

# The child in a domestic/family environment: consensus on risk factors for unintentional injuries

Criança em ambiente doméstico/ familiar: consenso quanto aos fatores de risco de lesão não intencional

Niño en el hogar/la familia: consenso en torno a los factores de riesgo de lesión no intencional.

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## Abstract

Childhood unintentional injuries have been considered as a study area which needs to be further developed, as it is one of the leading causes of death worldwide and, even when nonfatal, may have countless consequences for the children, their families and the community. This paper aims to identify the factors which influence the risk of unintentional injury in children up to four years living in a domestic/family environment. To this end, the Delphi technique was used to gather a panel of 15 to 23 multidisciplinary experts, and consensus was achieved after three rounds. Based on literature review and on the use of the abovementioned methodology, we concluded that injuries are multifactorial and that these factors are interactive and can be organized in four dimensions: child, primary caregiver/family, risk behaviours, and environment.

**Keywords:** accident prevention; home accidents; child; unintentional injury.

## Resumo

As lesões não intencionais na infância têm sido consideradas como uma área de estudo a desenvolver, por constituírem uma das principais causas de morte em todo o Mundo, para além de todas as outras consequências que influenciam a pessoa, família e comunidade da criança afetada. O presente artigo tem como objetivo identificar os fatores considerados relevantes na influência do risco de lesão não intencional em ambiente doméstico/ familiar em crianças até aos 4 anos. Para o efeito, realizou-se um painel de peritos, com recurso à técnica Delphi, no qual participaram 15 a 23 peritos multidisciplinares, tendo sido conseguida a obtenção de consenso em três rondas. Decorrente da revisão da literatura e da utilização da metodologia referida, conclui-se acerca da problemática das lesões ser multifatorial, cujos fatores interagem entre si, organizados em quatro dimensões: criança, cuidador principal/ família, comportamentos de risco e ambiente.

**Palavras-chave:** prevenção de acidentes; acidentes domésticos; criança; lesão não intencional.

## Resumen

Las lesiones no intencionales en la infancia han sido consideradas como un área de estudio por desarrollar, ya que constituyen una causa importante de muerte en el mundo, además de todas las otras consecuencias que afectan a cada niño, su familia y comunidad. Este artículo pretende identificar los factores considerados importantes en la influencia del riesgo de lesiones no intencionales en el hogar/la familia en los niños de hasta 4 años de edad. Con este fin, se creó un panel en el que participaron de 15 a 23 expertos multidisciplinares, se recurrió a la técnica Delphi y se logró llegar a un consenso en tres rondas. A partir de la revisión de la literatura y el uso de la metodología anterior, llegamos a la conclusión de que el problema de las lesiones es multifactorial y sus factores interactúan entre sí,, organizados en cuatro dimensiones: infantil, cuidador primario / familia, conductas de riesgo y ambiente.

**Palabras clave:** prevención de accidentes; accidentes domésticos; niño; lesiones no intencionales.

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## Introduction

Despite societal advances, unintentional injuries are one of the leading causes of death worldwide, representing a reality with disturbing effects at different levels, both statistically and at the level of the affected person, family and community.

Children are particularly vulnerable to injuries because of their curiosity and interest in the surrounding environment, which are important characteristics for the acquisition and development of skills that promote a healthy growth (Silva & Santos, 2011).

Unlike the term “accident”, the term “unintentional injury” implies that these injuries are predictable, preventable and non-accidental. An unintentional injury is “an unforeseen incident, where the intent to cause harm, injury or death was absent, but which resulted in injury” (CICEL, 2004, p. 249). Unintentional injuries include falls, drowning, poisoning, burns, suffocation, cuts and electrocution.

The designation home accidents relating to injuries occurring in a domestic environment or setting is

common in literature. However, preventing child injury at home is more than the implementation of a series of interventions, it is about safety management and promotion including coping with conflicting behaviours and beliefs, inherent to the interactions between people in a dynamic environment, such as home (Simpson, McGee, & Fougere, 2010).

