



INTER-COUNTRY SEMINAR ON  
SURVEILLANCE IN SMALLPOX ERADICATION  
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INDEXED

PRESENT STATUS AND FUTURE PLAN OF SMALLPOX  
ERADICATION PROGRAMME IN INDIA

by

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1. Introduction

On the basis of recommendations of the Central Expert Committee under the auspices of the Indian Council of Medical Research (1959) and having reviewed the experiences of a Pilot Project in each State (1961), the National Smallpox Eradication Programme was launched in the last quarter of 1962. One hundred and fifty-two smallpox eradication units were established to carry out a mass vaccination campaign, the target being successful vaccination of 80% of the population within a period of three years. After three years it was found that the vaccination target was not achieved and even in those areas where 80% coverage was achieved, outbreaks of smallpox were reported. It was then decided to raise the vaccination target to 100% of the population and the time limit was extended. In 1967 there was a high incidence of smallpox (83 943 cases) and the number of cases were more than those reported during the peak incidence in 1963. This necessitated an assessment of the programme.

The review indicated that there was repeated vaccination of the easily accessible group of population, mainly school children. The most significant weakness of the programme was in reporting and outbreak containment measures. Based on the recommendations of the Assessment Team, the previous strategy of mass vaccination was altered by giving emphasis to the surveillance component of the programme. Since then, top priorities have been accorded to primary vaccination, prompt detection and reporting of cases, and epidemiological investigation to trace the source of infection for effective containment.

2. Incidence of smallpox

Smallpox incidence in India has shown a characteristic seasonal and annual pattern. In past decades, the annual incidence of smallpox has risen to a sharp peak every 5 to 7 years. The incidence also rises in the year preceding the year of higher incidence. The last peak was observed in the year 1967. The maximum incidence is reported from the month of November to May and incidence is of much smaller magnitude during the period from June to October. The case fatality rate has shown a declining trend, the rate being 16.8% in 1971 as against 31.2% in 1967. The Infectious Diseases (I.D.) Hospital's data in 1971 indicated that 71% of total deaths occurred in the age-group 0-14 years and 23.7% of total deaths occurred among infants.

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India has reported an increased number of cases in 1972 and to date accounts for 42% of the world's incidence, as against 31% in 1971. Up to August 1972 (35th week), 20 724 cases have been reported, i.e. an increase of about 36% over the number recorded at this time in 1971. Yearly 70% of these cases are concentrated in three States - Bihar, Uttar Pradesh and West Bengal. This increase can be partially attributed to the improved reporting and surveillance activities which have been strengthened recently.

So far as smallpox incidence per hundred thousand population in 1971 is concerned, Haryana ranks first (26.5) followed by Rajasthan (18.8). These two States maintained this unique position in 1970 also (Appendix II).

More than 55% of the total cases in India were reported from 11 of 358 districts in the country in the first eight months of the year. One hundred and fifty-six districts have reported cases in 1972 as against 139 in 1971 (Appendix III). Single districts contributing more than 60% of the total cases in a particular State are six, viz. (i) Santhal Parganas (Bihar), (ii) 24 Parganas (West Bengal), (iii) Gulbarga (Mysore), (iv) Hissar (Haryana), (v) Hyderabad (Andhra Pradesh) and (vi) Thana (Maharashtra). The remaining districts reporting a high incidence are Budaun, Hamirpur and Shahjahanpur (Uttar Pradesh), Jaipur (Rajasthan) and Morena (Madhya Pradesh). The highest incidence annually reported shifts each year from one district to another. In 1971, Srikakulam reported 87% of the total incidence in Andhra Pradesh, Bijapur district 83% of the total cases in Mysore, Gurgaon district reported 66% of the cases in Haryana and Nagpur contributed 63% of the total in Maharashtra. It has been noted with concern the recent reports of 6 cases in Tripura and 4 cases in Arunachal Pradesh, which were previously considered free from smallpox.

