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# An Overview of GEOEPID: A Software Application to Assist Communicable Disease Surveillance in Georgia

*May 2006*

Developed by:

**Anton Luchitsky, MD**
PATH

**Galina Romanyuk, MD**
PATH

*For:*

Partners for Health Reform*plus*

*In cooperation with:*

Ministry of Labor, Health and Social Affairs of Georgia

National Center for Disease Control

Curatio International Foundation

Ministry of Labor, Health and Social Affairs
Public Health Department
National Center for Disease Control and Medical Statistics

Curatio International Foundation

This document was produced by PHR*plus* with funding from the US Agency for International Development (USAID) under Project No. 936-5974.13, Contract No. HRN-C-00-00-00019-00 and is in the public domain. The ideas and opinions in this document are the authors' and do not necessarily reflect those of USAID or its employees. Interested parties may use the report in part or whole, providing they maintain the integrity of the report and do not misrepresent its findings or present the work as their own. This and other HFS, PHR, and PHR*plus* documents can be viewed and downloaded on the project website, www.PHRplus.org.

Abt Associates Inc. ■ 4800 Montgomery Lane, Suite 600
Bethesda, Maryland 20814 ■ Tel: 301/913-0500 ■ Fax: 301/652-3916

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- *Delivery of quality services by health workers.*
- *Availability and appropriate use of health commodities.*

**May 2006**

**Recommended Citation**

Anton Luchitsky and Galina Romanyuk. May 2006. *An Overview of GEOVAC: A Software Application to Assist Communicable Disease Surveillance in Georgia.* Bethesda, MD: The Partners for Health Reform*plus* Project, Abt Associates Inc.

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**Contract/Project No.:** HRN-C-00-00-00019-00

**Submitted to:** USAID/Caucasus

and: Karen Cavanaugh, CTO
Health Systems Division
Office of Health, Infectious Disease and Nutrition
Center for Population, Health and Nutrition
Bureau for Global Programs, Field Support and Research
United States Agency for International Development

# Abstract

This overview describes the GEOEPID software application, a tool designed to help personnel of Georgia's National Center for Disease Control in Georgia and regional-level Centers of Public Health to process a large flow of disease surveillance-related data in much less time than the previous (manual) system. It allows them to quickly identify long-term and short-term trends in communicable disease morbidity and mortality, to characterize and compare the epidemiological situation with regard to various diseases in each region and in the country as a whole, to analyze distribution of cases by age group, to assess adequacy of laboratory confirmation, and most importantly to assess the impact of preventive and outbreak response actions and measures to improve disease surveillance system in general. In doing so, GEOEPID gives health workers more time to focus on the utilization of surveillance data for management and disease outbreak response purposes.

The GEOEPID software has been tested in the pilot region of Imereti, and numerous revisions and suggestions have been incorporated into the second version, which is now being used nationwide.

This overview illustrates GEOEPID functions, relating them to the features of the upgraded Georgian communicable disease surveillance system and demonstrating what GEOEPID can offer public health in the decision-making process. The paper is designed primarily for policymakers in countries planning to strengthen their disease surveillance systems, for donor organizations that can support such reforms, and for agencies working in these technical areas. It can also help policymakers and health workers in Georgia to plan and implement similar reforms in other sectors of the health care system.

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# Acronyms

| | |
|---|---|
| **CPH** | Center for Public Health |
| **IT** | Information Technology |
| **MoLHSA** | Ministry of Labor, Health and Social Affairs |
| **MB** | Megabyte |
| **NCDC** | National Center for Disease Control |
| **PC** | Personal Computer |
| **PHR*plus*** | Partners for Health Reform*plus* Project |
| **RAM** | Random Access Memory |
| **USAID** | United States Agency for International Development |

# Contributors

The second edition of the GEOEPID software application has been developed based on the numerous comments, ideas, and suggestions of the Ministry of Labor, Health and Social Affairs (MoLHSA) Expanded Working Group, headed by Dr. P. Imnadze, Director of the National Center for Disease Control (NCDC), Levan Baramidze, Health of the Public Health Department, and Curatio International Foundation.

The working group also included the following:

| | |
|---|---|
| *Levan Baramidze* | Head of the Public Health Department, MoLHSA |
| *Paata Imnadze* | Director, NCDC |
| *Shota Tsanava* | Deputy Director, NCDC |
| *Levan Baidoshvili* | Deputy Director, NCDC |
| *Khatuna Zakhashvili* | Chief of the Surveillance Unit, NCDC |
| *Manana Tsintsadze* | Deputy Director, NCDC |
| *Marina Shakh-Nazarova* | Chief of the Data Analysis & Presentation Unit, NCDC |
| *Rusudan Chlikadze* | Surveillance Unit, NCDC |
| *Ketevan Sanadze* | Surveillance Unit, NCDC |
| *Tsiuri Tushishvili* | Surveillance Unit, NCDC |
| *Robizon Tsiklauri* | Chief Specialist of the Epidemiological Control Division, Public Health Department, MoLHSA |
| *Kote Gvetadze* | Director, Kutaisi Regional Center for Public Health |
| *Lia Shekiladze* | Head of the Epidemiology Dept., Kutaisi Regional CPH |
| *Dali Kobuladze* | Deputy Director in Epidemiology, Kutaisi Regional CPH |

# Acknowledgments

The MoLHSA of Georgia and the authors of this document are grateful to the *U.S. Agency for International Development (USAID/Caucasus)* for the opportunity to realize plans on elaboration and introduction of the software application for the upgraded disease surveillance system in Georgia as well as for the opportunity to develop and produce this document.

The authors would like to thank Paata Imnadze and Khatuna Zakhashvili at the *National Center for Disease Control,* and Levan Baramidze at the *Ministry of Labor, Health and Social Affairs in Tbilisi* for their support in the design and implementation of the communicable disease surveillance system; Ivdity Chikovani, Mamuka Djibuti, and Keti Goguadze of the *Curatio International Foundation* for their contribution to the design and the development of both the information system and the software application; and Lynne Miller Franco of the *Partners for Health Reformplus Project* for the technical review of this publication.

The production of this software application was funded by USAID under the prime contract No. HRN-C-00-00-00019-00 and subcontract No. 02-011-HPSS-7544.

The data shown in forms and graphs in this publication are not associated with real institutions and are used for illustrative purposes only.

# 1. Introduction

The software application GEOEPID (Georgia Epidemiological Surveillance) is a supplement to the infectious disease surveillance system in Georgia that helps health workers at the National Center for Disease Control and regional[1] Centers of Public Health to do the following:

- Process a large flow of disease surveillance data in a timely manner. The application contains more than 70,000 formulas to provide an insight into various aspects of the operation of the country's surveillance program.
- Quickly draw the public health manager's attention to regions or districts with threatening epidemiological situations or suboptimal program performance and specify the nature of the problem.
- Assess the performance of the laboratory service in various regions and districts with respect to testing and confirmation of priority infectious disease.
- Assess the impact of case/outbreak control actions and performance improvement measures.
- Present information in a suitable form for decision making and for feedback to health workers at lower levels.
- Store the data electronically for future reference.

