and is reputed to have a very healthful climate. People from other parts of the Island go there to spend the summers, some of them suffering from tuberculosis and other chronic ailments. The average summer temperature of Adjuntas is about 70°F, and the winter temperature about 60°F.

Adjuntas is a rural municipality to the extent of 86.4 per cent of its population, according to the census of 1930. The total population is 18,075, but only 2,376 of these reside in the town; only 8 per cent of the people have colored blood in them.

The cyclone of 1928 caused great damage, practically destroying the coffee plantations, and has been the cause of much poverty and suffering in Adjuntas and other interior municipalities where coffee is the main product. It has not recovered from this blow as yet, and extreme poverty is the lot of the majority of the people. The hurricane of 1932 did not reach this district.

Mainly because the rural character of the municipality makes schools inaccessible to the majority of the inhabitants, only 58.6 per cent of the residents are literate.

Municipal Government.—The municipal budget of Adjuntas for 1933–34 was $32,585, of which $3,525, or 10.8 per cent, was used for medical attendance on the poor. As in Cataño, there is one municipal physician who attends the poor. There is no hospital, and indigent patients, when unable to attend the Municipal Dispensary, are visited by the doctor in their homes. Cases requiring hospitalization usually go to Ponce at their own expense.

There has been a Public Health Unit in Adjuntas since 1929, which is supported by the Insular Department of Health with some help from the Municipality. This Unit, located in a fine cement building, is under a full-time physician and two nurses, and weekly clinics are held there for tuberculosis, prenatal cases, and babies. A certain amount of school medical-inspection is done. The Director of the Public Health Unit is also the Local Health Officer of Adjuntas.

Health Conditions.—The death rate of Adjuntas during the five years from 1928 to 1932 was 18.9 per 1,000 inhabitants, or 14.1 per cent lower than the general rate of the Island, and 6.0 per cent lower than the Cataño rate. The average tuberculosis death rate during those years was

180.3 per 100,000 population, or 35.5 per cent lower than in the Island. This contrasts notably with conditions in Cataño, where the tuberculosis death rate during these years was 53.4 per cent higher than that of the Island. In Adjuntas 25 people died from tuberculosis during the year 1932. Uncinariasis is the main health problem, and it is calculated that 60 per cent of the people are infected with the hookworm parasite.

The town has an aqueduct, but no filtration or chlorinization plant. There is no sewer system in the town and no aqueduct in the rural zone.

Tuberculosis Dispensary.—At the tuberculosis dispensary of the Public Health Unit of Adjuntas, the following work was done, as indicated in Table IX:

TABLE IX

	Year 1931-32	Year 1932-33
Clinic attendance	887	721
New patients examined	189	108
New cases of tuberculosis found	51	21
Contacts examined	44	39
Visits made by nurses	267	566

The number of contacts examined was insufficient, and much less satisfactory than in Cataño. The number of visits to the homes was much more satisfactory in 1932–33 because of the activities of the survey, but it was not sufficient. At least 1,250 home visits during the year should have been made according to American Public Health Association standards.

Reporting of Cases.—Out of 25 deaths from tuberculosis that occurred in Adjuntas during 1932, only 7 had been reported as cases to the Health Department. All of these were reported by the Local Public Health Unit.

One of the cases was reported three days before death, the others, 9 months to 2 years before death. Although the proportion of cases reported was low, the report was made earlier than in Cataño. A total of 36 cases of tuberculosis was reported from Adjuntas to the Health Department during 1932.

Survey of the Homes.—The survey covered all of the town and a part of the rural area of the municipality. Every

180.3 per 100,000 population, or 35.5 per cent lower than in the Island. This contrasts notably with conditions in Cataño, where the tuberculosis death rate during these years was 53.4 per cent higher than that of the Island. In Adjuntas 25 people died from tuberculosis during the year 1932. Uncinariasis is the main health problem, and it is calculated that 60 per cent of the people are infected with the hookworm parasite.

The town has an aqueduct, but no filtration or chlorinization plant. There is a sewer system in the town and no aqueduct [illegible]

Slum homes in Cataño.
Barriada de gente pobre en Cataño.

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Peasant's home in Adjuntas.
Albergue campesino en la montaña de Adjuntas.

