Field Epidemiology Training Programs
Case Studies in Applied Epidemiology
No. 113-D12

Surveillance for Visceral Leishmaniasis in Iraq

Student's Guide

Learning Objectives

After completing this case study, the participant should be able to:

- ☐ Describe public health surveillance types and uses,
- ☐ Define sensitivity and specificity in the context of public health surveillance,
- ☐ Analyze surveillance data by time, person and place,
- ☐ Interpret surveillance data.

This case study is based on surveillance data from CDC Baghdad. The case study was written by Dr. Ban Majeed and Dr. Richard Dicker in 2011 for CDC's Division of Public Health Systems and Workforce Development.

Information on the communicable disease surveillance system in Iraq was provided by Dr. Adnan Nawar, Chief of the Surveillance Section, CDC Baghdad. This case study was funded, in part, by TEPHINET.

Department of Health and Human Services
Centers for Disease Control and Prevention
Center for Global Health
Division of Public Health Systems and Workforce Development

Part I: Introduction

Iraq's Communicable Disease Control Center (CDC Baghdad) within the Ministry of Health (MOH) houses several sections responsible for tracking communicable diseases and implementing control measures. The Surveillance Section at CDC Baghdad runs the National Surveillance System (NSS).

The NSS maintains a list of 32 reportable communicable diseases (see Appendix A). Whenever health care providers see a patient with a disease on the list, they must send in a case report. The case report flows from the health care provider to the surveillance unit at the district level, then to the provincial Department of Health (DOH) and finally to the Surveillance Section at CDC Baghdad.

Each week, staff of the Surveillance Section summarize the data from the individual case reports into a weekly summary surveillance report. This weekly summary report is sent to the district surveillance units, provincial DOHs, other offices within the MOH, and the World Health Organization. The Surveillance Section staff meet weekly with epidemiologists and other public health officers from CDC Baghdad to discuss the week's surveillance findings and to plan appropriate public health actions.

Assume that it is 2010, and you have joined the Surveillance Section as an epidemiologist. Your new supervisor — the Director of the Surveillance Section — has asked you to summarize Visceral Leishmaniasis (VL) data and present a short report on findings during the next weekly meeting. Weekly reporting of visceral leishmaniasis cases via the NSS became mandatory in 2008.

Visceral leishmaniasis, also known as kala azar, is a potentially fatal parasitic disease transmitted by sand flies. It is endemic in parts of Asia (especially India, Bangladesh, and Nepal), Africa, South America, and the Middle East, including Iraq. The disease is characterized by high fever, weight loss, swelling of the liver and spleen, and anemia.

Figure 1. List of notifiable diseases, Iraq, 2010

Acute flaccid paralysis
Animal bite
Anthrax
Brucellosis
Cholera
Clinical hepatitis, not otherwise specified
Diphtheria
Dysentery, bacillary
Echinococcosis (hydatid cyst)
Food poisoning
Hemorrhagic fever
Hepatitis A,B,C,E
HIV
Influenza-like illness (ILI)
Leishmaniasis, cutaneous (Baghdad boil)
Leishmaniasis, visceral (black fever)
Malaria
Schistosomiasis (bilhariziasis)
Measles, suspected
Meningitis, meningococcal
Meningitis, viral
Mumps
Pneumonia
Polio
Rabies, human
Rubella, suspected
Scabies
Tetanus
Tetanus, neonatal
Toxoplasmosis
Tuberculosis, extra-pulmonary
Tuberculosis, pulmonary
Typhoid fever
Typhus
Whooping cough
Unusual health event

Question 1: What is public health surveillance?

Question 2: Is the visceral leishmaniasis surveillance system in Iraq population-based or sentinel? Is it passive or active?

Question 3: What are the advantages of this type of system over the alternatives? What are the disadvantages?

