Expert Mission to Sri Lanka for Verification of Elimination of Lymphatic Filariasis

Report of the Mission
12–18 June 2011

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Executive summary

Lymphatic filariasis (LF) is a neglected tropical disease that continues to be a major public health problem in the South-East Asia Region (SEAR) of the World Health Organization (WHO). Nine of the 11 Member countries are endemic for LF. The Region has a disproportionate burden of illness with 63% of the population at risk and 50% of the infected people in the world.

SEAR has made significant progress towards achieving the goal of elimination by completing LF endemicity mapping by 2009 and increasing the number of implementation units (IU) practising two-drug strategy (diethylcarbamazine citrate (DEC) and albendazole) mass drug administration (MDA) in all endemic Member States. Significant scaling up of MDA operations occurred in the Region from 2006 to 2010: the programme to eliminate LF in Sri Lanka completed five rounds by 2006 and stopped MDA in 2007. The programme is implementing post-MDA surveillance including xenomonitoring.

Based on the recommendations of the Seventh Meeting of the Regional Programme Review Group (RPRG) for Elimination of Lymphatic Filariasis in 2010, an expert mission to Sri Lanka was organized by the WHO Regional Office for South-East Asia (WHO-SEARO) on 12–18 June 2011 as the first step to initiate the process of verification of elimination. The mission also provided technical inputs and guidelines to decide on the sample size for the Transmission Assessment Surveys (TAS) to verify interruption of LF transmission, and to prepare the dossier. The six members of the expert mission are listed in Section 1.1 of this Mission Report.

The objectives of the mission were: (a) to review the programme and assess the quality of testing and data collection; (b) to review the steps taken by the country to stop MDA; and (c) to assess the steps taken by the country as part of its post-MDA surveillance activities including the preparation of the dossier in accordance with the LF TAS Manual of WHO 2011.

The team held consultations with programme managers and senior officials of the Ministry of Health along with representatives of the WHO Country Office in Sri Lanka. The team examined documents and undertook field visits to observe Immunochromatographic Test (ICT) card testing in the schools to verify the interruption of LF transmission among the 6–7 year old children as per the LF TAS Manual of WHO 2011[1] At the end of the mission, the team had debriefing meetings with the same officials to discuss the field observations and compilation of the dossier required for certification of elimination of LF in Sri Lanka.

[1] WHO (2011): Monitoring and Epidemiological Assessment of Mass Drug Administration: Lymphatic Filariasis TAS. A Manual for National Elimination Programmes.

Elimination of lymphatic filariasis in Sri Lanka

In Sri Lanka, where the Anti-Filariasis Campaign (AFC) was initiated in 1947, the programme to eliminate lymphatic filariasis was started in 2001 covering eight endemic districts with a population of about 11 million. Each district with a population of 1-2 million was identified as one IU. As per the strategy to interrupt transmission of LF infection, five consecutive annual rounds of MDA with DEC+albendazole were completed in all the IUs. The reported coverage was consistently above 80% (range: 80.4–98.2%) confirmed by independent assessments. Side reactions were minimal and self-limiting without any reports of serious adverse events (SAE). After five rounds of MDA, the microfilaraemia (Mf) prevalence rate reduced to 0.05% (range: 0.02–0.11%). No children in the age group 2–4 years were positive for antigenaemia in the IUs, justifying the decision to stop MDA. Post-MDA monitoring was carried out with the available infrastructure. Subsequent surveys showed that the Mf prevalence rate continued to remain below 0.05% while an antigenaemia survey repeated in 2008 did not detect any positive children. Surveys were also carried out in non-endemic areas and the results did not show any evidence of infection/transmission.

The team made field visits to two IUs viz. Gampaha and Kalutara and an independent assessment was carried out during the current review. None of the 224 schoolchildren in the age group 6–7 years (grade 1 and 2) showed ICT positivity. Line listing of cases of lymphoedema and hydrocele has been completed and the health workers have been trained in morbidity management. Necessary steps have been initiated to compile the country dossier required for the certification of the elimination of LF.

Summary of the recommendations

For the Anti-Filariasis Campaign, the mission after examining the available data and conducting the field exercises, approved the stopping of the MDA in 2007. In addition, it recommended that the programme should:

- initiate all activities recommended for post-MDA surveillance (according to the revised WHO guidelines of 2011) and submit a report of these activities to the RPRG in 2012;
- initiate other post-MDA surveillance activities and strengthen screening activities in non-endemic areas;
- retain the existing infrastructure at all levels to continue post-MDA surveillance and morbidity management activities;
- initiate steps to compile the dossier required for the completion of the certification process and the preparation of a Plan of Action for post-MDA surveillance activities.

For WHO, the mission recommended that the programme:

- recognizing the rich experience and success of Sri Lanka and Maldives, should promote intercountry cooperation in LF elimination activities that would benefit other island nations in particular, and other endemic countries of the Region in general;
- should provide necessary technical support to countries that are on the verge of elimination of LF to enable them to complete their activities within the time-frame.

1. Background

Lymphatic filariasis (LF) is one of the vector-borne neglected tropical diseases, and a major public health problem in the WHO South-East Asia Region (SEAR) as it has the highest burden of the disease with 63% of the population at risk. Globally, 50% of infected people and more than 60% of children at risk are from SEAR. The Region delivered a cumulative 2.4 billion (85%) of the 2.8 billion doses delivered globally from 2000–2009. Nine out of 11 Member States are endemic for LF and all three lymphatic filarial parasites (*Wucheraria bancrofti, Brugia malayi* and *Brugia timori*) are prevalent.

The Global Programme to Eliminate Lymphatic Filariasis (GPELF), launched in 2000 with the goal to eliminate LF as a public health problem by 2020, is being implemented in 53 out of 72 endemic countries[1]. SEAR has made significant progress towards achieving the goal of elimination. Mapping has been completed in the nine endemic Member States, which have all adopted the WHO-recommended two-drug strategy (diethylcarbamzine citrate (DEC) and albendazole) for mass drug administration (MDA). The Member States and the partners have demonstrated their commitment to the programme by mobilizing funds to cover operational costs. Significant scaling up of MDA operations occurred in the Region. In 2010, 365 million of the 416 million targeted population were treated, 30% of whom were children.

In 2001, the two-drug combination MDA was administered only in Colombo district. From 2002 onwards, all the districts launched MDA. As a result, when MDA was stopped in 2007, only Colombo district had six rounds and the rest had five rounds of MDA. Sri Lanka completed five rounds of MDA by 2006 and stopped in 2007. Post-MDA surveillance is in progress in the country. In 2010, the Seventh Meeting of the Regional Programme Review Group (RPRG) for Elimination of LF recommended initiating the process of verification of elimination of LF in Sri Lanka as per the LF TAS Manual, WHO (2011), once it became available. Accordingly, the WHO expert mission to Sri Lanka was organized by the WHO Regional Office for South-East Asia (WHO-SEARO) from 12 to 18 June 2011 as the first step to initiate the process, and to provide techincal inputs and guidelines to carry out follow-up action such as Transmission Assessment Surveys (TAS) and preparation of the dossier.

1.1 Members of the mission

The expert mission consisted of the following members:

- Professor R.C. Mahajan, Emeritus Professor, Department of Parasitology, Postgraduate Institute of Medical Education and Research, Chandigarh, India (Chair)

- Professor M.M. Ismail, Professor Emeritus, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka
- Dr V. Kumaraswami, Lymphatic Filariasis Support Centre, Atlanta, Georgia, United States of America (Rapporteur)
- Dr K. Krishnamoorthy, Scientist F, Vector Control Research Centre (WHO Collaborating Centre), Puducherry, India
- Dr C.R. Revankar, Scientist, Vector-Borne and Neglected Tropical Diseases Control, VBN/WHO-SEARO
- Dr A.P. Dash, Regional Adviser, VBN/WHO-SEARO.

1.2 Terms of reference of the mission

The terms of reference of the mission were:

- to review the programme and assess the quality of testing and data collection by carrying out spot-checks;
- to review the steps taken by the country to stop MDA; and
- to assess the steps taken by the country as part of its post-MDA surveillance activities including the preparation of the dossier in accordance with the revised WHO guidelines of 2011.

1.3 Planning and description of activities of the mission

On arrival in Colombo, the capital city of Sri Lanka, the mission held consultations/briefings with programme managers and senior officials of the Ministry of Health (MoH) along with staff of the WHO Representative's (WR) Office. These meetings facilitated finalization of the activities of the mission and the necessary logistic arrangements. The national programme managers identified key members of the programme to plan field visits and provide records and documentation for examination. The list of documents to be consulted by the mission was also finalized. The mission members also had discussions with former key programme officials on historical information of the LF programme.

The mission undertook field visits to two LF-endemic districts – Gampaha and Kalutara – to observe the TAS in schools. The experts formed two sub-teams to observe the process of selection of schools, the compilation of the list of children to be tested and ICT card testing. The team also checked the quality of the ICT cards and randomly read the results of the tests along with the testers.

On return from the field visits, the mission members reviewed their findings with programme officials, sought clarifications and compiled their findings. At the end of the mission, the members held debriefing meetings with programme managers and senior

officials of the MoH to apprise them on the findings, recommendations and further follow-up action points, including dossier preparation.

The detailed itinerary of the mission and the list of officials and persons contacted are shown in Annexes 1 and 2, respectively.

2. Control of lymphatic filariasis prior to the elimination programme

The first microscopic diagnosis in the country was made at the Matara Hospital in 1893 and early infections were reported to be caused by *Brugia malayi*. Because of the large number of elephantiasis cases in the Galle area, the disease became known as "Galle leg" and Brugian filariasis was more widespread than Bancroftian filariasis[2]. The first report on the prevalence of filarial disease in Sri Lanka was based on the survey conducted in 1912–1913 focusing on urban areas. This was followed by a second survey in the 1930s in rural areas. *Wuchereria bancrofti* was restricted to Galle and Matara towns, whereas *B. malayi* was widespread along the south-west coast from Matara to Negombo, and in isolated pockets in the north-west, central north, east and south. An island-wide survey carried out during 1937–1939 showed scattered but active foci of *B. malayi* in the south-west, south-east and north-central areas, while small foci of *W. bancrofti* were found in the south-western coastal belt. The survey of the 1930s led to the inference that the occurrence of *B. malayi* was related to the distribution of the water plant, *Pistia stratiotes*[3].

A combination of factors triggered off an unexpected spread of Bancroftian filariasis away from its early "bridge-heads" in Galle and Matara towns to invade the south-western coastal areas and, later on, escalated through increased population mobility to inland areas. Historical events and suitable environmental conditions in the south-western coastal areas of Sri Lanka led to the establishment of a zone of endemic filariasis caused by *W. bancrofti* and transmitted by *Culex pipiens fatigans*.

The Anti-Filariasis Campaign (AFC) was established in 1947 as one of the first organizations in the world for the control of filariasis on a country-wide basis. The previous *B. malayi* foci, scattered over widely dispersed areas of the island, were apparently completely eliminated as a result of control of the *Mansonia* vectors by the destruction of the larval host plants in their swamp habitats during the 1947–1952 campaign[4]. This was further supported by the survey carried out by Gautamadasa in which none of the 53 000 blood films collected from earlier *B. malayi* foci showed Mf of *B. malayi*[5]. The AFC reports indicated no noticeable drop in Mf rate and indeed nearly 10 000 clinical cases were recorded at the clinics. However, an assessment report of the Sri Lankan Administrative Service Association (SASA) indicated that AFC was well organized; the methods of control followed were for the most part adequate and suited to local circumstances, and the results showed gradual increase in effectiveness[6]. The idea of mass chemotherapy was not considered for the situation of low Mf rates and anticipated low compliance[7].

