Supplemental materials for

Rousselot N, Tchassim B, Dumartin C, Clement M, Pariente A. Changes in the Ambulatory Use of Antibiotics in France Due to the COVID-19 Pandemic in 2020-2022: A Nationwide Time Series Analysis. *Ann Fam Med*. 2025;23(2):158-161.

ARIMA models

This SAS code analyzes the impact of the COVID-19 pandemic on the consumption of various antibiotics using an interrupted time series methodology through ARIMA models. In addition to modeling the data for 3-month, 1-year and 2-year periods, the code allows users to dynamically specify the p and q parameters of the ARIMA model. This is particularly useful for testing different structures of temporal dependence.

The classes of antibiotics, such as glycopeptides and cephalosporins, are defined at the beginning of the code, listing the names of each antibiotic. This structure facilitates the sequential analysis of each antibiotic within the category.

Two estimates per AUTOREG model are performed over 2-year, 1-year and 3-month periods for each antibiotic, using an autoregressive regression adjusted for monthly data (nlag=12) and the maximum likelihood (ML) method.

A series of ARIMA models is fitted for each antibiotic, allowing forecasting while excluding data after March 1, 2020, to ignore the immediate impact of the lockdown in the initial modeling. The ARIMA model uses dynamic p and q parameters, as well as the "time" parameter to model the prediction over several months of lag. This allows testing the time series with different values for the autoregressive p and moving average q components depending on the specific characteristics of each antibiotic.

Using the ARIMA parameters defined by the user, forecasts are extended over 25 months with a 95% confidence interval, to assess the projected consumption of each antibiotic along with the associated uncertainty.

```
%macro its(p=, q=, list=,time=);
%let glycop = AZITHROMYCINE - CLARITHROMYCINE - CLINDAMYCINE - DOXYCYCLINE - ERYTHROMYCINE -
FOSFOMYCINE - GENTAMICINE - JOSAMYCINE - METACYCLINE - MIDECAMYCINE - MINOCYCLINE - NETILMICINE -
PRISTINAMYCINE - ROXITHROMYCINE - SPIRAMYCINE - TELITHROMYCINE - TETRACYCLINE - THIAMPHENICOL -
FUCIDIQUE_ACIDE - SPIRAMYCINE_ASSO_ANTIBACTERIENS - TOBRAMYCINE;
%let betalact = AMOXICILLINE - AMOXICILLINE_INHIB_ENZYME - AMPICILLINE_INHIB_ENZYME -
BENZATHINE_BENZYLPENICILLINE - CLOXACILLINE - OXACILLINE - PHENOXYMETHYLPENICILLINE -
PIPERACILLINE_INHIB_ENZYME - PIVMECILLINAM;
%let cepheme = CEFACLOR - CEFADROXIL - CEFALEXINE - CEFEPIME - CEFIXIME - CEFOTIAM - CEFPODOXIME -
CEFRADINE - CEFTAZIDIME - CEFTRIAXONE - CEFUROXIME;
%let carb_oxa = AZTREONAM - IMIPENEM_INHIB_ENZYME - MEROPENEM;
%let inhib_prot = CIPROFLOXACINE - COLISTINE - LEVOFLOXACINE - LINCOMYCINE - LOMEFLOXACINE -
MOXIFLOXACINE - NITROFURANTOINE - NORFLOXACINE - OFLOXACINE;
%let inhib_folat = SULFADIAZINE - SULFAMETHOXAZOLE_TRIMETHOPRIME - TRIMETHOPRIME;
```

```
%macro process_its(list);
   %let count = %sysfunc(countw(&list., '-'));
   %do i=1 %to &count.;
      %let med = %scan(&list., &i., '-');

      data antibio.ddd_lib_atc5;
         set antibio.ddd_lib_atc5;
         Time = _N_;
         Lockdown = (Date >= '1mar2020'd);
         Time_after = intck('month', '1feb2020'd, Date);
         if Date < '1mar2020'd then Time_after = 0;
      run;

      data ddd_lib_atc5;
         set antibio.ddd_lib_atc5;
         if Date > '1mar2021'd then delete;
      run;

      /* Estimation on 2 years, 1 year or 3 months */
      proc autoreg data=antibio.ddd_lib_atc5 outest=E&time._&med. covout;
         model &med. = Time Lockdown Time_after /
            method=ml nlag=&time. backstep dwprob loglikl;
         output out=its p=pvar r=rvar;
      run;

      /* ARIMA model - monthly estimation with dynamic parameters */
      data ddd_lib_atc5_final;
         set antibio.ddd_lib_atc5;
         if Date >= '1mar2020'd then &med.=.;
      run;

      proc arima data=ddd_lib_atc5_final;
         identify var=&med.(1,&time.);
         estimate p=&p q=&q noint;
         forecast lead=25 interval=month id=Date out=forecast;
      run;
      quit;

      data forecast;
         set forecast;
         lci = forecast - 0.96 * std;
         uci = forecast + 0.96 * std;
      run;
```

```
      data atcF (keep=Date forecast std lci uci);
         merge antibio.ddd_lib_atc5 forecast;
         by Date;
      run;

      data F_&med.;
         set atcF(rename=(forecast=F_&med. lci=lci_&med. uci=uci_&med.));
         if Date < '1mar2020'd then F_&med. = .;
         if Date < '1mar2020'd then std = .;
         if Date < '1mar2020'd then uci_&med. = .;
         if Date < '1mar2020'd then lci_&med. = .;
      run;
   %end;
%mend;

/* Combine results for select list of drugs */
%do i=1 %to %sysfunc(countw(&list., '-'));
            %let med = %scan(&list., &i., '-');
            data Forecast_E&time.;
            E&time._&med.;
            run;
%end;

data antibio.Forecast;
   merge antibio.ddd_lib_atc5
      %do i=1 %to %sysfunc(countw(&list., '-'));
         %let med = %scan(&list., &i., '-');
         F_&med.
      %end;;
   by Date;
run;

%mend;
%its(p=1, q=1,list=&cepheme.,time=12); * Exemple for cephem drugs with 1 for p and q parameters
```

