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?September 1977

?THE 1976 SKIN TEST SURVEY

for

SCHISTOSOMIASIS IN PUERTO RICO

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and

(Cruz Maria Nazario

CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

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: THE 1976 SKIN TEST SURVEY FOR SCHISTOSOMIASIS IN PUERTO RICO*

*Contribution of the Center for Energy and Environment Research of the University of Puerto Rico, operated under Contract # EY-76-C-05-1833 for the U. \$. Energy Research and Development Administration

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ABSTRACT

Periodic evaluations of the geographic distribution of
Schistosoma mansoni infections have been made in Puerto Rico in

1963, 1969, and recently in 1976, using adult worm antigen for skin testing of children in a randomized sample of fifth graders. For the survey of 1976 reported herein, the island wide rate of positive reactors was 6%, half of what it had been in 1969. In addition to the overall drop in reactor rates there was a marked geographic shift of the area of highest rates to northeastern Puerto Rico, just east of San Juan on the coastal plain between Carolina and Luquillo. Also a new focus of transmission was discovered in the Castafier-Yauco area

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INTRODUCTION

?The parasitic disease schistosomiasis (bilharzia) has been under attack by health authorities in Puerto Rico since 1953 and periodic

ments have been made of the infection, including an island-wide survey of 1976, reported herein. For the first decade

of control operations, an evaluation of prevalence in the controlled areas was accomplished by examination of fecal specimens from school-children. However as the control program expanded and the prevalence and intensity of infections decreased, this method yielded little useful information and became very expensive. In 1963 these problems were overcome by the first island-wide survey using adult schistosome antigen, injected intradermally. A second, similar survey was repeated in 1969 and finally this third survey was finished in 1976. It was the purpose of these surveys to monitor changes occurring in distribution of the infection, and to define the impact of the operational control program. This report presents the results of the 1976 survey and the changes in comparison with the 1969 results

Evaluation of the control effort by measuring prevalence with the skin test at 5 to 10 year intervals was much better suited to the operational program than was the more expensive measurement of prevalence, incidence, or intensity of infection by annual fecal examinations[®]. The high cost of annual fecal surveys was justifiable only in the small pilot projects where rapid evaluation of control methods was needed in the early stages of the control program.

MATERIALS AND METHODS

Antigen for the skin test was prepared from adult

Schistosoma mansoni and standardized at a nitrogen concentration of 35-40 micrograms per liter, in the same manner as in the previous surveys^{??}, two batches of antigen were used, one batch from the antigen prepared for the 1969 survey at the University Hospital of the Puerto Rico School of Medicine, and the second batch prepared at the Puerto Rico Nuclear Center (now the Center for Energy and Environment Research), in 1976. A comparison was made between the two batches by injecting both antigens at slightly separated sites on the volar aspect of the forearms of 381 children. This was done to determine the required adjustment to the size of the reaction wheal from the 1976 batch of antigen so that the adjusted wheal sizes would be equivalent to the wheal sizes from the 1969 antigen

The geographic sampling system was based on the fifth-grade classrooms in public schools throughout Puerto Rico, identical to the system used in 1963 and 1969^{1?} About one out of every four classrooms

was sampled, testing all children in the classroom. For sampling

Purposes the classrooms were grouped into 31 watersheds, which were stratified into urban and rural zones and into sub-watershed areas

when geographical differences indicated a non-homogeneous valley. The randomized selection of classrooms had been conducted in 1963 and the same classrooms were repeated in 1969 and 1976 to preserve the comparability of the results.

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The methods of injecting, recording, and measuring the wheal size of the reaction were identical to the methods used in 1969. No control injections were used and the criteria for positivity were the

same as in 1969. For males under 14 years of age and for all females, a wheal area of 1.0 square centimeters or greater indicated a Positive reaction. For males age 14 and over, a wheal 1.2 square centimeters or greater in area was considered positive. This was a change from the 1963 criteria for positivity. The change was made after careful statistical analysis of reaction wheal sizes from the 22,548 children tested in 1969, when it was determined that the same reactor rates could be obtained with the new criteria, ignoring the control reaction?

The testing teams were trained by one of the authors (HINA) who also monitored their performance and personally re-tested the children if it appeared that incorrect procedures had been followed. This occurred in the Ponce region when the reaction size was recorded as the area of erythema, instead of the indurated wheal. Seven teams conducted the injections in April and May and also in September of 1976, testing fifth-graders in the first academic year and then retesting corresponding sixth-graders in the Ponce region in the early part of the second academic year.

