Self-inflicted injury																		
Yes	9	2.1	1	0.3	–	–	–	–	–	–	–	–	9	1.2	9	1.3	28	0.6
No	263	59.9	365	94.0	556	99.6	541	99.8	735	100.0	587	99.8	545	75.6	376	56.4	3,968	85.6
Unknown/blank	167	38.0	22	5.7	2	0.4	1	0.2	–	–	1	0.2	167	23.2	282	42.3	642	13.8
Type of aggression																		
Body force/beating	83	18.9	87	22.4	127	22.8	113	20.8	132	18.0	108	18.4	79	11.0	33	4.9	762	16.4
Threat	84	19.1	97	25.0	111	19.9	104	19.2	111	15.1	85	14.4	42	5.8	10	1.6	644	13.9
Firearm	7	1.6	3	0.8	6	1.1	5	0.9	4	0.5	1	0.2	–	–	3	0.4	29	0.6
Other	195	44.4	130	33.5	241	43.2	254	46.9	350	47.6	313	53.2	439	60.9	447	67.0	2,369	51.1
Unknown/blank	70	16.0	71	18.3	73	13.1	66	12.2	138	18.8	81	13.8	161	22.3	174	26.1	834	18.0

To be continue

Table 1 – Distribution of number and percentage of notifications of interpersonal/self-inflicted violence in children by year of notification, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	N=4,638	%
Characterization of perpetrator																		
Sex																		
Male	241	54.9	262	67.5	324	58.1	348	64.2	481	65.4	365	62.1	305	42.3	325	48.7	2,651	57.2
Female	51	11.6	39	10.1	82	14.7	41	7.6	121	16.5	97	16.5	133	18.4	62	9.3	626	13.4
Both sexes	11	2.5	12	3.1	19	3.4	20	3.7	27	3.7	28	4.7	33	4.6	34	5.1	184	4.0
Unknown/blank	136	31.0	75	19.3	133	23.8	133	24.5	106	14.4	98	16.7	250	34.7	246	36.9	1,177	25.4
Relationship with the victim																		
Father/mother/stepfather/stepmother	216	49.2	164	42.3	274	49.1	242	44.6	331	45.0	276	46.9	295	40.9	212	31.8	2,010	43.3
Friends/acquaintances	74	16.9	103	26.5	93	16.7	127	23.4	132	18.0	113	19.2	93	12.9	96	14.4	831	17.9
Strangers	11	2.5	13	3.4	18	3.2	16	3.0	36	4.9	21	3.6	11	1.5	16	2.4	142	3.1
Other	131	29.8	99	25.5	148	26.5	149	27.5	228	31.0	174	29.6	219	30.4	286	42.9	1,434	30.9
Unknown/blank	7	1.6	9	2.3	25	4.5	8	1.5	8	1.1	4	0.7	103	14.3	57	8.5	221	4.8
Suspected use of alcohol																		
Yes	39	8.9	42	10.8	59	10.6	56	10.3	70	9.5	46	7.8	26	3.6	41	6.1	379	8.2
No	167	38.0	171	44.1	227	40.7	228	42.1	325	44.2	236	40.2	262	36.3	149	22.4	1,765	38.0
Unknown/blank	233	53.1	175	45.1	272	48.7	258	47.6	340	46.3	306	52.0	433	60.1	477	71.5	2,494	53.8
Number of people involved																		
One	278	63.3	293	75.5	409	73.3	414	76.4	556	75.6	439	74.7	401	55.6	352	52.8	3,142	67.7
Two or more	56	12.8	45	11.6	71	12.7	59	10.9	66	9.0	51	8.6	56	7.8	68	10.2	472	10.2
Unknown/blank	105	23.9	50	12.9	78	14.0	69	12.7	113	15.4	98	16.7	264	36.6	247	37.0	1,024	22.1