Supplemental Table 1. Impact of the COVID pandemic and associated containment measures on monthly Defined Daily Doses (DDDs) reimbursements for antibiotics in France: estimation of the effect over the three-month period following the first French national lockdown start (March 2020).

Antibiotics	Global monthly trend (1/2010 to 5/2020)		Pandemic impact (level)		Pandemic impact (trend)		Change in DDDs observed vs. expected	
	n	[95%CI]	n	[95%CI]	n	[95%CI]	%	[95%CI]
Penicillins								
amoxicillin	**77,969**	**[59,875; 96,063]**	**-11,491,523**	**[-17,458,221; -5,524,825]**	719,339	[-1,619,269; 3,057,947]	**-27.5**	**[-35.1; -17.9]**
amox. – clavulanic ac.	8,849	[-4,552; 22,250]	**-3,477,879**	**[-6,388,666; -567,092]**	175,317	[-988,476; 1,339,110]	**-10.9**	**[-19.5; -0.3]**
cloxacillin	**-2,233**	**[-4135; -331]**	-32,383	[-148026; 83260]	-673	[-55,053; 53,707]	-6.6	[-27.5; 31.4]
oxacillin	**-1,868**	**[-3547; -189]**	-1,098	[-55545; 53349]	5,113	[-29,050; 39,276]	-41.6	[-94.1; 10.9]
benzylpenicillin	**-31**	**[-62; -1]**	-1,182	[-2,377; 13]	327	[-358; 1,011]	**-13.8****	**[-22.8; -4.9]**
phenoxymethylpenicillin	**1,940**	**[1641; 2239]**	**-397,189**	**[-572488; -221890]**	**134,037**	**[68,257; 199,817]**	**26.1**	**[2.5; 49.7]**
piperacillin	**30**	**[21; 39]**	-913	[-2658; 831]	-35	[-752; 681]	-15.9	[-39.6; 7.8]
pivmecillinam	**4,808**	**[2989; 6627]**	**-89,378**	**[-145694; -33062]**	18,844	[-10,212; 47,900]	**-10.2**	**[-14.4; -5.6]**
Cephalosporins								
cefuroxime	**-4,467**	**[-5,972; -2,962]**	-301,882	[-631,921; 28,157]	28,614	[-102,929; 160,157]	-15.6	[-40.8; 10.7]
cefaclor	**-1,058**	**[-1,294; -822]**	-27,732	[-79,552; 24,088]	5,710	[-15,282; 26,702]	-6.2	[-21.7; 9.2]
cefalexin	-15	[-38; 9]	-1,994	[-5,187; 1,199]	75	[-1,319; 1,470]	-1.7	[-13.8; 12.1]
cefotiam	***-2,456***	***[-3,034; -1,878]***	*-68*	*[-84,885; 84,748]*	*5,780*	*[-38,630; 50,190]*	*nc*	
cefpodoxime	**-8,376**	**[-12,792; -3,960]**	-555,564	[-1,262,111; 150,983]	49,210	[-235,783; 334,203]	-16.6	[-42.4; 9.2]
cefixime	480	[-2,370; 3,330]	-262,824	[-574,636; 48,988]	-10,874	[-165,753; 144,005]	-7.8	[-24.3; 8.7]
ceftriaxone	155	[-204; 513]	-24,190	[-107,387; 59,007]	-13,262	[-47,350; 20,826]	-2.7	[-10.3; 4.9]
cefepime	**17**	**[14; 21]**	-187	[-995; 622]	-143	[-481; 195]	**-22.0**	**[-40.4; -3.6]**
ceftazidime	51	[43; 58]	**-4,461**	**[-8,510; -412]**	-69	[-1,718; 1,580]	**-17.0**	**[-28.8; -6.6]**
cefadroxil	**-400**	**[-476; -325]**	-2,521	[-17,666; 12,624]	924	[-5,446; 7,294]	-23.9	[-63.7; 15.9]
Cyclines								
doxycycline	1,369	[-2,828; 5,566]	**-2,128,878**	**[-3,773,930; -483,826]**	179,472	[-477,955; 836,899]	**-21.7**	**[-43.0; 0.4]**
metacycline	***-524***	***[-747; -301]***	*236*	*[-11,703; 12,174]*	*1,222*	*[-5,086; 7,530]*	*nc*	
minocycline	**-1,468**	**[-2,431; -505]**	-4,422	[-28,181; 19,337]	2,941	[-12,145; 18,027]	-6.1	[-25.9; 13.7]
tetracycline	843	[-1,575; 3,262]	-144,812	[-314,356; 24,732]	21,446	[-68,752; 111,644]	-12.4	[-29.5; 4.7]

