



Ministry of Health  
National Malaria Control Centre

# Indoor Residual Spraying

## 2009 End of Spray Season Report



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*May, 2010*

## Abbreviations/Acronyms

DC	District Commissioner
DHMT	District Health Management Team
ECZ	Environmental Council of Zambia
EHT	Environmental Health Technician
HMIS	Health Management Information System
HSSP	Health Services and Systems Program
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
MACEPA	Malaria Control and Evaluation Partnership in Africa
MDSS	Malaria Decision Support System
MFPP	Malaria Focal Point Person
MIS	Malaria Indicator Survey
NHC	Neighborhood Health Committee
NMCC	National Malaria Control Centre
NMCP	National Malaria Control Program
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
RTI	Research Triangle Institute

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# 1 Introduction

## 1.1 Background

Zambia is a land-locked country in southern Africa bordering with Botswana, Zimbabwe, Mozambique, Malawi, Tanzania, the Democratic Republic of Congo, Angola, and Namibia. Forty-five percent of Zambia's population of approximately 13.2 million is below the age of 15. Malaria remains one of the major causes of morbidity and mortality in the country. Among the core interventions to combat this disease is indoor residual spraying (IRS) of housing units under the National Malaria Control Programme (NMCP), which is within the Ministry of Health. In 2009, IRS was implemented in 36 districts, across all of Zambia's nine provinces. IRS activities from the 2006 to the 2009 transmission period were funded by the Ministry of Health (MOH), with support from partners that included the U.S. Government's President's Malaria Initiative (PMI) through Abt Associates' Health Services and Systems Program (HSSP) and Research Triangle Institute (RTI), the Global Fund to fight AIDS, Tuberculosis and Malaria, the World Bank, and the Malaria Control and Evaluation Partnership in Africa (MACEPA).



Under HSSP, the goal of the malaria program is to contribute to the national effort of reducing malaria morbidity and mortality. The objective of the IRS program is to provide adequate technical, logistical and managerial assistance to the NMCP to achieve the stated target of reducing the incidence of malaria by 85% in selected IRS areas by the end of 2011.

HSSP began implementing IRS in collaboration with the National Malaria Control Center (NMCC) and other partners in 2006, with a mandate to cover 15 districts. In 2008, the MOH expanded IRS coverage to a total of 36 districts. During the 2009 spray season, HSSP support enabled the district teams to spray 779,180 structures (90.4% of targeted coverage) in 15 districts. Overall 1,191,517 structures were sprayed in the 36 selected districts (90.6% of the targeted coverage).

In partnership with NMCC, HSSP has provided technical, logistical, financial and managerial support for implementation of the IRS cycle. IRS operations are highly time-bound and must follow a strict schedule to assure that planning, procurement, training, commodity deliveries, spray operations, and entomological studies occur according to a set calendar. Adherence to technical guidelines and maintaining high productivity require careful and continuous monitoring and supervision.

## ***1.2 Epidemiology of Malaria in Zambia***

Malaria transmission in Zambia occurs through out the year. However, peak transmission occurs between November and April when the mean temperature is 27-38°C. The rainfall during this time frame ranges from as low as 500mm in the south to 1250mm and above in the north.

Malaria is a major public health problem in Zambia and is endemic in all nine provinces. It is the leading cause of morbidity and mortality. The burden of disease is highest among children under five years of age, pregnant women, and the poor and vulnerable in society. According to the Ministry of Health, in 2006, 4,978,458 malaria cases were reported, with an incidence of 412 per 1,000 population. In 2007, 4,442,518 malaria cases were reported with an incidence of 358 per 1,000. A remarkable reduction was achieved in 2008 when 3.2 million cases of malaria were reported with an incidence of 252 per 1,000 population (MOH, HMIS 2008). Zambia is thus poised to make further progress in reducing the health and economic burden attributable to malaria.

The 2008 National Malaria Indicator Survey (MIS) showed that malaria parasite prevalence in children less than five years of age has been reduced by 54% and severe anemia by 69%. The malaria burden is highest among children under five years of age and pregnant women. Malaria has a serious economic impact on Zambia, accounting for 6.8 million Disability Adjusted Life Years lost. This is even higher than for the burden of acute respiratory infections (5.4 million) and HIV/AIDS (3.2 million) (IRS Annual Report, 2007).

Zambia has gradually scaled up IRS implementation both within and across districts. This has progressed from five districts in 2003 to eight districts in 2005, and 15 districts in 2006. In 2008, the number of districts implementing IRS increased to 36 with at least two districts implementing IRS in each of the nine provinces. A map of these districts appears on the following page.



**Table 1** shows the malaria incidence per 1000 population in the 36 districts in the period 2002 to 2009. The table shows a general downward trend of malaria incidence in most districts.

