The Role of New Technologies in HAT Elimination

Session Date: Saturday, October 27

Session Time: 9:00am – 12:00pm

Session Location: Endymion, 8th Floor

Session Description: In this session we will present the role of new technologies in a data driven effort for elimination of human African trypanosomiais (HAT). HAT has been earmarked for elimination as a public health problem by 2020 and complete interruption of transmission by 2030. This will require concerted efforts towards case finding and epidemiological surveillance. We will present tools based on geographic information systems (GIS) and electronic data capturing that allow rational planning of active and passive case finding activities at district or provincial level, as well as a tool aimed at monitoring progress towards HAT elimination at the global level. The use of electronic data capturing has also made it possible to use pictures and videos for quality assurance purposes. There will be four presentations on tools currently in use, followed by a discussion.

Session Chairs: Albert Picado, Foundation for Innovative New Diagnostics (FIND) Geneva
Paul Verlé, Institute of Tropical Medicine (ITM) Antwerp

Session Rapporteur: Joanna Pritchard

PRESENTATIONS

1. The HAT Atlas: a GIS based system to monitor progress in HAT elimination, Gerardo Priotto, WHO
2. GIS-based data for rational planning of active case finding, Yves Claeys, ITM
3. Using mapping and remotely collected data to adapt passive screening activities, Joseph Ndungu, FIND
4. Digital imaging for external quality assurance, Epco Hasker, ITM

KEY DISCUSSION POINTS

The HAT Atlas: a GIS based system to monitor progress in HAT elimination

Gerardo Priotto of the World Health Organization (WHO) presented an overview of the HAT Atlas and its use by both the global program and national programs. The Atlas consolidates data from National Sleeping Sickness Control Programs, non-governmental organizations, and research institutions into a single global repository for monitoring and advancing progress in HAT elimination. It tracks and displays visually the two primary indicators of global progress, number of cases reported per year, and area at risk reporting more than one case per 10,000 people per year. Case distribution by village from 2000-2017 is captured in the Atlas with an average accuracy of approximately 1.4km. It also monitors villages missed and villages reporting no cases. Area at risk is calculated annually, using incidence by area at risk over a five-year period, measured in number of cases per pixel. It also tracks secondary indicators: geographical extent of the disease, populations at different levels of risk, and proportion of the population at risk covered by surveillance and

interventions. WHO headquarters accepts data from national programs in any format, which has the advantage of placing less stringent requirements on programs, but availability of data is limited by processing time once received. Next steps include improvement of data timeliness and completeness.

At the national level, the WHO has built staff capacity to use the HAT Atlas for monitoring and annual planning in 15 countries through in-person training at the national and province levels as well as through remote training exercises. National programs use the HAT Atlas to produce maps for annual planning, for evaluating active screening activities and for selecting sentinel sites for passive screening and clinical trials. National evaluation and planning for active screening require external technical support, and a protocol for national program staff is currently in development to replace this.

Several issues were raised in discussions of the global monitoring data. There is uncertainty about achieving adequate coverage in foci of infection, and there is a need to determine how to confirm interruption of transmission. There is also a question about what is happening elsewhere in Africa where there is no history of disease but environmental conditions are similar and there are no surveillance activities.

GIS-based data for rational planning of active case finding

Yves Claeys of ITM presented a GIS-based data system for planning active case finding at the province level that was piloted in two health districts of Democratic Republic of Congo (DRC) in 2016-2018. This approach includes two innovations to solve several challenges of the traditional paper-based systems, such as delays, errors, non-standard data, weak monitoring of screening activities in real-time, suboptimal allocation of screening teams, and possible under-reporting.