At each moment in time, the level represents the quantitative amount of antibiotic consumption while the trend corresponds to the variation of this amount since the start of the observation period (increase, decrease or stagnation).

*** Estimated since Jun 2018*

nc: not calculated because of important changes before covid

Annex 2: Impact of the COVID pandemic and associated containment measures on monthly Defined Daily Doses (DDDs) reimbursements for antibiotics in France: estimation of the effect over the three-month period following the first French national lockdown start (March 2020). (cont'd).

	Global monthly trend (1/2010 to 5/2020)		**Pandemic impact (level)**		**Pandemic impact (trend)**		**Change in DDDs observed vs. expected**	
	n	**[95%CI]**	**n**	**[95%CI]**	**n**	**[95%CI]**	**%**	**[95%CI]**
Macrolides								
azithromycin	**8,091**	**[5,809; 10,373]**	-407,849	[-915,648; 99,950]	205,066	[4,633; 405,499]	-6.3	[-24.7; 12.1]
clarithromycin	**-11,178**	**[-13,414; -8,942]**	-617,183	[-1,260,013; 25,647]	138,455	[-120,599; 397,509]	-9.8	[-29.6; 10.0]
erythromycin	**-592**	**[-929; -255]**	-32,233	[-72,962; 8,496]	5,481	[-11,413; 22,375]	-13.1	[-25.5; 0.8]
josamycin	**-2,871**	**[-3,910; -1,832]**	-160,517	[-442,667; 121,633]	3,366	[-105,788; 112,520]	-22.2	[-45.6; 1.2]
midecamycin	***-61***	***[-69; -53]***	*-57*	*[-2,357; 2,242]*	*240*	*[-707; 1,187]*	*nc*	
roxithromycin	**-1,709**	**[-3,131; -287]**	-311,627	[-627,379; 4,125]	40,015	[-91,091; 171,121]	**-17.7**	**[-32.7; -2.7]**
spiramycin	-182	[-672; 307]	-60,356	[-126,811; 6,099]	5,190	[-22,918; 33,298]	-7.1	[-16.7; 2.5]
spiramycin combined	**-2,327**	**[-2,827; -1,827]**	-127,109	[-337,349; 83,131]	-22,727	[-102,751; 57,297]	**-16.1**	**[-29.3; -2.7]**
Fluoroquinolones								
ciprofloxacin	-513	[-2,100; 1,075]	**-215,900**	**[-398,907; -32,893]**	45,644	[-29,266; 120,554]	-4.5	[-10.9; 2.9]
levofloxacin	-134	[-1,260; 993]	**-310,517**	**[-475,486; -145,548]**	65,202	[-3,541; 133,945]	-6.2	[-18.9; 6.0]
lomefloxacin	***-1,100***	***[-1,681; -519]***	*1,456*	*[-26,394; 29,306]*	*-6,611*	*[-19,164; 5,942]*	*nc*	
moxifloxacin	**-2,258**	**[-3,191; -1,325]**	-20,631	[-74,828; 33,566]	8,104	[-17,566; 33,774]	-7.3	[-23.1; 8.5]
norfloxacin	***-6,685***	***[-9,964; -3,406]***	*2,544*	*[-152,905; 157,993]*	*-9,866*	*[-79,159; 59,427]*	*nc*	