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RESULTS

In order to make the reaction rates from the 1976 batch of antigen comparable with those from the 1969 batch of antigen, the calibration trial was made on 381 children in May of 1976, using both antigens on each child. The children were from Luquillo, a high prevalence area, and from Ponce, an area with a low prevalence. The 1976 antigen produced larger wheals than did the 1969 antigen. An analysis of the size of the wheals and the ages of the children showed that the tendency to larger wheals from the 1976 antigen was greatest among ten year old children, with a decreasing difference in wheal

sizes on the older children (Table 1). Thus adjustments to the wheal sizes from the 1976 antigen were made by age.

It was necessary to reduce the wheal sizes of children who reacted positively to the 1976 antigen by 0.3 square centimeters for 1-year old children and 0.2 square centimeters for children 11 years and older, in order to obtain a reactor rate equivalent to that obtained from the 1969 antigen. Of the possible simple adjustments to wheal size, this one gave the closest approximation to the prevalence obtained with 1969 antigen on the same 381 children (Table 2). This correction was made on the individual data sheet for each child injected with the 1976 antigen who had an uncorrected wheal size of 1.0 square centimeters or greater. Thus after adjustment for antigen batch, the determination of positivity was uniform for all children tested in 1976, and equal to the determination of positivity in 1969

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The estimate of positive reactors to the skin test among fifth-graders was 6% + 1% for the entire island, calculated from the data on 10,224 children tested in the sample and adjusted for population and varying sample ratios in each watershed. Only two of the 31 watersheds had reactor rates markedly greater than 10% which is herein used as the definition of an endemic watershed (Table 3).

These two watersheds (2 and 4) were contiguous in northeastern Puerto Rico and included the municipalities of Luquillo, Rio Grande, Trujillo Alto, Carolina and Loiza. Watershed 4 had the highest reactor rate on

the island, 21%. The lowest rate was 1%, obtained in watershed 18

near Naranjito (Table 3). If the endemic zone is defined as those watersheds where the mean prevalence of positive reactors was 10% or greater, the population involved was almost half a million people with a mean rate of reactors about 16%, (Table 4).

Fourteen watersheds in the central and western portions of the island had a reactor rate less than 5%, indicating virtually no infections (Figure 1). Watersheds 24 and 25 in the Yauco area were an small anomaly of high rates with values of 13% and 10% respectively, compared to surrounding watersheds where the rates were 6% or less. The rates among urban children were not significantly different from

those in rural children.

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TABLE 1

DISTRIBUTION OF COMPARATIVE REACTION SIZES TO TWO ANTIGEN
BATCHES IN 381 CHILDREN FROM LUQUILLO
AND PONCE, PUERTO RICO, 1976

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WHEAL SIZE IN --NUMBER OF POSITIVE REACTORS--
SQUARE CENTIMETERS AGE 10 AGE 11 AGE 12 & 13,

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Less than 1.0 108/86" = 131/119 86/73

1.0 5/12 6/7 eu

1a wenn 3/4

aya 6/3 2/6 3/6

13 ws 213 1/4

14 o/2 3/2 1/0

1.5 and greater s/n 79 2/6

Total = 1.0 18/39 22/36 16/29

Total Tested 126 153 102

Prevalence 142/312 14% /22% 16%/29%

_?eoOTS

*Results from 1969 batch/results from 1976 batch

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TABLE 2

EFFECT OF ADJUSTMENT OF WHEAL SIZE FOR 1976 ANTIGEN ON RATE OF POSITIVE REACTORS AMONG 381 CHILDREN FROM LUQUILLO AND PONCE, PUERTO RICO, IN COMPARISON WITH PREVALENCE FROM 1969 ANTIGEN

1976 ANTIGEN-

Age =+1969 ANTIGEN--- > 7

Tm Before Adjustment After Adjustment

Years Number Per Cent Nunber Number Per Cent

10 18 4 39 18 14

u 22 4 34 20 13

12413 16 16 29 4 4

?TOTAL 56 14.7% 102 52 13.7%

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TABLE 3. REACTOR RATES TO THE SCHISTOSOMIASIS SKIN TEST BY WATERSHEDS
IN PUERTO RICO, 1976

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TABLE 4

REMAINING ENDEMIC AREA IN PUERTO RICO

(Watersheds with reactor rates of 10% or above in 1976)

