

2009 Fall Semester
WWS 571c
Syllabus

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Class: Thursdays 1:00-4:00 pm Room: Robertson 029
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Infectious diseases are major contributors to the global burden of illness in terms of morbidity and mortality. Over the past few decades and in spite of earlier achievements in controlling few major infections, new challenges are undermining the global effort by emergence and re-emergence of new pathogens, development of resistance in microbes and their vectors and intentional use of microorganisms to cause harm. Furthermore, policies and tools for prevention and control are not keeping pace with expanded threats.

Objectives:

This course has three objectives: First, it explores the biological and epidemiological fundamentals of human-microbes interaction including dynamics of transmission of infectious agents in human populations. This knowledge will then be used to examine the impact of different disease control strategies on interruption of transmission and reduction of burden of illness. The second objective is to examine several model infectious diseases as case studies to appreciate their endemicity, burden of illness and assess efforts to prevent or limit their spread. These will include viral infections such as Poliomyelitis and HIV/AIDS, bacterial pathogens such as tuberculosis and protozoa such as malaria. The third objective is to examine the role of several international organizations, partnerships and philanthropy in developing policies and implementing programs for control of global infection.

Readings:

The purpose of the required reading list is to expose students to a selective range of studies and reviews used to explore the challenge of global infection and strategies for their control. The course is intended to facilitate students appreciation of biological and epidemiological findings and how they are used to develop and implement control policies for infectious disease. The format of the class will combine lecture presentation and discussion. It is essential therefore, that students come to class having completed the readings assigned for each week. Additional reading may be distributed in class.

Date	Week	Topics	Papers
9/17	1	<ul style="list-style-type: none"> • Introduction and plan of course <ul style="list-style-type: none"> ➤ Objectives: ➤ Content ➤ Assignments • Challenges of Global Infection • Infectious history • New Challenges <ul style="list-style-type: none"> ➤ Emergence and reemergence ➤ Intent to harm 	<p>Lederberg J. (2000) Infectious history. <i>Science</i> 288:287-293.</p> <p>Lopez, A.D., <i>et al</i> (2006) Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. <i>Lancet</i> 367: 1747-1757.</p> <p>Jones, K.E., <i>et al</i> (2008) Global trends in emerging infectious diseases. <i>Nature</i> 451:990-994.</p> <p>Wolfe ND, Dunavan CP and Diamond J. (2007) Origins of major human infectious diseases. <i>Nature</i> 477: 279-283.</p> <p>Levy SB & Marshall B. (2004) Antibacterial resistance worldwide: causes, challenges and responses. <i>Nat Med Supp.</i> 10: S122-128.</p> <p>Elder BD, Dukic VM, and Dwyer G. (2006). Uncertainty in predictions of disease spread and public health responses to bioterrorism and emerging diseases. <i>PNAS</i> 103: 15693-15697.</p>
9/24	2	<p>Human-microbe interplay</p> <ul style="list-style-type: none"> • Epidemiology and dynamics <ul style="list-style-type: none"> ➤ Transmission dynamics ➤ R_0 • Immunology <ul style="list-style-type: none"> ➤ Innate and adaptive ➤ Recognition ➤ Effector mechanisms • Genetics <ul style="list-style-type: none"> ➤ Variability in microbes ➤ Host susceptibility 	<p>Pybus O.G., Rambaut A. (2009) Evolutionary analysis of the dynamics of viral infectious disease. <i>Nature Reviews Genetics</i>, 10:540-550.</p> <p>Grenfell B.T. <i>et al.</i> (2004) Unifying the Epidemiological and Evolutionary Dynamics of Pathogens. <i>Science</i> 303:327-332.</p> <p>Real L.A., Biek R. (2007) Infectious Disease Modeling and Dynamics of Transmission. <i>CTMI</i> 315:33-49.</p> <p>Palm N.W., Medzhitov R. (2009) Pattern recognition receptors and control of adaptive immunity. <i>Immunological Reviews</i>, 227:221-223.</p> <p>Alberts, B. <i>et al</i> (2007) Chapter 25 The Adaptive Immune System pp1539-1600. <i>In Molecular Biology of the Cell, Fifth Edition</i>, Garland Science Press.</p>

