Department of Health and Human Services
Public Health Service
Food and Drug Administration
Center for Drug Evaluation and Research
Office of Surveillance and Epidemiology

Drug Use Review

Date:	April 5, 2012
To:	Edward Cox, M.D. Director Office of Antimicrobial Products
Through:	Gerald Dal Pan, M.D., MHS Director Office of Surveillance and Epidemiology Laura Governale, Pharm.D., MBA Deputy Director for Drug Use Division of Epidemiology II Office of Surveillance and Epidemiology Hina Mehta, Pharm.D. Drug Use Data Analysis Team Leader Division of Epidemiology II Office of Surveillance and Epidemiology
From:	Tracy Pham, Pharm.D. Drug Use Data Analyst Division of Epidemiology II Office of Surveillance and Epidemiology
Drug Name(s):	Systemic Antibacterial Drug Products
Application Type/Number:	Multiple
Applicant/sponsor:	Multiple
OSE RCM #:	2012-544

This document contains proprietary drug use data obtained by FDA under contract. The drug use data/information in this document has been cleared for public release.

EXECUTIVE SUMMARY

The Division of Epidemiology II is providing an update of the drug utilization data in terms of number of kilograms or international units of selected systemic antibacterial drug products sold from manufacturers to various retail and non-retail channels of distribution for years 2010-2011 as a surrogate for nationwide antibacterial drug use in humans. Propriety drug use databases licensed by the FDA were used to conduct this analysis. Data findings are as follows:

- During years 2010 and 2011, the majority of kilograms of selected systemic antibacterial drug products sold were to outpatient retail pharmacy settings.
- Approximately 3.28 million kilograms of selected systemic antibacterial drug products were sold during year 2010, and around 3.29 million kilograms were sold during year 2011.
- Active ingredient amoxicillin accounted for the highest proportion of total kilograms sold of all selected systemic antibacterial drug products.

1 INTRODUCTION

This review provides an update of sales in terms of kilograms or international units of selected systemic antibacterial drug products distributed from manufacturers to various retail and non-retail settings for years 2010-2011.

2 METHODS AND MATERIALS

2.1 DATA SOURCES USED

Proprietary drug use databases licensed by the Agency were used to conduct this analysis (**see Appendix 2 for full database description**).

The IMS Health, IMS National Sales Perspectives™ database was used to obtain estimated number of kilograms or international units of selected systemic antibacterial drug products sold from manufacturers to various retail and non-retail channels of distribution in the U.S. These sales data represent the amount of product being sold from manufacturers into the "back-door" of various drug distribution outlets (e.g. retail pharmacies, hospitals, clinics, etc) – it does not reflect what is being sold to or administered to patients directly.

The number of kilograms or international units sold were reported for the active molecule, regardless of formulation (I.V., oral, etc). In addition, the data were reported for the total number of kilograms or international units sold of the active molecule, single-ingredient and combination products combined. For example, the number of kilograms sold of amoxicillin included kilograms sold of single-ingredient amoxicillin and amoxicillin from combination products, such as amoxicillin-clavulanate. Additional combination products reported by the single active ingredient were: ticarcillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam, imipenem-cilastatin, quinupristin-dalfopristin and trimethoprim-sulfamethoxazole.

3 RESULTS

3.1 SALES DATA BY SETTING OF CARE

Sales data during year 2010 indicated that approximately 74% of selected systemic antibacterial drug products were sold to outpatient retail pharmacies, 25% to non-retail settings, and 1% to mail-order/specialty pharmacies (*data not shown*). Sales data during year 2011 indicated that approximately 75.5% of selected systemic antibacterial drug products were sold to outpatient retail pharmacies, 24% to non-retail settings, and 1% to mail-order/specialty pharmacies (*data not shown*).[1]

3.2 SALES DATA BY DRUG CLASS AND MOLECULE

Tables 1 and 2 in Appendix 1 show the number of kilograms or international units sold of selected systemic antibacterial drugs by drug class and molecule. During year 2010 and year 2011, there were approximately 3.28 million kilograms and 3.29 million kilograms of selected systemic antibacterial drug products sold in the U.S. market, respectively (Table 1). The Penicillin drug class accounted for around 44% of total kilograms sold for each year (1.44 million kilograms sold during year 2010 and 1.46 million kilograms sold during year 2011). The Cephalosporin drug class followed with approximately 15% of total kilograms sold for each year (503,000 kilograms sold during year 2010 and 497,000 kilograms sold during year 2011). Around 15% of total kilograms sold for each year were from the Sulfa and TMP drug class (479,000 kilograms sold during year 2010 and 482,000 kilograms sold during year 2011). Active ingredient amoxicillin had the highest proportion of total kilograms sold of all selected systemic antibacterial drug products, accounting for approximately 34% (1.10 million kilograms sold during year 2010) and 35% (1.14 million kilograms sold during year 2011) (Table 2 – Part 1).