Visceral leishmaniasis is a parasitic disease caused by certain species of the *Leishmania* parasite and transmitted by the bite of infected female phlebotomine sand flies. Symptomatic illness is characterized by high fever, lymphadenopathy (enlarged lymph nodes), hepatosplenomegaly (enlarged liver and spleen), progressive emaciation, weakness and pancytopenia (marked decrease in red blood cells, white blood cells, and platelets). Clinical illness occurs more commonly in malnourished or immuno-compromised children, but infection can also result in malnutrition and immunocompromise. If untreated, the disease can be fatal.

In Iraq, the Kalazar Detect Rapid Test, a commercially available serologic test with a reported sensitivity of 90-100% and specificity of 95%-100%, is used to detect *Leishmania*-specific antibodies and confirm the diagnosis.

Question 4: What is sensitivity? What is specificity?

CDC Baghdad is responsible for developing and updating the national communicable disease guidelines, including case definitions for diseases under surveillance. These case definitions are used by health care providers to identify cases that must be reported.

CDC Baghdad uses the following case definitions for visceral leishmaniasis:

VL, suspected case = fever, hepatosplenomegaly, progressive emaciation, and pancytopenia;

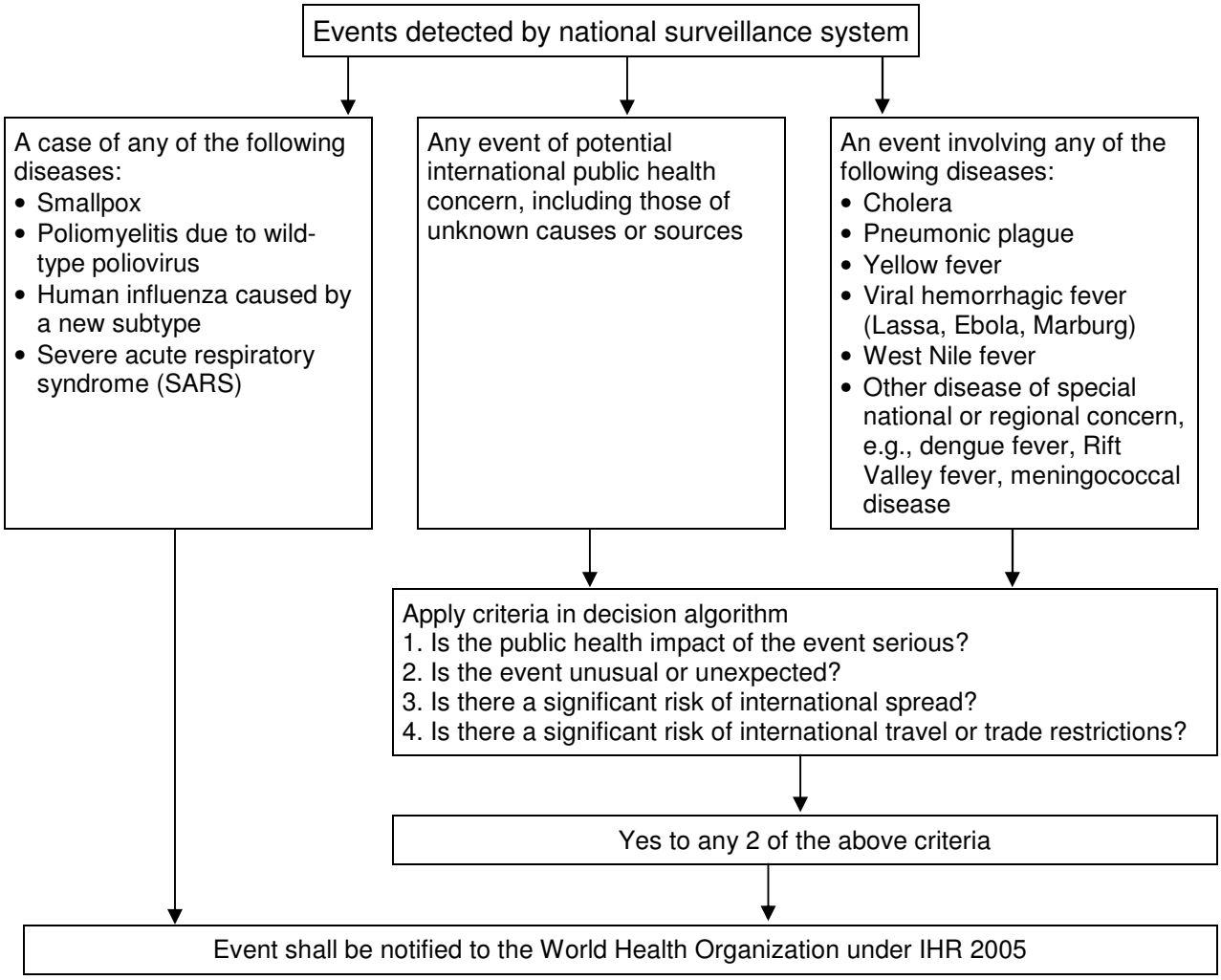
VL, confirmed case = suspected VL case with positive serologic test.