		➤ Impact	
10/1	3	<p>Control/Prevention of infectious disease</p> <ul style="list-style-type: none"> • Multiplicity of approaches <ul style="list-style-type: none"> ➤ Development ➤ Sanitation ➤ Antimicrobials ➤ Vaccines • Integrated approaches 	<p>Achievements in Public Health, 1900-1999:Control of Infectious Diseases. <i>MMWR</i> 48:621-629.</p> <p>Roush S.W. (2008) Historical Comparisons of Morbidity and Mortality for Vaccine-Preventable Diseases in the United States. <i>JAMA</i> 298:2155-2163.</p> <p>Plotkin S.A. (2005) Vaccines: past, present and future. <i>Nature Medicine</i> 11:suppl s5-s11.</p> <p>Rodier G., et al (2007) Global Public Health Security. <i>Emerging Infectious Diseases</i> 13:1447-1452.</p> <p>Boatin B.A., Richards F.O. Jr. (2006) Control of onchocerciasis. 61:349-94.</p>
10/8	4	<p>Case Studies I</p> <ul style="list-style-type: none"> ➤ Success with smallpox <ul style="list-style-type: none"> • Biological and clinical features • Properties of vaccine • Global Campaign ➤ Struggle with Polio <ul style="list-style-type: none"> • Biological and clinical features • Trivalent and monovalent vaccines • The case of Nigeria and India • Is eradication feasible? 	<p>Henderson DA. (1999) Lessons from the eradication campaigns. <i>Vaccine</i> 17:s53-s55.</p> <p>Centers for Disease Control and Prevention (CDC). (2007) Household transmission of vaccinia virus from contact with a military smallpox vaccinee--Illinois and Indiana, 2007. <i>MMWR</i> 56: 478-481.</p> <p>Racaniello VR. (2006) One hundred years of poliovirus pathogenesis. <i>Virology</i>. 344: 9-16.</p> <p>Rey M., Girard M. P. (2008) The global eradication of poliomyelitis: Progress and problems. <i>Comparative Immunology, Microbiology & Infectious Diseases</i> 31:317-325.</p> <p>Advisory Committee on Poliomyelitis Eradication: recommendations on the use of bivalent oral poliovirus vaccine types 1 and 3. (2009) <i>Weekly Epidemiological Record</i> 84:289-290.</p> <p>Bhattacharya S., Dasgupta R. (2009) A tale of two global health programs: Smallpox Eradication's Lessons for the Antipolio Campaign in India. <i>Public Health Then and Now</i>. 99(7):1176-1184.</p> <p>Paul, Y. (2009) Why polio has not been eradicated in India despite many remedial interventions? <i>Vaccine</i> 27:3700-3703.</p> <p>Kaufmann, J.R. and Feldbaum H. (2009) Diplomacy And The Polio Immunization Boycott in Northern Nigeria. <i>Health Affairs</i> 28(4):1091-1101.</p>