**Table 1: Malaria Incidence per 1,000 population in 36 districts, 2002-2009**

District	YEAR							
	2002	2003	2004	2005	2006	2007	2008	2009
Mumbwa	408.5	567	408.3	392.3	340.5	123.7	85	19.2
Kapiri-Mposhi	408	406	368	307	378	303	240	196
Kabwe	435	480	439	513	566	463	292	102
Chililabombwe	223.4	292.6	244.5	240.1	247.6	276.1	123.5	27.7
Kalulushi	409.6	426.7	456.4	430.2	442.4	369.2	241.1	128.9
Luanshya	447.3	449.1	322.7	340.3	376.4	310.4	169.1	182.2
Mufulira	359.6	415.7	364	361	349	302.9	244.3	187.2
Ndola	484	482	471	455	434	381	329	281
Chingola	254.1	232.6	223.5	250.3	213.7	178.2	83.1	104
Kitwe	405.0	412.3	458.9	371	394	303	248.7	103
Lufwanyama	447.8	448.7	363.5	408	524	378	177	181
Masaiti	449.3	510.3	454.9	427.8	459.5	420	267.9	212.7
Mpongwe	566	554	724	470	672	535	325	156
Chipata	447	483	487	463	437	398	336	278
Katete	505	563	515	524	547	543	498	-
Petauke	117	161	146	164	541	531	371	132
Nchelenge	332.2	319	263	326	379	329	287.8	
Kawambwa	369	399	365	386	528	405	211	306
Mansa	456.4	481.2	520.2	516.5	507	379.5	348.8	311.5
Chongwe	456	496	585	490	551	359	185	174
Kafue	334	412	443	303	318	308	255	127
Lusaka	267	301	199	202	169	109	178	104
Chilubi								
Kasama			353.2	385.0	435.1	428.38		
Mbala	311.2	331.2	313.1	341.6	339.8	378.9	194.8	59.4
Mpika	312.6	331.4	319.2	334.2	328.4	383.1	236.7	198.3
Kasempa	-	-	20.9	12.4	16.1	10.9	-	-
Solwezi	-	-	-	-	-	-	-	-
Choma	426	632.9	442	413.3	465.7	361	142.1	60.48
Kazungula	385	430	251	365	348	150	09	10
Livingstone	346	372.7	343.2	318.6		297.7	35.5	
Mazabuka	368.4	588.6	379.7	323.7	421.9	282.8	123	07
Monze		530.9	388.8	320.1	406.2	307.5	26.8	
Kaoma	472	546	461.4	435.1	491.0	384.0	208.0	148.0
Senanga	384	418	291	312	327	226	371	175
Mongu	573	584	483	521	585	538	495	248

Source: 2010 Post spray meeting, Kitwe

Note: Dash or blank cell shows data not available

## 2 Pre-Spray Phase

### 2.1 Training of trainers

The Training of Trainers (TOT) is meant for district supervisors who are expected to train spray operators during the cascade trainings. Traditionally, one TOT meeting is conducted each year prior to the IRS campaign. However, with the scale up to 36 districts in 2008, the project adopted a different approach to training, with three TOT meetings taking place at different venues. The three trainings were co-financed by PMI/HSSP and MOH. A total of 111 district supervisors were trained. The 2009 TOT meetings were held as shown in **Table 2**.

**Table 2: TOT Schedule of activities**

Date	Venue	Districts	Number Trained	Facilitators
9 – 13 July 2009	Savoy Hotel, Ndola	Solwezi, Kasempa, Luanshya, Kalulushi, Kitwe, Chingola, Mufulira, Chililabombwe, Mansa, Kawambwa, Nchelenge, Chilubi, Lufwanyama	34	Brian Chirwa, Paul Banda, Peter Mukuka, Mary Mtonga, Kenzo Mumba, Francis Matoka
	Tuskers Hotel, Kabwe	Ndola, Mpongwe, Masaiti, Mongu, Senanga, Kaoma, Kapiri Mposhi, Kabwe, Mumbwa, Mpika, Kasama, Mbala	41	Dayton Makusa, Cecilia Shinondo, Christopher Lungu, Rose Banda, Kalaluka, Abner Mtonga, Shonga, Mulenga, Teddy Wakung'uma
	Barn Motel, Lusaka	Livingstone, Kazungula, Choma, Monze, Mazabuka, Kafue, Petauke, Chipata, Katete, Chongwe, Lusaka	36	Chadwick Sikaala, Moonje Shimukowa, John Miller, Mutinta Mulinda, Ntindo malambo, Owen Munachilemba, Hilton Chibeleka

Conducting the TOT in three different areas, and at the same time, contributed towards enhanced capacity building by involving more supervisors as master trainers than in previous years. Prior to training, a pre-evaluation exercise for participants was conducted and the pre-test results varied between 65 and 85% of accurate responses. The meeting further emphasized the importance of careful selection of spray operators, provided ground rules to be followed during the IRS campaign, and highlighted the need for community sensitization and good program management skills.

Specifically, the facilitators emphasized the following focus areas:

- Definition of indoor residual spraying and the knowledge of long lasting insecticides
- Spraying techniques
- Training techniques and guidelines
- Philosophy of spraying indoor surfaces of selected structures
- Training in safe handling of insecticides, storage, implementation, and disposal
- Knowledge and use of IRS commodities such as spray pumps, personal protective equipment (PPE) and insecticides
- Environmental safe guards and personal protection
- Managing IRS information and the importance of data capture tools
- The importance of sensitizing the community for acceptance of IRS

The strategy taken in the 2009 TOT was to give an opportunity to selected potential master trainers to handle all aspects of the training, thus, building their capacity. The role of the national facilitators was to:

- **Observe** and only intervene to ensure that what was planned and expected to be done during the training was adhered to and clarified.
- **Evaluate** the master trainers in all areas of IRS that a master trainer is expected to be knowledgeable about.

## ***2.2 Cascade Training***

Training of spray operators is one of the most critical components of the IRS program as the success and impact of the program is entirely dependent on how well the spraying campaign is conducted. Given the large numbers of spray operators, it is not possible for them to be trained by national trainers. Therefore, the district trainers who participate in the TOT described above conduct the training of spray operators at district level.

