7th International Conference on Intercultural Education "Education, Health and ICT for a Transcultural World", EDUHEM 2016, 15-17 June 2016, Almeria, Spain

Design of a child development baseline (children aged 0 to 6 years) in Bolivia

Manuel Fernández Cruz, Emilio Jesús Lizarte Simón & José Gijón Puerta*

Facultad Ciencias de la Educación, University of Granada, Campus Universitario de Cartuja s/n, Granada 18071, Spain.

Abstract

In this paper, we describe the design of a baseline to set the values of child development in Bolivia, for children between birth and six years of age. It details the process of design and definition of the objectives of the baseline, and its methodological and operational aspects in relation to child development. Having the baseline of child development of Bolivian children up to six years old, by applying instruments adapted to the social, cultural, linguistic and family context of Bolivia, will be very useful since these development data can be used to compare them with international standards of child development commonly accepted, which is not possible at present. Moreover, establishing the baseline of child development in Bolivia will allow to compare the data currently obtained with those obtained by applying other not contextualized developmental scales commonly used in the country, such as the Abbreviated Scale Development Nelson Ortiz, the Ages & Stages Questionnaire (ASQ), Battelle Development Inventory or the National Screening Test (PRUNAPE).

1. Introduction

In this paper we present the methodological design for the elaboration of the baseline on child development from 0 to 4 years in Bolivia. The focused areas of study are: Personal / social; Adaptative; Motor; Communication; and Cognitive areas. The study was developed during 2015 in two departments of Bolivia: Chuquisaca & Potosi. For this

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* Corresponding author. Tel.: +34.958.240.610; fax: +34.958.248.965.
  E-mail address: elizarte@ugr.es

we have used as institutional references, the proposals of the Chilean Ministry of Health (Universidad Alberto Hurtado, 2009) and the Garrahan Hospital of Argentina (Lejárraga et al, 2013).

2. Objectives

The aim of the fieldwork is to establish the baseline of developmental delays in children aged 0 to 4 years in the departments of Chuquisaca and Potosi, to guide the action protocols in stimulation rooms that have just been implemented in Bolivia, and future assessments of the impact of public policy on Early Childhood Development.

The specific objectives established are: (a) to apply an internationally recognized standardized instrument (Battelle Developmental Inventory adapted by TEA editions for Spanish-speaking population); (B) to apply a screening document widely used in Latin America (Ages and Stages Questionnaire for Children ASQ-3, adapted to children of Bolivia); (C) to apply a screening tool (PRUNAPE national screening test developed by the Garrahan Hospital in Buenos Aires); (D) to apply an anthropometric instrument and a health questionnaire; (E) to determine the prevalence of developmental delays that can be generalized to the reference population; (F) to know the behaviour of cross development tools applied to the selected sample to be adjusted to the Bolivian reference population.

3. Methodology

The instruments selected for this baseline study have been previously validated. The content, construct and criterion based on sex and race of BATTELLE Inventory have been validated in a logical, conceptual and statistical processes. The authors recommend to submit progressive data of its application to strengthen its validity and reliability (Newborg, Stock and Wnek, 1996, in its Spanish adaptation by De la Cruz and Gonzalez, 2001). The ASQ-3 questionnaire has been extensively validated as an effective tool in detecting risks of developmental delay, through its combined use with other diagnostic tools (Bricker et al 1995). The PRUNAPE test has been validated in Argentina through the analysis of sensitivity, specificity and cut off points suitable for the detection of risks in development in contrast to specialized clinical diagnostic tests (Lejárraga et al, 2002). The areas to be evaluated coincide for the three instruments selected except for the cognitive or problem resolution areas ASQ-3, which has no correspondence in PRUNAPE area, as shown in Table 1. For the anthropometric measures and health risk assessment in development, the data to be taken are: weight, height, head circumference and identification of existence of foot edema. For the correct measurement of weight and height directions of the Pan American Health Organization (WHO) 2007 will be followed.

Table 1. Development areas and its evaluation

	Instruments		
Areas of early childhood development	BATTELLE	AQS-3	PRUNAPE
	Personal/social	Social/individual	Personal/social
	Adaptative		
	Motor	Gross motor	Gross motor
		Fine motor	Fine motor
	Communication	Communication	Language
	Cognitive	Problem resolution	

The methodological criteria that should guide the fieldwork for diagnosing baseline have to offer robustness of the findings, and a clear definition of the target population intervention. Thus, the criteria that have been considered are: (a) *complementarity criteria* facilitated by the joint application of the instruments selected to the same sample to study the behavior of each of the instruments and their complementarity for the best diagnostic of the delay; (B) *comparability criteria* is reached when handling a sample that has been recently diagnosed with the joint use of Questionnaire ASQ-3 and Nelson Ortiz Scale Development; (C) *Criteria of data triangulation* in the way that the

prevalence of delays that make up the baseline, have been elaborated based on 5 instruments in 2 field work carried out at successive times with a 9-month interval and 2 different institutions.