In Iraq, patients who meet the definition for a suspected case of visceral leishmaniasis will be tested with the serologic test to confirm or rule out the diagnosis.

Question 5: Do you think this case definition captures most visceral leishmaniasis cases in Iraq? Why or why not?

In 2005, member countries of the World Health Organization ratified the International Health Regulations (IHR). The aim of the IHR is to help the international community prevent and respond to acute public health emergencies that have the potential to cross borders and threaten people worldwide. The IHR require countries to report certain diseases and public health events of international concern to WHO. The IHR contain guidelines for determining which events should be reported, how quickly, and in what manner.

Figure 2. International Health Regulations (IHR) 2005 decision instrument (Annex 2) — Simplified



Question 6: Using the IHR 2005 Decision Instrument shown in Figure 2, determine whether CDC Baghdad needs to notify WHO about a domestic case of visceral leishmaniasis, Severe Acute Respiratory Syndrome (SARS), or Chikungunya.

In Iraq, visceral leishmaniasis is one of 32 communicable diseases on the list of reportable diseases (Appendix A). As new diseases are recognized or known diseases emerge or reemerge, health officials at CDC Baghdad must decide whether to add them to the reportable disease list.

Question 7: Using a scale of 0 (low) to 5 (high), assign a score for each criterion below for visceral leishmaniasis, Severe Acute Respiratory Syndrome (SARS), and Chikungunya. Sum your scores for each disease.
Note: Information sheets about the three diseases are provided below.

Criteria	visceral leishmaniasis	SARS	Chikungunya
WHO interest			
Disease incidence in Iraq			
Severity of the illness			
Mortality incidence			
Potential for outbreaks			
Public perception of risk			
Preventability			
Economic impact			
Immediate PH response			
Emerging / re-emerging			
Potential bioterrorism agent			
Total			

Fact Sheet: Visceral Leishmaniasis

- **What is Visceral Leishmaniasis (VL)?**
  Visceral leishmaniasis is a chronic systemic disease caused by obligate intracellular protozoa of the genus *Leishmania*. Some species give rise only to cutaneous disease, but visceral disease is caused by "Old World" (Africa, Asia, Europe) species *L. donovani* and *L. infantum* and "New World" (South America) species *L. chagasi*. The distribution of VL is world-wide, but 90% of VL cases are reported from India, Bangladesh, Nepal, Sudan, Ethiopia and Brazil.

- **Who gets VL?**
  Susceptibility is general. Immunocompromised children, patients with AIDS, and persons with malnutrition are more likely to develop symptomatic illness.