Safety is a vital resource for the development of the individual as it consists of a state in which risks and conditions that promote risk are controlled so as to preserve health and increase the well-being of individuals and communities (Mohan & Tiwari, 2000). Unintentional injuries are a complex and multi-causal phenomenon in which various factors from different dimensions interact, following the socio-ecological paradigm.

Considering the phenomenon of injuries as multifactorial and requiring interconnection between different disciplines and joint efforts, we organised the different factors into four dimensions: child, main caregiver/family, risk behaviours and environment, as shown in Figure 1.

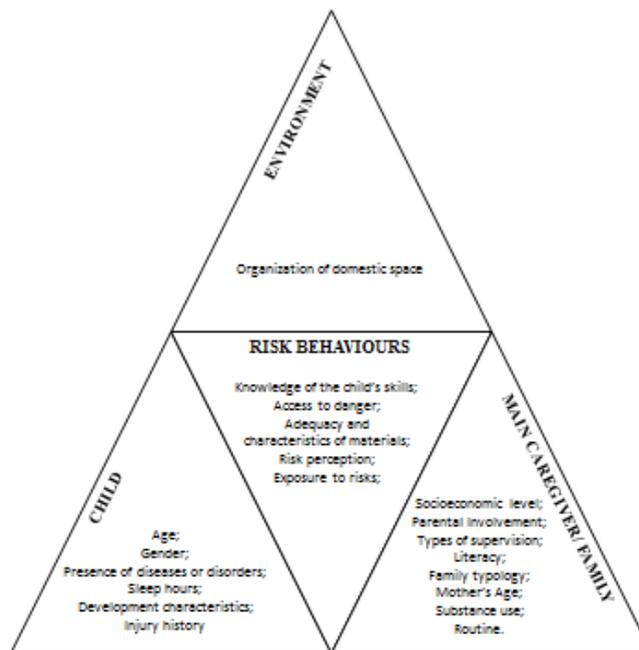


FIGURE 1 – Factors which influence the risk of unintentional injury in children according to the literature review

The factors in Figure 1 have indeed been considered in literature as important factors for a better understanding of injuries. Hence, while performing a search in the databases integrated in

b-on®, EBSCOhost® and PubMed®, as well as in the search engines Google® and Google Scholar®, we found that, although there are studies which mention risk factors for unintentional injuries in children and

provide examples of good practices, no instrument used to measure the risk of unintentional injury in children up to four years old living in a domestic/family environment was found.

Therefore, there seems to be a gap in this area, thus emerging the opportunity to develop an instrument capable of measuring the risk factors to which children are exposed and which serves as a basis for the planning of the care to be provided to the child and family, as well as for the design of other measures to promote population safety.

In fact, identifying the risk factors and analysing their influence in non-intentional injuries seems to be the necessary path to achieve a greater limitation of the issue and to build effective strategies to promote the safety of children and their families. This research study aims to identify the risk factors of unintentional injuries in children up to four years old in domestic/

family environment so as to build an instrument to measure this risk.

## Methodology

As previously referred to, an approach to unintentional injuries should contemplate the fact that these are influenced by multiple factors.

In order to build an instrument to measure the risk of unintentional injury in children up to four years living in a domestic/family environment and to validate its content, a Delphi panel was used. Its aim was to reach consensus on a complex topic through an interactive group process (Sousa, Frade, & Mendonça, 2005).

The design of the Delphi panel methodology is represented in Figure 2.