For the development of the baseline an ordered sequence of activities was established, which includes: (1) Identification of the sample; (2) Preparation of instruments; (3) Organization of work field actions; (4) Selection and training of applicators and supervisors; (5) Fieldwork pilot test; (6) Fieldwork; (7) Data processing; (8) Monitoring; (9) Data analysis; (10) Reporting of results.

Sample identification. The sample consists of 300 children of both genders ranging between 6 to 35 months old, in various municipalities in the departments of Chuquisaca and Potosi, according to the age distribution shown in Table 2.

Table 2. Age distribution of the sample for the baseline

Age range	Number of subjects
6-9	35
10-13	36
14-17	42
18-21	40
22-24	32
25-30	67
31-35	48
TOTAL	300

Preparation of instruments. Both Battelle Developmental Inventory and scale screening PRUNAPE have had to adjust their rules of application and understanding of the items to cultural and linguistic contexts particular to the departments of Chuquisaca and Potosi. The contextualization process has been validated during the training of pollsters and the piloting stage. Questionnaire ASQ-3 has already been adapted to the Bolivian children.

Field work organization. There must be the necessary and sufficient logistical organization (equipment, instruments, protocols, pathways) for the movement of pollsters teams in the territory of intervention. Regarding the application conditions, the following criteria will be used: (a) Search facilities access to the field and diagnostic case; (B) Generate an empathic relationship with parents or primary caregiver; (C) Find an affective and empathic relationship with the children subject of diagnosis; (D) Pay close attention while taking identification data, weight and height measures and the items applied in each of the instruments; (E) Record the information on the standardized data basis; (F) Monitor continuously the processes of application of instruments and recording of information.

Selection and training of pollsters and supervisors. The selection of 8 pollsters and 2 supervisors is done by personal interview and resume. An academic and professional profile was established for both pollsters and supervisors, which is presented in Table 3. An intensive training for supervisors was designed, previous to the training of pollsters, lasting two days. Also, there was an eight-day training session for pollsters prior to the beginning of the work field actions. The basic contents of both training processes are presented in Table 4.

Fieldwork pilot test. Once trained supervisors and pollsters, field training is done by direct application of instruments to children outside the sample selected, in the cities of Sucre and Potosi. Each pollster's team should perform a complete diagnosis to 6 children per team (24 children in total, 8% of the sample size).

Field work. We estimated a 10 weeks period for developing the field work. During this time the pollster's teams visit homes allocated in two successive rounds of non-simultaneous visits. There should be intersperse, at least, one day off for the child. The preparation of application logistics and itineraries is done organizing four routes: 2 itineraries in the Department of Chuquisaca and 2 itineraries in the Department of Potosi. Each itinerary is covered by one team of two pollsters.

Data processing. Data collection should be carried out in record sheets (paper), and then transferred daily to excel sheets using the electronic tablet available to each team pollster. A continuous analysis of consistency between the two formats: paper and electronic, must be done.

Table 3. Profile for pollsters and supervisors

Pollsters	Supervisors
Clinical psychologists with experience in applying child development diagnostic instruments	
Preferable experience in 4, 3, 2 or 1 instruments baseline survey	Supervisory experience
Computer knowledge: tablet use, Internet access, excel template management.	Ability to monitor: observation, good treatment, discretion, and ability to solve problems.
Good capacity of interrelation and communication	Capacity and willingness to lead teams and contact with community leaders and local authorities
Knowledge of Quechua	
Knowledge of the communities to be surveyed	
Availability during the survey application process available operating time during application	Availability during the field work action

Table 4. Training scheme for pollsters and supervisors.

Pollsters	Supervisors
Objective, expected results and final format	
Anthropometric and health measures characteristics	
PRUNAPE Features	
ASQ-3 Features	
BATELLE Features	
Work field actions characteristics	
Entering data in registration sheet (physical) and digital tablet.	Application logistics, workload per team, overall goal and daily goal
Geographic itineraries	
General supervision system: field supervision and monitoring of processing	
Role of the pollsters and pair work: explanation and discussion	Role of field supervisor: duties, obligations and functions
General process of access to the field, contact with the family and the child	Liaison function with the field work coordinator and liaison function with the processing supervisor at the office
Application logistics, workload per team, overall goal and daily goal	Organization of fieldwork. Previous tasks: socio-geographic knowledge, pollsters knowledge, contact with local authorities, oversight materials preparation, job scheduling, workload..
Tasks during the fieldwork: material preparation, contact with parents, test application, entering data in registration sheet (physical) and digital tablet .	Tasks during the fieldwork. Planning, preparation of materials, contact local authorities, reconnoitre, pollsters observation, verification of application, review of daily work, checking and reviewing of forms, monitoring verification, reception of inconsistencies listings, treatment of inconsistencies, replacement of sample homes; application of equivalences form, reporting to the coordinator.
Application practices of the anthropometric scale health questionnaire (revision of the instrument; role practice role; pollsters practice; practical application; group reflection)	Use of control forms
Application practices of the PRUNAPE; Application practices of the ASQ-3;	Practice with control forms
Application practices of the BATELLE (revision of the	

instrument; role practice role; pollsters practice; practical
application; group reflection)

Specific field work for pilot test

Supervision. It is done in two areas: field supervision and processing supervision. Field supervisors make a daily phone call tracking pollsters teams and accompanying daily random visits to each pollsters team in the data collection process (at least 20% of their data). Half of the visits are scheduled and the other half are random. The work of data entering into databases and data processing is monitored by daily monitoring of the consistency of data recorded by pollsters in 100% of cases.