Table 2 – Distribution of number and percentage of notifications of interpersonal/self-inflicted violence in adolescents by year of notification, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Characterization of the victim																		
Age range (in years)																		
10-14	272	72.3	335	74.3	451	65.8	553	65.2	700	70.4	612	72.3	624	74.3	481	73.7	4,028	70.7
15-19	104	27.7	116	25.7	234	34.2	295	34.8	295	29.6	235	27.7	216	25.7	172	26.3	1,667	29.3
Sex																		
Female	334	88.8	402	89.1	568	82.9	686	80.9	875	87.9	757	89.4	765	91.1	592	90.7	4,979	87.4
Male	42	11.2	49	10.9	117	17.1	162	19.1	120	12.1	90	10.6	75	8.9	61	9.3	716	12.6
Race/skin color																		
Brown	269	71.5	316	70.1	409	59.7	529	62.4	713	71.7	715	84.4	559	66.5	486	74.4	3,996	70.2
White	72	19.1	88	19.4	96	14.0	108	12.7	150	15.1	75	8.9	64	7.6	52	8.0	705	12.4
Black	13	3.5	8	1.8	12	1.8	21	2.5	23	2.3	12	1.4	19	2.3	11	1.7	119	2.0
Indigenous	7	1.9	3	0.7	24	3.5	2	0.2	7	0.7	5	0.6	2	0.2	2	0.3	52	0.9
Yellow	4	1.1	8	1.8	4	0.6	13	1.6	14	1.4	4	0.4	3	0.4	–	–	50	0.9
Unknown/blank	11	2.9	28	6.2	140	20.4	175	20.6	88	8.8	36	4.3	193	23.0	102	15.6	773	13.6
Schooling																		
Illiterate	1	0.3	7	1.6	2	0.3	5	0.6	5	0.5	6	0.7	6	0.7	4	0.6	36	0.6
Incomplete elementary education	258	68.6	307	68.1	362	52.8	493	58.1	644	64.7	593	70.0	528	62.9	409	62.6	3,594	63.1
Complete elementary education + Incomplete high school education	49	13.0	73	16.2	96	14.0	106	12.5	149	15.0	113	13.3	125	14.9	108	16.5	819	14.5
Complete high school education or over	8	2.1	12	2.6	28	4.1	26	3.1	40	4.0	21	2.5	14	1.6	18	2.8	167	2.9
Does not apply	1	0.3	–	–	–	–	–	–	–	–	–	–	1	0.1	–	–	2	–
Unknown/blank	59	15.7	52	11.5	197	28.8	218	25.7	157	15.8	114	13.5	166	19.8	114	17.5	1,077	18.9
Disability/disorder																		
Yes	12	3.2	23	5.1	24	3.5	25	2.9	25	2.5	26	3.0	20	2.4	17	2.6	172	3.0
No	332	88.3	382	84.7	527	76.9	619	73.0	759	76.3	424	50.1	438	52.1	503	77.0	3,984	70.0
Unknown/blank	32	8.5	46	10.2	134	19.6	204	24.1	211	21.2	397	46.9	382	45.5	133	20.4	1,539	27.0