Number of

Classrooms Reactor Rate Population

1976 1970

1. Fajardo, Ceiba 10 10.3% 3,300

2. Rio Grande, Luquillo 26 16.4 32,422

3. Naguabo 15 L104 17,996

4. Trujillo Alto, Carolina,

Loiza 70 20.7 177,374

5. Gurabo, Juncos, Las Pie-
dras 43 11.6 58,215,

6. Humacao 26 10.1 36,023

24. Guayanilla, Yauco

Penuelas a2 13.2 69,220

25. Upper Yauco, Castafier 12 10.2 10,000

TOTAL 202 434,550

Weighted Mean Prevalence = 15.6%

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Discussion

The similar natures of the 1976 survey and the 1969 survey

made it possible to compare geographic changes in the reactor rates

The rate for the island as a whole decreased to 6% + 1%, less than

half of what it had been in 1969. This decrease was general

throughout the island, occurring in 28 of 31 watersheds. The

occurrence of highest rates in northeastern Puerto Rico indicated a

marked change in the geographic distribution of schistosomiasis. The

high rate areas were previously concentrated in the south-

t

(Figure 2). In addition to the northward shift of the area of highest

reactor rates there was an extension of the non-endemic area with

virtually no infected persons, namely watersheds which had fewer

than 5% positive reactors (Figure 1). This covered 15 watersheds in

1976, compared to only three watersheds in 1969 (Figure 2).

The exact correlation between reactivity to the adult worm

antigen and schistosome infection has not been established, but it is

clear that periodic testing with the same methodology gives an indication of trends in infection rates, especially in terms of relative geographical changes. This information, while not corresponding quantitatively to transmission rates, is useful for establishing

Priorities for control programs and for

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The ultimate use of the 3 similar island-wide surveys is to quantitatively evaluate the effectiveness of the schistosomiasis control Program, and to define the current distribution of the infection throughout Puerto Rico. This is a complicated matter requiring calibration of the skin t.

t reactivity from each survey with prevalence

data by fecal examinations, and adjustment of the results from the 1963

survey to conform to the methodologies of the 1969 and 1976 surveys.

When these various calibrations and adjustments are accomplished, the

final evaluation will be made®,

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APPENDIX

The following appendix contains the maps and tables

for the skin test reactor rates by school for the 25% of

schools in the 1976 sample. There is one map and one table

for each of the 31 watersheds. Additional tables and

information from the 1963 and 1969 surveys can be found in

the draft publication of CEER entitled "Schistosomiasis

Prevalence in Puerto Rico, 1976" by Negrén and Nazario,

May 1977,

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Table B-

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TABLE A

REACTOR RATES BY WATERSHEDS FROM SKIN TEST FOR
SCHISTOSOMIASIS IN FIFTH GRADERS OF PUERTO RICO,

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TABLE 1, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS,

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TABLE 2, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS,

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2 13590z109-1 32 4 1205 ona

2 erer rioters 30 5 Lest 0.9

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2 13390ze05-1 27 1 37 O68

Toray 206 2 a7 8

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TABLE

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1 432102304 -1 16

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2 15210ç402-1 6

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TABLE 4, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

?BY INDIVIDUAL SAMPLE CLASSROOMS,

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1 12 7uvesoe=1 23 °

2 seu ovetva=1 4 24

2 boi suzi2o-1 28 6

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3 iBesvetus-1 32 5

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TABLE 5, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS,

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TABLE 6, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS,

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TABLE 7, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS .

WATERSHED AREA 7

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TESTED POSITIVE 190 ages,

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1 ioe fouluine 22 o 0:0 0.7

1 139 /91104-3 ai 2 95 O68

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1 Ase Tagsul-1 24 o 0.0 O68

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?TABLE G, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS ,

WATERSHED aRea 6

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2 1213041 53-1 30 4 4323

2 Leisdiise-1 35, 2 5:7

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Turan 219 4 8

GkAWU=TOTAL 408 28 .

?Total not calculated because of unequal sampling rats

OF because numbers vere too smell.

AVERAGE

ANTIGE

AREA

On

05,

026

ry

Ore

on

05

064

08,

ons,

0.7

004

Ore,

O68

O68

0.5,

0.5,

---Page Break---

SAN JUAN,RIO PIEDRAS

TYPE oF senoot

® vnsan

rural

@ URAL nor sampceo

O Unban nor sampceo

---Page Break---

TABLE

DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS,

STOATS setae se unt

UKsaN

toouttte st

koeet Lt s7=1

toouslaoz=1

teouitiar-b

teovethio-L

tooueligz =

deo tiid=1

bosseddoy=i

Fouavitae-1

Aebrdda sent

erenvenrens

sooveliva-l

swodsdaec=1

Jura

Runa

Bedsense-1

iowesesce-1

toovs2au5-1

loisveiva=1

Tatac

onaae=TUTAL

?Total not calculated because of unequal sampling ratios,

OF because numbers were too small,

besHro

Tt

35

25

a

29

27

\$4

20

2s

st

0

se

a

139

>a

Nusaea

> pOstTtVE

a

=39-

avern

ANTEGE

026

a6

---Page Break---

BAYAMON, CATANO, GUAYNABO.

MAP 10, AREA WO. 10

TYPE OF scHool

® vnsan

ok runaL

@ FuRAL Nor SAMPLED

O URBAN Nor SAMPLED

---Page Break---

TABLE 10. DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS .

WATESSHED AREA 10

RATE AVERAGE

STRATUM ? SUHUL-LOLE ? NUNAER _NUMAEE PER ANTIGHA

TestEN POSITIVE 150 aaa

vavad

3 TeLiiiue=t 20 ° 9 cee

3 pravevvesas an 2 54 8

3 Teli tises=i 27 1 0:5,

3 weligdizo-d os 1 06

3 feitetasy-1 23 ° 025

3 telvattue=1 13 a 005

3 JoLovdowo-1 29 2 0.7

3 lolovilis=1 20 ° 005

3 Letevisvi-1 31 9 026

3 Le svolive= 2s ° ons

rotate 259 ? aes a5

nukaL

1 ko s0vetea=1 au ° e.0 0.5

1 lowuseler=1 22 9 0.0 026

2 wel leesounL 2e o 920 0:5,

2 teso02304-1 3 ° 020 Ons

3 tollgeiuy-1 19 0 oro Ove

3 hooves vi=1 24 ° 900 06,

Tora 160 ° 0.0 os

mukaL

vkadu-TOT AL 399 6 . os

?Total not calculated because of unequal sampling ration,
OF because numbers were too small,

-A1-

---Page Break---

UPPER BAYAMON

MAP I, AREA No.1

000-ScMooL NUMBER

k= TYPE OF scHooL

TYPE OF scHooL

URBAN

RURAL

RURAL NOT SAMPLED

Oe@%*®

URBAN NOT SAMPLED

---Page Break---

TABLE 11, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS ,

WRTERSHED aa ea an

eare

STRATIM ? suuuuL-.00F NUMBER NUMBER per

TESTED enStTivE 100

wuRaL

1 106920491 26 ° oo

1 1edeuaiaae=t ul ° 920

1 1e0syas0i=1 26 ° 020

1 seeougior=1 35 3 Br

1 12evu2suL=1 29 1 34

Toran 127 4 Bel

okAMU-TOTAL 127 4 .

?Total not calculated because of unequal sanpling ration

OF because numbers ere too small.

AVER AG

ANTIGEN

aRes.

6

One

05,

on

oe

0.5

ory

---Page Break---

COMERIO, BARRANQUITAS, AIBONITO

CIDRA, CAYEY

MAP 12, AREA No. 12

TYPE oF senoot

@ vnvan

muna

@ rurar wor samPieo

O urean wor sampieo

---Page Break---

TABLE 1°, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS ,

Wares

TOATUM ? SuduL-LODE NUMBER

TesTeu.

Usiad

1 121 7oLs0g=1 a

1 beatuitus-1 32

2 sees9kioo=1 2%

3 1euddiewt =l s7

4 sedvoiiga- 2a

4 seecouas-d 26

forau 178

1 aga fctie-t 26

L 42d ie2su5-1 32

1 4229023 03-1 22

2 42090ç302-1 ve

2 teeuveiua=1 27

2 teezogt.a=1 a

3 1eu92be7=1 19

3 120 sub oe=1 20

3 1o2i0et 13-1 23

? Leeevesueni 12

Tora 208

wnanu-TOTAL 386,

?Total not calculated because of unequal sampling rat

OF because numbers were too small,

She

-45-

AREA

nuwae

positive

7

15:8

AVERAGE

ANTIGENS

AREAS

O66

ors,

03

Ore

Oe

05,

0.5

7

0.7

a5,

os

0.4

one

07

95,

Ons

---Page Break---

PATILLAS, ARROYO

MAP I3, AREA Wo.13

200-seno01 MuMeER

he = TYPE oF sence

100- % 1nrecTion

?~:

® vursan

we RuRAL

@ RuRAL Nor samPLeD

---Page Break---

TABLE 19, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS ,

WATERSHED AREA as

Tatum ? scusuL-c ove

Uswan

Todeutiue-1

AB>yliul =?

tbugdt 109-1

doavttuy-2

Tytac

unae

Lsavveevo-1

i3>e0ziai-1

Vs>quzsue=1

ts2s0eito-1

4>uede.u2-1

Dousvesur-t

todsvesve=1

ToTac

omauv= TOTAL

?Total not calculated because of unequal

kate

NUMBER NUMBER PER

TESTED POSITIVE 100

32 ° 0.0

25 ° a0

ar 1 ate

29 1 36

107 2 19

29 1 Bee

15 ° 60

23 2 a7

15 1 eT

28 ° oro

33 ° 9020

23 1 43

loo 5 3.0

21 7 .

oF because numbers vere too small,

-47-

vampling ratios,

AveRaG.

