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'HEALTHY' HOUSEHOLD AND CHILD SURVIVAL IN BRAZIL

Diana Oya Sawyer
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ESCOLA NACIONAL DE CIÊNCIAS ESTATÍSTICAS - ENCE

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Nº 10/92

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by

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'HEALTHY' HOUSEHOLD AND CHILD SURVIVAL IN BRAZIL

Diana Oya Sawyer[1]
Kaizô I. Beltrão[2]

The Demographic and Health Survey (DHS) carried out in Brazil in 1986[3] made available data for more comprehensive studies on child mortality in Brazil and brought us an excellent opportunity to test some hypotheses which were long time present in our mind.

During the last two decades child mortality in Brazil has been experiencing a steadily downward tendency. The current infant mortality can be estimated as been around 50 by 1000 live births which compared to estimates of around 80 by the mid 1970's indicates that infant mortality in Brazil is undergoing a process of a very rapid transition from high to medium level[4].

Previous study by the authors has shown that for some regions the changing mother's educational and parity composition were responsible for more than 60% of the overall child mortality decline[5]. A further refinement for those findings is to seek the path by which the mother's education would influence infant mortality differentials by introducing behavior variables as an intermediating dimension and to perform a multilevel analysis on the role of mother's education and economic variables on an ampler set of demographic variables.

To pursue our objectives we decided to work with a concept of 'healthy' household. The main idea is that underlying a broad group of related variables there is a non-observable factor responsible for their multicolinearity. These variables can be combined to produce an estimator

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[3]For more detail in the sample design, size and preliminary results see: ARRUDA, J.M. et alii. 1987. Pesquisa nacional sobre saude materno infantil e planejamento. Rio de Janeiro, 1987.

[4]The Northeast, although with signs of a more recent decline, is the only region, among the five Brazilian Great Regions with a persistent high infant mortality around 100 per thousand.

[5]BELTRAO, K.I. & SAWYER, D.O., 1990. Medidas de mortalidade na infância: efeitos da mudança da estrutura de educação da mãe e da fecundidade. *Relatórios de Pesquisa. IBGE/ENCE: Rio de Janeiro.*

of the non-observable factor which lies in an one dimensional sub-space. In our framework we considered one directly observed variable and three estimated factors: i. mother's educational level; ii. the material condition of the household; iii. household demographic composition and iv. health related behavior. For each of the three factors, households were identified by a pair of scores which represent its proximity to one of the two predefined ideal profiles describing the extremes conditions of 'least healthy' to 'most healthy'.

Those factors were considered as covariates of the household mortality experience in logistic regressions by which we could assess their relative weight in the household infant mortality experience differentials. Two multilevel logistic regression models were also considered. The first considered the mother's education as independent variable and the demographic and health related behavior as intermediate variables, and the second considered the material condition of the household as independent variable. In order to control the reverse effect of the household child experience on the health related behavior the models were run for the household's first live birth and for the totality of children ever born. The details of variables and models definition are explained in the next section.

THE MODELS AND THE VARIABLES

The dependent variable.

The dependent variable is the household infant mortality (${}_1q_0$), measured as a proportion of those live births that did not survive to the end of the first year of life. The infant mortality was defined for all children ever born in the household and for the first child ever born, they will be denominated respectively as ${}_1qm_0$ and ${}_1qp_0$.

The factors and their scores:

For the construction of factors, the Grade of Membership (GOM)[6] analysis was used to

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[6]For theoretical construction and empirical uses of the GOM analyses see, for examples:BERKMAN, L. & SINGER, B.. 1989, Black/White differences in health status and mortality among the elderly. *Demography*, 26(4), November. p.661-678; SINGER, B. 1989, Grade of membership representations; concepts and problems. In: ANDERSON, T.W. et alii (edts). *Probability, statistics and mathematics: essays in honor of Samuel Karlin.* San Diego: Academic Press; WOODBURY. M.A. et alii. 1978, Mathematical typology: a grade of membership technique for obtaining disease definition. *Computers and Biomedical Research*, 11, p.277-298;

score each household according to its similarity to the two descriptive extreme profiles. Combining theoretical understanding of the composition of a potentially or substantively 'healthy' household, a set of related variables were selected to define for each factor what would be the ideal extreme profiles of most likely 'least healthy' and 'most healthy' household.

The variables used to estimate each factor are presented in Chart 1.

The 'material condition of the household' was considered a factor underlying variables indicating the household sanitary infrastructure and a measurement of wealth by presence of consumer durable goods, and by the presence of a maid. Those wealthier households and with adequate sanitary infrastructure were considered potentially 'most healthy'. The 'household demographic composition' was another factor scored by mother's age at first delivery, parity, average intergenesic interval and presence of women aged 15 or more who could help look after children. The potentially 'most healthy' household profile was defined either by theoretical knowledge or by results found in the literature relative to demographic risk factors to infant mortality.

The last factor represented by GOM analysis was the 'health related behavior'. This factor intended to apprehend attitudes and knowledge that would pose different degree of risk to child survival. It was constructed by the proportion of children that were vaccinated within the recommended period against the usual infancy communicable diseases, adequate treatment in case of diarrhea, the proportion breastfed, prenatal care, preventive gynecological exams and knowledge of menstrual cycle.

In the GOM analysis the variables' joint probabilities are calculated as a linear combination of the distribution of a set of profiles (in our case predefined and in number of two). The scores are the maximum likelihood estimators of the weights corresponding to each profile.

The GOM algorithm would score households for each factor according to similarity to each of the two predefined extreme profiles. All the variables considered for the construction of a factor were dichotomic, the first category indicating an hypothesized non favorable condition for the survival.

Chart 1: Factors and their components

COVARIATES	VARIABLES	CATEGORIES
1. Mother's education	1. Literacy	1. fluently read and write 2. read and write with difficulty 3. neither read nor write
2. Material condition of the household	1. water	0. no inside running water 1. w/ inside running water
	2. sewage	0. none, precarious privy 1. pub. system, septic tank
	3. radio	0. no 1. yes
	4. TV	0. no 1. yes
	5. bicycle	0. no 1. yes
	6. car	0. no 1. yes
	7. refrigerator	0. no 1. yes
	8. washer	0. no 1. yes
	9. bathroom	0. no 1. yes
	10. maid	0. no 1. yes
3. Demographic composition of household	1. mother's age at first delivery	0. <20yrs or >=35yrs 1. 20 - 34yrs
	2. mean intergenesic interval	0. <24mo or >=48mo 1. 24 - 47mo
	3. mother's parity	0. >= 4 1. 1 - 3
	4. number of women above age 15	0. 1 1. 2 or more
4. Health related behavior	1. proportion of children vaccinated within recommended period a. polio (3 doses) b. diphtheria (3 doses) c. whooping cough (" ") d. tetanus (" ") e. measles (" ") f. tuberculosis	0. < 0.50 1. >= 0.50
	2. knowledge menstrual cycle	0. no 1. yes
	3. preventive cervical cancer test	0. no 1. yes
	4. proportion children with prenatal care	0. < 0.50 1. >= 0.50
	5. proportion children breastfed	0. < 0.50 1. >= 0.50
	6. adequate treatment in case of diarrhea	0. no 1. yes

In the 'most healthy' profile scale of a factor, households will be scored zero if all the variables are in the first category and one if they are all in the second, and vice-versa for the 'least healthy scale'. Different combinations of first and second categories would generate scores, in the 'least healthy' scale, that would be closer to one the more variables there are in the first category. In our study, the scores generated in the 'least healthy' scale were then used as covariates or as intermediate variables for the logital models.

The mother's educational level was also used as a covariate of infant mortality and was measured by the mother's degree of literacy.

The models:

The models used were:

a: Step-wise logit regression models that considered all the factors at the same level using each, at a turn, ${}_1qm_0$ and ${}_1qp_0$ as dependent variable. The rational for using those two models was to have some control over the fact that many of the variables which defined the scores for the factors were measured for the last five years (e.g. health related behavior) or at the moment of the survey (e.g. household material condition). By testing the significance of the difference among factors coefficients in the ${}_1qm_0$ and ${}_1qp_0$ models we could evaluate the existence of secular trends either in mortality levels or in the above mentioned variables. Although there is a confounding effect and we cannot discriminate between those trends, we can still list hypotheses consistent with the findings. Although using GOM scores and reducing the number of variables from 26 to four we manage to minimize the problem of colinearity, we did not solve it altogether. There is still some correlation among the factors considered which will be evident in the fitted nested models.

