

The end of 50 years of armed conflict in Colombia: the consequences of antipersonnel mines

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Abstract

Among the great tragedies produced by the armed conflict in Colombia, antipersonnel mines (MAP) have left their trail of pain, mainly due to the large number of victims affected both directly and indirectly. In the worst cases, MAP cause the death of its victims. Survivors have to deal with limb injuries and/or damage to vital structures. The Colombian health system is not trained to provide optimal health services for people affected by the armed conflict.

The Colombian health system is not trained to guarantee optimal health services for people affected by the armed conflict. According to the Pan American Health Organization (PAHO) there are barriers to the provision of appropriate care for victims. These include lack of knowledge of their rights, lack of remuneration for FOSYGA,

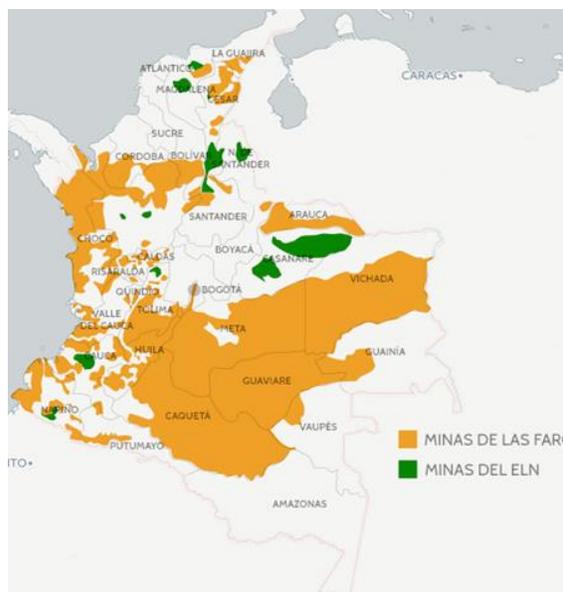
and lack of medical resources. All of these factors highlight the importance of (MAP) within the Colombian in public health services.

According to the Directorate for Integral Action against Antipersonnel Mines (DAICMA), 11,472 people were affected by antipersonnel mines were documented from 1990 to 2016. 1,165 victims were minors and 243 were fatalities. The departments of Antioquia, Meta and Caquetá have the highest number of accident and event figures due to MAP and unexploded ordnance (MUSE).

Palabras claves

Víctimas, trauma, discapacidad

Grafico 1.
Areas mined by the FARC and the ELN



Source:

<http://www.eltiempo.com/multimedia/especiales/situacion-de-minas-antipersona-en-colombia/15714557/1/>

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Submitted: May 15, 2016.

Revised: June 25, 2016.

Accepted: July 12, 2016.

Conflict of interest: None

Peer-reviewed: Yes

Introduction

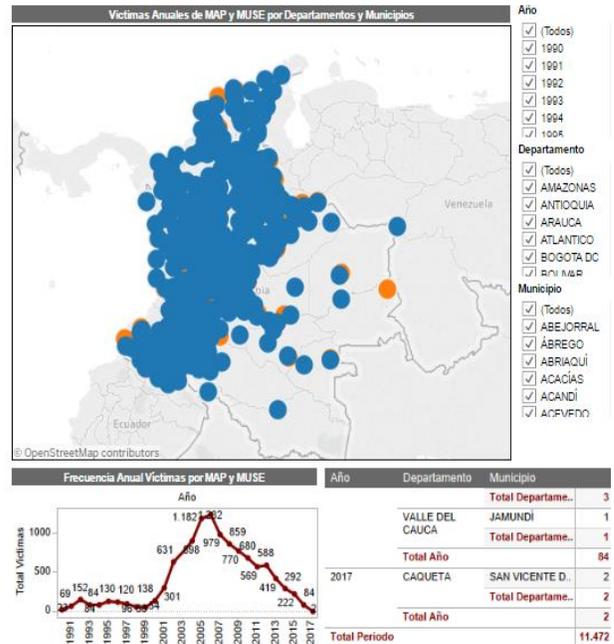
MAPs are discriminate explosives. An indiscriminate weapon is defined as a weapon that cannot be directed at a military objective or whose effects cannot be limited as required by international humanitarian law (IHL). Under IHL, the use of such 'inherently' indiscriminate weapon is prohibited as of Aug 8, 2017.

