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**INTERNATIONAL TUBERCULOSIS SURVEILLANCE CENTRE
13TH PROGRESS REPORT TO THE TSRU DIRECTING COMMITTEE
1990/1991**

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Introduction

The Tuberculin Research Unit TNO

The Tuberculin Research Unit was established in 1951 as part of the Division of Health Research TNO (Nederlands Organization for Applied Scientific Research).

Since January 1989 the Tuberculin Unit has been administered by and is part of the TNO Institute for Preventive Health Care (NIPG-TNO).

The activities of the Unit in international context take place as International Tuberculosis Surveillance Centre (ITSC).

ITSC is a collaborative activity of World Health Organization (WHO), the International Union against Tuberculosis and Lung Disease (IUATLD), the KNCV and the NIPG-TNO. Further more close collaboration is established with the Tuberculosis Surveillance Research Unit (TSRU) (director Dr. K. Styblo). Both ITSC and TSRU are housed at KNCV office, Riouwstraat 7, The Hague.

The aim of the Unit is to contribute to the surveillance of tuberculosis by executing (or by having executed) tuberculin surveys in countries with high and low prevalence of tuberculosis. Within the activities of the Unit the following tasks can be distinguished.

Research

The Netherlands

- The tuberculin survey in Dutch army recruits. The determination of the prevalence of tuberculous infection in all army recruits is the only source of information available about the magnitude of the risk of tuberculous infection in The Netherlands since 1956.
- The tuberculin investigation into specific and non-specific tuberculin sensitivity in schoolchildren in the city of Delft. The determination (once every five years) of the prevalence of infections with MOTT (Mycobacteria Other Than Tuberculosis) in schoolchildren in Delft is the only source of information on the prevalence and trend of infections with MOTT in The Netherlands.

International

Tuberculin surveys in schoolchildren in developing countries (in particular Tanzania, Malawi, Vietnam, Benin, Mozambique and Nicaragua).

The determination (once every five years) of the prevalence of tuberculous infection in schoolchildren in the developing countries is the only source of information about the magnitude of the tuberculosis problem and the effects of the national tuberculosis program on the transmission of the disease. This surveillance is of great scientific importance to investigate the impact of new intervention strategies. This surveillance is even more important now to investigate if the negative influence of the HIV epidemic on the tuberculosis problem can be curbed by existing intervention strategies.

International reference

The members of the Unit function as well in The Netherlands as in international context as references for the technique of tuberculin testing and reading. At the same time the Unit advises together with the scientific director of TSRU on the design and the analysis of the results of national tuberculin surveys.

In this respect use has been made of "Guidelines for estimating the risk of tuberculous infection from tuberculin test results in a representative sample of children" (Bulletin of the IUATLD, vol. 64, No 2, June 1989).

Training

On the request of the IUATLD, WHO and the Ministry of Health of a particular country, the ITSC trains national tuberculin teams for the execution of national tuberculin surveys in the framework of national tuberculosis programs in countries with high prevalence of tuberculosis. For the training use has been made of the "Technical guide for tuberculin survey teams" and "The WHO Standard Tuberculin test" prepared by the WHO Tuberculosis Research Office (WHO/TB/Tech. Guide 3, February 1963).

1. Research - The Netherlands

1.1. Tuberculin survey in Dutch army recruits

As in previous years (from 1956 onwards) the survey into the prevalence of tuberculin sensitivity was continued in cooperation with the Royal Netherlands Army Medical Service.

So far the results of these surveys are the only source of information about the trend of the risk of tuberculous infection in The Netherlands. Of 41,040 non BCG-vaccinated recruits tested in 1990 the percentage of reactors with indurations of 10mm and more to 1TU PPD RT23+Tween 80 was 0.42.

The survey will be continued. The following table shows per calendar year from 1956 on the results of these surveys.

RESULTS OF TUBERCULIN TESTING IN UNVACCINATED RECRUITS, AGED 20 YEARS THE NETHERLANDS 1956-1990							
Calendar year of survey	Number tested	Induration > 9mm		Induration > 7mm		Induration > 5mm	
		No.	%	No.	%	No.	%
1956	40.217	7.715	19.18	8.657	21.52	9.490	23.60
1957	38.163	6.235	16.33	7.063	18.51	7.845	20.55
1958	37.365	5.678	15.20	6.432	17.21	7.106	19.02
1959	41.101	5.580	13.58	6.025	14.66	6.511	15.84
1960	42.870	5.100	11.90	5.535	12.91	6.066	14.15
1961	44.918	4.921	10.95	5.300	11.80	5.793	12.90
1962	45.124	4.103	9.09	4.469	9.90	4.920	10.90
1963	44.600	3.421	7.67	3.742	8.39	4.161	9.33
1964	38.395	2.648	6.90	2.875	7.49	3.158	8.22
1965	38.999	2.461	6.31	2.756	7.07	3.278	8.40
1966	42.458	2.314	5.45	2.578	6.07	3.141	7.40
1967	34.177	1.697	4.97	1.894	5.54	2.259	6.61
1968	41.613	1.949	4.68	2.163	5.20	2.505	6.02
1969	41.035	1.792	4.37	1.995	4.86	2.304	5.61
1970	37.762	1.643	4.35	1.861	4.93	2.177	5.76
1971	44.460	1.972	4.47	2.200	4.99	2.478	5.62
1972	38.092	1.405	3.65	1.569	4.08	1.751	4.55
1973	41.628	1.134	2.72	1.356	3.26	1.622	3.89
1974	40.554	994	2.45	1.137	2.80	1.363	3.36
1975	38.473	872	2.27	1.016	2.64	1.182	3.07
1976	38.082	830	2.18	996	2.61	1.190	3.12
1977	42.987	890	2.07	1.044	2.43	1.201	2.79
1978	42.013	532	1.27	635	1.51	773	1.84
1979	44.665	521	1.17	629	1.41	747	1.67
1980	45.895	392	0.85	482	1.05	596	1.30
1981	45.893	386	0.84	480	1.04	600	1.31
1982	42.155	335	0.79	409	0.97	481	1.14
1983	44.331	325	0.73	395	0.89	468	1.06
1984	41.161	292	0.71	346	0.84	405	0.98
1985	43.265	196	0.45	243	0.56	346	0.80
1986	44.365	209	0.47	279	0.63	363	0.82
1987	45.737	189	0.41	257	0.56	344	0.75
1988	44.393	215	0.48	282	0.64	342	0.77
1989	43.801	175	0.40	233	0.50	293	0.67
1990	41.040	172	0.42	214	0.52	256	0.62

1.2. **Tuberculin survey into specific and non-specific tuberculin sensitivity in schoolchildren in the city of Delft**

The aim of the study is to investigate the prevalence of infections with MOTT (Mycobacteria Other Than Tuberculosis) in relation to infections with tubercle bacilli and their trend in schoolchildren aged 7-13 years.

Two simultaneously applied tuberculin tests are made, one with 2 TU PPD RT23+Tween 80 and the second test with a biologically comparable dose of PPD-Scrophylaceum+Tween 80. The survey is repeated every five years. The fifth round started in January 1991.

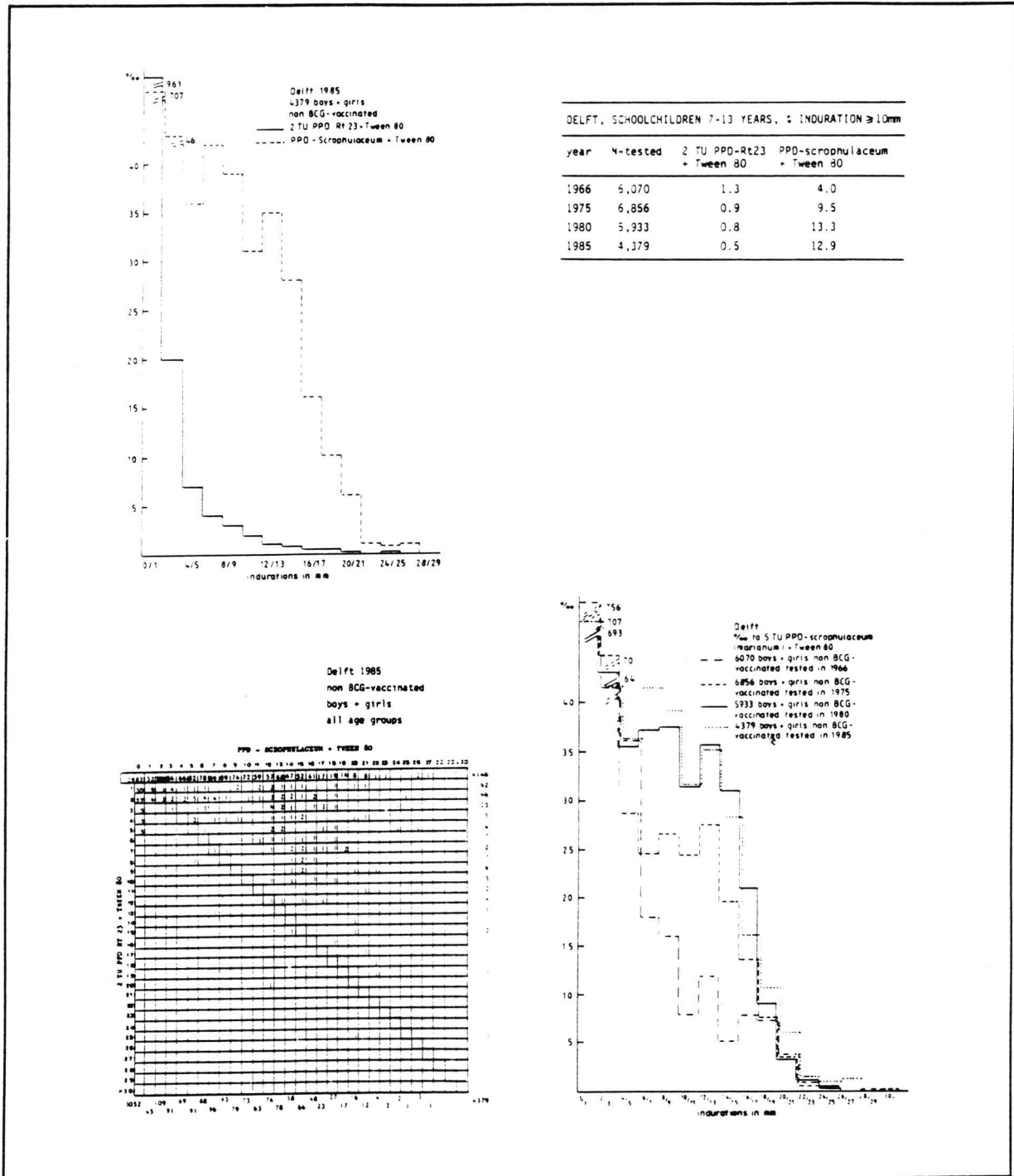
The results of the previous surveys are shown on the poster on the next page, which was presented during the IUATLD conference in Singapore in 1986.

