THIS ISSUE AT A GLANCE

- Editor’s Note
- Ethiopia National Malaria Indicator Survey 2011: A Technical Summary
- Cost Effectiveness Analysis of Preventing Mother-to-Child Transmission (PMTCT) Service Delivery Modalities in Addis Ababa Using Decision Models
- Production of Cell Culture Based Anti-rabies Vaccine in Ethiopia
- Progress Towards Laboratory Systems Strengthening & Quality Improvement in Ethiopia
- Researcher’s Profile
SNL Editorial Committee

Dr. Workenesh Ayele (Editor-in-Chief)
Ms. Meraf Woldeamanuel
Mr. Mesfin Teferra
Dr. Abraham Ali
Mr. Abinet Tekle
Mr. Elias Asfaw
Dear Readers, welcome to the second edition of *Ye Science Admas*, EHNRI’s Bi-annual Scientific Newsletter! This second issue coincides with the start of a new year (2013) and we would like to start by thanking all those who made outstanding contributions for the realization of the inaugural issue. In the same way we want to extend our sincere appreciation to everyone who responded to the call for articles for the present (second) issue. On the one hand our task as editors has been arduous but it has also been a tremendous learning experience; the extent of information shared was overwhelming. As editors we learned much about the editorial process, it also gave us the opportunity to meet some incredible people and learn about their research activities, a chance which we, as well as many of our readers, might not have otherwise gotten.

It is worthwhile to note that as we continue with our work as editors, we are already thinking ahead about our third edition and committed to having it be ready on time. It is our sincere hope that you will enjoy reading this present edition of the scientific newsletter as much as we have enjoyed putting it together for you. In order to reflect EHNRI’s increased focus on public health oriented projects of national importance, we have included sections featuring key findings and undertakings in major thematic public health areas identified as priorities for the Institute. In addition, we have presented this newsletter in a way to keep readers abreast of progress being made in selected areas of research being conducted by various research groups at EHNRI.

In step with these thoughts, we are pleased to note that this issue includes a section on the *Ethiopian National Malaria Indicator Survey 2011*, pioneers the *Cost Effectiveness Analysis of PMTCT Service Delivery Modalities in Addis Ababa*, provides information on an initiative which is very much at the forefront currently, the *National Rabies Survey Preliminary Report*, progress in *Production of Cell Culture Based Anti-Rabies Vaccine in Ethiopia* and includes a very insightful paper on *Progress Towards Laboratory Systems Strengthening and Quality Improvement in Ethiopia*. The profile of a young researcher is also featured in this edition. Thus we have tried to put together a mixed bag of timely and relevant articles from various public health areas which we hope will accommodate the interests of diverse readers. As editors, we feel that this sort of edition is best suited to showcase the scope of work being conducted at EHNRI, as it greatly assists to foster a spirit of general knowledge and information sharing.

Lastly, we would like to announce that the Scientific Newsletter Editorial Committee has prepared criteria for articles to be submitted to the newsletter, in the hope of streamlining and standardizing formats for various categories of articles. Readers are invited to refer to the appropriate section in this issue. We would like to thank you again for your contributions and reiterate our genuine hope that you will find the contents in this issue to be interesting and useful and that you will continue to contribute articles for future editions.

In addition, we welcome your comments, suggestions, and thoughts. We are very pleased to let you know that *Ye Science Admas* is now also available online through the Institute’s website. For those without ready internet access, hardcopies are available. As we aim for widespread dissemination of this newsletter, if you, or someone you know outside of EHNRI, would like to be added to our distribution list, please do not hesitate to contact us using the contact details provided in this issue.

With Best Wishes,

The Editors
**Research Findings**

**Ethiopia National Malaria Indicator Survey 2011: Technical Summary**

_Ethiopian Health and Nutrition Research Institute (EHNRI) & the MIS 2011 Technical Working Group_

**Background**

Malaria is seasonal in most parts of Ethiopia, with unstable transmission that lends itself to the outbreak of epidemics. The transmission patterns and intensity vary greatly due to the large diversity in altitude, rainfall, and population movements; areas below 2,000 meters (m) are considered to be malarious (or potentially malarious). Those areas are home to approximately 68% of the Ethiopian population and cover almost 75% of the country’s landmass.

The updated 2010 National Strategic Plan for Malaria Prevention, Control, and Elimination 2011–2015 is embedded in the health sector’s overarching framework, the Government of Ethiopia’s Health Sector Development Plan Four (HSDP IV) 2011–2015. Among the goals of the national strategic plan are:

- By 2015, achieve malaria elimination within specific geographical areas with historically low malaria transmission.
- By 2015, achieve near-zero malaria deaths in the remaining malaria-endemic areas of the country.

In 2005, the FMOH launched a massive program to scale-up key interventions. Since then Ethiopia has distributed 42 million insecticide-treated bed nets (ITNs) and long-lasting insecticidal nets (LLINs) and conducted indoor residual spraying (IRS) for 4.2 million households. In addition, access to Artemether Lumefantrine, (Coartem®) as a first-line treatment for uncomplicated malaria has led to more than 48 million treatment courses.

A Demographic and Health Survey (DHS) took place in Ethiopia in 2005 before this scale-up occurred. In order to evaluate progress, in 2007 the Federal Ministry of Health (FMOH) conducted a Malaria Indicator Survey (MIS), applying the Roll Back Malaria Monitoring and Evaluation Reference Group tool that uses similar methods to DHS and multiple indicator cluster surveys. The result of MIS 2007 demonstrated the main achievements of the program, in terms of implementing key malaria interventions. The follow-up 2011 MIS shed light on progress and the challenges ahead.

**Objective**

The 2011 Ethiopia MIS was conducted to measure progress toward achieving the goals and targets set in the Ethiopia National Strategic Plan for Malaria Prevention and Control 2005–2010.

**Methods**

The 2011 MIS was based on a two-stage cluster sample design of 10,444 households (HHs) in malarious areas, defined as areas below 2,000m altitude, and in malaria epidemic-prone areas, defined as areas between 2,000m and 2,500m. The sample was designed to generate nationally representative data, but also providing regional data for Oromia, SNNPR, Tigray, and Amhara, as well as combined Afar/Somali regional states and Benishangul-Gumuz/ Gambella regional states.
All enumeration areas in the country in villages with a mean altitude lower than 2,500m were stratified to provide the following estimation domains:

- National (country): urban for altitudes ≤ 2,000m.
- National (country): rural for altitudes ≤ 2,000m.
- National (country): for altitudes of < 2,500m.
- Sub-National: Amhara, Oromia, SNNPR, Tigray regional states as well as combined Afar/Somali regional states and Benishangul-Gumuz/Gambella regional states.

