GLOBAL ANTIBIOTIC RESISTANCE PARTNERSHIP (GARP) INAUGURAL MEETING

Antibiotic Resistance: Perspectives from non-GARP Countries - GHANA

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Global Antibiotic Resistance Partnership

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

University of Witwatersrand and Resources for the Future (RFF)

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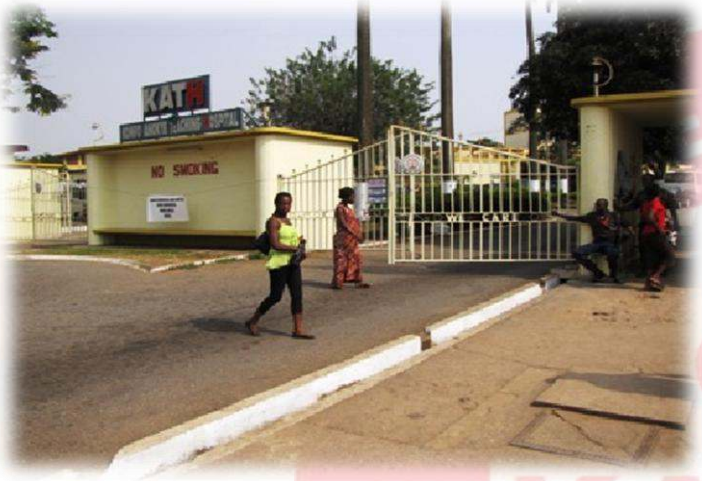
PRESENTATION OUTLINE

- Introduction to Ghana
- Introduction to KATH
- Healthcare in Ghana
- Procurement and distribution of medicines
- Antibiotics and resistance in Ghana
- Issues to consider

INTRODUCTION TO GHANA

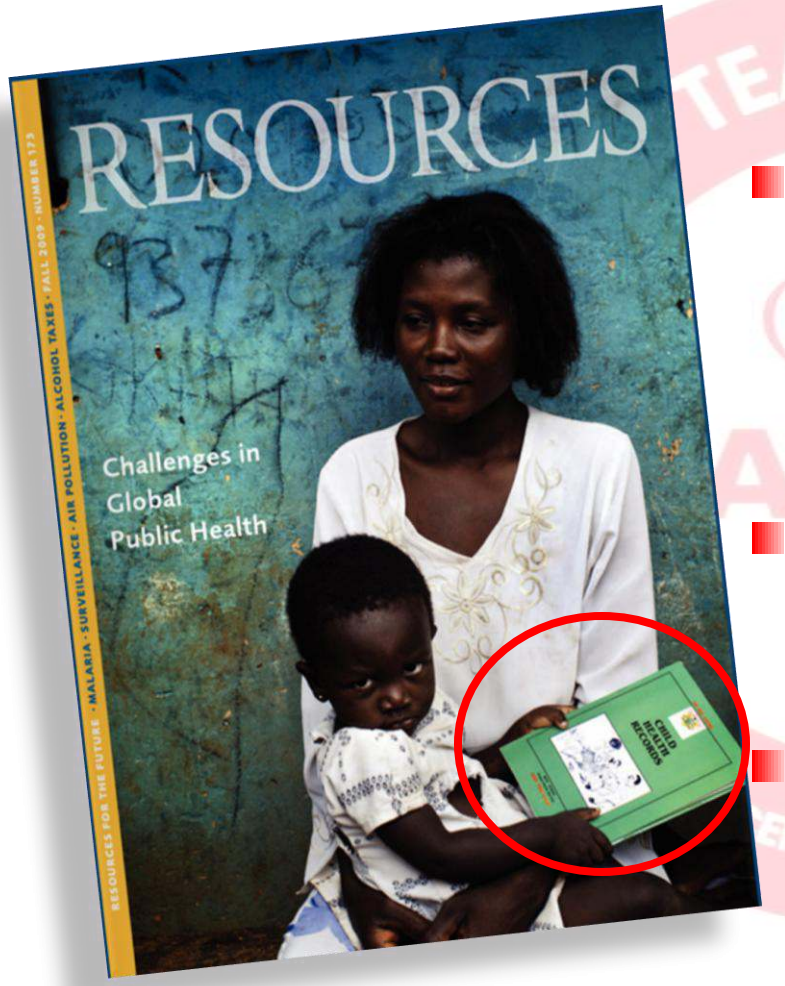
- **Total land area: 238,533 sq. Km. – slightly smaller than Oregon, USA.**
- **Population 23,887,812. Total population life expectancy: 60.1 years. Total population literacy: 57.9% (65% for ages 15+).**
- **Ten regions. Decentralization of government extends to the district level with 110 districts.**
- **HPI-1 value of 28.1%, ranked 89th among 135 countries, just below India and just ahead of Malawi & Uganda.**