By 1976, the efforts of AFC had reduced the Mf rate in the endemic belt to an average of less than 1%[8]. Vector control was the mainstay of AFC besides case detection and treatment. Control activities were carried out from 20 stations in addition to the mosquito control unit in Colombo. The introduction of mass treatment with single dose DEC in the late 1990s and subsequently in combination with albendazole became a landmark in the treatment and control of lymphatic filariasis.

2.1 Endemicity

Currently *W. bancrofti* is the only infection in the country and is transmitted by the sole vector *Culex quinquefasciatus*. Three provinces – Southern, Western and North Western – have been recognized as having endemic districts with a population of 9.8 million people at risk of infection (Map 1). This area covers about 500 square miles, is in the wet zone receiving rainfall during the south-west monsoon, and the land is relatively flat, sloping towards the sea and traversed by several streams and rivers. Results of entomological surveys indicated that transmission of *W. bancrofti* occurred throughout the year in the study community[9].

Data on Mf prevalence available for the endemic districts under AFC from 1981 note a range between 0.2–0.4 from 1981 to 2001, when MDA with DEC+albendazole was introduced in Colombo district (Figure 1).

2.2 Organizational structure of the programme

The AFC is responsible for the filariasis elimination programme and functions under the overall leadership of the Deputy Director-General of Health Services in charge of public health under the Directorate of Health Services. Filariasis control activities were decentralized in 1989. The responsibilities of the provincial health authorities included planning, implementation and monitoring filariasis control within the framework of the national programme. Currently the central AFC directorate has a staff of 35, including four medical officers and two laboratory staff. At the provincial level, five dedicated medical officers cover the eight endemic districts, plus public health inspectors.

2.3 Review of the elimination programme

The AFC initiated MDA campaigns using DEC alone during 1999–2001, followed by the WHO-recommended DEC+albendazole combination from 2002 onwards.

2.4 Identification/mapping of endemic areas

The country completed LF endemicity mapping of filariasis in 2001 and identified eight endemic districts; nine non-endemic districts and the remaining eight districts in the north-eastern region as grey area (Map 1). There were 116 Medical Officer of Health (MOH) units and 6410 villages in the eight endemic districts (with an enumerated

population of 9.98 million (Tables 1 and 2). The total population at risk as per the 2001 census was 11.04 million.

2.5 MDA activities

Endemic districts with populations of 0.53–2.18 million were designated as IUs. The first MDA in the national LF elimination programme covering the entire endemic region in 1999 delivered DEC to 62.7% of the population[6]. In 2000, two rounds of MDA, again using only DEC, reported programme coverage of 68.2% in April and 70.5% in November. In the May 2001 round, when a limited supply of albendazole was available, the combination of DEC and albendazole was administered on a trial basis only in the Colombo district with coverage of 76.7%. DEC alone was continued in the other seven LF-endemic districts.

Following implementation of the COMBI (communication for behaviour impact) programme, the first countrywide MDA campaign using the two-drug combination was carried out in July 2002 with a reported coverage of 80% of the 9.8 million people targeted. The second round of MDA with the two-drug combination was carried out in July 2003 with a sustained social mobilization campaign. The third, fourth and fifth rounds of MDA were carried out in 2004, 2005 and 2006 respectively. The target population, geographical coverage, epidemiological coverage and programme drug coverage are shown in Table 3. Figure 2 shows the reported treatment coverage.

Variation between the IUs was high during the first two rounds (30.3–75.3%) but minimal during the subsequent years. The average epidemiological coverage ranged between 63.8% and 85.8% in different rounds. In Kalutara IU (chosen as a representative district), five completed rounds of MDA showed coverage well above 85% in all rounds with minimal variations between MOH (Figure 3 and Table 4).

2.6 Coverage, compliance and occurrence of adverse events

Knowledge of lymphatic filariasis and the response to the July 2002 mass treatment campaign in two communities in the Galle district were assessed in a knowledge, attitude and practice (KAP) survey[9]. Respondents were drawn from a coastal community in Unawatuna (population sample 381), and an inland community in Baddegama (population sample 236) in the Galle district. They were interviewed twice, four weeks before the MDA and 4–7 days afterwards. The sample population of Unawatuna had a greater awareness of the clinical and parasitological features of the disease and the drug treatment. Only 5.5% of the combined sample attributed the cause of filariasis to a parasitic worm. However, over 70.0% knew that transmission was through mosquito bites.

Medicines were received by 76.9% of the Unawatuna population compared with 89.0% at Baddegama. Among those who received medicine, consumption was 91.8% in Unawatuna and 96.2% in Baddegama. Adverse effects were experienced by 22.9% individuals in both communities, most commonly drowsiness (37.8%), malaise (28.2%),

headache (16.8%), vomiting (5.1%), nausea (4.5%) and fever (3.9%). The community members spread the news on mass treatment on the previous evening and on the day of the treatment.

A questionnaire-based independent evaluation was carried out in 2003 after the second round of MDA with the two-drug combination to assess how far social mobilization had reached the people, their drug compliance and adverse reactions[5]. Three localities were selected from each district and 150–160 people from one locality were interviewed. A total of 4358 individuals were contacted. Information on MDA reached more people in the periphery than in Colombo. Over 35% people from Colombo municipality were unaware of the MDA. The overall drug coverage was 79.6% (Table 5).

Two districts with high reported coverage (Kalutara and Kurunegala) and two others with low reported coverage (Gampaha and Matara) were selected and from each district; 30 clusters with 30 houses were covered to assess coverage and compliance by independent survey during 2004. Out of 82.3% of the eligible population who received drugs, 72.8% received them at home. Of the total 16 006 participants, 11 847 (74.0%) ingested the drugs (Figure 4 and Table 6). The main reasons for not ingesting were prevailing sickness at the time of drug distribution, refusal and lack of interest. The coverage survey reflects an overall consumption of over 70% in three districts: Kalutara and Kurunegala achieved high coverage through house-to-house distribution while in Matara, added distribution from centres increased coverage. Side-effects for the two-drug regime were experienced by 5.8% of those who swallowed the drugs.

A school-based survey on coverage and consumption in 2004 covering 30 schools in Kurunegala district showed that 87.1% of the 900 grade 3–13 children consumed the drugs, of whom 9.4% reported mild side-effects (Table 7).

The types and severity of adverse drug reactions to DEC and albendazole were assessed in randomly selected urban populations from Colombo (n=1165) and rural populations from Gampaha (n=1154). Adverse drug reactions were reported by 12.6% of the population, in equal proportions from urban and rural areas[6]. The commonly reported adverse events were drowsiness (34.7%), headache (23.1%), gastrointestinal symptoms (18.7%) and dizziness or faintness (11.9%). However, most symptoms were mild (96.3%) and did not interfere with daily activities or require medical attention. Medical advice was sought by 3.2% individuals for their symptoms and one person (0.5%) who had severe abdominal pain was hospitalized.

2.7 Impact of monitorng microfilaraemia and antigenaemia in sentinel and spot-check sites

The team compiled available data on Mf surveys carried out in all eight endemic districts (Tables 8, 9, 10 and 11). Table 8 shows the number of individuals screened for Mf parasites during MDA (2001–2006) and post-MDA periods (2007, 2008 and 2010). No data were available for 2009. Trend analysis of Mf prevalence rate in the endemic districts

during pre-MDA, MDA and post-MDA indicated that the rate declined from 0.37 in 1995 to 0.19 in 2000. This rate further declined to 0.03 by 2006 when the MDA was stopped. The trend remained more or less constant until the end of 2010 (Figure 5 and Table 9). Mf prevalence was relatively higher in Kurunegala (0.34%), followed by Galle (0.24%). The overall Mf intensity was 334 per positive case in 2000 (pre-MDA period) and ranged between 280 and 437 in different years during MDA and post-MDA periods (Table 10). No data were available for 2010. Mf intensity fluctuated between 250 and 450 and showed no marked difference between pre-MDA, MDA and post-MDA periods (Figure 6).

Both Mf (cross-sectional community) and antigenaemia (children in the age group 2–4 years) surveys were carried out in all eight implementation districts prior to the fifth round of MDA. Two sentinel sites were selected from each district (16 sites) and from each site, 150 houses were selected. A total of 750 individuals from the selected houses plus all the children in the age class 2–4 in these houses were screened for Mf and antigenaemia respectively. Table 11 shows the declining trend in overall Mf rates from 0.083 in 2006 to 0.004 in 2008, indicating the positive impact of MDA. A total of 12 027 samples were examined from 16 sentinel sites. Ten Mf-positives were detected and 10 sites were Mf-free in 2006. In 2007, 67 092 individuals from these 16 sentinel sites were screened and the overall Mf rate was 0.05. Seven of the sites were free from microfilaraemia. In 2008, 89 929 individuals were screened and 0.04% found to be positive.

The number of children screened in the houses selected for the Mf survey ranged between 15 and 75 in different sentinel sites of IUs (Table 12). All 568 children screened for antigenaemia using ICT cards were negative, indicating an absence of transmission during the intervention period in 2006. In 2008, 4831 grade 1 students (6-year old) were screened in all the eight IUs by visiting 587 schools and all were free from antigenaemia (Table 13).

A study on the distribution of filarial elephantiasis and hydrocele in Matara district, as reported by local leaders and an immunological survey in areas with relatively high clinical rates, showed elephantiasis was clearly aggregated in the southern part of the district (7). *W. bancrofti* antigen and filaria-specific urinary IgG4 antibody were measured in 2436 subjects and the positive rates for antigen and antibody were 0.6% and 4.3%, respectively. The titre analysis of IgG4 according to age revealed that the youngest IgG4 positive was 3 years old, and that in children aged 10 years or less, there were 16 positives out of 607 children examined (2.6%). It was concluded that the filarial transmission was at a low level in the region.

2.8 Entomological surveys

Entomological surveys were carried out in all the endemic districts by the AFC. Monthly collections of indoor resting mosquitoes from selected localities were made and the vector mosquitoes were dissected to assess parasite infection and infectivity. The number of vector mosquitoes dissected annually ranged from 32 419 to 56 587 between 1995

and 2002 (Table 14). Data available for Kalutara district for the period 1997–2010 showed that the number of mosquitoes dissected per year varied from 4500 to 13 895 (Table 15). On an average, about 9000 mosquitoes were dissected per year with an estimated 72 000 per year from endemic disticts. Data from the eight endemic districts (Table 16) during the post-MDA phase (2007–2010) showed the average infection rate to range between 0.06 (2010) and 0.74% (2007). Gampaha and Galle districts recorded the highest and lowest infection rates, respectively. Vector infectivity was at a very low level even prior to MDA (0.07%) and fluctuated between 0.04 and 0.05 during MDA (Figure 7). During the post-MDA phase, it ranged between 0.0 and 0.05. In 2010, only one distict recorded infective mosquitoes (Table 17).

2.9 Morbidity management

Health workers in health posts of all islands were trained in morbidity management. However, it is yet to be promoted at community level. The number of patients visiting the morbidity clinics for the first time ranged between 600 and 1800 in different years (Figure 8). A study carried out in 2004 on lymphoedema management knowledge and practices among patients attending filariasis morbidity control clinics in Gampaha District showed that approximately two thirds of the 66 patients (22 males, 44 females) were aware of the importance of skin and nail hygiene, limb elevation and use of footwear. Washing was practised on a daily and twice-daily basis by 41% and 49% males and females, respectively. Approximately 65% patients had received health education from filariasis clinics. While recommending the referral of lymphoedema patients to morbidity control clinics, the study concluded that specific filariasis morbidity control clinics play an essential role in the dissemination of morbidity control knowledge[8].