One of the cases was reported three days before death, the others, 9 months to 2 years before death. Although the proportion of cases reported was low, the report was made earlier than in Cataño. A total of 36 cases of tuberculosis was reported from Adjuntas to the Health Department during 1932.

Survey of the Homes.—The survey covered all of the town and a part of the rural area of the municipality. Every

second house was visited in the town and every house in the country. The total number of houses thus visited was 457, of which 304, or 66.5 per cent were in the urban area, and 153, or 33.5 per cent, were in the rural area. Only 29 urban and 2 rural homes were in tenement houses. The total number of persons living in all the houses visited was 2,591, of which 1,675, or 65 per cent, lived in the town and 916, or 35 per cent, in the country. The average number of rooms in each home was 1.9, being 2 in the town, and 1.5 in the country, and the average number of people per room was 2.6 in the town and 3.9 in the country. As in Cataño, overcrowding within the home is greater in the rural area.

NUMBER OF PERSONS PER ROOM

	Urban	Rural
Cataño	2.3	4
Adjuntas	2.6	3.9

Barnard, Amberson and Loew [3] studied the families of 1,000 children who attended the schools of the Bellevue-Yorkville district, and found an average of 1.3 persons per room. They figured that 37 per cent of the children lived in overcrowded conditions, according to the old measure for overcrowding at 1.5 persons or more per room. Living accommodation in Cataño and Adjuntas induces excessive overcrowding, and in both places it is rare to find a household with less than two persons per room.

It is interesting to note that in Cataño, 35.6 per cent of the urban and 7.8 per cent of the rural homes are in tenement houses, while in Adjuntas only 9.5 per cent of the urban and 1.3 per cent of the rural homes are in tenement houses. This is an indication of the greater overcrowding of homes that exists in Cataño, which is one of the factors that facilitates the spread of contagion in this municipality and accounts for its high tuberculosis mortality.

The number of persons in each family in Adjuntas averaged 5.5 in the urban and 6 in the rural area, which is similar to what we found in Cataño.

Economic Condition of the Inhabitants.—The economic condition of the inhabitants was classified as "desperate" (no known income of any kind) in 56 per cent of the families.

Sixty-eight per cent of the families owned their own homes; in 15 per cent house was given free of rent to the householder, and in only 20 per cent was rent paid. Out of 84 families who paid rent, 82 per cent paid from $5 to $10 per month; 17 per cent paid from $10 to $20 per month, and only one paid over $20 per month. The large proportion of families who owned their homes in Adjuntas (68%) is noteworthy. This might be taken as an indication of prosperity, unless one is aware of the fact that the great majority of these houses are merely huts made of *yaguas*, sugar cane foliage, or packing boxes, with one or two small rooms, measuring usually about 8 × 9 ft., and that the plots on which they are built are not as a rule the property of the families who live in the houses, but are owned by landlords who have the right to have the house moved from their premises at any time. Thus, rather than being an indication of prosperity, home ownership under these conditions becomes an index of extreme poverty, since only the very poor, those that are *agregados* and who cannot afford to pay even the smallest amount for rent, submit to the inconvenience of building a hut on a plot of ground owned by somebody else who has the right to eject them, house and all, from the premises at a moment's notice. This form of home ownership is much more common in the country than in the towns.

Economic conditions in Cataño are considerably better than in Adjuntas, although, when compared with standards in the United States, the poverty of the people in both places is remarkable.

Tuberculosis History in the Family.—Out of a total of 457 families studied, 119, or 26 per cent, gave a positive history of tuberculosis. Eighty-five, or 71.4 per cent, of these were urban families, and 34, or 28.6 per cent, were rural. This shows a predominance of tuberculosis infection in the urban over the rural area.

In comparing the Adjuntas data with those of Cataño, it is noteworthy that the proportion of tuberculosis-history families having 4 or more tuberculous members, which in Cataño was 73 per cent, in Adjuntas was only 6.7 per cent. When comparing the urban and rural families who gave a positive history of tuberculosis in Cataño and Adjuntas, the interesting results recorded in Table X were obtained:

TABLE X

FAMILIES WITH POSITIVE HISTORIES OF TUBERCULOSIS

History of	Cataño, 155 (34%)						Adjuntas, 119 (26%)					
	Total		Urban		Rural		Total		Urban		Rural	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1 case	9	5.8	8	88.9	1	11.1	63	52.9	49	77.8	14	22.2
2 cases	...	.....	...	.....	...	.....	31	26.1	20	64.5	11	35.5
3 cases	33	21.3	29	87.9	4	12.1	17	14.3	11	64.7	6	35.3
4 cases	30	19.4	27	90.0	3	10.0	6	5.0	3	50.0	3	50.0
Over 4 cases	83	53.5	65	78.3	18	21.7	2	1.7	2	100.0	...	.....