The problem of smallpox is acute in several municipal corporations, especially Calcutta, Delhi, Jabalpur and Agra. The slums constitute a continuing reservoir and source of wide-spread transmission. Taking the addresses of 16 smallpox cases admitted to the I.D. Hospital, Calcutta, a total of 100 cases were detected in the affected areas of which only 49 cases were on the list of the Calcutta Corporation. This sounds a word of caution to other urban areas, particularly Delhi Municipal Corporation, where the number of cases reported are equal to the admissions to the I.D. Hospital.

The smallpox situation has improved in other parts of the country. Rajasthan State which had recorded a high incidence during 1970 and 1971, has succeeded in reducing smallpox incidence to a great extent. Gujarat State which had recorded more than 10% of the world's cases in 1967 (6 278 cases) has reported only 39 (of which 11 cases are importations) in the current year. Assam, Orissa and Punjab have also reported a very low incidence of smallpox in 1972. In Tamilnadu no indigenous smallpox case has been reported during the last two years. No secondary cases followed the one importation in the current year. No smallpox cases have been reported from Kerala and Himachal Pradesh this year. No smallpox has been reported for more than 4 years from Dadra and Nagar Haveli, L.M. and A. Islands, Nagaland, Manipur and, for more than 2 years, from Pondicherry (Appendix I). These examples indicate that if the programme is vigorously implemented it is possible to interrupt transmission within a short period.

### 3. Surveillance and reporting system

The scheme of strengthening of the State level organization for establishing surveillance teams at Headquarters has not yet been sanctioned. Thus, as an ad hoc measure, it has been suggested to the State Government to organize surveillance teams by nominating a few para-medical assistants from non-endemic districts and posting them at the State level. Utilizing the existing resources, surveillance teams are functioning in the States of Mysore, Uttar Pradesh and Rajasthan.

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In some States like West Bengal, Gujarat and Rajasthan, basic health workers/malaria surveillance workers have been given a printed coloured postcard which is pre-addressed for notification of smallpox cases. In most States all health staff have been instructed to report any known or suspected case of smallpox. All health workers have been provided with "recognition cards" to assist them in talking with the people to obtain information about suspected cases of smallpox. An incentive of Rs. 10 has been sanctioned in the States of Andhra Pradesh and Tamilnadu and Rs. 25 in Mysore, which is given to the first person who reports the occurrence of one or more cases of smallpox in the village or ward of a town which has not been declared affected.

Radical changes have been incorporated in the reporting system this year. The State Programme Officers have been authorised to send weekly district-wise data regarding smallpox to the Central Bureau of Health Intelligence which is the official notifying agency. A pro forma for submission of this report has also been supplied. Cases and deaths from the districts are now reported by the week of detection, irrespective of the date of occurrence. Adenda indicating the cases according to the weeks of their onset is submitted later. To assist the State Governments to receive reports regularly from the districts, a similar pro forma has been devised and sent to them.

Reporting is still delayed and incomplete. The analysis of data on receipt of report from the States to the Centre during the period June to August (23rd to 35th week) shows that in only 38% of the cases the weekly epidemiological data were received in time. The States/ Union Territories which are conspicuously late in the submission of weekly reports are Jammi and Kashmir, Himachal Pradesh, Manipur, Meghalaya, Nagaland, Punjab and Andaman and Nicobar Islands. The flow of information from district to State level also appears to be irregular. In the epidemic report of the 34th week, in the case of Madhya Pradesh, reports for only two of 43 districts were incorporated; in the case of Orissa it was 6 of thirteen, and in Uttar Pradesh, 43 of 54. Similar problems also exist in the flow of information from primary health centres to the District level. How an unreported hidden smallpox infection can develop into an epidemic of major proportion cannot be better demonstrated than the outbreak in Gulbarga district of Mysore, where over 1 350 cases have been reported this year.

The time lag between the onset of the first case and the reporting of outbreak is long in many cases. A sample analysis of the available information indicates that in 59% of the outbreaks, the report was received within two incubation periods of the onset of the disease. In another 41% of outbreaks, the first case was not detected until at least the third generation of cases. There are examples where outbreaks have continued for 10 generations before coming to the attention of the local health authority.

