THE ANTIMICROBIAL RESISTANCE SURVEILLANCE PROGRAM
PROGRESS REPORT
(January – December 2010)

EXECUTIVE SUMMARY

Highlights of Year 2010 Antimicrobial Resistance Surveillance Program (ARSP) Data

1. Resistance data for 22,122 bacterial isolates coming from 14 regions of the Philippines were analyzed for 2010.

2. Overall, methicillin resistant *Staphylococcus aureus* (MRSA) rate at 54% significantly increased from 45% of 2009. The resistance rate from Metro Manila increased from 45% in 2009 to 54% in 2010. MRSA rates were high and increasing for most sentinel sites. Among the regional sentinel sites, MRSA rates were as follows: Jose B. Lingad Memorial Regional Hospital (JLM) - 76%, Northern Mindanao Medical Center (NMC) - 75%, Batangas Regional Hospital (BRH) - 72%, Cagayan Valley Medical Center (CVM) - 67%, Zamboanga Medical Center (ZMC) - 65%, Vicente Sotto Memorial Medical Center (VSM) - 61%, Mariano Marcos Memorial Hospital and Medical Center (MAR) - 53%, Baguio General Hospital (BGH) - 48%, Davao Medical Center (DMC) - 46%, Eastern Visayas Regional Medical Center (EVR) - 36%, Celestino Gallares Memorial Hospital (GMH) - 34%, Corazon Locsin Montelibano Memorial Hospital (MMH) - 17%, Bicol Regional Training and Teaching Hospital (BRT) - 16% and Cotabato Regional and Medical Center (CMC) - 6%. There have been clinical cases of community-acquired MRSA reported by infectious disease specialists from within and outside Metro Manila. There were no confirmed isolates of vancomycin resistant *Staphylococcus aureus* in 2010.

3. Among the respiratory and invasive isolates of *Streptococcus pneumoniae*, there was no resistance to penicillin (as determined by screening with 1 ug oxacillin disk).

4. Among the isolates of *Haemophilus influenzae* – 34%, 16%, and 12% of the isolates were resistant to cotrimoxazole, ampicillin and chloramphenicol, respectively. Resistance rate was lower for ampicillin in 2010 at 16% compared to 17% in 2009. Resistance to cotrimoxazole and chloramphenicol decreased at 34% and 12% from 39% and 21%, respectively, in 2009.

5. Resistance rate of all *Salmonella* Typhi isolates to cotrimoxazole remained low at <5%. There was no resistance to chloramphenicol and ampicillin reported for 2010.

6. As has been previously observed, nontyphoidal *Salmonellae* showed higher resistance rates to chloramphenicol 17%, ampicillin 43%, and cotrimoxazole 29% compared to rates for *S.* Typhi. Resistance to chloramphenicol, ampicillin and cotrimoxazole increased from 10%, 17%, and 17%, respectively in 2009. One isolate

each of *S.* Enteritidis, *Salmonella* Wanatah, and *S.* Schwarzegrund were confirmed to be resistant to ciprofloxacin for 2010.

7. The resistance rate of *Shigella* to cotrimoxazole was 86% which was higher than the 2009 rate which was 75%. There was no ciprofloxacin nor nalidixic acid resistance reported for 2010.

8. As was observed in 2009, there was no resistance of *V. cholera* 01 to tetracycline. Resistance of *Vibrio cholera* to cotrimoxazole and chloramphenicol in 2010 remained low at 3% and 2%, respectively.

9. Many of the Enterobacteriaceae showed high resistance rates to several antibiotics tested and varied from sentinel site to sentinel site. The presence of extended spectrum beta lactamases (ESBLs) has continued to be documented among *E. coli* and *Klebsiella* from almost all sentinel sites in 2010 which is a big reason for concern. The estimated rates of ESBL for *E. coli* and *Klebsiella* were 13% and 25%, respectively.

10. For *Pseudomonas aeruginosa,* overall resistance to ceftazidime decreased from 15% to 12%. There was an decrease in resistance to imipenem (from 14% to 10%), cefepime (from 11% to 12%) and piperacillin tazobactam (from 16% to 11%). Among aminoglycosides, resistance to amikacin was lowest at 10%.

11. Among isolates of *Pseudomonas aeruginosa*, 5% (92 out of 1985) were multidrug resistant (resistant to at least 3 classes of antimicrobial agents) while 12% (127 out of 1034) of *Acinetobacter baumanii* isolates were multidrug resistant.

12. The gonococci exhibited rapidly increasing resistance against the fluoroquinolones (from 83% in 2009 to 85% in 2010 to ciprofloxacin) but decreased resistance to tetracycline (from 47% to 33%) but none against ceftriaxone, cefixime and spectinomycin.

13. The percentage of bacterial isolates cultured after 48 hours from hospital admission at one isolate per patient (presumptive nosocomial infections **without clinical confirmation**) ranged from 13-65%.

Recommendations

1. Based on the above-mentioned antimicrobial resistance surveillance data:

   a. In view of the continued high rates of methicillin/oxacillin resistance among staphylococci in 2010, there may be an indication to shift empiric treatment of suspected staphylococcal infections from oxacillin to vancomycin. However, in order to ensure prudent use of vancomycin, guidelines for judicious use of vancomycin should be followed.

b. Infections secondary to *Streptococcus pneumoniae* can be covered with penicillin or chloramphenicol although there is a need to closely monitor the changing trends of resistance among pneumococci.

c. Empiric treatment for suspected uncomplicated typhoid fever could still consist of either chloramphenicol or cotrimoxazole or amoxicillin/ampicillin.

d. The fluoroquinolones and 3rd generation cephalosporins are better treatment options for non-typhoidal *Salmonella*. However, physicians should be aware of the existence of fluoroquinolone resistant nontyphoidal *Salmonella* in a small proportion of isolates.

e. Ciprofloxacin may be considered as the drug of choice for treatment of suspected shigellosis among adult patients while nalidixic acid may be considered as empiric treatment for the pediatric age group. In view of the emerging resistance of *Shigella* to the quinolones, continued surveillance of the resistance pattern of this organism should be pursued with the possibility of considering alternative antimicrobial treatment such as ceftriaxone or azithromycin if the rates continue to rise.

f. Tetracycline, chloramphenicol and cotrimoxazole remain good treatment options for cholera cases.

g. Due to high resistance rate of *Haemophilus influenza* to ampicillin in 2010 (17% in 2009 to 16% in 2010) and since ampicillin resistance in *H. influenzae* is usually mediated by beta lactamase production, empiric treatment for suspected *H. influenza* infections may consist of beta lactam-beta lactamase inhibitor combinations, extended spectrum oral cephalosporins and the newer macrolides. Laboratories should therefore screen all isolates of *H. influenzae* for beta lactamases as part of its antimicrobial susceptibility test procedure.

h. Hospitals should base their treatment recommendations for the Enterobacteriaceae on their institution's prevailing resistance patterns as these patterns have been found to be variable from hospital to hospital. There is need to closely monitor the presence of ESBLs from among the Enterobacteriaceae in hospitals for epidemiologic purpose and in view of the very limited antibiotics (i.e. carbapenems, beta lactam-beta lactamase inhibitors) which can be utilized for patient therapy in the presence of such enzyme.

i. There is a need to closely monitor the emergence of gram-negative bacteria such as *Pseudomonas aeruginosa* and *Acinetobacter baumanii* with advanced antimicrobial resistance rendering them resistant to many classes of antibiotics. These pathogens have become global public health threat as they can be observed to be resistant to the most commonly used empiric antibiotics, such as cephalosporins, penicillins with beta-lactamase inhibitors and carbapenems, and are associated with high mortality. Treatment options for these pathogens are very limited as they are usually susceptible only to tigecycline and polymyxins.

j. **The continued rise in MRSA** rates **and cases of infection secondary to ESBL** may **indicate very inadequate implementation of infection control procedures in some hospitals, which the Department of Health (DOH) should look into.**

k. Cefixime and ceftriaxone can remain as empiric antibiotics of choice for gonococcal infections.

2. **In view of the evidence indicating serious antimicrobial resistance problems among bacteria causing diseases of public health importance in the Philippines, there is an urgent need to initiate/implement** interventions contained in the World Health Organization (WHO) document on the Global Strategy for Containment of Antimicrobial Resistance (AR) and in accordance with the WHO Six Policy Package to combat antimicrobial resistance. Specifically, national governments and health systems as stated in page 5 of the WHO document on the Global Strategy for Containment of Antimicrobial Resistance (AR) should create a national intersectoral task force in their country with sufficient resources and with broad membership to raise awareness about AR to promote implementation of interventions to contain resistance and development of indicators to monitor and evaluate the impact of AR containment strategy. Such task force needs to be created as soon as possible to direct AR containment efforts in the Philippines which are probably a very important first step towards orchestrating a national AR containment program for the country.

3. As recommended in the WHO Six Policy Package to combat antimicrobial resistance globally, AMR surveillance and monitoring systems should be strengthened through 1)use of the right epidemiologic methods, 2)application of standardized protocols, 3)adaption of model information systems and software for AMR surveillance (e.g. WHONET), 4)setting of quality assurance systems, including monitoring and supervision of laboratories, continuing education for staff, and verification of the AMR data collected, and 5) ensure that surveillance data are analyzed and reported promptly on a regular basis. Laboratory capacity for rapid and reliable diagnostic testing should also be strengthened to include provision of the best AMR diagnostic methods including rapid molecular techniques.

4. The DOH management needs to address the problem of shortage of laboratory personnel and funds both at the level of the national reference laboratories and

regional hospital laboratories. **An undermanned laboratory (usually in the form of only 1 medical technologist for microbiology in a regional hospital laboratory) will not be able to handle an expected big number of specimens in the event of an outbreak in a region and at the same time carry out responsibilities related to laboratory-based surveillance. This problem needs to be addressed immediately through the government's rationalization plan considering the role of laboratories in detecting outbreaks of infectious diseases and for the country to be able to comply with the requirements of International Health Regulations 2005.** The same recommendations hold true for **national reference laboratories** which have been given additional tasks such as surveillance, quality assurance, laboratory support for outbreak investigations, confirmatory testing, kit testing, and research but no additional personnel.

5. In relation to item 4, the DOH should provide support for the enhancement of **existing** laboratory-based surveillance programs (such as the ARSP) **utilizing molecular typing techniques and other subtyping techniques especially pulsed field gel electrophoresis,** the current gold standard among molecular typing methods because laboratory **subtyping finds clusters. Investigating clusters finds outbreaks and investigating outbreaks results in action.** Surveillance utilizing molecular subtyping techniques allows differentiation of isolates of the same species, monitoring the trends of specific subtypes of a specific pathogen by utilizing *highly dicriminatory* molecular subtyping methods and allows storage of DNA "fingerprints" in a dynamic database which will allow epidemiologists to be able to investigate outbreaks utilizing more sensitive and specific laboratory tests. Furthermore, the DOH should provide support to laboratories participating in international surveillance systems utilizing molecular typing methods such as PulseNet for it to be able to detect early on and implement control measures involving international outbreaks.

6. The Department of Health should establish and implement a masterplan for laboratory surveillance in the Philippines covering the most important bacteria, viruses, and parasites among etiologic agents of infectious disease. The absence of a master plan for laboratory surveillance in the Philippines has resulted in **duplication of some activities especially in the field of bacteriology** and the neglect of support for other essential services such as those for virology. It is extremely important that this problem be addressed as soon as possible in the light of the increased numbers of infectious disease outbreaks secondary to viruses such as influenza.

7. Government should strengthen and institutionalize **existing** laboratory surveillance systems such as the antimicrobial resistance surveillance program rather than create new systems. As recommended by the World Health Organization in its document entitled WHO Global Strategy for Containment of Antimicrobial Resistance (WHO/CDS/CSR/DRS 2001.2), the **best approach to strengthening a country's**

laboratory surveillance system is to build upon existing systems since the establishment of new systems would require a lot of resources.