A two-year test of GEOEPID in Georgia has proved this tool to be invaluable, as it allows a contemporary analysis of epidemiological and surveillance program data. Apart from the fact that it would be extremely difficult for such a comprehensive analysis to be done manually within a reasonable timeframe (more than 1,000 calculations are required monthly), health workers at the central and regional levels in Georgia no longer believe that a manual exercise of this sort represents the best use of their professional time, because information technology has become widely available at these levels.

GEOEPID also fulfills Georgia's need for a standardized surveillance data processing tool for use throughout the national health system; thus, it obviates the development of non-standardized information technology (IT)-based tools that some individual institutions had begun to create.

Once Georgia develops an integrated IT solution for the country's entire health information system, GEOEPID data can be seamlessly integrated with other health data on a new platform.

This document gives an overview of GEOEPID: It describes systems requirements, data entry procedures, and outputs produced on a routine basis. It also relates GEOEPID functions to the

[1] The GEOEPID application for the district level is being introduced in 2006, too.

features of the upgraded Georgian disease surveillance system and demonstrates what it can offer public health managers in the decision-making process.

As such, the document is intended to give countries ideas for how to create their own software systems. It is thus directed primarily at policymakers in countries planning to strengthen their surveillance systems, donor organizations that can support such reforms, and agencies working in these technical areas.

# 2. System Requirements

The GEOEPID system requirements are minimal. Users must have a Pentium-class computer with at least 64 MB RAM and 100 MB free disk space. Any computer manufactured in 1999 or later will meet these requirements.

Users also must have Excel (Excel-97 or a newer version) installed on their computers, because GEOEPID is based on the Excel platform and contains Visual Basic for Applications program code.

Excel was chosen because it meets the following criteria:

- It is part of the Microsoft Office package, widely available and used in Georgia.
- It is simple, reliable, and virus-resistant.
- It does not require support of skilled programmers.
- It can be modified and new modules can be easily added.
- The database is easy to store and archive.
- The graphics presentation function built into Excel helps utilize the data in the decision-making process.

GEOEPID maintenance skills (largely the capacity to use advanced Excel functions) have been successfully transferred to the surveillance program personnel in Georgia and, in fact, the Georgian language version of the application is currently in use in the country.

# 3. Data Entry

Data from district-level disease morbidity and mortality reports are entered on a monthly basis into the database at the regional centers of public health by an assistant epidemiologist or a PC operator. Data entry usually takes no more than two hours per region per month.

The GEOEPID application makes full use of standard Excel features for verifying data accuracy and protecting the database from accidental mistakes, such as:

- Data validation
- Automatic verification of totals
- Conditional formatting of data entered

After data entry, regional public health managers can immediately begin analyzing the dataset. A summary regional report is generated instantaneously and can be e-mailed to the National Center for Disease Control.

# 4. GEOEPID Output

The GEOEPID standard automatic output files include the following reports:

- Monthly and annual summary reports on infectious disease morbidity and mortality
- Tables and graphs permitting analysis of epidemiological data by time
- Tables and graphs permitting analysis of epidemiological data by place
- Tables and graphs permitting analysis of epidemiological data by age (with an additional sub-analysis by place)
- Tables and graphs on laboratory testing and confirmation of infectious diseases

The information in all GEOEPID output (report or analytical) files is derived from the database and is protected from manual changes to preclude tampering with output numbers.

The standard Excel conditional formatting function helps to quickly identify issues requiring prompt attention of the manager.

The following sections describe the GEOEPID output in more detail and illustrate many of the GEOEPID functions for both regional and national levels.

## 4.1 Summary Reports on Infectious Disease Morbidity and Mortality

The monthly and annual summary reports (produced both at regional and national level) are generated from the entry of individual district summary reports and contain information about the number, age breakdown, and laboratory testing and confirmation of cases and deaths of reportable infectious diseases.

The picture below illustrates a monthly report for the national level.

| Infectious and parasitic diseases morbidity and mortality | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Georgia | | March | | | | | | | 2006 | | | | DEATHS |
| Disease/age group | ICD-X Code | <1 | 1-4 | 5-14 | 15-19 | 20-29 | 30-59 | 60 and more | TOTAL CASES | LAB TESTED | LAB CONFIRMED | TOTAL CONFIRMED | |
| Diphtheria | A36 | | 1 | | | | | | 1 | 1 | 1 | 1 | |
| Pertussis | A37 | 4 | 5 | 1 | 1 | | | | 11 | | | | |
| Measles | B05 | 5 | 19 | 63 | 14 | 4 | 5 | | 110 | | | | |
| Rubella | B06 | 16 | 15 | 33 | 2 | 1 | | | 67 | 1 | 1 | 1 | |
| Mumps | B26 | | 1 | | | | | | 1 | | | | |
| Acute Viral Hepatistis A | B15 | | 7 | 40 | 16 | 16 | 8 | | 87 | 72 | 72 | 75 | |
| Acute Viral Hepatitis B | B16 | | | | 6 | 3 | 8 | 2 | 19 | 19 | 19 | 19 | |
| Acute Viral Hepatistis C | B17.1 | | | 1 | | 6 | 10 | 1 | 18 | 18 | 18 | | |
| Acute Viral Hepatitis E | B17.2 | | | | | | | | | | | | |
| Typhoid fever | A01 | | | | | 1 | | | 1 | 1 | 1 | | |
| Paratyphoid A, B, C fever | A01.1-4 | | | | | | | | | | | | |
| Other salmonellosis | A02 | 2 | 1 | | | | 2 | | 5 | 5 | 5 | | |
| Shigellosis | A03 | | 5 | | | | 1 | | 6 | 6 | 6 | | |
| Other intestinal bact. infections | A04 | 16 | 25 | 2 | 2 | 1 | 6 | 5 | 57 | 51 | 51 | | |
| of them Esherichiosis | A04.4 | 9 | 14 | 2 | | 1 | 5 | 4 | 35 | 35 | 35 | | |
| Yersiniosis | A04.6 | | | | | | | | | | | | |
| Foodborne Bacterial Intoxications | A05 | | 11 | 8 | 8 | 16 | 31 | 11 | 85 | 7 | 5 | | |
| of them Botulism | A05.1 | | | | | 2 | 2 | | 4 | 2 | 2 | | 1 |
| Amebiasis | A06 | | | | 1 | 1 | 1 | 1 | 4 | 4 | 4 | | |
| Unspecified inf diarrheal diseases | A09 | 90 | 161 | 61 | 23 | 34 | 69 | 25 | 463 | 372 | | | |
| Brucellosis | A23 | | | | | | 1 | | 1 | 1 | 1 | | |
| Meningococcaemia | A39.2 | | | 2 | | 1 | | | 3 | 3 | 3 | | |
| Meningitis total | | | 1 | 2 | | 1 | | 1 | 5 | 5 | 3 | | |
| Meningococcal meningitis | A39.0 | | | 1 | | | | | 1 | 1 | 1 | | |
| Hib meningitis | G00.0 | | | | | | | | | | | | |
| Pneumococcal meningitis | G00.1 | | | | | | | | | | | | |
| TB meningitis | A17.0 | | 1 | | | | | | 1 | 1 | 1 | | 1 |
| Other bacterial meningitis | | | | | | | | | | | | | |
| Malaria | B50-54 | | | | 1 | 1 | | | 2 | 2 | 2 | | |
| Leishmaniasis | B55 | 2 | 5 | 1 | | 1 | 3 | | 12 | 12 | 12 | | |
| Acute Respiratory Infections | J00-J06 | 3820 | 6999 | 12076 | 1799 | 1956 | 3070 | 2500 | 32220 | 193 | 193 | | |
| Influenza | J10-J11 | 181 | 386 | 905 | 401 | 488 | 640 | 506 | 3507 | 216 | 210 | | 1 |
| Hospitalized cases of ARI and influenza | J- 06.3; 22; 10; 10.1; 11; 11.1; 12; 12.1; 12.2; 12.8; 18. | 11 | 43 | 26 | 7 | 10 | 16 | 5 | 118 | 1 | 1 | | |