The fitted models were:

a1: $Y = Exp[\mu] + \varepsilon$;

a2: $Y = Exp[\mu + \alpha.B] + \varepsilon$;

a3: $Y = Exp[\mu + \beta.D] + \varepsilon$;

a4: $Y = Exp[\mu + \gamma.M] + \varepsilon$;

a5: $Y = Exp[\mu + \alpha.B + \beta.D] + \varepsilon$;

a6: $Y = Exp[\mu + \alpha.B + \beta.D + \gamma.M] + \varepsilon$;

a7: $Y = Exp[\mu + \alpha.B + \beta.D + \gamma.M + \delta_1.E_1 + \delta_2.E_2] + \varepsilon$

where Y is the odds for the mortality rate (either for all children or the first one, ${}_1qm_0$ and ${}_1qp_0$), μ is the average mortality in the logit scale for the best score (value zero) in each model; B represents the scores of behavioral factor, D represents the scores of household demographic condition, M represents the material condition scores, E_1 and E_2 are dummy variables for educational level 1 and 2, and ε is the stochastic term. The parameters estimated in the model were μ, α, β, γ, δ_1 and δ_2.

b: Multilevel logit regression models by which we could assess the way mother's educational level and material condition of the households would influence infant mortality through the intermediate factors (household demographic composition and health related behaviors).

The fitted models were:

b1: $Y_e = Exp[\mu_e + \alpha_e.B] + \varepsilon_e$;

b2: $Y_e = Exp[\mu_e + \beta_e.D] + \varepsilon_e$;

b3: $Y_e = Exp[\mu_e + \alpha_e.B + \beta_e.D] + \varepsilon_e$;

b4: $Y_m = Exp[\mu_m + \alpha_m.B] + \varepsilon_m$;

b5: $Y_m = Exp[\mu_m + \beta_m.D] + \varepsilon_m$;

b6: $Y_m = Exp[\mu_m + \alpha_m.B + \beta_m.D] + \varepsilon_m$;

where the subscripts $_e$ and $_m$, respectively represents conditional values for a given category of mother's educational level and material condition of the household and variables and parameters were already defined above. The households were categorized in three levels of material condition, the first level corresponds to households with scores 0 to .333 representing those with better conditions, the second corresponds to scores above .333 to .667 and the third to scores above .667.

RESULTS

Our sample consisted of 2370 households where there was at least one woman aged 15 to 44 and with at least one live birth. They are representative of the 6 regions considered in the DHS survey: the Southern States of Rio Grande do Sul, Santa Catarina and Parana; the State of Sao Paulo; the State of Rio de Janeiro; the Southeast Area of Minas Gerais, Espirito Santo and Brasilia; the Northeast Region and the urban North and Center-West Region. Unfortunately the sample size did not support a regional analysis, a desirable situation because of the extremely higher rates of infant mortality in the Northeast, if compared to other regions.

The structure of 'healthy' households

GRAPHS 1 to 3 present histograms for the GOM scores obtained for each factor in the 'least healthy' scale. As for the health related behavior scores, 14% of the households were scored exactly 1 (at the 'bad' extreme of the scale) and 12% were scored exactly 0. Even taking into consideration those with score 1, the distribution is right-skewed. 25% of our sample was classified with scores from 0 to .125; 50% were up to .266 and 75% up to score .577. As defined in this study, most of the households are classified in the 'most favorable ' side of the scale.

The household demographic factor comprised less variables for its scoring and the distribution is less continuous than the behavior scale but it showed a much more symmetric shape. The first quartile was at the score .333, the second at .500 and the third quartile at score .749.

The material condition of the household showed a left-skewed distribution, indicating higher proportions of the household in the 'less favorable' extreme of the scale. The three quartiles were at scores .443, .555 and .886, respectively.

The distribution for mother's educational level was 21% for households with illiterate mothers, 18% for those able to read and write with difficulty and 61% for those who reads and writes with fluency[7].

[7]There were only 3 households with more than one women with at least one child ever born.

The sample unweighted infant mortality rate for all children was .067 and for the first children was .088. Choosing them as threshold points that would divide the factor's scores int o the most and the least healthy groups, we can see in Graphs 4 to 6, which present mortality rates as afunction of the different factor scores, that for the health related behavior the threshold score is .4156; for demographic factor .5232 and for material condition .6481. Those threshold scores for the first children are, respectively .4342; .5310 and .6602. Table 1 shows the propo rtion of household classified in each of those groups. Mortality rates as functions of the scores were evaluated at a grid defined in [0,1], at .1 intervals. Other numerical values of the function were then obtained via linear interpolations of the function values at the grid.

Table 1. Proportion of households classified as 'most healthy' (below threshold score) according to GOM scores of each factor.

Factor	All Children	First Children
Health related behavior	71.81%	72.61%
Demographic composition	69.09%	69.66%
Material condition	66.83%	68.09%

The consistency of the data is corroborated by the very similar figures obtained for the estimated proportion of households below the threshold for the first and all children. They are also similar across factors as would be expected since we are actually estimating, through those factors, the proportion of households below the threshold point.

Fitted Models

Table 2 presents the adjusted coefficients for the stepwise logit regression (with analternative path when adding the second variable) for all the factors.

For both, all children and first children mortality rates, in the two parameter models (models a2, a3 and a4), behavioral, demographic and material scores were found significantly different from zero. When the first two were included together, they remained significantly different from zero (model a5). When material condition was also included in the fit (model a6) the 95% confidence interval for the parameters of both behavior and demographic scores did include zero and only material condition was statistically significant, but below the coefficients estimated in model a4 (material condition alone), a sign for colinearity among the variables in a6. In those models the estimates for the covariates parameters were always positive, even when not significantly different from zero, showing that mortality risks are increasing functions of scores, as expected.

Model a7 includes besides the above mentioned covariates two dummy variables representing mother's education (levels 1 and 2). The coefficients for the behavioral and demographic factors are not significantly different from zero, educational levels are significant but the material condition factor is significant only for all children, but not for the first children.

The larger the regression coefficient (in absolute value) for a given variable the more it discriminates (given that in our case all the scores have the same range 0-1, and are fairly well distributed in this range) between extreme profiles in the population. Among the factors considered the material condition of the household presents the larger mortality differentials between extreme profiles followed by the demographic composition and the health related behavioral score (see Graphs 4 to 6). The infant mortality rates ${}_1qm_0$ for those households scored 0 in material conditions (most healthy) was 26.9 per thousand, while for those scored 1 was 109.0. The respective rates for demographic composition was 39 and 107, and for health related behavior were 53 and 94. The differential magnifies to a six-fold figure when calculated from the intersections of the material, demographic and behavior scores. A regional decomposition of the rates would possibly reveal a large contribution of the Northeast region in the least healthy profile, and of the Southern states in the most healthy profile.

The overall ${}_1qm_0$ was 67.1 per thousand and the ${}_1qp_0$ was 88.3. In the logit scale they were statistically significant at 5% level. In models a2 to a6, μ is the logit of the infant mortality for the combination of 'most healthy' profile of each factor. The difference between the estimates for all and first children, were no longer significant. Their values were very similar when material condition of the household is among the covariates, for model a4 the corresponding infant mortality rate for all children was 26,3 per thousand and 29.5 for first children, for model a6 the respective rates were 25.1 and 28.1. We can see in Graphs 4 to 6 that as the scores increase the ${}_1qm_0$ and ${}_1qp_0$ diverge at the extreme least healthy profile. The differences of those rates were statistically significant.

Graphs 7 and 8 present, for all births and for the first births, the infant mortality rate curves as function of the three factors's scores. Comparing the curves of the different factors for both first and all births, we can observe that they converge at high scores. The 'least healthy' situation for all factors presents similar mortality rates, while scores near zero present more diverse values, indicating that family with high scores in one factor would also present high scores for the other factors.

For each of the factors in the two parameter models (a2 and a3), coefficients consistently were larger in absolute value for first children then for all children. This indicates that the factors discriminate better for the former and that differential mortality among first born was larger than for all births.

Considering the differences discussed in the previous paragraphs, between mortality rates for the first and all births we can say they are consistent with two overlapping situations:

1) If the factors' scores were constant over time, there would exist a secular declining trend in mortality levels, with a steeper slope for high mortality rates.

2) If mortality rates were constant over time for all given combinations of behavioral/demographic/material condition/educational levels, the computed score values for all factors, would have been higher if the reference date was the time of the first birth. Scores indicating worst material condition, higher risk demographic situation and health related behavior, would have shown a larger improvement over time.

Table 2. Estimated coefficients for the logital models

Model	Parameter	All Children	First Children
a1	μ	-2.6320*	-2.3350*
a2	μ	-2.8913*	-2.7350*
	α	0.6197*	0.9135*
a3	μ	-3.1932*	-2.9968*
	β	1.0695*	1.2399*
a4	μ	-3.1932*	-2.9968*
	γ	1.5100	-1.7500*
a5	μ	-3.2828*	-2.9968*
	α	0.4383*	0.7522*
	β	0.8934*	0.9655*
a6	μ	-3.6568*	-3.5439*
	α	0.0132	0.3382
	β	0.2530	0.3551
	γ	1.3677*	1.3200*
a7	μ	-2.6371*	-2.5518*
	α	-0.1090	0.1957
	β	0.3042	0.4704
	γ	0.7915*	0.7685
	δ_1	-1.0037*	-0.9617*
	δ_2	-0.2489*	-0.3280*

*Statistically significant at 5% level.