8. The Departments of Health and Agriculture (DA) should work towards the establishment of an **integrated laboratory surveillance of foodborne infections** as advocated by the World Health Organization through the WHO Global Salmonella Surveillance Program to be able to determine contamination of food by microorganisms along the entire food chain. An integrated surveillance system integrates etiologic agents of food and waterborne diseases from human, food, and animal data which will allow epidemiologists to trace sources of human foodborne infections by linking human cases to animal food sources and evaluating trends in sources of human foodborne illness. This will provide food safety programs with a strong scientific foundation upon which risk assessments and risk management strategies to control food borne infection/s can be based. The DOH and DA should tap the expertise of personnel who have undergone the six training courses of the WHO in this type of surveillance such as the ARSP staff, selected epidemiologists of the NEC, and laboratory staff of the National Meat Inspection Service and Bureau of Animal Industry.

9. There is a need to link the computer files of the National Epidemiology Center (NEC) and the ARSP in order to generate timely laboratory-confirmed statistics in infectious disease. To be able to accomplish this, the following needs to be done:

   a. All ARSP and National Epidemic Sentinel Surveillance System (NESSS) sentinel sites should be provided computers with dial up access for transfer and exchange of data.
   b. Data should be encoded by the data gatherer (epidemiologist/medical technologist) as they are generated. All sentinel site hospitals should be required to use a unique identifier such as the hospital record number in all laboratory request forms which will serve as a "link" between a patient's laboratory and clinical data in the hospital as required by Philhealth Circular No.25 series of 2005 on the revised and updated guidelines on hospital logbooks.

10. **The committee on ARSP strongly recommends that the program be provided with a sustainable source of funding by the Department of Health for maintenance and operating expenses and capital outlay.** Although the program was institutionalized in the DOH last October 23, 2002, to date, the program is dependent on DOH fund suballotments, which are insufficient and do not come on a regular basis.

11. All hospitals should be required to have antibiotic policies, which are actively implemented as a requirement for licensure.

12. Systems for monitoring antimicrobial use in hospitals and the community should be established and these findings linked to resistance and disease surveillance data.

13. The ARSP and the Bureau of Local Health Development of the DOH should continue to work together to provide the government's local executives relevant information on the existing problem of antimicrobial resistance and the most cost-effective antimicrobial regimens for treating the commonest infections in the community and hospital settings.

14. Technical support should be provided to ARSP sentinel sites for improving their data management skills to allow them to analyze their local data regularly instead on depending on the RITM coordinating committee

15. Surveillance of **presumptive** nosocomial infections and vaccine preventable diseases need to be improved to be able to determine the effectiveness of the DOH's control programs

16. The RITM coordinating committee should try to initiate remote data entry from its sentinel sites

THE ANTIMICROBIAL RESISTANCE SURVEILLANCE PROGRAM PROGRESS REPORT (January – December 2010)

By Sonia B. Sia, MD*, Celia C. Carlos, M.D., and ARSRL staff**

Highlights of 2010 Data

Resistance data for 22, 122 isolates at one isolate per patient were reported and analyzed with a 12% decrease in the number compared to that reported in 2009. This was mainly due to the decrease in the number of bacterial isolates reported for 2010 from 11 out of the 22 sentinel sites, namely Lung Center of the Philippines (LCP; -99.9%), Sto. Tomas University Hospital (STU; -60%), Mariano Marcos Memorial Hospital and Medical Center (MAR; -48%), Batangas Regional Hospital (BRH; -34%), Celestino Gallares Memorial Hospital (GMH; -32), Bicol Regional Training and Teaching Hospital (BRT; -31%), Rizal Medical Center (RMC; -25%), Baguio General Hospital (BGH; -21%), Far Eastern University Hospital (FEU; -20%), National Kidney Transplant Institute (NKI; -2%), and Cotabato Regional, Medical Center (CMC; -1%)(Table 1; Figure 1).

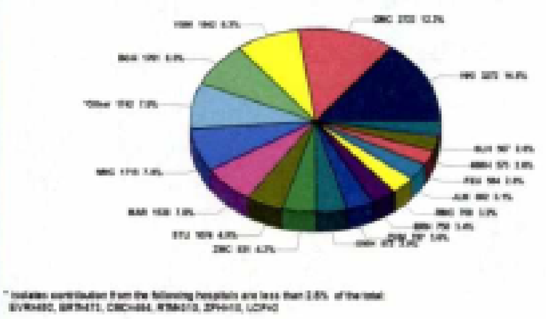
Table 1. Number of Bacterial Isolates. Antimicrobial Resistance Surveillance Program Philippine Department of Health 1994-2010

SENTINEL SITES	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change %
PGH^	4411	9696	14770	16600	8298	14591	12190	17052	15382	5191	6383^	9824	4511^	-	-	-	-	-
RMC	1996	2976	2458	1648	1863	1673	1739	1628	776	1075	1007	497	506	757	757	878	700	-25
NKI‡	1289	3655	2631	794	1917	1195	1650	1463	3004	4412	4468	5331	4009	2996	3112	3345	3272	-2
LCP	957	2660	3007	3112	777	360	851	537	1058	739	899	1949	5160	2548	2701	2694	2	-99.9
RTM^^	1237	831	1232	942	1510	1386	1325	1305	737	359	192^^	515	414	361	335	280	310	10
SLH	1125	593	974	909	714	711	1127	1240	192	1213	333	698	881	461	662	468	567	17
GMH*	517	786	1098	1251	1212	1682	1388	964	1240	803	799	359	522	886	826	1151	872	-32
ZMC*	218	595	832	1209	619	1099	1553	1444	1457	698	627	788	550	434	440	599	931	36
FEU	219	137	154	308	226	84	190	415	358	948	1286	1067	740	684	690	699	584	-20
STU	266	331	161	103	139	344	607	600	1369	2019	2011	1381	1124	1329	1180	1722	1074	-60
TVR§					190	971	947	1185	1046	469	145	694	799	491	466	340	493	31
MMH§					212	519	540	475	622	522	517	451	567	380	525	562	573	2
DMC//							2413	2691	3224	2549	2103	2369	2487	2161	2374	2523	2722	7
VSM//							1048	310	975	875	967	1224	991	1063	1241	1447	1842	21
BGH&							761	2092	1682	996	1009	1344	1213	1041	1329	2129	1761	-21
CMC¶							313	1025	390	690	475	742	796	686	541	459	454	-1
BRT&							-	307	219	388	344	485	399	388	401	618	473	-31
RTH#													40	32	19	-	-	-
ZPH#													56	67	53	38	10	-280
MAR																2275	1538	-48
BRH																1008	750	-34
CVM**																248	787	68
JLM**																387	692	44
NMC**																814	1715	53
TOTAL	12235	22260	27317	26966	17677	24615	28642	34733	33731	23946	23749	29782	25768	16765	17652	24684	22122	

* Data from August 1994 only
‡ No data submitted from July - December 1997
§ Data from October 1998 only; No data June 2008
// Data from February 2000
¶ Data from September 2000
& Data from January 2001
^ Data from January - June 2004 only, No data for Apr, Jun-Dec 2006
^^ Data from January to May 2004 only
\# *Neisseria gonorrhoea* isolates only
**Data from August 2009 only

*Head, Antimicrobial Resistance Surveillance Reference Laboratory
**Chairperson, Department of Health Committee on Antimicrobial Resistance Surveillance; Consultant in Pediatrics and Infectious Diseases and Head, Diarrhea Research Group, Research Institute for Tropical Medicine.

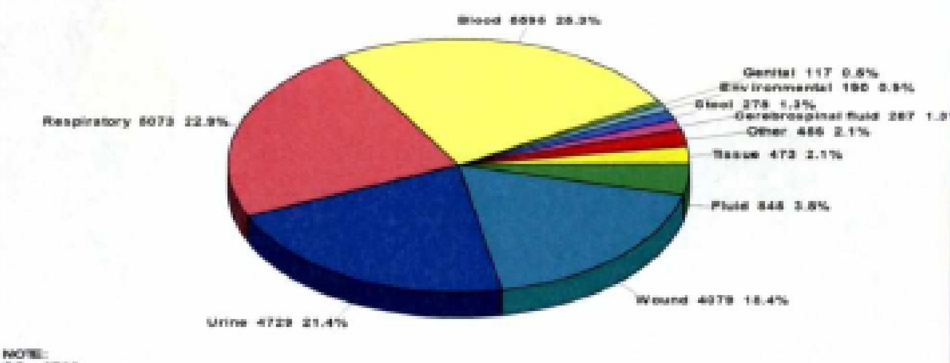
Figure 1. Percent Isolate Contribution of Each Institution, DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010 (N =22,122)



On the other hand, ten sentinel sites had increased number of reported isolates for 2010, namely: Cagayan Valley Medical Center (CVM; +68%), Northern Mindanao Medical Center (NMC; +53%), Jose B. Lingad Memorial Regional Hospital (JLM; +44%), Zamboanga Medical Center (ZMC; +36%), Eastern Visayas Regional Medical Center (EVR; +31%), Vicente Sotto Memorial Medical Center (VSM; +21%), San Lazaro Hospital (SLH; +24%), Research Institute for Tropical Medicine (RTM; +10%), Davao Medical Center (DMC; +7%), and and Corazon Locsin Montelibano Memorial Hospital (MMH; +2%). No data were received from Philippine General Hospital (PGH).

The most common specimen sources were blood and respiratory which accounted for 25% and 23% of all specimens respectively (Figure 2). The rest of the specimen sources were urine 21% and wounds 18%. There were 117 genital tract isolates reported, compared to 197 in 2009. There were 287 CSF isolates compared to 315 in 2009, less stool specimens at 278 in 2010 compared to 431 in 2009.

Figure 2. Distribution of Isolates by Source, DOH Antimicrobial Resistance Surveillance, Jan-Dec, 2010 (N = 22,122)

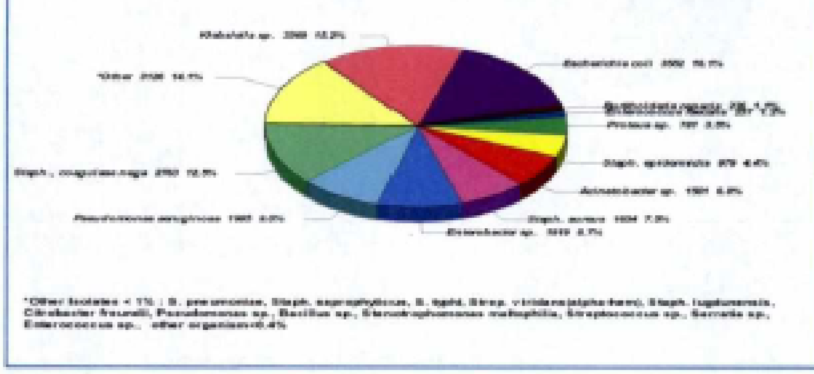


NOTE:

Of the 22 sentinel sites, EVR, FEU, GMH, MMH, NKI and STU performed sufficient number of QC tests for the QC organisms which consist of *E. coli* 25922, *Haemophilus influenzae* 49247, *Pseudomonas aeruginosa* 27853, *Staphylococcus aereus 25923* and *Streptococcus pneumoniae 49619.* DMC and VSM performed sufficient number of QC tests for the 4 QC organisms except for *H. influenza 49247* while BGH, BRT, CMC, JLM, MAR and RMC had sufficient QC tests except for *H. influenza 49247* and *Streptococcus pneumonia 49619*. The 3 hospitals participating in the gonorrhea surveillance did not submit NGO QC tests data.

The distribution of pathogens reported were as follows: *E. coli* –16%, *Klebsiella* – 15%, coagulase negative Staphylococci – 12%, *Pseudomonas aeruginosa* – 9%, *Enterobacter spp* – 9%, *Staphylococcus aureus* – 8%, *Acinetobacter spp* – 7%, *Staphylococcus epidermidis* – 4%, *Proteus sp.* – 4%, *Enterococcus faecalis* – 1%, *Burkholderia cepacia* – 1% and others - 14% (Figure 3).