Study into specific and non-specific tuberculin sensitivity in schoolchildren in Delft The Netherlands 1966 - 1985

I.T.S.C.

M.A. Bleiker
N.W. Duinker
O. Misljenovic

Whilst in the period 1966-1985 the prevalence of reaction reactors to human PPD- was decreasing the prevalence of reactors to PPD-scrophulaceum increased.



Pathology has not been reported in children reacting with indurations of 10 mm and more to PPD-scrophulaceum. However, the question remains unanswered why there is an increase in the sensitivity to PPD-scrophulaceum, and if this phenomenon is caused by infections of mycobacteriae other than *M. tuberculosis*, which one it really is and why.

2. Research - International

2.1. Preliminary results of tuberculin surveys carried out in Vietnam 1986-1990

2.1.1. Introduction

As part of the National Tuberculosis Program (modelled after the IUATLD supported programs in developing countries) tuberculin surveys were carried out in various parts of the country.

Because of the enormous size of the country and observed differences in case-detection, it was decided, before embarking on a large scale and costly national tuberculosis survey, to obtain an impression of the prevalence of infection in schoolchildren in some provinces according to the TSRU methodology described elsewhere.

All data presented are preliminary.

2.1.2. HCM City survey

In 1986, 1988 and 1989 a survey (with 1TU PPD RT23+TWEEN 80) was carried out in HCM City (urban districts). In order to obtain an estimate of the trend in the risk of infection in HCM City/Saigon, this survey was designed as a resurvey of the WHO prevalence survey of 1961-1962. The results of this survey were independently analyzed and presented at the World Conference on "Lung Health" (Boston, May 1990) (see annex 1). The preliminary results indicate a risk of infection (age-group 5-9 years) in the order of 2.6% and a decline in the risk of infection between 1961-1987 in the order of 1.5-2.2% per year.

2.1.3. Hanoi rural survey

In 1988, a survey (with 1TU PPD RT23+TWEEN 80) was carried out in a random sample of primary schools from all 12 Hanoi rural districts. In total 10,378 schoolchildren were tested and read (of whom 9,401 (91%) non-BCG vaccinated). The histogram is presented as figure 1. The results are presented in tables 1, 2, 3 and 4.

Preliminary results:

N=8,498

age 7 years	≥ 10mm	N=69	prevalence of infection 1.72%
age 8 years	≥ 10mm	N=77	
	total	146	

Conclusion

Assuming a 1% decline, the risk of infection is .22% in the age-group 7-8 years.

2.1.4. Hai Phong City survey

In March-April 1990, a survey (with 2TU PPD RT23+TWEEN 80) was carried out in a random sample of primary schools from all districts of Hai Phong City. In total 7,519 schoolchildren were tested and read (of whom 6,019 (80%) non-BCG vaccinated). The histogram of the distribution of indurations suggests a relatively high prevalence of MOTT. The mean induration in 153 smear-positive pulmonary patients tested in the National Institute of Tuberculosis and Respiratory Disease in Hanoi was 17.2mm. The histogram is presented as figure 2. The results are presented in tables 5 and 6.

Preliminary results:

N=5,360

age 7 years	N=($\geq 17 \times 2$)	228	
age 8 years	N=($\geq 17 \times 2$)	190	prevalence of infection 7.8%
		418	
	total		

Conclusion

Assuming a 1% decline, the risk of infection is .97% in the age-group 7-8 years.

2.1.5. Dong Thap province survey

In March 1990, a survey (with 2TU PPD RT23+TWEEN 80) was carried out in a random sample of primary schools from all districts of Dong Thap province. In total 5,192 schoolchildren (of whom 4,639 (89%) non-BCG vaccinated) were tested and read. The histogram is presented as figure 3. The results are presented in tables 7, 8 and 9.

Preliminary results:

N=2,929

age 7 years	$\geq 10\text{mm}$	N=167	
age 8 years	$\geq 10\text{mm}$	N=150	prevalence of infection 10.8%
		317	
	total		

Conclusion

Assuming a 1% decline, the risk of infection is 1.4% in the age-group 7-8 years.

2.1.6. Summary of the results presented

Year	Province	Age-group	Prevalence of infection	Estimated risk of infection	Estimated risk of infections in the age-group 5-19 years
1987	HCM City (urban districts)	5-9 years	19.6%	2.6%	3.3%
1988	Hanoi (rural districts)	7-8 years	1.7%	.22%	.28%
1990	Hai Phong City (urban and rural districts)	7-8 years	7.8%	1%	1.2%
1990	Dong Thap Province	7-8 years	10.8%	1.4%	1.8%

The estimated risk of infection in the age-group 5-19 years is calculated assuming that the difference between that risk and the age-group 5-9 years (or age-group 7-8 years) is 25%.

2.2. Preliminary results of a resurvey in 8 regions in Tanzania, 1983-1987

During the World Conference on "Lung Health" held in Boston in May 1990, a poster was presented on the national tuberculin survey in Tanzania. The text of the abstract as published in the "American review of Respiratory Disease" is given below, the poster itself is on the next page.

THE FIRST ROUND OF THE NATIONAL TUBERCULIN SURVEY IN TANZANIA, 1983-1987. PRELIMINARY RESULTS OF A RESURVEY IN 8 REGIONS, 1988-89. M.A. Bleiker, K. Styblo, H.J. Chum, M. van Cleeff, O. Misljenovic

The National Tuberculin Survey (NTS) in Tanzania was started in 1983 and was completed in 1987. The main aim of the NTS was to estimate the risk of tuberculous infection and to monitor its trend at 5-year intervals.

Nearly 80,000 school children from 60 (of 100) districts selected at random in 694 schools were tested with 2TU PPD Rt 23. Of them 34,432 had no BCG scar. The estimated risk of tuberculous infection in children aged 10.3 years was about 1.1%. If the tuberculin survey carried out by WHO in Kenya, Uganda and Tanzania in the 1950s are taken into consideration there was a definite, albeit slight, decrease in the risk of tuberculous infection in Tanzania of 1 to 2% annually between 1957 and 1985, for children aged 10 years. It is possible that there was a slightly higher decrease in the risk of infection than 1-2% from 1979 to 1985 when the NTLP was implemented.

The second round of the NTS covered 3 regions in 1988 and is being carried out in 5 regions in this year. The data of the first 2 years of the second round will be analysed and compared with the results from the same schools tested in 1983 and 1984. The second (and third) round of the NTS will be one of the most important sources of information on how well an efficient NTP carried out in Tanzania can curb the increase in the risk of tuberculous infection due to HIV infection.

The national tuberculin survey in Tanzania

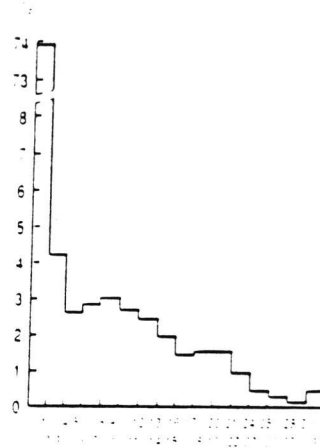
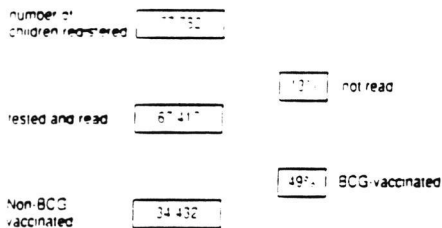
Royal Netherlands Tuberculosis Association
The Hague, The Netherlands
Bleker M.A., Syblo K., Chum H.J., van Cleeff M. and Misijenic O.