WNTIGEN,

ARES

os,

On6

0.7

ore

Ove

ove

ee

Orr

crs,

---Page Break---

GUAYAMA, SALINAS

MAP 14, AREA NO. 14

TYPE OF SCHOOL

® vnean

oe rural

© runs wor sauecen

© unoan wor saveceo

---Page Break---

TABLE 11, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS ,

WATERSHED

stearum

unoan

Aedvlive-1

econtreteny

teeo01e01-1

loesultus-1

A esddL0y=1

Tatat

kuna,

wocdeluy-1

s>02d2i09-1

iooeueaue=1

byogdeaua-1

432002304 -1

Loesuesut-2

ioeoveta-L

doauvzsue-1

ToTat

wkany=ToraL

servut-. oe

NUMBER

TESTED.

12

v7

22

25

96

aL

22

Se

to

2s

28

2a

a1

205

?Total not calculated becau:

AREA

nuwaes

Positive

of unequal

1s

nate

pling

OF because numbers were too small,

Pew

100

10.0

Bs

5.9

at

40

ea

1812

as

125

a3

mm

oro

ratios,

AVER AG

ANTIGEN

ake

0.7

06

or

on?

O05

deo

O66

0.7

ote

oo

Onn

0.7

on

oe

On

O06

---Page Break---

VILLALBA, JUANA DIAZ, COAMO, SANTA ISABEL

Five of senior

Bunsen

ruray

© runs wor samrces

O uneAN nor sampcen

---Page Break---

TABLE 1 DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS ,

WATERSH. 0 aR

TRATIG ?SCHUUL-LODE ?-MIMBER NUMMFa

TESTED onsiTive

koa

1 toa /oltuent 39 >

2 bToulteent uF 1

3 wooTaiiui=1 32 1

? a>eidilou=1 20 5

4 boetultve-i ry 2

Futat lee 14

muna

1 losiveaui=1 a> ?

1 to 9T9e300-1 82 2

2 sofa deava-1 Ww 1

2 to royed i ont 20 1

2 te loaeus-1 1 °

4 Delyesui-t B 2

3 190 ldetsa=d au 0

3 losTaesue-1 2s 5

. evierrevesy fi °

? boendenes-1 ar 1

Torac 224 te

eRaWW=TOTAL 389 30

?Total not calculated because of unequal sampling ratios,

OF because munbers vere too small,

51.

Rate

Pen

199

10.7

226

au

are

2020

AVERAGE

ANTIGEN

RFS

en

or,

or6

on?

0.7

or

7

cre

our

arr

on

Ore.

on?

De

on?

o7

der

---Page Break---

OROCOVIS

MAP I6, AREA NO. 16

200-schHooL numer

"

k= TPE oF sono:

20-% INFECTION

TYPE OF schoo

URBAN

RURAL

RURAL NOT SAMPLED

URBAN NoT SAMPLED

C@ex®@

---Page Break---

TABLE 16, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS,

WATERSHED AREA Oe

aare

STRATUM ScHUSL=SO IE MNER ware Per

TesTeD ?pastrive 100

Uni

2 susvltuaei 3h 1 3.2

> Aosutioi-e 2 no

TaTaL 4 1 ey

aUsat

1 LeIUbesd0=1 82 t 3a

1 swesseave=l 2 0 220

2 Lavsdeate=t ar 2 ne

? Ls ov2eue=1 26 1 318

2 Aiasvesuent 2s 2 sir

2 442502900 -2 2 1 ae

> Freseyeyas ? ° 19

Totae tye ? aon

oaanu= TTA 249 6 .

?Total not calculated because of unequal sampling ratios,

OF because numbers vere too small,

o.6,

6

---Page Break---

CIALES

MAP 17, AREA No.17

200-scHoot NUMBER

HE = TYPE OF SeHool

?00 % INFECTION

YPE OF SCHOOL

URBAN

we RURAL

@ RURAL NoT SAMPLED

O URBAN NoT SAMPLED

---Page Break---

TABLE 17, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS,

WATERSHED Roe a 47

mare

STRATUM SunUL-cODE ? NUMUER Hye PEL aaTHies

Testro? ensttiye toy agg

Uswas

1 Abad bey-t 1y ® co cer

talyausesne 20 5 Ay or

Tarae ?4 3 bee ow?

numa

1 Aad syciur- 22 1 45 ne

1 dadvvetayaL so ° oo Onn

1 bbasaetesat 12 ° eo O06

1 1135ues0e-1 3 1 a0 os,

1 tisdZsvo-1 55 a vo ono

2 Prirayiires 16 ° o9 ots

2 siasd2sui-1 22 1 ?5 mn

Torae 160, 2 1.8 0

vnaw=ToTAL 219 ° .