Figure 3. Distribution of Organisms Isolated, DOH Antimicrobial Resistance Surveillance, Jan-Dec, 2010 (N = 22,122



There were 4 isolates of *Moraxella catarrhalis* and 34 isolates of *Neisseria gonorrhea* (Figures 3a and 3b).

Fig. 3a. % Hospital Contribution for *Moraxella catarrhalis* DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010 (N =4)

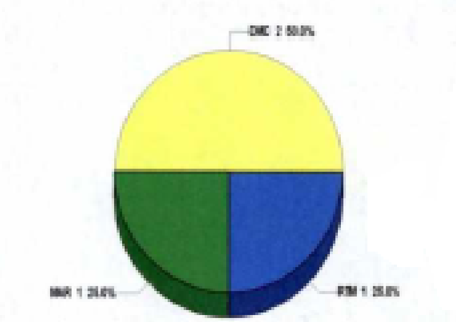
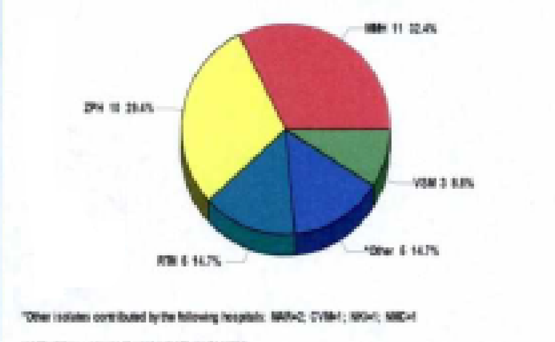


Fig. 3b. % Hospital Contribution for *Neisseria gonorrhoeae* DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010 (N =34)



The number of *Moraxella* isolates decreased from 384 isolates in 2009 to 4 in 2010 while the number of gonococcal isolates decreased by 114% from 73 in 2009 to 36 in 2010. DMC contributed 2 isolates of *M. catarrhalis,* while MAR and RTM contributed 1 isolate each. Thirty two percent (32%) of the gonococcal isolates came from patients of MMH, followed by Zamboanga Provincial Hospital (ZPH) – 29%, RTM 15%, and VSM 9%. The other sentinel sites contributing gonococcal isolates were MAR – 2, CVM – 1, NKI – 1 and NMC – 1. The other gonorrhea surveillance sites, Rafael Tumbokon Hospital (RTH) and SLH did not submit any *N. gonorrheae* isolates for 2010.

There were less isolates of *Salmonella* Typhi and *Vibrio cholerae* in 2010 at 165 and 45, respectively, compared to 203 and 88, respectively, in 2009. The top three contributors of *Salmonella* Typhi isolates were SLH 19%, VSM 18% and CMC 12% (Figure 3c). ZMC ranked as the highest contributor of *Vibrio cholerae* at 51%, followed by SLH 22%, and VSM 20% (Figures 3d).

Fig. 3c. % Hospital Contribution for *Salmonella typhi*
DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010
(N = 165)

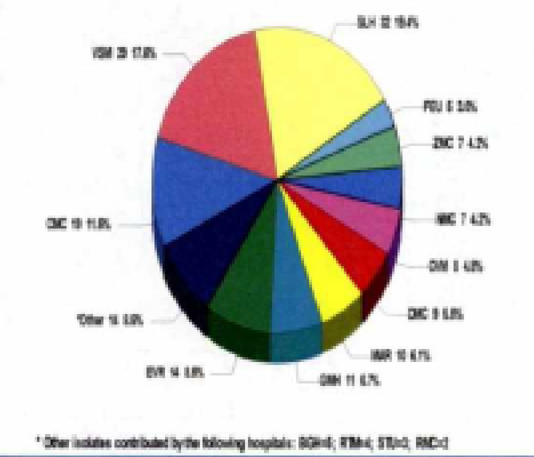
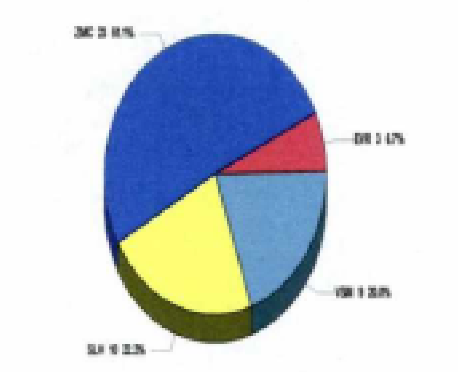


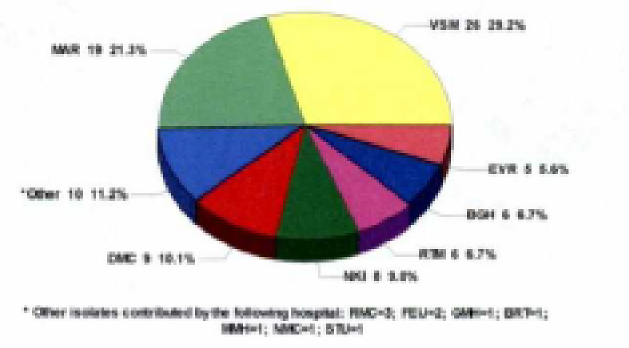
Fig. 3d. % Hospital Contribution for *Vibrio cholerae*
DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010
(N = 45)



There were 7 isolates of *Neisseria meningitides* which were reported by the following hospitals: SLH – 5, FEU - 1 and EVR – 1.

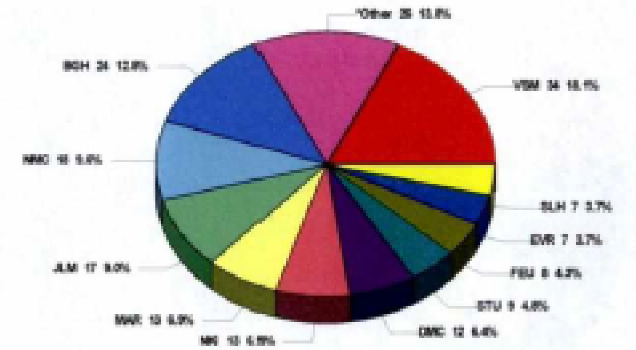
There was an 8% decrease in the number of *Haemophilus influenzae* isolates submitted - 89 against 96 in 2009. Fourteen out of the 22 tertiary care sentinel sites were able to identify *H. influenzae*. The following hospitals were the main contributors of data for *H. influenzae*: VSM 29%, MAR 21%, DMC 10%, NKI 9%, and RTM 7% (Figure 3e).

Fig. 3e. % Hospital Contribution for *Haemophilus influenzae*
DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010
(N = 89)



There was a 10% decrease in the total number of *Streptococcus pneumoniae* isolates noted for 2010 at 188 against the 208 contributed in 2009. The main contributors of data on *S. pneumoniae* were VSM 18%, BGH 13%, NMC 10%, JLM 9%, MAR 7% and NKI 7% (Figure 3f). Two sentinel sites were not able to report any *S. pneumoniae* namely LCP and CMC. There were 11 isolates of *Shigella* which were reported by 4 hospitals with GMH 5 isolates, VSM 3 isolates, NKI 2 isolates, and RTM 1 isolate.

Fig. 3f. % Hospital Contribution for *Streptococcus pneumoniae*
DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010
(N = 188)



* Other isolates contributed by the following hospitals: GMH=6; CVM=5; RTM=4; BRH=3; BRT=3; RMC=2; ZMC=2; MMH=1

Cervical swabs were collected from patients attending STD clinics as follows: RTH-2280, ZPH – 314, DMC – 135, STU – 114, VSM – 75, RMC – 47, MMH – 38, NMC – 30, FEU – 28, JLM – 28, ZMC – 12, RTM – 7, BRT - 6 and CVM – 2 (Figure 4a). An 8% increase in the number of cervical swabs collected in 2010 was noted with 3116 swabs as compared to 2,863 in 2009 (Figure 4b).

Fig. 4a. No. of Cervical Swabs Collected by Hospital/STD Clinic
DOH, Antimicrobial Resistance Surveillance, Jan-Dec, 2010
(N=3,116)

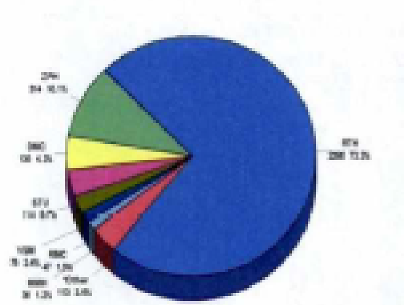
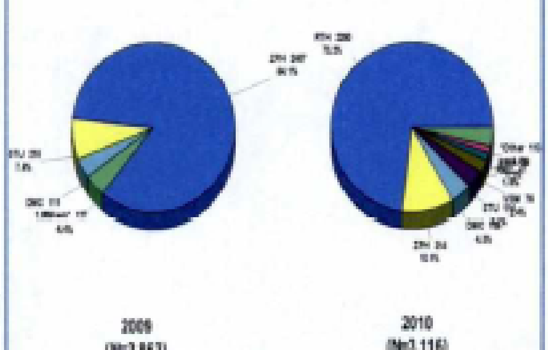


Fig. 4b. No. of Cervical Swabs Collected by Hospital/STD Clinic
DOH, Antimicrobial Resistance Surveillance,
2009 and 2010



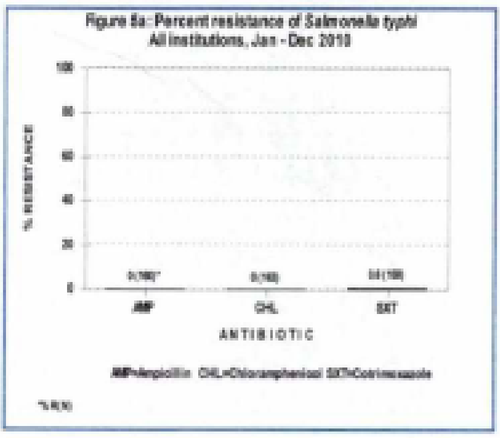
There was a 114% decrease (from 73 to 34) in the number of gonococcal isolates in 2010 compared to 2009 reported by sentinel sites. MMH had the most number of isolates contributed (11), followed by ZPH (10) and RTM (5) (Table 2). SLH, BRT, and EVR had no *N. gonorrhoeae* isolates reported.

