INCAP Publication 1507a

USES AND CONSTRAINTS OF SCHOOLCHILDREN'S HEIGHT DATA FOR PLANNING PURPOSES: NATIONAL EXPERIENCES IN CENTRAL AMERICA

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INTRODUCTION

In 1984 the authors described the background and rationale of incorporating data, generated through schools, into Food and Nutrition Surveillance Systems (FNSS) in Central America and Panama [1]. This follow-up paper examines the uses and constraints of this data source in screening for the most affected communities and evaluates the impact of the programmes and other uses of the data source in FNSS. It deals, furthermore, with the research activities necessary to assess the validity of the school data collection, and examines the representativeness of the data and the possibilities of cost reduction. Data flow and data processing are also discussed.

USES OF SCHOOL DATA IN FNSS

Screening for the Most Affected Communities

The Costa Rican census of schoolchildren's height, measuring all first-grade children in primary school in 1979, and similar measurements carried out in Panama in 1982, have yielded valuable information on the distribution of malnutrition in well-defined political-administrative units within these two countries [2, 3]. As these data are disaggregated to smaller political-administrative units, the differences in the prevalence of malnutrition among the units of comparison become larger [3]. Table 1 illustrates maximum and minimum height retardation (which is defined as less than minus two standard deviations of the mean value of the World Health Organization recommended pattern [4] for the 9 provinces, 66 districts, and 514 *corregimientos* into which Panama is politically and administratively divided. The same data also shows marked differences in height retardation among corregimientos within a district. Table 2 presents the differences observed in height retardation in children residing in corregimientos

TABLE 1. Higher and lower prevalences of height retardation in schoolchildren at the provinicial, district, and corregimiento level in the Republic of Panama. National Census of Schoolchildren's Height, 1982

Administrative units	Number of cases	Prevalence (%)
Provinces		
Los Santos	2,178	12.2
Veraguas	7,634	35.3
Provinces, districts		
Los Santos, Los Santos	567	7.2
San Blas, San Blas[a]	1,030	64.6
Provinces, districts, corregimientos		
Panama, Panama, Ancón[b]	60	0.0
Chiriquí, Barú, Los Limones[c]	40	95.0

a. San Blas is a *comarca* and although, in effect, it is more than a district, it is considered as such and not as a province for political administrative reasons.
b. There are 30 corregimientos in Panama with zero per cent height retardation. Corregimiento Ancón has the highest sample size.
c. There are 14 corregimientos with height retardation prevalence above 70 per cent.

Ailigandí (75 per cent) and Puerto Obaldía (7.3 per cent) from the district of San Blas where, as a whole, height retardation is high (64.6 per cent); and in corregimientos Natá (3.5 per cent) and Las Huacas (40 per cent) from the district of Natá, where height retardation (9.9 per cent) is low. Thus it is possible to send resources to less needy areas if height retardation data are analysed by districts only. The same information collected in Panama in 1982 has been disaggregated for 2,100 schools. The data have been valuable for identifying 120 corregimientos as priority areas for social and nutritional activities and for integrated rural development programmes [5]. The school height data were always in agreement with other data sources in identifying the most deprived and undernourished areas of Panama [6]. However, it is early to assume that these data sets will be used as basic information in directing government resources toward the identified priority corregimientos.

The census of schoolchildren's height conducted in Costa Rica in 1979 has also been a valuable planning tool for

This paper constitutes a summary of national experiences from Costa Rica, Panama, and Nicaragua, and INCAP's Research Program supporting the development of Food and Nutrition Surveillance Systems (FNSS).

TABLE 2. Height retardation in corregimientos from districts exhibiting as a whole high and low prevalences of height retardation. Census of Schoolchildren's Height, Republic of Panama, 1982

District and corregimiento	N	Prevalence (%)
District of Natá	494	9.9
Corregimiento Natá	144	3.5
Corregimiento Capellanía	111	7.2
Corregimiento El Cano	104	4.8
Corregimiento Guzmán	33	9.1
Corregimiento Las Huacas	60	40.0
Corregimiento Toza	42	9.5
District of San Blas	1,030	64.4
Corregimiento Ailigandí	401	75.3
Corregimiento Nargana	372	65.3
Corregimiento Puerto Obaldía	55	7.3
Corregimiento Tubula	202	57.4

Source: Ministry of Health/Ministry of Education [3].