FIRST ROUND 1983-1987

Tuberculin testing of schoolchildren from:

- The first 2 forms in 10-13 randomly selected primary schools in each of
- 61 of 95 districts chosen at random from all 20 regions
- WHO standard technique (2TU PPD Rt 23 + Tween 80)

The number of schoolchildren registered, tested and read and the proportion of BCG-vaccinated children (the average age of non-BCG-vaccinated was 9.8 years) in the NTS, 1983-1987



The distribution of diameters of induration to 2TU of PPD Rt 23 with Tween 80, in 34 432 schoolchildren aged 9.8 years in the NTS, Tanzania, 1983-1987

Estimated prevalence of tuberculous infection based on two cut-off points in 34 432 non-BCG-vaccinated schoolchildren Tanzania, 1983-1987

	No. of children tested without BCG scar	indurations (mm)	
		≥10	≥17x2
Total	34,432	4,659 (13.5%)	3,807 (11.1%)

The estimated risk of tuberculous infection in 34 432 non-BCG vaccinated schoolchildren (aged 10.3 years) based on the observed and the weighted prevalence by estimated populations per region assuming a 1% and 3% decrease in risk of tuberculous infection

prevalence at 10.3 years risk of infection	prevalence of tuberculous infection observed in the survey		weighted population per region	
	≥10	≥17x2	≥10	≥17x2
1% decrease	1.3%	1.1%	1.4%	1.1%
3% decrease	1.2%	1.0%	1.2%	1.0%

Since in some regions the rate of infections caused by mycobacteria other than *M. tuberculosis* or *M. bovis* (MOTT) are more frequent than in others, all the 61 districts have been divided into those where the frequency of infections caused by MOTT was lower and those where it was higher (This division was based on the estimated prevalence of tuberculous infection derived from the 2 cut-off points)

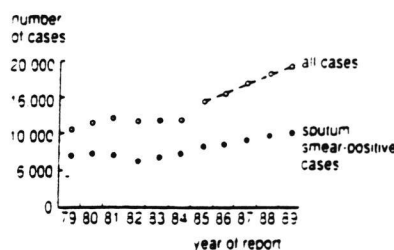
Districts with a lower and higher rate of infections induced by MOTT in 34 432 non-BCG-vaccinated children aged 10.3 years, Tanzania, 1983-1987

	no. of districts	no. of children tested	≥10		≥17x2	
			N	%	N	%
A lower rate of infection induced by MOTT						
subtotal	23	14,829	1,517	10.2	1,639	11.1
A higher rate of infection induced by MOTT						
subtotal	38	19,603	3,142	16.0	2,168	11.1
total	61	34,432	4,659	13.5	3,807	11.1

SECOND ROUND 1988-1992

The second round of the NTS will be one of important sources of information on how well an efficient NTP carried out in Tanzania can curb the increase in the risk of tuberculous infection due to HIV, the most decisive factor for further development of tuberculosis in countries with a high prevalence of both HIV and tuberculous infections.

The figure shows a steady increase in the reported cases in Tanzania since 1985. Several factors may contribute to this increase which cannot be easily separated. The spread of HIV infection in sub-Saharan Africa with its recognized potentially serious impact on the number of tuberculosis cases due to reactivation of remotely (as well as recently) acquired tuberculous infection provide strong circumstantial evidence that a major reason for the increase in tuberculosis cases in Tanzania is HIV-infection.



Reported tuberculosis cases, Tanzania 1979-1989

The table indicates estimated prevalences of infection for the second round of the NTS carried out in 1988 (number and percentage) and the first round from 1983 (percentage) in the 3 regions according to the 2 cut-off points.

Estimated prevalence of infection with *M. tuberculosis* per region based on assumptions for 2 cut-off points, Tanzania, 1983 and 1988

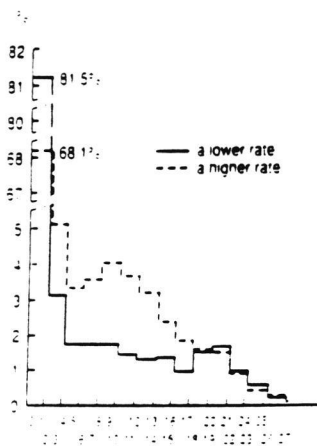
region	≥10 mm		≤17x2 mm	
	1988 N	1983 %	1988 N	1983 %
Arusna	290	10.8	264	9.9
Kilimanjaro	203	11.1	124	6.8
Tanga	333	20.8	154	9.6
total	826	13.5	542	8.9

The above table shows that there was no decrease in the prevalence of infection in the 3 regions from 1983 to 1988, although there was an increase in new smear-positive cases during the period under study, as demonstrated in the table below. However, it should be said that the introduction of short-course chemotherapy for sputum smear-positive cases on a large scale from 1985 on has attracted self-referral patients.

From this small resurvey in 3 regions, no conclusions can be drawn, whether the impact of HIV infection can be contained by the effective National Tuberculosis Programme in Tanzania.

New smear-positive cases reported to the TLCU Arusna, Kilimanjaro and Tanga, 1983 to 1988

region	1983	1984	1985	1986	1987	1988
Arusna	378	468	480	537	720	679
Kilimanjaro	246	275	285	617	237	278
Tanga	420	483	606	617	544	576



The distribution of diameters of induration to 2TU PPD Rt 23 with Tween 80, in districts with a lower and a higher rate of infections by MOTT

The figure shows that indurations with a size of 18 mm and over are very similar in both groups, whereas there is a large difference in indurations of 0-1 mm (81% and 68% respectively) and indurations from 3 to about 15 mm.

It seems that the 17 mm-or-more cut-off point is a suitable method for estimating the prevalence of tuberculous infection in countries with a high prevalence of infections caused by mycobacteria other than *M. tuberculosis* or *M. bovis*.

3. Training courses

3.1. Tuberculin survey and training course in Lilongwe, Malawi, November/December 1989

The terms of reference of this assignment were to conduct a training course for health personnel on standard WHO tuberculin testing and reading technique and on the BCG-scar examination in order to prepare them for the National Tuberculin Survey.

The Government of Malawi in cooperation with the IUATLD and the WHO is establishing a National Tuberculosis Program for Malawi. One of the items of this Program is to define the magnitude of the tuberculosis problem in the country and to be able to follow the changes in the magnitude. For this purpose a National Tuberculin Survey will be carried out among a representative sample of the school-population in the three regions of the country.

To ensure the reliability of the testing results and their international comparability the ITSC was asked to train the members of the Malawi National Tuberculin Team into the WHO standard Mantoux technique.

3.1.1. Results of the training of the national team

The theoretical part of the training took place in the "Old" hospital in Lilongwe, where the Regional Tuberculosis office is located. The "Technical guide for tuberculin survey teams" and "The WHO Standard Tuberculin Test" prepared by the WHO Tuberculosis Research Office (WHO/TB/Tech. Guide/3, February 1963) were distributed to the members of the National Team.

Participants of the training course were:

Mr. W. Nkhoma, TB Program Manager, Lilongwe
 Mr. N. Mbukwa, Regional TB Officer, Rumphi
 Mr. W.B. Munkha, Regional TB Officer, Blantyre
 Mr. L.N. Mbewe, District TB Officer, Blantyre
 Mr. B.D.K. Mhango, District TB Officer, Mzimba
 Mr. F.M.L. Salaniponi, Regional TB Officer, Lilongwe
 Mr. R.P. Tembo, District TB Officer, Lilongwe

Also present during the theoretical part of the training was Dr D.S. Nyangulu, TB Program Coordinator, Lilongwe.

For the practical part of the training, tuberculosis patients of a "Old" hospital and the schoolchildren of one large school were tested. The WHO Standard Mantoux test was performed. The test was made on the dorsal surface of the left forearm. 2 TU PPD RT23+Tween 80, produced in the State Serum Institute in Copenhagen was used.

Disposable syringes and needles, provided by IUATLD, were used, a separate set for each individual.

All the reactions were read after 72 hours. The transverse diameters of the indurations were measured and recorded in millimeters. Before tested each person was examined for a presence of a BCG scar.

Tuberculin reactions were measured simultaneously by all the members of the course. Firstly the findings were openly compared and the differences were discussed. Later the reactions were read by the so-called blind double readings. The correlation tables were made and the copies have been left as record for Mr. Nkhoma, TB Program Manager.

In total seven of the above mentioned members of the Malawian National Tuberculosis Program were trained. All the participants showed great interest and good results. The tables 10-16 give the correlation of the double readings. Pupils of the for training purpose chosen Chimutu-Capital City School in Lilongwe were tuberculin tested. The number of tested children was about 1,500, only 1,177 of them were present three days later for reading.

3.1.2. Results obtained by the tuberculin survey

During the training the schoolchildren of the for training purpose chosen Chimutu-Capital City School were tuberculin tested. The school was not chosen at random, but because it was easy accessible. Therefore the obtained results are not representative for the city of Lilongwe, but they might give an impression of the prevalence of tuberculous infection for this group of tested children. From a total of 1,177 children aged 8,4 years, who were tested and read, 832 (70,7%) showed a presence of a BCG scar.

The table below shows the numbers and percentages of unvaccinated and of children vaccinated with BCG reacting with indurations of 10mm and more, 14mm and more and 17mm and more to 2 TU PPD RT23+Tween 80. Figure 4 gives graphically the distribution of indurations in the examined group of children.

In addition, all the smear-positive pulmonary patients in the hospital were tuberculin tested. The results obtained by the 70 patients, younger than 40 years are graphically shown in figure 5. The mean induration in this group of tested persons was 15,7mm.

Lilongwe, Malawi 1989 1,177 children tuberculin tested, mean age 8,34 years				
	345 (29,3%) non BCG-vaccinated		832 (70,7%) BCG-vaccinated	
indurations in mm	nr.	%	nr.	%
≥ 10mm	50	14,5	211	25,4
≥ 14mm x (100:82)	19	6,7	88	12,9
≥ 17mm x 2	9	5,2	44	9,7

3.2. Retraining course of the Korean National Tuberculin Team,
Seoul and Taegu, Republic of Korea, March 1990

Reference is made to previous reports on the Korean National Tuberculosis Prevalence Surveys by Dr. J. Leowski, Dr. H.T. Lin, et al, taking place in intervals of five years.

One of the working methods of these surveys is tuberculin testing of persons aged three months on to obtain a reliable estimate of the annual tuberculosis infection rate.

For the survey 26 provincial tuberculosis supervisory nurses were chosen to take turns in tuberculin testing and eleven in reading of the tests.

On the request of WHO-Manila, ITSC reference nurse held the second training course, in order to provide the uniformity.