ofloxacin	226	[-4,462; 4,915]	**-247,351**	**[-470,461; -24,241]**	17,468	[-87,215; 122,151]	-3.9	[-12.1; 5.8]
Other antibiotics								
fusidic acid	**-1,032**	**[-1,174; -890]**	-15,283	[-55,783; 25,217]	314	[-17,143; 17,771]	-4.8	[-11.6; 2.0]
clindamycin	**1,353**	**[1,269; 1,437]**	**-52,073**	**[-87,339; -16,807]**	1,887	[-11,518; 15,292]	**-5.6**	**[-11.2; 0.0[**
lincomycin	*-7*	*[-15; 1]*	*1*	*[-645; 646]*	*1*	*[-303; 304]*	*nc*	
sulfadiazine	**-115**	**[-138; -92]**	-3,039	[-10,429; 4,351]	-637	[-3,588; 2,315]	**-41.9**	**[-52.3; -25.9]**
sulfamethoxazole - trimethoprim	**907**	**[745; 1,068]**	**-321,886**	**[-442,237; -201,535]**	**98,162**	**[52,462; 143,862]**	8.4	[-1.8; 18.6]
trimethoprim	**80**	**[53; 106]**	**-766**	**[-1,513; -20]**	77	[-306; 461]	-0.2	[-4.8; 4.4]
pristinamycin	**-1,140**	**[-3,905; 1,625]**	**-1,076,278**	**[-1,900,790; -251,766]**	112,194	[-233,883; 458,271]	**-15.9**	**[-24.1; -7.6]**
fosfomycin	**2,102**	**[1,986; 2,218]**	**-138,268**	**[-202,458; -74,078]**	23,555	[-985; 48,095]	**-10.4**	**[-13.9; -6.8]**
telithromycin	***-1,453***	***-1,810; -1,096]***	*-271*	*[-39,013; 38,471]*	*5,958*	*[-12,237; 24,153]*	*nc*	
thiamphenicol	***-2***	***[-3; -2]***	*-1*	*[-173; 171]*	*3*	*[-72; 78]*	*nc*	
colistin	**64**	**[29; 98]**	**-20,487**	**[-29,598; -11,376]**	**7,725**	**[4,247; 11,203]**	**8.1**	**[1.5; 14.7]**
nitrofurantoin	**-2,095**	**[-2,902; -1,288]**	-54,086	[-172,272; 64,100]	-1,636	[-61,817; 58,545]	**-185.1**	**[-246.5; -123.7]**
imipenem	5	[-2; 11]	-25	[-1,334; 1,284]	-221	[-743; 301]	-19.6	[-41.2; 2.0]
meropenem	**16**	**[12; 21]**	**-3,045**	**[-4,587; -1,503]**	**715**	**[101; 1,329]**	-4.9	[-24.6; 19.6]
aztreonam	**24**	**[15; 33]**	**-1,685**	**[-2,653; -717]**	**412**	**[7; 817]**	**27.5**	**[9.4; 45.6]**
tobramycin	70	[-318; 458]	-14,167	[-29,029; 695]	3,859	[-3,436; 11,154]	2.7	[-8.8 ; 14.2]
gentamicin	50	[-73; 173]	-675	[-3,550; 2,199]	-408	[-2,119; 1,304]	-2.9	[-7.4; 2.1]
netilmicin	***-173***	***[-259; -86]***	*122*	*[-5,035; 5,279]*	*731*	*[-2,563; 4,025]*	*nc*	

Supplemental Table 2. Impact of the COVID pandemic and associated containment measures on monthly Defined Daily Doses (DDDs) reimbursements for antibiotics in France: estimation of the effect over the 12-month period following the first French national lockdown start (March 2020).