At present, these explosives are widely used in Asia, Europe, Africa and America.² In Afghanistan, “Operation Salam” was initially created by the United Nations to train civilian personnel; but this approach was found to be ineffective. NGOs who specialized in de-mining were then used. In contrast to Afghanistan, Kuwait has the financial capacity to cover the expenses of de-mining (at a cost of \$ 700 million); and has not had to resort to United Nations assistance. Other countries such as Somalia have not been able to implement an effective program against MAPs despite international support.

The situation in Colombia with respect to de-mining is complex. There is a lack of systematic information on the location of these mines, creating uncertainty and potential exposure of vulnerable populations.³

Given the magnitude of this phenomenon of the Colombian armed conflict “between 1996 and 2005, 7,065 events related to antipersonnel mines, MAP, and abandoned unexploded ordnance (MUSE) were recorded. Of these, 2,185 were accidents, (31%), and 4,880 incidents, (69%). Table 2 shows the increase in these injuries. 2002 was the year in which the dialogues between the Government of Andrés Pastrana and the FARC guerrillas were broken off; MUSE incidents recorded their highest peak in 2004, when 1,947 events occurred, 520 accidents, (27%), and 1,427 incidents, (73%). These events occurred in 31 of Colombia’s 32 departments and in 567 municipalities; 50% of the country's municipalities were or are threatened by the presence or suspicion of MAP or MUSE in their territories. Taking into account only the accidents, 2005 was the most critical year. There were 1,103 civilians and military victims. By comparison, Colombia was above other countries like Cambodia, where there were 875 victims, and from Afghanistan, where 848 were registered.”⁴

Graph 2
Map of Colombia, victims of MAP and MUSE from 1991 - 2017



Source:
<http://www.accioncontraminas.gov.co/estadisticas/Paginas/victimas-minas-antipersonal.aspx>

A brief history of antipersonnel mines

The use of antipersonnel mines dates back to World War I. German soldiers buried artillery caps filled with gunpowder or dynamite with a detonator on the ground in order to delay the advance of the artillery and enemy tanks. Due to their size, the antipersonnel mines, underwent great changes in their design which also increased their lethality.

In the Second World War, smaller and more easily hidden devices were used. In Vietnam, American forces deployed mines by land and air, in order to defend their troops. Ironically, many American soldiers were victims of their own mines. In some African countries such as Angola and Mozambique, and in countries such as Nicaragua and Cambodia, a large number of civilian victims have been damaged by antipersonnel mines. This not only reflects in the mortality of the population but also in the increase in physical disabilities as a result of multiple amputations in accidents involving these devices.

The use of antipersonal mines during the Civil War contributed to forced displacements. Estimates suggest that 4.4744.064 de personas were displaced. In addition 8.3 million hectares and 350.000 farms were abandoned. The use of MAP worsened the situation by blocking access to farms, disrupting the local economy. The territory became a war zone where children had no Access to education, and health. The use of MAP mean that they were in constant risk of becoming one more victim.³

This map of Colombia, identifies the country's departments and municipalities, according to statistics carried out by the Colombian Vice presidency. There are to date, 11,472 victims of MAP and MUSE from 1991 to 2017.

Clasification of MAP & MUSE

MAPs can be very rudimentary although other mines can involve complex models with electronic timing, assembly, and ignition devices. They are classified according to their structure, the detonation system, the activation mechanism and their effect .1

The materials used for assembling mines include glass, plastic, wood or metal. The detonation system can be electric or chemical. The activation mechanism may involve pressure, traction, pressure relief, traction relief, and the induction of sensors or electrical.

One method commonly used to classify mines is their effect; mines can be divided into those that produce shock waves, fragmentation (static or jumping) or directional fragmentation. MAPs that produce a shock wave are usually made up of a plastic box containing an explosive charge, a detonator and a trigger device. They are activated by pressure; these are traction driven systems. Despite their small size (diameter <80 mm and <100 grams) they reach a destruction radius of 1-2 meters with sufficient power to generate very serious wounds. 1.5

When its effect occurs through fragmentation, the explosive is wrapped in metal or plastic and inlaid with steel spheres or other metal fragments with cylindrical or cubic shapes with steely edges. These are activated electronically, by pressure or traction, and generate a radius of destruction of approximately 15-25 meters. They are easily spread by airplanes

or helicopters. When the mine is activated it creates a propulsion that causes a jump between 1-2 meters before exploding.

