

## ORIGINAL

# Pediatric intensive care in Latin America<sup>☆</sup>

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### KEYWORDS

Pediatric Intensive Care;  
Latin America;  
Health survey

### Abstract

**Objective:** To describe the practice of Pediatric Intensive Care in Latin America and compare it with two European countries.

**Design:** Analysis of data presented by member countries of the Sociedad Latinoamericana de Cuidado Intensivo Pediátrico (SLACIP), Spain and Portugal, in the context of a Symposium of Spanish and Portuguese-speaking pediatric intensivists during the Fifth World Congress on Pediatric Intensive Care.

**Setting:** Pediatric Intensive Care Units (PICUs).

**Participants:** Pediatric intensivists in representation of each member country of the SLACIP, Spain and Portugal.

**Interventions:** None.

**Variables of interest:** Each country presented its data on child health, medical facilities for children, Pediatric Intensive Care Units, pediatric intensivists, certification procedures, equipment, morbidity, mortality, and issues requiring intervention in each participating country.

**Results:** Data from 11 countries were analyzed. Nine countries were from Latin America (Argentina, Colombia, Cuba, Chile, Ecuador, Honduras, Mexico, Dominican Republic and Uruguay), and two from Europe (Spain and Portugal). Data from Bolivia and Guatemala were partially considered. Populational, institutional, and operative differences were identified. Mean PICU mortality was 13.29% in Latin America and 5% in the European countries ( $p = 0.005$ ). There was an inverse relationship between mortality and availability of Pediatric Intensive Care Units, pediatric intensivists, number of beds, and number of pediatric specialty centers. Financial and logistic limitations, as well as deficiencies in support disciplines, severity of diseases, malnutrition, late admissions, and inadequate initial treatments could be important contributors to mortality at least in some of these countries.

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**PALABRAS CLAVE**

Cuidados intensivos  
pediátricos;  
Latinoamérica;  
Encuesta de salud

*Conclusion:* There are important differences in population, morbidity, and mortality in critically ill children among the participating countries. Mortality shows an inverse correlation to the availability of Pediatric Intensive Care Units, intensive care beds, pediatric intensivists, and pediatric subspecialty centers.

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**Los cuidados intensivos pediátricos en Latinoamérica****Resumen**

*Objetivo:* Conocer cómo es la práctica de los cuidados intensivos pediátricos en Latinoamérica en comparación con 2 países europeos.

*Diseño:* Recopilación y análisis de los datos presentados por los países miembros de la Sociedad Latinoamericana de Cuidado Intensivo Pediátrico (SLACIP), España y Portugal, en el Simposio de Intensivistas Pediátricos de Habla Española y Portuguesa realizado durante el V Congreso Mundial de Cuidado Intensivo Pediátrico.

*Ámbito:* Unidades de cuidado intensivo pediátrico.

*Participantes:* Intensivistas pediátricos representantes de los países que conforman la SLACIP, España y Portugal.

*Intervenciones:* Ninguna.

*Variables de interés general:* Se recolectaron, de cada país, indicadores de salud infantil, características de las instituciones de salud dedicadas al cuidado de los niños, unidades de cuidados intensivos pediátricos (UCIP), intensivistas pediátricos, procesos de certificación dentro de la especialidad, equipamiento de las diferentes unidades, casuística, cifras de mortalidad y principales problemas que requieren solución en cada uno de los países participantes.

*Resultados:* Se analizaron los datos de 11 países, 9 latinoamericanos (Argentina, Colombia, Cuba, Chile, Ecuador, Honduras, México, República Dominicana y Uruguay) y 2 europeos (España y Portugal). Los datos de Bolivia y Guatemala fueron considerados solo parcialmente. Se identificaron diferencias poblacionales, institucionales y operativas entre los diferentes países. La mortalidad promedio fue 13,29% en las UCIP latinoamericanas y 5% en las UCIP europeas ( $p = 0,005$ ). La mortalidad se correlacionó de forma inversa con la disponibilidad de UCIP, número de intensivistas pediátricos, número de camas y número de centros pediátricos de especialidad. Limitaciones logísticas y financieras, deficiencias en las disciplinas de apoyo, estado general precario de los pacientes por desnutrición, retraso en su ingreso y tratamientos iniciales inadecuados, pueden ser contribuyentes significativos a la mortalidad al menos en algunos de estos países.