3. Justification/rationale for stopping MDA

The programme justified the stopping of MDA in endemic districts for the following reasons.

- Minimum five rounds of MDA were completed using the two-drug regimen in all the eight endemic districts.
- The reported coverage was uniformly high in all the districts. The coverage levels were confirmed by independent surveys.
- The Mf prevalence in the districts as a whole and in sentinel sites was well below the threshold of 1% and hence an antigenaemia survey was planned (as per the 2005 WHO guidelines). Antigenaemia survey carried out among children in the age group 2–4 years in 2006 did not show any antigen positivity indicating that children born after MDA were free from LF infection.
- Entomological data showed the presence of very low vector infection (below 1%) and zero infectivity rates (except Gampaha).

4. Field visits to Gampaha and Kalutara districts

The expert team accompanied by AFC and MoH officals visited Gampaha and Kalutara districts to observe the ICT card testing and review the elimination activities (Map 2).

4.1 Gampaha district

The Gampaha district (Map 3) has a population of 2.4 million distributed in 15 MOH (sub-districts) with an Mf prevalence of 0.18% in 2000, prior to MDA. After the first round of MDA in 2002 it dropped below 0.1% and during the post-MDA period has been 0.05% (Table 9 and Figure 9). The coverage of drug distribution ranged between 66.4% and 87.2% in different years: surveys showed 70.6% coverage in 2003 and 82.7% in 2004 while consumption of the drug was assessed to be 76.6%. Vector infection, which was initially over 1%, dropped to 0.45% in 2010 (Table 16) and infectivity rate was 0.01% in 2010 (Table 17).

During the visit, ICT card testing was carried out in two schools. A total of 112 students in grades 1 and 2 were tested and none were found positive, indicating no transmission of LF infection.

4.2 Kalutara district

There are 12 MOHs (subdistricts) in Kalutara district (Map 4), with a population of 1.18 million. This district has been known to be endemic for decades. Under the AFC, between 95 000 and 152 000 slides were examined for Mf and the prevalence prior to MDA ranged between 0.3–0.15% in different years. After MDA, Mf prevalence declined, reaching 0.05% at the end of four rounds of MDA and 0.01 during post-MDA (Figure 10). Vector infection fluctuated between 0.45–0.27% in different years, infectivity was very low and no infective mosquitoes were recorded (Figure11).

The team visited a school located in Padura MOH of this district where 76 students (all boys) were screened for antigenaemia using ICT. None was found positive. In another school located in Beruwala MOH, 56 students (35 boys and 21 girls) were screened and none was found positive.

5. Review with Ministry of Health officials

The team debriefed the Secretary to Health and the Director-General of Health, Sri Lanka and other officials on the mission findings. The MoH officials reiterated the commitment of the government to the elimination programme and assured support to post-MDA activities, the preparation of the dossier and ICT card testing of 12 000 sample school-children as per the revised WHO guidelines. The success of the programme was attributed to good leadership and a well-developed health network, and extended support was offered for training health personnel from other countries on LF elimination.

The Secretary assured that all efforts would be made to retain the staff structure required for completion of elimination activities and the AFC would receive full support for all its activities in this area.

6. Proposed plan of action during the post-MDA phase

Having completed five rounds of MDA, Sri Lanka is therefore ready to carry out the WHO-recommended TAS in the areas where MDA was successfully completed. The ICT card testing that was done during the visit of the team was the first step and the TAS will be completed by testing approximately 12 000 children in all the endemic districts. In addition, TAS needs to be done at least once in selected non-endemic areas. AFC units in each endemic district can be utilized for the post-MDA surveillance.

The further steps to be undertaken by the programme based on the revised WHO guidelines are outlined in Annex 3.

7. Summary of programme review and conclusions

- The Anti-Filariasis Campaign (AFC) was initiated in 1947 when anti-larval measures were utilized. DEC chemotherapy was added to the programme in 1949.
- Sri Lanka launched the programme to eliminate lymphatic filariasis in 2001 covering eight endemic districts with a population of about 11 million.
- Each district with a population of about 1–2 million was identified as the IU. Five rounds of MDA with DEC+albendazole were completed in all IUs with no break in annual treatments from 2002 onwards.
- The reported coverage was consistently above 80% (range 80.4–98.2%) in all rounds following the first round in 2001.
- Independent assessment of the third round of MDA in four IUs showed an overall coverage of 82.3% and consumption of 74.1%. Side reactions were minimal and self-limiting with no report of serious adverse reactions.
- Baseline Mf prevalence was below 1% (range 0.09–0.34%) in all IUs prior to the MDA campaign. Monthly entomological surveys were carried out in all IUs and vector infection and infectivity rates were assessed by dissection.
- After five rounds of MDA with DEC+albendazole the Mf prevalence (sample size 3–6%) was reduced to 0.05 % (range 0.02–0.11%) and no child in the age group 2–4 was positive for antigenaemia in the IUs. This finding supported the decision to stop MDA.

- The MDA campaigns and post-MDA monitoring were carried out with the infrastructure available at the district (IU) level under the anti-filariasis campaign.
- Assessment of Mf prevalence was continued every year in the IUs after MDA and maintained below 0.05%. An antigenaemia survey repeated in 2008 detected no positive children nor infectivity among the vectors. The results suggested continued absence of transmission (no new infection among children), exposure (no infective vectors) and resurgence of infection (no increase in Mf prevalence). Sporadic reports of occurrence of *B. malayi* infections were reported in the north-western parts of the country.
- Surveys were also carried out in non-endemic areas and the results showed no evidence of infection/transmission.
- Field visits were made to Gampaha and Kalutara and an independent assessment carried out during the current review. None of the 224 children in the age group 6–7 years showed ICT positivity.
- Line listing of cases of lymphoedema and hydrocele has been completed and the health workers have been trained in morbidity management.
- Steps have been initiated to compile the dossier required for the certification of elimination.

8. Recommendations

For the Anti-Filariasis Campaign, the mission places on record its appreciation of the efforts of the Government of Sri Lanka, the Directorate of Public Health and the Anti-Filariasis Campaign to eliminate lymphatic filariasis in the country. The mission, after examining the available data and conducting the field exercises, approved the stopping of the MDA in 2007. In addition, the mission recommended:

(1) initiation of all the activities recommended for post-MDA surveillance [according to the LF TAS Manual, WHO (2011)] and submission of a report to the RPRG in 2012;

(2) initiation of other post-MDA surveillance activities – parasitological, antigenaemia, xenomonitoring, clinical case documentation (including non-MDA districts) that may be appropriate to ensure that surveillance utilizes all the available tools; the country is urged to consider strengthening the existing infrastructure to continue these post-MDA stopping activities;

(3) strengthening of screening activities in non-endemic areas (including possible *B. malayi* pockets in north-western areas) and establishment of mechanisms to identify and treat microfilaremics among immigrants and army recruits;

(4) retention of the existing infrastructure at all levels to continue post-MDA surveillance activities;

(5) continued morbidity management activities in all areas where LF cases are present and exploration of an integrated approach for disability management;

(6) compilation of the dossier to initiate the process of certification: a suggested outline based on the LF TAS Manual, WHO (2011) is attached (Annex 1);

(7) preparation of a Plan of Action for TAS, post-MDA surveillance and dossier compilation (including activities, timelines and budget);

(8) exploration of funding avenues for the activities listed above.

For WHO, the mission:

- Recognizing the rich experience and success of Maldives and Sri Lanka, recommends the promotion of intercountry cooperation in LF elimination activities that would benefit other island nations in particular, and other endemic countries of the Region in general.
- Urges WHO to provide necessary technical support to countries that are on the verge of elimination of LF to enable them to complete their activities within the timeframe.

9. References

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Annex 1

Programme of the mission in Sri Lanka

12 June (Sunday)

Arrival of team in Colombo

13 June (Monday)

Forenoon – Briefing with WR at WHO Country Office, Sri Lanka – Dr Eikubota (Ag.WR) and Dr Supriya Warusavithana, NPO

Afternoon – Briefing with MoH officials

Discussion with Dr W.A. Sunil Settnayake, Director, district level programme managers, Anti-filaria campaign, Sri Lanka

14 June (Tuesday)

Forenoon – Team 1 – field visit to Gampaha district for spot check and screened 56 school entrants for antigenaemia

Team 2 – field visit to Pandura in Kalutara district for spot check and screened 56 school entrants for antigenaemia

Afternoon – Discussion with MoH officials

15 June (Wednesday)

Forenoon – Review of field activities and data analysis at MoH office

16 June (Thursday)

Forenoon – Team 1 – field visit to Gampaha district for spot check and screening for antigenaemia

Team 2 – field visit to Beruwala in Kalutara district for spot check and screened 56 school entrants for antigenaemia

Afternoon – Discussion with MoH officials

Discussion with Dr Thilaka Liyanage, former Programme Manager of the LF Elimination Programme and Dr Supriya Warusavithana, NPO at WR Office

17 June (Friday)

Forenoon – Meeting with Dr Ajith Mendis, the Director General of Health Services
Meeting with Dr T.R.C. Reberu, Secretary to Health, Government of Sri Lanka

Afternoon – Discussion with MoH officials
Debriefing with WR

18 June (Saturday)

Forenoon – Prepare report at Directorate of Anti-filaria Campaign

Afternoon – Departure for Maldives

Annex 2

Officials met by the members of the mission in Sri Lanka

Sl. No	Name	Designation
1	Dr T.R.C. Reberu	Secretary to Health, Government of Sri Lanka
2	Dr Ajith Mendis	Director General of Health Services, Sri Lanka
3	Dr Eikubota	Ag.WR, WHO Country Office, Sri Lanka
4	Dr Supriya Warusavithana	National Programme Officer, WHO Country Office, Sri Lanka
5	Dr W.A. Sunil Settinayake	Director, Anti-Filariasis Campaign(AFC), Sri Lanka
6	Dr Dilhani Samarasekera	Medical Officer and Consultant, Community Physician, AFC, Sri Lanka
7	Dr Champa Hepugode	Medical Officer, AFC Unit, Gampaha district
8	Dr Chandana Perera	Medical Officer, Anti-filariasis Unit, Kalutara district
9	Dr Samudrika Perera	Medical Officer, Anti-filariasis campaign, Sri Lanka
10	Dr W.D. Premakumara	Medical Officer, Anti-filariasis campaign, Sri Lanka
11	Dr Chandrika George	Medical Officer Anti-filariasis campaign, Sri Lanka
12	Dr Anura Wijeyathilake	Medical Officer, Anti-filariasis campaign, Sri Lanka
13	Dr N. Sivakumar	Medical Officer, Pandura, Sri Lanka
14	Dr Thilaka Liyanage	Former Programme Manager of the Anti Filariasis Campaign

Annex 3

Summary of activities to be carried out by the Programmes during the post-MDA phase

(based on LF TAS Manual, WHO,2011)

1. Periodic Transmission Assessment Survey (TAS)

1.1 Antigenaemia survey among children in the age class 6 and 7 years

Two post-MDA surveys are to be carried out; one 2–3 years after last MDA and another after a gap of two years from the first. In 2011 the first survey can be completed. It has already been estimated that about 12 000 children in the age class 6–7 years are to be screened with ICT for antigenaemia. As the school attendance is above 80%, a school-based survey can be carried out. The steps involved in this are:

(1) Prepare a list of schools in each IU

(2) Prepare a list of students in the schools in the age class 6 and 7 years

(3) Obtain permission from the school to conduct the survey

(4) Procure ICT cards

(5) Screen the required number of children in each IU following systematic sampling procedure with written consent of the parents

(6) Treat children if found positive for antigenaemia.