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	n	**[95%CI]**	**n**	**[95%CI]**	**n**	**[95%CI]**	**%**	**[95%CI]**
Penicillins								
amoxicillin	**82,496**	**[60,291; 104,701]**	**-7,717,230**	**[-10,036,119; -5,398,341]**	91,919	[-174,418; 358,256]	**-55.5**	**[-71.8; -39.2]**
amox. – clavulanic ac.	8,877	[-3,820; 21,574]	**-2,239,120**	**[-3,385,473; -1,092,767]**	62,622	[-72,997; 198,241]	**-24.9**	**[-32.2; -17.6]**
cloxacillin	**-2,228**	**[-4,063; -393]**	-8,962	[-81,227; 63,303]	-1,399	[-12,822; 10,024]	-6.3	[-17.0; 4.4]
oxacillin	**-1,855**	**[-3,475; -235]**	987	[-44,674; 46,648]	3,928	[-9,872; 17,728]	16.5	[-68.1; 84.6]
benzylpenicillin	**28**	**[9; 47]**	**-320**	**[-630; -10]**	-19	[-40; 3]	5.5**	[-3.9; 14.9]
phenoxymethylpenicillin	**1,942**	**[1,649; 2,235]**	5,162	[-35,647; 45,971]	-3,675	[-8,441; 1,091]	11.8	[-2.5; 26.1]
piperacillin	**30**	**[21; 38]**	-222	[-830; 386]	28	[-61; 117]	-11.8	[-35.3; 11.7]
pivmecillinam	**4,961**	**[3,021; 6,901]**	**54,704**	**[4,395; 105,013]**	**-24,316**	**[-34,360; -14,272]**	**-105.5**	**[-136.5; -74.5]**
Cephalosporins								
cefuroxime	**-4,472**	**[-6,216; -2,728]**	**-214,744**	**[-304,379; -125,109]**	5,581	[-9,019; 20,181]	**-32.0**	**[-41.4; -22.6]**
cefaclor	**-1,074**	**[-1,242; -906]**	-12,434	[-27,330; 2,462]	1,042	[-1,573; 3,657]	**-14.4**	**[-18.6; -10.2]**
cefalexin	-15	[-38; 8]	-814	[-2,264; 636]	36	[-197; 269]	-1.7	[-13.8; 12.1]
cefotiam	***-2,442***	***[-2,990; -1,894]***	*4,601*	*[-47,317; 56,519]*	*2,739*	*[-6,484; 11,962]*	*nc*	
cefpodoxime	**-8,023**	**[-12,471; -3,575]**	**-415,372**	**[-592,066; -238,678]**	15,923	[-13,141; 44,987]	**-25.6**	**[-33.1; -18.1]**
cefixime	176	[-2,617; 2,968]	-54,436	[-247,359; 138,487]	7,334	[-32,385; 47,053]	-6.8	[-14.7; -1.1]
ceftriaxone	150	[-195; 495]	**-41,164**	**[-65,280; -17,048]**	-574	[-4,825; 3,676]	**-27.5**	**[-35.6; -19.4]**
cefepime	**17**	**[14; 21]**	-210	[-528; 109]	9	[-32; 51]	-8.3	[-10.7; -5.9]
ceftazidime	**50**	**[41; 58]**	**-2,098**	**[-3,531; -665]**	-89	[-355; 177]	-6.9	[-21.2; 7.4]
cefadroxil	**-399**	**[-471; -326]**	-1,370	[-5,917; 3,177]	239	[-557; 1,034]	-3.1	[-15.6; -12.1]
Cyclines								
doxycycline	963	[-3,278; 5,205]	-510,433	[-1,032,212; 11,346]	9,554	[-21,095; 40,203]	-3.5	[-17.5; 10.5]
metacycline	***-519***	***[-733; -304]***	*733*	*[-8,934; 10,401]*	*687*	*[-1,223; 2,597]*	*nc*	
minocycline	**-1,459**	**[-2,390; -528]**	1,523	[-14,317; 17,363]	2,355	[-4,113; 8,823]	-0.3	[-2.4; 1.8]
tetracycline	652	[-1,829; 3,133]	46,979	[-94,330; 188,288]	-3,897	[-24,848; 17,054]	5.4	[-11.6; 22.4]

At each moment in time, the level represents the quantitative amount of antibiotic consumption while the trend corresponds to the variation of this amount since the start of the observation period (increase, decrease or stagnation).

*** Estimated since Jun 2018*

nc: not calculated because of important changes before covid

Annex 3: Impact of the COVID pandemic and its containment measures on monthly Defined Daily Doses (DDDs) reimbursements for antibiotics in France: estimation of the effect over the 12-month period following the first French national lockdown start (March 2020) (cont'd).