Only three nurses took part in the previous course and survey. The others were new in this kind of work. The theoretical part of the course took place in the Korean Institute of Tuberculosis in Seoul and Taegu.

Participants of the training course were:

In Seoul: Mrs. Kang Mi Kyoung, supervising nurse of the KIT,
Mrs. Hong Mi Kyoung, Seoul City
Mrs. Lee In Soon, Incheon City
Mrs. Shin Tae Soon, Kang Won Province
Mrs. Suk Nyoun Ja, Choong book Province
Mrs. Leem Jung In, Juk Buk Province
Mrs. Shin Ok Ja, Juk Nam Province

In Taegu: Mrs. Whang Moo Il, Pusan City
Mrs. Yoo Ki Nam, Kyoung Nam Province
Mrs. Lee Soon Ok, Kyoung Buk Province
Mrs. Ma Kim Hae Sook, Choong Nam Province

For the practical part of the training the schoolchildren of four primary schools in Seoul and Taegu were tuberculin tested, all together about 1,500 persons.

Firstly the findings were openly compared and if any, the differences were discussed. Later the reactions were read by so called double blind readings. The correlation tables were made for all the members of the team and copies have been left as record by Dr. Hong, the Director of the KIT.

The results of the double readings are satisfactory.

Table 17 gives the correlation of the indurations read by the ITSC reference nurse and Ms. Kang Mi Kyoung, who is considered as a National Reference Nurse and will be responsible to cooperate and keep the value and uniformity of the tuberculin testing and BCG-vaccination throughout the country.

3.3. Training course of the nurses working in the national study for AIDS and tuberculosis research in Kigali, Rwanda, 5-19 November 1989.

On request of WHO-Geneva, seven nurses were trained into the standard tuberculin testing and reading technique. The ITSC reference nurse worked together with Dr. Susan Allen, who is in charge of the Project San Francisco. This Project follows and provides health care for about 1,500 women and 4,800 children. One third of the women is HIV positive. Randomly selected 320 of these women were tuberculin tested during the training course.

Participants of the course were:

Mrs. Claire Nyirashema
Mrs. Mecktilde Mukankuku
Mrs. Vestine Mutarabayire
Mrs. Susan Nyiramana
Mrs. Eugenie Uzazigira
Mrs. Xaverine Muhayimana
Mrs. Jeanette Mkankusi (nurse from the hospital)

All of them were inexperienced in this kind of work and took great interest in the training program.

4. International conferences

Members of the Unit participated in:

1. "European Workshop/Course on Tuberculosis Control in Low Prevalence Countries" in Wolfheze, March 1990, The Netherlands.

A paper on "The application of the WHO standard tuberculin test in the elimination phase of tuberculosis" was presented.

2. During the World Conference on "Lung Health" in Boston in May 1990, Dr. M.A. Bleiker and O. Misljenovic acted as moderators of a Sunrise Seminar "Tuberculin Testing. Present Products and Current Methods".

The extent of the tuberculosis problem in Vietnam and its trend

Royal Netherlands Tuberculosis Association
The Hague, The Netherlands
Broekmans J.F., Paauw R.E. and Nguyen Dinh Huong

The study

The study concerns a tuberculin survey carried out in 1986-1989 in Ho Chi Minh City (previously Saigon) in Vietnam. The result of this survey is compared with the result of the tuberculin prevalence survey carried out by WHO in 1961/1962. In both surveys the WHO standard tuberculin test was performed using 1 TU PPD RT 23+ Tween 80 produced in the Statens Serum Institute in Copenhagen.

The 1961/1962 WHO survey

In this WHO survey 20 sub-districts of Saigon where chosen at random with probabilities to the population size. A sub-district at that time had a population of about 20,000. In each sub-district one sector (population about 2,000) was randomly selected, in which 700 persons of all ages were examined



Figure 1 Map of Saigon showing the 18 sample units of the 1961/1962 WHO survey (see Table 1)

The 1986-1989 survey
A tuberculin survey was carried out in cooperation with the International Tuberculosis Surveillance Centre (ITSC) in school children from selected schools in the 18 sub-districts of the 1961/1962 WHO survey (Table 1). In 1987 a sub-district had a population of about 48,000. The tuberculin survey was carried out in two parts:
Part I. In 1986 selected schools in 9 sub-districts were surveyed
Part II. In 1989/1989 selected schools in the other 9 sub-districts were surveyed

Table 1

Sub-district	ITSC 1986	Vietnamese team 1986	ITSC 1989
Ban Nghie	X	X	X
Tran-Oueng Khai	X	X	X
Nguyen-Canh Chan	X	X	X
Bui Vien	X	X	X
Le Van Duyet	X	X	X
Phan Thanh Guan	X	X	X
Cu Xa Do Thanh	X	X	X
Ly Nhon	X	X	X
Phu Thuan	X	X	X
Hong Bang	X	X	X
An Dong	X	X	X
Cho Quan	X	X	X
Minh Mang	X	X	X
Phu Tho	X	X	X
Nguyen Tri Phong	X	X	X
Phu Lam	X	X	X
Canh Tay	X	X	X
Canh Tiec	X	X	X
Xom Cu	X	X	X
excluded			

Methodological aspects

- The cut off point separating specific from non-specific sensitivity

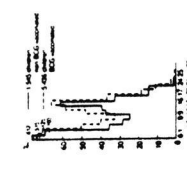


Figure 2 Distribution of diameters of induration to 1 TU of PPD RT 23 with Tween 80 in 1,545 non-BCG vaccinated children aged approximately 7.5 years. Ho Chi Minh City, Vietnam 1986/1988

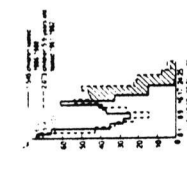


Figure 3 Distribution of diameters of induration to 1 TU of PPD RT 23 with Tween 80 in non-BCG vaccinated children aged approximately 7.5 years. Ho Chi Minh City, Vietnam 1986/1988

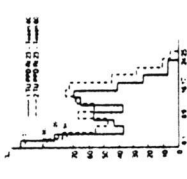


Figure 4 272 Non-BCG vaccinated children. Ho Chi Minh City, Vietnam 1989

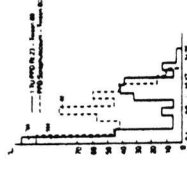


Figure 5 849 BCG vaccinated children. Ho Chi Minh City, Vietnam 1989

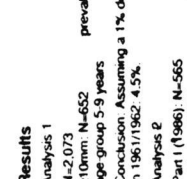


Figure 6 316 Non-BCG vaccinated children. Ho Chi Minh City, Vietnam 1989

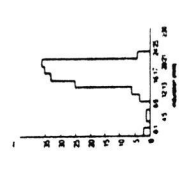


Figure 7 146 Patients with tuberculosis under 40 years with positive sputum tested with 1 TU PPD RT 23+ Tween 80. Ho Chi Minh City, Vietnam 1989

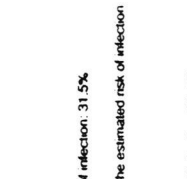


Figure 8 Annual risk of infection in Vietnam (Saigon/Ho Chi Minh City) 1961-1987 and The Netherlands 1950-1987

Estimated age: 7.5 years
Conclusion: Assuming a 1% decline the estimated risk of infection in 1986-1989: 2.6%.

Analysis 3
What is the "maximum" risk of infection in 1986-1989?
For the purpose of this analysis the results in non-BCG vaccinated children and BCG vaccinated children (in total 9,687 children) are combined.

Part I in 1986: prevalence of infection: 23.4%
Part II in 1989 and 1989: prevalence of infection: 22.1%
Part I and part II combined: average prevalence of infection: 22.7%
Estimated age: 7.5 years.

Conclusion: Assuming a 1% decline the estimated "maximum" risk of infection in 1986-1989: 3.1%.