KOMFO ANOKYE TEACHNIG HOSPITAL (KATH), KUMASI *http://www.kathhsp.org*



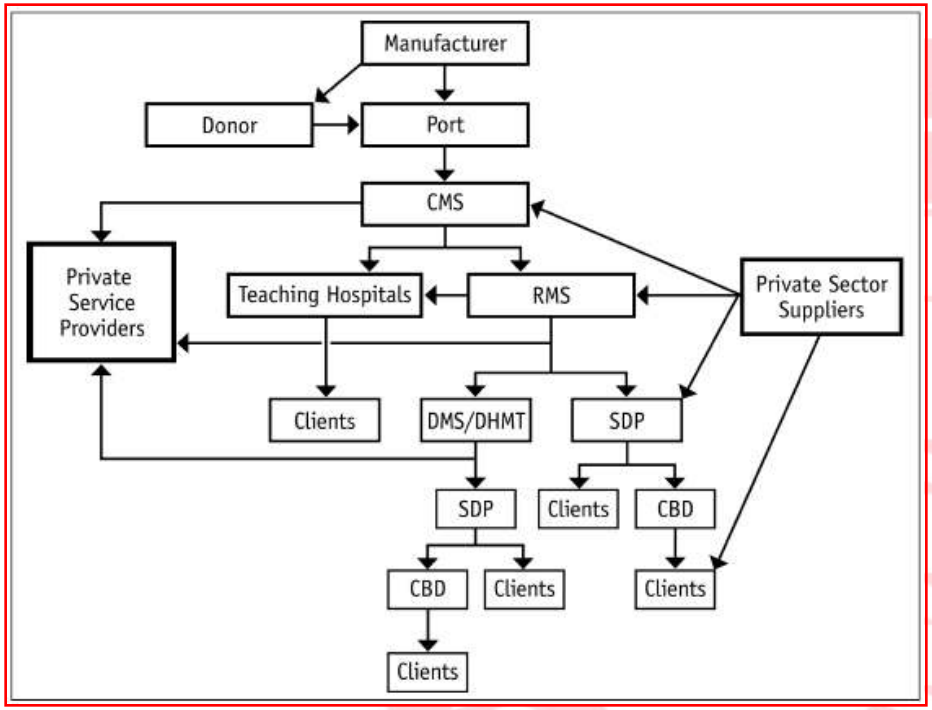
- **Located in the Ashanti region. Formed in 1955 & provides tertiary health care to over half of the population of Ghana.**
- **2nd largest hospital in Ghana: over 1,200 beds, 450 doctors and 800 nurses.**
- **Also serves WA sub-region & now has an ultra modern A&E centre.**
- **IPC policy and interdepartmental team in place.**
- **R&D unit promotes research and partnerships *(http://www.kathhsp.org/rd.html)***

HEALTHCARE IN GHANA



- < 60% of the population (92% in urban and 45% in rural areas) has access to health services.
- Malaria together with ARIs, diarrhoea, malnutrition, anemia, and measles, account for about 50% of all childhood admissions to health facilities and for 30% of childhood deaths.
- Health care system is controlled by the MoH (policy formulation) under which the GHS (implementing arm) operates.
- Total GDP: 15.1 bn US$. Approx. 6.8% of *GDP* spent on *health* care a little over US$35 per capita. Development partners support over 50%. NHIS since 2005 funded by 2.5% NHIL.

