Incidence of urinary tract infections and antibiotic resistance in the outpatient setting: a cross-sectional study

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Abstract

Purpose

In 2012-2013, a cross-sectional survey was conducted in women visiting a general practitioner for a urinary tract infection (UTI), to estimate the annual incidence of UTIs due to antibiotic-resistant *Escherichia coli* (*E. coli)*.

Methods

A sampling design (stratification, stages and sampling weights) was taken into account in all analyses. Urine analyses were performed for each woman and centralised in one laboratory.

Results

Among 538 included women, urine culture confirmed UTI in 75.2% of cases. *E. coli* represented 82.8% of species. Among *E. coli,* resistance (I + R) was most common to amoxicillin (38% [95% confidence interval: 31.1–44.5]) and to trimethoprim/sulfamethoxazole (18.1% [12.0–24.1]). Resistance to ciprofloxacin and cefotaxime was lower (1.9% in both cases, [0.3–3.5]), as it was for nitrofurantoin (0.4 [0–1,0]) and fosfomycin (0). Extended-spectrum β-lactamase (ESBL) represented 1.6% of *E. coli* [0.2–2.9]. Annual incidence rate of confirmed UTI was estimated at 2,400 per 100,000 women [1,800–3,000]. Incidence rates of UTI due to fluroquinolone-resistant and ESBL-producing *E. coli* were estimated at 102 per 100,000 women [75–129] and at 32 [24–41], respectively.

Conclusions

ESBL had been found in a community population, and even though the rate was low, it represents a warning and confirms that surveillance should continue.

Key words: urinary tract infection; *Escherichia coli;* antibiotic resistance; incidence; general population; general practitioner.

Introduction

Urinary tract infections (UTIs) are one of the most common community-onset infections. UTIs are often due to Enterobacteriaceae, in particular *Escherichia coli (E. coli). E. coli* accounts for 70–80% of positive urine cultures.[1] Enterobacteriaceae are part of the gut flora, which exposes those bacteria to selective pressure produced by antibiotic prescription.[2] An increasing prevalence of antimicrobial resistance is observed for UTIs.[2, 3] Since 2000, extended-spectrum β-lactamase (ESBL)-producing *E. coli* have emerged worldwide in both community and hospital settings.[4, 5] Unfortunately, ESBL-positive isolates are also commonly resistant to fluoroquinolone and trimethoprim/sulfamethoxazole, two antibiotics widely used to treat community-onset UTIs.[4] In France, the prevalence of antimicrobial resistance in UTIs due to *E. coli* has increased for inpatient and in faecal carriage among healthy subjects.[6, 7] For community-onset UTIs, French data are scant. Information about antibiotic resistance for uncomplicated UTIs is limited because they do not require systematic urine cultures.[8]

The aim of this study was to estimate the annual incidence of UTI caused by antibiotic-resistant *E. coli* among women visiting a general practitioner (GP) in France.

Materials and Methods

Design and study population

The Drug Resistant Urinary Tract Infection (Druti) study was conducted in France between January 2012 and February 2013 by the GPs of the Sentinelles network.[9] This was a prospective, national observational survey. Eligible patients were female patients 18 years of age and older visiting their GP for presumed UTI (i.e., complaining of at least one clinical symptom of UTI—pain or bladder tenderness, pollakiuria or urinary urgency—for less than 7 days). Additional eligibility criteria included living in France at least 6 months in a year, not being institutionalised (in hospital or nursing home) at the time of the study, having a good understanding of the French language, not having cognitive disorders. Furthermore, women recorded in the study as eligible even if they were not included, could not be eligible during 8 weeks after this registration. To be included, women had to agree to participate, not taken an antibiotic in the past 7 days, have seen their GP in a working day for transportation of urine samples (Monday, Tuesday, Wednesday and Thursday) and be able to provide a midstream urine sample during the consultation. For each included patient, the GP administered a questionnaire that was completed during the consultation. The questionnaire included questions regarding the patient's demographic characteristics (age, household members and nationality), clinical status (chronic diseases and comorbidities, particularly pregnancy, urinary tract disorder, previous UTIs and urinary catheterisation) and other epidemiological characteristic for ancillary studies. For example, hospitalization within 12 months before the study was collected in the questionnaire to evaluate if it could be a risk factor for resistance. To recover any missing data, within 2 weeks of inclusion, a trained investigator telephoned the GP and patient to verify the information.

Concerning uncomplicated and complicated UTIs, various classifications are reported.[8, 10, 11] According to French recommendations, in 2008, cystitis were defined as local symptoms

(pain or bladder tenderness, pollakiuria or urinary urgency) and pyelonephritis were defined as UTI with fever >38°C. Complicated UTI was defined as UTI occurring in a woman with urinary tract anomalies, pregnant, aged 65 years and older or treated for a chronic disease (diabetes, cancer or renal insufficiency).