To be continue

Continuation

Table 2 – Distribution of number and percentage of notifications of interpersonal/self-inflicted violence in adolescents by year of notification, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Characterization of incident																		
Notifying sources																		
Primary care	5	1.3	6	1.3	13	1.9	10	1.2	35	3.5	14	1.7	18	2.1	14	2.1	115	2.0
Medium complexity	3	0.8	4	0.9	3	0.4	15	1.8	17	1.7	8	0.9	3	0.4	4	0.6	57	1.0
High complexity	364	96.8	334	74.1	541	79.0	670	79.0	662	66.6	594	70.1	619	73.7	547	83.8	4,331	76.1
Other	4	1.1	107	23.7	128	18.7	153	18.0	281	28.2	231	27.3	200	23.8	88	13.5	1,192	20.9
Place of incident																		
Residence	180	47.9	253	56.1	377	55.0	489	57.7	623	62.6	583	68.8	504	60.0	413	63.2	3,422	60.1
Street	37	9.8	51	11.3	78	11.4	69	8.1	94	9.4	113	13.3	72	8.6	69	10.6	583	10.2
Public thoroughfare	6	1.6	19	4.2	11	1.6	15	1.7	17	1.7	15	1.8	7	0.8	6	0.9	96	1.7
Other	117	31.1	84	18.6	110	16.1	110	13.0	147	14.8	89	10.6	86	10.2	56	8.6	799	14.0
Unknown/blank	36	9.6	44	9.8	109	15.9	165	19.5	114	11.5	47	5.5	171	20.4	109	16.7	795	14.0
Time of day of incident																		
Morning (6 a.m. – 11.59 a.m.)	34	9.0	37	8.2	71	10.4	84	9.9	131	13.2	118	13.9	114	13.6	96	14.7	685	12.0
Afternoon (12 p.m. – 5.59 p.m.)	33	8.8	58	12.9	82	12.0	132	15.6	167	16.8	190	22.4	157	18.7	118	18.1	937	16.5
Night (6 p.m. – 11.59 p.m.)	40	10.6	53	11.8	133	19.4	122	14.4	217	21.8	193	22.8	159	18.9	146	22.4	1,063	18.6
Early morning (0.00 a.m. – 5.59 a.m.)	13	3.5	24	5.2	49	7.1	66	7.7	85	8.5	86	10.2	65	7.7	66	10.0	454	8.0
Unknown/blank	256	68.1	279	61.9	350	51.1	444	52.4	395	39.7	260	30.7	345	41.1	227	34.8	2,556	44.9
Recurrence																		
Yes	143	38.0	229	50.8	270	39.4	327	38.5	405	40.7	384	45.3	179	21.3	102	15.6	2,039	35.8
No	160	42.6	158	35.0	262	38.3	339	40.0	456	45.8	396	46.8	406	48.3	385	59.0	2,562	45.0
Unknown/blank	73	19.4	64	14.2	153	22.3	182	21.5	134	13.5	67	7.9	255	30.4	166	25.4	1,094	19.2
Self-inflicted injury																		
Yes	19	5.0	26	5.8	49	7.2	20	2.4	17	1.8	11	1.3	25	3.0	26	4.0	193	3.4
No	265	70.5	333	73.8	492	71.8	650	76.6	880	88.4	784	92.6	581	69.1	486	74.4	4,471	78.5
Unknown/blank	92	24.5	92	20.4	144	21.0	178	21.0	98	9.8	52	6.1	234	27.9	141	21.6	1,031	18.1
Type of aggression																		
Body force/beatings	156	41.5	165	36.6	233	34.0	263	31.0	359	36.1	273	32.2	176	21.0	68	10.4	1,693	29.7
Threat	135	35.9	166	36.8	236	34.5	236	27.8	240	24.1	210	24.8	90	10.7	40	6.1	1,353	23.8
Firearm	24	6.4	21	4.7	48	7.0	73	8.6	56	5.6	40	4.7	26	3.1	11	1.7	299	5.3
Other	24	6.4	56	12.4	108	15.7	163	19.3	276	27.8	277	32.8	404	48.1	495	75.8	1,803	31.6
Unknown/blank	37	9.8	43	9.5	60	8.8	113	13.3	64	6.4	47	5.5	144	17.1	39	6.0	547	9.6