- **How does VL spread?**
  VL is transmitted by the bite of infected sand flies. It can also be transmitted by blood transfusion or sharing of contaminated needles. Congenital transmission has been reported, but appears to be rare. Sporadic or epidemic leishmaniasis occurs when humans enter the sylvatic habitat for economic or military purposes, or when human habitation encroaches on the sylvatic setting. In domestic cycles, humans or dogs form the predominant or sole infection reservoir. In the Mediterranean basin and parts of Latin America, visceral leishmaniasis transmission is zoonotic (dog – sand fly – human). In South Asia and the Middle East, transmission is usually anthroponotic (human - sand fly - human).

- **What are the clinical features of VL?**
  It is a febrile illness with weight loss, enlargement of the spleen and liver, and decreases in the production of blood cells that can lead to anemia, bleeding and infections with other microorganisms.

- **How soon after infection do symptoms of VL appear?**
  Incubation period usually ranges from 2-6 months

- **When and for how long is a person able to spread VL?**
  VL is not transmitted from person to person. But humans remain infectious to sand flies when the parasite is present in circulating blood or skin. Infectivity to sand flies might last even after clinical recovery.

- **What are the complications associated with VL?**
  Post kala azar dermal Leishmaniasis and, if the disease is left untreated, death.

- **Is there a treatment for VL?**
  Yes, pentavalent antimonials (Sb5). However, treatment can have severe adverse reactions, and resistance is increasing.

- **Is there a vaccine?**
  No

- **What can be done?**
  Preventive and control measures include vector and reservoir control. Culling of stray dogs, use of insecticides, bed nets, and personal protection (e.g., clothing that covers the body).

Fact Sheet: Chikungunya fever

- **What is Chikungunya fever?**
  It is a viral disease transmitted to humans by the bite of infected mosquitoes. The geographic range of the virus is primarily in Africa and Asia.

- **Who gets Chikungunya?**
  Susceptibility is general. Immunocompromised children, patients with AIDS, malnutrition are more likely to develop symptomatic illness.

- **How does Chikungunya spread?**
  It is transmitted by the bite of infected mosquitoes, usually of the genus *Aedes*. On rare occasions, mother to fetus transmission especially during labor.

- **What are the clinical features of Chikungunya?**
  It is characterized by fever, headache, nausea, vomiting, fatigue, muscle pain, rash, and joint pain. Symptoms last from few days to couple weeks.

- **How soon after infection do symptoms of Chikungunya appear?**
  Incubation period usually ranges from 2-12 days, usually 3-7 days

- **When and for how long is a person able to spread Chikungunya?**
  Not transmitted from person to person. But humans remain infectious to mosquitos for the first few days after onset of illness. Infected humans can introduce the infection into new receptive areas.

- **What are the complications associated with Chikungunya?**
  Can be a debilitating illness, severe debilitating joint pain might occur, death is rare and when it occurs, is usually in the elderly.

- **Is there a treatment for Chikungunya?**
  No specific antiviral treatment. Symptomatic treatment with an antipyretic and anti-inflammatory agent such as paracetamol is commonly used.

- **Is there a vaccine?**
  No

- **What can be done?**
  Preventive and control measures focus primarily on mosquito control.

Fact Sheet: SARS

- **What is SARS?**
  Severe acute respiratory syndrome (SARS) is a viral respiratory illness caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV). SARS was first recognized as the cause of a large outbreak in Asia in February 2003, characterized by severe acute respiratory illness and high case fatality rates. Over the next few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained. According to the World Health Organization (WHO), a total of 8,098 people worldwide became sick with SARS during the 2003 outbreak. Of these, 774 died.

- **How does SARS spread?**
  The main way that SARS spreads is by the respiratory route and close person-to-person contact. The virus that causes SARS is transmitted most readily by respiratory droplets (droplet spread) produced when an infected person coughs or sneezes. Droplet spread occurs when droplets from the cough or sneeze of an infected person are propelled a short distance (generally up to 3 feet) through the air and deposited on the mucous membranes of the mouth, nose, or eyes of a susceptible person who is nearby. The virus also can spread when a person touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose, or eye(s). In limited settings SARS may have spread through the air (airborne spread) or feces.