Tables 3 and 4 present the estimated coefficients for the multilevel models, controlled respectively by educational and material condition levels. Only for the highest educational level behavioral and demographic factors were found significant in the two parameters model (b1 and b2). When both intermediate factors were present (model b3), only the demographic was significantly different from zero. Even considering that they were not significantly different from zero, all the coefficients were smaller for the lowest levels of education (2 and 3) suggesting that the intermediate factors are less important in these strata.

For each educational level, the constant factor (μ) 95% confidence interval, did not include the estimated value for the other levels constant factor, in all models. The correspondent infant mortality rates ranged from 34.9 per thousand for more educated women to a value of 120.2 for less educated women in the 'most healthy' profile in the behavior factor; from 39.4 to 87.4 in the demographic factor and 36.2 to 84.4 in the material factor.

Table 3. Estimated coefficients by the multilevel models. Controlled by educational levels

		Educational Levels[1]			
Model	Parameter	All	1	2	3
b1	μ	-2.8913*	-3.3207*	-2.3621*	-1.9901*
	α	0.6197*	0.6139*	-0.1699	0.1679
b2	μ	-3.1932*	-3.6335*	-2.4615*	-2.3459*
	β	1.0695*	1.0712*	0.0460	0.7566*
b3	μ	-3.2828*	-3.6806*	-2.4088*	-2.3838*
	α	0.4383*	0.4115	-0.1946	-0.0935
	β	0.8934*	0.8765*	0.1099	0.7391

*Statistically significant at 5% level.

[1] 1: Fluently read and write; 2: Read and write with difficulty; 3. Neither read nor write.

Table 4. Estimated coefficients by the multilevel models. Controlled by material condition levels

		Material Condition Levels[1]			
Model	Parameter	All	1	2	3
b4	μ	-2.8913*	-3.5487*	-2.7645*	-2.3963*
	α	0.6197*	0.7895	-0.3555	0.2179
b5	μ	-3.1932*	-3.0919*	-3.3821*	-2.5360*
	β	1.0695*	-0.9932	1.0985*	0.4282
b6	μ	-3.2828*	-3.2852*	-3.2898*	-2.6405*
	α	0.4383*	0.6390	-0.4878	0.1945
	β	0.8934*	-0.8383	1.1679*	0.4109

*Statistically significant at 5% level.
[1] 1. Best; 2. Average; 3. Worst.

Controlling for material condition, only for the middle level the demographic factor was found significant, both in the two and in the three parameter models (b4 to b6). The behavioral factor was never statistically different from zero.

As for the constant factor, although with narrower differentials among material condition categories, it was verified a similar pattern with those obtained in the multilevel analysis controlled by educational levels. The infant mortality rates for those households in 'most healthy' side of the intermediate variables' scale ranged from 28.0 per thousand to 83.5 in model b4; 39.4 to 73.4, in model b5 and 36.2 to 66.6, in model b6.

The lack of significance of the intermediate factors can be seen more clearly in Graphs 9 to 12, which show the infant mortality curves as function of the intermediate factors for each level of mother education and material condition. If the intermediate factors were significant mediating factors for independent variables (mother's education and material condition of the household), we would expect a fan shaped pattern of the independent variable levels' curves according to intermediate factors' scores. They would be convergent around score 0 and divergent around score 1, indicating that as we move from households with potentially healthier behavior or demographic composition to those potentially less healthy the infant mortality differentials would be widening. What we see in the Graphs 9 to 12 are quite different pattern. The infant mortality curves for levels 1 and 3 of mother's education and household's material condition present a more parallel-like pattern as a consequence of the non significance of the intermediate factors in discriminating the mortality differentials between levels of the independent variables. The intermediate levels of the independent variables show a non regular pattern, probably due to the smaller number of cases in these categories.

FINAL COMMENTS

One of the main problem we face in assessing the determinants of infant mortality is the difficulty in combining a comprehensive framework and a sufficient sample size that would provide reliable estimates of the relevant differentials and that would reveal sub-populations specificities. A comprehensive framework involves many multidimensional determinants which operate in a multilevel pathway.The usual clustering methods for multidimensional determinants may result in a combination of variables with very few or no frequency, either because of the sample size or because of the nature of the determinants themselves. At the same time we want to apprehend the heterogeneity of the underlying determinant represented by a set of variables, we want also a relatively spread distribution of cases.

The GOM scores we used to represent the degree of similarity of the households to a given set of predefined profiles of their material condition, demographic composition and health related behavior were based on 10, 4 and 11 variables respectively. There was a reduction of 25 variables to 3 underlying factors which by their turn, along with mother's educational level, revealed a good discriminatory capacity in discerning the infant mortality differentials.

Our understanding of the concept of potentially and substantively healthy household was the guideline to predetermine the most and the least healthy profile for each household. The choice of variables to include and their categorization, although based on theoretical assumptions or on the accumulated evidences in the literature, can be reformulated and retested.

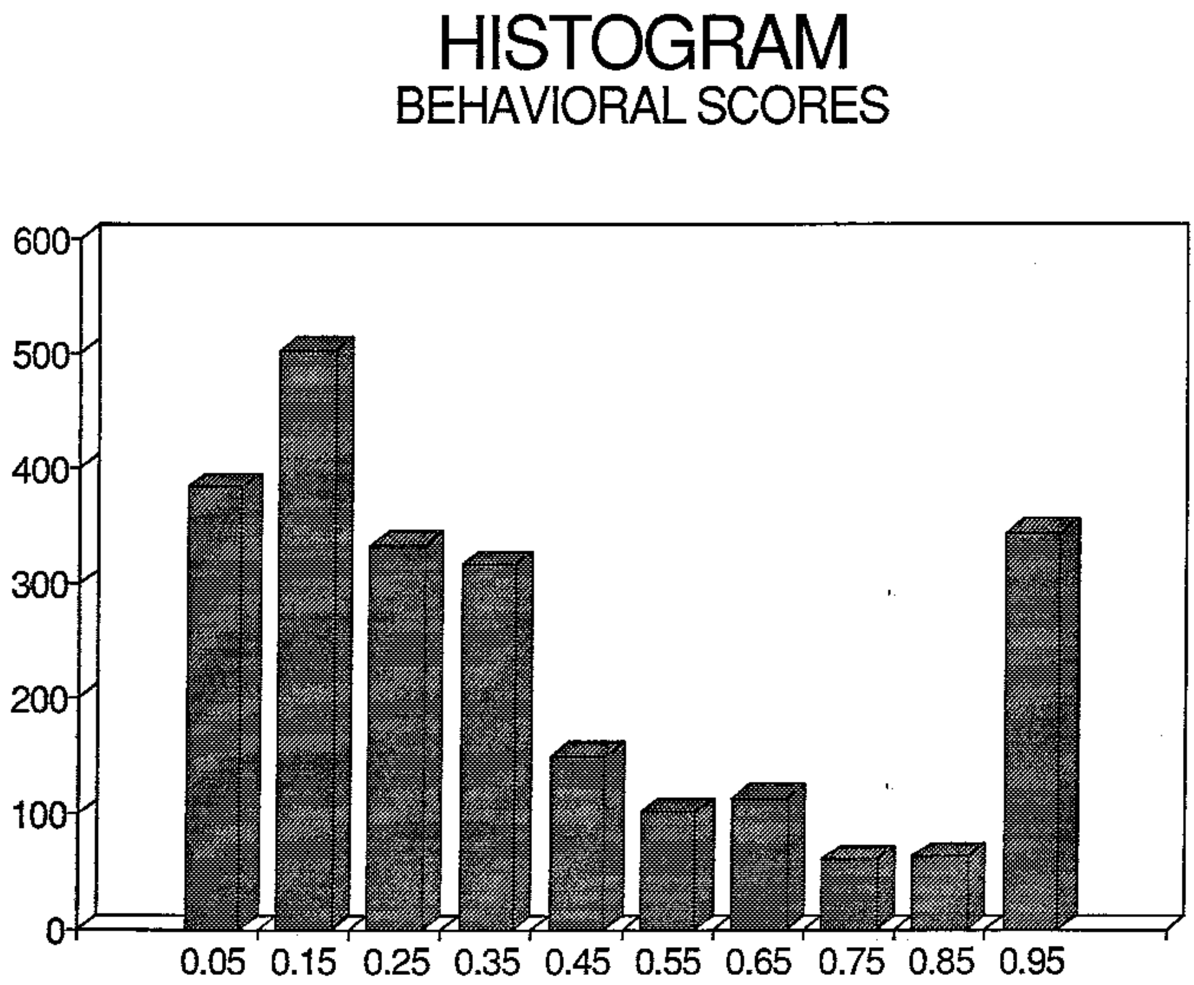
The other problem present in most of the infant mortality determinants studies based on reproductive histories is the non temporal simultaneity of the dependent and independent variables.Usually socio-economic conditions of the individuals and of the household are taken for the moment of the survey which may not coincide with the time of the occurrence of the death. The problem of non simultaneity is more aggravated for behavior variables because of the reverse effect that could be operating. A behavior could be changed because of the occurrence of a child death. We ran our models for the first children ever born and for all children to detect any confounding effects that could be present in the analysis. We faced a possible confounding effect of a secular downward trend of the infant mortality rates and improvement in health promoting attitudes and knowledge. This is certainly one area for further methodological improvement.