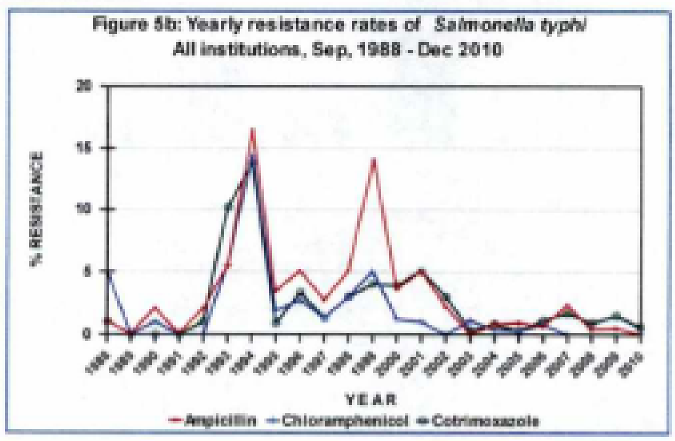
Table 2. Number of *Neisseria gonorrhea*. Antimicrobial Resistance Surveillance Program Philippine Department of Health 1995-2010

SENTINEL SITES	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ARS										37	5					
BGH												1	2		1	
BRL	13	2														
BRT							65	26	32	64	72					
CVM																1
DMC								2			1				1	
EVR					3	3	3	4					1			
FEU			1			1		1	2	1						
GMH				1	1	3	2	4							3	
LCP		1														
MAR																2
MMH				2	7	2	18	4						2	8	11
NKI											1	1	1			1
NMC																1
PGH	1	1	9	3	1	1	5		8							
PPH								4	4							
RMC								1	2		1	2	1	2	1	
RTH							53	68	32	69	8	39	32	19		
RTM	17	63	49	147	306	291	320	14	65	33	5	1	6	2		5
SLH											52	50				
STU										3		4	1	1	7	
VSM						3	3	4		5	1	8	3	4	15	3
ZPH						4	24	30		45	51	56	67	53	37	10
TOTAL	31	67	59	153	318	308	493	162	145	257	197	162	114	83	73	34

1. Enteric pathogens

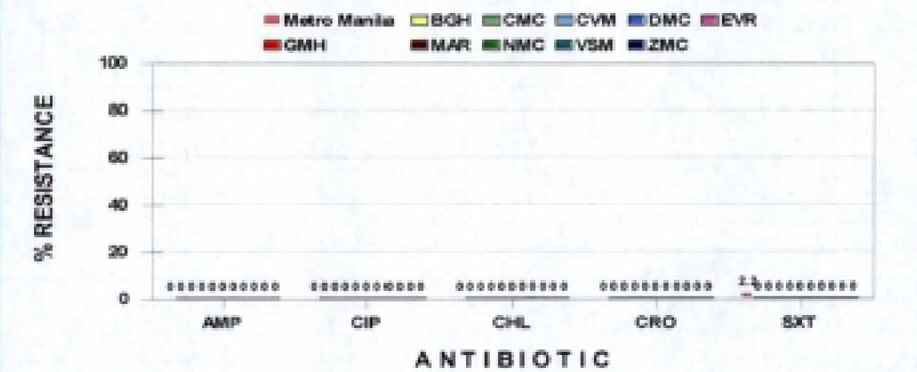
Resistance rates of all *Salmonella* Typhi isolates to cotrimoxazole remained low at 0.6% as was in 2009 (1.5%). There was no chloramphenicol nor ampicillin resistance reported for 2010 (Figures 5a and 5b). There was no ciprofloxacin resistant *S.* Typhi reported for 2010 as in the past many years. There was also no *S.* Typhi isolate reported to be resistant to ceftriaxone in contrast to 2009 where 2 isolates (BRH-1 and SLH-1) were reported to be ceftriaxone resistant but were not confirmed. SLH and RTM reported 1 and 2 isolates, respectively, which were nalidixic acid resistant but these were not confirmed.





The resistance rate of *S.* Typhi gathered from regional hospitals show that the organism remains to be sensitive to chloramphenicol, cotrimoxazole and ampicillin, where no resistance was observed to chloramphenicol and ampicillin while resistance to cotrimoxazole was at 2% for Metro Manila (Figure 5C). Based on the above epidemiologic information, empiric therapy for suspected uncomplicated typhoid fever could still consist of chloramphenicol, cotrimoxazole, or amoxicillin.

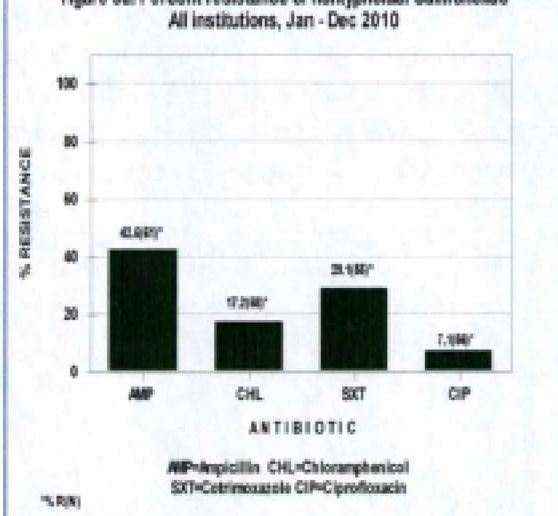
Figure 5c. % Resistance* of *Salmonella typhi* in Metro Manila and Regional Hospitals ARSP, Jan-Dec, 2010



*No. of isolates tested:
Ampicillin: MM=46; BGH=6; CMC=19; CVM=6; DMC=6; EVR=14; GMH=11; MAR=10; NMC=7; VSM=29; ZMC=6
Ciprofloxacin: MM=46; BGH=6; CMC=19; CVM=6; DMC=6; EVR=14; GMH=11; MAR=8; NMC=7; VSM=29; ZMC=6
Chloramphenicol: MM=46; BGH=6; CMC=19; CVM=6; DMC=6; EVR=14; GMH=11; MAR=10; NMC=7; VSM=29; ZMC=6
Ceftriaxone: MM=46; BGH=6; CMC=19; CVM=6; DMC=6; EVR=14; GMH=11; MAR=10; NMC=7; VSM=29; ZMC=6
Co-trimoxazole: MM=46; BGH=6; CMC=19; CVM=6; DMC=6; EVR=14; GMH=11; MAR=8; NMC=7; VSM=29; ZMC=6

As has been previously observed, nontyphoidal *Salmonellae* showed higher resistance rates to chloramphenicol 17%, ampicillin 43%, and cotrimoxazole 29% compared to rates for *S.* Typhi (Figures 5a and 6a&b). Resistance to ampicillin increased at 43% in 2010 compared to the rate in 2009(17%). There was likewise an increase in the resistance to chloramphenicol and cotri

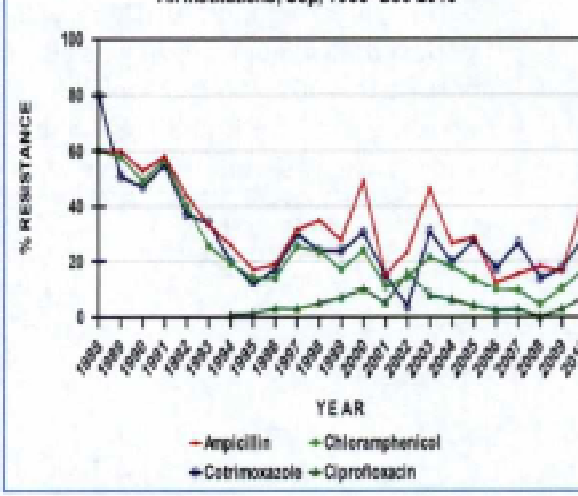
Figure 6a. Percent resistance of nontyphoidal Salmonellae All institutions, Jan - Dec 2010



AMP=Ampicillin CHL=Chloramphenicol
SXT=Cotrimoxazole CIP=Ciprofloxacin

*%R(N)

Figure 6b. Yearly resistance rates of nontyphoidal Salmonellae All institutions, Sep, 1988 -Dec 2010



moxazole from 10% in 2009 to 17% in 2010 and 17% in 2009 to 29% in 2010, respectively. One isolate of *S.* Enteritidis from STU, 1 *Salmonella* Wanatah from NKI, and 1 isolate of *S.* Schwarzegrund from NKI were confirmed to be resistant to ciprofloxacin for 2010. Ten nontyphoidal salmonella were nalidixic acid resistant by MIC (Annex A). Of the referred isolates, 3 *Salmonella* Enteritides (2 from UST, 1 from DMC), 2 *Salmonella* Albany (2 from DMC), 1 *Salmonella* Typhimurium (from JLM), 1 *Salmonella* Schwarzengrund from NKI , 1 *Salmonella* Heidelberg from VSM, 1 *Salmonella* Stanley from STU and 1 *Salmonella* Wanatah from NKI were confirmed to be nalidixic acid resistant.

Annex B (located at the end of this document) summarizes the results of confirmatory tests on *Salmonella* isolates referred to the Antimicrobial Resistance Surveillance Reference Laboratory (ARSRL) in 2010. There were 128 & 32 viable *S.* Typhi and non-typhoidal *Salmonella* isolates, respectively, confirmed at the ARSRL. The most common nontyphoidal *Salmonella* serotypes identified were *Salmonella* Enteritidis (7 isolates) and *Salmonella* Typhimurium (7 isolates).

The resistance rate of *Shigella* to cotrimoxazole was 86% which was higher than the figure of 75% in 2009. There was no ciprofloxacin nor nalidixic acid resistance reported for 2010 (Figure 7a-c). Three out of 11 of the *Shigella* isolates came from Metro Manila. Of the regional sites, GMH reported 5 *Shigella* isolates, and VSM 3 isolates. Nalidixic acid had become the first line treatment of Shigellosis in areas of the world where cotrimoxazole resistance is high.

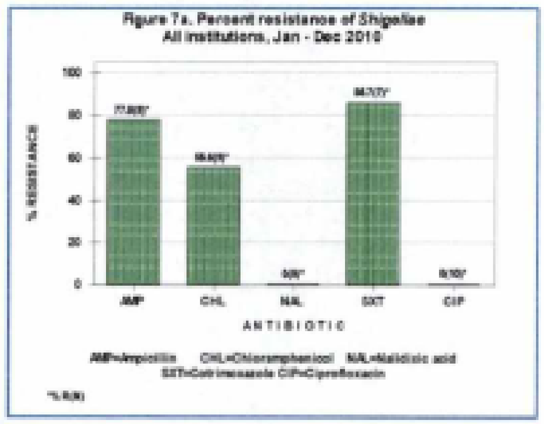


Figure 7a. Percent resistance of Shigellae All institutions, Jan - Dec 2010

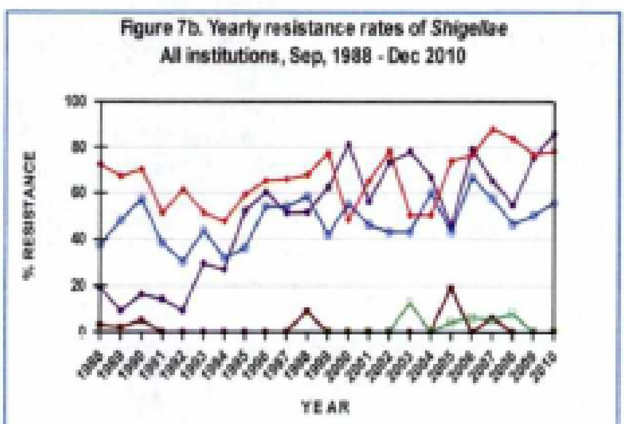


Figure 7b. Yearly resistance rates of Shigellae All institutions, Sep, 1988 - Dec 2010

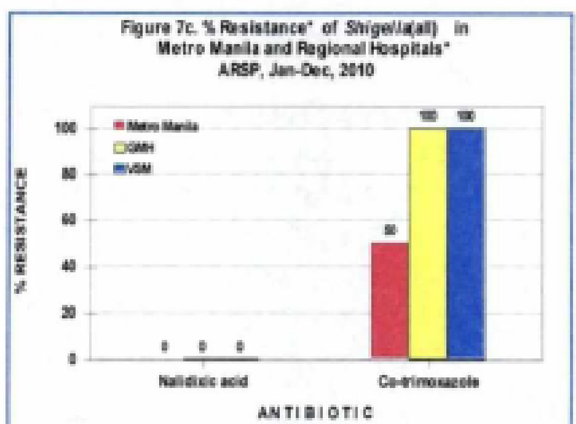
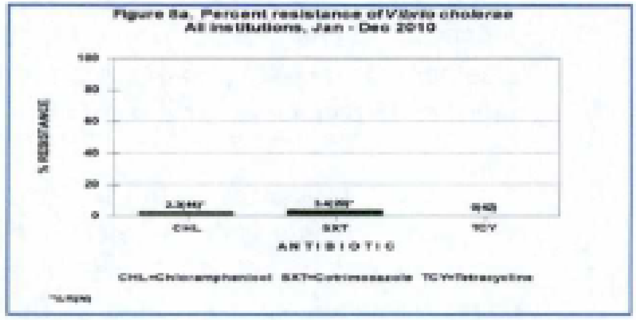
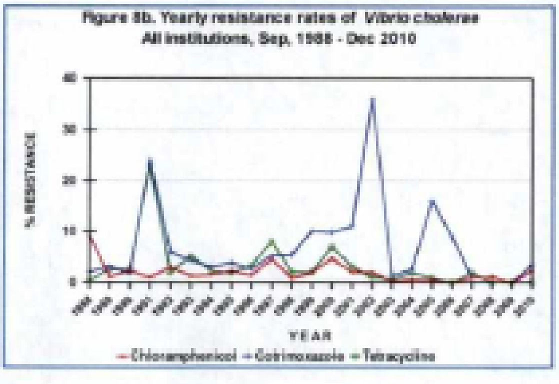