Finally, directional mines involving fragmentation or horizontal effects are those in which fragments can be projected in a certain direction, usually fixed on tree trunks or at ground level. They are activated by traction or electrical mechanisms, and produce the largest destruction radius that covers 50-100 meters.

In Colombia, high complexity mines have been used as well as artisanal mines. Some of the most recognized are "the mines bankrupt legs", type "Chinese hat", type "drawer", type "antipersonnel fan", type "sack", among others.

Figure 3.
Chinese hat type mine



4.
Crate type mine



Figure 5.
Costal type mine



Source: <http://copernico.escuelaing.edu.co>

Effects on health and impairment

Several decades of armed conflict in Colombia have left a situation that primarily afflicts the rural population; antipersonnel mines have been addressed as a public health problem. Given the magnitude of the population affected by mines and by the volume of citizens who are directly or indirectly impacted. We should remember that antipersonnel mines not only generate physical damage but also there is psychological, social, and economic damage to the victim.

Table 1.
Bastion Classification: type of wounds caused by MAP

Class 1: Foot Confinement Damage
Class 2: Commitment of the leg, which allows the tourniquet to be placed under the knee.
Class 3: Commitment of the proximal third of the leg or the distal third of the thigh, allows application of the tourniquet above the knee.
Class 4: proximal thigh involvement, does not allow the application of the tourniquet
Class 5: Buttock Commitment. A. Abdominal and intraperitoneal injury. B. Injury to the genitals and perineum C. Pelvic ring injury D. Injury of the upper limbs

Source: <http://www.mdcalc.com>

The wounds and damage produced by a mine are very complex injuries given the anatomical issues when there are both internal and external injuries. Limbs are often involved. Care

becomes difficult when the care is provided in contaminated areas. The Bastion Classification is used to classify wound and injuries. la destrucción de miembros y que se aumenta por la contaminación y suciedad de las heridas, que comprometen extremidades y órganos. Acogiendo la clasificación propuesta por Bastion, en la tabla 1, se puede caracterizar de una el tipo de lesiones.

Table 2.
Classification of the effects of mines on limbs according to the Ministry of Health

Primary or immediate effects:	-Amputation -Fractures, dislocations and myotendinous lesions -Burns -Vascular and peripheral nerve lesions -Bacterial contamination -Strange bodies
Side effects:	-Ischemia -Compartment syndrome -Infection -No union of fractures and deformity -Paralysis -Pain
Systemic effects and other organs and systems:	-Posttraumatic stress syndrome -Hypovolemic shock -Sepsis -Tetanus - reperfusion syndrome and its complications (due to tourniquet, occlusion of the temporal arterial flow due to the deformity before a fracture or dislocation or after a late vascular repair) -Catabolism

Source: own elaboration

Table 2 describes the effects of mines on the limbs according to the guide for the medical-surgical management of wounded in situations of armed conflict prepared by the Colombian Ministry of Health in April 2011, these effects can be initially classified as immediate or primary and secondary.

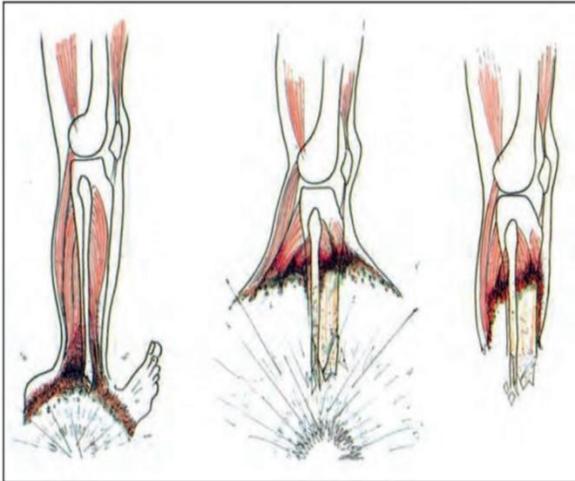
The first step is to control bleeding in all types of limb injury is to use direct pressure. The use of a blood pressure cuff near the lesion above the patient's systolic pressure is an effective means of control. The tourniquet is another appropriate means to control the bleeding only if a person in charge of can observe it every hour for 10 minutes

and the patient will be taken to the operating room in one or two hours⁷.