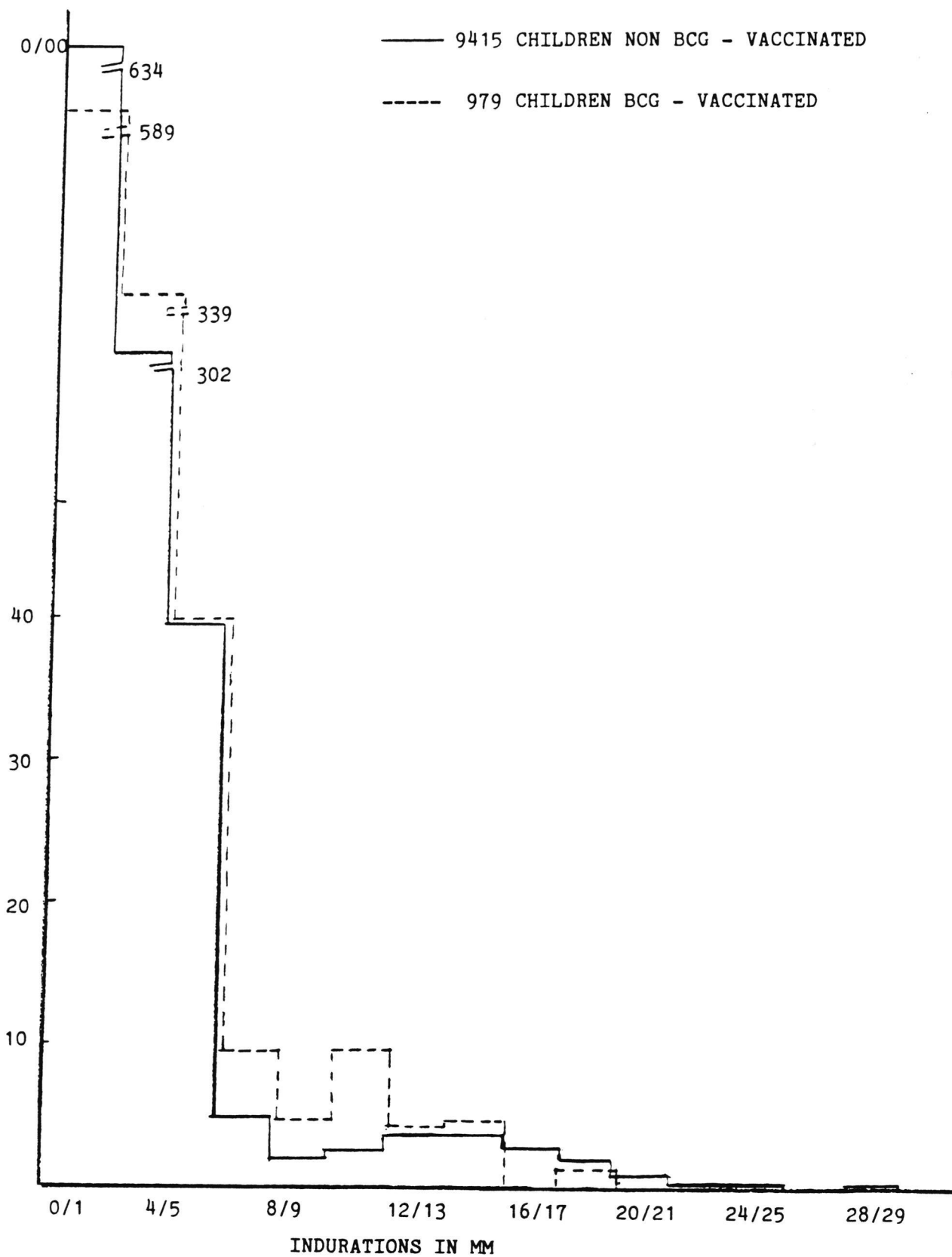
Analysis 4
What is the trend in the risk of infection in Saigon/Ho Chi Minh City between 1961/1962 and 1986-1989?

Based on the results of analysis 1, 2 and 3 it can be concluded that the estimated decrease in the risk of infection between 1961/1962 and 1986-1989 in Saigon/Ho Chi Minh City is in the order of 1.5-2.2% per year (Figure 6)

Results
Analysis 1
N=2,073
2-10mm: N=652
prevalence of infection: 31.5%
age group 5-9 years
Conclusion: Assuming a 1% decline the estimated risk of infection in 1961/1962: 4.5%
Analysis 2
Part I (1986): N=565
5-10mm: N=115
prevalence of infection: 20.4%
Part II (1989/1989): N=1,573
2-10mm: N=298
prevalence of infection: 18.8%
Part I and part II combined:
Average prevalence of infection 19.6%

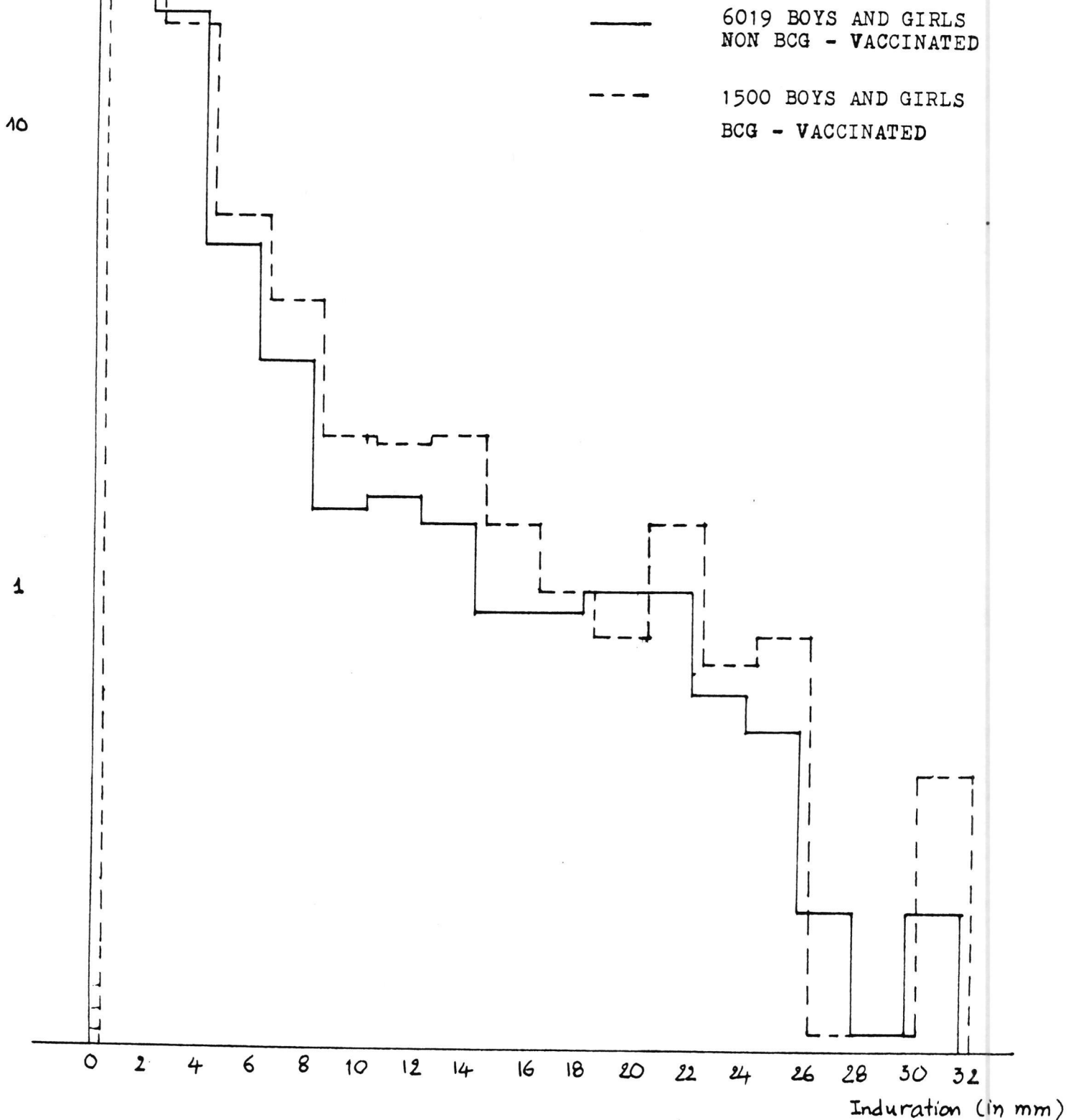
Conclusion
The estimated annual risk of infection in Saigon/Ho Chi Minh City in Vietnam is about 2.6% in 1987 for the age group 5-9 years. The present data suggest a decline in the tuberculosis problem between 1961 and 1987 in the order of 1.5-2.2% per year.

DISTRIBUTION OF DIAMETERS OF INDURATION TO 1 TU PPD RT 23 + TWEEN 80
 HANOI (ALL DISTRICTS) - VIETNAM 1988
 BOYS AND GIRLS