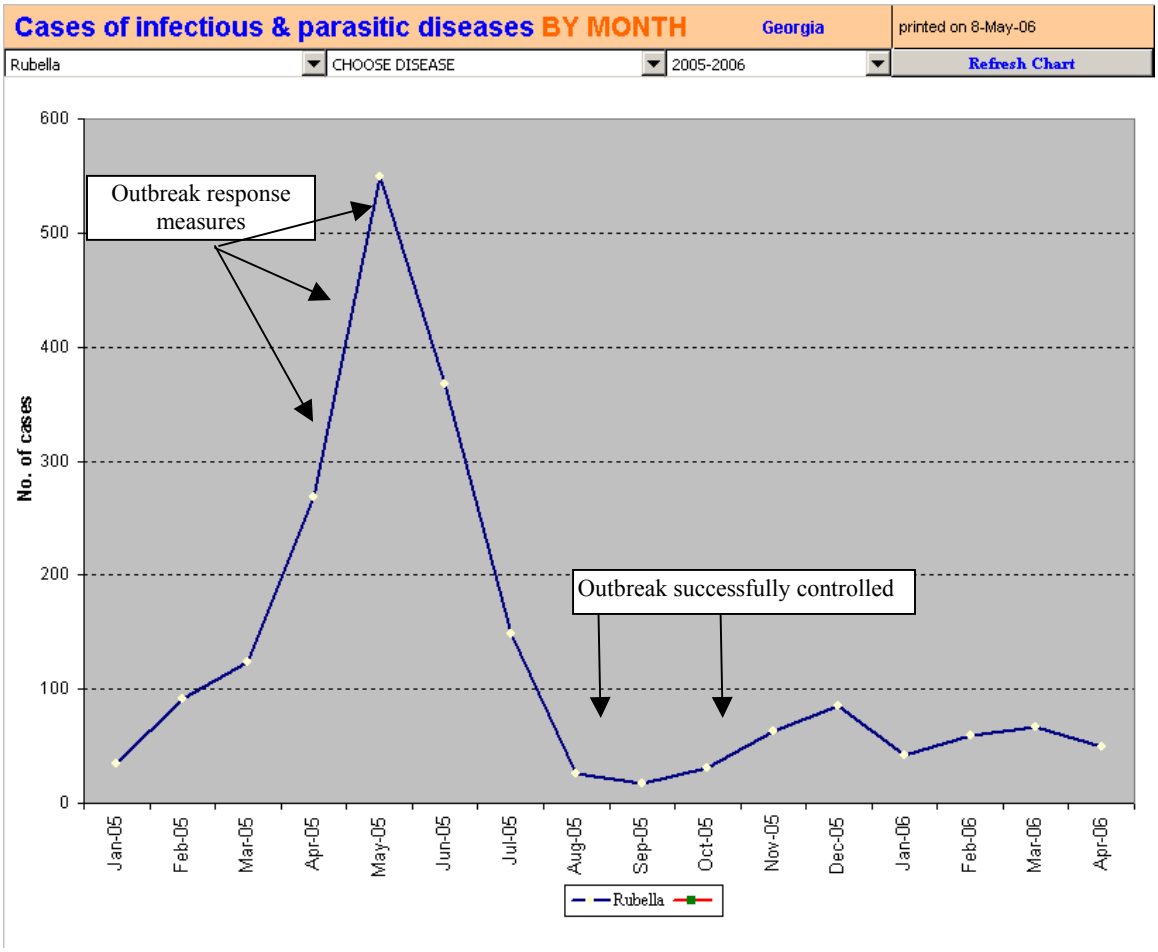
Press here to see of all fatal cases this month (data refreshed every time the button is pressed)

| Disease/age group | | <1 | 1-4 | 5-14 | 15-19 | 20-29 | 30-59 | 60 and more | TOTAL CASES | LAB TESTED | LAB CONFIRMED | TOTAL CONFIRMED | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Botulism | A05.1 | | | | | | 1 | | 1 | 1 | 1 | 1 | |
| TB meningitis | A17.0 | | 1 | | | | | | 1 | 1 | 1 | 1 | |
| Influenza | J10-J11 | | | 1 | | | | | 1 | 1 | 1 | 1 | |

## 4.2 Tables and Graphs Permitting Analysis of Epidemiological Data by Time

Monitoring of disease occurrence over time in various territories helps public health managers ***promptly identify abrupt changes in the epidemiological situation that signal the need for additional investigation and institution of large-scale outbreak control and disease prevention measures***. The graph on the following page depicts an outbreak of rubella, and allows for the implementation of the following control measures:

- Isolation of cases
- Identification and immunization of susceptible persons
- Counseling and testing of pregnant women
- Outreach health education in affected communities