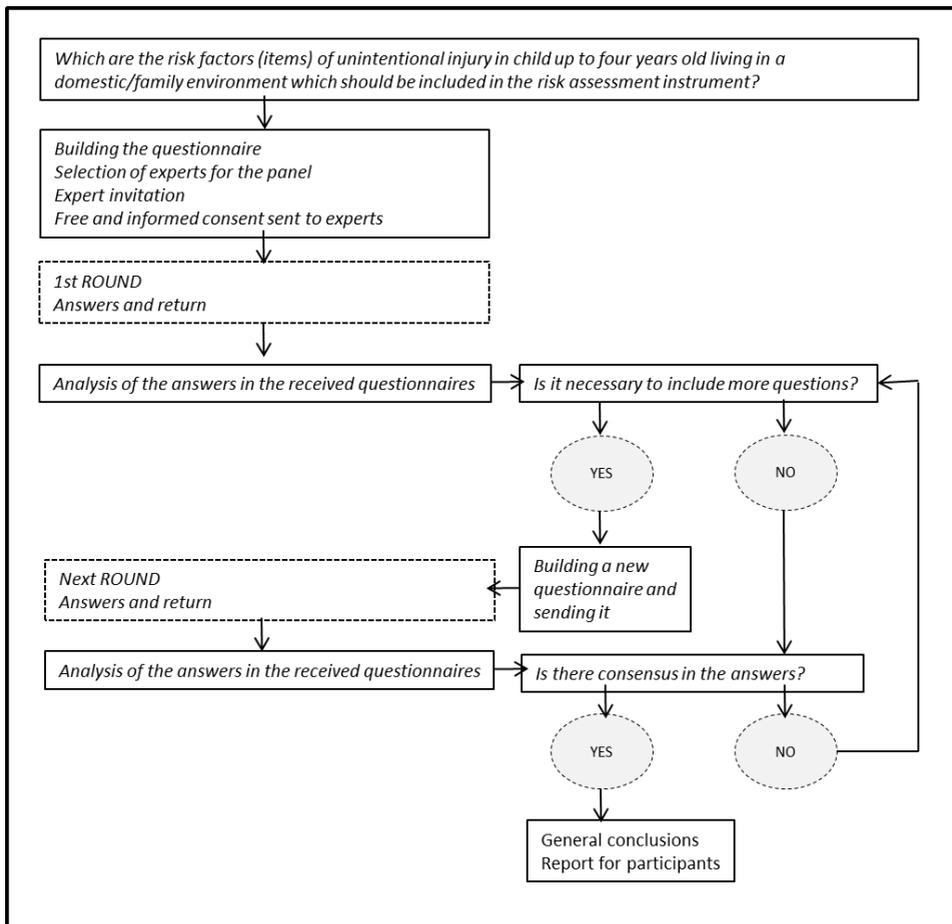


FIGURE 2 – Design of the Delphi panel methodology

The Delphi panel is a qualitative research technique with a variety of assumptions to be met throughout the process: respondents' anonymity; feedback as the results of each panel round are returned to the group as a collective answer in order to validate the answers and prepare for the next round; statistical representation of the distribution of the results provided by the group, since the answers are statistically summarized and returned to the group; interaction, as this technique involves communication between researcher and expert group, performed through the answers to the sent out questionnaires; and the expertise of each expert, as expert selection is an essential aspect for the success of this technique.

In this study, the panel of experts included individuals whose "knowledge and education in a given field is recognized, both from a scientific perspective, in the broader sense of the term, and conventionally acquired in higher education, and from practice, accumulated in the course of their professional experience" (Nunes, 2010, p. 3). Hence, the following criteria for inclusion in the expert panel were established: Health professionals, namely nurses and physicians, working in a paediatric ward of a hospital or in primary health care setting within the scope of the child and young person programme, recognized as experts in the area by their peers; researchers with recognised work in this area; Professionals and representatives of organisations with relevant work on childhood injuries; Parents of children up to 4 years old.

The fact that the experts came from different geographical areas of the country led to the development of this technique using questionnaires sent out by electronic mail, which "does not require geographical boundaries for the selection of experts, allowing for the participation of larger groups of people than focal groups" (Silva, Rodrigues, Silva, & Witt, 2009, p. 349).

According to our search, no standard was found regarding the number of experts to be included in the panel. Therefore, a non-probabilistic intentional sample was composed so that the group "represented the most recent thinking in an area" (Streiner & Norman, 2008, p. 23). In total, invitations for collaboration were sent to 34 individuals, namely health professionals, higher education teachers, researchers, representatives of organizations of reference in the field of injuries, and parents of children up to 4 years old. Of these, 24 individuals accepted to participate. All ethical requirements for the correct development of the method were followed.