Antibiotics	**Global monthly trend (1/2010 to 3/2021)**		**Pandemic impact (level)**		**Pandemic impact (trend)**		**Change in DDDs observed vs. expected**	
	n	**[95%CI]**	**n**	**[95%CI]**	**n**	**[95%CI]**	**%**	**[95%CI]**
Macrolides								
azithromycin	**7,785**	**[5,594; 9,976]**	149,551	[-16,273; 315,375]	4,296	[-8,260; 16,852]	**2.7**	**[0.1; 5.3]**
clarithromycin	**-11,153**	**[-13,404; -8,902]**	**-247,662**	**[-441,840; -53,484]**	**13,256**	**[590; 25,922]**	**-26.9**	**[-34.8; -19]**
erythromycin	**-596**	**[-907; -285]**	-8,658	[-26,674; 9,358]	-61	[-1,545; 1,423]	-3.3	[-17.2; 10.6]
josamycin	**-2,762**	**[-3,816; -1,708]**	**-150,027**	**[-207,130; -92,924]**	**5,817**	**[1,750; 9,884]**	**-39.0**	**[-50.5; -27.5]**
midecamycin	***-61***	***[-69; -53]***	*367*	*[-877; 1,610]*	*46*	*[-157; 250]*	*nc*	
roxithromycin	-1,702	[-3,569; 165]	**-174,926**	**[-313,466; -36,386]**	2,182	[-14,257; 18,621]	**-44.7**	**[-67.8; -21.6]**
spiramycin	-197	[-748; 355]	**-33,035**	**[-64,227; -1,843]**	-227	[-4,017; 3,563]	**-34.4**	**[-44.5; -24.3]**
spiramycin asso	**-2,301**	**[-2,739; -1,863]**	**-84,035**	**[-128,592; -39,478]**	2,360	[-490; 5,210]	-5.8	[-19.0; 7.4]
Fluoroquinolones								
ciprofloxacin	-487	[-1,853; 880]	-44,393	[-111,519; 22,733]	2,167	[-5,848; 10,182]	-2.6	[-9.8; 4.6]
levofloxacin	-207	[-1,248; 833]	-78	[-77,066; 76,909]	5,355	[-4,267; 14,977]	**-23.6**	**[-30.5; -16.7]**
lomefloxacin	***-1,111***	***[-1,654; -568]***	*-10,093*	*[-26,913; 6,727]*	*1,079*	*[-1,884; 4,042]*	*nc*	
moxifloxacin	**-2,255**	**[-3,133; -1,377]**	-2,696	[-31,511; 26,119]	2,201	[-1,713; 6,115]	-2.0	[-7.4; 3.4]
norfloxacin	***-6,675***	***[-9,829; -3,521]***	*-27,415*	*[-120,130; 65,300]*	*6,515*	*[-9,040; 22,070]*	*nc*	
ofloxacin	347	[-3,370; 4,064]	**-130,093**	**[-248,834; -11,352]**	-1,455	[-19,990; 17,080]	-3.4	[-18.1; 14.7]
Other antibiotics								
fusidic acid	**-1,034**	**[-1,164; -904]**	-9,236	[-25,655; 7,183]	-212	[-1,312; 888]	-11.6	[-25.0; 1.8]
clindamycin	**1,353**	**[1,277; 1,429]**	**-16,400**	**[-25,466; -7,334]**	**737**	**[163; 1,311]**	**-7.7**	**[-10; -5.4]**
lincomycin	*-7*	*[-15; 1]*	*-4*	*[-423; 415]*	*2*	*[-55; 60]*	*nc*	
sulfadiazine	**-112**	**[-135; -90]**	-2,925	[-6,338; 488]	234	[-184; 651]	-8.7	[-21.3; 3.9]
sulfamethoxazole - tmp	**907**	**[735; 1,079]**	-12,838	[-34,474; 8,798]	117	[-1,233; 1,468]	-5.5	[-17.1; 6.1]
trimethoprim	**101**	**[73; 129]**	-318	[-1,106; 469]	**135**	**[6; 265]**	**79.6**	**[56.2; 103.0]**
pristinamycin	-1,160	[-3,789; 1,469]	**-516,872**	**[-929,606; -104,138]**	6,065	[-45,123; 57,253]	**-29.1**	**[-47.7; -10.5]**
fosfomycin	**2,112**	**[2,010; 2,214]**	**-26,645**	**[-39,344; -13,946]**	-79	[-873; 716]	**-8.6**	**[-16.1; -1.1]**
telithromycin	***-1,291***	***[-1,603; -979]***	*11,658*	*[-11,298; 34,614]*	*1,290*	*[-1,835; 4,415]*	*nc*	
thiamphenicol	***-2***	***[-3; -2]***	*2*	*[-82; 86]*	*2*	*[-9; 12]*	*nc*	
colistin	**48**	**[26; 71]**	**7,370**	**[4,562; 10,178]**	**-840**	**[-1,177; -503]**	-2.1	[-9.2; 5.0]
nitrofurantoin	**-2,138**	**[-2,928; -1,348]**	**-96,218**	**[-181,999; -10,437]**	8,718	[-3,584; 21,020]	-21.3	[-55.6; 13.0]
imipenem	5	[-1; 10]	-51	[-664; 561]	-74	[-154; 6]	-19.6	[-41.2; 2.0]
meropenem	**16**	**[12; 19]**	66	[-591; 723]	**-154**	**[-234; -74]**	-4.9	[-24.6; 19.6]
aztreonam	**24**	**[15; 33]**	211	[-184; 606]	**-100**	**[-184; -16]**	**27.5**	**[9.4; 45.6]**
tobramycin	56	[-216; 327]	3,324	[-5,433; 12,081]	-558	[-1,487; 371]	-5.3	[-12.7; 2.1]
gentamicin	47	[-67; 162]	-38	[-2,003; 1,926]	-173	[-642; 295]	-2.9	[-7.4; 2.1]
netilmicin	***-170***	***[-253; -86]***	*177*	*[-4,398; 4,752]*	*430*	*[-1,048; 1,908]*	*nc*	

Supplemental Table 3. Impact of the COVID pandemic and its containment measures on monthly Defined Daily Doses (DDDs) reimbursements for antibiotics in France: estimation of the effect over the over the 24-month period following the first French national lockdown start (March 2020).