*The objective of the cascade training is to ensure that spray operators have the capacity required to safely and correctly conduct IRS operations according to given instructions.*

Training was initiated on different dates in the districts mainly because the required funds were not sent to the districts to enable them to commence training at the same time. By 28<sup>th</sup> July, 2009, the first district (Chongwe) had started training. The last district (Senanga) completed training on 2<sup>nd</sup> November, 2009. The national plan called for all training to commence in July, for a period of 21 days. Table 3 shows the dates the cascade training actually started in the districts and the number of spray operators trained listed according to gender.

**Table 3: Number of trained spray operators in each district**

Province/ District	Duration of Training			Number of people trained		
	Start Date (DD/MM/YY)	End Date (DD/MM/YY)	Total No. of Days	Males	Females	Total
<b>Central</b>						
Kapiri-Mposhi	14/09/09	04/10/09	21	20	15	35
Mumbwa	11/09/09	05/10/09	21	22	8	30
Kabwe	04/08/09	28/08/09	21	45	25	70
<b>Copperbelt</b>						
Chililabombwe	29/08/09	18/09/09	21	20	15	35
Kalulushi	29/08/09	24/09/09	21	45	15	60
Luanshya	29/08/09	17/09/09	21	35	15	50
Mufulira	29/08/09	22/09/09	21	59	16	75
Ndola	21/08/09	17/09/09	21	70	60	130
Chingola	29/08/09	22/09/09	21	34	23	57
Kitwe	04/08/09	25/08/09	21	86	44	130
Lufwanyama	13/08/09	04/09/09	21	33	7	40
Masaiti	01/09/09	22/09/09	21	20	15	35
Mpongwe	07/09/09	27/09/09	21	30	15	45
<b>Eastern</b>						
Chipata	23/09/09	13/10/09	21	47	18	65
Katete	08/09/09	28/09/09	21	35	10	45
Petauke	08/09/09	05/10/09	21	35	10	45
<b>Luapula</b>						
Nchelenge	7/09/09	30/09/09	21	41	9	50
Kawambwa	14/09/09	13/10/09	21	35	10	45
Mansa	27/08/09	19/09/09	21	31	4	35
<b>Lusaka</b>						
Chongwe	28/07/09	21/08/09	21	40	0	40
Kafue	13/08/09	05/09/09	21	37	18	55
Lusaka	05/08/09	28/08/09	21	212	178	390
<b>Northern</b>						
Chilubi	07/09/09	01/10/09	21	31	09	40
Kasama	09/09/09	06/10/09	21	38	12	50
Mbala	04/09/09	27/09/09	21	24	16	40
Mpika	14/09/09	07/10/09	21	21	09	30
<b>North-Western</b>						
Kasempa	15/09/09	6/10/09	21	19	11	30
Solwezi	5/08/09	28/08/09	21	35	10	45
<b>Southern</b>						
Choma	20/08/09	17/09/09	21	39	6	45
Kazungula	08/08/09	29/08/09	21	32	11	43
Livingstone	08/08/09	29/08/09	21	40	10	50
Mazabuka	03/08/09	24/08/09	21	36	14	50
Monze	15/08/09	06/09/09	21	24	8	32
<b>Western</b>						
Kaoma	22/09/09	9/10/90	21	64	16	80
Senanga	16/10/09	2/11/09	15	24	9	33
Mongu	24/09/09	14/10/09	21	37	3	40

To ensure standardization and adherence to established procedures, national facilitators made visits to all of the 36 IRS districts during the training period. Selection of spray operators was done by the individual districts. All of the spray operators were subjected to pre- and post-tests to gauge their performance. The training was financed by HSSP and the Ministry of Health. Details on the training have been documented separately in the respective training reports.

### 2.3 Geocoding Activities

Enumeration of housing units is carried out annually to support quantification of malaria control activities. Data is primarily collected using personal data assistants (PDAs) and exported to a geographic information system (GIS) for the purposes of analysis, spatial display, and reporting. HSSP guided enumeration of housing units in 19 districts. In five of these districts - Mufulira, Luanshya, Livingstone, Mazabuka, and Kafue - only areas not previously enumerated were done. Table 4 shows the districts in which structures were enumerated, as well as the number of structures targeted for IRS and those actually sprayed.

A total of 13 districts had more structures enumerated than the target set for IRS, indicating that the aim is to ensure more structures than those planned for IRS are captured. Kafue, Katete and Masaiti recorded more structures sprayed than those enumerated because their initial target was to enumerate areas marked for IRS. However, the districts sprayed more structures making it necessary to update the new areas.