## Results

The first round of the Delphi panel usually begins with a set of open-ended questions. However, we decided to show the results of the previously conducted literature review to the experts, always providing them with the opportunity to integrate new risk factors. This option is in line with several studies and documents published on the subject under analysis. Thus, the first round aimed to identify the level of agreement assigned by the experts to the various risk factors for unintentional injuries in children up to 4 years old living in a domestic/family environment, as well as assess the need to include other risk factors. In the first round of the expert panel, the group was asked to assess the agreement of the different items included in the questionnaire on a 4-point Likert scale ranging between "totally disagree" and "totally agree". Data resulting from the application of the scale were analysed taking into account the previously established agreement criteria (Table 1).

TABLE 1 — Consensus criteria in Delphi Panel rounds (adapted from Fink, Kosecoff, Chassin, & Brook, 1984)

Agreement criteria for inclusion	Agreement criteria for exclusion
Average greater than or equal to 2	Average lower than 2
At least 75% scoring 3 and 4	More than 75% scoring 1 and 2
More than 65% scoring 4 (high agreement)	More than 65% scoring 1 (high agreement)
Lack of comments from members of the expert panel indicating ambiguity or misunderstanding of the questions.	Lack of comments from members of the expert panel indicating ambiguity or misunderstanding of the questions.

The previously mentioned criteria were then applied to each of the 75 items which composed the first questionnaire of the Delphi panel. Results were analysed, summarised and returned to the experts so as to continue the process through consecutive rounds until agreement on all items was obtained.

The first round of the expert panel was held in June 2011 and was attended by 15 experts, which corresponds to a response rate of 62.5% when compared to the total number of experts who had accepted to participate in the expert group. Of the 15 experts who answered the first questionnaire, 13 were professionals in the area under analysis and 2 were caregivers of children up to four years old. Regarding the 13 experts in the area who participated in the first round, 12 were female (92%). Their mean age was 43 years (minimum of 27 years and maximum of 58 years) and their average professional experience was 22 years, of which, on average, 14 years were in the area of child and paediatric health. As for professional category, an expert was full professor, five were nursing teachers, five were nurses and two were physicians. In terms of academic and professional qualifications, this

was a highly qualified group, where more than 92% of the professionals had a higher level of education or equivalent to post-graduate studies, 15% of whom were PhDs. Approximately 62% of the experts in the area of study mentioned having research studies carried out in the area under analysis. With regard to child caregivers, one was female and the other was male; both were graduated and had children aged up to four years old.

Results showed that approximately 65% of the items obtained agreement on the first round, most of them with high agreement. The remaining 35% of the items were to find agreement in subsequent stages. All items related to the relationship between the child's age and the risk of unintentional injury, as well as the type of supervision, the importance of the relationship between the child and the caregiver and a large part of risk behaviours obtained percentages of agreement which allowed them to be directly included in the risk assessment instrument. The items which did not obtain agreement in the first round are described in Table 2.

TABLE 2 — Results of the 1<sup>st</sup> Round of the Delphi Panel

Dimension	Items related to	Mean	Without agreement	
			Scores 1 and 2 (%)	Scores 3 and 4 (%)
Child	Male child	2.80	40.0	60.0
	Belong to ethnic minority groups	2.40	60.0	40.0
	Obese child	2.33	60.0	40.0
	Child with chronic disease	2.33	60.0	40.0
	Child with low birth weight	2.33	60.0	40.0
	Have previous history of injury	2.93	46.7	53.3
Main Caregiver/family	Mother less than 20 years old at the first birth	2.73	26.7	73.3
	Have smoking parents	2.67	40.0	60.0
	Have more than two brothers	2.80	40.0	60.0
	Belong to a monoparental family	2.07	73.3	26.7
	Living in a rural environment	2.47	46.7	53.3
	Lower parental involvement up to 6 months	3.00	26.7	73.3
Risk Behaviours	Unemployed parents	2.73	33.3	66.7
	Caregivers who don't read educational books on children	2.53	53.3	46.7
	Not having swimming lessons	2.73	40.0	60.0
	Putt duvet on the infant bed up to 6 months	3.13	26.7	73.3
	Do not put the infant in the supine position in bed	2.87	40.0	60.0
	Use baby carrier for infant	3.13	26.7	73.3
Environment	Not having a smoke detector at home	3.00	26.7	73.3
	Not having a premixing tap in the bathtub	3.13	33.3	66.7
	Not having home visitation	2.80	33.3	66.7