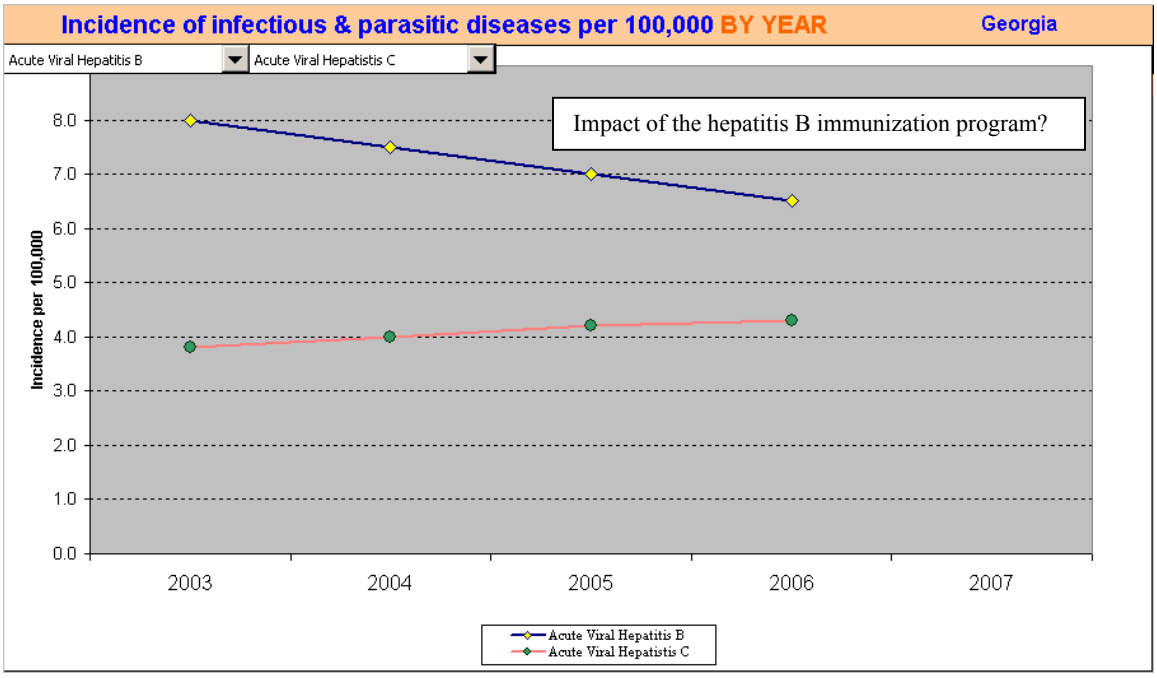

- Establishing active congenital rubella syndrome surveillance
- Graphs like this can be used for advocacy purposes to obtain addition resources that are often needed to implement the entire spectrum of recommended response measures.
- Public health managers can also easily ***evaluate the effectiveness of case/outbreak control actions*** to determine if a change of strategy and/or additional resources are needed.
- GEOEPID also presents infectious diseases morbidity in tables that give a snapshot of epidemiological situation for all reportable diseases. An example follows.

**Cases of infectious and parasitic diseases BY MONTH**

| Georgia | 2005 | | | | | | | | | | | | 2006 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Period 2005-2006 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Diphtheria | | 1 | 1 | 2 | 1 | | | | | 1 | 1 | 3 | 1 | | 1 | | | | | | | | | |
| Pertussis | 4 | 9 | 4 | 11 | 13 | 16 | 20 | 17 | 21 | 22 | 11 | 16 | 11 | 11 | 11 | | | | | | | | | |
| Measles | 97 | 131 | 127 | 200 | 188 | 139 | 89 | 39 | 42 | 20 | 46 | 39 | 42 | 53 | 110 | | | | | | | | | |
| Rubella | 35 | 91 | 124 | 269 | 549 | 368 | 148 | 26 | 17 | 31 | 63 | 85 | 42 | 59 | 67 | | | | | | | | | |
| Mumps | 3 | 7 | 5 | 18 | 15 | 9 | 6 | 2 | 11 | 7 | 14 | 14 | 7 | 3 | 1 | | | | | | | | | |
| Acute Viral Hepatistis A | 86 | 106 | 80 | 64 | 43 | 37 | 25 | 50 | 48 | 111 | 118 | 114 | 129 | 122 | 87 | | | | | | | | | |
| Acute Viral Hepatitis B | 33 | 20 | 20 | 16 | 35 | 24 | 31 | 29 | 30 | 30 | 19 | 20 | 14 | 23 | 19 | | | | | | | | | |
| Acute Viral Hepatistis C | 7 | 12 | 21 | 14 | 11 | 16 | 21 | 22 | 14 | 20 | 13 | 8 | 12 | 17 | 18 | | | | | | | | | |
| Acute Viral Hepatitis E | | | | | | | | | | | | | | | | | | | | | | | | |
| Typhoid fever | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| Paratyphoid A, B, C fever | | | | | | | | | | | | | | | | | | | | | | | | |
| Other salmonellosis | 10 | 8 | 8 | 30 | 17 | 66 | 29 | 47 | 33 | 16 | 8 | 1 | 3 | 3 | 5 | | | | | | | | | |
| Shigellosis | 15 | 10 | 15 | 50 | 63 | 16 | 16 | 16 | 29 | 33 | 37 | 12 | 20 | 12 | 6 | | | | | | | | | |
| Other intestinal bact. infections | 76 | 80 | 40 | 88 | 97 | 171 | 86 | 74 | 103 | 112 | 61 | 42 | 54 | 71 | 57 | | | | | | | | | |
| of them Esherichiosis | 54 | 58 | 65 | 66 | 64 | 143 | 73 | 46 | 76 | 75 | 44 | 24 | 41 | 56 | 35 | | | | | | | | | |
| Yersiniosis | | | 30 | | | | | 1 | | 1 | | | | | | | | | | | | | | |
| Foodborne Bacterial Intoxications | 22 | 21 | 23 | 31 | 36 | 68 | 115 | 137 | 76 | 98 | 55 | 50 | 58 | 75 | 85 | | | | | | | | | |
| Botulism | | 2 | 2 | 1 | | | 1 | | 2 | 2 | 3 | 12 | 5 | 7 | 4 | | | | | | | | | |
| Amebiasis | | 1 | 1 | | 1 | 1 | 4 | | 5 | | | | 4 | 1 | 4 | | | | | | | | | |
| Unspecified inf diarrheal diseases | 464 | 522 | 557 | 559 | 612 | 602 | 730 | 952 | 913 | 661 | 415 | 401 | 323 | 371 | 463 | | | | | | | | | |
| Brucellosis | 2 | 2 | 9 | 10 | 17 | 15 | 35 | 3 | 7 | 12 | | 16 | | 2 | 1 | | | | | | | | | |
| Meningococcaemia | | | | | | | | | | | | | 1 | 1 | 3 | | | | | | | | | |
| Meningitis total | | | | | | | | | | | | | 1 | 2 | 5 | | | | | | | | | |
| of them N. meningitids | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| Haemophilus Influenza B | | | | | | | | | | | | | | | | | | | | | | | | |
| S.pneumoniae | | | | | | | | | | | | | | | | | | | | | | | | |
| M tuberculosis | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| other bacterial menigitis | | | | | | | | | | | | | | 2 | | | | | | | | | | |
| Malaria | 1 | 1 | 2 | 10 | 16 | 21 | 34 | 23 | 10 | 2 | | | | | 2 | | | | | | | | | |
| Leishmaniasis | 13 | 11 | 14 | 20 | 17 | 13 | 15 | 11 | 12 | 3 | 5 | 10 | 9 | 9 | 12 | | | | | | | | | |
| Acute Respiratory Infections | 11,436 | 15,428 | 15,786 | 19,732 | 15,605 | 14,614 | 12,899 | 11,228 | 15,529 | 19,676 | 21,011 | 22,323 | 20,255 | 21,410 | 32,220 | | | | | | | | | |
| Influenza | 1,546 | 2,045 | 1,954 | 1,697 | 1,256 | 830 | 507 | 526 | 736 | 833 | 992 | 1,274 | 1,644 | 1,582 | 3,507 | | | | | | | | | |
| Hospitalized cases of ARI & Infl | 1 | | 76 | 45 | 72 | 55 | 28 | 62 | 47 | 15 | 9 | 59 | 20 | 17 | 118 | | | | | | | | | |