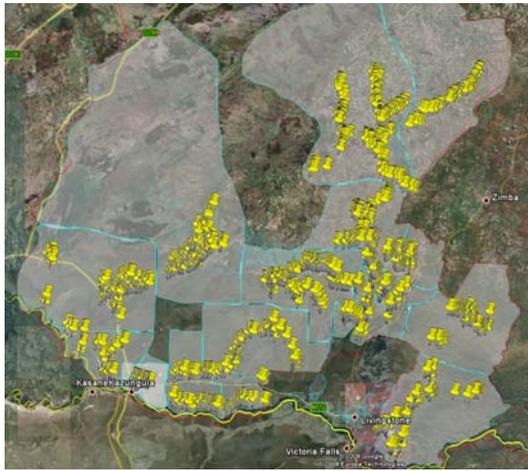
**Table 4: Estimated number of people, households, and structures enumerated, targeted for spraying and structures sprayed by district, 2009**

District	Population	Households	Number of Structures			
			Enumerated	Enumerated to-date	Targeted for spraying	Sprayed
Chilubi	45,618	12,662	21,804	21,804	17,000	15,326
Kafue	3,863*	806*	1,108*	24,599	33,106	31,104
Kaoma	102,168	26,671	39,905	39,905	32,662	30,609
Kasempa	43,920	11,278	17,236	17,236	10,000	8,162
Katete	62,316	14,442	23,178	23,178	25,000	24,921
Kawambwa	54,358	10,361	22,042	22,042	12,000	11,082
Livingstone	1,919*	447*	503*	25,078	24,600	22,555
Luanshya	4,310*	954*	1,592*	31,059	25,500	23,399
Lufwanyama	34,883	8,077	15,456	15,456	13,784	11,865
Masaiti	67,161	14,825	16,614	16,614	20,581	18,259
Mazabuka	11,421*	2,555*	4,281*	36,818	21,000	20,831
Mbala	31,833	10,535	17,798	17,798	20,000	16,772
Monze	46,388	9,726	13,110	13,110	12,000	10,000
Mpika	34,548	6,111	10,379	10,379	10,000	8,377
Mpongwe	31,666	10,393	13,129	13,129	17,000	18,046
Mufulira	3,600*	1,033*	1,179*	33,459	33,804	30,964
Nchelenge	88,439	23,440	33,025	33,025	28,000	27,604
Petauke	100,341	34,399	59,955	59,955	40,000	36,488
Senanga	54,782	13,687	22,336	22,336	12,000	9,650

\* Enumeration updates

Delineation of IRS areas was initiated during the year to assist in the development of the malaria decision support system (MDSS) which is being spearheaded by the Innovative

Vector Control Consortium. One of the modules in the planned system is the IRS module, which would link spray operator data to GIS. Nine districts - Lusaka, Livingstone, Kazungula, Kabwe, Mumbwa, Kapiri Mposhi, Choma, Monze and Mazabuka - had spray areas delineated. Delineation of IRS spray areas entails carefully defining spray area boundaries within each district. The technique was done using Google Earth to identify features on the ground. Using these features, districts were assisted to define spray areas as units of areas that would be used to efficiently deploy spray teams. Defining these areas in an urban setting was less challenging as compared



*Delineation of IRS areas in Kazungula District*

to a rural setting because urban settings have easily identifiable features to assist with the demarcation. A case in point was Kazungula District delineation was challenging due to difficulties in defining catchment area boundaries. However, overlaying Google layers with data derived from PDAs provided useful information to enable such delineations to be done in Kazungula District.

### 3 Spraying Phase

Actual spraying was initiated by district teams on 3rd October, 2009 and ended on 18th January, 2010; thus, spraying continued into the rainy season. Startup of the spray campaign was challenging for the districts because funds had not reached the districts in time, despite the fact that the spray campaign was officially launched on 17th September, 2009. Details for each district are provided in Table 5.

**Table 5: District Population and IRS implementation dates**

District	Population Size	Date of IRS Launch	IRS Implementation		
			Start Date	End Date	No. of Days
<b>Central Province</b>					
Mumbwa	214,794	20/10/09	09/10/09	23/10/09	55
Kapiri-Mposhi	255,147	10/10/09	14/10/09	05/12/09	45
Kabwe	172,033	13/10/09	9/10/09	26/10/09	41
<b>Copperbelt Province</b>					
Chililabombwe	95,013	15/10/09	21/09/09	01/12/09	33
Kalulushi	94,010	10/10/09	12/10/09	21/11/09	38
Luanshya	186,440	12/10/09	10/10/09	07/01/10	47
Mufulira	194,656	15/10/09	12/10/09	21/11/09	35
Ndola	487,881	17/09/09	14/09/09	27/11/09	53
Chingola	231,331	11/10/09	12/10/09	18/01/10	54
Kitwe	485,275	30/09/09	06/10/09	09/12/09	45

District	Population Size	Date of IRS Launch	IRS Implementation		
			Start Date	End Date	No. of Days
Lufwanyama	82,717	14/10/09	12/10/09	26/11/09	36
Masaiti	123,484	11/10/09	11/10/09	30/11/09	46
Mpongwe	94,471	03/10/09	05/10/09	07/11/09	29
<b>Eastern Province</b>					
Chipata	486,954	14/10/09	15/10/09	13/12/09	57
Katete	247,351	05/10/09	07/10/09	22/11/09	45
Petauke	322,497	09/10/09	14/10/09	22/12/09	55
<b>Luapula Province</b>					
Nchelenge	155,510	2/10/09	5/10/09	5/12/09	45
Kawambwa	133,277	14/10/09	16/10/09	4/12/09	30
Mansa	238,748	-	12/10/09	5/12/09	42
<b>Lusaka Province</b>					
Chongwe	216,972	28/10/09	12/10/09	19/12/09	55
Kafue	283,745	16/11/09	12/10/09	21/12/09	50
Lusaka	2,553,363	Not done	12/10/09	31/12/09	65
<b>Northern Province</b>					
Chilubi	92,596	06/11/09	11/11/09	10/12/09	28
Kasama	239,383	16/10/09	19/10/09	22/01/2010	45
Mbala	210,656	12/11/09	03/11/09	24/12/09	34
Mpika	175,357	08/11/09	02/11/09	24/12/09	42
<b>North-Western Province</b>					
Kasempa	71,248	16/10/09	15/10/09	28/11/09	45
Solwezi	266,000	-	07/10/09	09/12/09	64
<b>Southern Province</b>					
Choma	253,523	19/10/09	12/10/09	27/11/09	38
Kazungula	91,478	15/10/09	9/10/09	29/12/09	51
Livingstone	130,960	13/10/2009	8/10/09	26/12/09	43
Mazabuka	274,306	18/09/09	1/10/09	17/11/09	36
Monze	225,660	16/10/09	8/10/09	18/11/09	38
<b>Western Province</b>					
Kaoma	214,417	13/10/09	14/10/09	08/12/09	40
Senanga	135,136	02/11/09	04/11/09	04/12/09	30
Mongu	194,934	17/10/09	20/10/09	16/01/10	63