The survey was conducted during October, November, and December 2011 by 31 teams, using standard questionnaires programmed into personal digital assistants (PDAs). In each selected enumeration area, all households were mapped, and 25 households were randomly selected by the PDA program. Interviews regarding household characteristics and nets were conducted in those 25 households.

A total of 444 enumeration areas of 25 households each were sampled nationally, randomly selected with population proportional to size.

Blood samples were taken from all children under five years of age (U5) in every household and from persons of all ages in every fourth household. Malaria parasite testing was done using CareStart™ rapid diagnostic tests to facilitate case management during the survey, and both thick and thin smear blood slides were taken to assess malaria infection rates. Hemoglobin testing for anaemia was done using HemocueHb 201 analyzers for children U5.

**Results**

A total of 432 clusters, 10,444 households and 47,248 people were surveyed, with more than half (5,819 households) in areas under 2,000m, including 15.7% children under five years of age and 6.7% self-reported pregnant women. Interviews regarding reproductive history, fever treatment, and malaria knowledge were conducted with 8,817 women of childbearing age.

A total of 11,933 blood slides and 4,846 anaemia tests were examined. A brief summary of the findings from MIS 2011 is presented and compared to results of the first MIS survey conducted in 2007. While comparisons of MIS 2007 to 2011 may be revealing, the statistical approaches used differed and so results should be interpreted with caution.

**Mosquito Net Ownership**

Nationally, the results showed that the percentage of households with at least one mosquito net in malaria-endemic areas was lower in MIS 2011 (55.2%) than in MIS 2007 (68.9%). Regional comparisons showed that households in Tigray had the highest increase in ownership of at least one net per household (from 53.7% in 2007 to 65.8% in 2011). By contrast Oromia had the lowest achievement in net ownership (45.6% in 2007 and 44.3% in 2011).

![Figure 1. National and regional comparison by percentage of households with one or more mosquito nets in areas with elevation <2,000m between MIS 2007 and MIS 2011.](image)
The average number of nets per household showed a decline at the national level (1.1 in 2007 to 0.7 in 2011). However, in some regions the average number of nets per household had increased. The largest increase was in Tigray (1.0 vs. 1.2), followed by SNNPR (0.8 vs. 0.9).

Insecticide-treated mosquito net use

Nationally, progress has been observed in terms of net use among children U5 in households that owned nets. The percentage of children U5 who had slept under a mosquito net on the night preceding the survey was 60.2% in 2007, increasing to 64.5% in 2011. Tigray demonstrated the highest increase (from 47.3% in 2007 to 67.7% in 2011). Oromia showed a decrease in net use by children U5 (Figure 2).

The national findings showed no improvement in net use among pregnant women in 2011 compared to 2007. However, a regional difference was observed in net use among pregnant women in households that owned at least one net. SNNPR demonstrated the highest increment in net use among pregnant women (63.1% in 2007 to 75.2% in 2011).

Indoor residual spraying

Compared to the MIS 2007, the MIS 2011 demonstrated a significant increase with respect to IRS coverage. The percentage of households sprayed in the 12 months preceding the surveys were 20% in 2007 and 46.6% in 2011. In 2011, only 8.5% of households living at elevations above 2,000m were covered with IRS, suggesting better targeting of IRS resources compared to LLINs within non-malarious areas. Figure 3 demonstrates the achievements of all regional states with respect to IRS.
Households protected by nets, LLINs, and/or IRS

The MIS 2011 demonstrated improvement in the percentage of households that were protected by at least one LLIN and/or IRS, compared to MIS 2007, as shown in Figure 5.

Prevalence and prompt treatment of fever

National fever prevalence among children U5 decreased from 24.0% in 2007 to 19.7% in 2011 (Figure 6 and 7). Declines were steepest among children less than one year of age (from 21.8% in 2007 to 14.9% in 2011).
The percentage of children under 5 years of age living below 2,000m who took an anti-malarial drug within 24 hours of the onset of fever showed a significant increase in MIS 2011 compared to MIS 2007 (from 11.9% to 32.6%). These findings likely indicate the increased availability and access to quality malaria diagnostic and treatment services for children U5 with fevers at new health centers and health posts staffed with health extension workers and other providers since the 2007 MIS. Oromia showed the largest gain from 6.6% in 2007 to 38.8% in 2011.

Malaria parasites

As a snap shot survey MIS does not provide a good measure of prevalence. However, compared to the MIS 2007 results, the MIS 2011 microscopic blood-smear test results for altitudes below 2,000m showed a small increase in malaria prevalence, from 0.9% to 1.3%, respectively. There was very little malaria (0.1%) detected by microscopy at altitudes above 2,000m, and the malaria detected there was almost exclusively found to be P. vivax. The 13-fold higher malaria prevalence detected by microscopy in areas below 2,000m compared to areas above 2,000m confirmed the longstanding FMOH practice of using altitude as a proxy for malaria risk and, therefore, as a basis for targeting malaria-related resource allocations.

The proportion of women living in malaria-endemic areas who knew that malaria transmission could be prevented by mosquito nets increased nationally from 38.2% in MIS 2007 to 63.4% in MIS 2011. The largest increase was recorded in Oromia (22.6% in 2007 vs. 65.5% in 2011).

General malaria knowledge

Comparing 2007 and 2011 MIS results, the proportion of women living in malaria-endemic areas who knew that malaria was caused by mosquito bites increased from 41.1% to 71.2% (Figure 7). This knowledge had increased in every major region surveyed.

Figure 7. National and regional comparison of the percentage of women in areas with elevations <2,000m who reported mosquito bites as the cause of malaria between MIS 2007 and MIS 2011.

Challenges: One of the challenges in implementing the MIS 2011 was that mapping resources from CSA and others were inadequate for planning the survey, resulting in major misclassification of enumeration areas (EAS surveyed based upon their planned versus measured by PDA/GPS). Better maps (with accurate altitude measurements) are needed to properly classify rural areas of Ethiopia so that expensive resources including LLINS, IRS and Coartem® are properly aligned and targeted to households living at altitudes <2,000m, which have substantially higher malaria prevalence (and probably higher malaria illness risk).
Conclusions

Having established itself in recent years as an African leader in halting malaria, Ethiopia today continues making important progress toward reducing the burden imposed on individuals, communities, the health system, and on the overall national development. The 2007 MIS was the country’s first nationally representative survey comparing progress in a range of indicators based on the 2005 Demographic and Health Survey. The follow-up 2011 MIS demonstrates that Ethiopia is sustaining its commitment to progress.