10/15	5	<p>Case Studies II Malaria</p> <ul style="list-style-type: none"> • Biology and burden • Control strategies • Limitations <ul style="list-style-type: none"> ➤ Confused objectives ➤ Antimalarial resistance ➤ Insecticide resistance • ? Vaccines 	<p>Greenwood B. M., <i>et al</i> (2008) Malaria: progress perils and prospects for eradication. <i>The Journal of Clinical Investigation</i> 118:1266-1276.</p> <p>Roca-Feltrer A., Carneiro I, Armstrong Schellenberg J. R. (2008) Estimates of the burden of malaria morbidity in Africa in children under the age of 5 years. <i>Trop. Med. Int. Health</i> 13:771-783.</p> <p>Langhorne J., <i>et al</i> (2008) Immunity to malaria: more questions than answers. <i>Nature Immunology</i> 9:725-732.</p> <p>Walther B., Walther M. (2007) What does it take to control Malaria? <i>Ann. Trop. Med. Parasitol.</i> 101:657-672.</p> <p>Dondorp, A.M. <i>et al.</i> (2009) Artemisinin resistance in Plasmodium falciparum malaria. <i>New England Journal of Medicine</i> 361(5):455-467.</p>
10/22	6	<p>Case Studies III TB</p> <ul style="list-style-type: none"> • Biology and burden • Control Strategies <ul style="list-style-type: none"> ➤ Historical ➤ Current: Drugs BCG ➤ Implementation: DOTS • Drug resistance • Vaccines 	<p>Dye C., <i>et al</i> (2008) Measuring tuberculosis burden, trends, and the impact of control programmes. <i>The Lancet</i> 8:233-243.</p> <p>Young D. B., <i>et al</i> (2008) Confronting the scientific obstacles to global control of tuberculosis. <i>The Journal of Clinical Investigation</i> 118:1255-1265.</p> <p>Hoft D. F. (2008) Tuberculosis vaccine development: goals, immunological design, and evaluation. <i>The Lancet</i> 372:164-175.</p> <p>Floyd K., Pantoja A. (2008) Financial resources required for tuberculosis control to achieve global targets set for 2015. <i>Bulletin of the World Health Organization</i> 86:568-576.</p>
10/29	7	<p>Case Studies IV Influenza</p> <ul style="list-style-type: none"> • Basic Virology • Seasonal Influenza <ul style="list-style-type: none"> - Impact - Control - Prevention 	<p>Glezen WP. (2008) Clinical practice. Prevention and treatment of seasonal influenza. <i>New England Journal of Medicine</i> 359(24):2579-2585.</p> <p>Monto AS, Whitley RJ. (2008) Seasonal and pandemic influenza: a 2007 update on challenges and solutions. <i>Clinical Infectious Diseases</i> 46(7):1024-1031.</p> <p>Brammer L, Budd A, Cox N. (2009) Seasonal and pandemic influenza surveillance considerations for constructing multicomponent systems. <i>Influenza and Other Respiratory Viruses</i> 3(2):51-58.</p>

		<ul style="list-style-type: none"> • Pandemic Flu <ul style="list-style-type: none"> - Status report - Surveillance - Control Measures <ul style="list-style-type: none"> ▪ Public Health ▪ Antivirals ▪ Vaccine 	<p>Bitar D., Groubar A, Desencios JC. (2009) International travels and fever screening during epidemics: a literature review on the effectiveness and potential use of non-contact infrared thermometers. <i>Euro Serveillance</i> 14(6)pii: 19115.</p> <p>Writing Committee of the Second World Health Organization Consultation on Clinical Aspects of Human Infection with Avian Influenza A (H5N1) Virus. (2008) Update on Avian influenza A (H5N1) virus infection in humans. <i>New England Journal of Medicine</i> 358(3):261-273.</p> <p>Cauchemez S, <i>et al.</i> (2009) Closure of schools during an influenza pandemic. <i>Lancet Infectious Disease</i>. 9(8):473-81.</p>
11/12	8	<p>Case Studies V HIV/AIDS</p> <ul style="list-style-type: none"> • Biology of human and animal immunodeficiency viruses • Host-pathogen relationship • Antiretroviral therapy <ul style="list-style-type: none"> ➤ Discovery ➤ Policy ➤ PEPFAR • Opportunistic infections/TB • Vaccine research • Prevention Policies 	<p>Heeney J. L., Dalgies A. G., Weiss R. A. (2006) Origins of HIV and the evolution of resistance to AIDS. <i>Science</i> 313:462-466.</p> <p>Piot P. (2006) AIDS: from crisis management to sustained strategic response. <i>The Lancet</i> 368:526-530.</p> <p>Walker B. D., Burton D. R. (2008) Toward an AIDS Vaccine. <i>Science</i> 320:760-764.</p> <p>Fauci, A. S., <i>et al</i> (2008) HIV vaccine research: the way forward. <i>Science</i> 321:530-532</p> <p>Wools-Kaloustain K, Kimaiyo S, Diero L. <i>et al.</i> (2006) Viability and effectiveness of large scale HIV treatment initiatives in Sub-Saharan Africa: experience from Western Kenya. <i>AIDS</i> 20:41-48.</p> <p>Gruskin S., Tarantola D. (2008) Universal Access to HIV prevention, treatment and care: assessing the inclusion of human rights in international and national strategic plans. <i>AIDS</i> 22:Suppl 2:s123-32.</p> <p>Russell S, <i>et al.</i> (2007) Coming back from the dead: living with HIV as a chronic condition in rural Africa. <i>Health Policy and Planning</i> pp.1-4.</p> <p>Charles M, Pape JW. (2006) Tuberculosis and HIV: Implications in the developing world. <i>Curr HIV/AIDS Rep.</i> 3: 139-144.</p>
11/19	9	<p>Case Studies VI The big killers of children</p> <ul style="list-style-type: none"> • Pneumonia <ul style="list-style-type: none"> ➤ Etiology and 	<p>Mulholland K. (2007) Perspectives on the burden of pneumonia in children. <i>Vaccine</i>. 25: 2394-2397.</p> <p>Roth D. E., <i>et al</i> (2008) Acute lower respiratory infections in childhood: opportunities for reducing the global burden through nutritional interventions. <i>Bulletin of the World Health</i></p>