The current technique is an open amputation with preservation of the length of the amputation in which all viable soft tissue is conserved. Debridement is performed in order to eliminate all non-viable tissues and foreign bodies, it is no different from other wounds in war surgery.

The explosive force of the mine causes the separation of the facial planes, often very close to the wound site, this should be considered for the exploration and search for contamination and devitalized tissues to avoid necrosis and subsequent infection.¹¹

Graph 6.
Illustration of explosive effects on lower limb



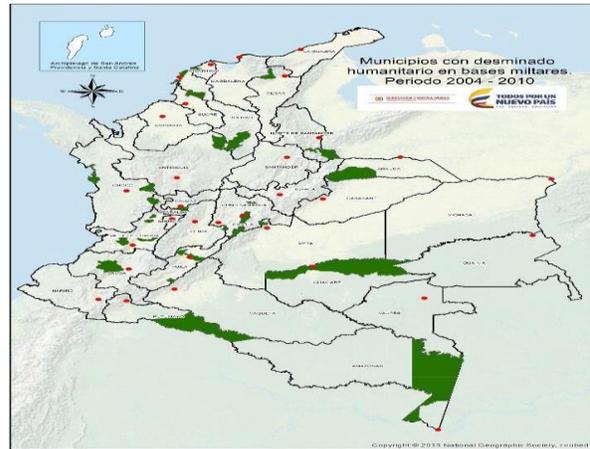
1. Diagram showing how the heñida by the explosion of a seemingly confined antipersonnel mine at the foot has an important shared mental commitment.
2. Diagram of a traumatic amputee of the infesting limb with sharing commitment; with preservation of gastronemius and skin.
3. Diagram showing how when the skin and muscle return to their place they cover the true magnitude of the lesion. Umbrella effect "

Source: Amputation for War Wounds, Coupland, ICRC
Source: Coupland RM. Amputation for war wounds. ICRC 2012

Treatment prior to immediate hospital care must be based on the functional recovery of the patient, both of the affected limb, as well as the patient's integrity and independence. Treatment must involve a psychosocial approach, which assumes the treatment of psychological sequelae

that could trigger the trauma. This has led to the Integrated Route of Health Care and Functional Rehabilitation for Victims of MAP / MUSE has been generated, which describes the processes so that victims can access the rehabilitation and repair services offered by the Colombian government Colombian for this type of victims, however an example of the failure of chain of care is that lack of comprehensive psychology services as level I and II care centers do not have psychology services that complement the comprehensive management of these patients. 17

Graph 7.
Municipalities with humanitarian demining in military bases 2004-2010



Source:
<http://www.accioncontraminas.gov.co/estadisticas/Paginas/Opciones-de-Desminado-Humanitario.aspx>

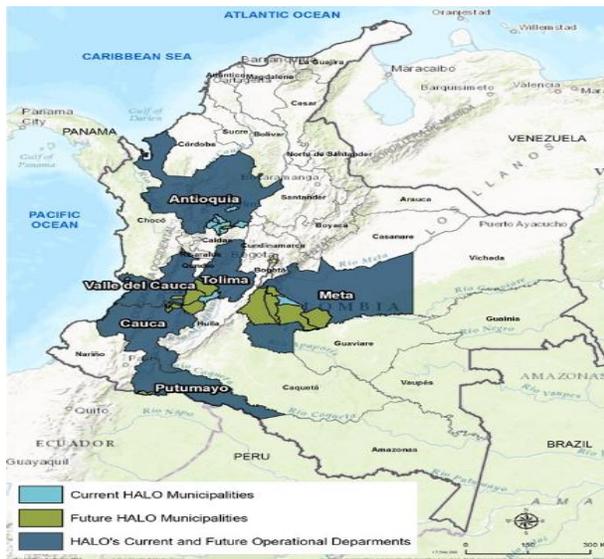
To date, the following municipalities have been declared "Free of suspicion of antipersonnel mines." This includes the municipalities of: Guatapé; The Union, Nariño; San Carlos and San Francisco in Antioquia; El Dorado in Meta; Zambrano in Bolívar and San Vicente de Chucurí in Santander.