TABLE I

## INTERVAL BETWEEN THE ONSET OF FIRST CASE AND REPORTING

Interval	Number of outbreaks				
	Maharashtra	Rajasthan	M.P.	West Bengal	Gujarat
0 to 7 days	1	-	2	1	1
7 days to 1 month	5	22	29	11	5
Over 1 month	8	18	21	4	3
TOTAL	14	40	52	16	9

The situation has nevertheless been improving since 1967, when the Assessment Team estimated that only one of 10 cases was reported in the States studied. In 1971 (October to November) an active search for smallpox cases was carried out in selected areas in 11 of 19 districts of Gujarat. No additional case could be discovered which might have experienced illness during the preceding four months.

#### 4. Epidemiological investigation and outbreak containment

Immediate response or visit to the village or site within 24 to 48 hours following the initial report, is a general feature. But there are certain deficiencies in the containment measures taken. The vaccination coverage of the affected and neighbouring areas is generally incomplete and delayed. Tracing of the source of infection in many instances is poor. In Calcutta Metropolitan Immunization Organization's (C.M.I.O.) report, the source is given for only 23 of 115 outbreaks and this information is too general to allow for adequate cross-notification. (The listing of cases is not complete in many outbreaks.) In 24 Parganas (West Bengal), the source of infection was listed in only 30% of the outbreaks. In Uttar Pradesh, tracing of the source of infection could be done in 65% of the outbreaks. An example of a village with a population of 1 132 in West Bengal may be cited here. The date of the outbreak was 7 January 1972; information was received on 28 March 1972, a delay of 80 days. The epidemiological report dated 15 April 1972 showed 35 cases in the village. During a visit by a Central Officer on 18 April, he was given a list of 70 cases. During the house to house survey, 117 cases were detected. Of these 117 cases, 80 had already occurred before the outbreak was known.

The States are having problems with imported cases of smallpox. An analysis shows that most of the cases are from districts having common borders with neighbouring States. In Rajasthan, in 10 of 40 outbreaks studied, the source of infection was suspected to be from the neighbouring States. In Gujarat in 1971, out of 44 outbreaks, 17 were traced to Rajasthan and Madhya Pradesh. Another District or State outside Madhya Pradesh was definitely identified as providing the source of infection in 46% of the outbreaks. In Maharashtra in 1971, out of 14 outbreaks, 12 were related to cases imported from other States. In the first quarter of 1972, 6 importations to Bihar have been confirmed from Calcutta City. Of 7 outbreaks in Orissa in 1971, 4 were traced to Calcutta and one was suspected from Assam. In Calcutta the source of 6 outbreaks had been mentioned as Bangladesh by C.M.I.O. In Delhi, 35% of the reported cases this year are considered to be importations, mostly from Uttar Pradesh.

The above data indicate the importance of cross notification in the programme. Cross notification is not done in many cases. The written notification sometimes lacks identifying information. In many instances, replies were not given, either denying or confirming the importation. Adjacent States are not currently informed about problems in adjoining areas.

#### 5. Vaccination coverage

Freeze-dried smallpox vaccine is being produced at the four selected Institutes in the country. In 1971, 52 million doses were produced and the remaining requirement was met from supplies from the Government of the USSR. The vaccine storage and distribution system has now been streamlined. Use of freeze-dried smallpox vaccine and multiple puncture technique with bifurcated needle is now universal in the country.

The level of vaccination work has not met the national prescribed target of 6% and 20% of the total population by primary vaccination and revaccination respectively in 1971. During the last three years, on an average, only 4.2% of the population were covered by primary vaccination. Considering an estimated backlog of 13.5% at the beginning of the fourth Five Year Plan (1969) this performance indicates that it has not been possible to make an appreciable dent in the backlog of unprotected persons. Likewise, the revaccination performance has also not exceeded 12.4% of the total population in a year (Appendix IV).

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The fact that a large number of adults have developed smallpox in 24 Parganas and Cooch Behar (West Bengal) and Santhal Parganas (Bihar), indicates a low immunity level even in the higher age group. During outbreak containment in some villages, about 30% of the population received vaccination for the first time.

Consolidated scar survey reports for a few States indicate that immunity status is improving in those places.