## 4 IRS Monitoring and Supervision

Monitoring and supervision ensures that spraying campaigns are conducted correctly, and in line with established guidelines and procedures. Three monitoring and supervision exercises are usually conducted: one at the beginning of the spraying campaign, one in the middle of the spraying campaign, and one towards the end of the spraying campaign. For each monitoring and supervision exercise, teams go out to the various districts.

The districts started on a good note despite receiving the implementation funds late. All of the districts were ready in terms of the availability of personal protective equipment. Spray operators were recruited and ready for the campaign. Districts were ready for the launch and the launch programs had already been prepared. As mentioned above, however, start of the campaign was delayed by almost a month in some districts, due to late release of the

implementation funds. The biggest challenge was rain, particularly for those districts in the high rainfall belt and those districts with many days to spray.

All IRS teams from all levels made extra effort to ensure that adequate coverage was attained by the end of the spray season. These extra efforts involved very close monitoring of these activities on the ground. The recommendations made to the districts during the monitoring and supervision exercise helped improve the program for the rest of the spray season. The most critical element of IRS in practice is to ensure that the right amount of insecticide is deposited on the designated surfaces. To achieve good coverage, there is need for a systematic approach on the ground. The funds need to be in place at the same time so that the program starts at the same time in all the districts. It was regrettable that because of the delay of funds and the haphazard manner in which the districts were receiving the funds, monitoring time was lost.

Table 6 shows IRS coverage, structures sprayed, and the population protected in 36 districts in 2009. A total of 1,191,517 structures were sprayed against the target of 1,313,941 (90.6%) and an estimated 5,638,551 people were protected against malaria.

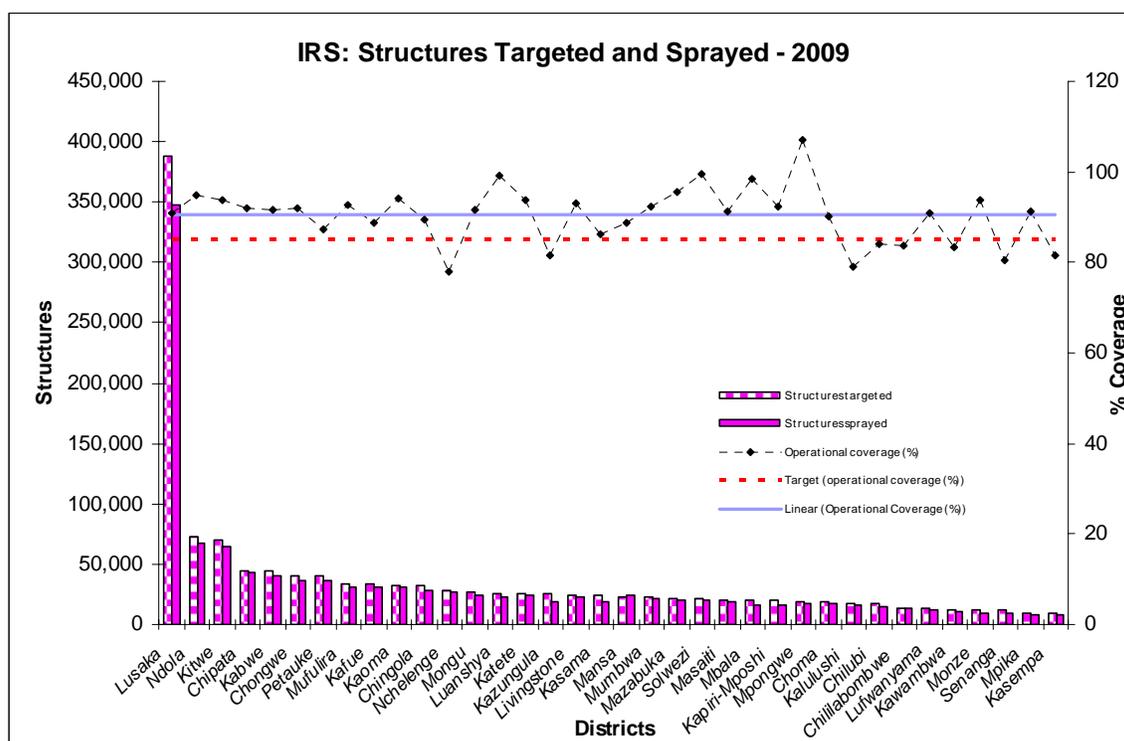
**Table 6: IRS coverage, structures sprayed, and number of people protected in 36 districts, 2009**