We note from the above that the number of families having a positive history of tuberculosis is much higher in the town than in the country. 83 per cent of the Cataño families having a positive history of tuberculosis, and 71.4 per cent of the Adjuntas families having a similar history, lived in the towns.

The very notable difference between the proportion of families with 4 or more tuberculous members in Cataño (73%) and Adjuntas (6.7%) must be taken as evidence that conditions within the Cataño homes are much more favorable to the spread of tuberculosis than they are in the homes of Adjuntas.

There were 467 people who lived with active cases of tuberculosis in Cataño, including 257 children under 15, and 149 in Adjuntas, including 59 children. Fifty-five per cent of the Cataño contacts lived in residences of only 1 or 2 rooms with their cases of tuberculosis, and 19 per cent lived in houses of 1 room. In Adjuntas the proportion of contacts living with cases of tuberculosis in residences of 1 or 2 rooms was 73 per cent, while 46 per cent lived in one-room huts. Thus, opportunities for contagion within the family were greater in the rural municipality.

Cases of Tuberculosis.—Thirty cases of tuberculosis were found. This is equivalent to 1.1 per cent of the population in the surveyed homes, which is a much lower proportion than was found in Cataño, where the number of cases of tuberculosis constituted 2.4 per cent of the surveyed population.

Of the 30 cases found, 11 were moderately advanced, or

far advanced, and the rest were minimal cases. Twenty-four lived in the town, making up 1.4 per cent of the population of the surveyed homes, and 6 lived in the country, making up 0.6 per cent of the population in rural homes surveyed.

It is thus seen that the case incidence is over twice as high in the town as in the country. In Cataño the proportion of cases in the urban area was over four times higher than in the rural region.

The following table compares the number of cases found in Cataño and Adjuntas:

	Cataño	Adjuntas
Population of the surveyed area	2,470	2,591
Number of tuberculosis cases found	61	30
Percentage	2.4%	1.1%

Since the survey took in every second house in the town and every house in the country, it may be estimated that the total number of tuberculosis cases in the town of Adjuntas is 48, and in the country 6, making a total of 54 cases in the survey area.

According to sex, race and age, the cases of tuberculosis were classified as follows:

TABLE XI

Age	Urban	Rural	Urban (21)						Rural (6)					
			Male			Female			Male			Female		
			W	M	B	W	M	B	W	M	B	W	M	B
0–1 year	...	...	6	3	1	6	7	1	2	...	...	4	...	...
1–5 years	...	...												
6–9 years	3	...												
10–14 years	2	3												
15–24 years	12	1												
25–34 years	6	1												
35–44 years	1	...												
45 and over	...	1												

According to the form of tuberculosis, the cases were classified as follows:

Latent apical	1
Minimal	12
Moderately advanced	6
Far advanced	5
Non-pulmonary tuberculosis	1
Pulmonary infiltration (childhood type)	5

Out of 61 pulmonary cases in Cataño, 48, or 80 per cent, had extensive lesions. Out of 29 in Adjuntas, extensive lesions were found in 16, or 55 per cent, showing not only a smaller incidence of cases, but also a lower proportion of advanced lesions among the cases found in Adjuntas.

A total of 810 X-ray plates of the chest were taken. These included X-ray chest plates on 143 contacts. Besides the above findings, the following conditions were revealed by these studies.

Pulmonary nodule calcified	2
Tracheo-bronchial lymph nodes calcified	228

Although the number of cases with manifest pulmonary tuberculosis was much greater in Cataño, the proportion of calcified tracheobronchial lymph nodes was considerably larger in Adjuntas.

Nine of the cases of tuberculosis were under the care of the municipal physician, 15 were registered at the tuberculosis dispensary, and the rest were not under medical treatment.