*Conclusión:* Existen diferencias significativas en términos poblacionales y de morbimortalidad entre los países estudiados. La mortalidad se correlaciona de forma inversa con la disponibilidad de UCIP, número de intensivistas pediátricos, número de camas y número de centros pediátricos de especialidad.

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**Introduction**

In the year 2000, the World Health Organization (WHO) established its "Goals for the Millennium", with the purpose of improving human living conditions by the year 2015.<sup>1</sup> The fourth goal is of particular interest for pediatricians: "To reduce mortality by two-thirds among children under 5 years of age by the year 2015". Reaching this goal would mean avoiding over 6 million deaths every year.<sup>2</sup>

The strategy designed for reaching these "Goals for the Millennium" is mainly based on the adoption of preventive health measures, but it is unlikely for them to be reached in many countries, due to a series of problems.<sup>3,4</sup> New alternative actions are moreover needed,<sup>5</sup> such as those that depend on emergency services and Pediatric Intensive Care (PIC), which should be available to all children who need them.<sup>6</sup> In this sense, it has been shown that the planned and

careful implementation of such actions can easily reduce mortality by at least 50%.<sup>7</sup>

PIC is a relatively new discipline in Pediatrics. The first Pediatric Intensive Care Unit (PICU) was created in Gothenburg (Sweden) in 1955, and the first such Unit in the United States was established in the Children's Hospital of the District of Columbia in 1965.<sup>8</sup> In Latin America, PICUs were created in the period between 1972 and 1990.<sup>9</sup> Although these units have shown important advances, similar in many cases to those found in more developed countries, little is known of the general characteristics of their organization or development. The publications found on this subject in the international literature are few, and there are no reliable registries of the available PICU beds, their accessibility, or the quality of the care provided.<sup>10-13</sup>

The Latin American Society of Pediatric Intensive Care (*Sociedad Latinoamericana de Cuidado Intensivo Pediátrico*,

SLACIP) was created in 1993 following a first meeting of Latin American pediatric intensivists on occasion of the First World Congress of the specialty held in Baltimore.<sup>14</sup> Starting in 1996, the SLACIP has organized the Symposium of Spanish- and Portuguese-Speaking Pediatric Intensivists as an event prior to the world congresses in the field, creating a scenario aiming to favor professional development and the exchange of experiences among Latin American countries, Spain and Portugal. However, a genuine regional perspective of PIC in the member countries of the SLACIP is lacking. A comparison with European references such as Spain and Portugal could help identify strengths, weaknesses, and areas requiring further development through the adoption of policies and strategies specifically designed to the effect.<sup>6</sup>

With this idea in mind, in 2006 the SLACIP requested each country to supply its general health information and specific data on PIC practice. A preliminary analysis was made in 2007 on occasion of the World Congress of PIC held in Geneva (Switzerland),<sup>15</sup> and this analysis is now expanded and described in the present article.

## Patients and methods

Six months before the V World Congress of PIC, the Presidents of the national societies in the discipline in each Latin American country, as well as in Spain and Portugal, received an invitation to participate with a poster in the Symposium of Spanish- and Portuguese-Speaking Pediatric Intensivists. Where the official representative of each country was not known, contact was made with renowned experts in the field, as established from the registries of the SLACIP. The poster was required to offer the following information: country; name of the Society, Association, Branch or Chapter; total population of the country and population under 18 years of age; the five leading causes of infant and neonatal morbidity–mortality; infant and neonate mortality rates; general hospitals with Pediatric Departments; pediatric hospitals; pediatric hospital beds; pediatric traumatology or heart surgery centers; PICUs and their geographic distribution; PICU beds; PIC beds within adult Intensive Care Units (ICUs); and PICU beds per 30,000 children. Regarding PICU care activities, information was requested on the most frequent disorders and on the prevalence of denutrition among the children admitted due to critical disease. In relation to the technology available in the Units, data were compiled on the availability of conventional mechanical ventilation (MV), noninvasive MV, high-frequency MV, nitric oxide, heliox, invasive monitorization, the use of extracorporeal techniques (hemodialysis, peritoneal dialysis, plasmapheresis), and the use of enteral or parenteral nutrition. Information was also requested on the number of pediatric intensivists in the country, their formal professional certification process, the presence or absence of national clinical guides, and the existence or absence of inter-institutional collaborative projects. As general indicators, information was collected on mortality in the PICU and on the incidence of nosocomial infections. Lastly, data were requested on the main problems affecting the operation of the PICUs. One of the authors (SCM) compiled the data and analyzed them using the R version 2.12.2 statistical software (*R Foundation for Statistical Computing*, Vienna, Austria). Posteriorly, a data