		<p>biological features</p> <ul style="list-style-type: none"> ➤ Burden of illness ➤ Management ➤ ? vaccines <ul style="list-style-type: none"> • Diarrhea <ul style="list-style-type: none"> ➤ Etiology ➤ Burden of illness ➤ Management <ul style="list-style-type: none"> ▪ Water sanitation ▪ Oral rehydration ▪ ? vaccines 	<p><i>Organization</i> 86:356-364.</p> <p>Graham S. M., <i>et al</i> (2008) Challenges to improving case management of childhood pneumonia at health facilities in resource-limited settings. <i>Bulletin of the World Health Organization</i> 86:349-355.</p> <p>Scott J. A. G., <i>et al</i> (2008) Pneumonia research to reduce childhood mortality in the developing world. <i>The Journal of Clinical Investigation</i> 118:1291-1300.</p> <p>Petri Jr W. A., <i>et al</i> (2008) Enteric infections, diarrhea, and their impact on function and development. <i>The Journal of Clinical Investigation</i> 118:1277-1290.</p> <p>Keusch G. T. <i>et al</i> (2006) Diarrheal Disease. In <i>Disease Control Priorities in Developing Countries</i>. D. T. Jamison <i>et al</i> (eds) <i>Oxford University Press</i>, New York, NY 371-388.</p> <p>Cunliffe N., Nakagomi O. (2007) Introduction of rotavirus vaccines in developing countries: remaining challenges. <i>Ann. Trop. Paediatr.</i> 27:157-167.</p>
12/3	10	<p>The Global Response to Challenges of Infectious Diseases</p> <ul style="list-style-type: none"> - Millennium Development Goals - International organizations <ul style="list-style-type: none"> WHO UNICEF - New Partnerships <ul style="list-style-type: none"> GAVI Alliance Global Fund for HIV, TB and Malaria 	<p>Downs T. J. and Larson H. J. (2007) Achieving Millenium Development Goals for health: Building understanding, trust and capacity to respond. <i>Health Policy</i> 83:144-161.</p> <p>Cohen J. (2006) The New World of Global Health. <i>Science</i> 311:162-167.</p> <p>Cutts FT (1998) Advances and challenges for the expanded progression on Immunization. <i>British Med. Bul.</i> 54:445-461.</p> <p>Baker M. G. and Fidler D. P. (2006) Global public health surveillance under new international health regulations. <i>Emerg. Infect. Dis.</i> 12:1058-1065.</p> <p>UNICEF's Role in Global Immunization.</p> <p>Global Immunization Vision and Strategy 2006-2015. http://who.int/vaccines-document/docsPDF/GIVS_final_EN.pdf.</p> <p>GAVI Alliance Strategy (2007-2010) accessed at http://www.gavialliance.org/vision/strategy/index.php on 8/8/08.</p> <p>Lu C, <i>et al</i> (2006) Effect of the Global Alliance for Vaccines and Immunisation on diphtheria, tetanus, and pertussis vaccine coverage: an independent assessment. <i>Lancet.</i> 368: 1088-1095.</p> <p>Radelet S, Siddiqi B. (2007) Global Fund grant programmes: an analysis of evaluation scores. <i>Lancet.</i> 369: 1807-1813.</p>