District	Number of Structures Targeted for Spraying			Number of Structures Sprayed			Coverage (%)	Population Protected
	Formal	Informal	Total	Formal	Informal	Total		
Kabwe	24,568	19,432	44,000	22,828	17,165	39,993	90.9	172,033
Chililabombwe	8,260	5,640	13,900	9,351	3,823	13,174	94.8	101,160
Kalulushi	8,796	8,204	17,000	7,799	8,110	15,909	93.6	74,266
Luanshya	18,652	6,848	25,500	17,820	5,579	23,399	91.8	137,035
Mufulira	23,534	10,270	33,804	21,424	9,540	30,964	91.6	163,679
Ndola	49,906	22,636	72,542	48,980	17,758	66,738	92.0	409,214
Chingola	25,351	6,328	31,679	21,501	6,142	27,643	87.3	141,875
Kitwe	56,000	14,000	70,000	50,526	14,453	64,979	92.8	360,606
Chongwe	5,745	34,470	40,215	31,486	4,240	35,726	88.8	83,611
Kafue	16,753	16,353	33,106	15,654	15,450	31,104	94.0	164,205
Lusaka	291,126	97,042	388,168	276,618	70,347	346,965	89.4	1,906,986
Kazungula	2,500	22,500	25,000	1,063	18,432	19,495	78.0	99,678
Livingstone	8,717	15,883	24,600	15,190	7,365	22,555	91.7	121,118
Mazabuka	16,000	5,000	21,000	15,640	5,191	20,831	99.2	80,574
Solwezi		21,000	21,000	6,840	12,865	19,705	93.8	93,604
<b>Subtotal – 15 districts</b>	<b>555,908</b>	<b>305,606</b>	<b>861,514</b>	<b>562,720</b>	<b>216,460</b>	<b>779,180</b>	<b>90.4</b>	<b>4,109,644</b>
Kapiri-Mposhi	6,500	13,500	20,000	5,452	10,894	16,346	81.7	57,678
Mumbwa	5,275	18,975	22,495	5,008	15,944	20,952	93.1	76,418
Lufwanyama	1,232	12,552	13,784	1,117	10,748	11,865	86.1	56,743
Masaiti	4,720	15,861	20,581	3,915	14,344	18,259	88.7	75,152
Mpongwe	2,500	17,000	19,500	1,645	16,401	18,046	92.5	82,572
Chipata	12,000	33,000	45,000	10,748	32,305	43,053	95.7	176,136
Katete	8,000	17,000	25,000	7,621	17,300	24,921	99.7	88,501

District	Number of Structures Targeted for Spraying			Number of Structures Sprayed			Coverage (%)	Population Protected
	Formal	Informal	Total	Formal	Informal	Total		
Petauke	13,000	27,000	40,000	14,186	22,302	36,488	91.2	83,977
Nchelenge			28,000	2,509	25,095	27,604	98.6	101,423
Kawambwa			12,000	2,211	8,871	11,082	92.4	58,414
Mansa			23,000	4,426	20,155	24,581	106.9	62,275
Chilubi	200	16800	17,000	165	15,161	15,326	90.2	60,927
Kasama	16,000	8,000	24,000	12,260	6,665	18,925	78.9	90,084
Mbala	7000	13000	20,000	4,704	12,068	16,772	83.9	36,612
Mpika	4000	6000	10,000	3,922	4,455	8,377	83.8	41,236
Choma	8,000	10,905	18,905	7,236	9,921	17,157	90.8	86,382
Monze	4,500	7,500	12,000	4,011	5,989	10,000	83.3	42,428
Kaoma	6,900	25,762	32,662	5,111	25,498	30,609	93.7	103,048
Senanga	1,020	10,980	12,000	887	8763	9650	80.4	33,003
Mongu	8,825	17,675	26,500	8,045	16,117	24162	91.2	91,912
Kasempa			10,000	1,210	6,952	8,162	81.6	23,986
<b>Subtotal – 21 districts</b>	<b>109,672</b>	<b>271,510</b>	<b>452,427</b>	<b>106,389</b>	<b>305,948</b>	<b>412,337</b>	<b>91.1</b>	<b>1,528,907</b>
<b>TOTAL</b>	<b>665,580</b>	<b>577,116</b>	<b>1,313,941</b>	<b>669,109</b>	<b>522,408</b>	<b>1,191,517</b>	<b>90.6</b>	<b>5,638,551</b>

Note: Blank cell shows data not available

The graph presented below shows the coverage – households sprayed against households targeted - attained by all 36 districts. Eight districts recorded below the acceptable operational coverage of 85%. Twenty-one districts recorded coverage above the national average of 90.6%.



## **5 Comparison of IRS targets and coverage from 2006 to 2009**

Since the IRS program started, there has been a gradual scale up within the districts. A look at the 15 original districts shows that in 2006 six districts - Kafue, Chongwe, Solwezi, Mufulira, Kalulushi, and Mazabuka - recorded coverage of less than 85%. This underachievement was reduced to one district by 2009, Kazungula. Please see Table 7, which shows fluctuations in district level coverage over time. These fluctuations could be the result of poor supervision at local level, particularly in previous years. In 2009, however, underachievement was largely related to funding difficulties. Kazungula District was forced to stop spraying after exhausting the first allocated funds. By the time the next allocation was received, the rains had gathered momentum and impacted the rest of the spray campaign.