1.2 Xenomonitoring

Entomological surveys have been a regular activity of the AFC. Monthly collections were carried out and the adult female mosquitoes were dissected for parasite infection and infectivity. The number of mosquitoes dissected was as high as 10–12 thousand per year. PCR-based xenomonitoring is now recommended as a method of assessing transmission. Mosquitoes can be collected using gravid traps. In each Evaluation Unit (IU=EU), 30 clusters (evaluation area) can be selected using probability proportional to size (PPS) sampling method and from each cluster seven houses/premises can be selected at random. From each house a pool of 25 mosquitoes can be collected. The number of pools per EU will be 270. The vector mosquitoes are to be air dried after identification and sent to the centralized laboratory for PCR assay. The infection rate can be derived following the assay. This has to be done during the peak season of vector abundance.

1.3 Microfilaria (Mf) survey in sentinel and spot-check sites

As has been done prior to, during and post-MDA, cross-sectional community surveys for Mf prevalence are to be continued in the sentinel and spot-check sites. The minimum sample size in each site is 500.

1.4 Confirmation of absence of transmission in non-endemic areas

TAS can be carried out at least once during the post-MDA surveillance in selected non-endemic districts. This is to ensure that there is no resurgence of infection/transmission.

1.5 Long-term monitoring LF among

- recruits
- migrants.

1.6 Integration of surveillance

It may be explored to integrate LF surveillance with:

- other neglected tropical diseases
- population surveys.

1.7 Morbidity management

Health workers have already been trained in morbidity management (MM). All the clinical cases of LF are to be line listed and trained on MM. Close monitoring of these cases is also required to ensure that the patients are regularly practicing MM and the assure they perceive the benefits. Necessary materials can be supplied/replaced.

2. Preparation of dossier and certification process

A rigourous exercise is required for applying for certification. Activities have to be planned well in advance so as to make all the necessary documents are compiled and supported by data. The foramt for dossier is given in Annex 4.

Annex 4

Guidelines for the preparation of the dossier
(based on the LF TAS Manual, WHO,2011)

The dossier should present, in an organized fashion, the evidence for filariasis elimination for the entire country. If geographically separate foci existed within a country, they should be dealt with separately.

Terms that are used at a national level that may not be understood internationally should be defined (e.g. "imported case", "endemic district").

Spatial presentation of data is encouraged. At a minimum, maps should be included that show each implementation unit, as well as a national- or regional-level maps indicating endemic and non-endemic areas.

Dossier Contents

1. General description

The general description should focus on:

- Geographic and economic features of the country, particularly as they relate to risk of filariasis transmission.
- The health system, with an emphasis on its capacity to detect affected persons and provide them treatment.
- The geographic distribution, feeding behaviour, density, and competence of the vector mosquitoes.
- Immigration patterns to and from filariasis endemic areas (including other countries).
- The occurrence of lymphatic filariasis in neighbouring countries and the status of filariasis control or elimination efforts in these countries.

2. History of lymphatic filariasis

- A detailed description, including maps, of historic foci of lymphatic filariasis transmission, as documented by both government and research efforts. This should include a review of data on prevalence and intensity of filariasis infection in humans and vector mosquitoes.
- Evidence for the absence of filariasis in areas considered non-endemic. Information should be provided on how non-endemic areas were defined and on surveillance in these areas to provide assurance that they remain non-endemic.

- A description of filarial disease, including geographic distribution, prevalence, and treatment for the various clinical manifestations.

3. Interventions

- A detailed description of all measures to control or interrupt transmission in each focus. This description should include details of screening, selective treatment, MDA, and ancillary measures such as environmental and economic improvement, vector control, and other relevant interventions such as elimination or control activities targeting other vector-borne diseases (e.g. malaria eradication efforts).
- Review of case management for filarial disease.

4. Assessment of interventions

- A detailed description of surveys and studies conducted to evaluate the impact of these measures (e.g. microfilaraemia surveys). This chapter would include data from sentinel sites and surveys for antigenaemia, as currently recommended by WHO, as well as other surveys or evaluations that were conducted before the GPELF was established. It should also include any sampling undertaken as part of the decision to stop MDAs or other interventions.
- Details should be provided on sampling methods and procedures that were used to assess baseline prevalence, monitor the programme, and assess stopping points for MDA.
- Review of any data collected on the impact of interventions on filarial disease.

5. Surveillance

- A full review of any surveillance activities undertaken since MDAs and other interventions were stopped, including a description of case follow-up activities completed for each positive case detected.
- Review of the filariasis case reports through routine disease surveillance or other systems for case detection.
- Evidence that adequate sampling or surveillance was conducted in all previously endemic areas and in areas that were of uncertain endemicity during initial mapping.
- Details on surveys done in cross-border areas and in immigrants from filariasis-endemic areas (e.g. date of surveys, number of persons tested, test results, follow-up of any microfilaraemia-positives).
- Demonstration that any positive cases detected following MDA represented isolated events not traceable to an area of transmission. If an area of potential transmission was discovered, evidence should be presented that subsequent interventions (e.g. MDA) were successful.

6. Additional data that support the elimination of lymphatic filariasis

7. Bibliography

- Published and any available unpublished studies on lymphatic filariasis, its geographic distribution and control, including theses and dissertations.

Annex-5

Maps, Tables and Graphs

Map 1: ***Filariasis distribution in Sri Lanka (2001)***
Population at risk: 9.8 million spread over in 500 sq.miles

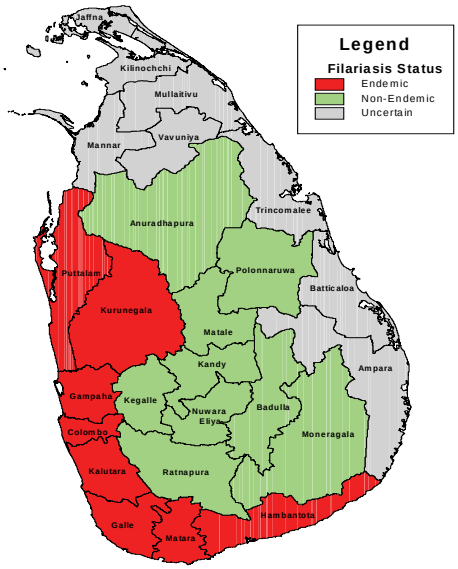


Figure 1: ***Microfilarial prevalence in different years from the eight endemic districts 1981-2008***

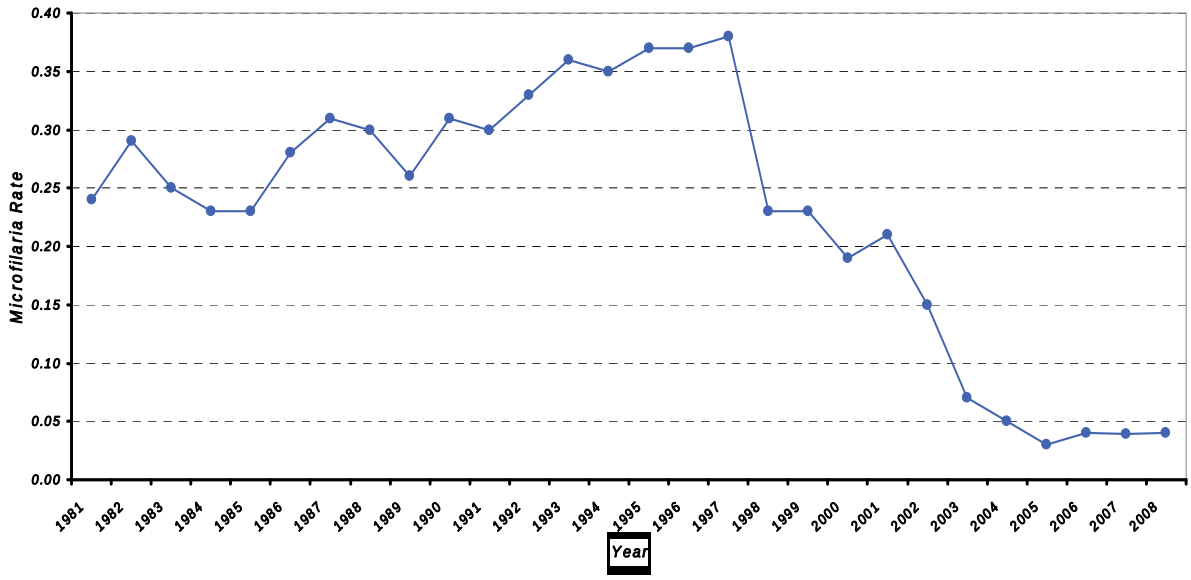


Table1: *District-wise LF endemicity in Sri Lanka 2001*

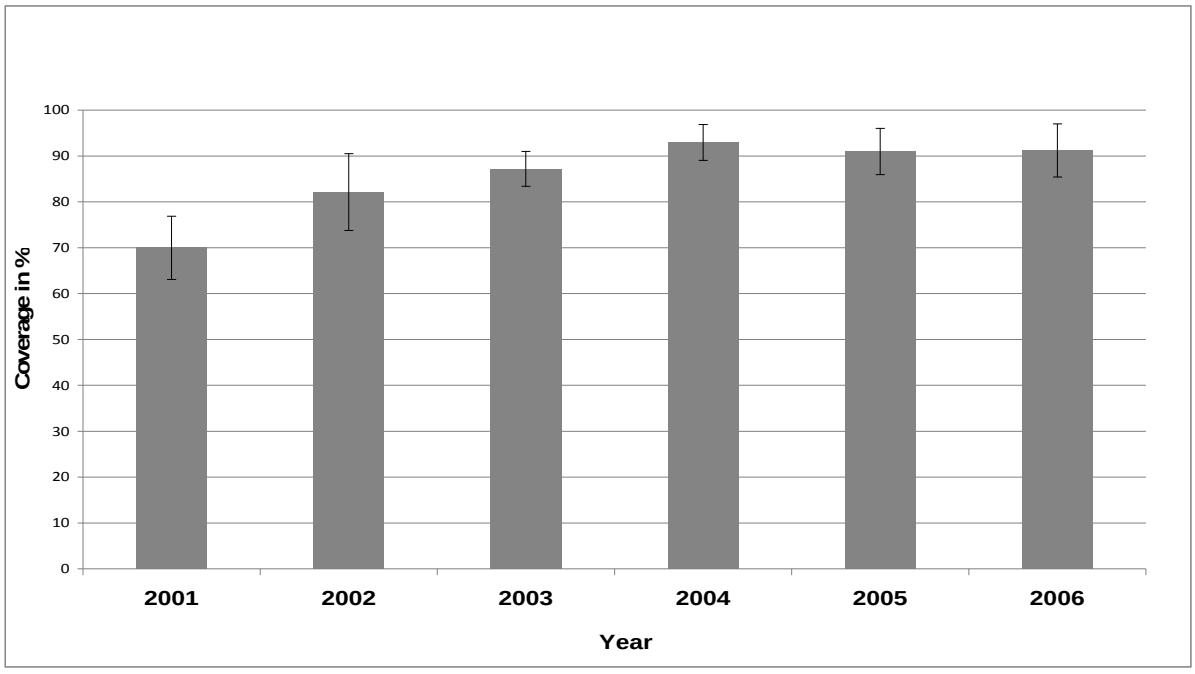
District	Endemic/non-endemic/Grey area	Number of sub-districts/MOH *	Population (Census 2001)
Colombo	Endemic	13	2 522 078
Gampaha	Endemic	15	2 461 615
Kalutara	Endemic	12	1 182 672
Galle	Endemic	19	1 080 342
Matara	Endemic	17	819 844
Hambantota	Endemic	11	577 452
Kurunegala	Endemic	20	1 573 571
Puttlam	Endemic	9	827 394
Sub total endemic		**116**	**11 044 968**
Anuradhapura	Non-endemic	19	821 979
Polonnanuwa	Non-endemic	7	397 023
Matale	Non-endemic	12	486 262
Kandy	Non-endemic	23	1 386 410
Kegalle	Non-endemic	11	825 908
Nuwara Eliya	Non-endemic	6	747 586
Badulla	Non-endemic	5	842 261
Moneragala	Non-endemic	11	466 728
Ratnapura	Non-endemic	17	1 118 635
Batticaloa	Non-endemic		579 469
Trincomalae	Non-endemic		412 547
Ampara	Non-endemic		592 997
Vavuniya	Non-endemic		182 957
Mannar	Non-endemic		103 688
Mullaithivu	Non-endemic		220 311
Jafna	Non-endemic		650 720
Kilinochi	Non-endemic		181 080
Sub total non-endemic			**10 016 561**
Grand total			**21 061 529**