Eight of the 29 pulmonary cases gave positive sputum. The Gaffky counts of these sputa were as follows:

1 was Gaffky II
4 were Gaffky III
1 was Gaffky IV
1 was Gaffky V
1 was Gaffky VII

The one case of non-pulmonary tuberculosis was tuberculosis of the hip-joint in a child.

Tuberculin Tests.—The intradermic tuberculin test (Mantoux) was applied to 1,114 children under 15. Forty-five decimal five per cent reacted positively.

There is an unduly high proportion of reactors among children under one. This is of no special significance on account of the small number of infants that were injected (62).

TABLE XII

RESULTS OF THE TUBERCULIN TEST IN ADJUNTAS ACCORDING TO AGE

	Total examined	Per cent positive
Total	1,114	45.5
Less than 1 year	62	43.5
1–4 years	296	43.1
5–9 years	392	42.6
10–15 years	364	58.2

The proportion of positive reactions in the town was 50.8 per cent, and in the country, 37.7 per cent. The reactions according to residence were as follows:

TABLE XIII

REACTIONS ACCORDING TO RESIDENCE (ADJUNTAS)

Total	Urban		Rural	
	Number Injected	Per cent Positive	Number Injected	Per cent Positive
Total	663	50.8	451	37.7
Less than 1 year	30	46.7	32	40.6
1–4 years	160	34.4	136	33.8
5–9 years	246	47.2	146	34.9
10–15 years	227	67.0	137	43.8

Comparing the above results with those of Cataño, we find in Adjuntas a lower proportion of reactors both in town and country at all ages, except in babies under one, in whom the percentage of reactions is higher in Adjuntas than in Cataño.

The incidence of infection (except in the small number of children under one) is lower at all ages in the country than in the town, and the difference seems to be greater the older the child.

In Cataño, as in Adjuntas, the incidence of positive reactions was higher in children under one in the rural section than in the urban.

According to race, the percentage of reactors is slightly higher for mulatto than for white children. In Cataño there was a somewhat higher proportion of positive reactors among mulattoes than in Adjuntas. There were no negroes among the children tested in Adjuntas.

TABLE XIV

REACTIONS ACCORDING TO SEX AND COLOR IN ADJUNTAS

	Male Number Injected	% Positive	Female Number Injected	% Positive
Total	540	46.3	574	44.8
White	373	46.1	394	42.9
Mulattoes	160	46.3	170	48.2
Black	7	57.1	10	60.2

Fifty-nine children lived with cases of tuberculosis. Fifteen lived with positive sputum cases, and of these 12 were reactors. Forty-four lived with negative sputum cases, and of these 22 reacted to tuberculin.

TABLE XV

INTENSITY OF REACTION TO TUBERCULIN ACCORDING TO AGE IN ADJUNTAS

Age Groups	Number tested	Positive		+		++		+++		++++	
		No.	%	No.	%	No.	%	No.	%	No.	%
Under 1 year	125	50	40.0	34	68.0	13	26.0	2	4.0	1	2.0
1–4 years	560	256	45.7	142	55.5	44	17.2	54	21.1	16	6.3
5–9 years	772	408	52.8	126	30.9	61	15.0	199	48.8	22	5.4
10–15 years	671	463	69.0	96	20.7	59	12.7	268	57.9	40	8.6
Total	2,128	1,177	55.3	398	33.8	177	15.0	523	44.4	79	6.7

INTENSITY OF REACTION TO TUBERCULIN ACCORDING TO AGE IN ADJUNTAS

Age Groups	Number tested	Positive		+		++		+++		++++	
		No.	%	No.	%	No.	%	No.	%	No.	%
Under 1 year	62	27	43.5	19	70.4	5	18.5	2	7.4	1	3.7
1–4 years	296	101	34.1	62	61.4	16	15.8	18	17.8	5	5.0
5–9 years	392	167	42.6	45	26.9	21	12.6	84	50.3	17	10.2
10–15 years	364	212	58.2	40	18.9	17	8.0	136	64.2	19	9.0
Total	1,114	507	45.5	166	32.7	59	11.6	240	47.3	42	8.3

Taking the results of the tuberculin test in Cataño and Adjuntas together, we find that the intensity, as well as the frequency of the reaction, tends to be less in the younger age groups. Thus, while 55.5 per cent of the one-plus reactions occurred in children under 4, only 21.1 per cent of the

three-plus reactions occurred in this age-group. On the other hand, 57.9 of the strong reactions (+ + +) occurred in the age group 10–15. Only one child under one gave a four-plus reaction. These occurred as follows: 6.3 per cent in the group of children under 4; 5.4 per cent in those from 5 to 9; 8.6 per cent in those from 10 to 15.