PROCUREMENT AND DISTRIBUTION OF MEDICINES



- EML and STG in place since 1998 and reviewed periodically, strictly adhered to in the public sector, but private sector is questionable.
- 3-layer supply chain: CMS, RMS, and SDPs plus the transportation network.
- Informal private sector (close men). Can sell any number of tabs/caps including singles depending on ability to pay.
- Greater Accra and the Ashanti region together have 837 of the country's 964 pharmacies *(2003)*.
- Private hospitals, pharmacies, chemical seller's shops, and private maternity homes provide additional interface between medicines and patients. Local manufacturers exist.

ANTIBIOTICS IN GHANA

- **Open market policy of importation of drugs. Influx of antibiotics into Ghanaian market from both local and foreign manufacturers and increased OTC abuse. Popularly called "topae" (bomb!).**
- **Commonly used are chloramphenicol (for typhoid, meningitis etc), ampicillin and penicillin based others (for wound infections).**
- **Small 1998 study showed local and foreign manufacturers to be producing quality drugs.** ***(Helegbe et al 2009)***
- **Often prescribed without lab test.**

RESISTANCE TO ANTIMICROBIAL DRUGS IN GHANA (I)

- **No active surveillance system in place to date.**
- **Most comprehensive data is from a study published in 2003 sponsored by the Ghanaian-Dutch collaboration for Health R&D.** ***(Newman, Frimpong et al)***
- **Sentinel-type, carried out in 9 out of the 10 regions in Ghana. 2 teaching hospitals, 7 regional hospitals, & 2 district hospitals.**
- **Aim was to determine the prevailing bacterial agents involved in infections in Ghana, and the current incidence of antibiotic resistance of these agents.**

RESISTANCE TO ANTIMICROBIAL DRUGS IN GHANA (II)

- **Total of 5,099 bacterial isolates from various clinical specimens of patients, and data collected over 1 yr. Bacteria mainly Gram negative; *E. coli* commonest, followed by *Staph. aureus, Klebsiella spp. and P. aeruginosa,* making up 56% of the organisms studied.**
- **Isolates identified by culture and biochemical reactions, and Kirby Bauer method used to test susceptibility to 16 antimicrobial agents.**
- **MIC of some of the multiple resistant isolates of epidemiological significance was also determined using the E-test.**

RESISTANCE TO ANTIMICROBIAL DRUGS IN GHANA (III)