4 LIMITATIONS

Findings from this review should be interpreted in the context of the known limitations of the databases used. During year 2010 and year 2011, the majority of kilograms of selected systemic antibacterial drugs were sold primarily to the outpatient retail pharmacy settings based on the IMS Health, IMS National Sales Perspectives™. These data do not provide a direct estimate of use but do provide a national estimate of units sold from the manufacturer into the various channels of distribution. The amount of product purchased by these retail and non-retail channels of distribution may be a possible surrogate for human use, if we assume the facilities purchase drugs in quantities reflective of actual patient use.

5 CONCLUSIONS

[1] IMS Health, IMS Nationals Sales Perspectives™. Years 2010-2011. Data extracted March 2012. File: NSPC 2012-544 Antibacterials KG channels 3-21-12.xls

Approximately 3.28 million kilograms of selected systemic antibacterial drugs were sold during year 2010 and around 3.29 million kilograms were sold during year 2011. Active ingredient amoxicillin had the highest proportion of total kilograms sold of all selected systemic antibacterial drug products throughout the time period examined.

APPENDIX 1: TABLES

Table 1. Number of kilograms of selected systemic antibacterial drug products by drug class sold from manufacturers to retail* and non-retail channels of distribution in the U.S., years 2010-2011**

	Year 2010		Year 2011	
	Sales in Kilograms	*KG %*	Sales in Kilograms	*KG %*
Antibacterial Market	**3,278,906**	***100.0%***	**3,289,176**	***100.0%***
Penicillins	1,439,930	*43.9%*	1,460,421	*44.4%*
Cephalosporins	502,561	*15.3%*	496,910	*15.1%*
Sulfa and TMP	479,484	*14.6%*	481,664	*14.6%*
Quinolones	281,557	*8.6%*	277,439	*8.4%*
Macrolides	164,309	*5.0%*	164,028	*5.0%*
Nitroimidazoles	114,991	*3.5%*	120,976	*3.7%*
Tetracyclines	129,183	*3.9%*	113,832	*3.5%*
Lincosamides	69,235	*2.1%*	71,455	*2.2%*
Carbapenems/penems	13,173	*0.4%*	14,184	*0.4%*
Aminoglycosides	6,991	*0.2%*	6,485	*0.2%*
Oxalozolidinones	5,144	*0.2%*	5,009	*0.2%*
Monobactams	3,782	*0.1%*	4,771	*0.1%*
Lipopeptides	1,123	*0.0%*	1,131	*0.0%*
Ketolides	63	*0.0%*	62	*0.0%*
Streptogrammins	38	*0.0%*	32	*0.0%*
Others	67,342	*2.1%*	70,776	*2.2%*

Source: IMS Health, IMS National Sales Perspective™. Years 2010-2011. Extracted March 2012.
File: NSPC 2012-544 Antibacterials KG USC molecules 3-2-12.xls
*Retail channels include chain, independent, foodstore, mail order, discount house, and mass merchandise pharmacies in the entire United States.
**Non-Retail channels include hospitals, long-term care facilities, clinics, home healthcare providers, and HMOs in the entire United States.

Table 2 - Part 1. Number of kilograms or international units of selected systemic antibacterial drug products by drug class and molecule sold from manufacturers to retail* and non-retail channels of distribution in the U.S., years 2010-2011**

	Year 2010		Year 2011	
	Sales in Kilograms	*KG %*	Sales in Kilograms	*KG %*
Antibacterial Drug Class				
Penicillins	**1,439,930**	***100.0%***	**1,460,421**	***100.0%***
Amoxicillin	1,102,773	*76.6%*	1,140,920	*78.1%*
Piperacillin	142,667	*9.9%*	136,004	*9.3%*
Penicillin V	128,165	*8.9%*	119,765	*8.2%*
Ampicillin	42,643	*3.0%*	42,448	*2.9%*
Nafcillin	10,011	*0.7%*	9,152	*0.6%*
Dicloxacillin	7,188	*0.5%*	6,939	*0.5%*
Oxacillin	2,885	*0.2%*	2,853	*0.2%*
Ticarcillin	3,596	*0.2%*	2,339	*0.2%*
Penicillin G	2.38E+10 (IU)	--	2.23E+10 (IU)	--
Mezlocillin				
Azlocillin				
Carbenicillin				
Cloxacillin				

Source: IMS Health, IMS National Sales Perspective™. Years 2010-2011. Extracted March 2012. File: NSPC 2012-544 Antibacterials KG USC molecules 3-2-12.xls

*Retail channels include chain, independent, foodstore, mail order, discount house, and mass merchandise pharmacies in the entire United States.

**Non-Retail channels include hospitals, long-term care facilities, clinics, home healthcare providers, and HMOs in the entire United States.