TABLE II  
PERCENTAGE OF UNPROTECTED CHILDREN

Age group	Percentage unprotected						
	Gujarat		Bombay	Himachal Pradesh		Madhya Pradesh	
	1969	1970	1971	1971	1972	1971	1972
0 to 1 year	26-60	12-34	9.4	36.5	24.7	48.2	23
1 to 4 years	4-20	1-4	0.6	3.6	1.3	10.1	3
5 to 14 years	1-3	0.2-2	0.2	1.0	0.5	1.4	1

In 1970 and 1971, 72% and 74% respectively of primary vaccinations were subsequently inspected. The percentage of inspection of primary vaccination was between 50 and 70% only in Andhra Pradesh, Assam, Kerala, Madhya Pradesh, Punjab, Rajasthan and Haryana in both these years.

The practice of neo-natal vaccination has not yet become a routine procedure in institutional confinements. Progress of neo-natal vaccination in Madhya Pradesh is encouraging and is tabulated below:

TABLE III  
NEO-NATAL VACCINATIONS IN MADHYA PRADESH

<u>Year</u>	<u>No. of neo-natal vaccinations</u>
1968	15 874
1969	20 147
1970	47 409
1971	53 464

In Kaira district of Gujarat, during January to August 1972, 22% of the primary vaccinations performed were among neonates, with a success rate of 93.6%.

#### 6. Laboratory diagnosis

A few atypical cases may create difficulties in the clinical diagnosis for which laboratory investigation will be required. In areas where there is a very low incidence or which are virtually free from smallpox, every case must be carefully investigated and confirmed in a laboratory. To assist the programme officers with the laboratory diagnosis of smallpox cases as and when required, six Regional Reference Centres have been identified. Each Centre will serve a group of States/Union Territories. The Centres are:

1. National Institute of Communicable Diseases, Delhi
2. Institute of Preventive Medicine, Hyderabad
3. School of Tropical Medicine, Calcutta
4. Madras Medical College, Madras
5. Calicut Medical College, Kerala
6. Vaccine Institute, Baroda

#### 7. Future plans

Future plans are specifically aimed at eliminating the deficiencies in the on-going programme and strengthening the various components of the programme, placing more emphasis on problem and vulnerable areas. Hard work will be necessary in West Bengal and Bihar. Special efforts will be made in the following directions:

- (a) The reporting procedure will be strengthened at all levels with the objective of quick and complete notification. A "nil" reporting system will be insisted upon.
- (b) Active surveillance teams will be organized at State and District levels. Passive surveillance will be streamlined.
- (c) Every suspected case of smallpox will be investigated and its source of infection traced. Proper containment and follow-up visits will be obligatory.
- (d) The areas reporting "nil" cases will be confirmed to ensure that no endemic foci of smallpox exist.
- (e) The procedure of exchange of information of epidemiological significance with the neighbouring States and countries will be streamlined.
- (f) Intensive vaccination and active search for cases will be organized, particularly in the districts bordering endemic areas.
- (g) Apart from intensifying supervision at all levels, scar surveys will be conducted on a representative sample basis in order to ascertain the immunity status of the population.
- (h) Efforts will be made to attain self-sufficiency in freeze-dried smallpox vaccine within the next two years.
- (i) Health education measures will be surveillance oriented so that the significance of early reporting of even suspected cases of smallpox is brought home to all concerned.
- (j) Periodic assessment of the status of the programme by independent agencies will be organized.
- (k) Suitable training programmes will be organized for the various categories of staff engaged in the eradication effort.

These measures if effectively carried out under the able supervision of State Programme Officers, will assure a smallpox free status in the very near future.

SMALLPOX CASES AND DEATHS BY STATE  
INDIA - 1969, 1970, 1971 AND 1972 (JAN-AUG).