The digital data capture and interactive planning tool permits rapid, flexible planning and resource allocation before and during the screening activities. It follows WHO guidelines for active screening. The tool also supports analysis of case data to detect patterns and to inform phase-out of active screening and improves the quantity and quality of data (standardized location data, increased demographic data, and data on absentees). Program staff are very happy with the system because it is user-friendly, powerful, and customizable. The project also introduced “mini teams” that travel by motorcycle and conduct door-to-door screenings to supplement traditional teams. They have the same screening capacity as traditional teams with fewer staff. In combination, the digital technology and mini-teams have facilitated a robust improvement in data completeness and timeliness, more efficient use of resources, and capacity to easily create, monitor, and adapt work plans. Planned next steps include integration in the system of vector control activities.

A number of issues were raised in discussions of active screening. As case counts drop to historic lows, active screening programs need to increase operational efficiency, increase coverage of infection sites (not only where cases were identified), assess data needs, and effectively communicate to donors the benefits of new approaches and better tools. Specific issues raised included the timeliness, completeness, and quality of data at all levels; the ability of national programs to manage and monitor programs efficiently; the need for more information on sites of infection and how to reach at-risk populations who miss screenings; and the need to adapt the targeting strategy.

Using mapping and remotely collected data to adapt passive screening activities

Joseph Ndung'u of FIND presented an innovative approach to scaling up passive screening using mapping and short messaging service (SMS). As the prevalence of HAT declines, passive screening will become more important and needs to scale up significantly. Currently, however, despite the availability of new diagnostic tests for Gambian HAT (gHAT), less than 5% of health facilities are involved in diagnosing gHAT. The project employed mapping and mobile phones in new ways and developed an algorithm to guide the implementation of screening to strategically located health facilities.

Mapping was used to identify underserved areas and strategically located facilities and sites where infection could have occurred. This information facilitated decisions on the best use of facilities. Interventions based on the mapping data substantially increased coverage: distance to screening with rapid diagnostic tests (RDTs) was reduced from 23km to 2.5km and distance to microscopy was reduced from 23km to 12.5km. Use of mobile phones for data capture, data transfer, requests for data, and reminders to patients permitted more rigorous, timely, and efficient program management and monitoring. The resulting data improvements enabled programs to monitor cases, coverage, and supply chain issues more effectively; to plan reactive screening; and to adapt to changing disease dynamics and population movements.

Refugees and internally displaced people (IDP) are difficult to reach while moving from one place to another, whereas refugee settlements provided an opportunity to treat those who were formerly scattered widely in insecure areas. However, if the refugees integrate into the host community it may become necessary to actively screen the entire community. Sometimes outreach to refugees and IDPs requires different partners to implement; in the pilot, the South Sudanese ministry of health was able to reach IDP settlements.

One issue raised was the capacity of peripheral health structures to add services without additional resources. Cases were cited where services are not offered due to insufficient resources. This can be exacerbated when other disease programs provide additional funds to provide disease-specific services. In the FIND-supported projects, staff did not see the additional tests as a great burden and used them when available. With the RDT the staff do not receive any additional incentive.

Digital imaging for external quality assurance

Epco Hasker of ITM presented a new digital imaging tool for quality assurance in HAT diagnostics. Accuracy of diagnostics is critical for program efficiency and monitoring, but quality assurance exercises in malaria, tuberculosis, and HAT have demonstrated that results of microscopy under routine conditions are not always reliable. The project developed and tested a tool for external quality assurance of microscopy making use of digital imaging. Thus, it was possible to overcome the limitation that the most sensitive diagnostic procedures for HAT rely on visualizing live trypanosomes, as a result of which slides cannot be stored for external quality control.

The system uses a USB camera and tablet for digital imaging and electronic data capture. The user takes videos of all positive confirmation tests and a sample of negatives, as well as pictures of a sample of card agglutination test for trypanosomiasis (CATT) and/or RDT positives and negatives. A built-in algorithm in the app indicates when a picture or video is required. Pictures and videos are uploaded to the server for remote quality assessment. The system is part of the larger data capturing system that was developed and piloted in the TrypElim project in two districts of DRC and is now ready for scale-up.