To be continue

Continuation

Table 2 – Distribution of number and percentage of notifications of interpersonal/self-inflicted violence in adolescents by year of notification, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	N=5,695	n
Characterization of perpetrator																		
Sex																		
Male	311	82.7	407	90.2	532	77.7	652	76.9	824	82.8	717	84.7	585	69.6	526	80.6	4,554	80.0
Female	18	4.8	10	2.2	21	3.1	25	2.9	60	6.0	65	7.7	63	7.5	30	4.6	292	5.1
Both sexes	6	1.6	5	1.2	9	1.2	9	1.1	15	1.6	9	1.0	11	1.4	8	1.2	72	1.3
Unknown/blank	41	10.9	29	6.4	123	18.0	162	19.1	96	9.6	56	6.6	181	21.5	89	13.6	777	13.6
Relationship with the victim																		
Father/mother/stepfather/stepmother	68	18.1	81	18.0	105	15.3	130	15.3	192	19.3	201	23.7	157	18.7	137	21.0	1,071	18.8
Friends/acquaintances	105	27.9	145	32.2	159	23.2	208	24.5	226	22.7	254	30.0	174	20.7	145	22.2	1,416	24.9
Strangers	81	21.6	78	17.3	133	19.5	148	17.5	184	18.5	144	17.0	122	14.5	102	15.6	992	17.4
Other	120	31.9	146	32.3	211	30.8	233	27.5	389	39.1	244	28.8	272	32.4	250	38.3	1,865	32.7
Unknown/blank	2	0.5	1	0.2	77	11.2	129	15.2	4	0.4	4	0.5	115	13.7	19	2.9	351	6.2
Suspected use of alcohol																		
Yes	57	15.2	91	20.2	100	14.6	127	15.0	164	16.5	107	12.6	100	11.9	102	15.6	848	14.9
No	167	44.4	221	49.0	296	43.2	329	38.8	442	44.4	348	41.1	378	45.0	244	37.4	2,425	42.6
Unknown/blank	152	40.4	139	30.8	289	42.2	392	46.2	389	39.1	392	46.3	362	43.1	307	47.0	2,422	42.5
Number of people involved																		
One	288	76.6	350	77.6	478	69.8	584	68.9	759	76.3	666	78.6	555	66.0	478	73.2	4,158	73.0
Two or more	53	14.1	68	15.1	85	12.4	97	11.4	130	13.0	104	12.3	92	11.0	74	11.3	703	12.4
Unknown/blank	35	9.3	33	7.3	122	17.8	167	19.7	106	10.7	77	9.1	193	23.0	101	15.5	834	14.6

Table 3 – Completeness of child interpersonal/self-inflicted violence notification form fields, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
General data																
Notification date ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Notification UF ^b	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Notification municipality ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Notifying unit ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Incident date ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Information about the victim																
Date of birth ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Age ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Sex ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Pregnant ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	666	99.9
Race/skin color	416	94.8	360	92.8	496	88.9	509	93.9	683	92.9	550	93.5	536	74.3	433	64.9
Schooling	423	96.4	371	95.6	525	94.1	519	95.8	706	96.0	560	95.2	683	94.7	638	95.6
UF ^b of residence ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Municipality of residence ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	720	99.9	667	100.0
Zone of residence	428	97.5	385	99.2	551	98.7	536	98.9	733	99.7	581	98.8	705	97.8	636	95.4
Occupation	180	41.0	184	47.4	207	37.1	216	39.8	334	45.4	209	35.5	109	15.1	104	15.6
Marital status	437	99.5	386	99.5	556	99.6	541	99.8	735	100.0	588	100.0	620	86.0	614	92.1
Disability/disorder	320	72.9	309	79.6	410	73.5	459	84.7	540	73.5	301	51.2	395	54.8	417	62.5
Type of disability/disorder	431	98.2	378	97.4	536	96.1	538	99.3	731	99.5	581	98.8	594	82.4	611	91.6
Information about the incident																
UF ^b	421	95.9	348	89.7	527	94.4	517	95.4	685	93.2	523	88.9	620	86.0	615	92.2
Municipality	423	96.4	344	88.7	518	92.8	511	94.3	679	92.4	517	87.9	620	86.0	612	91.8
Zone	377	85.9	349	89.9	520	93.2	506	93.4	656	89.3	532	90.5	563	78.1	519	77.8
Time	104	23.7	123	31.7	172	30.8	232	42.8	369	50.2	282	48.0	311	43.1	272	40.8
Place	372	84.7	351	90.5	499	89.4	494	91.1	661	89.9	537	91.3	539	74.8	440	66.0
Occurred previously	217	49.4	243	62.6	312	55.9	386	71.2	483	65.7	410	69.7	388	53.8	338	50.7
Self-inflicted injury	272	62.0	366	94.3	556	99.6	541	99.8	735	100.0	587	99.8	554	76.8	385	57.7