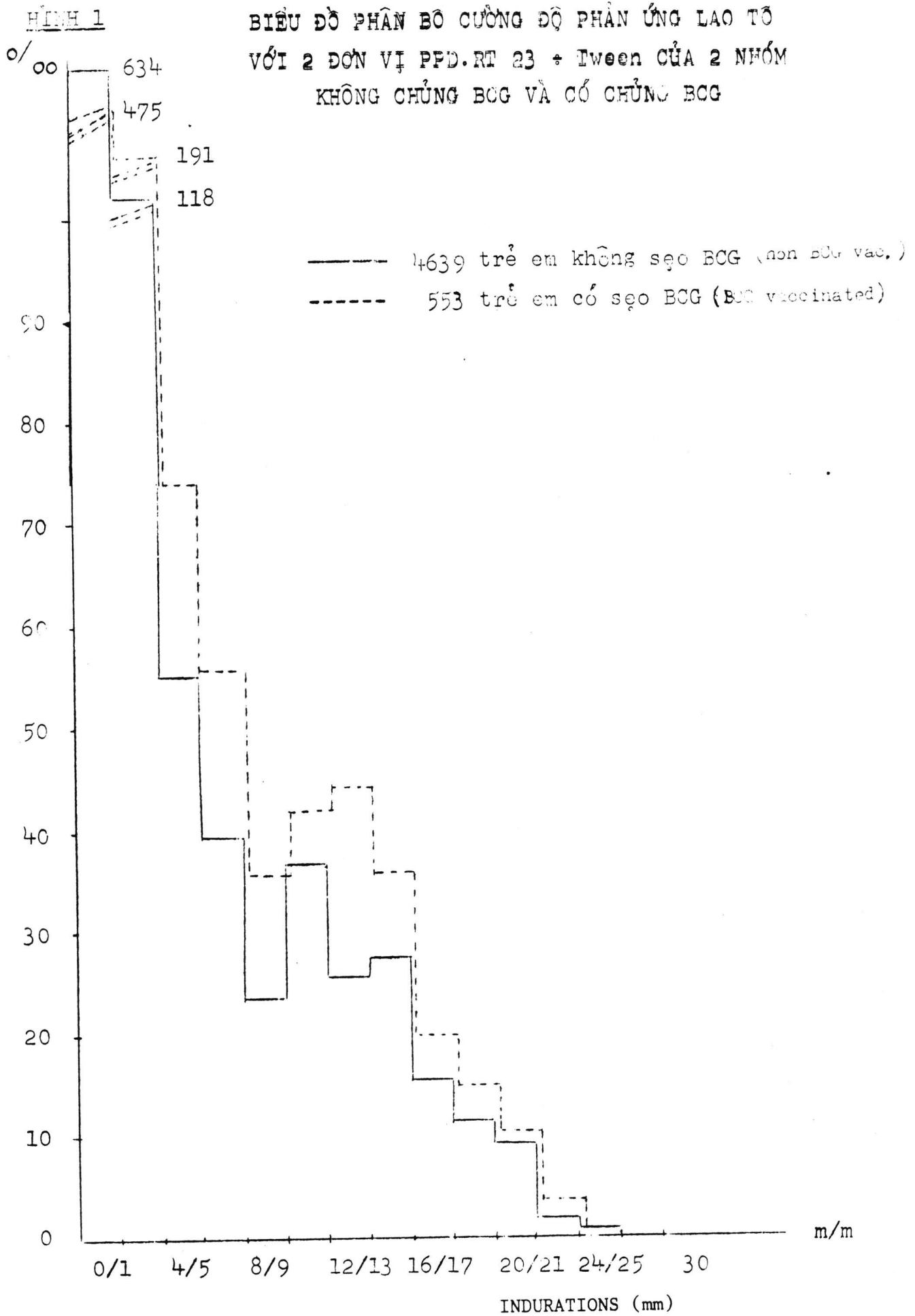
100 %

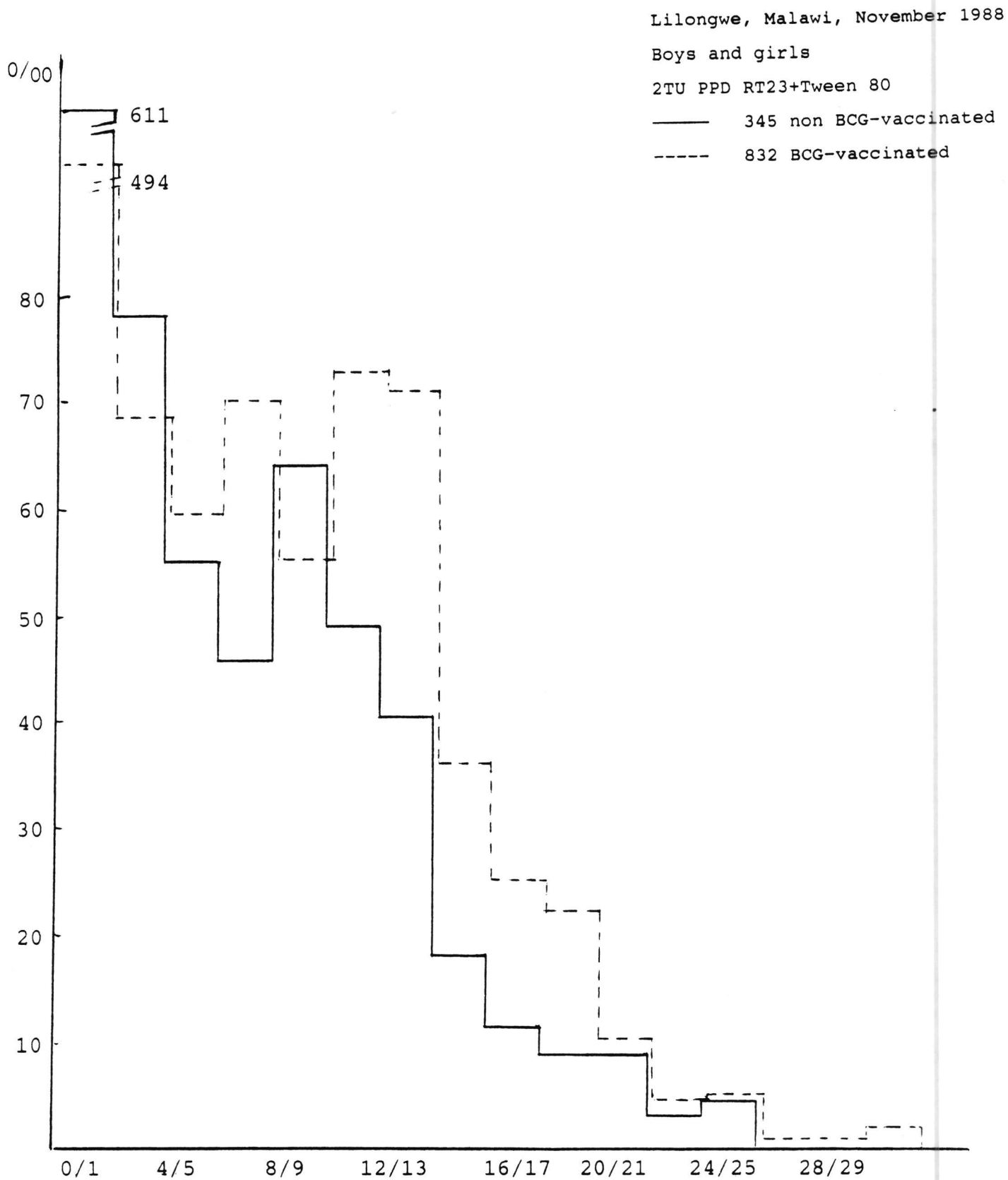
VIETNAM APRIL 1990
HAI-PHONG CITY
FREQUENCY DISTRIBUTION BY THE SIDE
OF TUBERCULIN REACTION
(TO 2 TU PPD RT 23 + TWEEN 80)



Distribution of diameters of induration to 2TU of PPD Rt23
 With tween 80 in 4639 non BCG - vaccinated children and 553
 BCG vaccinated, DONG THAP province, 1990

Figure 3





Lilongwe, Malawi, November 1989

70 tuberculosis patients (under 40 years)