It can be established that a municipality is considered free of suspicion of antipersonnel mines when the operator to whom the task has been assigned has made all reasonable efforts to identify and eliminate any suspicion of antipersonnel mines in the area.³

Humanitarian de-mining refers to the humanitarian assistance provided to communities affected by Antipersonnel Mines (MAP) and unexploded ordnance (MUSE). These should follow the National Humanitarian De-mining

Standards, which were developed based on national legislation, the International Standards for Action against Mines (IMAS) and the Fundamental Principles of Humanity, Neutrality and Impartiality.

Graph 8.
Presencia de HALO trust en Colombia



Source: <https://www.halotrust.org/where-we-work/south-america/colombia/>

Graph 9.
Humanitarian De-mining Techniques- BRDEH



Source: <http://www.ingenierosmilitares.mil.co/?idcategoria=321128>

The purpose is to make more free land available from antipersonnel mines to be used freely by displaced persons, victims of the armed conflict and the community in general.

Phases of Humanitarian Demining

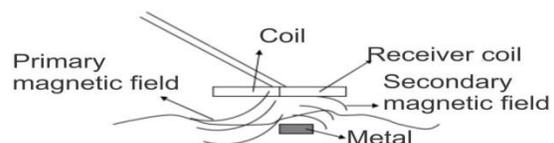
There are three phases of 1) de-mining;, 2) non-technical study, 3) technical study and clearance.

The non-technical study involves the collection and analysis of sufficient information on the contamination of MAP and MUSE in the territory. The second phase, the technical study, is an invasive physical investigation, in order to confirm or distort the areas with suspected contamination by these devices. In the third phase, the clearance, based on the previous investigation, if the presence of MAP and MUSE is confirmed, the actions for the removal and / or destruction of all hazards in the affected area begin to be carried out.

MAP and MUSE Detection Techniques

1. *Metal detectors*: these devices work by means of a principle called (electromagnetic induction), a a phenomenon that consists in generating electric fields through electromagnetic fields. By means of a battery, current flows through a coil, generating a primary electromagnetic field in the form of pulses. This magnetic field induces an electric current in buried metals. The metal will produce a much weaker *secondary* electromagnetic field and will depend on the electromagnetic properties of the compound. The depth for the perception of objects, is determined by the diameter of the coil used however this diameter is inversely proportional to the intensity of the current and the primary electromagnetic field. Metal detectors can interfere with electromagnetic signals near the explored place, such as the presence of high voltage cables, radio transmitters and electric motors. In addition, they are also subject to having a large number of false positives due to the presence of other metallic objects in the area.

Graph 10.
Illustration of the operation of the metal detector



Source: http://www.bdigital.unal.edu.co/843/1/71376534_2009.pdf

Ground penetration radar is a technique, in which electromagnetic radiation is used in the microwave band of the radio spectrum, employing one or several antennas to which alternating current is supplied to emit radio waves that penetrate the earth. These antennas are going to detect reflected waves from buried objects. The signals are transformed into an image, where anomalies or foreign objects can be identified in the field. It is used as a complement to the metal detector, since it can identify non-metallic objects underground.⁵

Animals used for MAP and MUSE detection

When mines are buried they will release vapors from the explosive into the environment. It is said that approximately 95% of the vapors are absorbed by the earth and 5% are released into the atmosphere. Dogs have a great sense of smell and special trainers train dogs to sniff out the vapors of certain explosives. Detection by this means is subject to the good communication of the canine with the trainer, interpreting the signals generated by the dog, who must be trained periodically so that they can accomplish an excellent work in the detection of explosives. In the open field, with a lot of wind, false positives can occur, due to the vapors emanating from explosives that are planted in areas where strong air currents occur.⁵

The Ottawa Treaty

On December 3, 1997 Colombia signed the “Ottawa Convention” otherwise known as the the Ottawa Convention.⁷ The treaty constitutes an international response to the destruction of MAPs and the prohibition of the employment, storage, production and the transfer of these ordinance in 162 countries. Colombia regulates it in Law 759 of 2002, which penalizes those who employ, produce, market, transfer or store them. The law emphasizes humanitarian de-mining, assistance to victims, the promotion and defense of humanitarian law and international humanitarian law, destruction of stored antipersonnel mines and awareness campaigns.

Based on Law 759, cooperating organizations such as the Program for Integral Action against Mines (PAICMA) formed by the Observatory of Antipersonnel Mines, and assistance and assistance actions for victims originate.