State/ Territory	1969		1970		1971		1972 (Jan-Aug)	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
<u>State</u>								
1. Andhra Pradesh	1 892	338	358	79	214	38	351	29
2. Assam	603	92	77	32	35	12	8	2
3. Bihar	1 878	516	353	91	1 307	344	3 967	825
4. Gujarat	6 278	1 115	2 492	433	2 38	34	39	2
5. Haryana	683	124	2 161	329	2 617	367	1 501	213
6. Himachal Pradesh	-	-	1	-	11	6	-	-
7. Jammu & Kashmir	4	-	-	-	11	1	4	-
8. Kerala	9	1	28	7	-	-	-	-
9. Madhya Pradesh	852	143	1 036	282	1 008	168	1 100	172
10. Maharashtra	1 302	317	233	70	7	-	208	38
11. Manipur	-	-	-	-	-	-	-	-
12. Meghalaya	-	-	-	-	-	-	1 309	-
13. Mysore	152	35	126	18	223	24	-	111
14. Nagaland	-	-	-	-	-	-	-	-
15. Orissa	1 247	309	105	29	16	4	4	2
16. Punjab	234	30	234	32	101	17	39	4
17. Rajasthan	1 439	232	4 074	564	4 821	444	1 590	184
18. Tamil Nadu	6	1	-	-	160	21	1	-
19. Tripura	-	-	-	-	-	-	6	-
20. Uttar Pradesh	881	241	1 024	281	4 862	1 109	7 617	1 512
21. West Bengal	1 518	603	342	106	217	49	2 855	779
<u>U.T.</u>								
22. A & N Islands	-	-	-	-	-	-	-	-
23. Arunachal Pradesh	118	45	-	-	-	-	4	-
24. Chandigarh	-	-	9	3	-	-	-	-
25. D & N Haveli	-	-	-	-	-	-	-	-
26. Delhi	28	11	96	15	318	79	121	22
27. Goa Daman & Diu	12	3	1	1	-	-	-	-
28. LMA Islands	-	-	-	-	-	-	-	-
29. Mizoram	-	-	-	-	-	-	-	-
30. Pondicherry	3	-	-	-	-	-	-	-
INDIA - TOTAL	19 139	4 156	12 750	2 370	16 166	2 717	20 724	3 896

SMALLPOX CASE RATES PER 100 000 POPULATION  
FROM 1969 TO 1971

State/Union Territory	1969	1970	1971
<u>State</u>			
1. Andhra Pradesh	4.4	0.8	0.5
2. Assam	4.0	0.5	0.2
3. Bihar	3.3	0.5	2.3
4. Gujarat	24.2	9.3	0.9
5. Haryana	7.6	21.7	26.5
6. Himachal Pradesh	-	0.03	0.4
7. Jammu & Kashmir	0.1	-	0.2
8. Kerala	0.04	1.3	0.01
9. Madhya Pradesh	2.1	2.5	2.4
10. Maharashtra	2.6	0.4	0.3
11. Manipur	-	-	-
12. Meghalya	-	-	-
13. Mysore	0.5	0.4	0.6
14. Nagaland	-	-	-
15. Orissa	5.8	0.5	-
16. Punjab	1.7	1.7	0.8
17. Rajasthan	5.6	15.8	18.8
18. Tamil Nadu	0.01	-	0.02
19. Tripura	-	-	-
20. Uttar Pradesh	1.0	1.2	5.5
21. West Bengal	3.4	0.8	0.5
<u>U.T.</u>			
22. A & N Islands	-	-	-
23. Arunachal	30.2	-	-
24. Chandigarh	-	3.4	-
25. D & N Haveli	-	-	-
26. Delhi	0.7	2.3	7.9
27. Goa Daman & Diu	-	-	-
28. IMA Islands	-	-	-
29. Mizoram	-	-	-
30. Pondicherry	0.7	-	-
INDIA			