* MOH: Medical Officer of Health area

Table 2: *Population details of LF endemic districts 2001*

Region/ Province	Name of the endemic district	Census population (2001)	Population In endemic district	Number of villages	Year of first MDA round
Western Province	Colombo	2 522 078	2 100 644	377	2001
	Gampaha	2 461 615	2 180 242	1180	2002
	Kalutara	1 182 672	1 067 000	712	2002
Southern Province	Galle	1 080 342	1 016 201	839	2002
	Matara	819 844	770 726	609	2002
	Hambanthota	577 452	538 984	568	2002
North-Western Province	Kurunegala	1 573 571	1 583 484	527	2002
	Puttlam	827 394	730 807	1598	2002
Total		**11 044 968**	**9 988 088**	**6 410**	

Figure 2: ***Drug coverage reported by the Anti Filariasis Campaign: 2001-2006 (95 CI-Overall)***



In 2001, MDA with DEC and albendazole was introduced in Colombo only.

Table 3: *Drug Coverage in the endemic districts in MDA rounds 2002-2006*

Sl.No.	Name of the endemic Implementation Unit	Targeted population	Number of villages	Number of urban areas	2002						
					Population		Number of people ingested drugs	Geographical coverage (%)		Epidemio-logical coverage (%)	Programme drug coverage (%)
					Total	Target		Rural	Urban		
1	Colombo	2100644	377	180	2214616	2171388	1666389	100	100	75.25	76.74
2	Gampaha	2180242	1180	59	2080483	1714151	1380538	100	100	66.36	80.54
3	Kalutara	1067000	712	49	1074144	1052213	730685	100	100	68.02	69.44
4	Galle	1016201	839	56	1016419	990536	570105	100	100	56.09	57.56
5	Matara	770726	609	31	780746	761238	445113	100	100	57.01	58.47
6	Hambanthota	538984	568	8	542698	525370	321165	100	100	59.18	61.13
7	Kurunegala	1583484	527	21	1575749	1452389	1049922	100	100	66.63	72.29
8	Puttlam	730807	1598	12	725892	455175	220470	100	100	30.37	48.44
	Total	9988088	6410	416	10010747	9122460	6384387	100	100	63.78	69.99

2003							2004						
Population		Number of people ingested drugs	Geographical coverage (%)		Epidemio-logical coverage (%)	Programme drug coverage (%)	Population		Number of people ingested drugs	Geographical coverage (%)		Epidemio-logical coverage (%)	Programme drug coverage (%)
Total	Target		Rural	Urban			Total	Target		Rural	Urban		
2214616	2113034	1802113	100	100	81.37	85.29	2100644	1932593	1743091	100	100	82.98	90.19
2080483	2150211	1729549	100	100	83.13	80.44	2180242	2005823	1748137	100	100	80.18	87.15
1074144	1043351	965084	100	100	89.85	92.50	1067000	981640	1001083	100	100	93.82	101.98
1016419	918892	867283	100	100	85.33	94.38	1016201	934905	846878	100	100	83.34	90.58
780746	763675	682040	100	100	87.36	89.31	770726	709068	695928	100	100	90.30	98.15
542698	542698	506962	100	100	93.42	93.42	538984	495865	511152	100	100	94.84	103.08
1575749	1575749	1389957	100	100	88.21	88.21	1583484	1456805	1378897	100	100	87.08	94.65
725892	735892	641049	100	100	88.31	87.11	730807	672342	616761	100	100	84.39	91.73
10010747	9843502	8584037	100	100	85.75	87.21	9988088	9189041	8541927	100	100	85.52	92.96

2005							2006						
Population		Number of people ingested drugs	Geographical coverage (%)		Epidemio-logical coverage (%)	Programme drug coverage (%)	Population		Number of people ingested drugs	Geographical coverage (%)		Epidemio-logical coverage (%)	Programme drug coverage (%)
Total	Target		Rural	Urban			Total	Target		Rural	Urban		
2202956	2026720	1718185	100	100	77.99	84.8	2202956	2026720	1934102	100	100	87.80	95.43
2201668	2025535	1721889	100	100	78.21	85.0	2229331	2055079	1642640	100	100	73.68	79.93
1022620	1022620	1036275	100	100	101.34	101.4	1199379	1103429	1029409	100	100	85.83	93.29
1033157	950504	834609	100	100	80.78	87.8	1039554	950504	899734	100	100	86.55	94.66
777872	715642	669223	100	100	86.03	93.5	792398	715642	650671	100	100	82.11	90.92
545047	501443	510205	100	100	93.61	101.0	581542	523388	516096	100	100	88.75	98.61
623487	1493608	1417365	100	100	87.30	94.9	1643847	1493608	1438794	100	100	87.53	96.33
737678	678664	659160	100	100	89.36	97.2	770959	738501	650528	100	100	84.38	88.09
10144485	9414736	8566911	100	100	84.45	90.99	10459966	9606871	8761974	100	100	83.77	91.21

Figure 3: ***Drug coverage reported by the Anti Filariasis Campaign in Kalutara district 2001-2006 (95 CI and Overall)***

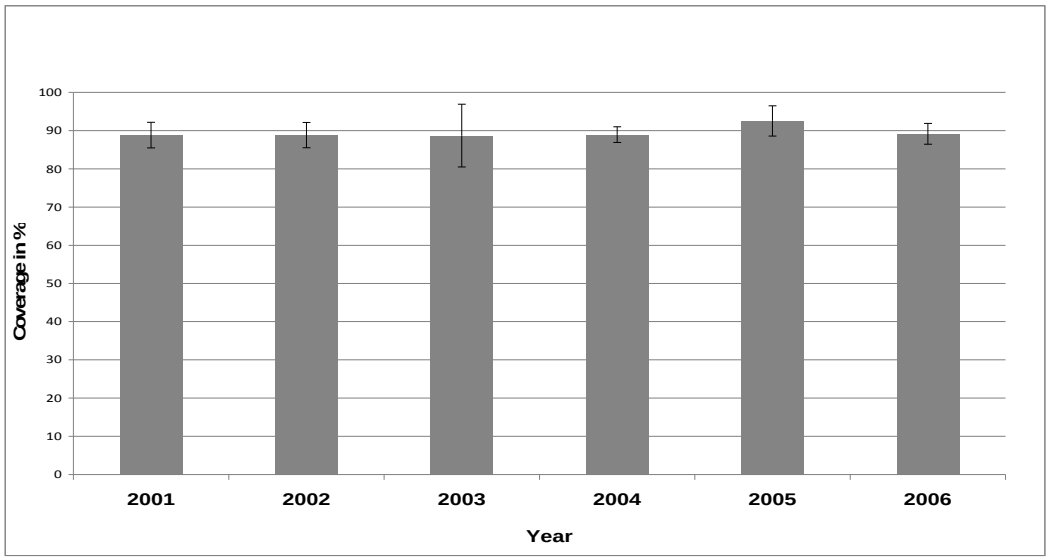


Table 4: *MoH-wise drug coverage in Kalutara district 2002-2006*

MOH	2002				2003				2004			
	Total population	Population targeted	Epidemio-logical Coverage (%)	Programme drug coverage (%)	Population targeted	Number of people ingested drugs	Epidemio-logical coverage (%)	Programme drug coverage (%)	Population targeted	Number of people. ingested drugs	Epidemio-logical coverage (%)	Programme drug coverage (%)
Kalutara	121805	119237	81.27	83.02	102890	101685	83.48	98.83	119315	99571	81.75	83.45
Panadura	237178	211975	76.18	85.23	208719	193581	81.62	92.75	205481	180674	76.18	87.93
Beruwala	159701	137453	80.91	94.00	137450	124221	77.78	90.38	138713	126272	79.07	91.03
Matugama	130844	102813	76.78	97.72	106608	101990	77.95	95.67	114574	105100	80.32	91.73
Bandaragama	100695	133313	118.24	89.31	126052	128353	127.47	101.83	91720	86385	85.79	94.18
Bulathsinhala	68748	66808	82.57	84.97	63064	57355	83.43	90.95	69925	58758	85.47	84.03
Aalawatta	88251	87096	81.87	82.95	82200	43666	49.48	53.12	81781	73660	83.47	90.07
Hoaana	154787	166218	98.52	91.75	162732	126521	81.74	77.75	144502	132377	85.52	91.61
Walallavitta	55566	53245	86.04	89.79	53636	48235	86.81	89.93	56738	49036	88.25	86.43
Total	1117575	1078158	85.70	88.83	1043351	925607	82.82	88.71	1104004	982154	81.89	88.96

MOH	2005				2006			
	Population targeted	Number of people ingested drugs	Epidemiological coverage (%)	Programme drug coverage (%)	Population targeted	Number of people ingested drugs	Epidemiological coverage (%)	Programme drug coverage (%)
Kalutara	111966	91842	75.40	82.03	116846	102521	84.17	87.74
Panadura	234290	216855	91.43	92.56	232809	212566	89.62	91.30
Beruwala	140709	119732	74.97	85.09	148031	120712	75.59	81.55
Matugama	107060	107944	82.50	100.83	124135	109682	83.83	88.36
Bandaragama	97510	91698	91.07	94.04	100740	93067	92.42	92.38
Bulathsinhala	66506	57936	84.27	87.11	68748	60767	88.39	88.39
Aalawatta	80862	76666	86.87	94.81	85632	80333	91.03	93.81
Hoaana	137178	136735	88.34	99.68	149045	127109	82.12	85.28
Walallavitta	51707	49265	88.66	95.28	52816	50271	90.47	95.18
Total	1104253	1021926	85.20	92.54	1154378	1029475	85.83	89.18

Table 5: *Independent assessment of drug coverage and consumption 2003*

District	Number of people contacted	% of people received the drugs	% of people consumed the drug out of total eligible
Hambanthota	490	96.3	NA
Matara	478	81.8	NA
Galle	470	80.2	NA
Kalutara	497	91.8	NA
Colombo	475	64.4	NA
Gampaha	510	70.6	NA
Kurunegala	477	89.5	NA
Puttalam	478	94.8	NA
Colombo Municipality	483	46.6	NA
Total	4358	79.6	71.4