Since 2007, Ethiopia intensified its focus on scaling up indoor residual spraying of households, resulting in a more than two-fold increase in IRS coverage (from 20% in 2007 to 46.6% in 2011). Similarly, there was slight increase seen in the percentage of households protected by at least one LLIN and/or IRS (from 71.2% in 2007 to 71.8% in 2011). The percentage of children with fever in the last two weeks fell from 24% in 2007 to 19.7% in 2011, and the percentage of children with a fever who sought treatment from a facility/health provider the same /next day of fever onset increased from 11.9% in 2007 to 32.6% in 2011. Ethiopia faced challenges in ITN coverage from 2007 to 2011, with declines in the percentage of households that have at least one net (from 68.9% to 55.2%). Generally, Ethiopia’s steep gains in IRS coverage to some extent offset the challenges in sustaining LLIN coverage. Among households that owned at least one net, the percentage of children under age 5 and pregnant women who slept under a net the night preceding the survey remained essentially unchanged from 2007 to 2011.

While differences in statistical approaches used for the 2007 and 2011 MIS mean that one should exercise caution in making direct comparisons, the general trends are informative.

The result obtained demonstrates that generally gains in malaria control are sustained. However, as Ethiopia sets its sights on eliminating malaria, further sustaining commitments and expanding gains are critical.

Acknowledgment

The study was conducted by the Ethiopian Health and Nutrition Research Institute (EHNRI) with financial and technical support from various partners: The Central Statistics Agency (CSA), the World Health Organization, the United States Agency for International Development, the US Centers for Disease Control and Prevention/President’s Malaria Initiative, The Carter Center, the United Nations Children’s Fund, the Center for National Health Development in Ethiopia, the Malaria Consortium, Research Triangle Institute, Family Health International, International Center for AIDS Care and Treatment Programs at Columbia University (ICAP), and the Malaria Control and Evaluation Partnership in Africa (MACEPA), a program at PATH.

References

Major reference:
Executive Summary

**Background:** Ethiopia, located in Sub-Saharan Africa, is one of the countries most affected by the HIV pandemic. The national adult HIV prevalence was estimated at 2.3 percent in 2009 (Single point estimate, 2007). The capital city, Addis Ababa had an estimated HIV prevalence among ANC attendances of 12.1% in 2005 (FMOH/NHAPCO, 2006). A total of 5,237 and 40,826 HIV positive births and HIV positive pregnant women respectively were estimated to be present in Addis Ababa from 2005-2010 (Single Point Estimate, 2007).

**Evaluation Question:** Which PMTCT service delivery modality was the most cost-effective strategy?

**Objective of the study:** The major aim of this economic evaluation was to compare alternative service delivery approaches of HIV PMTCT in terms of both their cost and consequences (effectiveness). The comparative approaches/ strategies included: no intervention, opt-in approach, opt-out approach, mandatory HIV testing approach of PMTCT service delivery and universal treatment. In addition, the average per client costs of providing PMTCT service was estimated for providing relevant cost information to program managers and decision makers.

**Methodology:** The study employed both primary and secondary data to populate the parameters in the decision model. The primary data was collected from the randomly selected 16 health facilities (9 governmental and 7 private) using an expert interview, review of financial records and medical report review tools through a cross sectional survey conducted in Addis Ababa.

Relevant secondary data on the effectiveness of various options of PMTCT service delivery was collected by searching major databases including WHO/HINARI. The cost effectiveness analysis (CEA) was undertaken by using an Excel-based decision model (Microsoft Office Excel 2003 software). Sensitivity analysis was also undertaken for those parameters where there was uncertainty. Micro costing/bottom-up approach was used to estimate the average cost.

**Result of study:** The average cost of voluntary counselling and testing per pregnant woman (during ANC, labour and delivery) varied (range 2.14 birr [$0.22]) to 133.75 birr [$13.55], based on the amount of service received by the client). CEA among the three alternatives (no intervention, opt-in and opt-out approach) showed that the opt-out approach was the most cost effective approach, costing 9,597,906.62 birr [$972,038.34] and with a potential to avert 640 cases at a cost effectiveness ratio (CER) of 1,989.76 birr ($201.51).

When the comparison was extended to include mandatory HIV testing and universal treatment approaches, adopting the universal treatment approach was found to be the most cost-saving modality, with an estimated cost-saving of 60,206.27 birr [$6,097.45 at a CER of 95.90 birr [$9.71]. However, the sensitivity analysis showed that mandatory HIV testing option was highly sensitive to HIV prevalence among pregnant women.
Conclusion and Recommendation: The study found that in Addis Ababa adopting the opt-out approach of PMTCT service delivery modality was the most cost effective strategy. It was the preferred economical option across all ranges of model parameters analysed in the model. When the comparison was extended to include other two alternatives (mandatory HIV testing and universal treatment), universal treatment was found to be the most cost-saving and cost-effective approach over a wider range of parameters in the sensitivity analysis. Furthermore, the option of mandatory HIV testing would also be a preferred cost-effective mode of PMTCT service delivery at the highest HIV prevalence (P>24.8) settings.

Introduction

More than 1500 children become infected with HIV every day. The vast majority (more than 90%) acquire the infection from their mother. Since the beginning of the pandemic, of the over 5 million infants who have been infected with HIV, 90% were born in Africa. Mother-to-child-transmission (MTCT) is the single most important source of HIV infection in children. Most of these mothers and children live in Sub-Saharan Africa where infant, child and maternal mortality rates are generally high. In 2003 alone, 630,000 children were newly infected with the AIDS virus, with 90% of these infections occurring in Sub-Saharan Africa (SSA). In addition, it is estimated that 6 million children of the eastern and southern Africa region have become orphaned by AIDS. The most important source of HIV infection in children and infants is the transmission of HIV from mother to child during pregnancy, child birth or breastfeeding.

Model Input Parameters

Based on the perspective of the health care system, the cost estimation was made on additional cost of resources for MTCT intervention to the existing service (antenatal care and labour and delivery) for pregnant mothers. The alternative PMTCT strategies analysed in the decision model were no intervention, ‘opt-in approach’ of PMTCT service delivery and ‘opt-out approach’ of PMTCT service delivery. A hypothetical cohort of total expected pregnancies (75,758) projected by the FMOH health and health related indicators 2000(2008/9) at the base year (2001 Ethiopian Calendar) in Addis Ababa was considered for averaging out and folding back analysis of the cost and effectiveness of each alternative. The prevalence of 12.1% was taken for the base case analysis and the prevalence rate variation from 0.0% - 24.8% (0.0% to 24.8%) was considered in the sensitivity analysis.