Numbers of bacteria isolates from various clinical sites

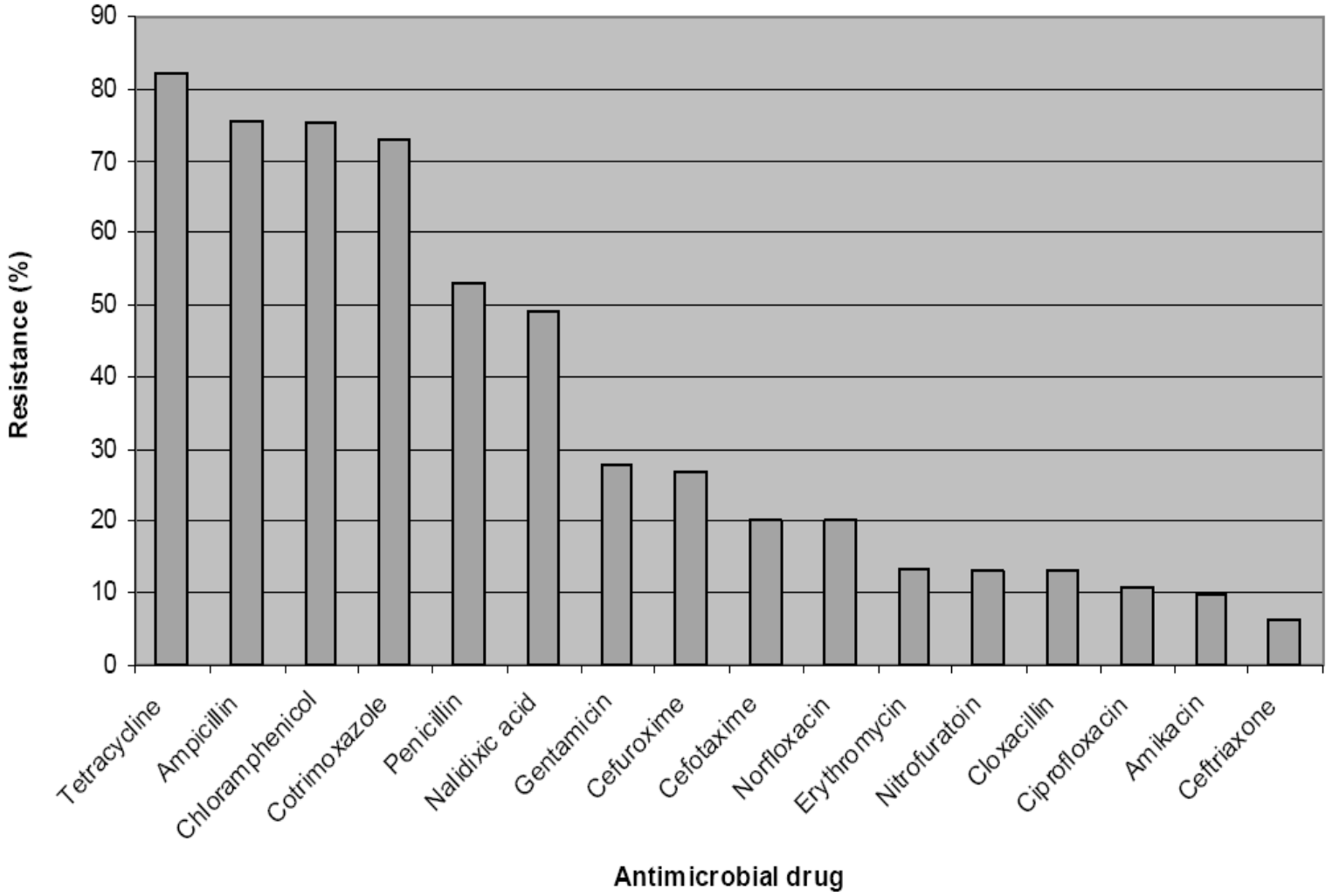
Bacterial agent	N	ws	Blood	Urine	Sputum	Hvs	Aspirate	Csf	Stool	Others
Escherichia coli	1105	128	85	662	35	116	1	3	2	(73)
Staphylococcus aureus	788	138	381	60	16	32	24	2	0	(135)
Klebsiella spp.	536	76	126	127	90	5	2	2	0	(108)
Pseudomonas aeruginosa	441	211	28	40	50	6	2	2	0	(102)
Proteus spp.	397	189	18	42	19	19	3	0	0	(107)
Non typhoidal *Salmonella*	247	5	209	11	0	0	3	0	15	(4)
Enterobacter spp.	275	62	78	7	58	23	2	3	0	(42)
Salmonella typhi	109	0	101	2	0	0	0	1	3	(2)
Streptococcus spp	127	14	6	21	12	49	1	1	0	(23)
Citrobacter spp.	120	35	10	17	20	18	2	0	0	(18)
Acinetobacter spp.	88	31	30	4	13	1	0	1	0	(8)
Streptococcus pneumoniae	51	0	8	0	4	0	1	35	0	(3)
Neisseria meningitidis	11	0	0	0	0	0	0	11	0	(0)
Neisseria gonorrhoeae	17	0	0	8*	0	1	0	0	0	(8)
Shigella spp.	4	0	1	0	0	0	0	0	3	(0)
Haemophilus influenzae	4	0	0	0	0	0	0	3	0	(1)
Vibrio cholerae	1	0	0	0	0	0	0	0	1	(0)
Total	**4321**	**889**	**1081**	**1001**	**317**	**270**	**41**	**64**	**24**	**(634)**

N = total isolates; ws = wound swab; hvs = high vaginal swab; csf = cerebrospinal fluid
* isolated from urethral specimen
( ) bacteria isolated from specimens other than those listed are in bracket

Source: Newman, Frimpong et al, 2003.