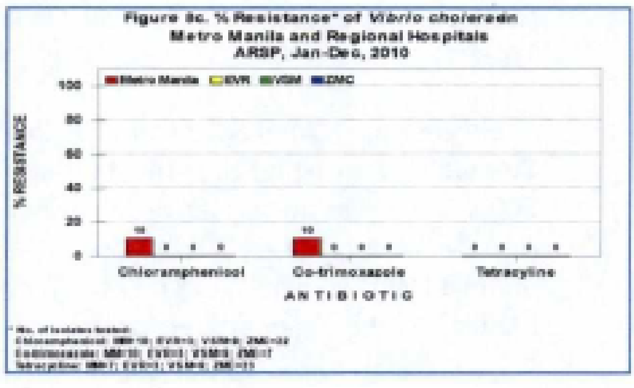
Figure 7c. % Resistance* of Shigella(all) in Metro Manila and Regional Hospitals* ARSP, Jan-Dec, 2010

In order to obtain a reasonable statistical estimate of cumulative %R for *Shigella*, we combined the results of isolates from 2008 to 2010 to obtain a total required number of isolates (>30 isolates). The resistance rate of shigella for the combined 2008 to 2010 isolates are as follows: resistance to cotrimoxazole is 70%, ciprofloxacin 3% and nalidixic acid 0%.

As was observed in 2009, there was no resistance of *V. cholera* 01 to tetracycline in 2010 (Figure 8a-c, Annex C). There was an increase in resistance to cotrimoxazole at 3% in 2010 against 0% in 2009. An increase in resistance to chloramphenicol was also observed at 2% against 0% in 2009.

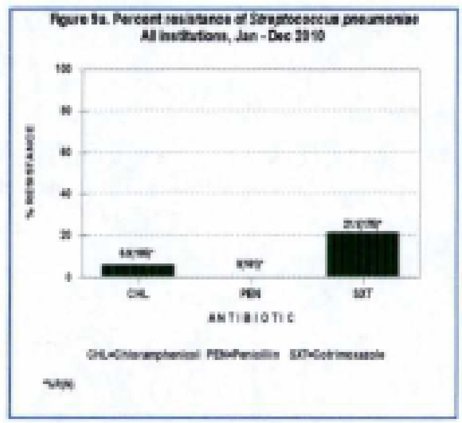


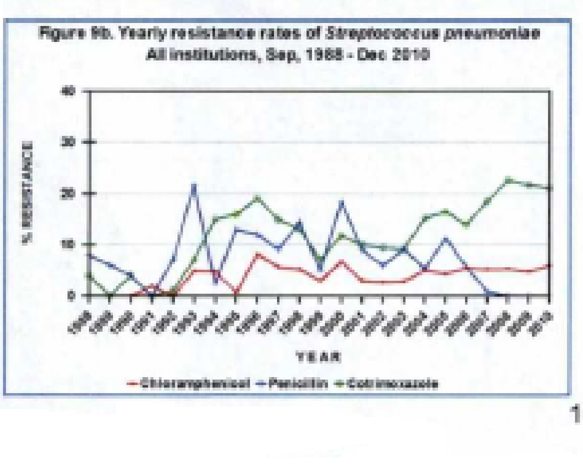


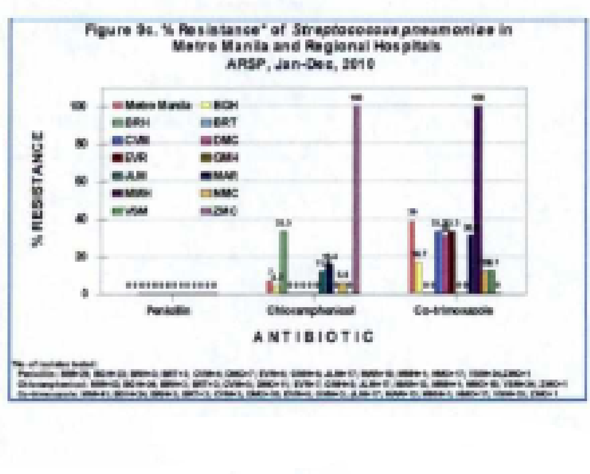


2. ARI pathogens

Among the respiratory and invasive isolates of *Streptococcus pneumoniae*, there was 0% resistance to penicillin (as determined by screening with 1 ug oxacillin disk) in 2010 the same as was observed in 2009. There was a decrease in resistance to cotrimoxazole at 21% from 22% in 2009, while resistance to chloramphenicol increased from 5% in 2009 to 6% in 2010(Figure 9a-c). The listing of the *S. pneumoniae* isolates referred to the ARSRL and their confirmatory test results are contained in Annex D located at the end of this document.







Among the isolates of *Haemophilus influenzae* – 34%, 16%, and 12% of the isolates were resistant to cotrimoxazole, ampicillin and chloramphenicol, respectively (Figures 10a&b). Resistance rate was lower for ampicillin in 2010 at 16% compared to 17% in 2009. Resistance to cotrimoxazole and chloramphenicol decreased at 34% and 12% from 39% and 21%, respectively, in 2009. The summary of confirmatory test results of *Moraxella*, *Haemophilus*, and *Neisseria meningitides* is presented in Annex E located at the end of this document.

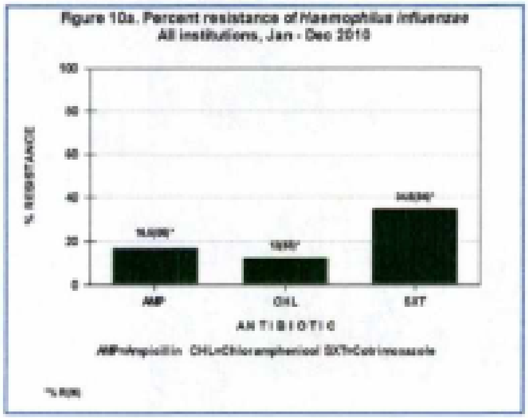


Figure 10a. Percent resistance of Haemophilus influenzae All institutions, Jan - Dec 2010

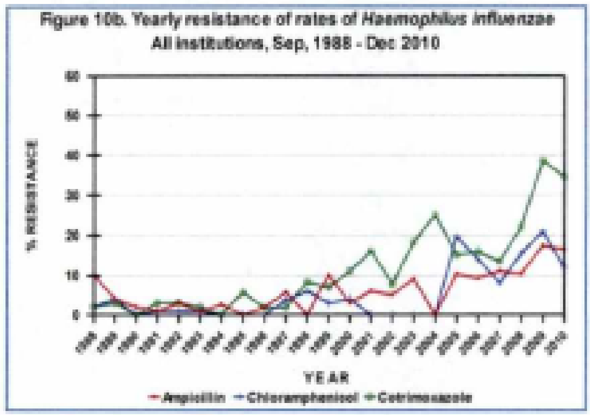


Figure 10b. Yearly resistance of rates of Haemophilus influenzae All institutions, Sep, 1988 - Dec 2010

3. Staphylococci and other Gram positive cocci

Only forty six percent (46%) of *Staphylococcus aureus* isolates remained sensitive to oxacillin as compared to 55% in 2009 (Figure 11a&b). There were 680 referred MRSA tested of which 256 came from Metro Manila. Those of the regional hospitals totaled 424 which were as follows: BGH (108), JLM (89), VSM (67), CVM (51), MAR (34), NMC (27), EVR (18), GMH (12), BRH (7), BRT (4), MMH (4), ZMC (1) CMC (1) and DMC (1).

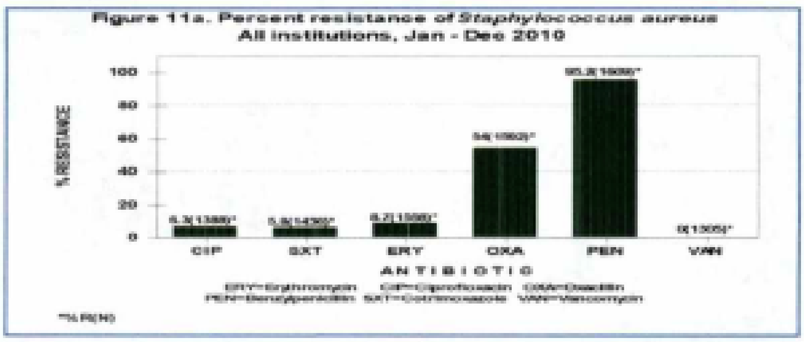


Figure 11a. Percent resistance of Staphylococcus aureus All institutions, Jan - Dec 2010

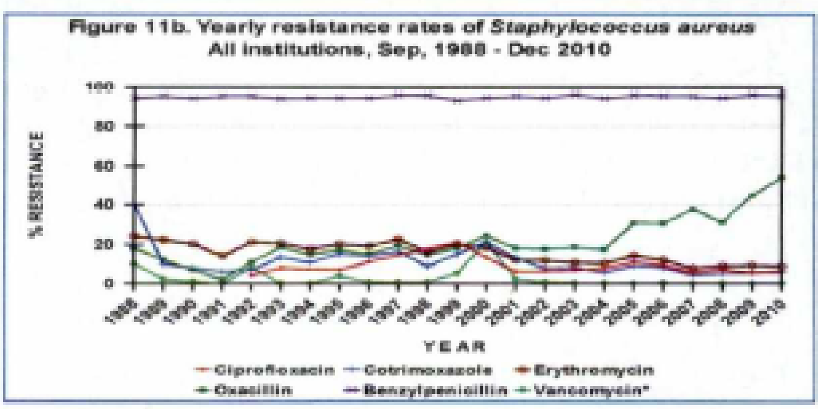


Figure 11b. Yearly resistance rates of Staphylococcus aureus All institutions, Sep, 1988 - Dec 2010

Overall MRSA rate increased at 54% compared to 45% in 2009. Resistance rate from Metro Manila increased from 45% in 2009 to 51% in 2010. Among the regional sentinel sites, MRSA rates were as follows: JLM (76%), NMC (75%), BRH (72%), CVM (67%), ZMC 65%, VSM (61%), MAR (53%), BGH (48%), DMC (46%), EVR (36%), GMH (34%), MMH (17%), BRT (16%) and CMC (6%) (Figures 11c and 11d).