**Table 1** Neonatal mortality, infant mortality and Pediatric Intensive Care Unit mortality in Latin American countries, Spain and Portugal.

Country	Neonatal mortality <sup>a</sup>	Infant mortality <sup>b</sup>	PICU mortality
Argentina	9	13	10%
Bolivia	25	46	9%
Colombia	12	16	12%
Cuba	3	5	5.2%
Chile	5	7	6.5%
Ecuador	11	21	15%
Spain	2	4	4%
Guatemala	11	29	22%
Honduras	15	26	25%
Mexico	7	15	13%
Portugal	2	3	6%
Dominican Republic	19	27	23%
Uruguay	8	14	5.5%

<sup>a</sup> Per 1000 live births, WHO 2008.

<sup>b</sup> In children under 5 years of age, per 1000 live births, WHO 2008.

check and update was made referring to the vital and public health statistics according to the official information of the WHO.<sup>16,17</sup>

## Results

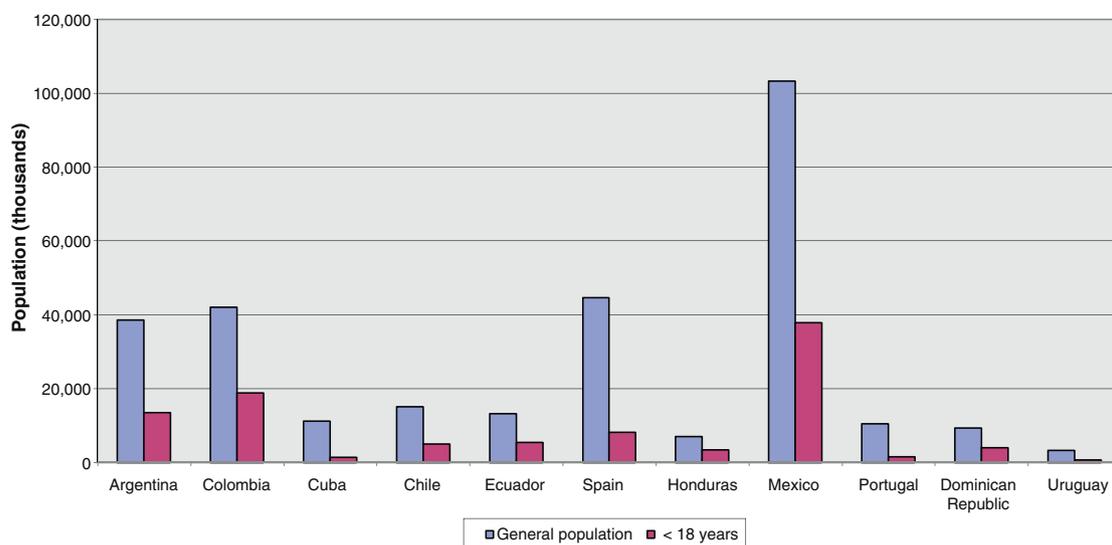
A total of 11 countries participated in the project: 9 Latin American nations (Argentina, Colombia, Cuba, Chile, Ecuador, Honduras, Mexico, the Dominican Republic and Uruguay) and two European countries (Spain and Portugal). Bolivia and Guatemala submitted incomplete data that were considered only in part.