RESISTANCE TO ANTIMICROBIAL DRUGS IN GHANA (IV)

Prevalence of resistance among antimicrobial drugs



Source: Newman, Frimpong et al, 2003.

RESISTANCE TO ANTIMICROBIAL DRUGS IN GHANA (V)

Prevalence of multiple drug resistance among bacterial agents

Bacterial agent	Total isolates	No. of mdr isolates	%mdr isolates
Pseudomonas aeruginosa	441	100	22.7
Other *Streptococcus* spp.	127	100	78.7
Acinetobacter spp.	88	57	64.8
Citrobacter spp.	120	78	65.0
Streptococcus pneumoniae	51	4	7.8
Escherichia coli	1105	768	69.5
Enterobacter spp.	275	166	60.4
Salmonella typhi	109	68	62.4
Non tyhoidal *Salmonella*	247	149	60.3
Klebsiella spp.	536	309	57.6
Proteus spp.	397	222	55.9
Nesisseria gonorrhoea	17	2	11.8
Staphylococcus aureus	788	333	42.3

Mdr = multiple drug resistant

Source: Newman, Frimpong et al, 2003.

RESISTANCE TO ANTIMICROBIAL DRUGS IN GHANA (VI)

Minimum inhibitory concentration (MIC) of bacterial isolates

Bacterial agent	N	Antimicrobial drug	RANGE OF MIC (ug/ml)
Staphylococcus aureus	*18	Cefuroxime	0.25-4.0 (* 8 isolates > 256)
	*18	Gentamicin	0.19-24.0 (* 3 isolates >256)
Salmonella typhi	*10	Cefuroxime	1.5-6.0 (* 2 isolates > 256)
	10	Ciprofloxacin	0.004-0.094
	10	Gentamicin	0.19-1.5
Non typhoidal *Salmonella*	*14	Cefuroxime	3.0-48.0 (* 5 isolates >256)
	*14	Ciprofloxacin	0.008-0.38 (* 1 isolate >32)
	14	Gentamicin	0.25-4.0
Vibrio cholerae	1	Ciprofloxacin	0.094
	1	Cefuroxime	12.000
	1	Ampicillin	64.000
Shigella spp	1	Ciprofloxacin	0.064

Source: Newman, Frimpong et al, 2003.

SEVERAL LIMITATIONS

- Biochemical identification identical but discrepancies among hospitals in sensitivity results.
- C/S not done on a regular basis due to lack of basic inputs (petri dishes, media etc.)
- Inability to isolate fastidious organisms in some regional hospitals.
- Anaerobes not collected due to cost of Gaspak etc.

RESISTANCE AGAINST ANTI-TB DRUGS USED IN GHANA

- **2,064 patients with new cases of pulmonary TB nation-wide enrolled in a cross-sectional study. September 2001 to December 2004.** ***(Gyapong, Ohene-Adjei et al)***
- **76.5% of isolates susceptible to all drugs tested, 14.7% monodrug resistant, 8.7% multi-or polydrug resistant to combinations.**
- **Overall prevalence of any drug resistance: 23.5%**
- **Highest level of resistance was against streptomycin, followed by isoniazid. Lower resistance to rifampin, pyrazinamide, and thiacetazone.**

WHAT TO DO? AS USUAL…

- Standardized collection and testing methods nation-wide.
- System of distribution of trained technologists and technicians.
- Re-evaluation of the indications for the use of amp, tet, chloramp and cotrim in view of the high levels of resistance observed.
- Lab-based national sentinel survey of susceptibility and drug use. Surveillance program.

ISSUES TO CONSIDER

- Our presence here is evidence of the crucial nature of this problem. Policies alone are not the solution.
- Weigh the problem using "government scales" and tip balance appropriately.
- Borrow from climate change approach? Advantage: few nay-sayers.
- Thorough understanding of both formal and informal healthcare delivery system is needed.
- Upstream and downstream efforts needed and solutions worked into health system.

…The expertise and capacity developed in these initial five countries will become the core of a wider partnership… ***(GARP website)***