In our study, there was a strong indication that the over-mortality of the first born decreases as the scores move from least to most healthy profile. For the most healthy households the differences between all children and first children are not statistically significant.

The multilevel analyses using demographic and behavior scores as intermediate factors indicated that they were not important mediating factors for the effect of mother's educational and household material condition of the household on infant mortality. The most immanent implication is that a woman who was illiterate or who lived in poor material conditions even having optimal health promoting behavior would never had reached for her children the mortality levels attained by her more educated and affluent counterparts.

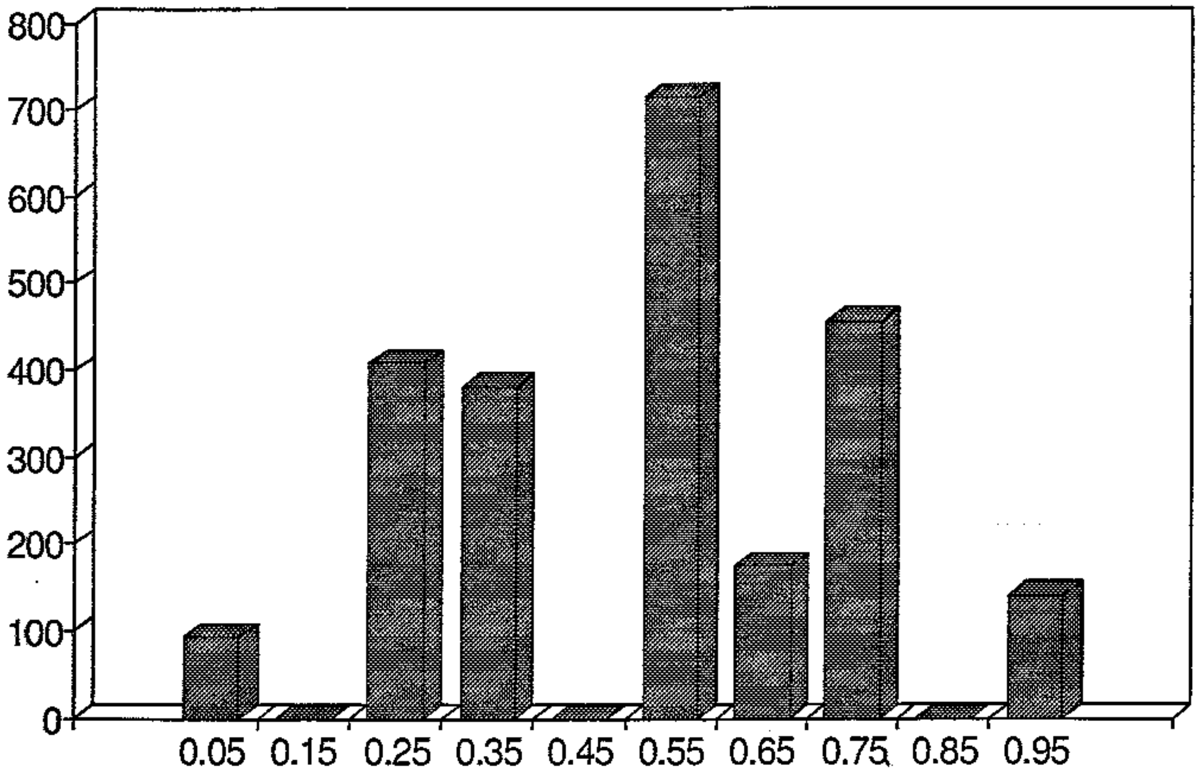
Unfortunately, the sample size may not be large enough to accommodate a multilevel analysis and ensure tight confidence intervals, even with this reduced number of variables. The non significant effects of the intermediate factors should be regarded with caution.