### Population data

The population of the participating countries totaled 298,503,361 inhabitants, ranging from 3,300,000 inhabitants in Uruguay to a little over 100,000,000 in Mexico. The population under 18 years of age totaled 100,574,490 inhabitants, though the figure contributed by Portugal corresponded to subjects under 14 years of age. On average, 33.7% of the population was underage. Fig. 1 shows the percentage distribution of the underage population versus the general population. The European countries and Cuba presented a low proportion of underage individuals, related to a drop in birth rate. The rest of the Latin American countries showed a significant proportion of children and young individuals in their populations, ranging from 27% in Uruguay to 50% in Honduras.

### Mortality

Table 1 shows the data supplied by the participating country, while Table 2 establishes a comparison between the Latin American and European countries. The most



**Figure 1** General population and population under 18 years of age.

frequent causes of perinatal mortality were premature birth, congenital malformations, chromosomal alterations, congenital heart disease, asphyxia and intracranial bleeding. Honduras reported trauma as the first cause of perinatal mortality, while Uruguay cited hemorrhagic disorders and sudden death as significant problems associated to mortality.

Mean infant mortality (affecting children under 5 years of age) was 17.4 per 1000 live births (Table 1). Spain reported 43.8 deaths per 100,000 inhabitants between one month and 18 years of age, though the WHO-based data cite 4 deaths per 1000 live births. Colombia and Mexico did not report this rate, though the WHO registered 16 and 15 deaths per 1000 live births in these countries. The described causes of infant mortality included perinatal disorders, congenital malformations, congenital heart diseases, pneumonia, acute diarrhea, sepsis, denutrition, accidents and traumatism, diseases of the nervous system, and oncohematological diseases. In the countries with the highest infant mortality rates such as the Dominican Republic, Honduras and Ecuador, the predominant causes were infections (mainly of a respiratory and gastrointestinal nature) and denutrition. In the European countries there was a prevalence of non-infectious conditions such as traumatism, tumors, nervous system disorders, congenital malformations and cardiorespiratory problems. The Dominican Republic was the only country citing infection with the

human immunodeficiency virus (HIV) as a cause of infant mortality.

### Hospital infrastructure for pediatric patients

All countries had numerous general hospitals with Pediatric Departments, though the number of available beds was not reported. In comparison, the number of pediatric hospitals was limited, with the exception of Cuba, Argentina, Spain, and Mexico. Such hospitals are preferentially located in the major cities. Honduras has no pediatric hospital, Uruguay has only one, the Dominican Republic and Chile each have three, Portugal likewise has three, and Ecuador has four pediatric hospitals. Here again the number of available beds in each center was not specified. Pediatric centers specialized in trauma and heart surgery were found to be more numerous in Argentina and Mexico.

Fig. 2 reports the number of PICUs in the participating countries. The Dominican Republic, Honduras, Uruguay, and Ecuador have the fewest Units. In contrast, Spain, Argentina, and Mexico have the largest number of PICUs. The number of PICU beds was seen to range from 16 in Honduras to 979 in Argentina (Fig. 3). This information was not available in the case of the Mexican PICUs. Mention likewise was not made of the number of pediatric beds which some general hospital assign to children within adult ICUs.

**Table 2** Comparison of mortality data by regions.

Region	Latin America		Europe		<i>p</i>	95%CI
	$\bar{x}$	OF	$\bar{x}$	OF		
Neonatal mortality <sup>a</sup>	11.36	6.36	2.0	0	0.0006	5.09–13.63
Infant mortality <sup>b</sup>	19.90	11.67	3.5	0.7	0.0008	8.52–24.29
PICU mortality	13.29	7.16	5	1.41	0.005	2.99–13.58

<sup>a</sup> Per 1000 live births, WHO 2008.

<sup>b</sup> In children under 5 years of age, per 1000 live births, WHO 2008.