The second round of the expert panel aimed to achieve agreement for the items which did not obtain it in the first round, and, simultaneously, begin organising the items previously agreed upon. Thus, the consensus criteria listed in Table 2 were used and data were separately analysed, distinguishing between the items whose agreement had still not been achieved and the items which had been agreed upon by the experts. In this latter group, the score given by the experts was codified and the responses were prioritized so that the scores would reflect the relative contribution to each response alternative and

item for the risk of unintentional injury in children up to 4 years old living in a domestic/family environment. In this round, which took place in the second half of July 2011, 23 experts participated (about 96% of adherence), of which 17 were professional experts in the area and 6 were caregivers of children up to four years old.

Based on what was previously mentioned, the results were presented by dimension since more than 90% of the experts agreed with this type of organisation for the items. Table 3 shows the items agreed upon by the experts.

TABLE 3 — Results of the 2<sup>nd</sup> Round of the Delphi Panel

Dimension	Items related to	Mean	With agreement	
			Inclusion of at least 75% scoring 3 and 4 (%)	Exclusion of at least 75% scoring 1 and 2 (%)
Child	Previous history of injury	3.04	78.3	
	Number of hours of sleep per day	3.35	91.3	
	Birth weight	1.78		87.0
	Child development	3.22	87.0	
	Child behavioural characteristics	3.65	100.0	
Main care-giver/family	Parental Bond	3.09	82.6	
	Number of hours of sleep per day	3.39	95.7	
	Number of members of the household	3.04	82.6	
	Family typology	2.96	78.3	
	Adornments in children	3.52	95.7	
Risk Behaviours	Level of understanding of the measures to be taken in the event of injury	3.35	87.0	
	Levels of knowledge of the health resources to be used in the event of injury	3.30	87.0	
	Access to candles	3.39	91.3	
	Access to balloons	3.35	87.0	
	Condition of the baby cot	3.26	82.6	

As already mentioned, experts were asked on a subsequent stage to define each of the dimensions regarding their level of priority. According to the experts, the least relevant dimension was the one related to the environment, whereas risk behaviours drew greater attention. The dimensions related to the child and the main caregiver/family obtained similar results, and, slightly below in terms of priority, was the dimension risk behaviours.

The third round of the Delphi panel was held in the second half of September 2011 and aimed to assess the experts' level of agreement regarding the level of understanding and clarity of the questions, as well as the criterion and score assigned to each item, taking into account the experts' answers in the two previous

rounds. In this round, around 80% of the participants intervened, and 19 experts (caregivers of children up to four years old and professional experts in the area) answered the questionnaire.

As regards the dimension child, all items obtained 89 to 100% agreements in terms of the level of clarity and understanding. In fact, most items obtained levels of agreement equal to or greater than 95%, indicating that each item was correctly written and did not create misunderstandings. In what concerns criteria and scores assigned to each item, the values of full agreement (score 1 = adequate) ranged between 79 and 100%. The item which obtained the lowest level of agreement (79%) was associated with the risk of unintentional injury according to the child's age,

taking into account the selected age ranges.

In terms of the level of clarity and understanding of the items in the dimension main caregiver/family, the answers ranged between 74% and 100%, thus highlighting item clarity. The item with approximately 74% was the one assessing the socioeconomic and cultural context.