GRAPH 1

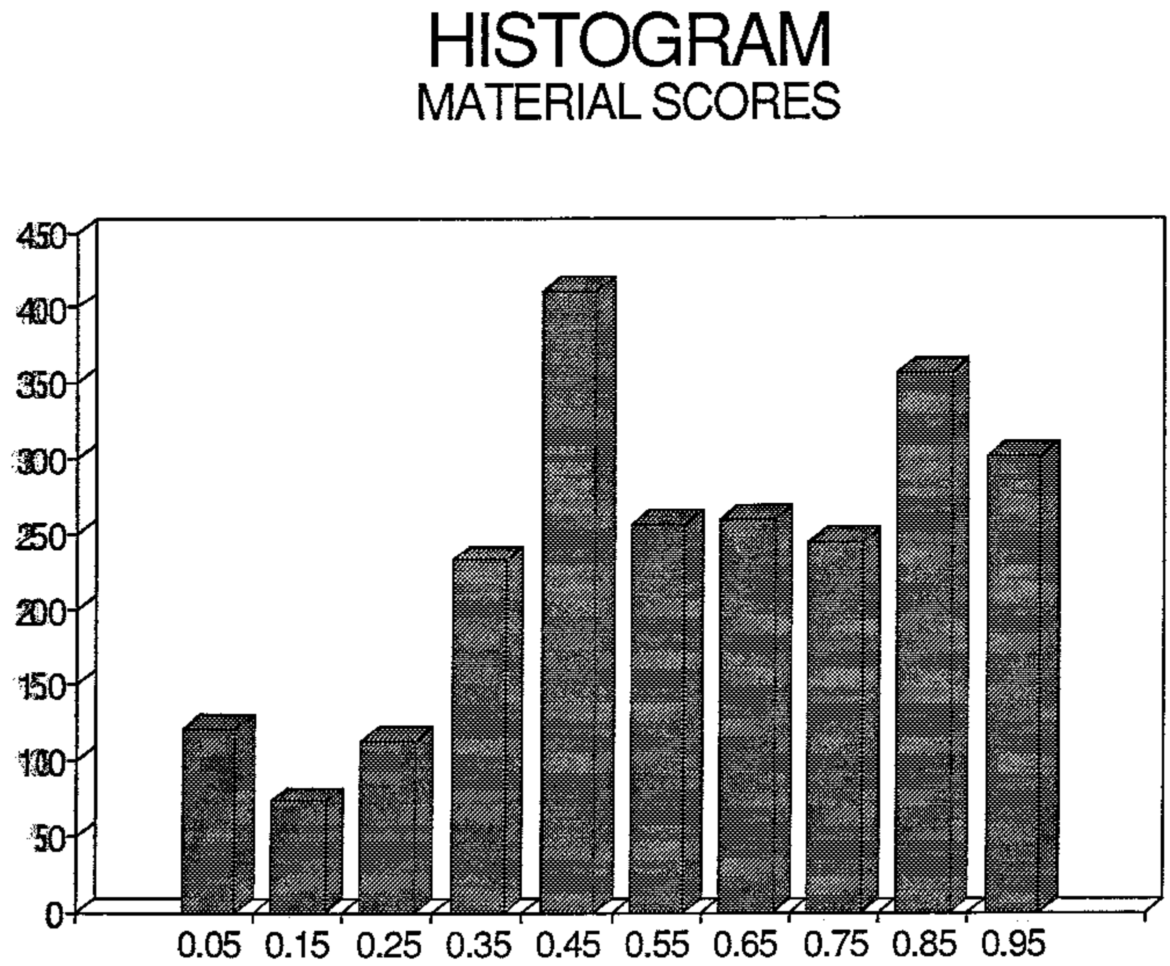

HISTOGRAM
BEHAVIORAL SCORES
600
500
400
300
200
100
0
0.05
0.15
0.25
0.35
0.45
0.55
0.65
0.75
0.85
0.95

GRAPH 2

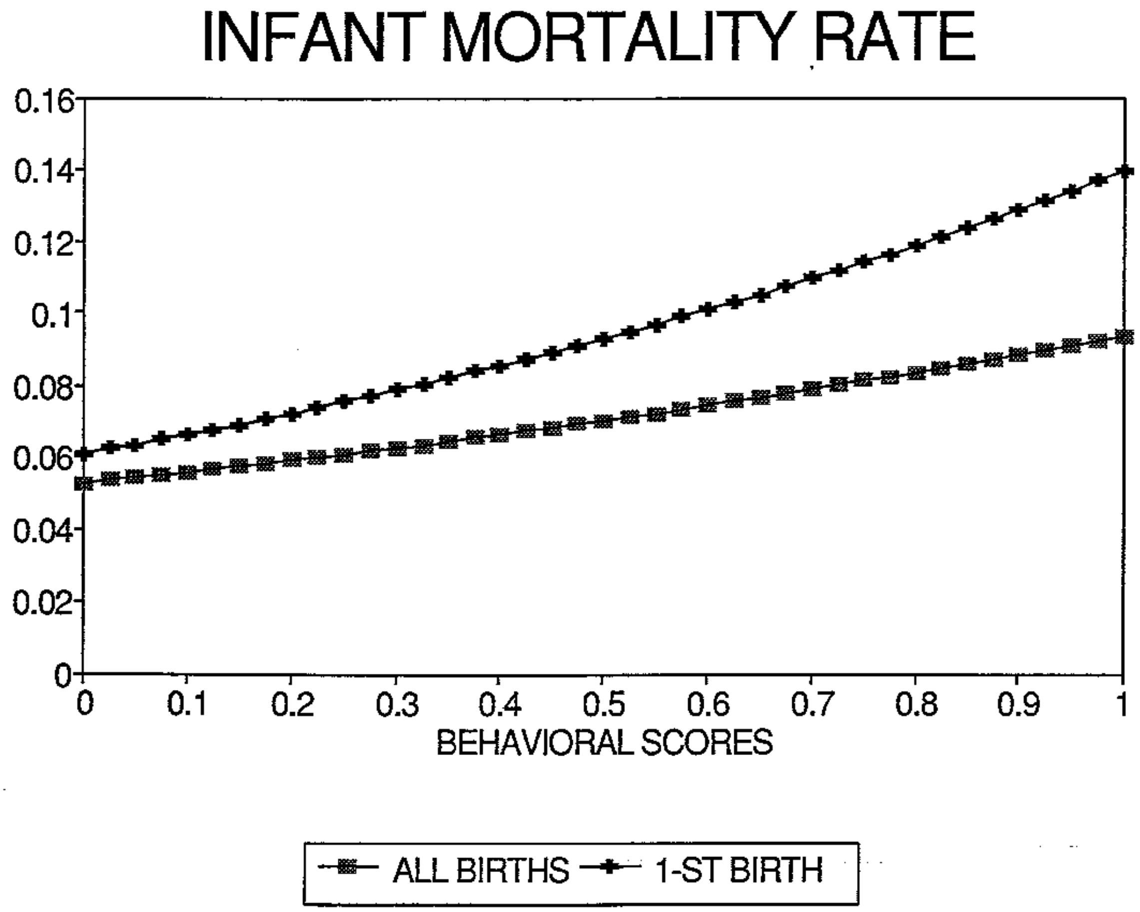
HISTOGRAM
DEMOGRAPHIC SCORES



GRAPH 3


HISTOGRAM
MATERIAL SCORES
450
400
350
300
250
200
150
100
50
0
0.05 0.15 0.25 0.35 0.45 0.55 0.65 0.75 0.85 0.95

GRAPH 4


INFANT MORTALITY RATE
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
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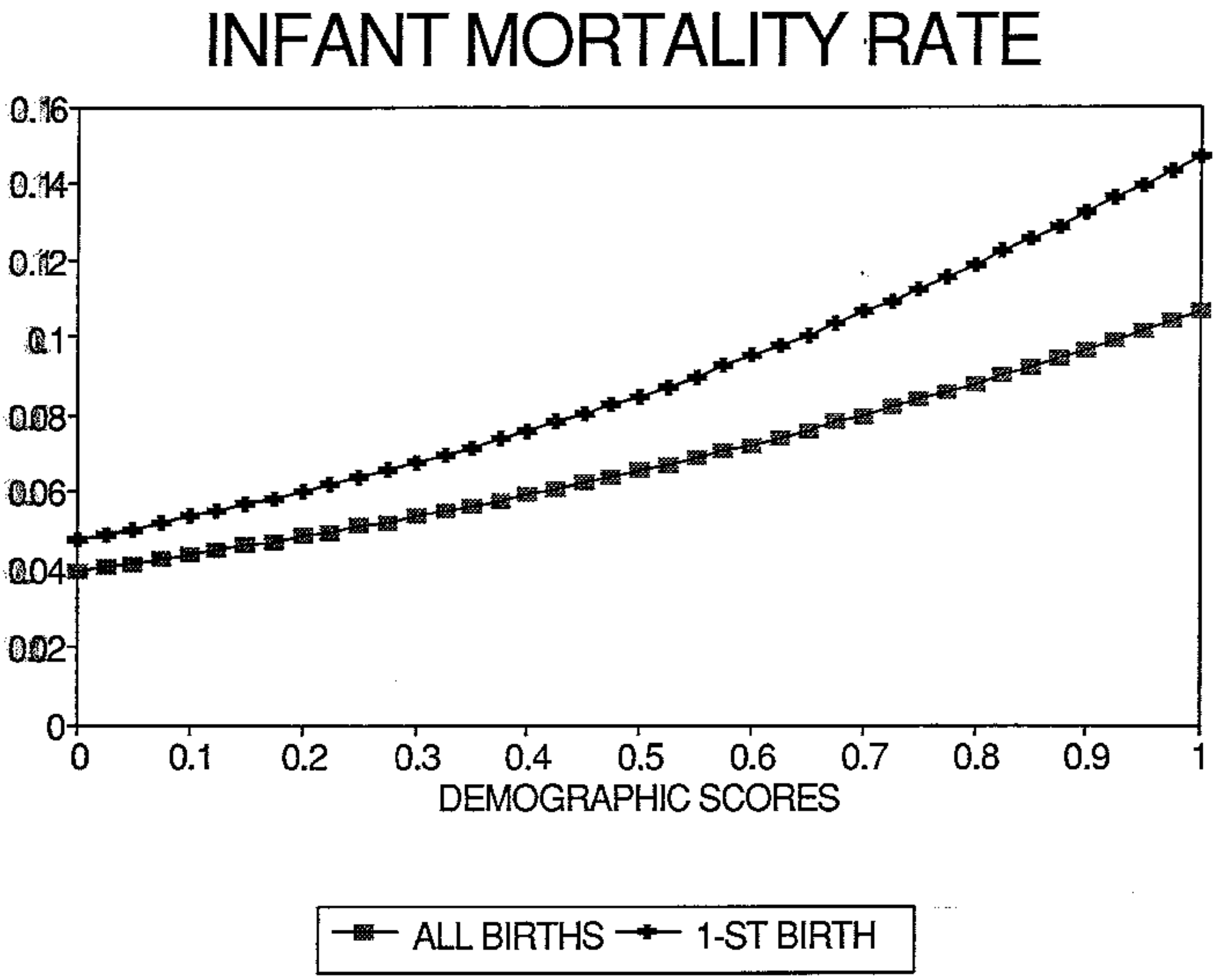
0.7
0.8
0.9
1
BEHAVIORAL SCORES
ALL BIRTHS
1-ST BIRTH