Aronson[4] applied the intradermic tuberculin test to 5,300 colored children under 14, in the southern part of the United States. Of these, 1,982, or 37.4 per cent gave positive reactions. According to age they reacted as follows:

TABLE XVI

RESULTS OF THE TUBERCULIN TEST IN COLORED CHILDREN OF SOUTHERN UNITED STATES (ARONSON)

Age	Number Tested	Number Positive	Per Cent Positive
0–4 years	770	121	15.7
5–9 years	2,095	633	30.2
10–14 years	2,435	1,228	50.4

Thus, the incidence of infection among colored children in the southern part of the United States is lower than among Puerto Rican children. On the other hand, our results do not differ greatly from those obtained by Hetherington and his colleagues in Philadelphia[5], where 37 per cent reacted at the age of 5, 71 per cent at the age of 10, and 80 per cent at the age of 15.

As to the intensity of the reaction, the results obtained by Aronson were similar to ours in that the lower the age the smaller was the incidence of the strong reactions. The incidence of + + + + reactions in our series, however, is excessively high as compared to Aronson's.

TABLE XVII

INTENSITY OF REACTIONS TO TUBERCULIN IN ARONSON'S SERIES

Age Groups	Number tested	Positive		+		++		+++		++++	
		No.	%	No.	%	No.	%	No.	%	No.	%
0–4 years	770	121	15.6	64	52.9	47	38.8	10	8.3	...	.....
5–9 years	2,095	633	30.1	256	40.4	268	42.3	106	16.7	3	.1
10–14 years	2,435	1,228	50.4	427	34.8	575	46.8	225	18.3	1	.5
Total	5,300	1,982	37.4	747	37.7	890	44.9	341	17.2	4	2

Aronson found in the South a higher incidence of infection and also greater sensitivity to tuberculin in the colored persons as compared with the white (proved by a larger percentage of reactions to the smaller dose, 0.01 mgm.) and a greater intensity of reaction. This is probably due to greater exposure to tuberculosis because of poorer environmental conditions. Our results showed a slightly higher incidence of infection among mulattoes than among the whites, and a somewhat greater incidence (about 7 per cent more) among blacks than among whites. The small difference is due to the fact that environmental conditions among us are quite bad in white and colored.

Aronson also found that in the white race tuberculosis infection was higher among girls than among boys ranging in age from 5–14, but markedly lower in girls from 15 to 19 than in boys of the same age. Hetherington, McPhedran, Landis and Opie [6] found tuberculosis infection more frequently in girls than in boys of the same age, while Chadwick and Zacks [7], using the Pirquet method, found it more frequently in boys. Our series shows a slightly higher proportion of reactors among boys than among girls. This difference is noted both in white and in colored children.

TABLE XVIII

REACTIONS ACCORDING TO SEX AND COLOR IN CATAÑO AND ADJUNTAS

	Male Number injected	% Positive	Female Number injected	% Positive
Total	1,058	56.5	1,070	54.1
White	599	53.1	627	49.8
Mulatto	374	58.0	367	58.0
Black	85	74.1	76	71.1

Dickey and Seitz [8] of San Francisco, California, made the intracutaneous tuberculin test on 3,500 children of 1 to 14, who attended the Children's Clinic of the Standford University Medical School. Their results were as follows:

Age	Number Injected	Number Positive	% Positive
1–4 years	963	145	15%
5–9 years	1,612	337	21%
10–14 years	925	341	37%

Reports of workers in other parts of the world differ considerably as to the results of the intracutaneous tuberculin test, but the results of our series are higher than practically all the others.

As to the effects of different conditions on the incidence of reactions to the tuberculin test, we believe, with Dickey and Seitz, that "the number of individuals in any community infected with tuberculosis depends rather on the opportunity for becoming infected, than on race, economic status, or climate".