Antibiotics	**Global monthly trend (1/2010 to 3/2022)**		**Pandemic impact (level)**		**Pandemic impact (trend)**	
	n	**[95%CI]**	**n**	**[95%CI]**	**n**	**[95%CI]**
Penicillins						
amoxicillin	**78,050**	**[59,535; 96,565]**	**-3,571,544**	**[-5,383,742; -1,759,346]**	**-522,711**	**[-643,703; -401,719]**
amox. – clavulanic ac.	8,188	[-4,891; 21,267]	-822,201	[-1,685,432; 41,030]	**-160,427**	**[-221,008; -99,846]**
cloxacillin	**-2,235**	**[-4,004; -466]**	-11,195	[-75,228; 52,838]	-700	[-7,325; 5,926]
oxacillin	**-1,867**	**[-3,419; -315]**	345	[-42,411; 43,101]	4,694	[-3,647; 13,035]
benzylpenicillin	**20**	**[13; 28]**	**-181**	**[-358; -3]**	1	[-18; 20]
phenoxymethylpenicillin	**1,933**	**[1,646; 2,220]**	27,823	[-3,155; 58,801]	**-7,496**	**[-9,435; -5,557]**
piperacillin	**30**	**[20; 39]**	-609	[-1,245; 27]	**72**	**[17; 126]**
pivmecillinam	**4,695**	**[3,327; 6,063]**	**171,486**	**[110,147; 232,825]**	**-40,842**	**[-47,571; -34,113]**
Cephalosporins						
cefuroxime	**-4,460**	**[-5,522; -3,398]**	-57,654	[-147,289; 31,981]	**-18,498**	**[-24,626; -12,370]**
cefaclor	**-1,075**	**[-1,237; -913]**	431	[-14,592; 15,455]	**-1,157**	**[-2,158; -156]**
cefalexin	**-15**	**[-37; 7]**	-688	[-2,140; 764]	12	[-94; 119]
cefotiam	***-2,446***	***[-2,966; -1,926]***	*3,263*	*[-48,686; 55,212]*	*3,135*	*[-907; 7,177]*
cefpodoxime	**-8,331**	**[-12,520; -4,142]**	-139,623	[-316,317; 37,071]	**-26,609**	**[-40,362; -12,856]**
cefixime	367	[-2,336; 3,069]	-37,743	[-230,665; 155,179]	-17,565	[-37,464; 2,334]
ceftriaxone	140	[-193; 473]	-21,135	[-45,806; 3,536]	**-3,747**	**[-5,428; -2,066]**
cefepime	17	[14; 21]	**-331**	**[-655; -6]**	35	[13; 57]
ceftazidime	**50**	**[40; 60]**	**-1,961**	**[-3,406; -516]**	**-129**	**[-219; -39]**
cefadroxil	**-398**	**[-468; -328]**	43	[-4,507; 4,594]	-37	[-380; 306]
Cyclines						
doxycycline	986	[-3,738; 5,710]	**-1,061,868**	**[-1,766,720; -357,016]**	**97,154**	**[11,218; 183,090]**
metacycline	***-521***	***[-727; -315]***	*512*	*[-8,217; 9,241]*	*803*	*[-240; 1,845]*
minocycline	**-1,456**	**[-2,345; -567]**	1,555	[-13,417; 16,527]	2,322	[-2,388; 7,032]
tetracycline	615	[-1,760; 2,991]	15,585	[-104,910; 136,080]	4,318	[-6,366; 15,002]

At each moment in time, the level represents the quantitative amount of antibiotic consumption while the trend corresponds to the variation of this amount since the start of the observation period (increase, decrease or stagnation).

Annex 4: Impact of the COVID pandemic and its containment measures on monthly Defined Daily Doses (DDDs) reimbursements for antibiotics in France: estimation of the effect over the 24-month period following the first French national lockdown start (March 2020) (cont'd).