2TU PPD RT23+TWEEN 80

Mean induration = 15.7mm

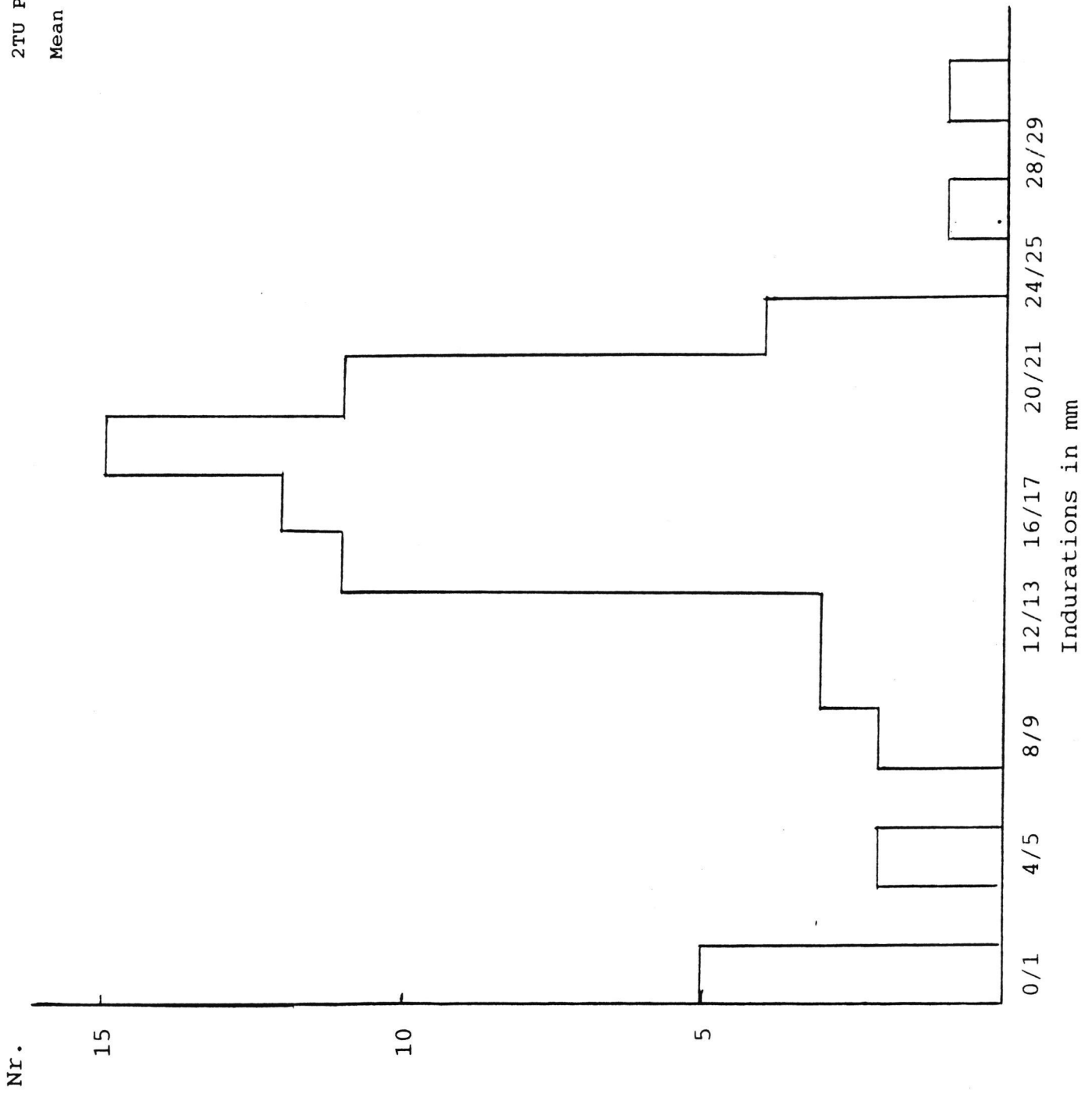


Figure 5

VIETNAM - HANOI 1988
 ALL DISTRICTS
 NON BCG-VACCINATED

TUBERCULIN INDICES TO 1 TU PPD RT 23 + TWEEN 80

AGE	BOYS						GIRLS						BOYS AND GIRLS								
	TOTAL NUMBER	indurations ≥ 6 mm			indurations ≥ 10 mm			TOTAL NUMBER	indurations ≥ 6 mm			indurations ≥ 10 mm			TOTAL NUMBER	indurations ≥ 6 mm			indurations ≥ 10 mm		
		Nr.	%	Nr.	%	Nr.	%		Nr.	%	Nr.	%	Nr.	%		Nr.	%	Nr.	%	Nr.	%
		6	2174	48	2.20	35	1.61		48	2.26	34	1.63	2083	47		2.26	34	1.63	4258	95	2.23
7	2199	50	2.27	32	1.46	57	2.79	45	2.20	2041	57	2.79	45	2.20	4240	107	2.52	77	1.82		
8	416	15	3.61	9	2.16	8	2.80	6	2.10	286	8	2.80	6	2.10	702	23	3.28	15	2.14		
9	84	6	(7.14)	2	(2.38)	2	(3.85)	2	(3.85)	52	2	(3.85)	2	(3.85)	136	8	5.88	4	2.94		
10	37	2	(5.41)	2	(5.41)	1	(5.0)	1	(5.0)	20	1	(5.0)	1	(5.0)	57	3	(5.26)	3	(5.26)		
11	10	-		-		-		-		2	-		-		12	-		-			
12	8	1	(12.5)	-		-		-		2	-		-		10	1	(10.0)	-			
TOTAL	4928	122	2.48	80	1.62	115	2.56	88	1.96	4486	115	2.56	88	1.96	9415 *	237	2.52	168	1.78		

* 1 girl (13 years old) out of report

VIETNAM - HANOI 1988
 ALL DISTRICTS
 BCG-VACCINATED

TUBERCULIN INDICES TO 1 TU PPD RT 23 + TWEEN 80

AGE	BOYS				GIRLS				BOYS AND GIRLS					
	TOTAL NUMBER	indurations			TOTAL NUMBER	indurations			TOTAL NUMBER	indurations				
		≥ 6 mm	≥ 10 mm			≥ 6 mm	≥ 10 mm			≥ 6 mm	≥ 10 mm			
			Nr.	%			Nr.	%			Nr.	%	Nr.	%
6	206	6	2.91	3	1.46	5	2.31	3	1.39	422	11	2.61	6	1.42
7	239	8	3.35	4	1.67	7	2.94	4	1.68	477	15	3.14	8	1.68
8	38	3	(7.89)	2	(5.26)	2	(6.90)	2	(6.90)	67	5	(7.46)	4	(5.97)
9	6	-	-	-	-	-	-	-	-	10	-	-	-	-
10	2	-	-	-	-	-	-	-	-	2	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	1	-	-	-	-
TOTAL	491	17	3.46	9	1.83	14	2.87	9	1.84	979	31	3.17	18	1.84

VIETNAM - HANOI 1988
ALL DISTRICTS
BOYS AND GIRLS

TUBERCULIN INDICES TO 1 TU PPD RT 23 + TWEEN 80

AGE	NON BCG-VACCINATED					BCG-VACCINATED					GRAN TOTAL NUMBER		PREVIOUSLY VACCINATED WITH BCG	
	TOTAL NUMBER	indurations				TOTAL NUMBER	indurations				TOTAL NUMBER	Nr.	%	
		≥ 6 mm	≥ 10 mm				≥ 6 mm	≥ 10 mm						
			Nr.	%	Nr.			%	Nr.	%				Nr.
6	4258	95	2.23	69	1.62	422	11	2.61	6	1.42	4680	422	9.02	
7	4240	107	2.52	77	1.82	477	15	3.14	8	1.68	4717	477	10.11	
8	702	23	3.28	15	2.14	67	5	(7.46)	4	(5.97)	769	67	8.71	
9	136	8	5.88	4	2.94	10	-	-	-	-	146	10	6.85	
10	57	3	(5.26)	3	(5.26)	2	-	-	-	-	59	2	(3.39)	
11	12	-	-	-	-	-	-	-	-	-	12	-	-	
12	10	1	(10.0)	-	-	1	-	-	-	-	11	1	(9.09)	
TOTAL	9415	237	2.52	168	1.78	979	31	3.17	18	1.84	10394	979	9.42	

VIETNAM - HANOI 1988
 PER DISTRICT
 BOYS AND GIRLS 6-12 YEARS OLD

TUBERCULIN INDICES TO 1 TU PPD RT 23 + TWEEN 80

DISTRICTS	NON BCG - VACCINATED				BCG - VACCINATED				TOTAL NUMBER		PREVIOUSLY VACCINATED WITH BCG	
	TOTAL NUMBER	indurations			TOTAL NUMBER	indurations			TOTAL NUMBER	Nr.	%	
		≥ 6 mm	≥ 10 mm			≥ 6 mm	≥ 10 mm					
			Nr.	%			Nr.	%				Nr.
1. TU LIEM	574	8	1.39	7	1.22	3	2.34	2	1.56	128	18.23	
2. HOAI DUC	948	34	3.59	25	2.64	2	1.36	1	0.68	147	13.42	
3. DAN PHUONG	306	7	2.29	6	1.96	1	(6.25)	1	(6.25)	16	4.97	
4. THACH THAT	506	14	2.77	10	1.98	6	3.30	3	1.65	182	26.45	
5. PHUC THO	788	13	1.65	11	1.40	1	(1.19)	1	(1.19)	84	9.63	
6. SON TAY	448	6	1.34	5	1.12	1	(2.44)	-	-	41	8.38	
7. BA VI	1028	37	3.60	22	2.14	4	(21.05)	3	(15.79)	19	1.81	
8. ME LINH	1132	32	2.82	26	2.30	1	(2.70)	1	(2.70)	37	3.17	
9. SOC SON	1008	16	1.56	9	0.89	-	-	-	-	16	1.56	
10. DONG ANH	1004	21	2.09	12	1.20	5	(9.80)	2	(3.92)	51	4.83	
11. GIA LAM	1252	42	3.35	30	2.40	5	3.03	2	1.21	165	11.64	
12. THANH TRI	421	7	1.66	6	1.43	2	(2.15)	2	(2.15)	93	18.09	
TOTAL	9415	236	2.51	169	1.80	31	3.17	18	1.84	979	9.42	

MANTOUX TESTING VIETNAM 1990; HAI PHONG

BOYS AND GIRLS WITHOUT BCG

AGE	INDURATION IN MM.																																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
4			1																																
5				1																															
6	1313	430	306	145	103	49	50	29	29	9	27	8	10	14	6	10	6	14	17	17	22	9	8	10	7	7	4	2	1	1	2				
7	1321	407	305	176	98	45	47	34	25	5	26	17	24	19	14	22	10	10	10	9	19	8	8	6	7	11	5	0	2	0	4	1			
8	236	66	64	29	24	8	9	11	19	3	9	2	6	8	2	4	6	7	3	2	0	1	2	1	1	0	1	0	0	1	0	1			
9	53	7	17	8	2	1	5	3	0	1	1	2	2	2	0	2	0	1	0	1	0	1	1												
10	9	2	1	1	1	1	0	0	0	0	2	1	1	0	1	1	0	0																	
11					1			1	1																										
12																																			
13																							1												
Totaal	2932	912	694	360	229	104	111	78	74	18	65	31	43	43	23	39	22	32	30	29	41	19	20	17	15	18	10	2	3	1	7	1	1		
6024	3844		1054		333		189		92		96		86		62		54		59		60	37		33			12		4		8		1		

MANTOUX TESTING VIETNAM 1990; HAI PHONG

BOYS AND GIRLS WITH BCG

AGE	INDURATION IN MM.																																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
6	360	94	80	63	31	16	18	15	13	3	11	8	14	7	3	5	4	4	7	0	6	6	3		2	5	1	1							
7	296	93	45	38	23	16	13	8	14	4	11	3	6	4	4	7	1	4	4	1	5	1	6	1		4									
8	35	7	11		3	2	2	5					1		1		1	1	1	1	1														
9	7	1	3	1	2	2		1										1			1					1									
10	2		1	1										1																					
11						1																													
Totaal	700	195	140	103	59	37	33	29	27	7	22	11	21	12	8	12	5	10	11	2	13	7	9	1	2	10	1	1	2	0	6				
1496	895		243		96		62		34		33		33		20		15		13		20	10		12		2		2		6					

MANTOUX TESTING VIETNAM 1990; HAI PHONG

TUBERCULIN INDICES TO 1 TU PPD RT 23 + TWEEN 80														
AGE	TOTAL NUMBER		NON BCG-VACCINATED				BCG-VACCINATED				GRAN TOTAL NUMBER		PREVIOUSLY VACCINATED WITH BCG	
	6 MM	%	INDURATIONS		TOTAL NUMBER	INDURATIONS		TOTAL NUMBER	6 MM	%	10 MM	%	Nr.	%
			Nr.	%		Nr.	%							
4	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	2665	269	10,09%	167	6,27%	783	121	15,45%	71	9,07%	3448	783	22,71%	0
7	2695	296	10,98%	189	7,01%	617	93	15,07%	71	11,51%	3312	617	18,63%	0
8	526	90	17,11%	46	8,75%	70	10	14,29%	5	7,14%	596	70	11,74%	0
9	110	17	15,45%	10	9,09%	20	4	20,00%	1	5,00%	130	20	15,38%	0
10	21	6	28,57%	3	14,29%	5	1	20,00%	1	20,00%	26	5	19,23%	0
11	4	3	75,00%	0	0	1	0	0	0	0	5	1	20,00%	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	1	100,00%	1	100,00%	0	0	0	0	0	1	0	0	0
TOTAAL	6024	682	11,32%	416	6,91%	1496	229	15,31%	149	9,96%	7520	1496	19,89%	0

Table 1.