selecting communities and political-administrative zones as priority areas for social/nutrition programmes. The Costa Rican data were disaggregated and reported for the 7 provinces, 80 *cantones,* and 412 districts into which the country is divided [2]. Data from different communities of Costa Rica have been requested and used by governmental offices, universities, and other institutions interested in health and nutrition programmes. Table 3 is taken from a report [7] which motivated the decision of the President of Costa Rica (1978-1982) to declare the 10 cantones with the highest proportion of children with height retardation as priority cantones for social development activities. There are marked differences between the worst- and the best-off cantones, not only in the prevalence of height retardation but also in all the other socio-economic indicators shown in table 3. The school data collected in 1979 was one of the four data sources used in a study conducted by the Ministry of Planning, with the major objective of mapping the distribution of poverty in Costa Rica [8]. The ten cantones shown in table 3, and three additional ones which also exhibited high levels of height retardation, were subsequently selected as priority areas for investments in Integrated Rural Development Programmes [8].

Nicaragua conducted its first national census of schoolchildren's height in 1985 [9, 10], with the stated objective of identifying those communities most affected by malnutrition, which would receive prority allocation of government funds for social/nutrition action programmes.

Thus a valuable and low-cost tool for screening communities which exhibit the highest levels of malnutrition has been developed and used in Central American countries.

Evaluation of Programme Impacts

In Costa Rica and Panama since 1979 the national census of schoolchildren's height has been used to propose evaluations of regional social nutrition and rural development programmes.

The period 1975-1980 was characterized in Costa Rica by large investments in social/nutrition programmes targeted to dispersed rural communities. As shown in table 4, a preliminary analysis of the overall nutritional impacts of these activities, conducted by Valverde et al. [11], used the 1979 and 1981 census of schoolchildren's heights. The analysis compares the changes in nutritional conditions over time in 10 cantones initially identified with the highest prevalence of malnutrition in 1979. Local research institutions in Costa Rica, in collaboration with the Institute of Nutrition of Central America and Panama (INCAP), are planning to ascertain the overall and specific nutritional impacts of various national health and nutrition interventions. They use as dependent variables the data already generated in 1979, 1981, 1983, and 1985 as part of the schoolchildren's height census [12]. The proposed study will use communities as units analyses. The various interventions to be used as independent variables were introduced at different times. Therefore, one of the dependent variables will be the prevalence of height retardation at the community level, analysed in different cohorts of children exposed for different time periods to the interventions.

Camacho et al. [13] studied the impact on schoolchildren's height gains of 30 months of participation in school feeding programmes in Costa Rica. These authors used the 1979 schoolchildren's height census as baseline information and measured heights 30 months later, in a sample of children studied in 1979. Children exhibiting more problems in height retardation in 1979 had greater height gains than their counterparts who exhibited fewer nutritional problems. Although children who were worst off, nutritionally speaking, when they were enrolled in school had greater height gains, changes in height cannot only be attributed to the school meal programme. However, it is important to note that some groups of children exhibiting height retardation in 1979 had height gains above the values expected in children of the same age and sex growing normally in developing nations. The latter finding suggests that, in spite of nutritional deficiencies during the first years of life, the school-age period can also be used to reduce the detrimental effects on growth of low consumption and/or utilization of energy and nutrients occurring during those early years.

The Nicaraguan government will also use the school data, not only as a means for targeting and planning Integrated Rural Development Programmes (IRDP), but also for

TABLE 3. Social profile of the ten *cantones* exhibiting higher and lower levels of height retardation in children attending first grade. National Census of Schoolchildren's Height, 1979, and Census of Population and Housing, 1983, Costa Rica

Canton	Percentage of cases				
	Height retardation	Illiteracy	Poor housing	No excreta disposal system	No potable water
High prevalence of height retardation					
Coto Brus	25	18	20	39	78
Los Chiles	23	35	16	53	89
Buenos Aires	23	23	29	52	84
Aserrí	23	13	17	16	12
Pococí	22	15	15	19	62
Turrubares	22	30	17	37	45
Guatuso	22	29	16	44	87
Guácimo	21	18	15	21	55
Tarrazú	21	16	18	18	18
Golfito	21	17	12	24	38
Low prevalence of height retardation					
Tibás	7	4	10	1	1
Moravia	7	3	8	2	5
Alfaro Ruiz	7	7	6	2	12
Montes de Oca	6	3	8	1	2
Barba	6	6	11	2	2
Central San José	6	4	10	0	1
Atenas	6	10	15	7	15
Goicoechea	5	4	9	1	2
Palmares	5	6	8	7	8
Belén	4	5	6	4	2

Source: Valverde et al. [7].

conducting comparative impact evaluations of different types of IRDP [9, 10]. The census data will be used as a dependent variable to contrast the nutritional impacts, over time, of different types of interventions and to control for other factors, not related to the programmes, that may influence nutritional status.