Investigation required

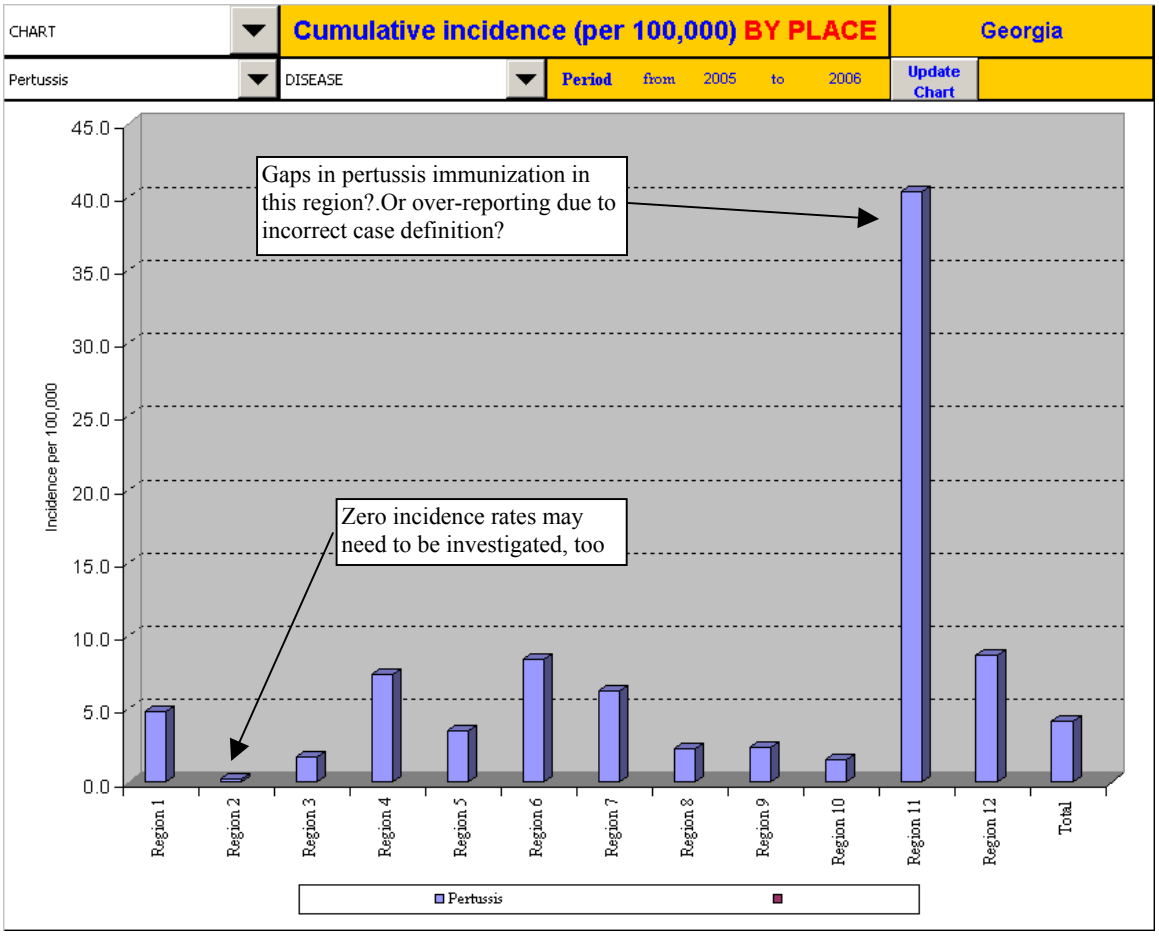
Finally, ***analysis of long-term disease trends*** is useful for a number of strategic and policy decisions, such as optimization of existing laws/regulation/procedures, introduction of new vaccines, budgeting of existing program funds, selecting topics for training, and assessing the impact of policy changes and advocacy for additional funds.



## 4.3 Tables and Graphs Permitting Analysis of Epidemiological Data by Place

Analyzing data according to place by comparing incidence rates can help determine why and how a disease is spreading. The analysis can help managers identify "high-risk" areas that require priority attention and help them advocate for the most rational allocation of resources for corrective and prophylactic measures.

Zero or low incidence rates may be indicative of poor health worker adherence to existing case detection and reporting requirements, which would also need to be corrected.




Disease incidence information can be also displayed in a table, which is a useful way to see incidence rates of various reportable diseases in one place (see below).