## NUMBER OF DISTRICTS REPORTING SMALLPOX DURING 1969-1972

State/Union Territory	Total No. of Dis-tricts	No. of Districts reporting cases during			
		1969	1970	1971	1972 (Jan-Aug)
<u>State</u>					
1. Andhra Pradesh	21	15	6	3	5
2. Assam	10	6	4	1	1
3. Bihar	17	11	9	7	10
4. Gujarat	19	18	15	11	7
5. Haryana	7	7	7	7	7
6. Himachal Pradesh	10	-	1	3	-
7. Jammu & Kashmir	10	1	-	1	1
8. Kerala	10	4	6	7	-
9. Madhya Pradesh	43	27	22	17	24
10. Maharashtra	26	17	12	6	8
11. Manipur	5	-	-	-	-
12. Meghalaya	2	-	-	-	-
13. Mysore	19	9	6	5	7
14. Nagaland	3	-	-	-	-
15. Orissa	13	10	4	4	1
16. Punjab	12	6	8	7	7
17. Rajasthan	26	22	26	24	21
18. Tamil Nadu	14	3	-	1	1
19. Tripura	3	-	-	-	1
20. Uttar Pradesh	54	36	23	27	39
21. West Bengal	16	12	9	7	14
<u>U.T.</u>					
22. A & N Islands	1	-	-	-	-
23. Arunachal	5	1	-	-	1
24. Chandigarh	1	-	1	-	-
25. D & N Haveli	1	-	-	-	-
26. Delhi	1	1	1	1	1
27. Goa Daman & Diu	3	2	1	-	-
28. LMA Island	1	-	-	-	1
29. Mizoram	1	-	-	-	-
30. Pondicherry	4	1	-	-	-
TOTAL:	358	209	161	139	156

## APPENDIX IV

## STATE-WISE VACCINATION PERFORMANCE DURING 1970 &amp; 1971

State/Union Territory	1970			1971		
	No. of FVs done* (ML.)	% of pop. covered.	No. of RVs done* (ML.)	% of pop. covered.	No. of FVs done* (ML.)	% of pop. covered.
<u>State</u>						
1. Andhra Pradesh	1.83	4.2	2.37	5.5	1.88	4.3
2. Assam	0.52	3.5	3.13	21.1	0.59	4.0
3. Bihar	2.42	4.2	5.93	10.5	2.39	4.2
4. Gujarat	1.12	4.2	2.14	8.0	1.31	4.9
5. Haryana	0.47	4.7	1.09	11.0	0.56	5.6
6. Himachal Pradesh	0.13	3.7	0.88	24.1	0.13	3.7
7. J & Kashmir	0.12	2.6	0.60	13.0	0.15	3.2
8. Kerala	0.74	3.7	1.94	9.2	0.70	3.2
9. Madhya Pradesh	2.04	5.0	2.98	7.2	2.08	5.0
10. Maharashtra	2.18	4.5	5.01	10.0	2.23	4.4
11. Manipur	0.07	6.3	0.12	11.4	0.04	4.1
**12. Meghalaya	-	-	-	-	0.001	1.7
13. Mysore	1.17	4.0	3.80	13.0	1.34	4.6
14. Nagaland	0.04	8.0	0.27	53.4	0.03	6.4
15. Orissa	0.99	4.6	2.36	10.9	1.29	5.5
16. Punjab	0.54	4.1	2.68	20.6	1.21	5.5
17. Rajasthan	1.40	5.3	1.93	17.2	1.16	4.5
18. Tamil Nadu	1.43	3.5	1.20	3.0	1.49	3.6
19. Tripura	0.05	3.4	0.35	23.6	0.13	8.1
20. Uttar Pradesh	4.45	5.0	7.24	8.2	4.51	5.1
21. West Bengal	1.05	2.4	7.09	16.0	1.37	3.1
<u>U.T.</u>						
22. A & N Islands	0.005	5.5	0.02	20.0	0.003	2.7
23. Arunachal Pradesh	0.03	7.0	0.09	22.5	0.03	6.0
24. Chandigarh	0.009	4.2	0.08	41.5	0.01	4.3
25. D & N Haveli	0.02	3.0	0.009	12.7	0.004	5.1
26. Delhi	0.13	3.3	0.52	13.1	0.18	4.4
27. Goa Daman & Diu	0.02	3.5	0.16	24.0	0.03	3.1
28. LMA Island	0.001	3.7	0.004	15.3	0.001	3.3
**29. Mizoram	-	-	-	-	-	-
30. Pondicherry	0.02	4.5	0.07	11.2	0.02	4.5
INDIA	22.98	4.2	53.08	9.7	24.20	4.4
					68.09	12.4