- **What are the clinical features of SARS?**
  In general, SARS begins with a high fever, e.g., temperature greater than 101°F (>38.3°C). Other symptoms may include headache, an overall feeling of discomfort, and body aches. Some people also have mild respiratory symptoms at the outset. About 10 percent to 20 percent of patients have diarrhea. After 2 to 7 days, SARS patients may develop a dry cough. Most patients develop pneumonia.

- **How soon after infection do symptoms of SARS appear?**
  Incubation period is from 2 to 10 days.

- **What are the complications associated with SARS?**
  Respiratory failure, heart failure, liver failure, and death.

- **Is there a treatment for SARS?**
  Symptomatic treatment such as antiviral therapy, antibiotic, oxygen

- **Is there a vaccine?**
  No

- **What can be done?**
  Isolation of patients to prevent spread of disease. Avoid contact with the reservoir (Chinese horseshoe bats), intermediate host (probably civets), and open air animal markets where they are sold.

Part II: Analysis of surveillance data

Surveillance officers in the Surveillance Section use Microsoft Excel to enter and analyze data. Surveillance data is useful to describe diseases or other health events in terms of time, person and place. Below is a table of the VL national surveillance data for the period of 1990-2009.

Table 1: Number of visceral leishmaniasis reported cases through the National Surveillance System, Iraq, 1990–2009

Year	No. of cases	Year	No. of cases
1990	337	2000	2,610
1991	163	2001	2,893
1992	422	2002	3,218
1993	305	2003	2,521
1994	461	2004	3,171
1995	437	2005	2,059
1996	532	2006	1,572
1997	724	2007	775
1998	754	2008	1,009
1999	763	2009	1,549

Question 8a: What type of graph would you use to display the data in Table 1?

Question 8b: Graph the data in Table 1.

Question 8c: Describe your graph.

Question 9: What are some possible explanations for the sharp rise from 1999 to 2000?

More detailed information was available on cases reported during the period of 2007-2009.

Table 2: Number of visceral leishmaniasis reported cases through the National Surveillance System by month, Iraq, 2007–2009

Month	2007	2008	2009
Jan	114	120	180
Feb	143	192	304
Mar	134	141	222
Apr	95	130	168
May	34	111	96
Jun	55	60	64
Jul	30	40	66
Aug	39	32	50
Sep	36	27	56
Oct	23	26	64
Nov	21	49	101
Dec	51	77	178
Total	775	1,005	1,549

Question 10a: Graph the data in Table 2 by month.

Question 10b: Interpret the graph, i.e. does VL appear to have a seasonal pattern?

Analysis of surveillance data in terms of demographic characteristics of cases is helpful to identify the population at risk. Information on age and sex of cases are usually routinely collected.

Table 3: Reported visceral leishmaniasis cases by age, Iraq National Surveillance System, 2007–2009

Year	Age group				
	<1 yr	1-4 yr	4-15 yr	15+ yr	Total
2007	236	483	51	5	775
2008	344	596	60	5	1,005
2009	489	955	96	9	1,549

Table 4: Reported visceral leishmaniasis cases by sex, Iraq National Surveillance System, 2007–2009

Year	Male	Female	Total
2007	412	363	775
2008	539	470	1,009
2009	809	740	1,549

Question 11a: What type of graph would you use to display the data in Table 3 and Table 4?

Question 11b: Graph the data in Table 3 and Table 4.

Question 11c: Interpret your graphs.

Table 5 provides the geographic distribution of visceral leishmaniasis cases in Iraq from 2007 to 2009. Understanding the geographic distribution is helpful to identify the most affected areas and to target intervention efforts.