GRAPH 5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0.12
0.1
0.08
0.06
0.04
0.02
0
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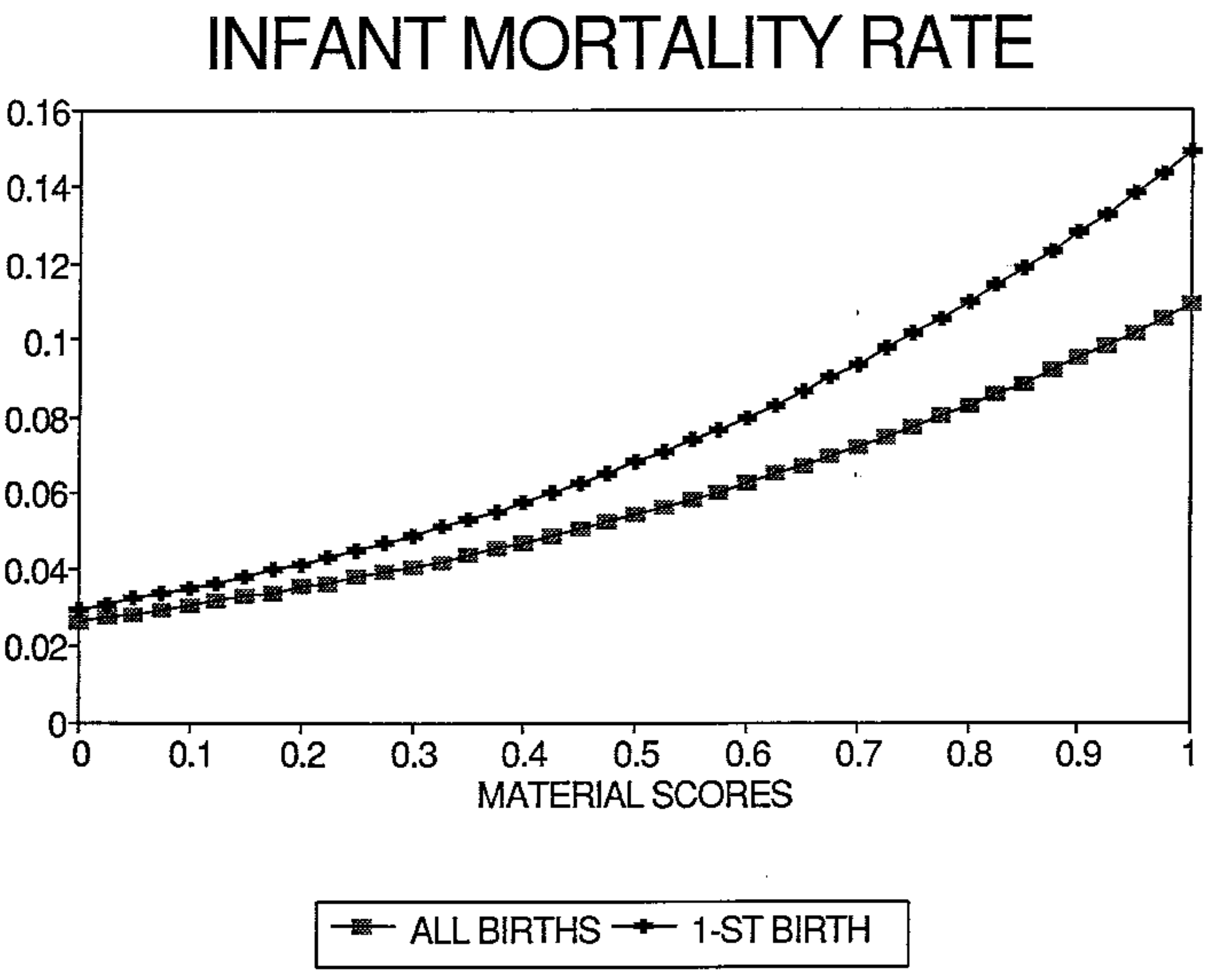
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
DEMOGRAPHIC SCORES
ALL BIRTHS
1-ST BIRTH

GRAPH 6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0.04
0.02
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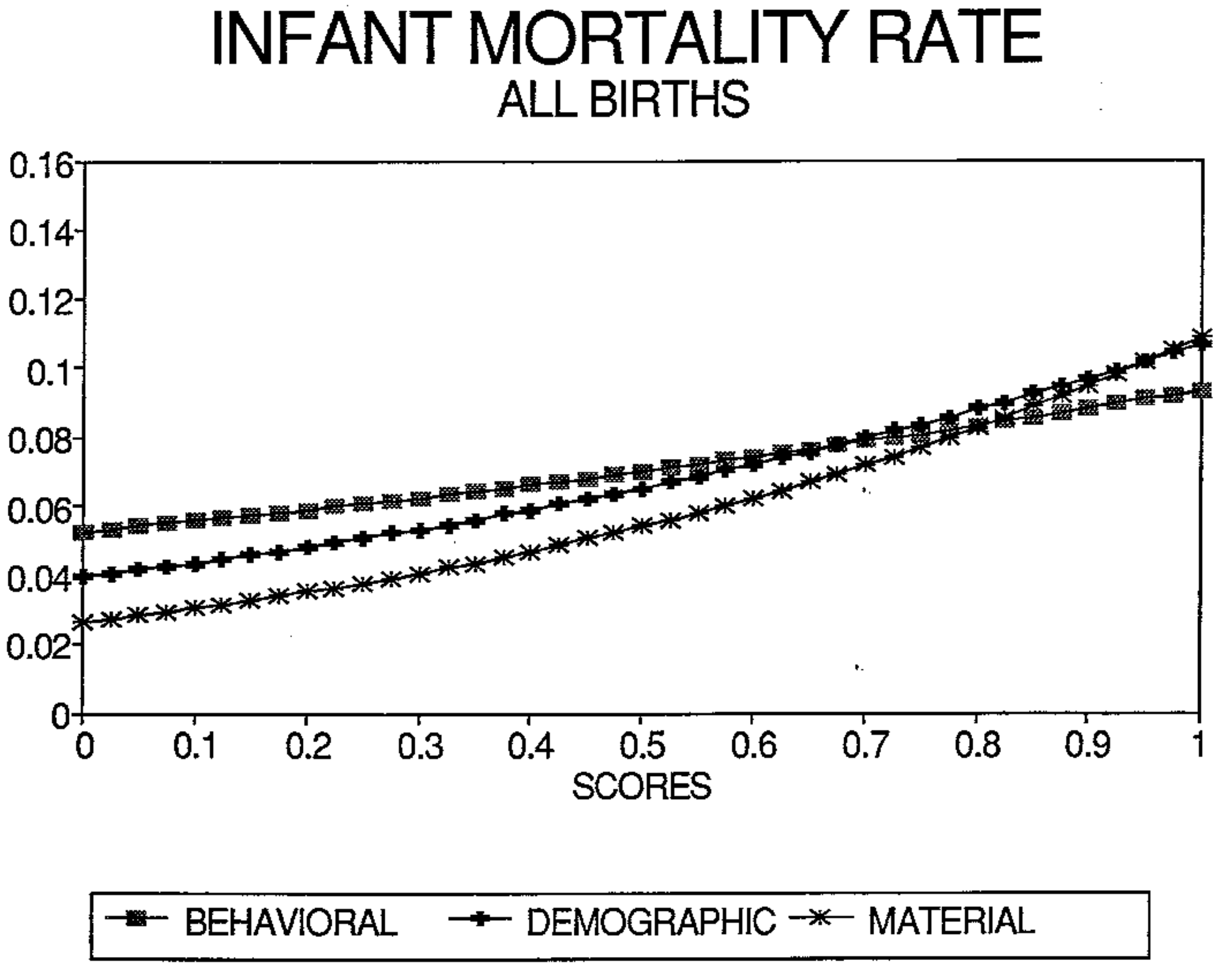
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
MATERIAL SCORES
ALL BIRTHS
1-ST BIRTH

GRAPH 7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0.1
0.2
0.3
0.4
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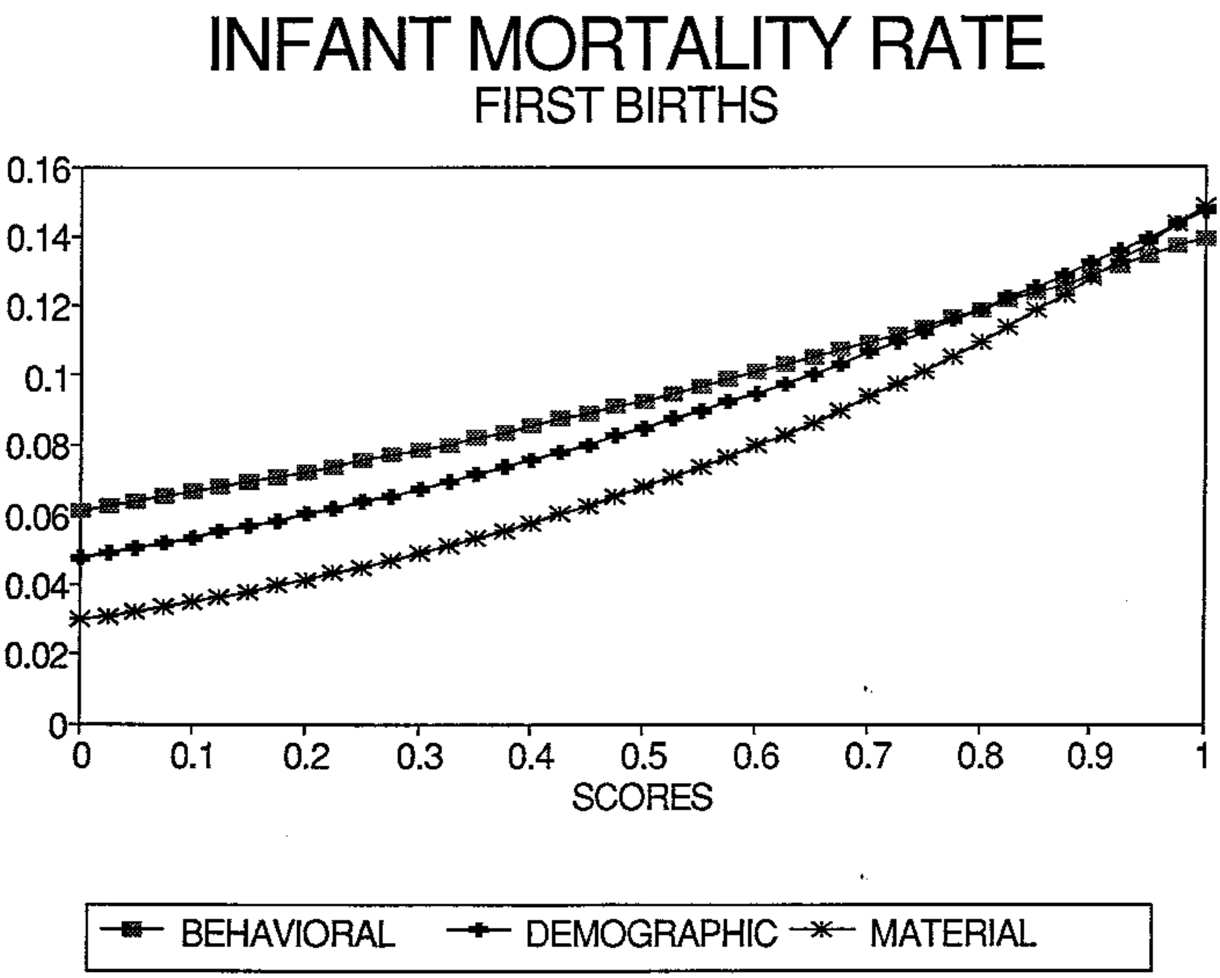
0.8
0.9
1
SCORES
BEHAVIORAL
DEMOGRAPHIC
MATERIAL