*Beta-lactamase inhibitors that are part of a beta-lactam/beta-lactamase inhibitor combination (e.g., clavulanic acid, tazobactam, and sulbactam) and cilastatin are not included in this table. See text for how combination molecules are quantified.

Table 2 - Part 2. Number of kilograms or international units of selected systemic antibacterial drug products by drug class and molecule sold from manufacturers to retail* and non-retail channels of distribution in the U.S., years 2010-2011**

	Year 2010		Year 2011	
	Sales in Kilograms	KG %	Sales in Kilograms	KG %
Antibacterial Drug Class				
Cephalosporins	**502,561**	***100.0%***	**496,910**	***100.0%***
First generation	360,509	*71.7%*	349,276	*70.3%*
Cephalexin	309,058	*85.7%*	298,205	*85.4%*
Cefazolin	39,715	*11.0%*	39,748	*11.4%*
Cefadroxil	11,737	*3.3%*	11,323	*3.2%*
Cephalothin				
Cephapirin				
Cephradine				
Second generation	47,363	*9.4%*	47,691	*9.6%*
Cefuroxime axetil	27,280	*57.6%*	28,951	*60.7%*
Cefprozil	11,077	*23.4%*	10,695	*22.4%*
Cefoxitin	4,220	*8.9%*	4,265	*8.9%*
Cefaclor	2,462	*5.2%*	1,834	*3.8%*
Cefuroxime	1,484	*3.1%*	1,405	*2.9%*
Cefotetan	840	*1.8%*	540	*1.1%*
Cefamandole				
Cefonocid				
Cefmetazole				
Loracarbef				
Third generation	82,097	*16.3%*	85,973	*17.3%*
Cefdinir	41,032	*50.0%*	43,400	*50.5%*
Ceftriaxone	29,766	*36.3%*	31,344	*36.5%*
Ceftazidime	5,432	*6.6%*	5,114	*5.9%*
Cefotaxime	2,555	*3.1%*	2,485	*2.9%*
Cefixime	1,807	*2.2%*	1,892	*2.2%*
Cefpodoxime (proxetil)	1,112	*1.4%*	1,202	*1.4%*
Cefditoren (pivoxil)	338	*0.4%*	397	*0.5%*
Ceftibuten	55	*0.1%*	138	*0.2%*
Ceftizoxime				
Cefoperazone				
Moxalactam				
Fourth generation	12,591	*2.5%*	13,754	*2.8%*
Cefepime	12,591	*100.0%*	13,754	*100.0%*
Fifth generation			216	*0.0%*
Ceftaroline fosamil			216	*100.0%*
Sulfa and TMP	**479,484**	***100.0%***	**481,664**	***100.0%***
Sulfamethoxazole	396,217	*82.6%*	398,379	*82.7%*
Trimethoprim	80,828	*16.9%*	81,304	*16.9%*
Sulfadiazine	1,166	*0.2%*	1,114	*0.2%*
Sulfisoxazole	1,273	*0.3%*	867	*0.2%*
Quinolones	**281,557**	***100.0%***	**277,439**	***100.0%***
Ciprofloxacin	210,282	*74.7%*	209,832	*75.6%*
Levofloxacin	57,542	*20.4%*	55,827	*20.1%*
Moxifloxacin	12,779	*4.5%*	11,003	*4.0%*
Ofloxacin	605	*0.2%*	431	*0.2%*
Norfloxacin	237	*0.1%*	215	*0.1%*
Gemifloxacin	111	*0.0%*	131	*0.0%*
Naladixic acid				
Macrolides	**164,309**	***100.0%***	**164,028**	***100.0%***
Azithromycin	88,432	*53.8%*	104,499	*63.7%*
Clarithromycin	49,880	*30.4%*	41,442	*25.3%*
Erythromycin	25,997	*15.8%*	18,058	*11.0%*
Fidaxomicin			28	*0.0%*
Dirithromycin				

Source: IMS Health, IMS National Sales Perspective™. Years 2010-2011. Extracted March 2012. File: NSPC 2012-544 Antibacterials KG USC molecules 3-2-12.xls

*Retail channels include chain, independent, foodstore, mail order, discount house, and mass merchandise pharmacies in the entire United States.

**Non-Retail channels include hospitals, long-term care facilities, clinics, home healthcare providers, and HMOs in the entire United States.

*Beta-lactamase inhibitors that are part of a beta-lactam/beta-lactamase inhibitor combination (e.g., clavulanic acid, tazobactam, and sulbactam) and cilastatin are not included in this table. See text for how combination molecules are quantified.