?Total not calculated because of unequal sanpling ratio

oF because numbers were too snail,

a552

---Page Break---

TOA ALTA,NARANJITO

MAP 18, AREA No. 18

?S

00-scHoot NUMBER

= TYPE OF scHool

'00~% INFECTION

TYPE OF SCHOOL

@® ursan

RURAL

*

@ RURAL NoT SAMPLED

© URBAN NoT SAMPLED

---Page Break---

TABLE 18. DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS,

WATERSHED Sara OM

Rate

STRAT SuMuu-CODE NUMBER UME PEK

TESTED pNSITIVE 100

URBAN

2 dedeviavi-1 aa e oo

2 kes2uiioi~2 24 ° C20

4 Loodyis01-1 32 ° 00

5 loosvtivi-e 82 1 an

Turae 16 1

muKaL

1 leeeverus-1 ? °

1 wolleesos-1 20 °

? Ledeveiuo-1 +9 1

2 Aesedeude-1 2a 9

3 132502φ40-1 32 °

3 hocoveedenl 20 1

5 lowsuceue-2 27 2

3 aeosveoul = 15 °

tata lar 2

vawWw-TOTAL 301 3 .

?Total not calculated because of unequal sampling ratios,

OF because numbers were too small.

57

AVERAG

ANTIGE

AREY

a8

---Page Break---

DORADO, TOA BAJA, VEGA BAJA, VEGA ALTA

COROZAL, MOROVIS

O unean wor saupues

---Page Break---

TABLE 19, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS ,

WATERSHED

STRATUM yCHuuL-00?

uRsAN

Lugsviou-1

Aooyldui=1

f1rsditui=1

tu 209k40e-1

lester =1

iireviiee-1

does0ukeo-1

Torae

nun at

doesv2sve-L

Li ssvesue-t

aiTooieita-1

sLTso241 7-1

Li rev2sai-1

harsozsgge-1

seredei1>-1

leesvesul=1

logsvesve-1

roTan

NuMaER

TESTED

29

26

27

4

34

29

32

aun

23

52

2

15

20

en

2>

er

pen

omawu=TOTAL 434

Area

NuMBFe

eostTive

a

RATE AveR ate

pes AwTIGEN

4953

?Total not calculated because of unequal sampling ratios,

oF beau

umbers vere too om

---Page Break---

BARCELONETA, MANATI

MAP 20, AREA No. 20

200 seHe04 nuMaen

= TYPE oF scHoo.

00- % INFEerion

i

FLonion?

TYPE OF scHooL

® vroan

te RURAL

@ = euRAL wor sampLeo

o

URBAN NOT SAMPLED

??=:

---Page Break---

TABLE 20, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS ,

STRATUS ? sunuuL-L ane

UKou

stsbLiis=1

hasatitans

taoydLata=e

Alssuiien-1

Absovlaot-e

Lig suttueet

vata

wuRae

Livtoesoe-1

Lia iy23ur-1

tiovoesua=1

Abowt2i00-1

Lissozeue-1

Li yaueeuo=1

41s302300-1

furan

RAMU TOTAL

exsn

suwen

step

19

28

iW

23

22

28

139

26

ar

iT

20

ar

18

35

165,

306

aAaea

Nyaacs

Postrive

19

16

?Total not calculated because of unequal

OF because numbers vere too small,

20

parte

109

1645

low

wT

fal

ne

3.8

20

Week

ANTI

aura

---Page Break---

ARECIBO

TYPE OF sewoou

®

*

e

o

URBAN

RURAL

RURAL NOT SAMPLED

URBAN NOT SAMPLED

---Page Break---

TABLE 21, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS,

WATEYSHED AREa a

RATE aveBaun

TRATUY ? seadueee ODE NUINER NUMBER Pra ANTIGoW

Theo wastttve 100, ARE

ussae

1 tiv luluiuz=i ts ° a oO.

1 kgs adboa= 1 20 1 32 on

1 iloruiios=1 42 4 0) O16

1 reernrrweny aa 2 16 one

1 Ler odis3-1 29 2 eo o.7

1 ey itesee n ° 020 os

hotan 14s 5 Bed o.7

puna.

1 Wo setoe-t 3 10.7 on

1 rereyrevest 1 wt 0.7

1 Ligvoesos=1 ° oo Oo?

1 ty (uesuy=1 1 ca on

1 hid ryesus-1 le o o.0 0.7

I 4.2702309-1 22 9 020 0.7

rotan aa > +9 oe

oaAWATOTAL 272 to . or

?Total not calculated because of unequal sampling ratios,

OF because numbers vere too small,

63+

---Page Break---

UTUADO, JAYUYA, ADJUNTAS

MAP 22, AREA No.2?

RURAL NOT SAMPLED

---Page Break---

TABLE 22, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS .

WATES SHED ABER 22

are Avra.

STRATUM serduL-VODE ?NUMHER NUMBER PER ANTIOS

TESTED PASITIVE ma ane

Unsan

1 LATA 39-1 32 °

1 bouioig2=1 2a 2

2 LTivdewe=1 20 °

2 LuTWohas a= 2a 2

2 Ainaiea=2 2> °

4 tos0uLui-1 29 1

? peseayevier 25 1

Tura 187 6

Pua

1 AiTivesva-2 3s °

1 41 7402500-1 24 °

1 s17L02345-2 6 °

1 ti Tives0i=1 22 9

L kooidetes=1 22 7

? Lirivesue=t 3 1

5 ALLivesve=1 20 3

3 417102305-1 22 1

3 43 30023u2-1 38 l

? Lb soveius=1 32 1

* 15 300eLei-1 26 5

jurae ae 19 eeu Onn

wmaNU=TOTAL 468 25 . owe

?Total not calculated because of unequal sampling ratios,

OF because numbers were too small.

-65-

---Page Break---

PONCE

Type or send

oe RURAL

@ GuRAL wor saurceo

© unean wor sawpces

---Page Break---

sTRaTis

TABLE 23, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

etude 2

uasan

perenreveent

A>>0d1au a=

A>Seualle-1

Aodoulsee=1

absutusoi-1

to>0411U3-1

1oouklive-t

About tiv l=

Azuakidond

tatae

uct

43 31vzaue-1

lozeueleu-i

1>0denoa-1

apoadesui-1

s>ouueaso-1

Apdovel 7-1

s>>uL2iaa-1

lodaizede-1

lpz0kesue-1

rorac

BY INDIVIDUAL SAMPLE CLASSROOMS.

TERSHERD

NUMBER

TESTED

25

25

be

ar

u

31

29

26

20

240

33

\$2

ey

De.

6

2

28

32

ab

ais

SRAWJ-TOTAL 401

?Total not calculated because of unequal sampling ratios,

anea

NUMBER

Positive

te

of because numbers were too small,

-67-

23

pate

Per

107

ee

a)

1526.

SeT)

a2

020

3h4

000

520

AERA

aNTTGen,

area.

08

on

0.7

oe

7

on?

O26

ove

O08

---Page Break---

YAUCO, GUAYANILLA, PENUELAS

Seater or sevoet

MAP 26, AREA Wo. 26 eee en

Type of sensor

@® vnean

Je nua

@ una nor samreo

O unBAN nor sawpteo

---Page Break---

TABLE 24, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS,

wate

STEATU4 ? SCJue-e ODE ua

asst

unease

1 feeperenyas) 19

1 Abdy Lavine B

1 perenyervery 23

2 Aevolity=1 30

2 Bewites-1 27

? Devotien-2 >a

3 woT1uLivin1 35

3 Peary yers 21

TuTae 216

puma

2 aees0eetin1 a5

2 wewesvi-1 33

? 1>>30ç30e-1 2

3 1>T792.u9-1 20

3 1pTTueiio=1 36

3 Lo7rugsvand 39

3 s71029ue-1 28

a leulvecvi=1 32

? AST zio-1 34

Toran 278

nyse

whanu-TOTAL 696

?Total not calculated because of unequal sampling ratios,

SHED AREA

e

numace

postrive

39

6

OF because numbers vere too small.

-69-

24

Te

pea

109

10.5

oat

0.9

B3

ma

low

wh

vis

10.2

lee

1522

25

15.0

16.7

2802

0.9

3

20.6

14.0

AVERA Se

ANTE

aan

Oe

one

0.7

---Page Break---

UPPER YAUCO, CASTANER

MAP 25, AREA NO. 25

eray

TYPE OF scHoot

® urean

de RURAL

@ muRAL Kor samPceo

© urean nor sampceo

---Page Break---

TABLE 25 DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

?BY INDIVIDUAL SAMPLE CLASSROOMS

WATEY SHED

STRATUM SunyDL-CUDE ?NUYBER

TESTED,

KURA

1 Lisvoersu-1 °

1 tLvuesus-1 1s

1 Thgudgs02=1 20

1 aovivesui=1 23

1 Lotti s-1 23

Turat oa

VAANU=TOTAL 98

NuMBER

Postrive

10

19

25

aare

Pea

100

low

009

Bu

1t4

ins

re.

?Total not calculated because of unequal sampling ratio

OF because numbers vere too small.

?ne

AVE RAN,

ANTE

---Page Break---

AGUADILLA,RINCON, LARES, MATILLO, MOCA. AGUADA,ISABELA,QUEBRADILLAS.SAN
SEBASTIAN, CAMUY

0 aa me i

---Page Break---

?TABLE 26. DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS

WATESSHED APES Bo

KATE AVERAG.