Sample size

The sample size was calculated from a proportion of fluoroquinolone resistance of 18% from Annual report of the European Antimicrobial Resistance Surveillance Network 2012 (EARS-Net), with a precision of 4.5%, leading to the inclusion of 280 positive samples for *E. coli*.[12] On the basis of a proportion of positive urine cultures of 70% and a proportion of *E. coli* isolated from a positive sample of 77%,[1] it was necessary to include 520 urine samples. Considering a median number of consultations for UTI of 16 per year per GP and a proportion of eligible patients included of 34%, it was necessary to recruit 96 GPs to obtain 520 included patients.

Bacteriological analyses and definitions

For all urine cultures, bacterial identification and susceptibility testing were performed at the same laboratory: the Department of Microbiology of Ambroise Paré University Hospital, Paris. Bacteriological analyses and antimicrobial susceptibility testing were described elsewhere.[13] They were conducted according to the recommendations of the French Society of Microbiology and the European Committee on Antimicrobial Susceptibility Testing.[14-17]. As previously described, ESBL was identified by specific polymerase chain reaction (PCR) and sequencing.[17, 18]

Multidrug resistance (MDR) was defined as acquired resistance to at least three of the following antimicrobial categories: penicillins, penicillins and β-lactamase inhibitors, antipseudomonas penicillins and β-lactamase inhibitors, monobactams, carbapenems, non-extended spectrum cephalosporins, extended-spectrum cephalosporins, anti-MRSA (methicillin-resistant *Staphylococcus aureus*) cephalosporins, cephamycins, aminoglycosides, tetracyclines, glycylcyclines, folate pathway inhibitors, fluoroquinolones,

phenicols, phosphonic acids and polymyxins (antimicrobial categories were dropped if species had intrinsic resistance).[19]

Statistical analysis

The sampling design (stratification, stages and sampling weights) was taken into account in all analyses to make inference to the population.[20] Collection of samples was based on two-stage, stratified, random sampling. At the first stage, the sampling frame of all GPs in France was stratified in five strata defined as five French inter-regions (North, East, West, South-West, and South-East). GPs of the Sentinelles' network participating in the biological sampling protocol were assumed to be selected from each stratum of a sampling frame using simple, random sampling. This hypothesis means that each sampling unit (GPs participating in the study) had, in each stratum, the same probability of being selected and saw the same proportion of patients with UTI as other practitioners in France. At the second stage, GPs proposed inclusion in the study and collected urine samples from all women matching the eligibility criteria. Thus, the probability of inclusion at this stage was calculated for each woman according to the number of women with a urine culture result, divided by the number of eligible women consulted for a presumed UTI. Strata and stages were used to accurately estimate associated variances. Sampling weights were post-stratified using the number of consultations for GPs participating in the study compared with the number of consultations for all GPs in France provided by the national health insurance system (CNAM).

For the descriptive analysis, we expressed the estimated proportions with 95% confidence intervals (CIs) of the qualitative variables in the population. Incidences of UTI and UTI due to antibiotic-resistant *E. coli* were estimated taking into account the sampling design. The annual incidence rate was calculated as the incidence divided by the size of the French female population over 18 (at the first January 2012: 25,862,849 women).[21] Categorical variables were compared using the Pearson squared Chi^2 test, whereas the Student's *t*-test was used to compare continuous data. A *p-value* of ≤ 0.05 was considered statistically significant. Data were collected with EPI-Data and analysed with the R survey package[22] or Stata.

Ethical considerations

The study obtained research authorisation from the French independent administrative authority protecting privacy and personal data (CNIL), number 911,485, and from the local human investigation committee of *Ile de France V*.

Results

Out of the expected 96 GPs, 87 GPs participated in the study (North: 13, East: 13, West: 14, South-East: 26 and South-West: 21). In total, GPs saw 1,569 women with symptoms of UTI (Fig. 1). Urine samples were collected for 538 included women. The three main reasons for non-inclusion were unavailability for the transport of the urine sample (34%), lack of time of the GP for inclusion (18%) and previous antibiotic treatment in the past 7 days (14%).

Mean age of the included women was 45 years old. The majority of participants had a history of previous UTI (84% [95% CI: 80–88]), but few had recurrent UTIs (≥3 episodes in the past 12 months) (7% [5–10]). Clinical symptoms were pain or bladder tenderness in 93% [90–96] of cases, pollakiuria in 92% [88–95], urinary urgency in 76% [69–82], flank or pelvic pain in 43% [36–51], hematuria in 23% [19–28] and fever in 7% [5–11]. Complicated UTIs represented 23% [18–28] of UTI cases. Women treated for a chronic disease (diabetes, cancer or renal insufficiency), pregnancy and urinary tract anomalies represented 6% [4-10], 3% [2-5], and 2% [1-4] of UTI cases, respectively. A quarter of the included women were aged 65 years and older (16%, [11-22]). There were no women with chronic indwelling urinary catheters, and only five women had had an intermittent urinary catheter in the last month (1%, [0-4]).