To be continue

Continuation

Table 3 – Completeness of child interpersonal/self-inflicted violence notification form fields, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Information about violence																
Type of violence	433	98.6	384	99.0	558	100.0	540	99.6	735	100.0	587	99.8	620	86.0	615	92.2
Type of aggression	369	84.0	317	81.7	485	86.9	476	87.8	597	81.2	507	86.2	560	77.7	493	73.9
Type of sexual violence	428	97.5	364	93.8	525	94.1	530	97.8	700	95.2	561	95.4	608	84.3	608	91.1
Procedure performed	429	97.7	371	95.6	552	98.9	540	99.6	732	99.6	587	99.8	615	85.3	613	91.9
Information about perpetrator of violence																
Number of people involved	334	76.1	338	87.1	480	86.0	473	87.3	622	84.6	490	83.3	457	63.4	420	63.0
Relationship with victim	432	98.4	379	97.7	533	95.5	534	98.5	727	98.9	584	99.3	618	85.7	610	91.5
Sex of probable perpetrator	303	69.0	313	80.7	425	76.2	409	75.5	629	85.6	490	83.3	471	65.3	421	63.1
Suspected use of alcohol	206	46.9	213	54.9	286	51.3	284	52.4	395	53.7	282	47.9	288	39.9	190	28.5
Other information																
Referral	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0
Work-related violence	370	84.3	334	86.1	460	82.4	500	92.3	684	93.1	531	90.3	511	70.9	454	68.1
CAT ^c issued	403	91.8	377	97.2	531	95.2	537	99.1	716	97.4	575	97.8	614	85.2	614	92.0
Circumstances of injury	163	37.1	182	46.9	181	32.4	223	41.1	296	40.3	279	47.4	318	44.1	366	54.9
Data of case closure ^a	439	100.0	388	100.0	558	100.0	542	100.0	735	100.0	588	100.0	721	100.0	667	100.0

a) Notification form required field.

b) UF: Federative Unit.

c) CAT: Communication of Accident at Work.

Table 4 – Completeness of adolescent interpersonal/self-inflicted violence notification form fields, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
General data																
Notification date ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Notification UF ^b	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Notification municipality ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Notifying data ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Incident date ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Information about the victim																
Date of birth ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Age ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Sex ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Pregnant ^a	337	89.6	392	86.9	569	83.1	661	77.9	642	64.5	520	61.4	425	50.6	325	49.8
Race/skin color	365	97.1	423	93.8	545	79.6	673	79.4	907	91.2	811	95.7	647	77.0	551	84.4
Schooling	317	84.3	399	88.5	488	71.2	630	74.3	838	84.2	733	86.5	674	80.2	539	82.5
UF ^b of residence ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Municipality of residence ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Zone of residence	369	98.1	450	99.8	671	97.9	835	98.5	991	99.6	838	98.9	819	97.5	634	97.1
Occupation	316	84.0	371	82.3	462	67.4	560	66.0	774	77.8	650	76.7	322	38.3	158	24.2
Marital status	370	98.4	415	92.0	582	85.0	697	82.2	892	89.6	755	89.1	561	66.8	305	46.7
Disability/disorder	344	91.5	405	89.8	552	80.6	644	75.9	784	78.8	450	53.1	458	54.5	520	79.6
Type of disability/disorder	375	99.7	442	98.0	626	91.4	816	96.2	989	99.4	847	100.0	721	85.8	635	97.2
Information about the incident																
UF ^b	368	97.9	422	93.6	626	91.4	791	93.3	909	91.4	834	98.5	730	86.9	636	97.4
Municipality	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0
Zone	320	85.1	421	93.3	605	88.3	760	89.6	887	89.1	804	94.9	661	78.7	623	95.4
Time	120	31.9	172	38.1	335	48.9	404	47.6	600	60.3	587	69.3	495	58.9	426	65.2
Place	340	90.4	407	90.2	576	84.1	683	80.5	881	88.5	800	94.4	669	79.6	544	83.3
Occurred previously	303	80.6	387	85.8	532	77.7	666	78.5	861	86.5	780	92.1	585	69.6	487	74.6
Self-inflicted injury	284	75.5	359	79.6	541	79.0	670	79.0	897	90.2	795	93.9	606	72.1	512	78.4