GRAPH 8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0.2
0.3
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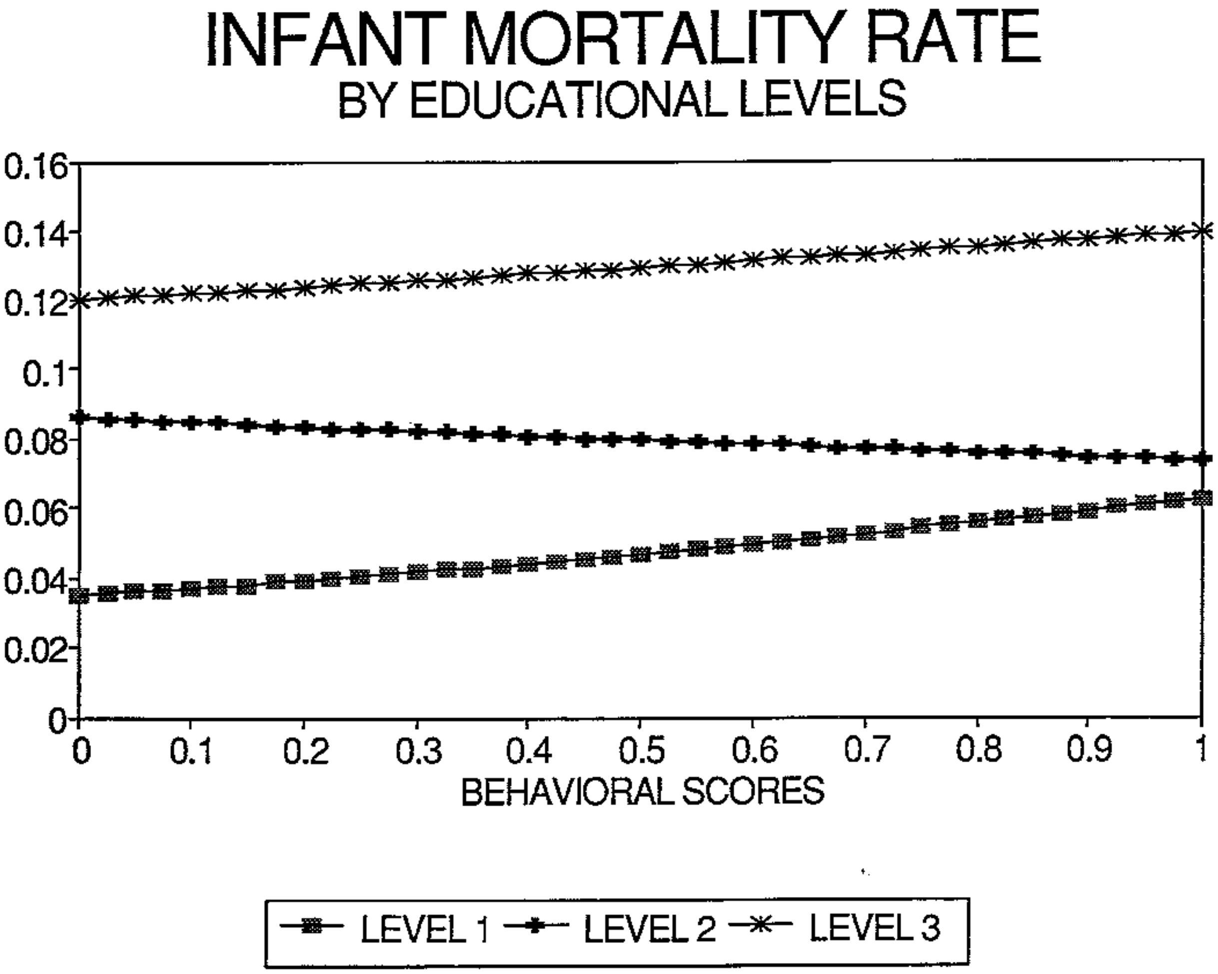
0.9
1
SCORES
BEHAVIORAL
DEMOGRAPHIC
MATERIAL

GRAPH 9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0
0
0.1
0.2
0.3
0.4
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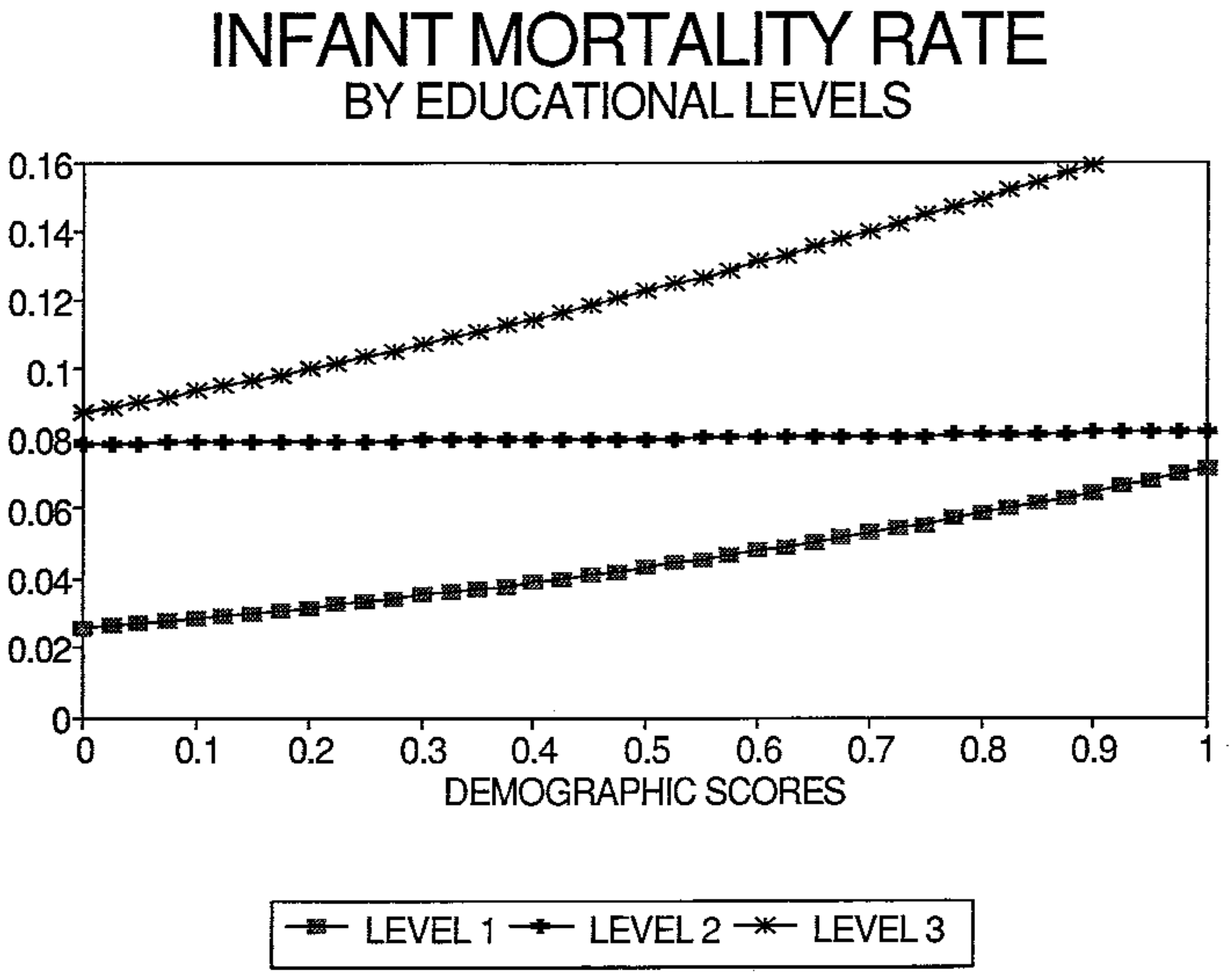
0.7
0.8
0.9
1
BEHAVIORAL SCORES
LEVEL 1
LEVEL 2
LEVEL 3