**Infectious and parasitic diseases morbidity (per 100,000) BY PLACE** — Georgia

Cumulative incidence by place (table) | Period | Refresh | from 2005 to 2006

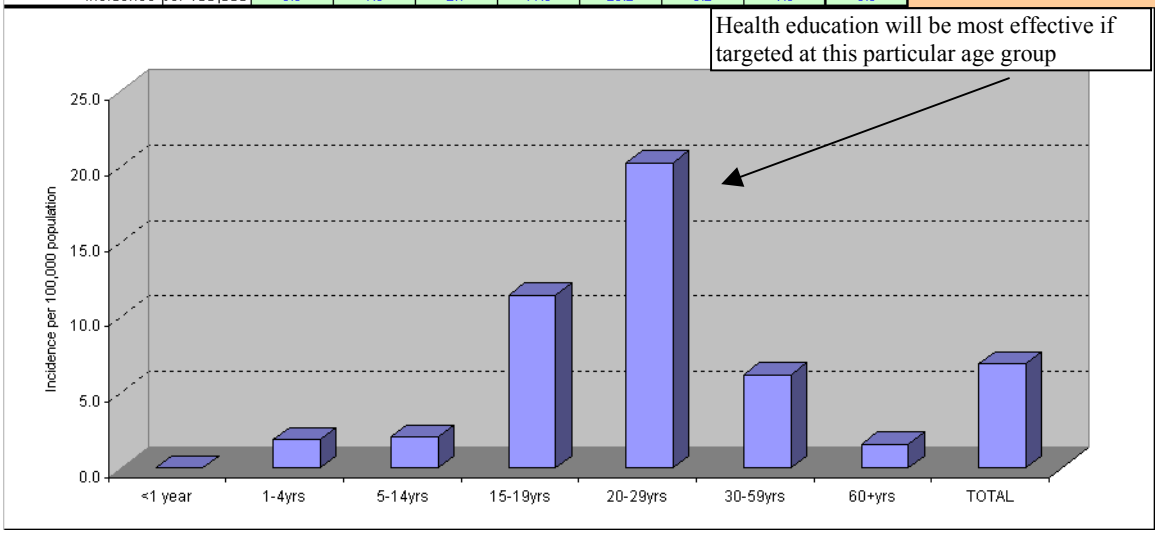
| DISEASE | Adjara | Kakheti | Imereti | Samegrelo | Shida Kartli | Kvemo Kartli | Guria | Tbilisi | Samtskhe-Javakheti | Mtskheta-Mtianeti | Racha - Lechkhumi | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diphtheria | 0.8 | | | | | 0.2 | 0.7 | 0.6 | | 0.8 | | | **0.3** |
| Pertussis | 5.9 | 0.2 | 2.0 | 7.7 | 3.5 | 8.8 | 7.0 | 2.4 | 2.4 | 1.5 | 40.3 | 8.7 | **4.4** |
| Measles | 8.5 | 21.4 | 9.5 | 24.0 | 76.7 | 44.8 | 7.0 | 40.4 | 21.2 | 34.7 | 26.2 | 52.1 | **30.7** |
| Rubella | 65.5 | 11.8 | 36.3 | 12.6 | 38.8 | 27.3 | 15.3 | 87.8 | 18.8 | 43.1 | 2.0 | 37.9 | **44.5** |
| Mumps | 1.9 | 0.7 | 3.3 | 1.2 | 2.2 | 2.0 | 0.7 | 4.5 | | 5.4 | | 7.9 | **2.7** |
| Acute Viral Hepatistis A | 76.1 | 49.8 | 23.8 | 6.7 | 56.4 | 5.0 | 0.7 | 26.1 | 10.1 | 6.9 | 20.2 | 10.3 | **27.5** |
| Acute Viral Hepatitis B | 15.4 | 8.6 | 7.6 | 4.9 | 5.4 | 4.4 | 25.8 | 9.0 | 2.9 | 2.3 | 2.0 | 10.3 | **8.2** |
| Acute Viral Hepatistis C | 5.3 | 4.2 | 5.4 | 6.7 | 2.5 | 5.2 | 3.5 | 5.9 | 1.0 | 2.3 | | 12.6 | **5.1** |
| Acute Viral Hepatitis E | | | | | | | | | | | | | |
| Typhoid fever | | | | | 0.3 | | | | | | | | **0.0** |
| Paratyphoid A, B, C fever | | | | | | | | | | | | | |
| Other salmonellosis | 0.3 | 1.2 | 1.3 | 2.0 | 3.2 | 17.5 | | 12.2 | 4.3 | 13.1 | | 4.7 | **6.4** |
| Shigellosis | 0.5 | 1.0 | 10.6 | 17.8 | 4.1 | 16.5 | 0.7 | 7.7 | 6.3 | 0.8 | 4.0 | 2.4 | **7.9** |
| Other intestinal bact. infections | 74.2 | 17.2 | 59.2 | 36.6 | | 42.6 | 10.5 | 2.3 | 1.0 | 1.5 | 22.2 | 27.6 | **27.3** |
| of them Escherichiosis | 71.8 | 11.8 | 46.3 | 27.9 | | 28.5 | 0.7 | 0.4 | | | | 15.0 | **20.7** |
| Yersiniosis | | | 4.3 | | | | | 0.2 | | | | | **0.7** |
| Foodborne Bacterial Intoxications | 41.8 | 3.0 | 5.6 | 25.2 | 1.6 | 27.1 | 23.7 | 12.5 | | 8.5 | 68.6 | 224.9 | **21.4** |
| Botulism | 2.1 | 1.0 | | | | 1.2 | 2.1 | 1.6 | | 2.3 | | | **0.9** |
| Amebiasis | | | 0.3 | | | 0.8 | 0.7 | 1.2 | | | | 1.6 | **0.5** |
| Unspecified inf diarrheal diseases | 504.0 | 57.2 | 326.0 | 156.4 | 58.0 | 197.2 | 69.1 | 121.0 | 145.0 | 65.5 | 324.6 | 308.6 | **192.6** |
| Brucellosis | | 20.9 | 0.1 | | 1.6 | 5.4 | | 0.3 | 0.5 | 6.9 | | | **3.0** |
| Meningococcaemia | | | 0.3 | 0.2 | | 0.4 | | | | | | | **0.1** |
| Meningitis total | | | 0.1 | | | 0.2 | | 0.6 | | | | | **0.2** |
| Meningococcal meningitis | | | | | | | | 0.1 | | | | | **0.0** |
| Hib meningitis | | | | | | | | | | | | | |
| Pneumococcal meningitis | | | | | | | | | | | | | |
| TB meningitis | | | | | | | | 0.1 | | | | | **0.0** |
| Other bacterial menigitis | | | 0.1 | | | | | 0.1 | | | | | **0.0** |
| Malaria | 0.5 | 9.9 | 0.4 | 0.2 | | 14.7 | 0.7 | 0.2 | | | | | **2.7** |
| Leishmaniasis | | 3.0 | 0.4 | | 0.3 | 2.6 | | 13.3 | | 0.8 | | | **3.9** |
| Acute Respiratory Infections | 4,096.2 | 5,201.7 | 9,604.2 | 3,445.8 | 7,497.5 | 2,446.2 | 8,823.7 | 7,132.9 | 4,212.9 | 7,582.9 | 2,651.5 | 4,812.7 | **6,066.4** |
| Influenza | 553.2 | 454.4 | 546.5 | 382.8 | 605.3 | 451.2 | 1,130.2 | 229.1 | 359.8 | 1,532.8 | 237.9 | 426.2 | **471.7** |
| Hospitalized cases of ARI and influenza | 5.1 | 4.4 | | 0.2 | 0.3 | 52.7 | | 13.4 | 28.4 | 2.3 | 233.9 | | **14.1** |

## 4.4 Tables and Graphs Permitting Analysis of Epidemiological Data by Age

For each of the reportable diseases in Georgia, the GEOEPID worksheets allow monitoring of disease incidence by age group. Analyzing data in this way can help further specify the group at greatest risk and indicate potential risk factors.

**Incidence of selected infectious diseases by age group, region and year** — Georgia | 2005

| Acute Viral Hep B | <1 year | 1-4yrs | 5-14yrs | 15-19yrs | 20-29yrs | 30-59yrs | 60+yrs | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Population | 45,725 | 211,618 | 679,699 | 366,332 | 646,923 | 1,662,887 | 823,610 | 4,436,794 |
| No. of cases | 0 | 4 | 14 | 42 | 131 | 103 | 13 | 307 |
| Incidence per 100,000 | 0.0 | 1.9 | 2.1 | 11.5 | 20.2 | 6.2 | 1.6 | 6.9 |



For example, the graph above demonstrates that clinical cases of acute viral hepatitis B in Georgia are concentrated among young people age 15-29 years suggesting that sexual contact and that intravenous drug use may play a leading role in the transmission of the virus.