To be continue

Continuation

Table 4 – Completeness of adolescent interpersonal/self-inflicted violence notification form fields, Manaus, Amazonas, 2009-2016

Information fields	2009		2010		2011		2012		2013		2014		2015		2016	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Information about violence																
Type of violence	374	99.5	448	99.3	685	100.0	845	99.6	994	99.9	845	99.8	730	87.1	636	97.4
Type of aggression	339	90.2	408	90.5	625	91.2	735	86.7	931	93.6	800	94.5	696	82.9	614	94.0
Type of sexual violence	369	98.1	442	98.0	599	87.4	713	84.1	976	98.1	830	98.0	726	86.4	627	96.0
Procedure performed	365	97.1	425	94.2	656	95.8	799	94.2	974	97.9	827	97.6	644	76.7	466	71.4
Information about perpetrator of violence																
Number of people involved	341	90.7	418	92.7	563	82.2	681	80.3	889	89.3	770	90.9	647	77.0	552	84.5
Relationship with victim	374	99.5	450	99.8	608	88.8	719	84.8	991	99.6	843	99.5	725	86.3	634	97.1
Sex of probable perpetrator	335	89.1	422	93.6	562	82.0	686	80.9	899	90.4	791	93.4	659	78.4	564	86.4
Suspected use of alcohol	224	59.6	312	69.2	396	57.8	456	53.8	606	60.9	455	53.7	478	56.9	346	53.0
Other information																
Referral	376	100.0	451	100.0	683	99.7	846	99.8	995	100.0	847	100.0	840	100.0	653	100.0
Work-related violence	324	86.2	420	93.1	579	84.5	709	83.6	917	92.2	802	94.7	633	75.4	552	84.5
CAT ^b issue ^d	336	89.4	437	96.9	600	87.6	809	95.4	979	98.4	836	98.7	723	86.1	634	97.1
Circumstances of injury	156	41.5	240	53.2	242	35.3	357	42.1	447	44.9	479	56.6	440	52.4	489	74.9
Data of case closure ^a	376	100.0	451	100.0	685	100.0	848	100.0	995	100.0	847	100.0	840	100.0	653	100.0

a) Notification form required field.

b) UF: Federative Unit.

c) CAT: Communication of Accident at Work.

of the state of Pará, also found that sexual violence was the most frequently notified type (41.8%) among violence practiced against young people.²³ Given the context of VIVA implantation in Manaus, it is possible to postulate that greater occurrence of notification of sexual violence cases, in relation to other types of violence, may be due to the fact of the municipality having a Sexual Violence Victim Care Service (SAVVIS), which promotes compulsory notification of all cases. Other aspects which may have contributed to this situation lie in two facts: (i) Brazil's Northern region having the largest number of child and adolescent sexual exploitation trafficking routes;²⁴ and (ii) the Child and Adolescent Protection Councils not adopting the intersectoral notification form, thus resulting in underreporting of other types of violence. It would be interesting for future studies to address the theme with the aim of investigating whether prioritizing cases of sexual violence is peculiar to Manaus or whether they are a regional characteristic.