Figure 11c. % Resistance* of *Staphylococcus aureus* in Metro Manila and Regional Hospitals ARSP, Jan-Dec, 2010

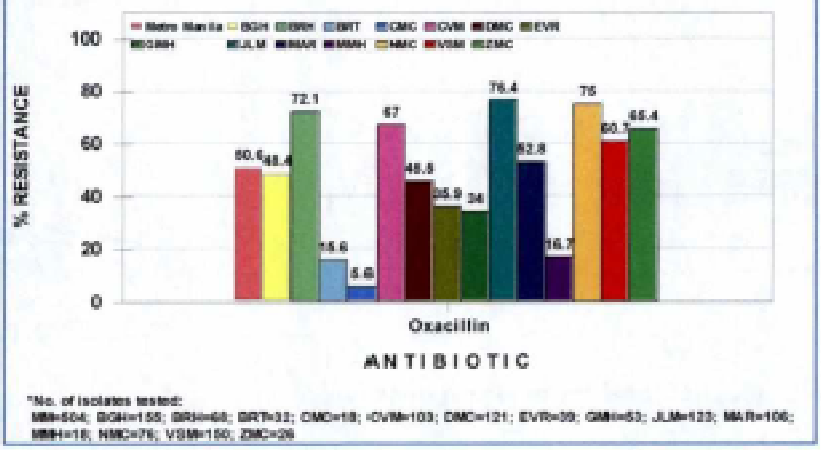
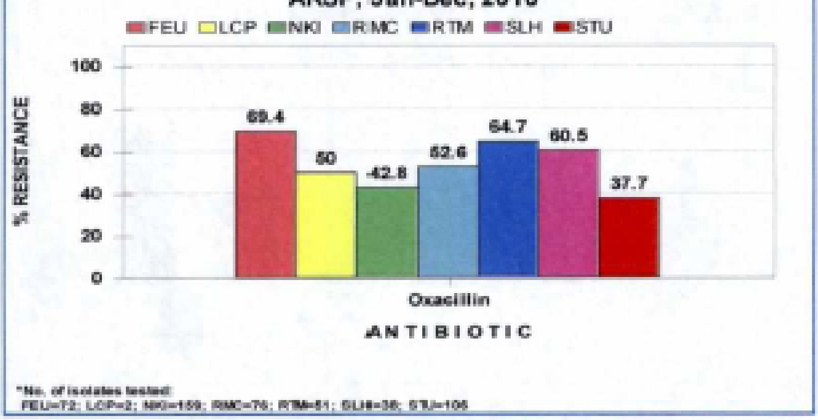


Figure 11d. Resistance* of *Staphylococcus aureus* in Metro Manila Hospitals ARSP, Jan-Dec, 2010



Results of MICs done by ARSRL on 680 oxacillin-resistant isolates showed that 563 (83 %) were truly methicillin-resistant (MRSA) (Table 3, Annex F). Other hospitals with confirmed MRSA are listed in the table presented in the subsequent portions of this report, documenting the persistence of the problem of methicillin resistance in said hospitals.

Table 3. Number of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Referred from Sentinel Sites, DOH ARSP, January to December 2010.

HOSPITAL	No. of referred MRSA isolates	No.of referred MRSA isolates confirmed by ARSRL as MRSA	Total Number of confirmed MRSA by sentinel site*
BGH	108	94	101
BRH	7	4	4
BRT	4	4	5
CMC	1	1	1
CVM	51	42	43
DMC	1	1	5
EVR	18	15	16
FEU	56	38	40
GMH	12	11	12
JLM	89	86	89
LCP	0	0	1
MAR	34	24	24
MMH	4	3	3
NKI	63	45	46
NMC	27	17	21
RMC	69	56	57
RTM	-	-	-
SLH	2	2	5
STU	66	55	55
VSM	67	65	90
ZMC	1	0	0
TOTAL	**680**	**563**	**618**

* includes referred Staphylococcus sp isolates other than S. aureus identified by ARSRL as MRSA.

Resistance rate of *Staphylococcus epidermidis* to oxacillin decreased to 63% from 70% in 2009 as well as resistance to cotrimoxazole at 44% from 48% in 2009. Resistance to erythromycin also decreased to 53% from 54% in 2009. There was one isolate of vancomycin resistant *Staphylococcus epidermidis* reported in 2010 but this was not confirmed (Figure 12a&b). This isolate was reported by UST from a 19-year old outpatient. There was no vancomycin resistant *S. aureus* reported for 2010.

Figure 12a. Percent resistance of *Staphylococcus epidermidis* All institutions, Jan - Dec 2010

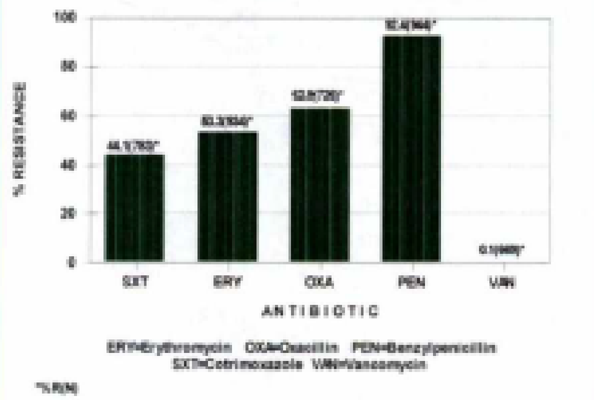
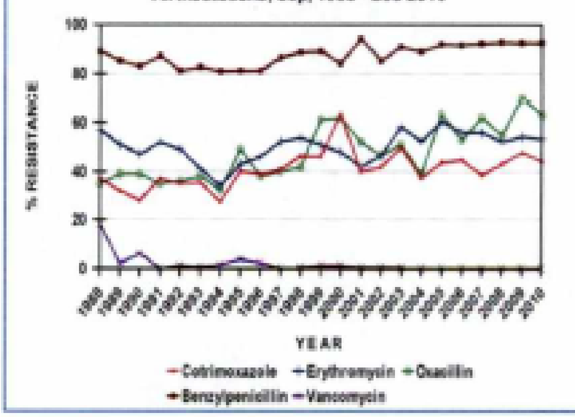


Figure 12b. Yearly resistance rates of *Staphylococcus epidermidis* All institutions, Sep, 1988 - Dec 2010



There were 257 and 60 isolates of *Enterococcus faecalis* and *E. faecium*, respectively. Majority of *E. faecalis* (115 isolates) came from NKI while most of *E. faecium* (34 isolates) came from DMC. Vancomycin and ampicillin resistance among *E. faecalis* and *E. faecium* were 0.9% and 0%, respectively for vancomycin and 6% and 49%, respectively for ampicillin. Vancomycin resistant Enterococcus faecalis were reported by MAR (1 isolate), NMC (2 isolates) and VSM (1 isolate).

4. Gram negative bacilli

For *Pseudomonas aeruginosa*, overall resistance to ceftazidime decreased at 12% in 2010 from 15% in 2009 while resistance to ciprofloxacin likewise decreased from 22% (2009) to 16% (Figures 13a & b).

Figure 13a: Percent resistance of *Pseudomonas aeruginosa*
All institutions, Jan - Dec 2010

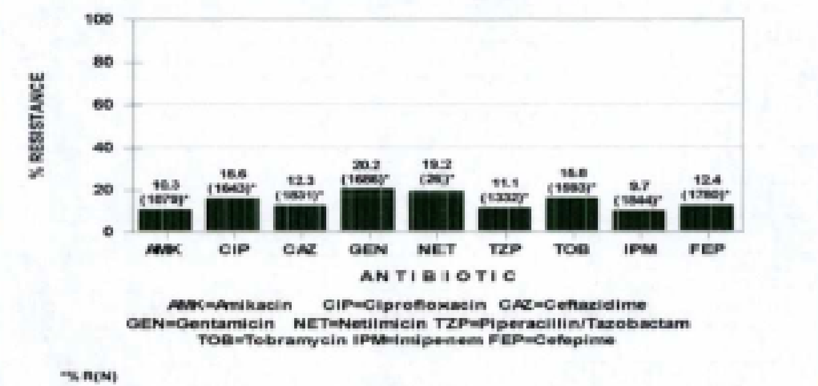
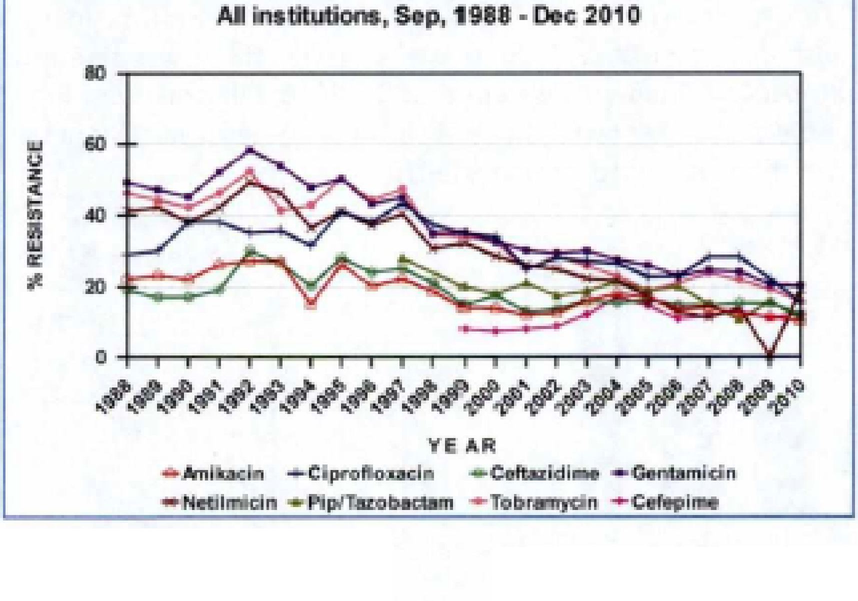
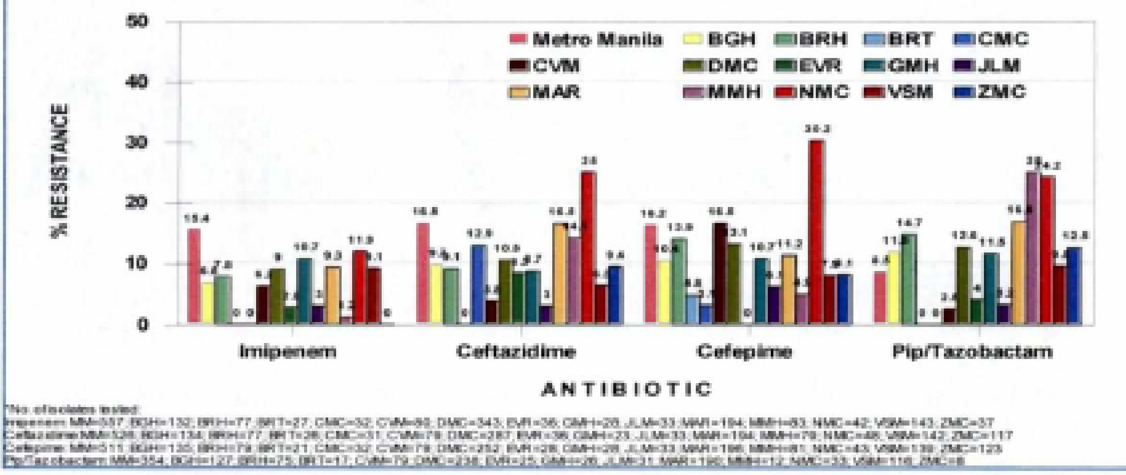


Figure 13b: Yearly resistance rates of *Pseudomonas aeruginosa*
All institutions, Sep, 1988 - Dec 2010



There was a decrease in resistance to piperacillin/tazobactam (from 16% to 11%). Among aminoglycosides, there was 19% resistance to netilmycin while resistance rates for amikacin, tobramycin and gentamicin ranged from 10-20%. Comparing resistance rates among regions, imipenem resistance was highest in Metro Manila at 15%. Ceftazidime resistance was highest in NMC, MAR, and Metro Manila at 25%, 16%, and 16%, respectively. Cefepime resistance was highest in NMC and Metro Manila at 30% and 16%, respectively (Figure 13c, Annex G).

Figure 13c. % Resistance* of *Pseudomonas aeruginosa* in Metro Manila and Regional Hospitals ARSP, Jan-Dec, 2010



Many of the Enterobacteriaceae showed high resistance rates to several antibiotics tested but resistance rates of *E. coli* to cotrimoxazole increased to 70% from that of 2009 (67%) (Figures 14a and 14b). Resistance rate to ampicillin remained the same at 80% while the resistance rates to the third generation cephalosporin (ceftriaxone) increased from 18% in 2009 to 22% in 2010. Resistance to fourth generation cephalosporin (cefepime) also increased at 23% in 2010 compared to 21% in 2009. A resistance rate to the second generation cephalosporin (cefuroxime) was noted at 25% (which increased from 20% in 2009) while beta lactam-beta lactamase inhibitors (i.e. ampicillin-sulbactam) increased to 32% from 30% in 2009.