Antibiotics	**Global monthly trend (1/2010 to 3/2022)**		**Pandemic impact (level)**		**Pandemic impact (trend)**	
	n	**[95%CI]**	**n**	**[95%CI]**	**n**	**[95%CI]**
Macrolides						
azithromycin	**7,654**	**[5,949; 9,359]**	**396,165**	**[208,943; 583,387]**	**-35,800**	**[-58,104; -13,496]**
clarithromycin	**-11,359**	**[-13,591; -9,127]**	104,323	[-141,908; 350,554]	**-44,669**	**[-74,939; -14,399]**
erythromycin	**-593**	**[-914; -272]**	-5,459	[-27,139; 16,221]	-809	[-3,863; 2,245]
josamycin	**-2,860**	**[-3,873; -1,847]**	-79,661	[-162,898; 3,576]	-5,150	[-15,106; 4,806]
midecamycin	***-61***	***[-69; -53]***	*367*	*[-877; 1,610]*	*46*	*[-157; 250]*
roxithromycin	**-1,799**	**[-3,551; -47]**	23,618	[-85,615; 132,851]	**-30,122**	**[-38,559; -21,685]**
spiramycin	-226	[-776; 325]	5,684	[-19,324; 30,692]	**-6,838**	**[-8,987; -4,689]**
spiramycin asso	57	[-225; 338]	4,005	[-5,832; 13,842]	-794	[-2,383; 796]
Fluoroquinolones						
ciprofloxacin	-520	[-1,833; 794]	-7,814	[-58,191; 42,563]	-3,893	[-7,914; 128]
levofloxacin	-202	[-1,233; 829]	23,620	[-43,753; 90,993]	**-13,419**	**[-17,874; -8,964]**
lomefloxacin	***-1,106***	***[-1,655; -557]***	*-13,225*	*[-28,180; 1,730]*	*1,463*	*[-467; 3,393]*
lomefloxacin	***-1,106***	***[-1,655; -557]***	*-13,225*	*[-28,180; 1,730]*	*1,463*	*[-467; 3,393]*
moxifloxacin	**-2,260**	**[-3,117; -1,403]**	7,898	[-13,745; 29,541]	213	[-1,703; 2,129]
norfloxacin	***-6,680***	***[-9,735; -3,625]***	*-29,736*	*[-113,657; 54,185]*	*7,244*	*[-3,291; 17,779]*
ofloxacin	353	[-3,183; 3,890]	**-139,308**	**[-241,145; -37,471]**	213	[-10,209; 10,635]
Other antibiotics						
fusidic acid	**-1,034**	**[-1,171; -897]**	-9,265	[-30,037; 11,507]	-174	[-2,884; 2,537]
clindamycin	**1,370**	**[1,174; 1,566]**	**-26,792**	**[-37,610; -15,974]**	**1,965**	**[654; 3,276]**
lincomycin	*-7*	*[-14; 1]*	*-3*	*[-378; 372]*	*2*	*[-34; 38]*
sulfadiazine	**-113**	**[-134; -93]**	**-3,220**	**[-6,031; -409]**	**302**	**[121; 483]**
SMX - trimethoprim	**899**	**[733; 1,064]**	12,273	[-16,733; 41,279]	**-4,069**	**[-7,601; -537]**
trimethoprim	**78**	**[38; 118]**	-39	[-782; 704]	**305**	**[200; 409]**
pristinamycin	-1,336	[-5,358; 2,686]	-180,398	[-510,738; 149,942]	**-51,218**	**[-73,862; -28,574]**
fosfomycin	**2,110**	**[2,010; 2,210]**	**-24,587**	**[-43,813; -5,361]**	-501	[-2,909; 1,906]
telithromycin	***-1,424***	***[-1,727; -1,121]***	*6,813*	*[-11,330; 24,956]*	***1,560***	***[3; 3,117]***
thiamphenicol	***-2***	***[-3; -2]***	*3*	*[-63; 69]*	*2*	*[-3; 7]*
colistin	**52**	**[23; 80]**	**5,478**	**[2,547; 8,409]**	**-705**	**[-891; -519]**
nitrofurantoin	**-2,113**	**[-2,956; -1,270]**	**-114,793**	**[-183,745; -45,841]**	**14,335**	**[8,996; 19,674]**
imipenem	4	[-1; 10]	-195	[-751; 361]	-29	[-68; 11]
meropenem	**15**	**[11; 20]**	**610**	**[61; 1,160]**	**-235**	**[-270; -201]**
aztreonam	**24**	**[16; 33]**	212	[-171; 595]	**-96**	**[-145; -47]**
tobramycin	57	[-225; 338]	4,005	[-5,832; 13,842]	-794	[-2,383; 796]
gentamicin	49	[-70; 168]	-2	[-2,104; 2,100]	-219	[-919; 480]
netilmicin	***-172***	***[-252; -92]***	*2*	*[-4,371; 4,374]*	*625*	*[-65; 1,316]*