The study employed both primary and secondary data to populate the parameters in the decision model. The primary data were collected from the randomly selected 16 health facilities in Addis Ababa (9 governmental and 7 private) using an expert interview, review of financial records and medical report review tools through a cross sectional survey design in Addis Ababa. Relevant secondary data on the effectiveness of various options of PMTCT service delivery was collected from the Federal Ministry of Health (FMOH) national publication and WHO/HINARI medical databases. Published studies were collected from the two medical databases using search terms: cost effectiveness analysis, mother-to-child-transmission, Zidovudine (ZDV), Nevirapine (NVP) and Lamivudine (3TC). Five model parameters (acceptance of pre-test counselling via opt-in approach, acceptance of pre-test counselling via opt-out approach, adherence to regimens, acceptance of ARV drugs and interventions costs) were collected and extrapolated from the survey conducted from October 5-20, 2009. The vertical HIV transmission rate without antiretroviral drugs varies across various studies. Hence, the risk of transmission in the absence of the therapy was assumed to be 25.8%. Moreover, the transmission rate variation of 30-45% was considered in the sensitivity analysis.
In addition the field efficacy study on multiple drug prophylaxis regimens in Abidjan, Cote d’Ivoire showed a transmission rate of 6.5% (95% CI, 3.9-9.1%) with ZDV+NVPSd, a 72% reduction compared with ZDV alone (95% CI 52-88%; P=0.0002 adjusted for maternal CD4 count, clinical stage and breastfeeding). However, with multiple drug prophylaxis involving ZDV+3TC+NVPSd the transmission rate had further dropped to 4.7% (95% CI 2.4-7.0%). At the base case analysis, a 4.7% transmission rate was considered in the decision model. An acceptance rate of 47.01% and 29.15% for pre-test counselling using the ‘opt-out’ and ‘opt-in’ approaches respectively, was considered in the base case analysis. The variation of acceptance rate across different reports was analyzed through sensitivity analyses.

Cost estimates for PMTCT service delivery were analyzed and extrapolated from the survey. The cost estimations were valued in 2001 Ethiopian fiscal year (EFY) price and 2008 USD ($) dollar (1 USD ~9.8740 birr). The average medical cost estimation to care for an HIV infected child from published studies ($356.5) was taken for the reference case analysis. Parallely the variation of medical costs associated for caring for HIV-infected infants ($281 to $432) was considered in the sensitivity analysis.

Results

For a hypothetical cohort of 75,758 pregnant mothers and an HIV prevalence rate of 12.1%, there would be total of 9,167 HIV positive pregnant mothers in Addis Ababa. Under the ‘no intervention’ option, and assuming a vertical transmission rate of 25.8%, the expected number of HIV-infected infants born to these mothers in Addis Ababa would be 2,365. Starting with the same cohort of pregnant mothers and implementing multiple drug HIV prophylaxis through the ‘opt-out approach’ would avert 640 HIV infant infections.
The opt-out approach would result in 243 more infections being averted as compared to the opt-in approach which would have averted 397 infections. Adopting the routine antenatal care (ANC) HIV testing would result into an additional cost of 279,182.88 birr [28,274.55]. Adapting the ‘opt-out’ versus ‘opt-in’ approach would result in a net cost of 1,272,868.43 birr [128,911.12] and 993,685.55 birr [100,636.58] respectively. Although adopting the opt-out approach would lead to huge amount of program cost as compared to the opt-in approach, adopting the routine ANC HIV testing (‘opt-out’) approach would be the most preferred cost-effective strategy comparing the three alternatives modes of PMTCT service delivery. Hence, adopting the routine ANC HIV testing (‘opt-out’) approach would be the preferred cost-effective strategy through offering a lower net cost per infections averted as compared to the opt-in approach.

Conclusion and Discussion

Under the base case analysis, adopting the opt-out approach would lead to an aversion of 243 more cases of pediatric HIV infection with an estimated net cost of 1,272,868.43 birr ($128,911.12). Hence adopting the routine ANC HIV testing approach would save more lives with a lowest cost per HIV infection averted as compared to the opt-in approach. Except for the ‘HIV prevalence among don’t accept groups’ model parameter analyzed in the sensitivity analysis, the ‘opt-out approach’ would be the dominant and preferred cost-effective strategy of PMTCT service delivery. Hence, adopting the routine ANC HIV testing (‘opt-out’) approach would be the preferred cost-effective strategy through offering a lower net cost per infections averted as compared to the opt-in approach.

Similarly in Zimbabwe and Ukraine, was analysis has shown that an increased acceptance of HIV testing under the opt-out approach would contribute for the reduction of HIV infection among babies born from HIV positive mothers. Furthermore, other professionals De Cock and colleagues argue that adopting the opt-out approach as the relevant strategy for preventing MTCT and “opt-out” testing (whereby HIV testing is routine unless the person to be tested explicitly refuses the test) conforms to human rights principles. Hence, the net cost per HIV infection averted using the opt-in and opt-out approach is 2,504.52 ($253.65) and 1,989.76 ($201.51) respectively, clearly indicating that adopting the ‘opt-out approach’ would be the most preferred cost-effective strategy of PMTCT service delivery.

The universal provision of prophylaxis was estimated to be the preferred cost saving option as compared to the other three modes of service deliveries over major model parameters. This study finding has similar results with cost effectiveness analysis studies on single-dose nevirapine and antiviral drug therapy to reduce mother-to-child HIV transmission in Sub Saharan African countries. A similar result was also estimated in a cost effectiveness analysis study conducted in Ethiopia, taking a hypothetical cohort of 100,000 pregnant women and comparing universal treatment, targeted treatment and no interventions alternatives.

In conclusion, three points should be noted. First, provision of pre-test counseling through the opt-out approach would be the preferable cost effective PMTCT service delivery strategy requiring a relatively lower cost for HIV infection aversion ($201.51) as compared to the opt-in approach ($253.65) in Addis Ababa. Thus concerned bodies (stakeholders) in Addis Ababa should consider the opt-out approach as compared to the opt-in approach for the achievement of the national PMTCT goals in the existing resource set-up.
Secondly, concerned bodies involved in the PMTCT program should be committed to increase the uptake of the HIV testing through routine ANC HIV testing “opt-out approach” to 62% and more, so that a huge number of HIV infections could be averted with a lower cost for HIV infection aversion. Thirdly, in a setting where HIV prevalence among “don’t accept groups” (lowest tendency of accepting HIV infection testing among those individuals who are at risk of acquiring a disease) is highest, provision of “opt-in” modes of pre-test counseling should be the recommended cost-effective option. Finally, especially in the lowest VCT cost set-up (where there is not yet a robust PMTCT service in place), adopting the opt-out approach would be the preferable economical option by averting more HIV infections with the least cost.