The notifications analyzed showed that reported violence was higher among the one to five-year-old age group in children, and among the ten to fourteen age group in adolescents. Other studies also indicate that early childhood is the age group most at risk of violence, owing to the child being most dependent on its carer, reduced power of argumentation as a form of discipline and difficulty in countering violent attitudes.^{17,25,26} If during the first year of life, negligence is the most common form of violence, with effect from being one year old other forms of violence begin to stand out, especially physical, sexual and psychological violence.¹¹

The greater part of reported violence against children and adolescents in Manaus was perpetrated against girls, for whom sexual violence tends to be more frequent.¹¹ However, this pattern is different to that presented in the majority of studies, in which males are the main victims, given that physical violence is the most commonly reported form.¹¹⁻¹³ With regard to race/skin color, in Manaus, differently to the rest of Brazil,²⁷ brown skin color was predominant regardless of whether cases involved children or adolescents. It was also found that the majority of children were not attending school and that a significant part of the adolescents had not yet completed their elementary education.

The majority of notifications of violence against children and adolescents were made by high complexity health services. This fact may reveal the severity

of cases, related principally to sexual violence. On the other hand, this finding may also arise from health professionals in these services being better prepared. This scenario also suggests flaws in the process of detection and notification of situations of violence in primary healthcare centers, where comprehensive care and ability to identify situations of violence should be the key focus of attention, above all for the Family Health Strategy.²⁸

Studies using Sinan data also found evidence that the victim's home was the place where violence most occurred among children and adolescents.^{11,19,23} As indicated by other studies on this subject in Brazil, frequent use of physical force in these incidents may be related to abuse of power, authority, imposing limits and to the condition of being subordinated.^{11-14,16,17,20-22}

With regard to the perpetrators' characteristics and kinship with children, the results presented in this study are similar to those of other research, by revealing, for example, that the main perpetrator was a family member.^{11,13-15,17,18} In the case of adolescents, however, friends or acquaintances of the victim were the main perpetrators of violence. This latter finding differs from studies conducted in that states of Rio Grande do Sul¹⁹ and Pernambuco,²² which pointed to legal guardians (father, mother, stepfather or stepmother) as being the main perpetrators of violence. On the other hand, greater frequency of just one perpetrator as found in this study, has also been reported by studies based on Brazil as a whole.²⁷

Generally speaking, both with regard to individual field completeness, and also completeness of entire notification forms, the results point to over 80% of situations being classified as having good completeness. However, among fields that are not required fields, such as race/skin color, disability/disorder, recurrence, suspected use of alcohol, place and time of incident, completeness classification oscillated over most of the years analyzed. A similar result was found by a previous study, conducted in Pernambuco, in which the authors indicated regular completeness of the fields intended to characterize violence (time of incident, place, recurrence, type of violence, type of aggression) and to characterize the probable perpetrator (sex, relationship with the victim),²⁹ and very low completeness for the following variables: schooling, time of incident and use of alcohol by the perpetrator.³⁰ It appears to be pertinent that the importance of this information for violence sur-

veillance should be continually emphasized in health services throughout Brazil, since low completeness of the fields relating to them reduces not only the performance of municipal surveillance, but also hinders the development of specific actions aimed both at reducing case occurrence and also at case follow-up.

Despite the limitations found, inherent to studies using secondary data and inherent to the possibility of absence of certain information having compromised the description of notified cases, identification of the characteristics of the victims, incidents and perpetrators is extremely relevant for health service managers and/or health workers who wish to intervene in the cycle of violence. We hope that this study will give impetus to further studies dedicated to exploring other possibilities of analyzing this theme.

Contrary to the national scenario, sexual violence was the most notified type in Manaus, indicating the need for training aimed at detecting other types of violence (physical, psychological, negligence, child labor etc.) in the municipality. Improving the

quality of the data analyzed requires notification monitoring, as well as continuing preparation of the health professionals involved. Progress in this area depends on correct identification of suspected cases and painstaking completion of the notification form, resulting from awareness raising actions aimed at health professionals in order to increase coverage and quality of form filling-in, since notification of violence against children and adolescents is a first step for actions to control this condition..

Authors' contributions

Oliveira NE, Moraes CL and Junger WL contributed to the conception and design of the article, data analysis and interpretation and drafting the manuscript. Reichenheim ME contributed to data interpretation and writing the manuscript. All the authors have approved the final version and are responsible for all aspects of this work, including the guarantee of its accuracy and integrity.

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