Việt Nam 1990

Dong Thap province

Boys and girls

III UBERCULIN INDICES TO 2 TU PPB RT23 + TWEEEM 80

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AGE	NON BCG - VACCINATED			BCG - VACCINATED			PREVIOUSLY VACCINATED WITH BCG						
	TOTAL NUMBER	Indurations ≥ 6 mm	%	TOTAL NUMBER	Indurations ≥ 6 mm	%	TOTAL NUMBER	Indurations ≥ 10 mm	%				
7	1969	249	14,7	167	10,5	256	63	24,6	36	14	1852	256	13,8
8	1333	210	15,7	150	11,3	165	30	18,2	23	13,9	1498	165	11,0
9	858	181	21,1	121	14,1	66	25	37,9	14	21,2	924	66	7,1
10	490	132	26,9	80	16,3	40	14	35,0	9	22,5	530	40	7,5
11	362	117	32,5	79	21,8	26	12	46,2	11	42,3	388	26	6,7
TOTAL	4639	689	19,2	597	12,9	553	144	26,0	93	16,8	5192	553	10,6

TABLE 2

VIET NAM 1990

DONG THAP PROVINCE

NON BCG - VACCINATED

III UBERCULIN INDICES TO 2 TU PPD RT23 + TWEEN 80

---:0:---

AGE	BOYS				GIRLS				BOYS AND GIRLS			
	Indurations		TOTAL		Indurations		TOTAL		Indurations		TOTAL	
	> 6 mm	> 10 mm	NUMBER	%	> 6 mm	> 10 mm	NUMBER	%	> 6 mm	> 10 mm	NUMBER	%
	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%	Nr.	%
7	145	16,1	98	12,2	104	13,1	69	8,7	249	15,6	167	10,5
8	121	18,3	87	10,9	89	13,2	63	9,4	210	15,7	150	11,3
9	97	22,8	60	18,8	64	14,8	41	9,5	161	18,8	121	14,1
10	274	33,2	55	20,3	41	18,7	25	11,4	490	26,9	60	16,3
11	191	38,7	52	27,2	43	25,2	27	15,8	362	32,3	79	21,8
TOTAL	528	22,5	372	15,8	341	14,9	225	9,8	869	18,7	597	12,9

TABLE 3

VIET NA 1990
DONG THAP PROVINCE

III TUBERCULIN INDICES TO 2 TU PPD RT23 + TWEEEN 80

BCC - VACCINATED

AGE	BOYS				GIRLS				BOYS AND GIRLS						
	TOTAL NUMBER	> 6 mm	> 10 mm	%	TOTAL NUMBER	> 6 mm	> 10 mm	%	TOTAL NUMBER	> 6 mm	> 10 mm	%			
7	129	38	29,5	20	15,5	127	25	19,7	16	12,8	255	63	24,6	36	14,0
8	73	9	12,3	6	8,2	92	21	22,8	17	18,5	165	30	18,2	23	13,9
9	57	19	33,4	11	19,7	29	5	20,1	3	10,3	66	25	37,9	14	21,2
10	16	7	43,8	5	31,3	24	7	29,2	4	16,7	40	14	35,0	9	22,5
11	19	11	57,9	11	57,9	7	1	14,3	0	0	26	12	46,1	11	42,3
TOTAL	274	84	30,7	55	19,3	275	60	21,5	40	14,3	553	144	26,0	75	16,8

LILONGWE - MALAWI NOVEMBER 1989

MR. W. NKHOMA - LILONGWE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	>30	
0	59																															
1				1	1																											
2	3	1	1		3																											
3	2						1																									
4				1	3	1																										
5						5																										
6					1	1	1		1																							
7						1			3																							
8						1		2	2	2	1																					
9									2	2																						
10								1	1	1	1		1																			
11							1			2		1	1																			
12										1	1	1		1	1																	
13											1		1	1	1																	
14													1	1	3																	
15													1	1	2	2	1															
16														2	1	1	1	1														
17														2	1		1															
18															1	1																
19																1	1	1	1		1											
20																	1	1														
21																		1								1						
22																																
23																										1						
24																																
25																						1			1							
26																																
27																										1						
28																																
29																																
>30																																
	64	1	1	1	5	4		10	2	6	6	8	4	2	3	4	8	9	4	5	5	1	1	1	2	1						

59
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LILONGWE - MALAWI NOVEMBER 1989

MR. N. M. MBUKWA - RUMPHI

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	>30		
0	115	1		1																												117	
1	1																															1	
2	5			1																												6	
3	1			2	2	2																										7	
4		1			1																											2	
5				3			1	1																								5	
6				1			1		2																							4	
7						1	3	2																								6	
8						1	2	1		1																						5	
9						1	1	1					2																			5	
10							1	1	1		3		2																			8	
11										2	2	3	3																			10	
12							1				2	5	3																			11	
13										1	1		1	1	1																	5	
14											1	1	1																			3	
15											1	1		2	1	1																6	
16												1		1	1		1															4	
17												1	2	1	1		1	1				1	1									7	
18														2	1	1		1	2	1												8	
19															1						5	1										7	
20																							1									1	
21																1						1	2									4	
22																							2									2	
23																																	
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26																																	
27																												1				1	
28																																	
29																																	
> 30																																	

122 1 1 8 3 3 7 7 6 1 9 6 11 9 2 5 3 6 4 1 8 7 4 1

235

LILONGWE - MALAWI NOVEMBER 1989

MR. W.B. MUNKHA - BLANTYRE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	>30						
0	41																																41				
1	1																																1				
2	1					1																											2				
3				1		1																												2			
4				1		3																												3			
5					1	2																												3			
6								1																										1			
7				1																														1			
8					1				3		4																							8			
9					1	2			1		4		1	1																				10			
10									1		1	2	2																					6			
11									1		5			1																				7			
12											4		2			1																		7			
13											1	1		1																				3			
14											1	3	1			2	1																	8			
15																4																			4		
16											1		1	2	2																				6		
17																		1	1																2		
18																		2	1	2	1														6		
19																				1	3		1												5		
20																					1	1													2		
21																					3	2													5		
22																						1	1				1								3		
23																						1			1										2		
24																																					
25																																					
26																											1									1	
27																																					
28																																					
29																																					
>30																																				1	1
	43				2	8	4		1	6	20		2	8	5	2	11	3		2	4		1	7		4	3		2		1			1	140		

LILONGWE - MALAWI NOVEMBER 1989

MR. B.D.K. MHANGO - MZIMBA

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	>30		
0	84			1																												85	
1	2																															2	
2				3																												3	
3	1		2		1	1																										5	
4			1																													1	
5				1	2	1																										4	
6			1		2	1	1																									5	
7				2		1		2																								5	
8				1	1						3																					5	
9							1	1	2	1																						5	
10							2	1			1																					4	
11						1				3		1	1																			6	
12											2	3	1																			6	
13											3			2																		5	
14									1	1					2																	4	
15											1	1		1	2																	5	
16															1																	1	
17																1																1	
18															1	1	2	1														5	
19																1	1	2														4	
20																	1															2	
21																																4	
22																																2	
23																																	
24																																	
25																																	1
26																																	1
27																																	
28																																	
29																																	
>30																																	
	87		8	1	8	4	3	3	4	8	6	7	4	2	3	6	4	5	1	1	2		2	1	1							171	

LILONGWE - MALAWI NOVEMBER 1989

MR. F.M.L. SALANIPONI - LILONGWE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	>30		
0	98	1																														99	
1	1	2	2	2																												7	
2	4	3	5	5	2																											19	
3	1			2	4																											7	
4			2	2	4	1																										9	
5				1	3	3	2	1																								10	
6					1	2	2	2	1	1																						9	
7						3	2	1	2	1																						9	
8					1	1	3	3	3	1	2																					14	
9						1	1	2	1	3	1																					9	
10								5	1	3	2																					11	
11									2	1	4	1	1																			9	
12										3		3	3	1	2																	12	
13										2	1	3	1	1	2																	10	
14												2	2	2																		6	
15													1	4	1	2	1															9	
16														3	2	1																6	
17															1			1	1													3	
18																1	1		1													3	
19																	1	2	2	1												6	
20																			1		1											2	
21																			1		1	1										3	
22																																	
23																																	1
24																																	
25																											1						1
26																																	
27																												1					1
28																																	
29																																	
>30																																	
	104	6	9	12	13	6	9	9	13	10	15	10	7	8	9	10	6	1	6	3	5	2										275	

O. MISLJENOVIC - ITSC

LILONGWE - MALAWI NOVEMBER 1989

MR. R.P. TEMBO - LILONGWE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	>30					
116																																			116	
1	3		4																																7	
2	7		5	5	2																														19	
3		1	4	4	1	2																													12	
4			1	2	1	4	1	1																											10	
5					1	4	1	1																											7	
6				1	2	2	5	2																											12	
7						3	4	3	3	1	1																								15	
8						1	1	1	8	3	2																								16	
9						2	2	1	1	4	1	1																							12	
10						1	1	3	2	1	1	4																							13	
11								4		5	4	1																							14	
12								1		4	1	7	1	1	2																				17	
13									1	3	2	3	3																						12	
14											1	1	2	1																					5	
15											1		3	2	3																				9	
16														3										1	1										5	
17														1	2										1	2									6	
18																									2	1									3	
19																								1	1	3	3								8	
20																										1		1							2	
21																									1	1	2	1							5	
22																									1										2	
23																										1									2	
24																												2							2	
25																													2						2	
26																																				
27																																				1
28																																				
29																																				
>30																																				2
	126	1	14		7	16	15		20	8	20	9	18		5	7	10		5	8		6	4		5	1		4	2					2	236	