Table 2 - Part 3. Number of kilograms or international units of selected systemic antibacterial drug products by drug class and molecule sold from manufacturers to retail* and non-retail channels of distribution in the U.S., years 2010-2011**

	Year 2010		Year 2011	
	Sales in Kilograms	*KG %*	Sales in Kilograms	*KG %*
Antibacterial Drug Class				
Nitroimidazoles	**114,991**	***100.0%***	**120,976**	***100.0%***
Metronidazole	113,974	*99.1%*	120,021	*99.2%*
Tinidazole	1,017	*0.9%*	955	*0.8%*
Tetracyclines	**129,183**	***100.0%***	**113,832**	***100.0%***
Doxycycline	62,732	*48.6%*	64,956	*57.1%*
Tetracycline	45,011	*34.8%*	27,186	*23.9%*
Minocycline	20,173	*15.6%*	20,486	*18.0%*
Demeclocycline	1,127	*0.9%*	1,084	*1.0%*
Tigecycline	141	*0.1%*	120	*0.1%*
Oxytetracycline				
Lincosamides	**69,235**	***100.0%***	**71,455**	***100.0%***
Clindamycin	68,930	*99.6%*	71,173	*99.6%*
Lincomycin	305	*0.4%*	281	*0.4%*
Carbapenems/penems	**13,173**	***0.4%***	**14,184**	***0.4%***
Meropenem	4,900	*37.2%*	6,132	*43.2%*
Imipenem	2,972	*22.6%*	2,362	*16.7%*
Ertapenem	3,505	*26.6%*	3,819	*26.9%*
Doripenem	1,796	*13.6%*	1,870	*13.2%*
Aminoglycosides	**6,991**	***100.0%***	**6,485**	***100.0%***
Neomycin	3,668	*52.5%*	3,203	*49.4%*
Tobramycin	1,766	*25.3%*	1,835	*28.3%*
Gentamicin	1,039	*14.9%*	941	*14.5%*
Amikacin	411	*5.9%*	400	*6.2%*
Paromomycin	67	*1.0%*	71	*1.1%*
Streptomycin	39	*0.6%*	35	*0.5%*
Kanamycin	0.18	*0.0%*		
Spectinomycin				
Oxalozolidinones	**5,144**	***100.0%***	**5,009**	***100.0%***
Linezolid	5,144	*100.0%*	5,009	*100.0%*
Monobactams	**3,782**	***100.0%***	**4,771**	***100.0%***
Aztreonam	3,782	*100.0%*	4,771	*100.0%*
Lipopeptides	**1,123**	***100.0%***	**1,131**	***100.0%***
Daptomycin	1,123	*100.0%*	1,131	*100.0%*
Ketolides	**63**	***100.0%***	**62**	***100.0%***
Telithromycin	63	*100.0%*	62	*100.0%*
Streptogrammins	**38**	***100.0%***	**32**	***100.0%***
Dalfopristin	26	*70.0%*	23	*70.0%*
Quinupristin	11	*30.0%*	10	*30.0%*
Others	**67,342**	***100.0%***	**70,776**	***100.0%***
Vancomycin	40,923	*60.8%*	44,256	*62.5%*
Nitrofurantoin	18,810	*27.9%*	18,438	*26.1%*
Rifampin	6,710	*10.0%*	6,949	*9.8%*
Fosfomycin	662	*1.0%*	857	*1.2%*
Colistin	137	*0.2%*	144	*0.2%*
Telavancin	50	*0.1%*	85	*0.1%*
Chloramphenicol	52	*0.1%*	46	*0.1%*
Polymyxin B	8.45E+08 (I.U.)	--	8.06E+08 (I.U.)	--
Colistimethate sodium				

Source: IMS Health, IMS National Sales Perspective™. Years 2010-2011. Extracted March 2012. File: NSPC 2012-544 Antibacterials KG USC molecules 3-2-12.xls

*Retail channels include chain, independent, foodstore, mail order, discount house, and mass merchandise pharmacies in the entire United States.

**Non-Retail channels include hospitals, long-term care facilities, clinics, home healthcare providers, and HMOs in the entire United States.

*Beta-lactamase inhibitors that are part of a beta-lactam/beta-lactamase inhibitor combination (e.g., clavulanic acid, tazobactam, and sulbactam) and cilastatin are not included in this table. See text for how combination molecules are quantified.

APPENDIX 2: DATABASE DESCRIPTIONS

IMS Health, IMS National Sales Perspectives™: Retail and Non-Retail

The IMS Health, IMS National Sales Perspectives™ measures the volume of drug products, both prescription and over-the-counter, and selected diagnostic products moving from manufacturers into various outlets within the retail and non-retail markets. Volume is expressed in terms of sales dollars, eaches, extended units, and share of market. These data are based on national projections. Outlets within the retail market include the following pharmacy settings: chain drug stores, independent drug stores, mass merchandisers, food stores, and mail service. Outlets within the non-retail market include clinics, non-federal hospitals, federal facilities, HMOs, long-term care facilities, home health care, and other miscellaneous settings.