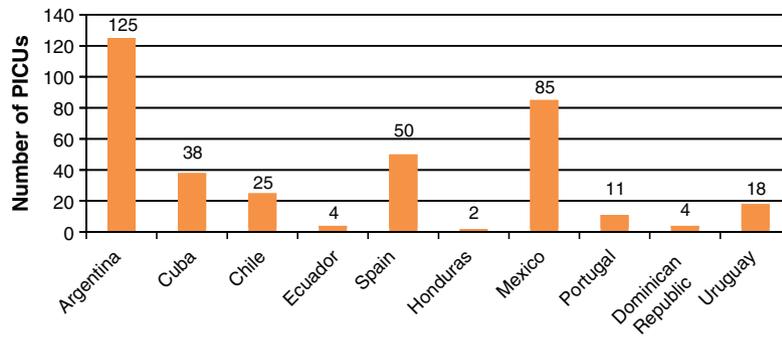


Figure 2 Pediatric Intensive Care Units.

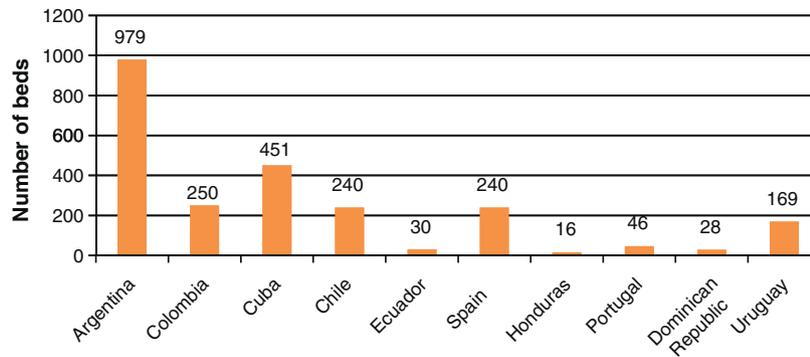


Figure 3 Pediatric Intensive Care beds.

Globally, among the countries studied there was approximately one bed per 40,000 children.

The number of pediatric intensivists was seen to be highly variable (Fig. 4). The countries with the greatest number of such specialists are Cuba, Argentina, Spain, and Mexico. In contrast, the Dominican Republic has two pediatric intensivists, Honduras has 9, and Ecuador has 33 (the number of members of the Ecuadorian Society of Pediatric Intensive Care was reported). Most of the countries, with the exception of these latter three, establish intensivist certification through University postgraduate training or formal recognition on the part of the respective professional societies or Medical Colleges.

The conditions most commonly dealt with in the PICUs of the Latin American countries were found to be postoperative

support, infectious diseases, neurological disorders, respiratory processes, traumatism, oncological diseases and immune depression, cardiovascular diseases, and intoxications. These conditions are related to the causes of infant mortality described above. Dengue was cited in one country (Dominican Republic), and intoxications in another (Ecuador).

Table 3 reports the technological means available in the PICUs of the participating countries. Although almost all such Units are equipped with the basic technological means, certain forms of life support such as high-frequency ventilation, extracorporeal membrane oxygenation (ECMO), heliox, nitric oxide, continuous EEG monitorization, and jugular bulb catheterization are more limited. Significant differences were observed in PICU equipment within one same

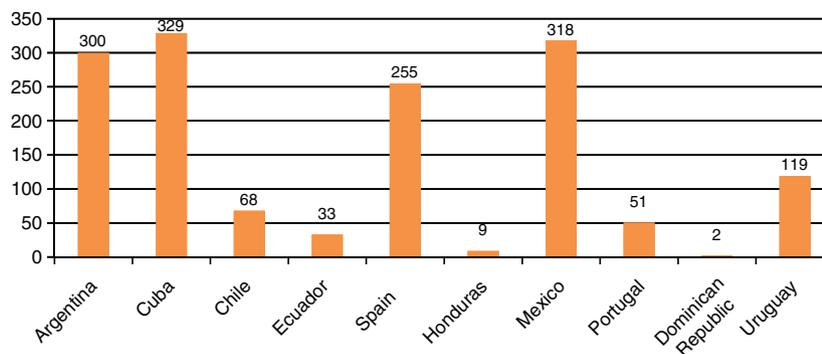


Figure 4 Pediatric intensivists.