Table 7 further illustrates that some districts increased their 2007 targets compared to the 2006 targets, but reduced their 2008 targets or maintained their 2007 targets in 2008. A similar pattern is observed in some districts which maintained their 2008 targets in 2009. Districts such as Kazungula, Luanshya, and Livingstone maintained similar targets in 2007 and 2008. As for the 21 new districts, Mpika, Senanga and Mongu had lower target figures than the previous year. This could be attributed to overestimating the number of structures during the first year.

Table 7: Comparison of district coverage over time

District	2006*			2007*			2008			2009		
	Target	Sprayed	Coverage									
Lusaka	242,536	217,870	89.8	320,189	300,334	93.8	400,000	396,672	99.2	388,168	346,965	89.4
Ndola	66,616	59,771	89.7	73,277	65,640	89.6	72,542	65,332	90.1	72,542	66,738	92.0
Kitwe	61,192	56,427	92.2	62,000	63,691	102.7	63,000	58,926	93.5	70,000	64,979	92.8
Kabwe	30,172	28,157	93.3	44,516	35,452	79.6	40,000	38,976	97.4	44,000	39,993	90.9
Kazungula	19,200	16,470	85.8	25,000	23,634	94.5	25,000	20,627	82.5	25,000	19,495	78.0
Luanshya	23,903	21,355	89.3	25,385	23,618	93.0	25,385	22,076	87.0	25,500	23,399	91.8
Livingstone	34,347	29,882	87.0	24,139	22,750	94.2	24,139	22,620	93.7	24,600	22,555	91.7
Kafue	19,700	15,702	79.7	24,000	23,085	96.2	27,500	22,044	80.2	33,106	31,104	94.0
Chongwe	20,000	15,398	77.0	20,519	20,417	99.5	29,041	25,648	88.3	40,215	35,726	88.8
Solwezi	20,220	14,037	69.4	20,500	17,616	85.9	21,000	17,510	83.4	21,000	19,705	93.8
Mufulira	15,454	12,184	78.8	17,002	15,460	90.9	18,000	16,414	91.2	33,804	30,964	91.6
Kalulushi	14,381	10,741	74.7	16,241	15,087	92.9	16,550	15,422	93.2	17,000	15,909	93.6
Mazabuka	42,000	30,425	72.4	14,000	14,026	100.2	21,000	19,860	94.6	21,000	20,831	99.2
Chingola	5,000	4,635	92.7	10,517	10,167	96.7	12,600	11,840	94.0	31,679	27,643	87.3
Chililabombwe	5,495	4,823	87.8	6,571	6,242	95.0	6,428	5,656	88.0	13,900	13,174	94.8
Kapiri-Mposhi							13,000	11,666	89.7	20,000	16,346	81.7
Mumbwa							16,683	15,971	95.7	22,495	20,952	93.1
Lufwanyama							12,408	7,765	62.6	13,784	11,865	86.1
Masaiti							10,000	7,846	78.5	20,581	18,259	88.7
Mpongwe							13,232	12,718	96.1	19,500	18,046	92.5
Chipata							38,000	33,155	87.3	45,000	43,053	95.7
Katete							22,000	22,296	101.3	25,000	24,921	99.7
Petauke							20,566	20,120	97.8	40,000	36,488	91.2
Nchelenge							21,600	21,401	99.1	28,000	27,604	98.6
Kawambwa							6,000	5,555	92.6	12,000	11,082	92.4
Mansa							15,354	12,108	78.9	23,000	24,581	106.9
Chilubi							7,102	6,800	95.7	17,000	15,326	90.2

District	2006*			2007*			2008			2009		
	Target	Sprayed	Coverage									
Kasama							15,000	13,037	86.9	24,000	18,925	78.9
Mbala							11,347	9,557	84.2	20,000	16,772	83.9
Mpika							10,758	10,231	95.1	10,000	8,377	83.8
Choma							13,718	12,153	88.6	18,905	17,157	90.8
Monze							10,000	6,117	61.2	12,000	10,000	83.3
Kaoma							14,591	13,662	93.6	32,662	30,609	93.7
Senanga							12,655	8,322	65.8	12,000	9,650	80.4
Mongu							32,135	25,448	79.2	26,500	24,162	91.2
Kasempa							5,750	3,603	62.7	10,000	8,162	81.6

**Note:**

*\*New districts, not in bold, started spraying in 2008*

## 6 Renovation of IRS Storage Facilities

During 2009, HSSP supported renovation of three IRS storage facilities in Mazabuka, Ndola and Kitwe.

Storage assessments carried out by both HSSP and the Environmental Council of Zambia, aimed at establishing compliance with USAID/WHO storage standards, revealed that most of the IRS storage facilities were out of compliance. Budgetary constraints prevented refurbishment of IRS storage facilities in all 15 IRS districts supported by the US Government. In agreement with USAID, rehabilitation works were executed only in Mazabuka, Ndola and Kitwe. Depending on resource availability, other IRS districts might be considered in future as well and districts have been encouraged to provide adequate storage facilities from their own resources.

The HSSP team began the rehabilitation process by assessing the facilities to establish the actual needs, preparing of architectural drawings, and obtaining permission from the civic authorities in the affected districts to undertake the rehabilitation.

The storage facilities in the three selected IRS districts lacked the following:

- Adequate storage rooms to store chemicals, PPE and sprayer pumps
- Lack of office accommodation for the stores manager/store man
- Good ventilation to prevent the build up of insecticide vapor and stop temperatures from getting very high
- The floors were not smooth enough to avoid absorption of spillages and allow easy cleaning
- Direct accessibility to outside without passing through other rooms
- No adequate lighting
- No fire fighting equipment
- No hazard warning signs

It was important to ensure that the storage facilities were compliant to offer safeguards against human exposure and environmental pollution generally associated with the use of insecticides.