STRAT ? uHaue-echr MUMEEE ne eR ANTIGEN

Liste easirtye a0 AREA

vasa

1 4sG2v1101-1 a6 ° 0.0 Os

2 isu sdtava=1 eu 0 ono 5,

2 As0301106-1 \ 1 2s 5,

2 Asasutivi=1 20 1 he 0.5,

3 Assz0Lvoi=1 3 * ie 0.7

3 is3ovaioi-2 rss 9 000 on

? Aseoviivi-t 21 ° 000 oe

5 ALsuditui=1 2H 2 mm on?

5 Lisvulloe-d al 1 ans 07

6 Ttsattui-1 1 2 1005 ora

6 wesayvevest 22 1 a8 7

a tiseutivant » ° co 006

luTae 326 1 BT 0.8

nunaL

1 agouuei1a-1 25 2 C0 Ons

1 Asdsveise=t 2e 2 a9 a4

2 tsoev2s0e-1 ? ° cr

2 heey dzaue-1 23 1 ?9

5 teu sdesue-1 30 c 209

3 [e390caas-1 23 9 0.0

3 seevvesuseL 36 : 2ia

? froooei 33-1 6 1 ots

4 seuaaioa-1 1s o on) on6

4 Meouesus=1 20 ° 0.0 006

5 Lidqvesve=1 a1 ° 0 on

6 Lbiyueius-1 2 a so 5,

é Aibwetuo=1 26 2 nr 07

1 remryayyert 33 ° 00 out

8 hag tugau3?1 24 0 an on?

8 Hoedel 4-1 31 a eo oT

forae aan 5 1.2

RANU-TOTAL 745, " .

?Total not calculated because of unequal a

oF because numbers vere too small,

-73-

---Page Break---

ARASCO, LAS MARIAS

---Page Break---

TABLE 27, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS.

WATE® SHED ARER OF

PATE AVER Ae

STRATUM SCHUJL-CODE NUMBER NUMBER PER ANTIGEN

TESTED POSITIVE 100 ane a.

asad

2 Leytudioi-1 34 2 59 D5

3 tevoultus-1 40 ° oro on6

3 sevudiiua-2 30 1 323 on6

1 (tucoti0s-3 29 ° ea Orn

Tata iss 3 es 265

muna,

1 Aseluziue-1 4 o 640

1 Issovesva-1 30 ° 0.0

2 isslverita1 n ° 029

2 Assovesui-1 2 1 400

2 fereryrrver) 25 ° eo

3 Levoo2iuy=1 3 ° 0.9

3 trusseiea-d 30 ° 0.0

3 ereryrevary 23 ° ee

3 legodeboe=2 22 ° oo

3 Issovesvinl 34 ° 0.9

forae 22a 1 0.5

pxauu-TOTAL 354 + . O.>

?Total not calculated because of unequal sampling ratios,

oF becau:

numbers were too small.

-15-

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MAP 28, AREA NO.28 see also

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TABLE 28, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

?BY INDIVIDUAL SAMPLE CLASSROOMS,

WATES SHED AREA 28

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TABLE 29. DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS,

WATERSHED AREA ay

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or because numbers were too small.

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TABLE 30, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS
BY INDIVIDUAL SAMPLE CLASSROOMS.

WASTE SHED AREA 30

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TESTED POSITIVE 109 aged

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of unequal sampling ratios,

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VIEQUES

MAP 31, AREA Wo. 31 (viEouES)

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TABLE 31, DISTRIBUTION OF POSITIVE SKIN TEST REACTORS

BY INDIVIDUAL SAMPLE CLASSROOMS.

WATERSHED AKER BL

RATE AVERAOL

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SUMMARY

SKIN TEST DATA FOR SURVEYS OF 1963, 1969 AND 1976.
BY SCHOOL, ARRANGED BY WATERSHED

This summary correlates the number of positive skin-test reactors and children tested for each of the three surveys, including the code numbers for the school. The number reported as positive is according to the definition of that particular year.

---Page Break---

SKIN TEST DATA FOR 1963, 1969 AND 1976
(Arranged by watershed).

Summary of Skin Test Data for 1963, 1969, and 1976:

Summary of Skin Test Data for 1963, 1969, and 1976

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SKI TEST DATA FoR 796 5,199 11976"

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By waren swEPs.

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SKI TEST OATA FOR 196 5,199 119%

By waren SWEPS.

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By WATER SHEPS. a

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By waren SWEPS.

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By waren SWEPS.

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SKI TEST BATA FoR 196 5,199 1 197%

By waren SWEPS.

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By waren swEPS.

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By waree sveps.

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