			Galárraga O., Bertozzi S. M. (2008) Stakeholders' opinions and expectations of the Global Fund and their potential economic implications. <i>AIDS</i> 22 :Suppl 1:s7-s15.
12/10	11	<p>Global Investment in Health</p> <ul style="list-style-type: none"> - Increased Funding - Focus <p>Global Philanthropy</p> <ul style="list-style-type: none"> - US - Europe - Other countries 	<p>Litzow, J.M. and Bauchener H. (2006) The grand challenges of the Gates Foundation: what impact on global child health. <i>J.R. Soc. Med.</i> 99:191-174.</p> <p>Burke MA and Matlin SA (eds) (2008) Global Forum for Health Research, <i>Monitoring Financial Flows for Health Research 2008</i>. Chapter 2, Global financing and flows. P23-54.</p> <p>Editorial (2009) What has the Gates Foundation done for global health? <i>The Lancet.</i> 373:1577.</p> <p>Källander K and Nsungwa-Sabiiti J. (2009) Comment: Accelerating the health impact of the Gates Foundation. <i>The Lancet.</i> 373:1584-1583.</p> <p>McCoy D, Kembhavi G, Patel J, Luintel A., (2009) The Bill & Melinda Gates Foundation's grant-making programme for global health. <i>The Lancet</i>, 373:1645-1653.</p> <p>Allen L <i>et al.</i> Wellcome Trust: Assessment Framework Report Volume 1 2007/08 pp5-8.</p>
12/17	12	<p>Global Infection: a look forward</p> <p>Scientific knowledge</p> <ul style="list-style-type: none"> • The microbiome • Discovery and introduction of new tools <ul style="list-style-type: none"> ➤ Antimicrobials ➤ Vaccines ➤ Sustainability • A global architecture 	<p>Turnbaugh P. J. <i>et al</i> (2007) The human microbiome project. <i>Nature</i> 449:804-810.</p> <p>Molyneux D. H. (2008) Combating the "other diseases" of MDG 6: changing the paradigm to achieve equity and poverty reduction? <i>Trans. Royal Soc. Trop. Med. Hyg.</i> 102:509-519.</p> <p>Weekly epidemiological record. (2008) <i>World Health Organization</i> 83:193-208.</p> <p>Ezzati M. <i>et al</i> (2005) Environmental risks in the developing world: exposure indicators for evaluating interventions, programmes and policies. <i>J. Epidemiol Community Health</i> 59:15-22.</p> <p>Singer B. H., Ryff C. D. (2007) Neglected Tropical Diseases, Neglected Data Sources and Neglected Issues. <i>PLoS Neglected Tropical Diseases</i> 1:e104,1-3.</p> <p>WHO (2007), World Health Report: Global public health security in the 21st century: Conclusions & Recommendations.). pp 66-67</p> <p>Pickering T. (2009) An Opportunity We Cannot Waste. <i>Science</i> 325:11.</p>

Requirements:

Students are expected to attend classes regularly and engage actively in class discussions, having reviewed carefully the assigned readings.

In addition, each student will be required to prepare the following.