The analysis of the diagnosis information obtained is made using the instruments own standards and analysis matrices. This allows individual reports for each of the instruments and global reports of prevalence of developmental delays observed in the whole sample.

4. Results

The results obtained with the Battelle Developmental Inventory (Newborg, J., Stock, J. R, and Wnek, L., 1996) will be offered according to the standardization of the manual adapted by De la Cruz and Gonzalez. The inventory provides up to 30 possible scores by subject, 22 correspond to the subareas of the scale, 5 areas, 2 to the group of motor subareas and 1 to total overall score. Additionally, as Behrman, Bravo, Urzua (2010) made in the Longitudinal Survey of Early Childhood held in Chile, will be proceeded to an adjustment of the results to the average of the sample analyzed using the standard score z. In both cases it will be deemed that z scores below 1.5 present developmental delay, scores above 1.5 present accelerated development and midrange scores present situation of normality. For the purposes of the diagnosis baseline we can consider the prevalence of subjects, that being in the normal range (ie between -1.5 +1.5 z), have not developed functions and skills appropriate for their age in some areas or sub-areas analyzed by the Inventory. With the inventory data, the following analyzes were performed: (a) Profile of each subject with direct scores, percentiles and standard z scores (the scale of the manual) in areas, subareas and Global Inventory; (b) Percentage of subjects that fall into each of the three ranges set in the typical score (the scale of the manual) in areas, subareas and Global Inventory; (c) Percentage of subjects that fall into each of the three ranges set in the typical score (of the sample) in areas, subareas and Global Inventory; (d) Average scores in areas and subareas by age group, gender, department and range of Body Mass Index; (f) Determination of areas and sub-areas of development in which subjects assigned to the normal range (between -1.5 +1.5 z z) present some delay indicating the percentage for age group as an indicator of its relative prevalence in the sample analyzed. Comparison of prevalences using typical score for standardized sample (scale of the manual) and specific sample of the departments of Chuquisaca and Potosi; (g) Prevalence of developmental delays in areas, subareas and overall development coefficient by age group, gender, department and range Body Mass Index.

The results obtained with the screening questionnaire ASQ-3 adapted to the Bolivian child population, will allow to know the percentage of child population at risk of development delays in the sample studied. The instrument manual refers the direct score in each evaluated area of the three possible categories (Squires, J. Bricker, D., 2009): (a) development above expectations; (b) development just above expectations requiring stimulation activities; (c) development below expectations that require thorough assessment. With ASQ-3 data the following analyzes will be performed: (1) direct scores of each subject, per development area and global; (2) Mean/mid scores in areas by age group, gender, department and range of Body Mass Index; (3) Percentage of subjects in each of the three categories provided and prevalence of risk situations associated with developmental delay considering only category c and the sum of b + c categories; (4) Percentage of risk situations in areas by age group, gender, department and of range Body Mass Index.

5. Conclusions

The results obtained with the test screening PRUNAPE allow to establish two categories in the sample evaluated: (a) subjects without developmental risk; (b) subjects with developmental risk. Lejárraga H. et al (2002), authors of the

test include in the first category those subjects that surpass all tests in the 90th percentile and do not fail more than one of the bands of 75-90 percentiles. In the second category there are included, and therefore are children at risk, those who fail a test in the 90th percentile or two tests of the band percentiles 75-90. It will be recommended a further evaluation. With the data obtained with the application of PRUNAPE the following analyzes are performed: (1) direct scores of each subject, per development area and global; (2) Mean scores in areas by age group, gender, department and range of Body Mass Index; (3) Percentage of subjects in each of the two categories provided (subjects without developmental risk, subjects with developmental risk) in the areas evaluated; (4) Percentage of risk situations in areas by age group, gender, department and range of Body Mass Index;

Along with these analyzes, the triangulation of the four instruments information will allow to make the following analysis of the two screenings (ASQ-3 and PRUNAPE) regarding the Battelle Developmental Inventory considered as a diagnostic test: Sensitivity Analysis; Specificity Analysis; Positive predictive value analysis; Negative predictive value analysis of; Proportion of false positives analysis; Proportion of false negatives analysis; Agreement percentage analysis; Kappa coefficient analysis. Similarly correlations between instruments and between instruments and independent variables as Department, Body Mass Index and other anthropometric and health data taken will be studied.

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