GRAPH 10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0
0
0.1
0.2
0.3
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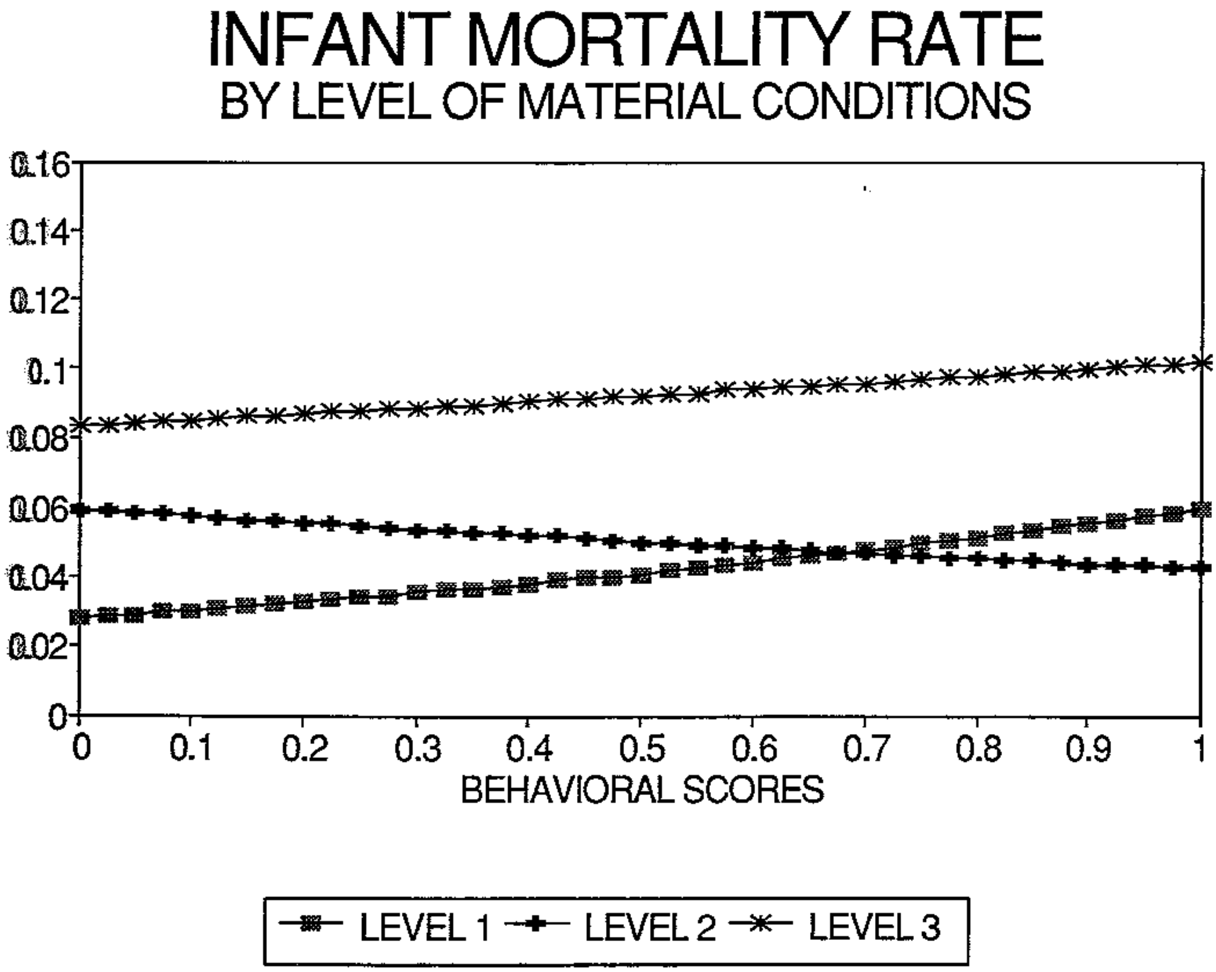
1
DEMOGRAPHIC SCORES
LEVEL 1
LEVEL 2
LEVEL 3

GRAPH 11


INFANT MORTALITY RATE
BY LEVEL OF MATERIAL CONDITIONS
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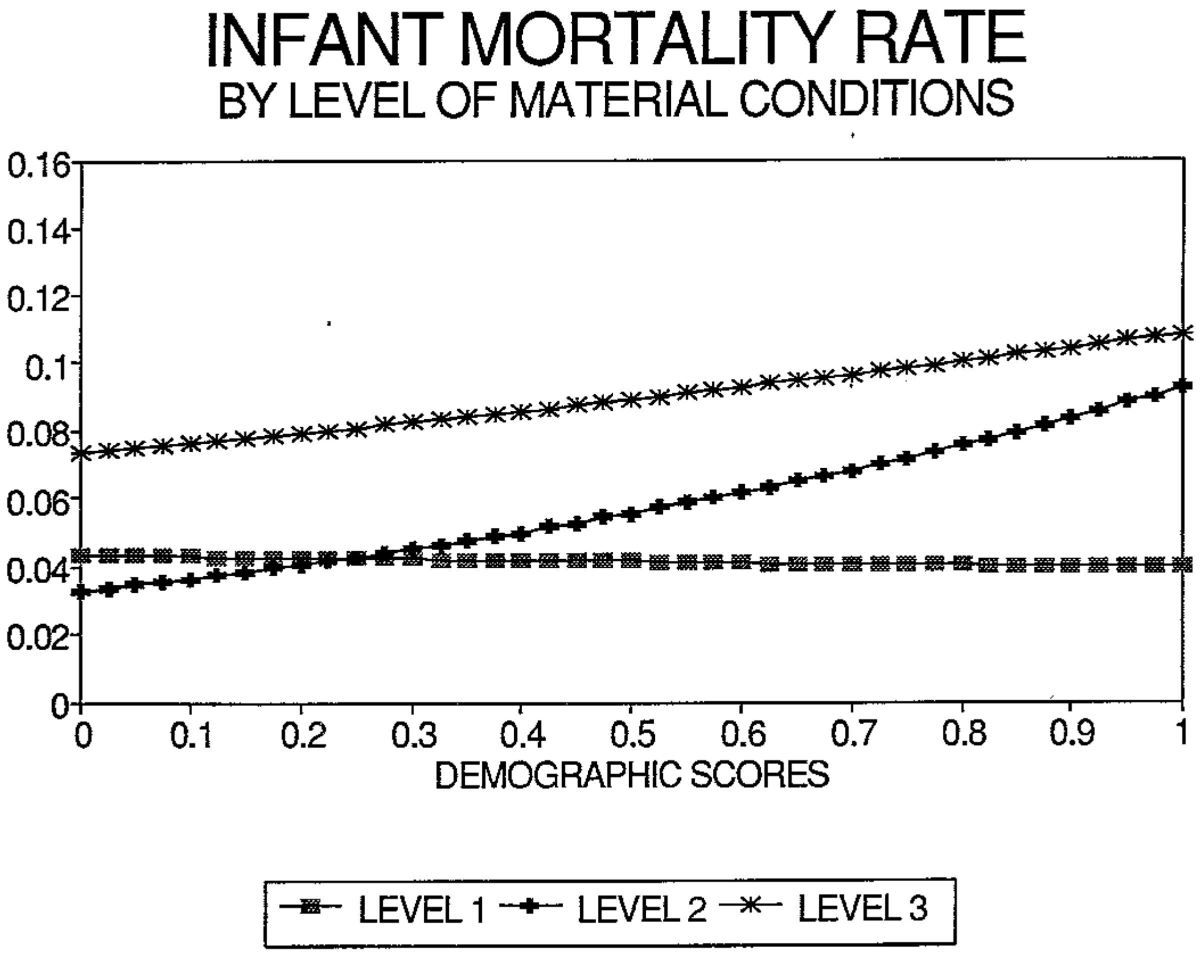
BEHAVIORAL SCORES
LEVEL 1 LEVEL 2 LEVEL 3

GRAPH 12


INFANT MORTALITY RATE
BY LEVEL OF MATERIAL CONDITIONS
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0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
DEMOGRAPHIC SCORES
LEVEL 1
LEVEL 2
LEVEL 3

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