Thus the census of schoolchildren's height, conducted periodically, is a highly effective way of evaluating the impact on nutritional status of various kinds of nutritional intervention programmes for deprived populations.

Other Uses

Figure 1 shows the mean height values according to age of males measured in Costa Rica in 1979 [14]. The solid lines reflect the median height values of the WHO-recommended reference pattern for children aged 60 to 144 months. Under 60 months of age, the mean value of heights of Costa Rican children are above the median value reported in the WHO reference pattern; however, as the age increases, the mean height values of Costa Rican children fall below the median value of heights reported in the same reference pattern. Thus, at 144 months the difference between the mean height value of Costa Rican children and the median value of the WHO reference pattern is around 15 cm. Therefore the age of admittance to first grade is an excellent indicator of the nutritional status of children, since in Costa Rica no child repeats first grade and all children measured in 1979 were attending school for the first time.

The educational authorities of Costa Rica, however, saw the same data, describing children's school starting age and their nutritional status, in a different way. Since 1860 school attendance for children over 7 years old has been free and compulsory; yet the 1979 census showed that 13.2 per cent of Costa Rican children above eight years old were attending school for the first time [14]. The information proved to be more useful to the Ministry of Education for identifying attendance problems in their education system than for its nutritional implications.

As the census of schoolchildren's height becomes a periodic

TABLE 4. Height retardation in 1979 and 1981[a] in schoolchildren from the ten *cantones* identified as having the highest prevalence of height retardation in Costa Rica in 1979.

Canton	Prevalence of height retardation (%)		
	1979 (A)	1981 (B)	Change (B-A/A)100[a]
Coto Brus	24.6	20.4	−17
Los Chiles	23.1	20.4	−37
Buenos Aires	23.0	15.8	−31
Aserrí	22.8	18.4	−19
Pococí	22.1	14.1	−36
Turrubares	21.7	26.4	+22
Guatuso	21.6	11.7	−46
Guácimo	21.3	18.2	−15
Tarrazú	21.2	9.8	−54
Golfito	21.0	17.0	−59

a. Pineda [10].

activity in all Central American countries, other potential uses will be identified.

CONSTRAINTS AND RESEARCH ACTIVITIES

INCAP and the national authorities responsible for FNSS activities in its member countries identified several key points which demanded research before the school data could be fully recommended as a core element of FNSS.

The first research task conducted in Costa Rica consisted in testing the value of the instrument and the set of instructions used by teachers as mechanisms to collect valid anthropometric data for FNSS. The activity entailed a series of pretests, until it was established that measurement errors in absolute height values were within acceptable limits [15]. With a broader understanding on the uses of FNSS data (selecting populations and not individuals for action programmes), the criteria for accurate data collection were modified from the use of absolute height values within acceptable limits to the teacher's capacity to estimate correctly the prevalence of height retardation in groups of children. This latter approach was tested in Guatemala and reported by Velasco-González et al. [16]. These authors showed that, in spite of differences in absolute values as measured by the teachers and experienced anthropometrists in Guatemala, teachers estimated the prevalence of height retardation correctly. Similar evidence has been reported for Nicaragua, where the modified version developed in Guatemala was modified again and tested in rural areas. The results showed that teachers were also able to measure accurately not only the prevalence but also the absolute height values: teachers and supervisors obtained results of 119.2 ± 6.7 cm and 119.1 ± 6.1 cm respectively [10].

The census of schoolchildren's height conducted in Costa Rica in 1981 also gathered information of a socio-economic nature, such as the occupation and education of the head of the household, family migratory patterns, and the number of children under five years of age. The data were collected through a sheet taken home by children (as homework) to be filled in by their parents or guardians.

The validation of the socio-economic data thus collected included household visits conducted before the 1981 school census started. The validation activity showed that the information reported by the child and its parents was very accurate; only in two per cent of the cases was one mistake in reporting found. Furthermore, a validation exercise was also conducted to ascertain whether teachers were coding the socio-economic variables correctly, and no major errors were identified.