Colombia accepted the Mine Ban Treaty, which was signed on December 3, 1997, known as the Ottawa Convention.⁷ The treaty constitutes an international response to the destruction of MAPs and the prohibition of employment, storage, and production and transfer of these artifacts in 162 countries Colombia regulates it in Law 759 of 2002, which penalizes those who employ, produce, market, yield or store them. In addition, this law emphasizes humanitarian demining, assistance to victims, the promotion and defense of humanitarian law and international humanitarian law, destruction of stored antipersonnel mines and awareness campaigns. From this law, cooperation organizations such as the Program for Integral Action against Mines (PAICMA) formed by the Observatory of Antipersonnel Mines, and assistance and assistance actions for victims originate.

Colombia’s Military Industry

Colombia’s military Industry (Indumil), is owned by the Colombian State. It stopped producing MAP, since September 1998 and has destroyed its production equipment on November 18, 1999. The State also concluded the destruction of its mining reserves on October 24, 2004, before the deadline established by the Treaty.

Vestiges of the Civil War

The great difficulty in fulfilling Law 759 lies in the ignorance of the insurgent groups that planted the mines. Many of the rebels who ordered the distribution, quantity and location of the mines did not keep an adequate record. The key data for deactivating MUSE are unknown. In 2010, the difficulties with removal of mines

The Vice Presidency of the Republic made an extension request to the Colombian government to comply with article 5 of the signed convention. He notes:

there are still limitations related to the completeness and quality of the information provided by the different sources. To this, we must add the fact that there is no certainty about how much longer the armed groups outside the law will continue to use antipersonnel mines. Variables such as the planting of new explosive devices and variations in safety conditions should be incorporated. in the

prediction and prioritization models for the execution of minefield cleaning activities. Faced with this particular situation of incompleteness of information and uncertainty, the Colombian Government has estimated a baseline on the possible extent of pollution for each Colombian municipality.

In this way, the Military Industry (Indumil), owned by the Colombian State, stopped producing MAP in September 1998 and destroyed its production equipment on November 18, 1999. The State also concluded the destruction of its mining reserves. on October 24, 2004, before the deadline established by the Treaty.

The response from the Colombian Health System

Colombia now faces a major challenge in addressing the health needs of those who were affected by the armed conflict.

To understand understand this problem, the concepts of access and coverage to the health system must be differentiated. Coverage was ensured through laws that sought to improve access, however, even though most Colombians are linked to the SGSSS there are many factors that do not facilitate their access to health services. According to the Ministry of Health, 97% of the population is covered by the system, but with in the specific cases special barriers have been identified for the victims of MAP and MUSE described by PAHO. 14 These barriers are present from prehospital, hospital care and rehabilitation phase, these will be summarized in the graph.

The barriers that affect access to the health system require comprehensive management by the State. In the last two decades, a series of regulations have been implemented by the National Government and territorial governments to overcome the weaknesses and provide the enjoyment of the rights of the affected population.

It should be noted that the management of all the injured is not the same, since in the different scenarios of our country, the means and resources available vary considerably, which gives rise to different approaches to war surgery and its subsequent comprehensive management. We have understood that the management of war wounded by the military medical services of an

industrialized country is not the same as that of a rural public hospital in a third world country. Although the principles of wound treatment are identical in both cases, the diagnostic and therapeutic resources available are very different. Obviously, many of these limitations are also valid for the practice of trauma medicine and scheduled surgery in the civil field anywhere in the world.

Graph 6.
Barriers to health access for victims of MAP and MUSE

Prehospital care	<ul style="list-style-type: none"> • Ignorance of victims' rights • Lack of community training • Geographic barriers • Economic lack • Lack of remuneration by FOSYGA
Hospital care	<ul style="list-style-type: none"> • There are no psychological care protocols for these victims • There is no psychology service in the level I and II care centers • These health centers do not have the appropriate infrastructure for diagnosis or the ability to timely refer to other IPS
Rehabilitation	<ul style="list-style-type: none"> • Insufficient number of orthotists and prosthetists • Physiatrists, orthopedists and physiotherapists are concentrated in urban centers • Insufficient number of specialists to deal with trauma and common effects (physiatrists, audio logos) • The rehabilitation centers are located in departmental capitals

Source: Chacón González YH. Comprehensive look for the construction of the national access route to health services for the population in displacement of Colombia

The implications of the use of antipersonnel mines in the country, have marked a road, dead and disabled people, civilians and armed forces, increased by the barriers of the health system, and low capacity to solve complex emergency care in rural areas, as well as the subsequent comprehensive care of patients who are and have been affected by MAP and MUSE.