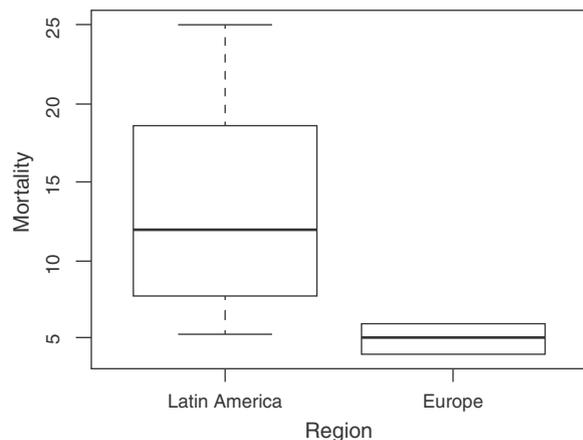
**Table 3** Available technological resources in the Pediatric Intensive Care Units.

Technique	Percentage
Conventional mechanical ventilation	100
Noninvasive ventilation	70
High-frequency ventilation	70
Nitric oxide	50
Heliox	40
Invasive hemodynamic monitorization	100
Pulmonary artery catheter	70
Intracranial pressure monitorization	90
Continuous EEG monitorization	70
Jugular bulb catheter	60
Renal replacement techniques	100
Enteral nutrition	100
Parenteral nutrition	90

country, and even within one same city. As an example, access to noninvasive ventilation or high-frequency ventilation was seen to vary greatly.

### Mortality in the PICUs

Mean PICU mortality in the studied countries was 12%, though this percentage ranged widely from 4% in Spain to 25% in Honduras (Table 1). The mean mortality in the Latin American PICUs was 13.29% versus 5% in the European Units—the difference between the two geographical settings being statistically significant ( $p=0.005$ ) (Table 2, Fig. 5). Mortality in turn was inversely correlated to PICU availability, the number of pediatric intensivists, the number of beds, and the number of specialized pediatric centers. Lesser PICU accessibility was correlated to increased mortality. The cases of Honduras, the Dominican Republic and Ecuador illustrate this correlation (Fig. 6), which does not necessarily apply to all countries however. As an example, Mexico has a greater number of specialized pediatric centers, but mortality is comparable to that reported in Ecuador.

**Figure 5** Comparison of mortality in the Pediatric Intensive Care Units.

### General organization of the specialty

Only two countries, Cuba and Spain, have national clinical guides in the specialty. In 7 countries joint studies are made on a collaborative basis. Few countries have offered information on nosocomial infections.

### Needs for the specialty

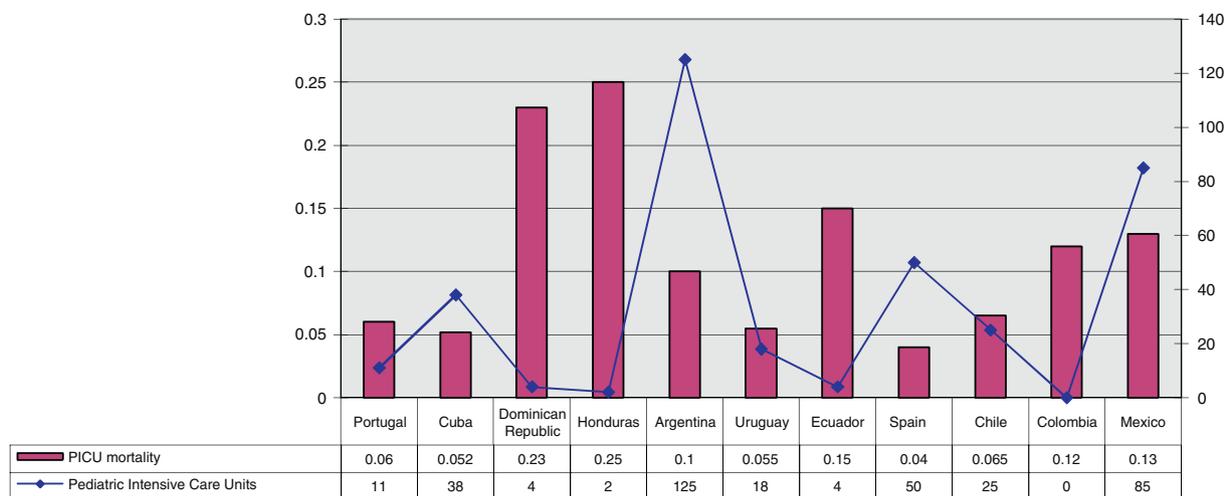
Ten countries reported problems requiring immediate solutions. Most were referred to human resource and/or infrastructural shortcomings. In this context, mention is made of the need to increase the number of pediatric intensivists, nurses and residents. In addition, the need for intensivists with 24-h shifts or duties is cited, together with the need to reinforce the training programs targeted to all personnel, at either national level or through exchange programs with other countries. Regarding infrastructure, the need for more units, the creation of intermediate care units, or improvements in equipment has been cited. These concerns in turn are followed by the need for improved means for transporting critical children, and the need to introduce national norms referred to diagnosis and treatment. Other concerns refer to the lack of regionalization and equity, with a heterogeneous distribution of resources in which some geographical areas are well covered while others are completely devoid of adequate coverage. Likewise, some populations are cited as having easy access to the most modern care, while other populations lack practically everything. Less frequently cited (but equally important) concerns are the need for research activities, reliable registry methods for all intensive care variables, the need to develop home care and follow-up units, and the need to incorporate Ethics Committees.