A research project was conducted using different cut-off points to mark the point below which children are said to be suffering from height retardation (< -2 standard deviations or below 90 per cent of the median value of height for children included in the WHO reference pattern). This study used 10 per cent of the corregimientos studied in Panama in 1982 [17]; its specific aim was to explore whether the use of the different approaches to determine height retardation made a difference in the ranking order of corregimientos according to the magnitude of malnutrition. The results showed that the corregimientos were ranked similarly by either approach. The value of the Spearman correlation was ($r = 0.995$). As expected, the approach using the standard deviations yielded, in all the studied corregimientos, higher prevalences of height retardation than the approach using the prevalence of children as expressed by the percentages of cases below 90 per cent of height-for-age. The data collected in Costa Rica and Panama also show that the school-height data yielded similar results in classifying districts or counties with more malnutrition as opposed to those estimated by anthropometric sample surveys of children under five or the mortality records of infants one to four years old.

INCAP has recently designed and tested an approach for identifying the steps and procedures required for an appropriate design of FNSS in developing nations [18]. This approach is based on an exhaustive review of existing sources of government information and on present and potential data needs of professionals who are responsible for political and technical decisions on government programmes. It is suggested that, prior to the operation of an FNSS in a country, the review of available data sources and identification of data needs should take place. Thus, any attempt to make use of data generated by the school system should take into account that which is actually or potentially available in the data source, and the likely

uses of the information by the educational and other government sectors.

INCAP has identified priority research areas supporting the use of schoolchildren's height data for FNSS activities. The first research area addresses the question of the bias introduced in interpreting data on the geographical distribution of malnutrition and changes over time, in situations where school attendance is low. This concern resulted from a belief that those children not attending school are nutritionally worse off than their counterparts from the same geographical area who attend school. If such a bias exists, it may mask real differences in the prevalence of malnutrition, which in turn may lead to a serious misclassification of priority target areas. Furthermore, if differences in nutritional conditions between school attenders and non-attenders truly exist and if, over a period of time, improvements in the school coverage system occur, the interpretation of changes in nutritional status will offer serious problems, because the populations compared in both periods will be different.

Data from the census conducted in 1979 in Costa Rica and in 1982 in Panama pointed out that the areas exhibiting the worst socio-economical conditions are likely to have more problems of access to educational services and also to exhibit the highest prevalence of malnutrition. This implies that, regardless of the lower attendance in schools and any likely differences in nutritional status between attenders and non-attenders, the height data from the school system may still rank communities correctly, according to the prevalence of malnutrition. The likely bias introduced by low school attendance, compared to the prevalence of height retardation over time periods, still needs to be addressed by a carefully designed field investigation.