Figure 4: ***Assessed coverage and consumption of drugs during post 4 MDA (2004) in four IUs***

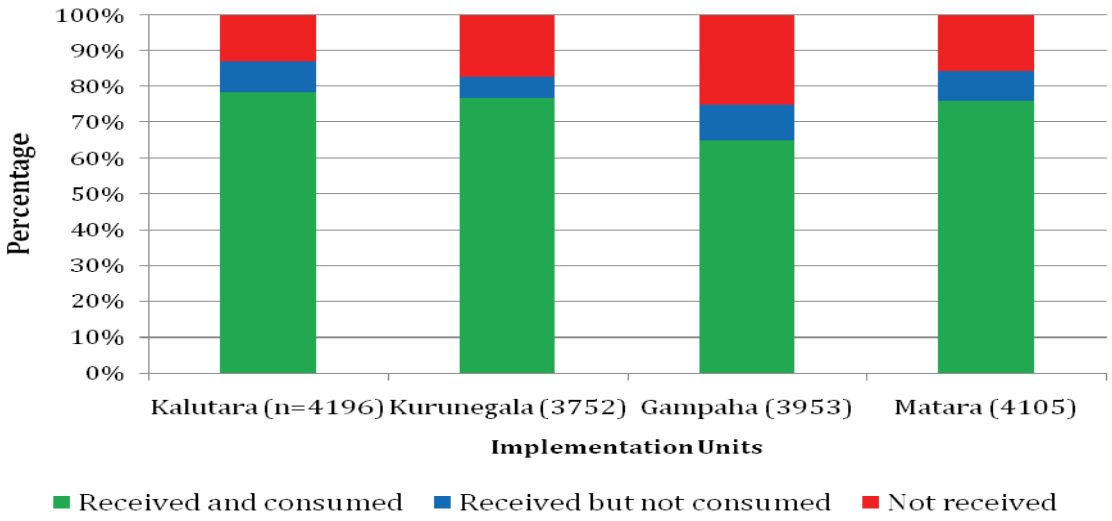


Table 6: *Drug coverage and consumption assessed independently in 2004 in four MDA districts*

District	Number of clusters covered	Number of people contacted	% of people received the drugs	% of people consumed the drugs	% of people consumed the drugs out of those received	Reason for not consuming (% out of not consumed)					% reported with Side effects
						Sick	Not interested	Not aware	Medication for other ailments	Out of station	
Kalutara	30	4196	87.08	78.29	89.90	34.69	17.62	10.30	7.59	9.21	4.38
Kurunegala	30	3752	82.70	76.63	92.65	37.72	15.79	6.14	6.58	14.91	4.63
Gampaha	30	3953	74.83	65.01	86.88	27.58	29.12	18.81	3.61	3.61	3.50
Matara	30	4105	84.19	75.93	90.19	39.53	23.89	7.67	2.06	6.49	2.66
Total	120	16006	82.29	74.02	89.95	34.37	22.28	11.40	4.83	7.85	3.80

Table 7: *School-based coverage cum consumption survey in 2004*

District	Number of clusters (schools) surveyed	Number of school children surveyed (Grade 3 – Grade 13)	Number of children ingested tablets	Coverage %	Adverse events		
					Nil	Mild	Severe
Kurunegala	30	900	784	87.1	706 (90.1%)	74 (9.4%)	Nil

Table 8: *Number of individuals screened during and post MDA periods in different districts*

District	During MDA						Post MDA			
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombo	131 092	106 414	99 348	105 603	NA	85 479	88 087	88 087	NA	45 914
Gampaha	NA	82 956	54 942	57 655	NA	37 355	54 009	54 009	NA	43 314
Kalutara	NA	150 771	144 959	77 658	NA	5 145	149 510	149 510	NA	94 630
Galle	NA	91 273	111 657	NA	NA	8 562	75 080	75 080	NA	51 540
Matara	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hambantota	NA	24 864	33 446	26 947	NA	17 549	37 171	37 171	NA	9 270
Kurunegala	NA	41 738	44 427	36 571	36 571	36 571	36 571	36 571	NA	42 549
Puttlam	NA	NA	21 900	22 363	NA	2 116	23 625	23 625	NA	36 086
Grand total	131 092	548 958	672 732	474 227	36 571	204 571	588 109	464 053	NA	323 303

Figure 5: ***Mf prevalance in endemic districts during pre, MDA and post-MDA periods***

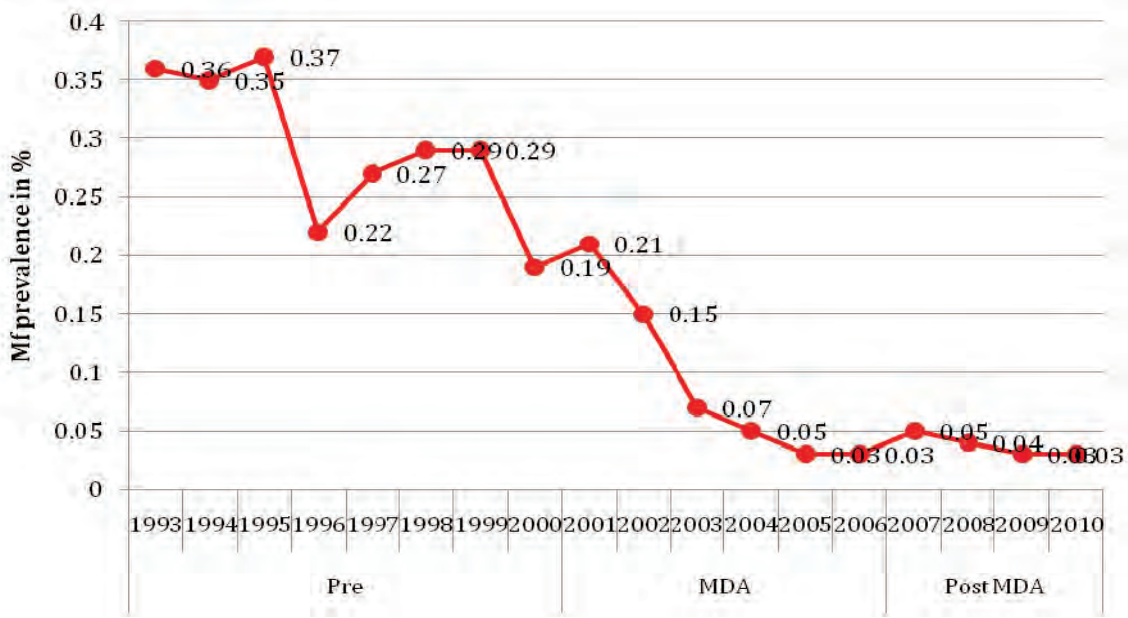


Table 9: *Microfilarial (Mf) prevalence in districts*

District	Microfilaria (Mf) prevalence										
	Pre MDA	During MDA						Post MDA			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombo	0.19	0.14	0.08	0.05	0.06	0.03	0.04	0.05	0.04	0.02	0.03
Gampaha	0.18	0.17	0.1	0.05	0.05	0.03	0.04	0.07	0.07	0.04	0.05
Kalutara	0.15	0.21	0.16	0.09	0.06	0.05	0.02	0.03	0.19	0.01	0.01
Galle	0.24	NA	0.26	NA	0.04	0.03	0.08	0.11	0.1	0.07	0.16
Matara	0.2	0.21	0.14	0.06	0.04	0.02	0.02	0.06	0.04	0.03	0.01
Hambanthota	0.09	0.08	0.1	0.04	0.01	0	0.01	0.005	0	0.01	0
Kurunegala	0.34	0.23	0.22	0.18	0.05	0.03	0.03	0.03	0.03	0.02	0.02
Puttlam	0.15	0.13	0.07	0.05	0.04	0.01	0.02	0.02	0.021	0.06	0.01
Overall	0.19	0.21	0.15	0.07	0.05	0.03	0.03	0.05	0.04	0.03	0.03

Table 10: *Microfilarial intensity in the endemic districts in Sri Lanka*

District	Microfilarial(Mf) intensity										
	Pre MDA	During MDA						Post MDA			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombo	401.7	338.5	346.4	379.8	340.0	403.4	NA	NA	342.0	475.0	NA
Gampaha	232.1	244.2	272.1	474.3	466.6	381.5	NA	NA	241.4	766.7	NA
Kalutara	288.9	264.0	301.6	505.1	520.1	419.2	NA	NA	315.7	392.6	NA
Galle	378.5	311.0	285.6	350.5	329.0	238.4	NA	NA	318.7	552.0	NA
Matara	263.6	270.4	198.9	233.9	381.8	385.4	NA	NA	800.0	289.7	NA
Hambanthota	281.7	326.5	325.0	320.0	300.0	0	NA	NA	0	250.0	NA
Kurunegala	390.3	281.3	300.0	282.3	547.5	516.6	NA	NA	347.0	509.1	NA
Puttlam	785.2	1250.0	287.5	1491.7	2150.0	483.3	NA	NA	100.0	212.5	NA
Overall	**333.9**	**290.4**	**279.6**	**408.2**	**422.4**	**401.7**	**NA**	**NA**	**NA**	**437.5**	**NA**

*Figure 6****: Mf intensity in the endemic districts during pre, MDA and post-MDA periods***

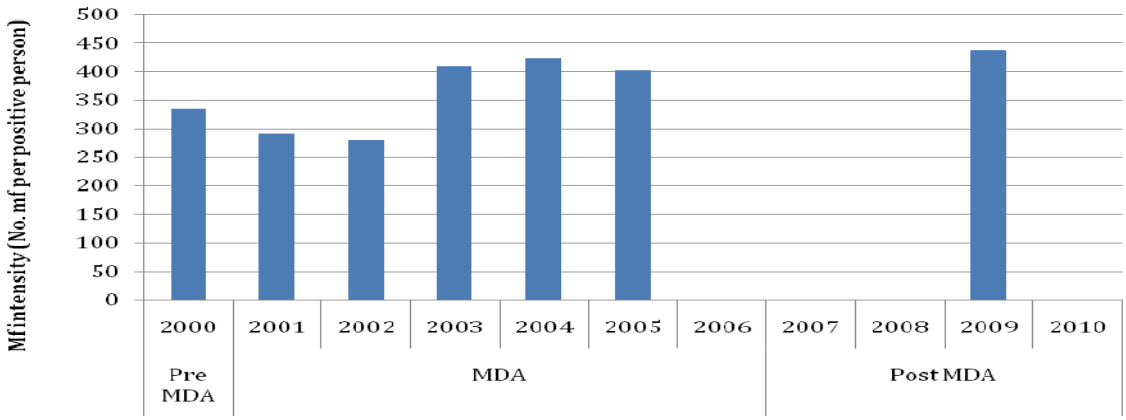


Table 11: *Micro filarial (Mf) prevalence in the sentinel sites in Sri Lanka*

District	Sentinel Site	2006				2007				2008		
		Number of blood film examined	Number of Mf positive	Mf rate (%)	MF Density	Number of blood films examined	Number of Mf positive	Mf rate (%)	MF density	Number of blood film examined	Number of Mf positive	Mf rate (%)
Colombo	Dehiwala East	798	1	0.13	900	8648	3	0.03	300	245	0	0.00
Colombo	Katukurunda	780	0	0	0	1154	1	0.08	100	10937	5	0.05
Kalutara	Katukurunda 1	750	0	0	0	622	0	-	-	4790	2	0.04
Kalutara	Udahamulla	750	0	0	0	1687	4	0.23	250	6616	4	0.06
Gampaha	Peliyagoda watte	750	0	0	0	4985	1	0.02	50	9676	0	0.00
Gampaha	Alwis town	750	0	0	0	5723	2	0.03	225	9244	1	0.01
Galle	Kaluwella	769	1	0.13	200	5884	8	0.14	318.75	3297	0	0.00
Galle	Unawatuna	750	3	0.37	250	7601	7	0.09	421.43	7278	20	0.27
Matara	Weligama N	684	3	0.43	383.3	4758	4	0.08	412	7497	3	0.04
Matara	Isadeen Town	733	0	0	0	1899	3	0.15	240	9266	3	0.03
Hambantota	Tangalle	764	0	0	0	7605	0	0	0	8381	0	0.00
Hambantota	Hambantota S	749	0	0	0	7358	0	0	0	1752	0	0.00
Kurunegala	Yanthampalawa	750	0	0	0	900	0	0	0	562	0	0.00
Kurunegala	Kalahogedera	750	0	0	0	444	0	0	0	524	0	0.00
Puttlam	ChilawUC	750	1	0.13	200	3410	0	0	0	4633	1	0.02
Puttlam	Madampe	750	1	0.13	550	4414	0	0	0	5131	0	0.00
		12027	**10**	**0.083**	**375**	**67092**	**33**	**0.05**		**89829**	**39**	**0.04**