References:
Background

Rabies is an important disease that has been recognized for many centuries in Ethiopia (1). The disease is endemic throughout the country and results in a significant loss of human life every year (2). Previous estimations of rabies mortality have been based on projections utilizing data from the Rabies consultation section at Ethiopian Health and Nutrition Research Institute (EHNRI) and also survey findings from Addis Ababa which have been extrapolated to the total population of the country, assuming that there is a uniform distribution of risk factors throughout the country (3, 4, 5). However, different studies revealed that the burden of rabies is not uniformly distributed across different sectors of the society and that it is also influenced by socioeconomic and other related factors (6).

Studies have shown that a better understanding of the basic determinants attributed to the occurrence of rabies can be used to design appropriate intervention measures and to estimate human rabies deaths (7). However, the burden of the disease is underestimated and not well documented in most developing countries including Ethiopia. Thus, up-to-date information on rabies and rabies-related conditions are scanty, unreliable and controversial due to poor surveillance/reporting system in all sectors. As a result of this huge information gap, designing and applying appropriate prevention and control measures at the national as well as regional levels has proved to be difficult. Therefore, taking into consideration the gaps indicated above and in order to obtain accurate information to address the problem in coordinated manner, conducting a nationwide epidemiological survey on rabies is believed to have great significance to fully understanding the disease dynamics in the country.

Objective

The overall objective of the national rabies baseline survey was to generate comprehensive data on rabies and its related aspects in different human population groups in Ethiopia.

Methodology

This national rabies baseline survey is a population-based cross sectional study design using a multi-stage cluster sampling method with stratification by region and by urban/rural strata. The survey was conducted in all 9 regions (Afar, Amhara, Benshangul-Gumuz, Gambella, Harari, Oromia, SNNPR, Somali, and Tigray) and 2 special city administrations (Addis Ababa and Dire Dawa) from May to June 2012. A total sample size of 5280 households was calculated for this study. A cluster size of 30 households was used that produced a total of 176 clusters for the country. The total number of clusters calculated for the country was subsequently distributed among the regions using probability proportional to size (PPS) technique and power allocation calculation. A simple random sampling technique was used to select districts in a way that every district in the zone would have an equal chance to be selected for the survey. One enumeration area (EA), considered as cluster, was selected randomly from each district. Finally, the households were selected from EAs using systematic random sampling techniques (Figure 1).
All the selected households were visited separately and face-to-face interviews conducted with the head/spouse/adult respondent’s ≥ 18 years of age using structured and pre tested questionnaires. The informants were asked to report any human rabies deaths and exposure cases that occurred during the preceding five year period (from September 2007 to June 2012) among the household members. The exposure status and fatal human rabies cases were categorized based on WHO case definitions (8). All the data from the questionnaires were entered into CSPro version 4 and transferred to SPSS version 16.0 for cleaning and analysis.

Rabies exposure cases were reported from all regions while fatal human rabies cases were recorded only in 8 regions (Afar, Amhara, Benshangul-Gumuz, Gambella, Oromia, SNNPR, Somali, and Tigray) and from one city administration (Addis Ababa). Nevertheless, the highest number of rabies exposure cases and rabies fatalities were observed in Amhara and Oromia regional states, respectively.

The overall national annual incidence rate of exposure to rabies was 12/100,000 population. For rabies-related deaths the figure was 1.6/100,000 population. An almost similar estimation, more than 1000 deaths/year, was reported by the Ethiopian Ministry of Health in 1977 (9). This is the second highest incidence rate of human rabies deaths in the world next to India which reported 1.7 deaths per 100,000 population from a community-based survey (10). However, both the incidence of exposure to rabies and the number of human rabies-related deaths found in this study was much lower than previously reported (74.4 exposure cases per 100,000 population and 18.6 deaths per 100,000 population) in Ethiopia (3).

The majority of rabies fatalities in humans (60.0%) and rabies exposure cases (52.8%) were reported in children under the age of 15 years. Similarly, WHO has also reported a 5 times higher incidence rate of rabies in children aged <15 years compared to adults (11). This is mainly associated with the closer contact of this younger age group with dogs, and being unable to identify and escape from rabid animals.

Approximately 50% of human rabies victims had resorted to traditional treatment following an animal bite. In line with this finding there was a high preference of people from inaccessible areas to seek medical care from traditional healers instead of traveling long distances to receive post exposure anti-rabies vaccine. (1, 4, 5).
This is due to the deep-rooted belief in traditional medicine for rabies treatment among the rural community, inaccessibility of alternative modern, post exposure treatment in the nearby areas and lack of knowledge about the availability of modern medical treatment for rabies.

The animals primarily responsible for human rabies deaths (97.8%) and exposure cases (90.4%) were dogs. Unlike other canine rabies endemic countries that reported a high proportion of human rabies deaths from the bite of stray dogs (7, 10), findings of this study showed that stray and owned dogs were equally responsible for human rabies deaths in Ethiopia. This can be associated to the overall low vaccination coverage and poor management of owned dogs.

### Conclusion and Recommendation

Rabies is a major public health concern in all parts of the country although the magnitude of the problem varies from region to region. The findings from the recent national rabies survey have shown that the magnitude of the problem is much higher in rural areas where close to 85% of the population lives. School children are at a higher risk of being exposed to rabies and to rabies-related deaths. Preference for seeking traditional medicine for the treatment of rabies and low health seeking behavior for animal bites among the communities have contributed to the occurrence of higher rabies mortality rates in rural areas. Dogs (owned and stray) are the major animals responsible for the spread and transmission of rabies to humans in Ethiopia. However, the current level of canine (dog) rabies control and prevention intervention measures such as conducting mass vaccination of dogs and stray dog population control are not sufficient enough to put the disease under control in the country.

Therefore, to safeguard the public from rabies, primary intervention measures should focus on strengthening the prevention and control activities to control the disease in dogs.

### Acknowledgements

This study was conducted by the Ethiopian Health and Nutrition Research Institute with financial support from the Federal Government of Ethiopia.