1. Policy memo. Typed 2-3 pages, double spaced. Memo to the Minister/Secretary of health of a country of your choice that identifies an **EMERGING** public health issue that needs immediate attention. Explain why this should be considered an emerging problem (and not just its normal endemic prevalence), provide concrete evidence to justify your concerns and outline one or two approaches for solving or minimizing its impact. **This memo is due on Monday November 9th, 2009 by 5 pm; should be submitted electronically to Professor Mahmoud.**
2. Final research paper: Chose a pressing public health problem related to challenges of infectious diseases in developed or developing countries. The spectrum of choices may include endemic, emerging or re-emerging infections, consequence of interventions such as antibiotic resistance or specific settings for the use of microbes for bioterrorism. It also may include responses to infectious disease prevention or control plans. You have two options for your research paper:

One page proposal for final research paper should be submitted to Instructor electronically by November 25th 2009 at 5 pm. Final research paper should be 12-15 pages double spaced and submitted electronically to Instructor by Deans Day, January 12th 2010 at 5 pm.

1. Examine a specific public health issue with significant impact on a particular population e.g. age group, gender etc. Provide a detailed examination of evidence, quality of data, scientific information and gaps in evidence.
2. Propose a plan to address a specific public health problem in a developed or developing country. Provide evidence for the importance of the public health problem, what sectors of population is affected and how to measure the impact of anticipated results.
3. Please review criteria for evaluation of policy memo and final research paper to guide your written presentation.

Course Grading:

1. Class Participation (20%). Students are expected to come to class prepared to discuss readings and participate in a dialogue to present ideas effectively and to reach closure on subjects debated.
2. Policy Memo (30%)
3. Final Research Paper (50%)

Grading Rubrics:

Criteria for Evaluating class oral presentation

Policy Memo

A	<ul style="list-style-type: none">• Clearly identifies an emerging public health challenge (problem) in one country.• Provides concrete evidence about the likely effects of leaving the problem unsolved.• Provides concrete recommendations for solving the problem and why it was chosen.• Is organized and written logically and clearly.
B	<ul style="list-style-type: none">• Satisfies the basic requirements of the paper.• Argumentation about the importance of solving the problem is not clear.• Contains writing and organization errors.
C	<ul style="list-style-type: none">• Identifies an emerging public health challenge but demonstrates unsatisfactory logic in explaining its importance in the country.• Uses insufficient evidence to support argument.
D	<ul style="list-style-type: none">• Shows effort to complete assignment but fails to clearly identify an emerging public health challenge or provide evidence.
F	<ul style="list-style-type: none">• Fails to address basic requirements.

Final Research Paper

A	<ul style="list-style-type: none">• Documents a specific public health problem or a public health plan in a specific country with reference to at least 3 original sources• Reviews literature on possible solutions to this problem; include at least 5 original references and critique of each• Formulates specific policy recommendations• Executive summary is concise and communicates recommendations clearly• Demonstrates originality of thought• Is well organized and clearly written.
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B	<ul style="list-style-type: none"> • Satisfies the basic requirements of the assignment • Use of original sources is less than required • Includes some gaps in evidence used to support arguments and policy recommendations • Executive summary is not concise • Write up shows few errors
C	<ul style="list-style-type: none"> • Shows serious effort to identify problem but relies on secondary rather than primary sources • Provides weak evidence to support recommendations and arguments • Executive summary vague or missing • Contains substantial organizational or writing errors
D	<ul style="list-style-type: none"> • Shows effort to complete assignment but is seriously deficient in exploring literature, argument or recommendation
F	<ul style="list-style-type: none"> • Fails to meet basic requirements of assignment

Summary Schedule and Grading

- 1. Class participation: be prepared to discuss reading assignment at all scheduled classes. 20% of final grade.**
- 2. Policy memo (2-3 pages). Due November 9th, 2009. 30% of final grade.**
- 3. Research paper (12-15 pages). One page proposal due November 23rd, 2009. Full research paper due Deans Day, January 12th, 2009. 50% of final grade.**