Table 12: *Antigenaemia survey among children between 2-4 years in selected sentinel sites in 2006 (prior to fifth round of MDA)*

IU (District)	Sentinel Site	Number of children between 2-4 years tested for ICT	ICT results
Western Province			
Colombo	Dehiwala East	54	0
	Katukurunda	29	0
Kalutara	Katukurunda	75	0
	Udahamulla	48	0
Gampaha	Peliyagoda watte	44	0
	Alwis town	26	0
Southern Province			
Galle	Kaluwella	21	0
	Unawatuna	15	0
Matara	Weligama North	24	0
	Isadeen Town	45	0
Hambantota	Tangalle	37	0
	Hambantota	36	0
North Western Province			
Kurunegala	Yanthampalawa	25	0
	Kalahogedera	35	0
Puttlam	ChilawUC	43	0
	Madampe	44	0
Total		568	0

Table 13: *Antigenaemia survey carried out during 2008*

District	Number of schools visited	Number of Grade 1 students tested for ICT	Number of ICT positives
Colombo	75	600	0
Kalutara	76	600	0
Gampaha	69	608	0
Galle	74	600	0
Matara	71	601	0
Hambantota	75	604	0
Kurunegala	74	616	0
Puttlam	73	602	0
Total	**587**	**4831**	**0**

Table 14: *Results of entomological evaluation from 1995 - 2002*

Year	Number dissected	Infection rate (%)	Infectivity rate (%)
1995	32 419	0.63	0.06
1996	56 587	0.72	0.06
1997	48 671	0.55	0.05
1998	49 238	0.56	0.05
1999	52 621	0.49	0.04
2000	45 539	0.47	0.07
2001	43 347	0.46	0.03
2002	38 012	0.8	0.05

Table 15: *Number of vector mosquitoes dissected and infection and infectivity rates in Kalutara district*

	Year	Number of Mosquito dissected	Number of mosquito Infected	Number of mosquito Infective	Infection rate(%)	Infectivity rate(%)
Pre MDA	1997	13 895	53	13	0.38	0.09
	1998	10 789	49	13	0.45	0.12
	1999	9 975	34	12	0.34	0.12
	2000	10 846	38	20	0.35	0.18
	2001	8 441	15	13	0.18	0.15
MDA	2002	7 536	13	6	0.17	0.08
	2003	8 507	27	8	0.32	0.09
	2004	8 923	24	12	0.27	0.13
	2005	9 590	23	8	0.24	0.08
	2006	10 177	42	13	0.41	0.13
Post MDA	2007	9 040	40	10	0.44	0.11
	2008	10 779	29	1	0.27	0.01
	2009	7 927	15	0	0.19	0.00
	2010	4 503	12	0	0.27	0.00

Table 16: *Vector infection in the endemic districts*

District	Vector infection										
	Pre	MDA						Post MDA			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombo	0.49	0.45	0.20	0.24	0.68	0.71	0.97	1.28	0.01	1.20	0.00
Gampaha	NA	0.75	0.17	0.89	1.86	1.54	1.52	1.32	1.11	1.55	0.45
Kalutara	0.35	0.17	0.44	0.31	0.28	0.24	0.41	0.44	0.27	0.19	1.05
Galle	0.25	0.00	0.00	0.11	0.12	0.18	0.09	0.06	0.00	0.57	0.26
Matara	0.32	0.71	0.60	0.66	0.46	0.33	0.00	0.23	0.45	0.22	0.38
Hambanthota	0.00	NA	NA	NA	NA	NA	NA	NA	0.00	NA	0.00
Kurunegala	0.94	0.41	0.69	0.20	0.52	0.69	0.08	0.00		0.00	0.00
Puttlam	NA	NA	NA	NA	NA	NA	NA	NA	0.00	NA	0.00
Overall	**0.45**	**0.53**	**0.28**	**0.41**	**0.73**	**0.71**	**0.76**	**0.74**	**0.67**	**0.74**	**0.06**

NA = Not available

Table 17: *Vector infectivity in the endemic districts*

District	Vector infectivity										
	Pre	MDA						Post MDA			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombo	0.03	0.007	0.012	0	0.008	0.009	0.04	0.01	0	0	0.00
Gampaha	0.01	0.02	0.07	0	0.02	0.02	0.01	0	0.01	0	0.01
Kalutara	0.18	0.15	0	0.09	0.18	0.08	0.12	0	0.01	0	0
Galle	0.17	0	0	0.07	0	0.09	0	0	0.12	0	0
Matara	0.09	0.24	0.2	0.06	0.03	0.02	0	0.06	0.76	0	0
Hambanthota	0.09	NA	NA	NA	NA	NA	NA	NA	0	NA	0
Kurunegala	0.08	0	0.12	0.2	0.06	0.02	0	0	NA	0	0
Puttlam	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	0
Overall	**0.07**	**0.05**	**0.06**	**0.05**	**0.05**	**0.04**	**0.05**	**0.04**	**0.05**	**0**	**0.01**

NA = Not available

Figure 7: ***Vector infection and infectivity in the endemic districts***

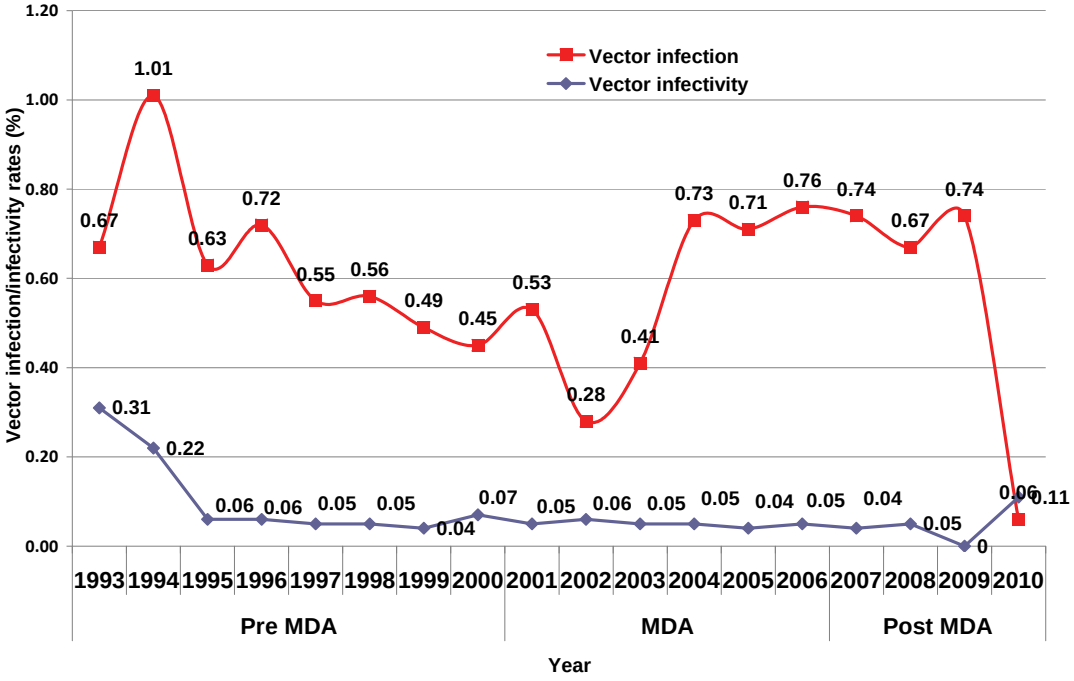
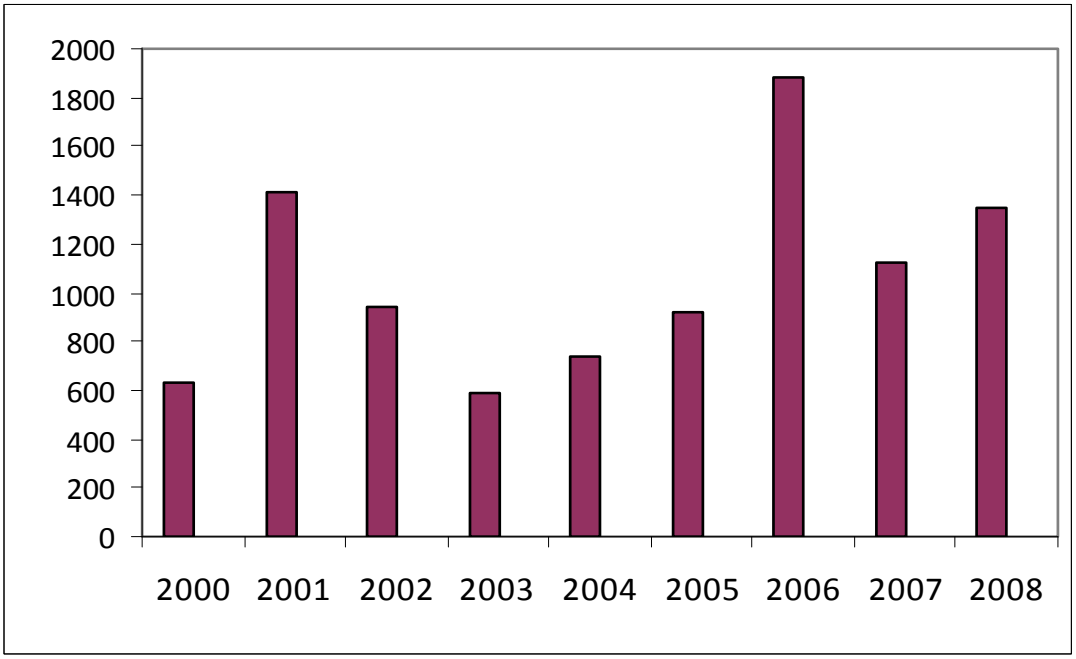
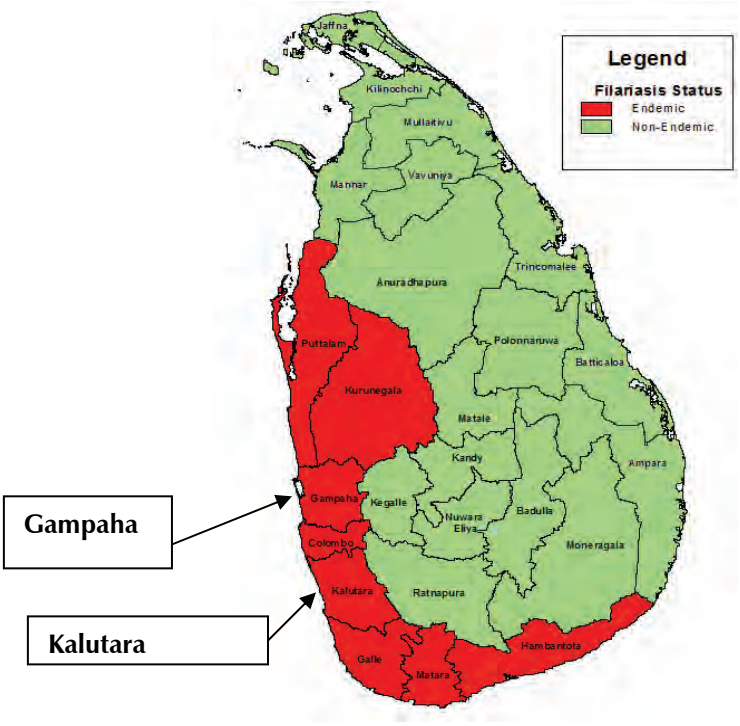