### References

Introduction

Although rabies vaccines have been in use since 1885, much remains to be done in the prevention and control of the infection, both in humans and animals. The early rabies vaccines derived from nervous tissue have now been superseded in purity, potency, and safety by products prepared in cell cultures. Every effort should be made to discontinue the use of vaccines derived from nervous tissue of adult animals, and to use these improved products (1).

Different animal species are responsible for the continued circulation of rabies virus on various continents. Rabies in dogs is the source of 99% of human infections and poses a threat to more than 3.3 billion people (2). There are an estimated 60,000 human rabies-related deaths worldwide each year. Of these, most cases occur in Asia and Africa (3). In 1992/1993 (G.C) human rabies in Addis Ababa, the capital city of Ethiopia, was surveyed and 464 rabies cases were identified. The 1992/1993 Addis Ababa data on human rabies cases was extrapolated to estimate the actual magnitude of human rabies throughout Ethiopia by using an assumption that there was uniform distribution of dog rabies and of human exposure and cases throughout the country. Thus, with an estimated 1993 population of 2.5 million in Addis Ababa and an estimated countrywide population of 55 million people, it was estimated that approximately 10,000 persons die of rabies in Ethiopia each year, and that more than 40,000 persons may require human rabies post-exposure treatment (PET) (4). Ethiopia’s current population (2012)is estimated at 85 million. The recorded number of fatal human cases from 2001-2009 was 386, with an annual range of 35 to 58 cases.

In the last ten years a minimum of 6,263 and a maximum of 21,832 doses of nerve-tissue based human anti-rabies vaccine were produced and distributed every year (5).

Louis Pasteur developed the first vaccine against rabies in 1885. The production of this initial vaccine was followed by subsequent technological improvements, in terms of both immunogenicity and safety. Rabies vaccines produced in mammalian neural tissues have the disadvantage of causing severe adverse reactions at an estimated rate of 0.3–0.8 per thousand treated patients (6). From the 1990s onwards, the World Health Organization (WHO) has recommended that nerve-tissue derived rabies vaccines be replaced by vaccines produced in substrates free from animal nervous tissues, as the latter are more immunogenic and, more importantly, safer (7,8). The vaccines recommended by WHO include those produced in Vero cells, available since the 1980s. Unfortunately, the cell culture rabies vaccines are expensive and not readily available to individuals living in developing countries such as Ethiopia where rabies is endemic in dogs (9). Today, rabies vaccines for both human and animal use are produced using different cell lines in cultures (10); one of the most widely used cell lines for human vaccine production is the non-tumorigenic Vero cell line (11). Sheep brain derived Fermi type anti-rabies vaccine is still being manufactured and utilized for the majority of exposed patients in Ethiopia, even though the use of this vaccine has been discouraged by the WHO since 1973. The high cost of tissue culture anti-rabies vaccine and inertia have been the main barriers to the replacement of the Fermi type anti-rabies vaccine. Currently EHNRI is working to revolutionize anti-rabies vaccine production by changing the nervous tissue vaccine (Fermi type) to cell culture based vaccine.

*lf* / ns *f* - Gregorian calendar
The important challenge of prevention and control of rabies in the world will require international efforts to increase the availability and use of high quality cell culture rabies vaccines for humans and animals. An important aspect of activities to ensure such availability is the transfer of technologies to developing countries for production of such vaccines. Extending the production of vaccines, using both existing and new manufacturing units, requires that careful attention be given to maintaining high standards of vaccine safety and efficacy by application of appropriate standardization and control procedures. A variety of cell-culture systems are available for the preparation of inactivated rabies vaccines for human or veterinary use. Vaccines produced for human use are inactivated by treatment with beta-Propiolactone for (12).

Transfer of the ability to manufacture improved rabies vaccines for use in animals or humans is dependent on two factors: a commitment by the government of the recipient country to a long-term programme on the prevention and control of rabies and an assurance that appropriate resources are, or will be, available to support production of anti-rabies vaccines for use in animals and humans, at a level necessary to meet national needs. Currently the Ethiopian government has invested heavily in upgrading the facilities required to produce anti-rabies vaccine in keeping with good manufacturing practice (GMP) standards. Government recognizes that rabies is a serious public health problem and vaccine production is one of the strategic focus areas to prevent and control rabies.

The objective of the programme is to establish cell culture based anti-rabies vaccine in Ethiopia for use in animals and humans according to WHO recommendations.

Methods
Vero and Baby Hamster Kidney (BHK)-21 cell lines were used for the manufacturing of anti-rabies vaccine. Vero cell line was initially obtained from the National Polio Laboratory, EHNRI and BHK-21 cell line was donated by the National Veterinary Institute (NVI), Bishoftu, Ethiopia. Evelyn-Rokitnicki Abelson (ERA) and Pasteur Virus (PV) fixed rabies strains were kindly donated by the Centers for Disease Control and Prevention, Atlanta (CDC). Working seed virus was prepared from the master seed virus for the production of the test vaccine. For the determination of rabies virus titer (13) monolayers of Vero cells on 96 well microtiter plates were infected with sample dilutions and incubated at 37°C with 5% CO₂ for 48, 72 and 96 hours respectively. Cells were then fixed in acetone, washed with phosphate buffered saline (PBS) and incubated with FITC-conjugated (fluorescein isothiocyanate) antibodies against rabies virus nucleocapsid protein (Pokrov, Russia) for 1 hour at 37°C.

The microtiter plates were then observed in a fluorescence microscope and the titer expressed as fluorescence focus doses 50% (FFD₅₀) as calculated by the Spearman-Karber method (14).

Production
Production of cell culture based rabies anti-vaccine was achieved using roller bottles. Initially, the multiplicity of infection of the virus was optimized on cell lines.

Results
Vero cells were infected with a multiplicity of infection (moi) of 0.1, 0.01 and 0.001 of ERA or PV virus strains. Rabies virus from the culture samples was then harvested and virus titer (FFD₅₀) determined individually at different incubation periods. Table 1 shows the results of titration of ERA rabies virus strain obtained from cultivation in Vero cells in flasks with different multiplicity of infection doses and incubation periods.
As shown in the above table, a Tissue Culture Infective Dose of 0.01 per cell at 72 hours of incubation was selected as the best titer for use in anti-rabies vaccine production using the PV strain. Large scale production of tissue culture derived anti-rabies vaccine was achieved using ERA and PV virus strain on Vero cell line in roller bottles. Although this method is labour intensive, it requires only modest investment in equipment.