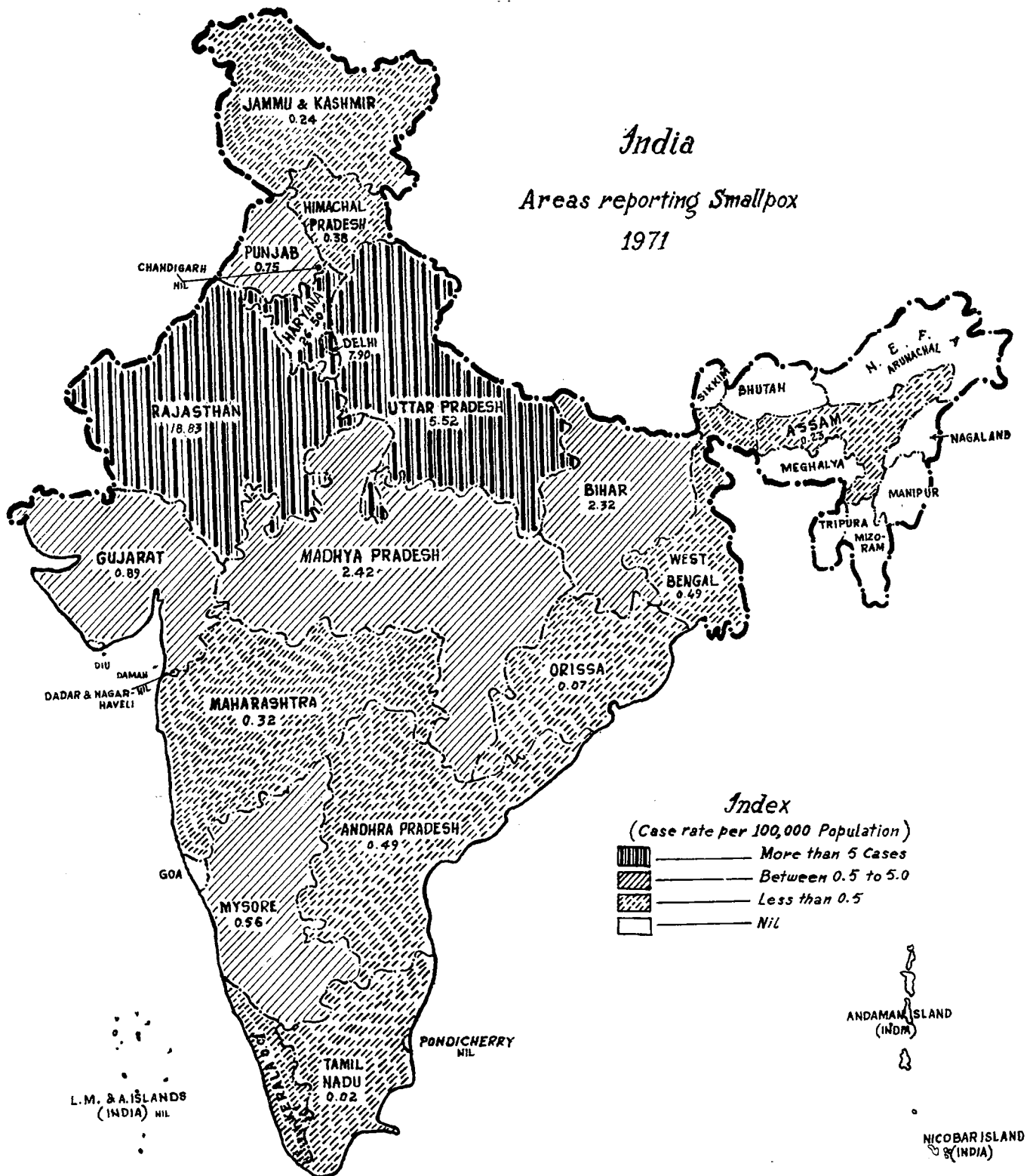
\*\* Formerly part of Assam

Note: \*(ML) = Figures in millions

# India





## Areas reporting Smallpox

### 1971



### Index

(Case rate per 100,000 Population)

-  More than 5 Cases
-  Between 0.5 to 5.0
-  Less than 0.5
-  Nil

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C.B.H.1