Table 5: Number and rate of visceral leishmaniasis reported cases by province, National Surveillance System, Iraq, 2007–2009

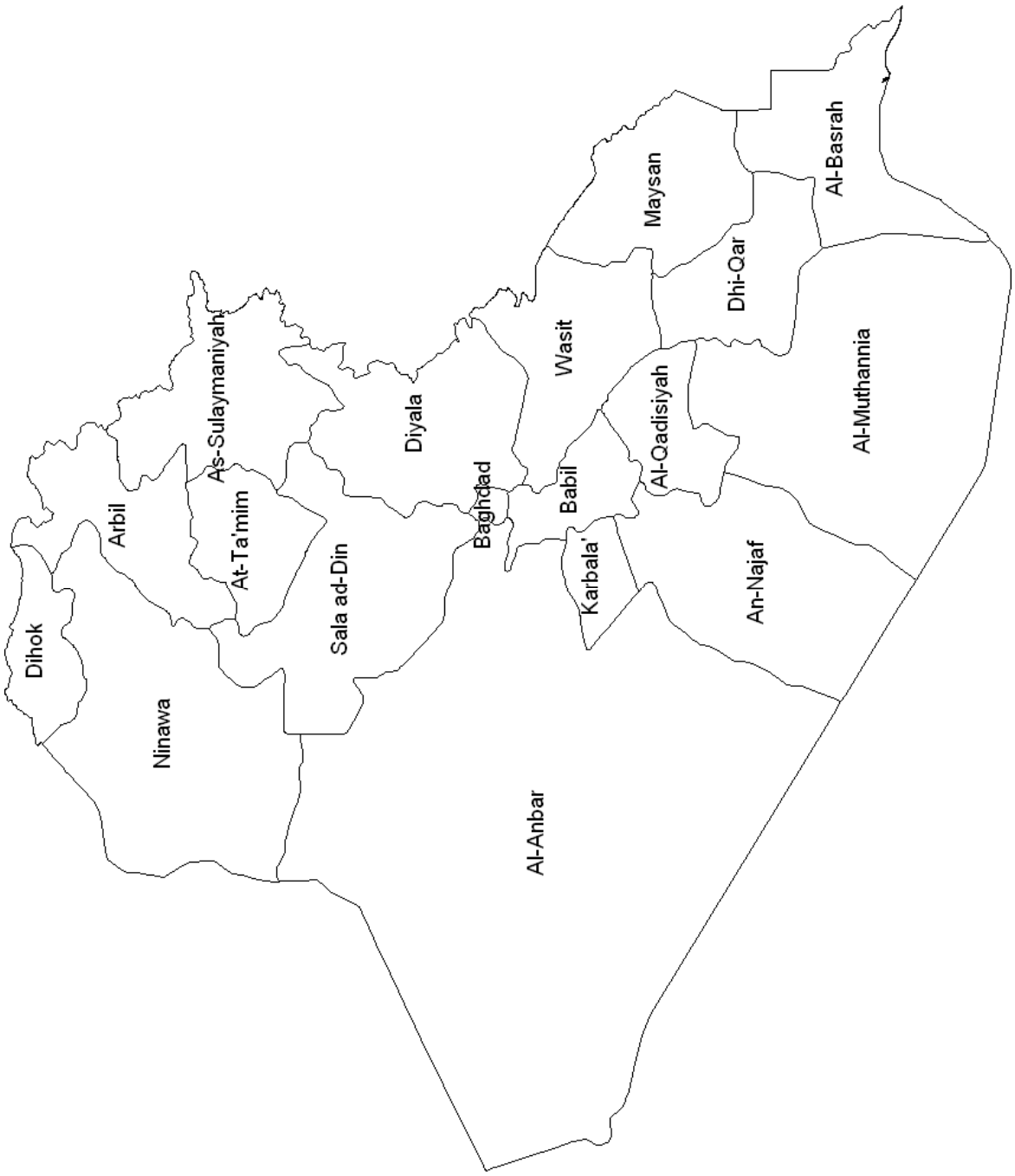
Province	2007	2008	2009	Mean Count 2007–2009	Population†	Rate per 100,000 / yr
Anbar	0	33	90	41.0	1,483,359	2.8
Arbil (Irbil)	0	0	0	0.0	1,532,081	0.0
Babil	59	138	128	108.3	1,729,666	6.3
Baghdad	61	147	157	121.7	6,702,538	1.8
Basrah	98	114	148	120.0	2,405,434	5.0
Dahuk	4	0	0	1.3	1,072,324	0.1
Diwania (Qadisiyah)	34	52	90	58.7	1,077,614	5.4
Diyala	22	133	403	186.0	1,371,035	13.6
Karbala'	22	15	36	24.3	1,013,254	2.4
Kirkuk (Tamim)	17	1	25	14.3	1,325,853	1.1
Maysan	100	121	167	129.3	922,890	14.1
Muthana	13	10	29	17.1	683,126	2.5
Najaf	4	11	8	7.7	1,221,228	0.6
Ninawa	0	0	0	0.0	3,106,948	0.0
Salah al Din	11	14	18	14.3	1,337,786	1.1
Sulaimania	0	1	0	0.3	1,784,853	0.02
Thi Qar	99	59	97	85.0	1,744,398	4.9
Wasit	231	156	153	180.0	1,150,079	15.6
Total	**775**	**1,005**	**1,549**	**1,109.7**	**31,664,466**	**3.5**