Acknowledgements

We would like to acknowledge Dr. Artem Metlin and Dr. Denis Bankovisky for their technical mentorship. We would also like to acknowledge the Centers for Disease Control and Prevention, (CDC) Atlanta, USA, for their kind donation of rabies virus strains. Lastly, we would like to thank the Ethiopian government for its commitment.

References


Background: Laboratories provide critical test results for disease diagnosis, treatment monitoring and surveillance. Despite their importance, laboratories are often under-resourced (1-4). Quality laboratory services that meet clinical, program and research needs are necessary (3). Laboratory accreditations provide external validation that laboratory services are accurate, reliable and timely (4). Strengthening Laboratory Management Towards Accreditation (SLMTA) was developed by the African Regional Office of the World Health Organization (WHO-AFRO) and its partners in 2009. This program is based on a stepwise recognition system that awards a range of one to five stars (5). Stars are granted based on assessment scores on the WHO AFRO Laboratory Accreditation Checklist. One, two, three, four and five stars are awarded for scores of above 55%, 65%, 75%, 85% and 95%, respectively.

Since 2010, a total of 45 laboratories were enrolled by the Ethiopian Health and Nutrition Research Institute (EHNRI) for participation in the SLMTA program. These laboratories included 6 EHNRI Laboratories, 7 Regional Reference Laboratories, and 32 Hospital Laboratories.

This paper examines the impact of the SLMTA program and onsite support. Major challenges in implementation of improvement projects were also identified.

Methods: The 45 laboratories were divided into 2 cohorts of implementation. For the first cohort in which 24 laboratories participated, SLMTA was implemented from June 2010 to October 2011 (Figure 1).

![Figure 1: Implementation process of SLMTA for the first cohort.](Image)

For the second cohort in which 21 laboratories took part, SLMTA was implemented from January 2011 to May 2012 (Figure 2).

![Figure 2: Implementation process of SLMTA for the second cohort.](Image)
After a baseline assessment, three consecutive trainings were provided to 2 laboratory personnel (laboratory head and quality officer) from each participant laboratory. After each workshop, 4 to 5 improvement projects were implemented by trainees. The improvement projects were assigned based on the gaps identified during the baseline assessment and the content covered in training. For example, improving customer satisfaction, improving proficiency in external quality assessment (EQA), reducing turnaround time (TAT) and reducing equipment downtime were some of the improvement projects.

Onsite support was provided for the implementation of the improvement projects (IPs). Onsite support for the first cohort was provided jointly by EHNRI, the Regions (Health Bureaus and Reference Laboratories) and four University-affiliated Partners (UPs). The four UPs were ICAP-Ethiopia (Columbia University), I-TECH-Ethiopia (University of Washington), JHU-TSEHAI (John Hopkins University), and UCSD-Ethiopia (University of California at San Diego). An average of 67.8 (24 to 80) hours of joint onsite support was provided to the first cohort. To mark the beginning of task shifting, the task of providing onsite support for the second cohort was handed over to the Regions and the four UPs. However, an average of only 2.3 (0 to 24) hours of joint onsite support was provided to the second cohort.

Exit assessment was conducted on 44 of the 45 SLMTA-enrolled laboratories. One of the first cohort laboratories was unwilling to participate in the exit assessment.

Major challenges encountered during implementation of SLMTA were also identified by focused group discussion of workshop participants from the various laboratories.

**Results:** An average of 16.9% (41.2% to 58.1%) and 11% (42.4% to 53.4%) increments in assessment scores were observed for the first and second cohort laboratories, respectively (Figure 3).

During baseline assessment, all of the laboratories in the first cohort and 95% of the laboratories in second cohort were at zero-star level (scored <55%). At the exit assessment, 57% (13 of 23) of the first cohort laboratories and 48% (10 of 21) of the second cohort laboratories attained 1 to 4 star levels. Two, three, and four star levels were achieved by 5, 3, and 1 laboratory, respectively (Figure 4).
Lack of harmonization with hospital reforms, inadequate onsite support, weak management support, inadequate knowledge of quality management systems, insufficient commitment among non-SLMTA-trained staff, and lack of quality management policies and procedures were the most important impediments to SLMTA implementation.

Discussion: The quality improvements of laboratories after enrollment in SLMTA were promising. This finding supports a previous study, which found immediate and tangible improvements following SLMTA training (5).

Classroom training without subsequent onsite support and reinforcement yields limited results (4). It has been shown that supportive site visits play a critical role and improvements would be much better if more extended onsite supports were provided.

From the focus group discussions, we learned that accreditation was not part of planning, budgeting, monitoring and evaluation at RHBs, hospitals and laboratories. Promoting the importance of accreditation is required to create a clear understanding and ownership at all levels (6).

Hospital reforms are underway in public health facilities nationwide, to increase customer satisfaction. Strengthening laboratory quality management should be considered an integral piece of this process. Failure to harmonize could hinder the pace and sustainability of health system reforms and quality improvements (6).

Conclusions: The improvements observed are promising and indicative that, with the proper guidance, laboratory accreditation can be attained within the short to mid-term. Provision of onsite support accelerates the improvement and it is an important part of the SLMTA program. Impediments to SLMTA implementation need to be avoided in order to bring sustained improvements.

Acknowledgment
EHNRI, Regional Health Bureaus, Regional Reference Laboratories, CDC-Ethiopia, ICAP-Ethiopia, I-TECH-Ethiopia, JHU-TSEHAI and UCSD-Ethiopia.

References
Mr. Dawit Assefa is a researcher at the Ethiopian Health and Nutrition Research Institute (EHNRI). He received his B.Pharm. in Pharmacy in 2000 from Addis Ababa University, School of Pharmacy. After four years of service as Head of Pharmacy Department in Mettu Karl Hospital and a year service as an Expert on Drug and Medical Supplies in Oromiya Regional Health Bureau, he was enrolled in graduate studies at Addis Ababa University, earning his M.Sc. in Pharmacoepidemiology and Social pharmacy in 2010. Since his first attachment to EHNRI for his MSc studies, he has been involved in the laboratory accreditation process of national HIV-1 drug resistance testing laboratory. Currently, he is serving as an assistant researcher and principal investigator of HIV-1 drug resistance testing laboratory at EHNRI.

He is currently conducting different researches on HIV-1 drug resistance including HIV-1 drug resistance monitoring survey and threshold survey. He has presented his research works in international conferences and he is a winner of the 16th International Conference on AIDS and STIs in Africa “YOUNG INVESTIGATOR AWARD OF ICASA 2011 IN TRACK A: BIOLOGY AND PATHOGENESIS OF HIV”.