Concerning the dimension risk behaviours, all items rated higher than 95%, which describes them as being clear and easy to understand. The exception to this classification was the item concerning falls. According to the experts' comments, the difficulty resided in understanding the designation "restraint systems", which was subsequently taken into consideration.

Finally, in the dimension environment, the level

of clarity and understanding of the items was unequivocal, always with ratings higher than 89%, in score 1. The only suggestion presented concerned the clarification of the designation "protection systems", since it is a very broad concept.

## Discussion

The experts' opinion led to the consolidation and development of the initial representation of the concept childhood unintentional injuries (Figure 1), the multiplicity of factors involved and the different dimensions that are closely interconnected, as shown in Figure 3.

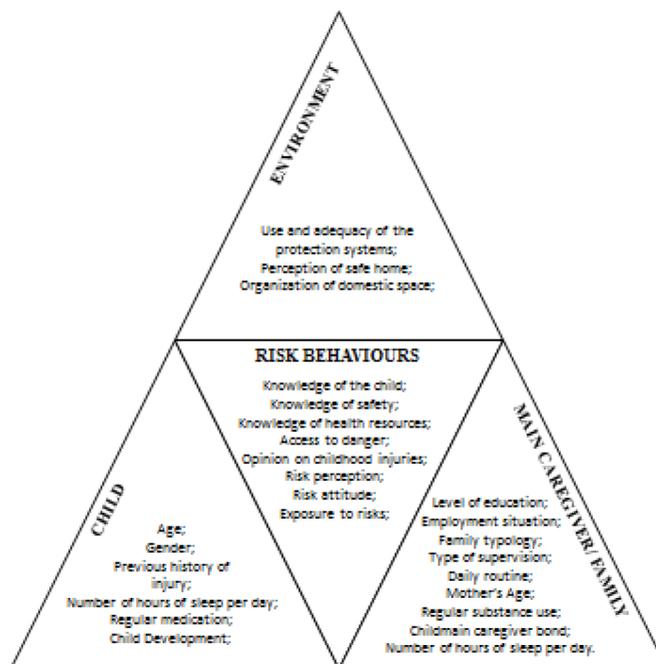


FIGURE 3 – Factors which influence the risk of unintentional injury in children resulting from the Delphi Panel

The comparison between the figures portraying the factors which influence the risk of unintentional injury in children both found in the literature review (Figure 1) and resulting from the Delphi Panel (Figure 3) shows that the four following dimensions were kept: child, main caregiver/family, risk behaviour and environment. Hence, the Delphi Panel contributed to better specify the items in each dimension, as well as clarify complex concepts.

Even though the issue of injuries should be analysed and understood as a multidimensional phenomenon, we chose to analyse and discuss the data resulting

from the panel of experts by dimension in order to facilitate their understanding.

Thus, concerning the dimension child, the experts' opinion was clear regarding the influence of the variables age and child development on the occurrence of unintentional injuries. It should be underlined that children up to four years of age experience many changes at multiple levels, which sometimes puts them in risk situations. This happens because children primarily learn to handle objects or interact with the environment taking into account the responses that these give back. Therefore caregivers' monitoring and supervision is

very important during this period (Cordovil, 2010; Morrongiello, Schmidt, & Schell, 2010).

The importance assigned by experts to the conditions related to the child itself was also evident. According to the experts, children with some type of disability, epilepsy or attention deficit/hyperactivity disorder are more prone to injury than children without these conditions. As for the presence of epilepsy in children, literature mentions that this condition increases the probability of unintentional injuries, particularly through drowning (Brenner, Saluja, & Smith, 2003).

Concerning the relationship between attention deficit/hyperactivity disorder and injuries, even if understudied in the literature, it has been demonstrated that children with this type of disorder have significantly more injury-risk-taking behaviours (Garzon, Huang, & Todd, 2008).