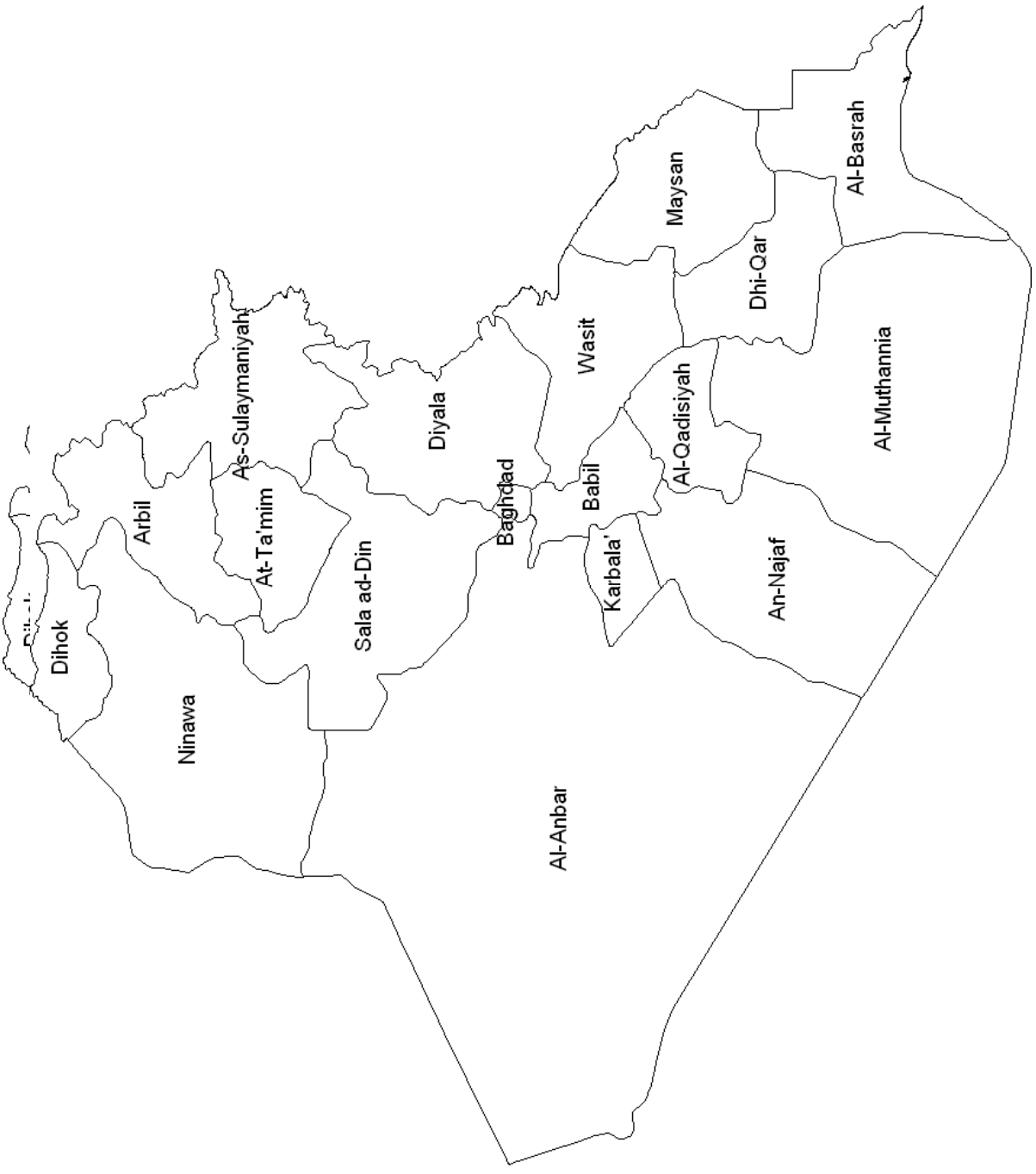
† Population estimate from Iraq Central Office for Statistics and Information Technology, 2009