Figure 8: ***Number of patients visiting the clinic for the first time***



Map 2: ***Field visits by the Team: Gampaha and Kalutara districts***



Map 3: ***Gampaha districts and endemicity of lymphatic filariasis***

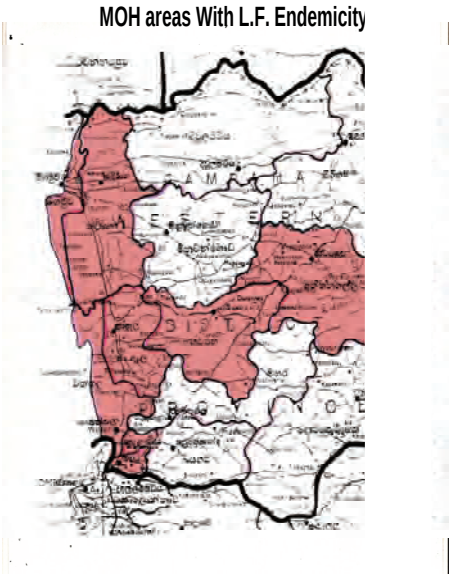
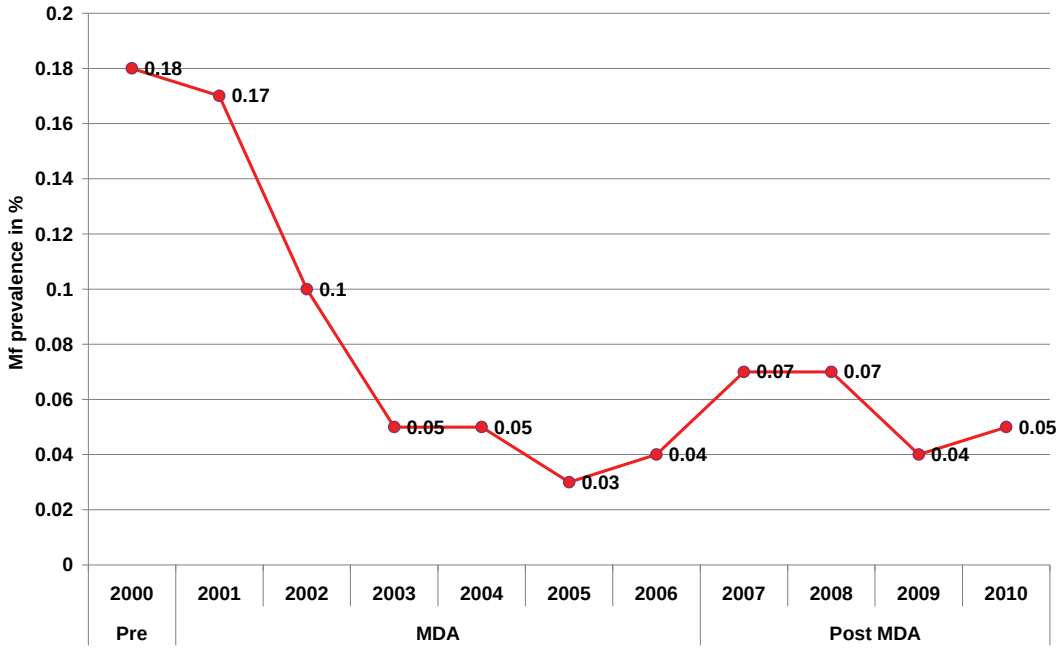


Figure 9: ***Microfilarial prevalance in Gampaha district***



Map 4: ***Kalutara district and the sites selected for spot-checks***

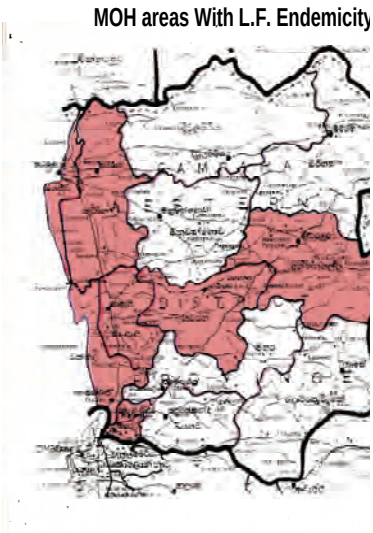


Figure 10: ***Microfilarial prevalance in Kalutara district***

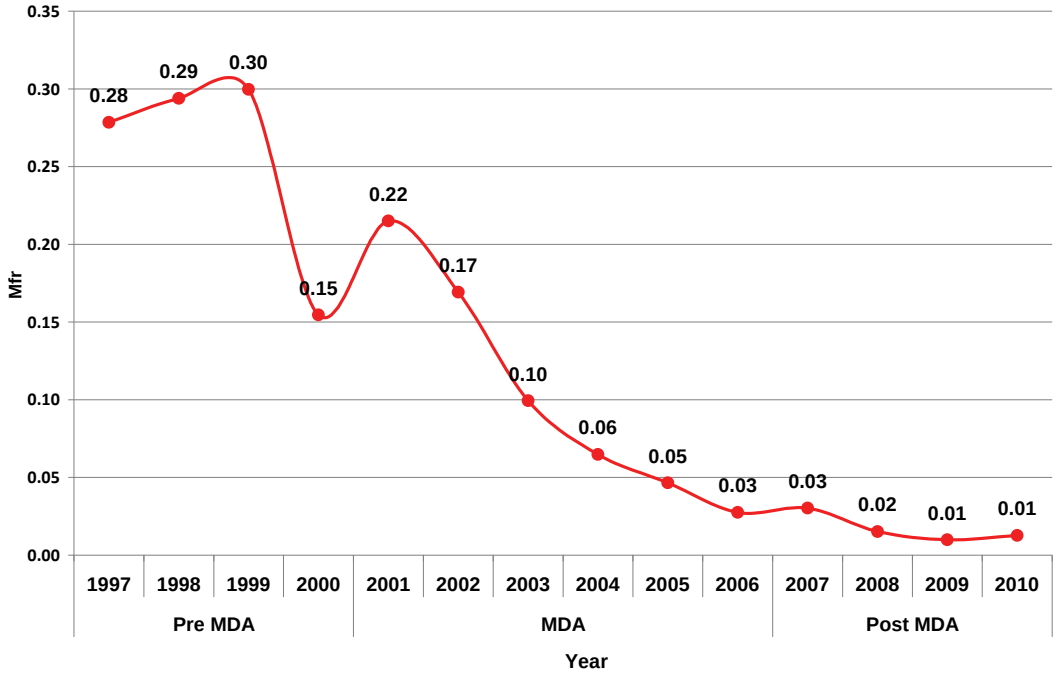
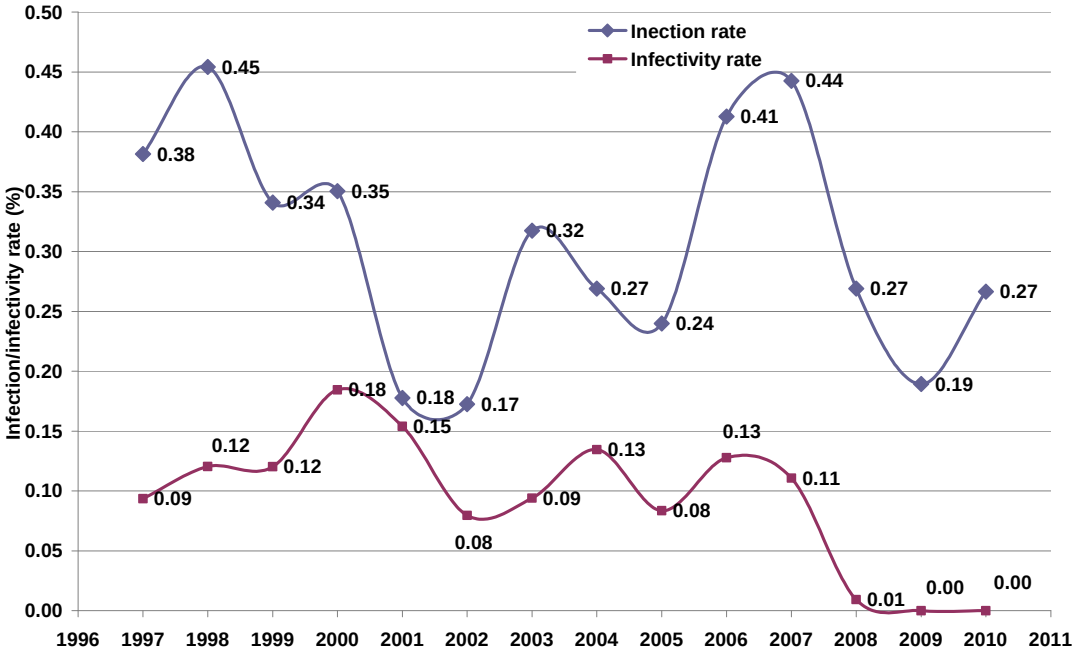


Figure 11: ***Vector infection and infectivity in Kalutara district***



WHO Expert Mission team with Director-General of Health Services, Ministry of Health, Sri Lanka

Lymphatic filariasis (LF) is endemic in 9 of the 11 Member States of the South-East Asia Region of the World Health Organization. Mass Drug Administration (MDA) has been implemented to achieve elimination of LF in the Region. In 2001, Sri Lanka initiated MDA in eight LF-endemic districts covering a population of 11 million, and stopped MDA in 2007 after completing five rounds. The microfilarial rate was well below 1%. Post-MDA surveillance including vector surveillance has been introduced.

As per the recommendations of the Regional Programme Review Group for Elimination of Lymphatic Filariasis, a WHO expert mission visited Sri Lanka in 2011 and initiated the process of verification of LF elimination. In line with the LF Transmission Assessment Survey Manual of WHO 2011, the team visited two endemic districts and tested 244 schoolchildren of 6-7 years of age with ICT cards for antigenaemia. All were found to be negative indicating that there was no transmission.

The expert team recommended continuation of ICT testing of the selected sample, and preparation of the dossier as part of the process of verification.

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