### Discussion

The present report offers a regional perspective of the population and morbidity–mortality data of 9 Latin American and two European countries, related to a number of aspects such as hospital infrastructure, human and technological resources, and to PIC practice in each of them. One of the significant findings is the important presence of young individuals (population under 18 years of age) in the majority of the Latin American countries, and the fact that mortality in these countries is fundamentally associated to infections, respiratory failure, heart disease, traumatism, neurological disorders, and oncohematological diseases.

The mortality figures differ significantly between the Latin American and European countries (Table 2). In Latin America, mortality is inversely correlated to PICU availability, the number of pediatric intensivists, the number of beds, and the number of specialized pediatric centers. The needs of the specialty as expressed by the participants in the study may help explain this situation, and include inequity and heterogeneity in the distribution of resources, and difficulties in accessing the existing services.

Access to emergency care in life-threatening situations constitutes a key health expectation for all communities. Medical care in general, and PIC in particular must contribute to satisfy these needs, with early and opportune



**Figure 6** Inverse correlation between mortality and the availability of Pediatric Intensive Care Units.

interventions. This consideration in turn underscores the logical interaction that should exist between intensivists and the healthcare professionals that care for patients in life-threatening situations. The actions of the pediatric intensivist should not be confined or limited to the setting of the PICU.<sup>15</sup>

In some cases, deficiencies in first provided care and in the transport of critical children to specialized centers where PIC is available can explain the mortality figures reported in Latin American PICUs. In a study of 21 hospitals in 7 developing countries, initial screening or triage of 131 children was found to be inadequate or late in 8% of the cases; clinical evaluation was deficient in 41% of the children; and there were delays in the start of treatment in 19% of the patients.<sup>18</sup> In another study, 50% of the in-hospital pediatric deaths occurred in the first 24 h after admission.<sup>19</sup> One of the factors that may explain this situation is that in general, the traditional training of healthcare professionals takes place in large urban hospital centers where emphasis is placed on diagnosis – leaving very little time for the teaching of the principles of emergency care. Accordingly, there is a marked difference between what is taught and what is really needed for resolving emergency situations. On the other hand, in many institutions there are very few professionals with formal training in intensive care, and those who are available are often poorly paid and frequently emigrate to other cities or countries.<sup>13</sup>

This report has a series of limitations that must be taken into account when interpreting the results obtained. Raw mortality data are presented, with no relation to severity scores—a fact that may partly explain the observed differences. The lack of reliable registries in most of the countries makes it difficult to present reliable and/or up to date information. As regards the needs of the specialty, those mentioned by the participants could be more related to their experience and the realities of their working environment than to the true situation of the country as a whole.