After reviewing this public health problem in Colombia, the question is after the signing of the peace agreement between the FARC (Revolutionary Armed Forces of Colombia) and the Colombian government, how will the demining of the MAP and MUSE planted by this insurgent group? According to the Colombian army, the FARC has now constituted a humanitarian demining group, to deactivate

explosive devices with mine characteristics that were planted during the 50 years of armed conflict. However, a problematic aspect is the lack of records about the exact location of these artifacts.

Finally, Colombia with the pots agreement moves towards more democratic processes but will have to bear for years, the costs of war and the indiscriminate use of these artifacts.

Note:

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References

1. Paz Penagos H. Minas antipersonal en Colombia. *Escuela Colombiana de Ingeniería*. <http://copernico.escuelaing.edu.co>(acceso: 2 de Mayo del 2017)
2. Barona CM, Calvo SF, Roa D, Gonzalez B. Colombia y las minas antipersonal: sembrando minas cosechando muerte. *UNICEF* 2000. <https://www.unicef.org>(acceso: 2 de Mayo del 2017)
3. Cauderay G. Las minas antipersonal. *CICR* 1993. <https://www.icrc.org> (acceso: 2 de Mayo del 2017).
4. Conflicto y minas antipersonal en Colombia. *Fundacion Seguridad & Democracia*. <http://www.acnur.org>(acceso: 8 de Mayo del 2017)
5. Williams J. Las minas terrestres y su eliminación. *Revista Internacional de la Cruz Roja* 1995 <https://www.icrc.org>(acceso 21 Abril del 2017).
6. *Dirección para la acción integral contra minas antipersonal*. <http://www.accioncontraminas.gov.co> (acceso: 2 de Mayo del 2017)
7. Pino Jaramillo YA. Determinacion de tecnicas de detección de explosivos optimas para el departamento de Antioquia. *Universidad Nacional de Colombia* 2009. <http://www.bdigital.unal.edu.co> (acceso: 2 de Mayo del 2017).
8. Convención de 1997 sobre la prohibición de las minas antipersonal y sobre su destrucción. *CICR* 2003. https://www.icrc.org/spa/assets/files/other/1997_minas.pdf (acceso: 2 de Mayo del 2017)
9. El Congreso de Colombia. Ley 759 de 2002. 2002. <https://www.mintic.gov.co>(acceso: 2 de Mayo del 2017)
10. Beney C, Guibert Vidal JL, Siervo MJ, Flórez T, Salamanca MSM, Gamboa Benavidez JH, et al. Guía para el manejo médico-quirúrgico de heridas en situación de conflicto armado. *CICR* 201. <https://www.icrc.org> (acceso: 2 de Mayo del 2017)
11. Gaviria Uribe A, Ruiz Gómez F, Dávila Guerrero CE, Burgos Bernal G, Corredor Ponguta JP, et al. Ruta Integral de Atención en Salud y de Rehabilitación Funcional para Víctimas de MAP/MUSE. *Ministerio de Salud y Protección Social* 2016. <http://www.accioncontraminas.gov.co> (acceso: 2 de Mayo del 2017).
12. Armada Nacional de Colombia. *La Magnitud de la Guerra en Colombia*. <https://www.armada.mil.co> (acceso: 2 de Mayo del 2017)
13. CICR, Epidemia Mundial Causada por el uso de las minas terrestres, Ginebra, La 1995.
14. Ayala García J. La salud en Colombia: más cobertura pero menos acceso. *Banco de la Republica* 2014.
15. Chacón González YH. Mirada integral para la construcción de la ruta nacional de acceso a los servicios de salud para la población en situación de desplazamiento de Colombia - PSD. *Organización Panamericana de Salud* 2009; pág. 71-76.
16. Gómez Giraldo M. La Colombia que se va desminar y la que seguirá en riesgo. *El Tiempo* 2015. <http://www.eltiempo.com>(acceso: 2 de Mayo del 2017).