Figure 14a. Percent resistance of *Escherichia coli* All institutions, Jan - Dec 2010

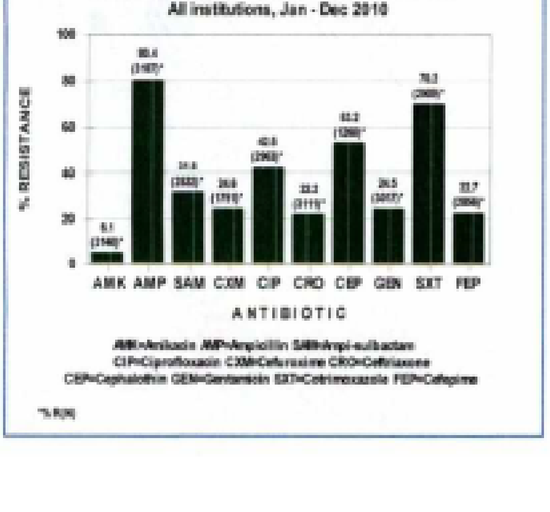
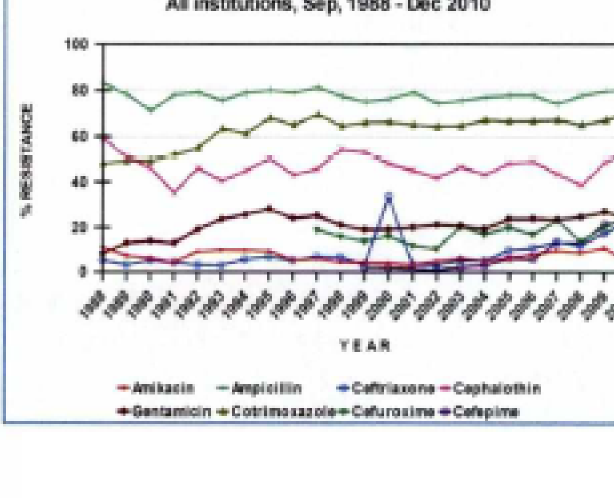
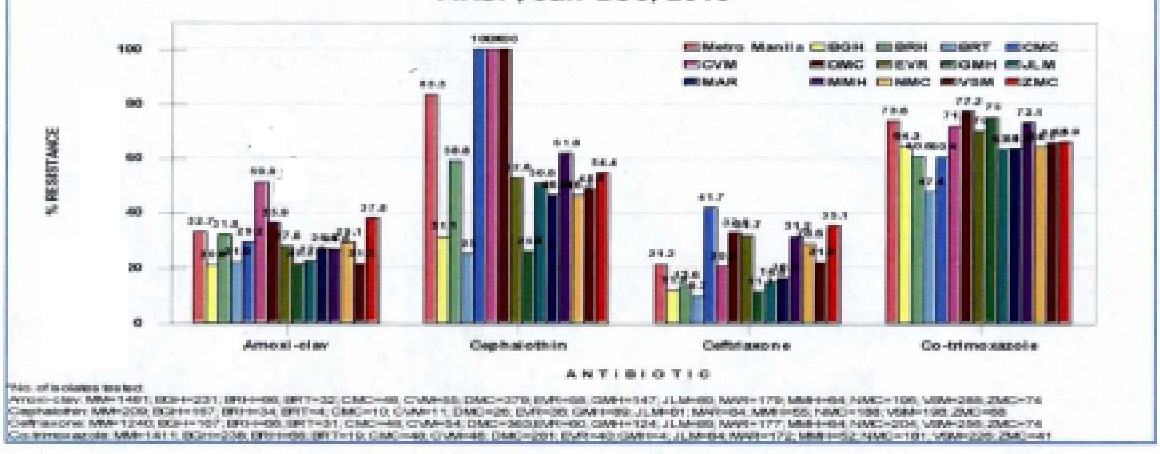


Figure 14b. Yearly resistance rates of *Escherichia coli* All institutions, Sep, 1988 - Dec 2010



No significant change was observed in comparing data for *E. coli* among regions. As had been seen in 2009, very high resistance rates existed against cotrimoxazole (range: 47% in BRT to 77% in DMC), cephalothin (range: 25% in BRT to 100% in CMC, CVM and DMC), but were variable for co-amoxiclav (range: 21% in BGH and GMH to 51% in CVM) (Figure 14c).

Figure 14c. % Resistance* of *Escherichia coli* in Metro Manila and Regional Hospitals ARSP, Jan-Dec, 2010



Other sentinel sites with high resistance rates to co-amoxiclav were ZMC (38%), MM (33%), BRH (32%), and NMC (29%). An abrupt decrease in resistance rate of *E. coli* to co-amoxiclav was observed for BRT (from 61% to 38%) MAR (from 53% to 26%), GMH (from 41% to 21%), NMC (from 50% to 29%), and ZMC (from 55% to 38%).An abrupt increase in resistance rate of *E. coli* to cephalotin was observed for VSM (from 30% to 48%) and JLM (from 40% to 51%). For BRT, 100% or 1 out 1 isolate of *E coli* isolate was ESBL producing, 79% (27 out of 34) for BGH, 88% (30 out of 34) for CMC, 79% (48 out of 61) for VSM and 72% (23 out of 32) for DMC. BRH and BRT referred only 1 isolates each of *E. coli* to the ARSRL for confirmation while no *E. coli* isolate was referred by LCP, SLH and RTM for confirmation (Annex H located at the end of this document).

Resistance rates of *Klebsiella* against 4 out of the 9 antibiotics increased for 2010 (Figures 15 a & b). Resistance rate for cefepime increased from 14.3% in 2009 to 21% while cefuroxime increased from 29% to 33%, ciprofloxacin (from 28% to 30%) and ceftriaxone (from 30% to 32%) (Figure 15a). High resistance rates were exhibited against first generation cephalosporins like cephalothin (47%) and second generation cephalosporins like cefuroxime (33%) and beta lactam-beta lactamase inhibitors like ampicillin-sulbactam at 33%. There was a high resistance rate against gentamicin (30%) but lower for amikacin where the resistance rate was 9%. Resistance rate remained almost the same for imipenem (from 0.7% in 2009 to 0.5% in 2010).

Figure 15a. Percent resistance of Klebsiella spp All institutions, Jan - Dec 2010

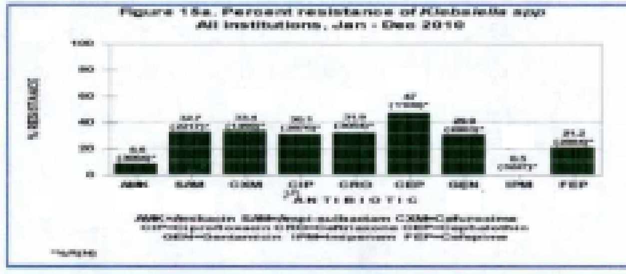
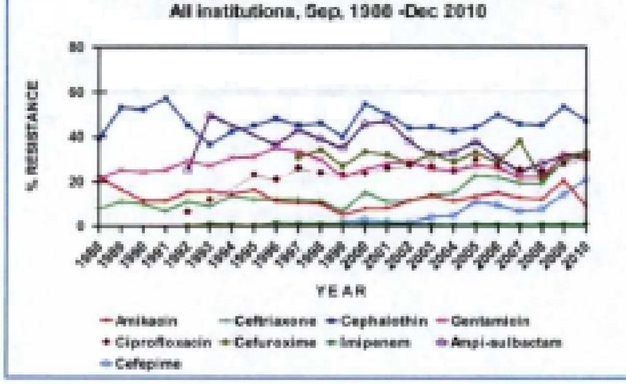


Figure 15b. Yearly resistance rates of *Klebsiella spp* All institutions, Sep, 1988 -Dec 2010



The presence of extended spectrum beta lactamases had been confirmed from bacterial isolates of *E. coli* and *Klebsiella* referred by 19 tertiary care sentinel sites of the ARSP to ARSRL as follows:

Table 4. Bacterial Isolates screened and confirmed for ESBL production from sentinel sites, DOH ARSP, January to December 2010

Organism	Total No. Of Isolates from all Sentinel Sites (A)	Total No. of CAZ Resistant Isolates by Disk Diffusion (ESBL suspect) (B)	% of CAZ Resistant Isolates (ESBL suspect) (B/A)	No. of CAZ Resistant Isolates Referred to ARSU* (C)	% of CAZ Resistant Isolates Referred to ARSU (C/B)	No. of CAZ resistant referred Isolates Confirmed by ARSRL to be ESBL (+)** (D)	No. of referred CAZ resistant Isolates w/ Non-Determinable Results (F)	No. of Negative ESBL Isolates (G)
Escherichia coli	3552	475	13.37%	249	52.42%	289	36	20
Klebsiella sp.	3369	483	24.73%	453	54.38%	414	106	10

CAZ -Ceftazidime

*based on site ceftazidime test results on disk diffusion

** includes referred isolates not suspected to be ESBL(+) but were later on confirmed at ARSRL to be ESBL(+)

NKI had the highest number of confirmed ESBL (+) isolates at 104 (15% of referred suspected ESBL producing isolates) followed by VSM at 89, MMH at 77, DMC at 55 and STU at 45. There is a need to closely monitor the presence of this enzyme among the *Enterobacteriaceae* in view of the very limited antibiotics (i.e. carbapenems, beta lactam-beta lactamase inhibitors) which can be utilized for patient therapy in the presence of such enzyme. Hospitals reporting many of these organisms should investigate whether these cases were associated with outbreaks and if so, investigated.

Resistance rates of urinary *E. coli* from outpatients versus inpatients showed no significant difference in rates for most antibiotics except for higher resistance rates among outpatient compared to inpatient isolates against ceftriaxone (35% vs 21.3%), cefuroxime axetil (60% versus 46%), cephalotin (67.3% versus 54.4%) and against nalidixic acid (56.5% versus 47.7%)(Table 5).

Table5. Percent Resistance of *E. coli* from Urine, Outpatients vs Inpatients, ALL Institutions, DOH ARSP for Jan – Dec, 2010

ANTIMICROBIAL AGENT	PERCENT RESISTANCE	
	OUTPATIENT (n=247)	INPATIENT (n=1848)
1. AMPICILLIN	85.4	82.2
2. CO-AMOXICLAV	36.2	29.2
3. CEPHALOTHIN	67.3	54.4
4. CEFUROXIME AXETIL	59.8	46.3
5. CEFTRIAXONE	35.1	21.3
6. CEFOTAXIME	33.5	26.1
7. COTRIMOXAZOLE	72	72.7
8. GENTAMICIN	31.7	25.5
9. AMIKACIN	4.7	5.6
10. CIPROFLOXACIN	57.4	46.4
11. NALIDIXIC ACID	56.5	47.7
12. NITROFURANTOIN	7.6	10.1

In isolates obtained from outpatients, least resistance was observed against nitrofurantoin among oral antibiotics at 8% while there was a remarkable increase in the resistance rate for nalidixic acid (from 34% in 2009 to 56% in 2010). For parenteral antibiotics, amikacin had the least resistance at 5% followed by gentamycin at 32%. Among in-patients, there was a significant decrease in resistance to amikacin (from 13% in 2009 to 6% in 2010).

In contrast, resistance rates of *Klebsiella* from respiratory specimens showed higher rates among most isolates from inpatients (Table 6) which was also the trend observed in 2009.