Preparation activities were followed by invitation and selection of vendors to execute the works, supervision, and completion of the works within the projected completion period.

## 7 Collection and Disposal of Waste

DDT waste disposal was a challenge, as policy dictates that all DDT waste should be repatriated back to the country of origin. This waste includes the empty insecticide containers (sachets), along with any insecticide that is not used prior to its expiry date. All DDT waste must be accounted for, classified, compacted, bundled, stored, collected, and

transported to the country of origin following all provisions of both local and international regulations. All DDT waste (3,510kgs) has been collected from the districts using DDT and has been stored in Lusaka pending transport back to South Africa. .

## **8 Special Studies**

The NMCC collaborated with HSSP on a number of studies during the year to support the scientific basis for the malaria control program. These included an impact study, vector density studies, and resistance studies. The impact study compared three sets of IRS and non IRS districts by reviewing clinical data and vector densities. The districts were paired as follows:-

- Solwezi was compared with Mwinilunga;
- Kabwe was compared with Mkushi;
- Kazungula was compared with Sesheke

The preliminary results of these comparisons showed that the IRS had an impact on both the vector densities and on the incidence of malaria. All the three comparisons showed that the reduction in the incidence and mortality was more in the IRS districts than in the non IRS districts. Furthermore, vector densities were lower in IRS districts than in non IRS districts. The study was carried out on an assumption that all parameters and interventions being equal for the compared districts the difference was the existence or non existence of IRS as an intervention.

To facilitate basic entomological studies to be carried out in the districts, HSSP trained environmental staff from ten districts for a period of ten days in basic entomology. The training focused on basic entomology methods, collection, physical identification, sexing, preserving and handling. This support was further boosted by provision of basic entomology kits for the districts.

## **9 Post-Spray Phase**

In order to share experiences from the spray campaign and chart the way forward, a post-spray meeting was held at the Hotel Edinburgh in Kitwe from 1<sup>st</sup> to 2<sup>nd</sup> February 2010. Two persons were invited from each of the 36 IRS districts, while 2 persons were invited from the Provincial Medical Offices. Those invited included the Provincial Medical Officers, Chief Environmental Health Officers, the District Medical Officers and the District IRS Managers.

During the post-spray meeting, results from the 2009 spray season were presented, and various expert presenters led detailed discussions on the core spraying activities; flow of funds to the districts and management of funds; information, education and communication for IRS; information management at district level, monitoring and supervision of the spray campaign; household enumeration; environmental compliance, entomology and strategic planning for the 2010 spray season. A key objective of the meeting was to identify

achievements, challenges and lessons learned from the 2009 spray season to inform planning for the following year's campaign.

## 10 Abstracts and Conferences

HSSP IRS staff presented three abstracts to the American Mosquito Control Association 75<sup>th</sup> Annual Conference in New Orleans in 2009. Two were oral presentations entitled “Doing It Right: The Zambian IRS Program” and “Maximizing Operational and Collaborative Efforts for Indoor Residual Spraying (IRS) Implementation in Zambia”. The third was a poster presentation entitled “Using Personal Data Assistants in Zambia’s Indoor Residual Spray Planning Process”.

## 11 Challenges and Solutions

The following chart summarizes some of the challenges faced during implementation of the 2009 spray season, how they were resolved, and recommendations made to enhance the 2010 spray season:

No.	Challenges	Solutions	Recommendations
1.	Delay in release of IRS operational funds by MOH resulting in delays to start and finish 2009 IRS on schedule	Some districts used available DHMT funds while others delayed implementation of IRS	<ul style="list-style-type: none"> <li>MOH has asked the districts to conduct more effective advance planning for IRS activities</li> <li>MOH and partners (World Bank, Global Funds and other partners) should accelerate release of funds for field operations</li> </ul>
2.	Inadequacy of storage facilities resulting in DDT, other insecticides, and equipment being stored in the same room	Three storage facilities have been refurbished in Kitwe, Mazabuka and Ndola.	Other districts have been encouraged to plan for construction/refurbishment of storage facilities using district funding
3.	Delays in receipt of data from districts resulted in delays to compile spray and coverage data on schedule	Compiled data only from districts that had sent on time	During training for the next spray season, the NMCC, will ensure that, data collection, compilation, and reporting are emphasized
4.	Weather: IRS implementation entered the rainy season	Increased the number of spray operators and supervisors but reduced the expenditure on other activities	MOH and partners (World Bank, Global Funds and other partners) should accelerate release of funds for field operations

No.	Challenges	Solutions	Recommendations
5.	Acceptance of the IRS program was not forthcoming in some communities	Strengthened sensitization of the community through more intensive use of IEC materials and messages by spray teams and IRS supervisors	Sensitization of the community should start early

## 12 Reports Produced

HSSP produced a number of reports in collaboration with the NMCC during the year; these include the following:

1. Needs Assessment report
2. Three IRS Monitoring and Support Supervision reports
  - a. September-October 2009 report
  - b. October-November 2009 report
  - c. December, 2009 report
3. IRS Post-Spray Meeting report
4. IRS Technical Working Group Meeting report
5. IRS Storage Facility Report
6. Impact assessment report: Impact of IRS on malaria incidence rates in selected districts of Zambia

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