DOCUMENT DOES NOT CONTAIN ECI

Reviewed by R Schuelke Date 4/30/97

409861

II Population Estimate

To estimate the number of births, deaths & the magnitude of the Bikini population after 30 years, information was used from the first draft of the Marshall Islands 5 year Health Plan prepared by the Trust Territory Department of Health Services Office of Health Planning & the Resources Department.

The document is undated, but the presence of data from 1975 indicates that it must have been prepared in the period of 1977 to 1979 when we received it. It was noted that there are apparent inconsistencies among several of the different tables. For example, Table III-1 gives data for the Marshall Islands for the period 1955-1975 and Table III-5 gives data for the infant mortality rate for 1976. In Table III-1, the infant death rate per 1000 births for 1970 through 1975 is given as 28.3, 33.6, 25.4, 46.4, 21.1 and 37.0. However, Table III-5 indicates the infant mortality rate to be only 17.04. We ~~have~~ used the data of Table III-1 in the following estimates; because it is more complete and it provides a self-consistent set of data. However, in view of the discrepancies, the results can only be considered as approximations. ~~In my view~~ This probably makes little real difference in view of the uncertainties in the risk ~~estimating~~ coefficients that were used. There is also a bias built into the data because of the inclusion of Ebye and Majaro in the overall Marshall Island rates. This arises from the different death rates (particularly infants) at these two locations. In many respects the population of Ebye & Majuro are quite dissimilar from the Bikini population because they have the advantage of a more advanced environment. For the estimates ~~we used~~ the last 5 or 6 year average of the data were used because they are probably ~~as being~~ the most representative of current conditions. From this, ~~we~~ the following were obtained:

1. Rate of increase of the population has been about 3.8%/yr.
2. Infant death rate to about 3.2% per birth.
3. Overall death rate ~~is~~ 0.54% per year.
4. Birth rate ~~is~~ 4.2% per year.

A population of 550 was assumed ~~to be~~ for the one that ~~may~~ might move back to ~~an island~~ Rikini-atoll. Values for other initial populations ~~may be~~ were obtained by ratios of the results.

The total population at the end of 30 years is given by the compounding equation:

$$P_{30} = 550\ (1+0.038)^{30} = 1684$$

The number of births in 30 years are given by:

$$B = 0.042 \times 550 \int_0^{30} (1.038)^x\ dx$$

where x is the time between 0 and 30. This gives

$$B = \frac{0.042 \times 550}{\ln 1.038}\ [1.038^{30} - 1] = 1277$$

Similarly, the number of deaths in the 30 year period would be:

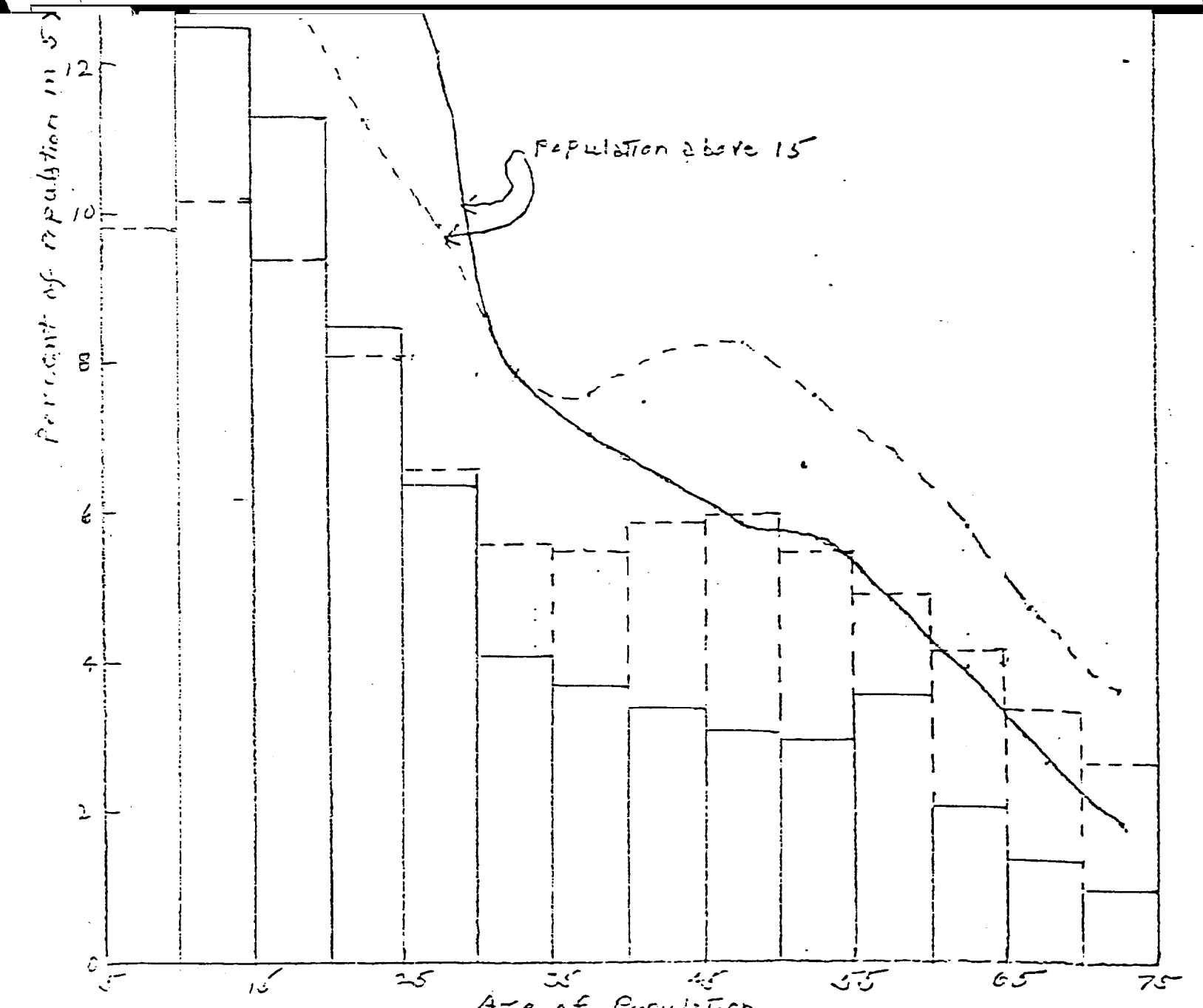
$$\text{Deaths} = 0.0054 \times 550 \int_0^{30} (1.038)^x\ dx$$

$$\text{Deaths} = \frac{0.0054 \times 550}{\ln 1.038}\ [1.038^{30} - 1] = 164$$

One other ~~item~~ datum needed is the reduction in 30 year dose to those born after the return because of the decrease in radiation levels and the smaller amount of time in the 30 year period that is spent on the island. For this, the total population dose for those born after returning assuming an initial dose rate of 1 rad/year is given by:

[redacted]

the Marshallese will be high by a factor of somewhere around 2-3 because of the distortion caused by the very high proportion of young people who have a relatively low natural cancer incidence.


Percent of population in 5's
12
10
8
6
4
2
0
Population above 15
15
25
35
45
55
65
75
Age of Population

~~Population Calculations~~

Using the preceding calculations for a population of 550, calculations were made for other population sizes

For a population of 550 (from preceding):

Deaths in 30 years = 164 $\approx$ 160
Births in 30 years = 1277 $\approx$ 1300

For a population 140 (the number that returned to Bikini):

Deaths in 30 years $\frac{164}{550} = \frac{x}{140}$, $x = \underline{\underline{41.7}} \approx 40$

Births in 30 years $\frac{1277}{550} = \frac{x}{140}$, $x = \underline{\underline{325.}} \approx 300$

For a population of 235:

Deaths in 30 years, $\frac{164}{550} = \frac{x}{235}$, $x = 70.07 \approx 70$

Births in 30 years, $\frac{1277}{550} = \frac{x}{235}$, $x = 545.62 \approx 550$

For A Population of 350

Deaths in 30 years, $\frac{164}{550} = \frac{x}{350}$, $x = 104.36 \approx 100$

Births in 30 years, $\frac{1277}{550} = \frac{x}{350}$, $x = 812.63 \approx 800$