Table 6. Percent Resistance of *Klebsiella* from Respiratory Specimens, Outpatients vs Inpatients, All Institutions, DOH ARSP Jan – Dec 2010

ANTIMICROBIAL AGENT	PERCENT RESISTANCE	
	OUTPATIENT (n=41)	INPATIENT (n=1430)
1. CO-AMOXICLAV	25.6	27.7
2. CEPHALOTHIN	17.6	32.8
3. CEFTRIAXONE	15.4	23.8
4. CEFUROXIME AXETIL	19.2	40.8
5. CIPROFLOXACIN	31.4	22.7
6. GENTAMICIN	21.1	22.6
7. AMIKACIN	0	5
8. CEFEPIME	7.5	15.8

Among outpatient isolates, there was a noted increase in resistance rates compared to 2009 data for ciprofloxacin (from 8% in 2009 to 31% in 2010), ceftriaxone (from 4% to 15%) and gentamycin (from 9% to 21%). Among inpatient isolates there was a significant increase in resistance rate for coamoxiclav (from 14% to 28%) while there was a significant decrease in resistance to cephalotin, from 47% to 33%.

For *Pseudomonas aeruginosa*, resistance rates tended to be higher for inpatients (Table 7). Among in-patients, there was an increase in resistance rate to netilmicin from 0% in 2009 to 11% in 2010 while there was a decrease in the resistance rate to ciprofloxacin from 23% in 2009 to 13% in 2010.

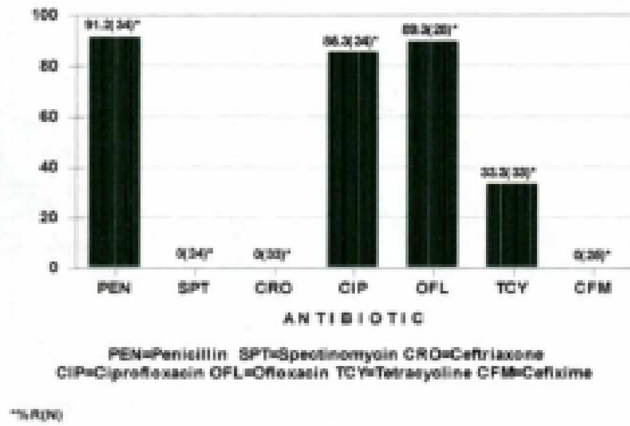
Table 7. Percent Resistance of *Pseudomonas aeruginosa* from Respiratory Specimens, Outpatients vs Inpatients, All Institutions, DOH ARSP Jan –Dec 2010

ANTIMICROBIAL AGENT	PERCENT RESISTANCE	
	OUTPATIENT (n=42)	INPATIENT (n=973)
1. GENTAMICIN	7.7	16.6
2. NETILMICIN	-	11.1
3. TOBRAMYCIN	10.5	13.8
4. AMIKACIN	4.9	7.4
5. CIPROFLOXACIN	5.3	13.3
6. CEFTAZIDIME	5.3	12.4
7. PIPERACILLIN-TAZOBACTAM	2.8	11.7
8. IMIPENEM	0	10.6
9. CEFEPIME	5	11.1

5. *Neisseria gonorrheae*

Resistance to ciprofloxacin and ofloxacin increased to 85% and 89% in 2010 from 83% and 79%, in 2009, respectively. Resistance to tetracycline decreased from 47% in 2009 to 33% in 2010. There were no spectinomycin, ceftriaxone and cefixime resistant isolates reported for 2010 (Figure 16a, Annex I).

Figure 16a. Percent Resistance of *Neisseria gonorrhea*
All institutions, Jan - Dec 2010



In 2010, a total 4473 isolates were referred: 161 from presumptively identified *Salmonella* isolates, 27 enterics other than *Salmonella*, 191 gram positive cocci other than Staphylococci, 101 *Moraxella*, *Haemophilus*, and *N. meningitides*, 1230 *Staphylococcus* isolates, 732 *Psuedomonas* and *Acinetobacter*, 1836 Enterobacteriaceae other than *Salmonella* and *Shigella*, and 28 gonococcal isolates with the rest of the isolates being mixed or not viable. In 2009, a total of 3592 isolates were referred for confirmation (2937 from non-gonococcal/nonSalmonella isolates and 40 from gonococcal isolates and 182 from presumptively identified Salmonella isolates). There is a 19% increase in the number of referred isolates. Please see Annex A - I for the lists of isolates that were sent to ARSRL for confirmation and Annex J for a listing of isolates with "unusual" susceptibility patterns.

6. Bacteria cultured after 48 hours of hospital admission (presumptive etiologic agents of nosocomial infections)

Starting 2005, the ARSP processed a department order requiring all laboratories and consequently all ARSP sentinel sites to enter the patient's hospital number and date of admission for purposes of creating a database of presumptive nosocomial infections (minus clinical confirmation). Table 8 presents the percentage of inpatient charts with inpatient dates of admission excluding PGH which did not submit culture data for 2010.

Table 8. Percentage of inpatient charts with inpatient dates of admission. DOH ARSP January –December 2010

Name of Laboratory	Number of inpatients	Number of inpatient charts with date of admission	Percentage of charts with date of admission (%)
BGH	1419	1403	99
BRH	627	540	86
BRT	439	371	85
CMC	415	403	97
CVM	621	593	95
DMC	2233	2227	100
EVR	404	389	96
FEU	501	492	98
GMH	652	652	100
JLM	641	371	58
LCP	2	2	100
MAR	996	990	99
MMH	471	468	99
NKI	2422	1728	71
NMC	1406	1387	99
RMC	593	583	98
RTM	73	15	21
SLH	515	421	82
STU	922	855	93
VSM	1380	1371	99
ZMC	761	759	100

Note that only 14% (3 out of 22) of the laboratories had not provided data covering more than 80% of inpatient charts with date of admission. Table 9 presents the percentage of bacterial isolates cultured after 48 hours from hospital admission at one isolate per patient (presumptive nosocomial infections):

Table 9. Percentage of bacterial isolates cultured after 48 hours from hospital admission. DOH ARSP Jan –Dec 2010

Name of Laboratory	Number of isolates cultured after 48 hours (at 1 isolate/patient)	Total isolates for 2010 (at 1 isolate/patient)	Percentage of isolates cultured beyond 48 hours
BGH	477	1403	34
BRH	256	540	47
BRT	102	371	27
CMC	94	403	23
CVM	78	593	13
DMC	1015	2227	46
EVR	157	389	40
FEU	91	492	18
GMH	251	652	38
JLM	90	371	24
LCP	1	2	50
MAR	459	990	46
MMH	303	468	65
NKI	443	1728	26
NMC	446	1387	32
RMC	341	583	58
RTM	2	15	13
SLH	208	421	49
STU	350	855	41
VSM	560	1371	41
ZMC	396	759	52

From the above table, hospitals with more than 30% of isolates cultured beyond 48 hours were BGH, BRH, DMC, EVR, GMH, LCP, MAR, MMH, NMC, RMC, SLH, STU, VSM and ZMC.

The following table presents the name of the ward with the biggest number of presumptive nosocomial isolates including the most common bacterial pathogens identified in the said ward.

Table 10. Ward with the biggest number of presumptive nosocomial isolates by sentinel sites. DOH ARSP January – December 2010

Name of Hospital	Ward with the biggest number of presumptive nosocomial isolates	Most common "nosocomial" isolate in the ward stated in the previous column
BGH	Surgery	*E. coli*
BRH	Surgery	*Enterobacter sp*
BRT	Medicine	*Klebsiella sp*
CMC	Pediatrics	Coagulase negative *Staphylococcus*
CVM	Pediatrics	Pseudomonas aeruginosa
DMC	ICU/Pediatrics	*Pseudomonas aeruginosa*
EVR	Inpatient	*Klebsiella sp*
FEU	Medicine	*Klebsiella sp*
GMH	Pediatrics	*E. coli*
JLM	Surgery	*Staphylococcus aureus*
MAR	Medicine	*Klebsiella sp*
MMH	Medicine	*Klebsiella sp*
NKI	Inpatient	*Pseudomonas aeruginosa*
NMC	Pediatrics	Acinetobacter
RMC	Medicine	*Enterobacter sp*
SLH	Medicine	*Klebsiella sp*
STU	Medicine	*E. coli*
VSM	Medicine	*Klebsiella sp.*
ZMC	Medicine	*Enterobacter sp*

7. Multidrug resistant pathogens

In the recent years, there had been a growing recognition of the emergence of gram-negative bacteria resistant to many classes of antibiotics. Among these are *Pseudomonas aeruginosa* and *Acinetobacter baumanii*.

ARSP 2010 data shows that 5% (92 out of 1985) of *Pseudomonas aeruginosa* isolates are multidrug resistant (resistant to at least 3 of the following antibiotics: imipenem, ceftazidime, ciprofloxacin and tobramycin). MDR *P. aeruginosa* were reported by 17 out of the 22 sites with the highest number (25 out of 92 or 27%) reported by NKI. Three sites, namely BRT, CMC, and FEU did not report any MDR *P. aeruginosa* while PGH did not submit any data for 2010 and LCP did not submit data on *P. aeruainosa*.

The table below lists the sentinel sites which reported MDR *P. aeruginosa* and the corresponding ward with the biggest number of MDR *P. aeruginosa* and the most common specimen source.

Table 11. MDR *Pseudomonas aeruginosa* by sentinel sites DOH ARSP January – December 2010

Name of Hospital	Number of MDR *P. aeruginosa* isolates	Number of presumptive nosocomial MDR *P. aeruginosa* isolates	Ward with the biggest number of MDR *Pseudomonas aeruginosa*	Most common specimen type from which MDR *Pseudomonas aeruginosa* were isolated
BGH	4	3	Medicine	Respiratory
BRH	2	1	not indicated	Respiratory/urine
CVM	1	0	Medicine	Other fluid
DMC	8	5	Medicine	Respiratory
EVR	1	1	Inpatient	Wound
GMH	2	2	Medicine/Neonatology	Urine/Respiratory
JLM	1	0	Pediatrics	Fluid
MAR	9	5	ICU	Respiratory
MMH	1	1	Surgery	Wound
NKI	25	9	Mixed	Urine
NMC	5	3	ICU	Respiratory
RMC	3	1	Medicine	Respiratory
RTM	1	0	Outpatient	Respiratory
SLH	8	8	Medicine	Respiratory
STU	10	7	Medicine	urine
VSM	8	7	Not indicated	urine
ZMC	3	3	Medicine	Respiratory
Total	92	56		

Among the MDR *P. aeruginosa* isolates with information on date of admission, 61% (56 out of 92) are presumptively nosocomial.

Among *Acinetobacter baumanii* isolates, 12% (127 out of 1034) are multidrug resistant (resistant to at least 3 of the following antibiotics: imipenem, ceftazidime, ciprofloxacin and tobramycin). These isolates were reported by 14 sentinel sites as shown in the table below with the highest number (41 out of 127 or 32%) reported by MAR (Table 12). Six sites did not report any MDR *A. baumanii* namely BRT, CMC, FEU, GMH, RTM, and VSM. PGH did not submit any data for 2010 and LCP did not submit data on *A. baumanii*.

Table 12. MDR *Acinetobacter baumanii* by sentinel sites DOH ARSP January – December 2010

Name of Hospital	Number of MDR *Acinetobacter baumanii* isolates	Number of presumptive nosocomial MDR *Acinetobacter baumanii* isolates	Ward with the biggest number of MDR *Acinetobacter baumanii*	Most common specimen type from which MDR *Acinetobacter baumanii* were isolated
BGH	32	19	Medicine	Respiratory
BRH	6	2	Outpatient	Respiratory
CVM	1	1	NICU	Blood
DMC	6	4	Pediatric	Urine
EVR	5	1	Inpatient	Blood
JLM	1	0	Medicine	Blood
MAR	41	29	ICU	Respiratory
MMH	3	3	Nursery	Blood
NKI	9	5	Ward 3	Others
NMC	6	4	Pediatrics	Blood
RMC	2	2	Medicine	Respiratory/Wound
SLH	3	0	Medicine	Respiratory
STU	4	3	Medicine	Tracheal aspirate/urine/wound/spinal fluid
ZMC	8	7	ICU	Respiratory
Total	127	80		

Among the MDR *A. baumanii* isolates with information on date of admission, 63% (80 out of 127) are presumptively nosocomial.