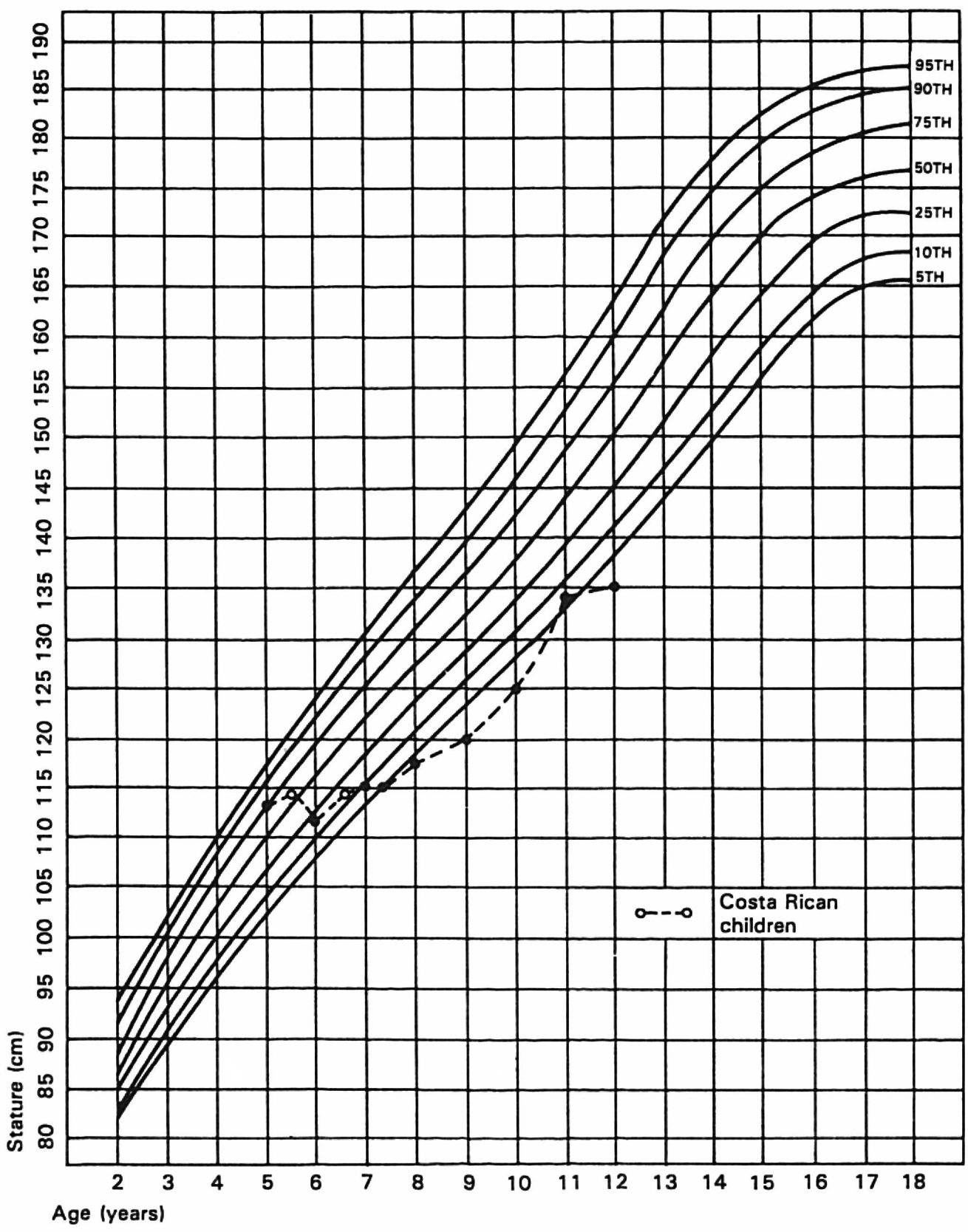

FIG. 1

INCAP is also committed to research activities which will lead to an easier and less costly approach to data handling at both the school and central levels. For example, each of the censuses carried out in Costa Rica in 1979, 1981, and 1983, and the one conducted in Panama in 1982, have collected data on approximately 52,000 to 60,000 individual children. Teachers have sent information for each individual's height, age, and sex to the central offices. Thus, it is necessary to design and test a set of instructions so that teachers may ascertain whether they can classify children's height correctly (as height-retarded and non-height-retarded children) at schools. If the latter approach does not introduce bias in estimating the true prevalence of height retardation at the school level, teachers will be requested to send a summary of children's height-for-age with a breakdown by sex and semester of age. The latter information can be contained in one computer register (card), thus reducing data entry in any future census in Costa Rica and Panama from 55,000 registers (one per child) to around 2,200 registers (one per teacher).

Furthermore, it is also necessary to determine whether teachers can obtain accurate and representative socio-economic information from parents or guardians on the day they register children attending first grade. The data collected by teachers is to be compared with data from household community surveys.

CONCLUSION

While it is still too early to evaluate the impact of FNSS activities and strategies in reducing or eliminating malnutrition, the current interest in collecting food, health, and nutrition data is likely to continue indefinitely.

A major conceptual and practical problem faced by developing nations is the lack of understanding that FNSS is not an isolated tool but a set of activities for the diagnosis, monitoring, and evaluation of an effective planning process. The allocation of time and resources in the planning stage of FNSS ensures that the designed system is what the users need and what the country can organize given its infrastructure and economic situation. The most useful indicators for measuring determinants of malnutrition, the impacts of specific programmes, global impacts, and government performance [1] should be identified and, together with the best data resources, should receive more attention in future FNSS design than in the past. The effective link between FNSS and those responsible for political and technical decisions should also be the subject of further investigation.

The data generated from the school systems in Central America and Panama have been the most important source in FNSS, leading to effective decisions for programme planning and evaluation. There is no doubt that, in terms of the amount of data collected, representativeness, and costs, this favourably compares with the information on nutritional status generated through the health sector. Furthermore, their potential to generate other types of data (socio-economic), useful in various sectors of food and nutrition planning, has been demonstrated. We may expect that most countries of Central America will centralize the collection of indicators of nutritional status problems.

At present, INCAP has responded, not only in providing technical assistance to its member countries for setting up FNSS, but also in conducting operational research projects to elucidate technical doubts about the data source and/or in devising methods which improve the efficiency of the system. It is expected that bilateral and international agencies, promoting the development of FNSS, will support the required operational research and training efforts which will confidently promote the use of data from the school systems as the core data source for FNSS in developing nations.

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