Question 12: Given the data in Table 5, why are numbers (case counts) useful? Why are rates useful?

Question 13a: Group the province-specific mean VL case counts from Table 5 into 4 categories, then map the data using the attached outline map of Iraq's provinces.

Question 13b: Group the province-specific VL rates in Table 5 into 4 categories, then map the data using the attached outline map of Iraq's provinces.


Dihok
Ninawa
Arbil
As-Sulaymaniyah
At-Ta'mim
Sala ad-Din
Diyala
Baghdad
Wasit
Babil
Karbala'
Al-Anbar
Al-Qadisiyah
An-Najaf
Maysan
Dhi-Qar
Al-Basrah
Al-Muthannia


Maysan
Al-Basrah
Dhi-Qar
Wasit
As-Sulaymaniyah
Diyala
Al-Qadisiyah
Al-Muthannia
Arbil
Baghdad
Babil
At-Ta'mim
Sala ad-Din
Karbala'
An-Najaf
Dihok
Ninawa
Al-Anbar

Question 14: Summarize your descriptive epidemiology findings.

Question 15: How could your findings be used to address the burden of visceral leishmaniasis in Iraq?

Question 16: In general, what are the purposes and uses of surveillance data?

Part III: Control

The national visceral leishmaniasis control plan implemented by the Iraqi health authorities includes, in addition to weekly reporting of cases, entomological investigations, and reservoir control by extermination of stray dogs and rodents, vector control by insecticide spraying and fogging and distribution of insecticide-impregnated bed nets to high risk families. Visceral leishmaniasis surveillance data is mainly used to plan and evaluate implemented visceral leishmaniasis control activities.

Question 17:	Optional homework: Create a two-page double spaced summary report and use Microsoft PowerPoint to create a presentation to use in the weekly meeting.

References and suggested readings:

- Baker MG and Fidler DP. Global Public Health Surveillance under New International Health Regulations. Emerging Infectious Diseases. 2006;12(7):1058-1065.
- Heymann D (ed). Control of Communicable Diseases Manual, 19th ed. Washington, DC: American Public Health Association, 2009.
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- http://www.cdc.gov/ncidod/dvbid/Chikungunya/CH_FactSheet.html,
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- Jacobson RL. Leishmaniasis in an era of conflict in the Middle East. Vectorborne and zoonotic diseases. 2011; 11(3):247-258.