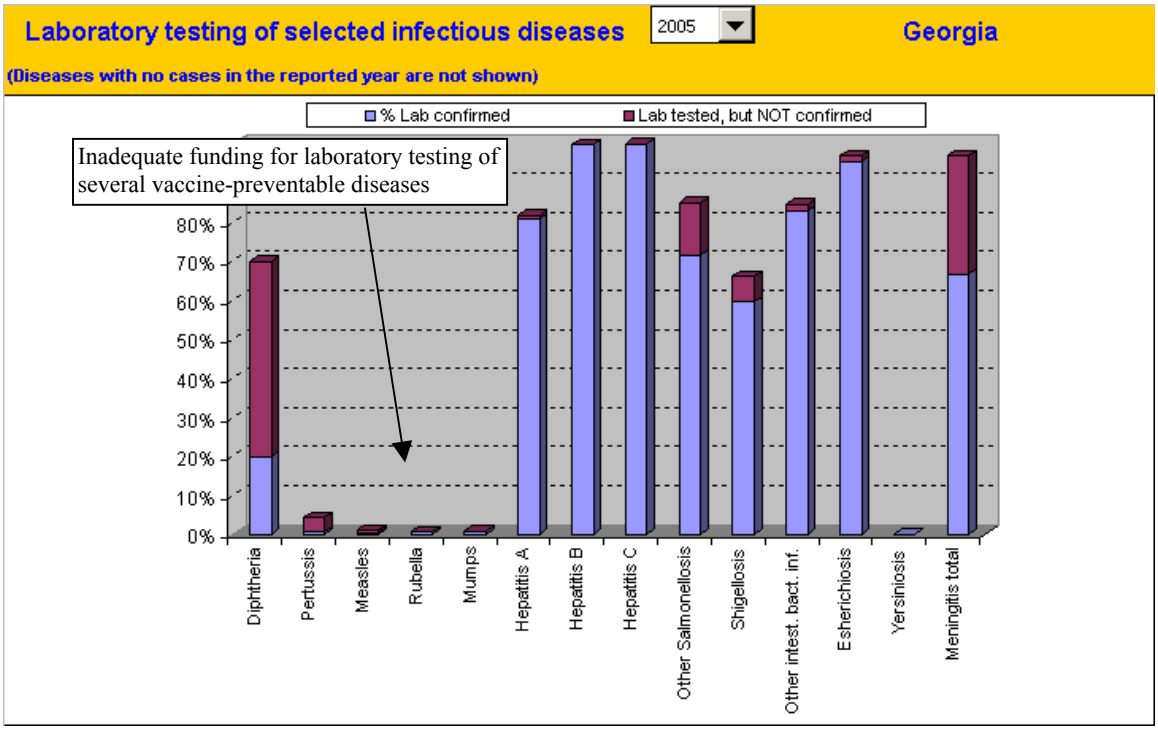
Armed with this information, managers can more easily target response interventions such as catch-up immunization education. It also helps in allocating scarce available resources in the way that is most appropriate to combat the disease.

## 4.5 Tables and Graphs on Laboratory Testing and Confirmation of Infectious Diseases

GEOPID allows monitoring of several indicators related to the functioning of the laboratory service as a component of the disease surveillance system:

- Proportion of cases that have been laboratory tested by disease, by region/district, and by year
- Case confirmation rates by disease, by region/district, and by year

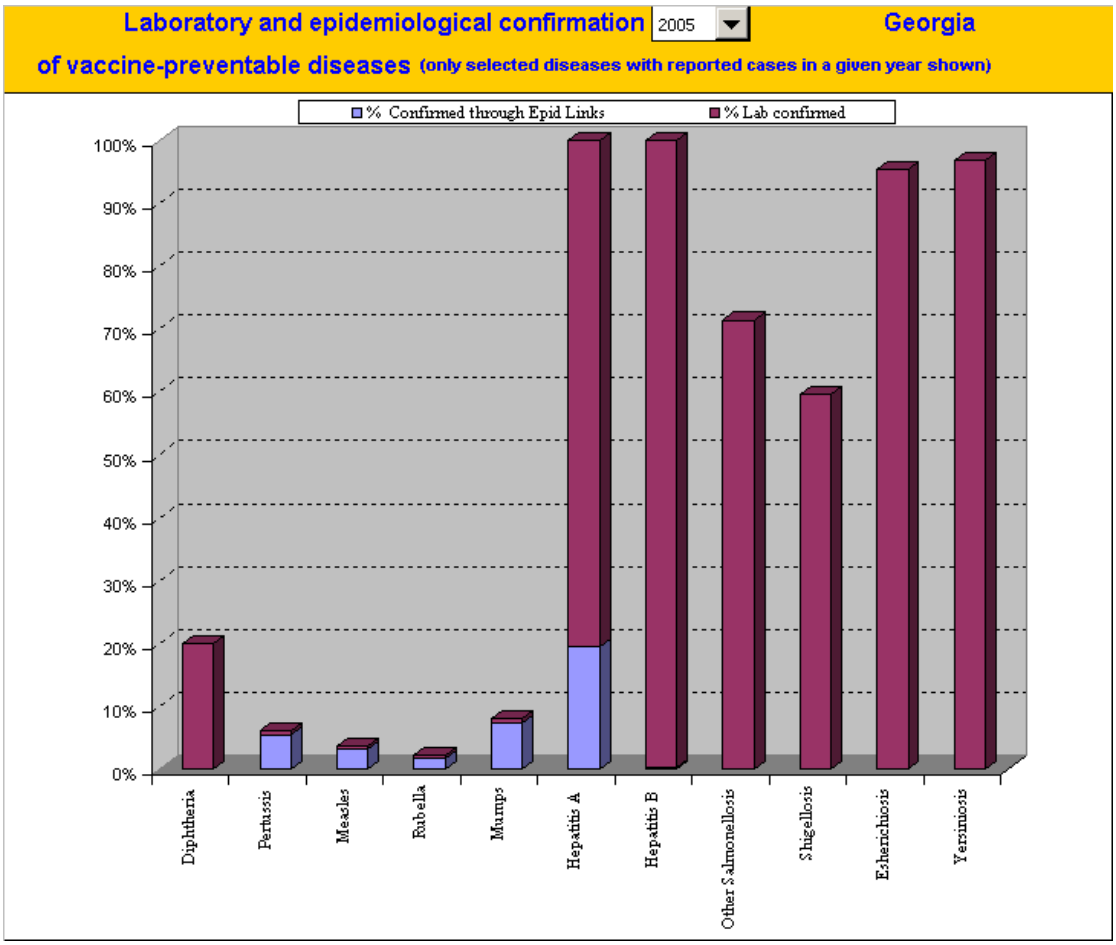
Monitoring the proportion of cases that have been laboratory tested is important, first and foremost, for diseases targeted for elimination or for considerable reduction (e.g., polio, measles, diphtheria), and for diseases that cannot be reliably diagnosed based only on a clinical presentation (such as acute viral Hepatitis B or C).



In a well-functioning surveillance system, disease confirmation[2] rates are expected to exceed 70 to 80 percent. For diseases in the elimination phase (polio, measles), this rate is expected to approach 100 percent, as shown by the following equation:

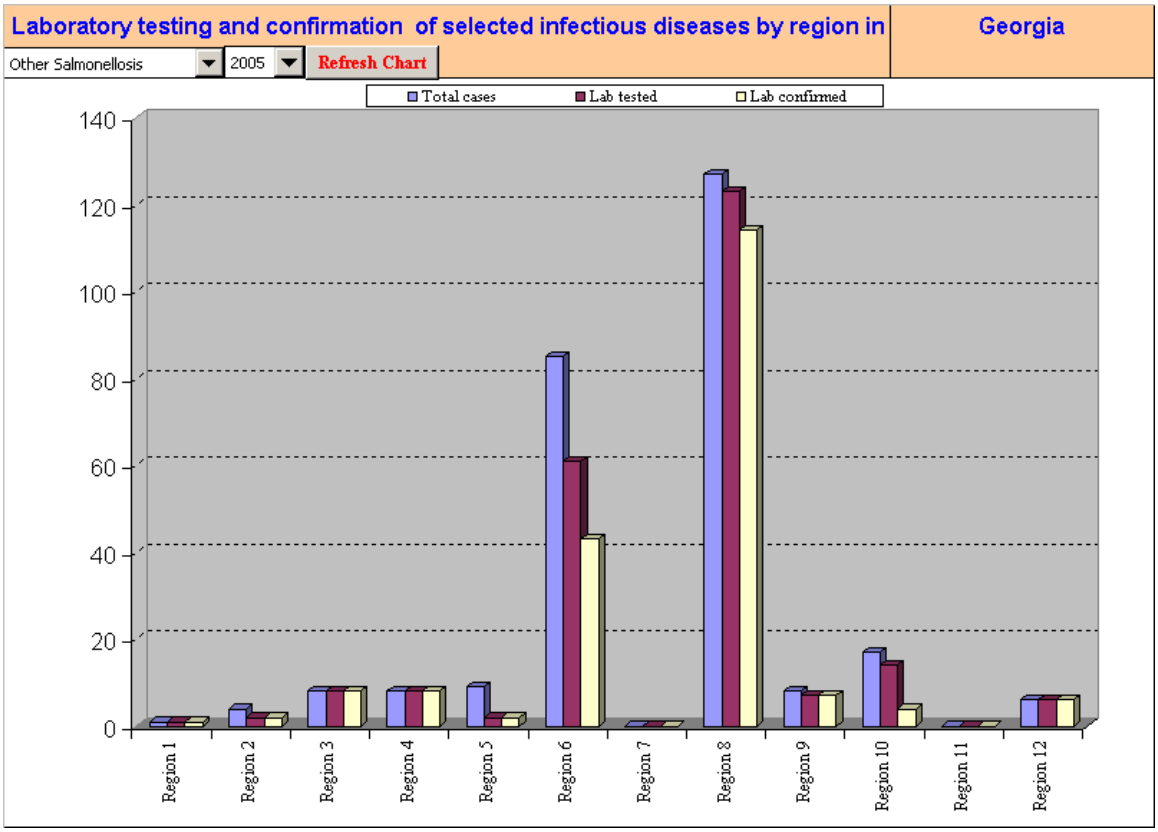
$$\textit{Case confirmation rate} = \frac{\textit{No. of confirmed cases}}{\textit{Total number of cases}} \times 100\%$$

GEOEPID facilitates computation of case confirmation rates, which are used by national and regional surveillance managers to assess the maturity of the surveillance system in various territories and in various settings, assess the success of disease elimination efforts, plan surveillance/laboratory system-strengthening activities, develop disease elimination strategies, suggest policy changes, and plan other long-term interventions such as mass immunization campaigns. These are decisions for which health managers cannot rely on reports that include unconfirmed cases.

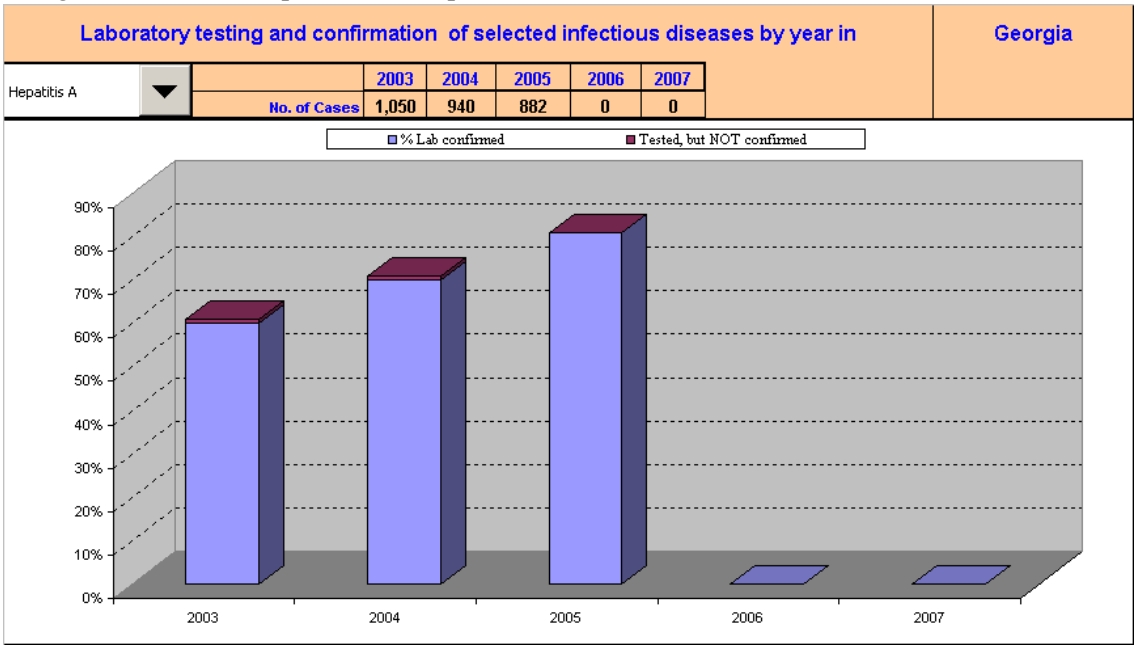



[2] A confirmed case is one that has been confirmed by disease-specific laboratory tests and/or where an epidemiological link to other laboratory-confirmed case(s) has been established.

Comparison of laboratory testing and confirmation rates by place is useful for assessing laboratory capacity and adherence to case confirmation requirements in districts and regions.




Finally, monitoring of laboratory testing and confirmation rates over the years, which GEOEPID makes easy, helps public health management identify the need for improving the laboratory network, capacity, and supplies, and assess the impact of investment in this areas as well as the effect of changes in surveillance protocols and practices.



# 5. In Conclusion

Countries that plan to strengthen their disease surveillance systems as well as donor organizations that are interested in supporting these efforts should consider investing a small portion of their funds in the development of a simple and unpretentious supplementary tool such as the GEOEPID application, which can be easily maintained and modified in-country, without external technical assistance.

We estimate that the application development may cost approximately $50,000; training and implementation, up to $35,000; and annual maintenance, $5-10,000.

Such a tool systematizes the process of using information technology for disease surveillance data processing at the provincial and peripheral levels in countries where health systems are under-funded, but where, nevertheless, technology is becoming widely available. It makes data processing and analysis much more efficient, and allows users to quickly find the underlying roots of the problems and to perform the types of analyses that they may not have done before due to either mathematical complexity or limited amount of time available for data processing.

Because it transforms data into information rapidly and in a format that assists interpretation, a software application like GEOEPID is also a very powerful tool to facilitate data utilization for management at all levels of the health system. Some examples of the types of managerial decisions made in Georgia with the help of GEOEPID were the development of a new public health law, advocacy for increased surveillance program funding, supplementary immunization activities, development and dissemination of health education materials related to priority infectious diseases, and feedback to and analysis of individual district performance.

Although GEOEPID was developed specifically for the communicable disease surveillance system in Georgia, similar software could easily be created for other countries that wish to improve their surveillance programs.