## Conclusion

There are significant differences in population and morbidity–mortality among the studied countries. Mortality

is inversely correlated to PICU availability, the number of pediatric intensivists, the number of beds, and the number of specialized pediatric centers. Logistic and financial limitations, deficiencies in the supporting disciplines (laboratory, imaging techniques, surgery, other sub-specialties), a precarious general patient condition secondary to advanced illness or denutrition, delays in admission and inadequate first provided treatments, a heterogeneous distribution of resources, and insufficient professional training in certain areas may all contribute significantly to mortality.

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## Conflicts of interest

The authors declare no conflicts of interest.

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## References

1. United Nations 2015 Millenium Development Goals. Available from: <http://www.un.org/millenniumgoals> [accessed 15 October 2010].

2. Baker T. Pediatric emergency and critical care in low-income countries. *Pediatr Anaesth*. 2009;19:23–7.
3. Sachs JD, McArthur JW. The millennium project: a plan for meeting the millennium development goals. *Lancet*. 2005;365:347–53.
4. Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? *Lancet*. 2003;361:2226–34.
5. Torjesen K, Olness K. International child health: state of the art. *Curr Probl Adolesc Health Care*. 2009;39:192–213.
6. Bryce J, el Arifeen S, Pariyo G, Lanata C, Gwatkin D, Habicht JP, the Multi-Country Evaluation of IMCI Study Group. Reducing child mortality: can public health deliver? *Lancet*. 2003;362:159–64.
7. Dünsen MW, Baelani I, Ganbold L. A review and analysis of intensive care medicine in the least developed countries. *Crit Care Med*. 2006;34:1234–42.
8. Epstein D, Brill JE. A history of pediatric critical care medicine. *Pediatr Res*. 2005;58:987–96.
9. Celis-Rodríguez E, Rubiano S. Critical care in Latin America: current situation. *Crit Care Clin*. 2006;22:439–46.
10. Barbosa AP, Da Cunha AJLA, De Carvalho ERM, Portella AF, De Andrade MP, Barbosa MC. Terapia intensiva neonatal e pediátrica no Rio de Janeiro: distribuição de leitos e análise de equidade. *Rev Assoc Med Bras*. 2002;48:303–11.
11. Barbosa AP. Terapia intensiva neonatal e pediátrica no Brasil: o ideal, o real e o possível. *J Pediatr (Rio J)*. 2004;80:437–8.
12. Souza DC, Troster EJ, De Carvalho WB, Shin SH, Cordeiro AM. Disponibilidade de unidades de terapia intensiva pediátrica e neonatal no Município de São Paulo. *J Pediatr (Rio J)*. 2004;80:453–60.
13. Fowler RA, Adhikari NKJ, Bhagwanjee S. Clinical review: critical care in the global context—disparities in burden of illness, access, and economics. *Crit Care*. 2008;12:225, doi:10.1186/cc6984.
14. Schnitzler EJ, Campos S. Organización de una Unidad de Cuidado Intensivo Pediátrico. In: Quiñones E, Ugazzi M, Campos S, Donoso F, Noviski N, editors. *Bases de Pediatría Crítica*. 4ª ed. Quito: Noción; 2007. p. 981–8.
15. Campos S. Delivery of Acute Care, The Latinamerican Perspective. Available from: [http://www.wfpiccs.org/docs/pcc2007/4\\_Delivery%20of%20Acute%20Care%20-%20Latin%20America\\_CAMPOS\\_Ecuador.pdf](http://www.wfpiccs.org/docs/pcc2007/4_Delivery%20of%20Acute%20Care%20-%20Latin%20America_CAMPOS_Ecuador.pdf) [accessed 15 December 2010].
16. World Health Organization (WHO). World Health Statistics 2010. Available from: <http://www.who.int/whosis/whostat/2010/en/index.html> [accessed 15 February 2011].
17. World Health Organization (WHO). Global Health Observatory (GHO). Available from: <http://www.who.int/gho/publications/en/index.html> [accessed 15 October 2010].
18. Nolan T, Angos P, Cunha AJ, Muhe L, Qazi S, Simoes EA, et al. Quality of hospital care for seriously ill children in less-developed countries. *Lancet*. 2001;357:106–10.
19. Molyneux E. Paediatric emergency care in developing countries. *Lancet*. 2001;357:86–7.