In relation to the dimension main caregiver/family, the analysis of the answers showed perfect consensus regarding the type of supervision. In fact, in the case of children aged up to four years old, with a high level of dependence on their caregivers, the caregivers' responsibility is huge. Therefore, when caregivers do not supervise them or do so inappropriately, the risk of unintentional injury increases, as it is frequently highlighted in the previously mentioned contemporary literature. Caregivers should also act in line with the child's behaviour, and partially modify and adapt their supervisory practices based on children's behavioural attributes (Morrongiello, Klemencic, & Corbett, 2008).

Mother's age at the moment of child birth was another relevant factor. According to the experts, there is agreement on the fact that children from adolescent mothers have greater risk of unintentional injury. The frequent consumption of alcohol and other substances by the caregiver were also associated with higher risk of childhood injury.

This analysis clarified the influence of some socio-economic characteristics on injuries, as was previously mentioned in the theoretical framework (Chaudhari, Srivastava, Moitra, & Desai, 2009; Mirkazemi & Kar, 2009; Atak, Karao lu, Korkmaz, & Usubutun, 2010). According to the experts, the caregivers' level of education, socioeconomic level and residence in an underprivileged area affect the risk of unintentional injury, putting children who come from families with poor schooling, lower social-economic status and residing in more underprivileged areas at greater risk.

Concerning the dimension risk behaviours, these did not raise major questions among the experts, probably because they are well-known and part of some media actions and campaigns on injury prevention. According to the experts, the relation between caregivers' inability to perceive and identify risks in the environment, and greater risk of unintentional injury in children up to four years old was clear. This analysis is in line with other authors who state that "during the process of discovering what the world has to offer the infant sometimes engages in risky situations" (Cordovil, 2010, p. 20). However, particularly in age groups in which most environments are selected and managed by adults, it is essential to understand the caregivers' perception of risk in relation to a certain environment, which will take us to the need for health professionals to work with parents on how they can adapt the environment and optimize its safety without removing its stimuli or inhibiting both curiosity and activity, which are important characteristics of the child.

Finally, with regard to the dimension environment, the experts considered that the home setting and the way it is organised, as well as the adequacy of the protection systems in terms of risks, are the main causes for the occurrence of unintentional injuries.

Although home is usually perceived to be a safe haven (Sikron, Giveon, Aharonson-Daniel, & Peleg, 2004), it is a scenario for numerous unintentional injuries in children aged up to four years olds. In fact, there are risks for children in every home, since physical environmental and equipment factors have emerged consistently as risk factors to childhood injury (Munro, Van Niekerk, & Seedat, 2006). Other characteristic concerning the occurrence of childhood injuries is the fact that, as well as the environment, the child is also constantly changing as a result of their development. Moreover, there are situations which result from an injury that are, in some way, facilitated by children's common characteristics, according to their stage of development, and sometimes by the inadequate behaviours observed in their caregivers (Souza, Rodrigues, & Barroso, 2000).

## Conclusion

The Delphi panel aimed to reach an expert consensus on the factors that, according to their

opinion and knowledge, influence the risk of unintentional injury in children up to four years old living in a domestic/family environment. Factors were initially chosen based on results taken from literature on the subject, and, from there on, risk factors were organised in four dimensions: child, main caregiver/family, risk behaviour and environment. Experts agreed on this organisation. Based on these initial risk factors and others added by experts, agreement rates of inclusion or exclusion for each risk factor were analysed in three rounds, until consensus was reached.

Despite the contributions to this field of knowledge, this study has several limitations which are inherent to the methodology used, and therefore mitigating strategies were implemented. One of the limitations concerns the composition of the expert panel, which might not be representative, given that the results reflect their opinions. Additionally, the adopted methodology, which aimed to reach a consensus, may lead to the elimination of extreme positions, based on the previously established consensus criteria.

However, rigour in the selection of the members for the expert panel and in the comparison between the results obtained and the results of the literature review ensured the correct development of the Delphi panel. This study also provides potential research areas, as the factors arising from the panel may be included in the design of an instrument to measure the risk of unintentional injury in children up to four years old living in a domestic/family environment, and contributes to a better understanding of this issue. Hence, effective strategies to reduce the impact and incidence of unintentional injuries during childhood should be implemented.

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