KNOWLEDGE GAPS IDENTIFIED

Global monitoring

- How should the active screening algorithm be modified to target sites of infection more specifically?
- What information is needed in order to understand where infection is taking place?
- How can national programs ensure that all appropriate data are reported to them?
- How should national programs address population movements into or out of areas at risk?
- How should the global program assess what is happening outside program areas?
- Why does the disease appear in one village and not another with similar risk factors?
- How does the program confirm that zero cases means zero transmission?
- What is the impact of larger social, economic, and environmental changes on the disease (e.g., changes in climate, habitat and human behavior patterns)?

Active screening

- Digital solutions for data collection, planning, and diagnosis increase program efficiency and accuracy, but what is needed to scale them up?
- How will programs support the use of hi-tech tools in harsh and remote settings?
- Where can programs obtain reliable and accurate geographic information?
- How might the program convey to donors the strategic benefits of investing in new digital tools?
- How should programs coordinate with vector control interventions?
- How does the program increase community participation in active screening and follow up on absentees?
- How will programs serve mobile populations more effectively?

Passive screening

- In the FIND-supported projects, the facilities provided the additional services but there are examples where this does not take place without additional financial resources. What determines implementation of additional HAT services by fixed health facilities?
- What opportunities are there to save time and costs in passive screening, such as multiplex diagnostic tools?
- Are there other pressing health problems in the target areas that can be addressed jointly with HAT programming to increase efficiency and buy-in?

RECOMMENDED NEXT STEPS

1. *Scale up digital solutions in the field*
    a. How can the economic and strategic advantages of digital tools be communicated effectively to donors?
    b. What operational steps are needed to scale up digital data tools globally?
    c. How will training and implementation be effectively scaled up across programs?
    d. What are the logistical challenges of managing the instruments in difficult, remote settings, and what do programs need to address them?
    e. How can such digital platforms be harmonized with the HAT Atlas?

f. What existing sources of reliable geographic information could be leveraged by the programs (GPS coordinates, place names, and populations)?

2. *Research sociocultural determinants of participation*
    a. What are the daily/weekly/seasonal activities of the populations in need of active screening, and how could screening activities be organized to become more convenient and accessible?
    b. What perceptions in the community cause low turnout for active screening, examining in particular the effects of stigma and perceived lack of risk?
    c. What information would convince non-compliant individuals/communities to participate and how should the information be packaged and disseminated to be most effective?
    d. What are the best practices for reaching refugees and IDPs?

3. *Research program sustainability*
    a. Research the factors affecting adoption of tools and provision of services
        i. What determines whether program staff will continue using the digital technology for program management and continue screening according to the (passive screening) protocol?
        ii. What are the appropriate time horizons?
    b. Research the options currently available or in the pipeline to provide time and cost savings through:
        i. A multiplex diagnostic tool
        ii. Eliminating the need for a confirmation test
    c. Research the options for combining HAT tools with tools that address other health problems that are more pressing needs in the area.

4. *Assess and adapt the overall screening strategy for improved coverage*
    a. What information would help programs identify and target interventions towards site of infection, such as additional indicators on patient history?
    b. How should this information be collected, and how will the program operationalize this?
    c. How can areas with insufficient coverage be specifically addressed? Would a global map highlighting insufficient coverage in the past five years help target interventions?
    d. What is needed to develop standard recommendations/guidelines on reaching mobile populations such as refugees, IDPs, and seasonal migrants?
        i. What lessons from the FIND-supported projects (and potentially other programs) can be developed into guidelines?
        ii. Would it be useful to map mobile populations not served by existing programs but vulnerable to disease?
    e. How can the current algorithm for active screening interventions be modified to:
        i. Focus more attention on site of infection
        ii. Include a standard approach to mobile populations?

5. *Research transmission inside and outside program areas*
    a. Why does disease appear in some places and not in others with apparently identical conditions?
    b. Are current methods able to predict disease based on local conditions (e.g., modelling, risk mapping)? If not, what methods can be developed?
    c. How can these methods help us foresee the impact of changes in conditions due to climate, economics, and human behavior?
    d. How is interruption of transmission confirmed?