

## Using the Haddon matrix to identify strategies to prevent playground injuries

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Every year we witness numerous playground injuries in children and a large part of them appear to be severe. Most injuries occur due to faulty equipment and improper surfaces below them, children's careless behavior, inadequate adult supervision and other factors.

If we want to prevent injuries we need to analyse the specific injury event and to identify interventions that might prevent such an event from happening again or that might reduce the harm done. In public health the conceptual model, the Haddon phase-factor matrix, is used as a tool and framework for understanding the origins of injury problems and for identifying multiple countermeasures to address injuries of many types.

The matrix combines four columns for epidemiological factors and three rows for time phases. The **epidemiological factors** defined by the columns in the matrix refer to the interacting factors that contribute to the injury process. The host is the person at risk of injury (e.g. child...). The agent of injury is energy (e.g. mechanical, thermal ...) that is transmitted to the host through a vehicle (e.g. object, person ...). Physical environment include all characteristics of the setting in which the injury event takes place (e.g. playground, home ...). The social environment refers to social and legal norms and practices in the society. The phases in the matrix refer to pre-event, event and post-event phase of the process that result in injury problem. The **pre-event phase** encompasses all that determines whether an accident will take place (e.g. careless behavior, equipment design, surface with obstacles...). The **event phase** includes all that determines whether injury will occur and its nature and severity once the accident takes place (e.g. height of equipment, protective surfacing, standards...). The **post-event phase** encompasses all that determines the extent to which personal injury is limited and repaired after the actual accident is over (first aid, emergency and hospital treatment, rehabilitation programs...).

Table: The Haddon matrix applied to the problem of playground injuries in children

	<b>Host</b> (children on playground)	<b>Agent/Vehicle</b> (playground equipment, surface under equipment)	<b>Physical environment</b> (playground)	<b>Social environment</b> (community norms, policies, rules)
<b>Pre-event</b>	Educate children about safety behavior rules	Equipment design appropriate to child's age	Enough space between play structures	Educate adults about safe behavior, countermeasures
	Children wear clothes without strings	Equipment stability, guardrails, protective barriers, safe openings...	Equipment with moving parts in separate area	Standards, policies, rules, financing
	Adult supervision	Surface free of objects	Playground free of rocks, tree roots, broken glass...	Maintenance, inspection of equipment
<b>Event</b>	Disproportionate body parts (exposure to head injuries)	Proper height of equipment	Proper use cone of protective surfacing around equipment	Educate adults about safe behavior, countermeasures
	Vulnerability of child's tissues	Soft, thick protective surface (wood chips, sand, rubber mats...)	Surface under equipment free of objects (bikes, backpacks)	Standards, policies, rules, financing
		Swing seat made of soft materials	Children don't stand under equipment	Technological development

<b>Post- event</b>	Adult supervision	Surface under equipment free of standing water (risk of drowning)	Avoiding exposure to cold environment (risk of frostbite)	Educate and train adults in first aid, emergency guidelines for schools...
	Assisting child and giving first aid		Efficient communication system, emergency transport	Medicine science development
			Emergency and hospital treatment accessibility	Rehabilitation programs accessibility

Different preventive strategies are identified within each cell of matrix and they aim to prevent accident, injury or health worsening/disability. It is necessary to perform several different strategies at the same time to achieve more effective results: safe behavior, implementation of safety measures by adults, supervision, teaching children how to use playground equipment safely, assuring safe playground equipment, education and training to give first aid, transportation, emergency and surgical treatment, rehabilitation ... The use of matrix can help to clarify which interventions might work at any or all phases of an event and which might be targeted towards any or all of the factors.

This conceptual model helped to shift injury prevention away from an early, naive preoccupation with distributing educational pamphlets and posters toward modifying the environments in which injuries occur. By developing new laws and enforcement mechanisms and through new technologies and engineering changes in products, injury experts from a broad range of disciplines contribute to prevent injuries. Still the human behavior and personal responsibility remain undeniably important in injury causation.

# Analysis of Strategies for Preventing of Injuries - Haddon Matrix



IVZ RS

	<b>Host (Personal Factors)</b>	<b>Agent/Vector</b>	<b>Physical Environment</b>	<b>Socio-economic Environment</b>
<b>Pre-event</b>	<p>Rules of safe behaviour</p> <p>Clothes without cords and strings</p> <p>Supervision</p>	<p>PE suitable for the age group</p> <p>Undamaged PE, surface</p> <p>Stability of PE</p>	<p>Spatial arrangement of P</p> <p>Obstacles on the P</p>	<p>Awareness of adults</p> <p>Standards, regulations</p> <p>Maintenance, financing</p>
<b>Event</b>	<p>Development characteristics</p> <p>Exposure of head</p>	<p>Height of PE</p> <p>Surface under PE</p> <p>Soft materials</p>	<p>Area (range) of surface</p> <p>Objects under PE</p> <p>Children under PE</p>	<p>Awareness of adults</p> <p>Standards, regulations</p> <p>Technological development, financing</p>
<b>Post-event</b>	<p>Supervision</p> <p>First Aid</p>	<p>Standing water (puddle) in proximity of PE</p>	<p>Cold (hypothermia)</p> <p>Communication</p> <p>Time from First Aid to Urgent Medical Aid and to hospital</p>	<p>Education, equipment for First Aid</p> <p>Possibility to act in emergency</p> <p>Treatment, rehabilitation</p>