DISCUSSION AND CONCLUSIONS

We have in Cataño and Adjuntas, two municipalities in strong contrast to each other in location, proximity to large cities, color of inhabitants, climate, prevalent diseases, and overcrowding.

We find an unusually high tuberculosis mortality, a high incidence of cases of tuberculosis, a high rate of tuberculosis infection, and a large proportion of families with tuberculosis history (34%) in the municipality having:

a large proportion of colored people
a greater overcrowding of dwellings
a greater intercourse with large centers of population
a hot climate
somewhat less poverty
somewhat less ignorance.

On the other hand, we have a relatively low tuberculosis mortality, low incidence of cases, low rate of infection, and lower proportion of families with tuberculosis history (26%), in the municipality having:

a low proportion of colored people
less overcrowding of dwellings
more overcrowding within the homes
comparative isolation from large towns
a cool and pleasant climate
more poverty
more ignorance.

The natural question that arises, then, is this: Which of the conditions listed above has had the greatest influence on the tuberculosis incidence of these two municipalities? An appraisal of the factors that may affect the tuberculosis incidence of the two communities leads us to the following conclusions:

Race.—Judging from the results of the tuberculin tests, the larger proportion of colored people in Cataño should not be considered an important factor in bringing about a larger tuberculosis incidence in that municipality.

Climate.—The difference in climate does not seem to be important. Climate, according to the best authorities, has little to do with the epidemiology of tuberculosis.

Ignorance.—The presumably greater ignorance of the Adjuntas people, as judged by their high rate of illiteracy, does not affect greatly the incidence of tuberculosis among them. Also, the difference in the illiteracy rate of the two communities is not large enough to be important.

Poverty.—Although poverty undoubtedly has a bearing on tuberculosis incidence, the difference between these two communities, both of which are very poor, is not large enough to be a deciding factor.

Overcrowding of dwellings.—The overcrowding of dwellings is, in our opinion, the one great factor that is responsible for the much higher tuberculosis incidence of Cataño. Where many poor families are crowded in tenements or in small houses huddled together on small tracts of land, the opportunities for contagion become multiple. One ambulatory case of tuberculosis with large numbers of tubercle bacilli in the sputum, can, under such conditions, infect a whole community. Nearness to large centers of population where the tuberculosis mortality is excessively high, is another important factor in the high tuberculosis mortality rate of Cataño.

Occupation of the people.—In Adjuntas the great majority of the people are farmers; in Cataño a fair proportion work in factories, commercial establishments or offices, where overcrowding offers great opportunities for contagion.

Overcrowding within the homes.—Overcrowding within the homes is greater in Adjuntas than in Cataño. This is in agreement with findings by other investigators, notably Clark[9], who found in 1930 an average of nearly 8 persons per dwelling in the rural districts of Puerto Rico. The proportion of families with tuberculosis history was 31 per cent higher in Cataño than in Adjuntas, and it was much higher in the urban districts (84% and 71%) than in the rural

sections of both municipalities (16% and 29%). Also, whereas in Cataño 73 per cent of the families with tuberculosis history had 4 or more tuberculous members, in Adjuntas the proportion of such families was only 6.7 per cent, which tends to show definitely that overcrowding within the homes has not been the determining factor of the higher tuberculosis incidence of Cataño.

Probable causes of high tuberculosis incidence in Cataño.— Great overcrowding of dwellings and nearness to large centers of population where tuberculosis incidence is high, appear to be the important factors in the causation of the high tuberculosis mortality and morbidity of Cataño, as compared with Adjuntas.

Certain facts stand out from these two surveys:

1. The great overcrowding in the homes, especially in the rural areas.
2. The large proportion of cases of tuberculosis in Cataño (2.4% of the surveyed population).
3. The greater seriousness of the tuberculosis problem in the towns than in the country.
4. The large proportion of families with history of tuberculosis.
5. The much greater preponderance in Cataño of families with a history of 4 or more tuberculous members.
6. The widespread infection in town and country, as revealed by the large percentage of reactors to the intradermic tuberculin test, especially in Cataño.
7. The scarcity of non-pulmonary tuberculosis. Only one case was found in the two areas surveyed.
8. The much lower incidence of tuberculosis in the mountain municipality (Adjuntas), having a larger percentage of white people and a predominantly rural population.
9. The frequency of calcified tracheo-bronchial lymph nodes.

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