Mr. Dawit Assefa currently serves as a principal investigator of HIV-1 drug resistance testing laboratory (WHO accredited laboratory) in the National HIV Laboratory at Ethiopian Health and Nutrition Research Institute (EHNRI).
This newsletter is intended mainly as a forum for sharing highlights of research findings, surveillance reports or other technical activity reports from work done at EHNRI in collaboration with diverse stakeholders. A wide range of contributions are being solicited in the following areas: infectious and non-infectious diseases, food science and nutrition, traditional and modern drugs, public health emergency management, laboratory quality management systems, production of biologicals and health systems research. Priority will be accorded to work which has national relevance, or work which reflects a significant finding of considerable impact to one or more communities in Ethiopia. Submissions to the newsletter may be review articles addressing specific health issues, progress reports of ongoing research projects, or contributions featuring one or more current issues of interest to public health. In order to showcase the broad range of technical activities which take place at EHNRI, the Scientific Newsletter (SNL) editorial committee has developed guidelines for authors. The scientific newsletter is intended to provide concise information in a relatively condensed manner, hence the proposition by the SNL editorial committee to set a word limit for articles. This is in order to make it possible to accommodate a number of informative articles in each issue of the newsletter representing different fields of work.

All contributions to the newsletter are highly valued but in order to have uniformity and set a standard, four main categories have been identified:

1. **Major article:** not to exceed 2500 words maximum, may incorporate up to 3(or 4) tables or figures and up to 15 references.

2. **Minor article:** not to exceed 1500 words maximum, may incorporate 1 (at most 2) figures or tables and up to 10 references.

3. **Research/project progress briefs:** not to exceed 1200 words maximum (optional to provide tables/figures) and may contain up to 5 references. Contributors may share work from projects which are still ongoing but which have preliminary data to share.

4. **Topical issues/position papers:** not to exceed 750 words. Contributors may share findings/news of interest to the EHNRI scientific community from research or programs conducted at EHNRI and elsewhere.

The first three categories should follow the standard format of scientific paper writing (statement of the problem, methodology, main findings and conclusion). Contributors are kindly requested to keep within the specified word limit and to adhere to other specifications requested.

Manuscripts should be written in English using Microsoft WORD, 12 pt Times New Roman font, and double line spacing (including references and tables) on one side of the paper, with wide margins (at least 3 1/2 cm). Before submitting the typescript, please check and correct the typing, as well as the references and numerical values given in the text. As far as possible, avoid footnotes and abbreviations; if abbreviations are essential they should be defined the first time they occur and used consistently. Main heading within the paper should be clearly distinguished from subheadings.
Guidelines for Contributors to EHNRI’s Scientific Newsletter...

Photos and Slides
Contributors are encouraged to provide their articles with photos depicting results from the research only. For printing, black and white or color paper copies or color slides are preferable. Digital photos of high resolution are acceptable (the resolution should be at least 250–300 dpi).

References
The contributor/s is/are responsible for the accuracy and completeness of his/her bibliography. References must follow the Vancouver style and should be numbered consecutively in the order in which they are first mentioned in the text and listed in numerical order at the end of the article.

(Source: http://en.wikipedia.org/wiki/Vancouver_system)

Ethical Compliance:
Research papers reporting animal or clinical studies should, where appropriate, contain a statement that they have been carried out with animal or human ethics committee approval. Each author should warrant that his or her research institution has fully approved the protocol for all scientific studies involving animals or humans and that all experiments of any kinds were conducted in compliance with ethical and humane principles of research after ethics committee approval.

Newsletter Policy and Copyright
Publishing in the newsletter will not restrict authors from sending their manuscripts to journals of their choosing for publication. Outside of this exception, it is prohibited to reproduce any articles published in EHNRI’s scientific newsletter without the prior knowledge and written consent of the authors and editors. Institutional affiliation should be clearly indicated for all authors. The principal /corresponding author should be clearly identified.

Submission of Articles, Review and Approval Process
Articles should be submitted in electronic version as a MS Word file by email attachment to the Technology Transfer and Research Translation Directorate/Editor-in-Chief or the Scientific Newsletter Publication Committee at scientific-newsletter@ehnri.gov.et. Abstracts are not required.

Manuscripts submitted will be reviewed by the scientific newsletter editorial committee. Manuscript acceptance will be based on the relevance of the contents and the technical quality. Manuscripts containing commercial advertisements will not be published. If the editor should make major changes to the manuscript, the final draft will be sent back to the principal/corresponding author for approval. It is the responsibility of the principal author to ensure that any changes made in the paper have the approval of the remaining authors as well.

Disclaimer
Any opinions which are expressed in articles are solely that of the authors and do not necessarily reflect the views of the SNL editorial committee. Authors shall be solely responsible for the accuracy of all information contained in articles submitted to the scientific newsletter.
The Ethiopian Health and Nutrition Research Institute (EHNRI) is the sole institute playing a role as the technical arm of the Federal Ministry of Health (FMoH) with a mission to protect and promote the health of the nation’s people by addressing priority public health and nutrition problems through problem-solving research, public health emergency management and by establishing and maintaining quality laboratory system.

EHNRI is the result of a merger in April 1995 between the former National Research Institute of Health (NRIH), the Ethiopian Nutrition Institute (ENI), and the Department of Traditional Medicine (DTM) of the Federal Ministry of Health (FMoH). The EHNRI, as a government organization, is the primary body in Ethiopia mandated to carry out research, training and provision of services for the public and organizations in the areas of health and nutrition.

Currently the institute is composed of different sectors dedicated to research and other key public health areas, making it one of its kind in Ethiopia. Eight major directorates are identified, including Health Systems Research Directorate, Infectious and Non-infectious Diseases Research Directorate, Food Science and Nutrition Research Directorate, Technology Transfer and Research Translation Directorate, Vaccine and Diagnostics Production Directorate, Traditional and Modern Medicine Research Directorate, Public Health Emergency Management Directorate, and Regional Laboratory Capacity Building Directorate.

Vision:

To see healthy, productive and prosperous Ethiopians.

Mission

To protect and promote the health of the Ethiopian people by addressing priority public health and nutrition problems through problem-solving research, public health emergency management, establishing and maintaining quality laboratory system.

Contact Us for more information:

Technology Transfer and Research Translation Directorate: EHNRI

P.O. Box 1242 Addis Ababa, Ethiopia
Gulelle Arbegnoch Street
Tel: +251 112 771 499
Email: scientificnewsletter@ehnri.gov.et
Website: www.ehnri.gov.et