Excluded women had less pollakiuria (91%), urinary urgency (64%) and flank or pelvic pain (34%) (with $p = 0.03$, $p < 0.01$ and $p < 0.01$, respectively).

An empirical antibiotic treatment was prescribed in 97% cases [95–98].

Out of the 538 included patients, 393 (75.2%) had a positive urine culture. Among the 393 urine samples with significant bacteriuria, 421 bacteria were isolated: 366 urine samples (93.1% [90.5–95.9]) had only one bacteria, 26 samples (6.6% [3.9–9.4]) had two bacteria and one sample (0.3% [0.0–1.3]) had three different bacteria. The most common pathogen

was *E. coli* (82.8%), followed by *Proteus mirabilis* (4.3%) (Table 1). According to symptoms, the rate of positive urine culture was not statistically different.

Among *E. coli,* resistance (I + R) was most common to amoxicillin (38%) and to trimethoprim/sulfamethoxazole (18.1%). Resistance to ciprofloxacin was low (1.9%), as it was to cefotaxime (1.9%) (Table 2). MDR concerned 20.4% [95% CI: 14.8–25.9] of *E. coli* (64 isolates), and resistance to at least one antibiotic concerned 43% [95% CI: 36.0–49.5] of *E. coli* (129 isolates). MDR *E. coli* were mainly resistant to amoxicillin (98.9% [95% CI: 91.7–99.9]), trimethoprim/sulfamethoxazole (50.3% [95% CI: 33.1–67.4]) and fluoroquinolone (15.3% [95% CI: 7.7–28.2]). Resistance rates were higher among older women except for amoxicillin; however, those differences were not statistically significant (Table 3). No differences in the distribution of resistance between the five regions have been shown (data not shown).

Six *E. coli* produced classical ESBLs (1.6% [0.2–2.9]), of which three produced a CTX-M-1 ESBL, two a CTX-M-14 ESBL and one a CTX-M-15 ESBL. All ESBL *E. coli* were associated with at least one of these following factors: hospitalisation, travel abroad or contact with a traveller or previous antibiotic intake.

The annual incidence rate of confirmed UTI in general practice was estimated at 2,400 per 100,000 women in France [1,800–3,000], with an annual incidence rate of UTI due to *E. coli* in general practice at 2,000 for 100,000 women [1,500–2,500] and with annual incidence rates of UTI due to FQ-resistant *E.* coli and ESBL *E. coli* in general practice at 102 for 100,000 women [75–129] and 32 [24–41], respectively (Table 4).

Discussion

The present study permitted the updating of annual incidence rates of UTI in general practice and provided actualised resistance rates in the community. It confirmed that FQ-resistant and ESBL-producing *E. coli* are circulating in the community, still at a low rate. The study also showed that a quarter of women visiting GP for presumed UTI had a negative urine culture.

It is difficult to compare our estimates of incidence of UTI with those previously published. In Switzerland, incidence rates of visits to a GP for lower UTI has been estimated at 1.6 per 100 inhabitants per year, but that study was conducted among men and women.[23] Because 84% of the patients were women and because the denominator included men and women, a lower rate than the one we estimated in women only was expected. In Canada, incidence rates of UTI with positive urine culture has been estimated at 17.5 per 1,000 inhabitants per year, an incidence still lower than our estimates, probably owing to the design of the study based on passive surveillance (thus, excluding many uncomplicated cases of lower UTI).[24]

In the Antimicrobial Resistance Epidemiological Survey on Cystitis (ARESC), 74.6% of patients had a positive urine culture, mostly *E. coli* (76.7% of the positive urine cultures).[11] In ECO.SENS II, 72.1% of patients had a positive urine culture, mostly *E. coli* (74.2% of the positive urine cultures).[25] However, both included only uncomplicated lower UTIs. Our proportion of positive urine cultures is close to those found, but our proportion of *E. coli* is higher than other studies because of patient characteristics: lower proportions of *E. coli* are reported in studies based on complicated or recurrent UTIs and in routine samples versus solicited ones.[1, 23] Available epidemiological data are mainly produced by passive surveillance, based on data from clinical microbiology laboratories. Because standard care for uncomplicated UTIs does not require a microbiological work-up,[26, 10] patients with complicated UTIs, with comorbidity or recent antimicrobial exposure, or with healthcare-related infections tend to be overrepresented in epidemiological studies based on passive

surveillance.[23, 27, 28] As a consequence, surveillance in community settings only based on data from routine clinical microbiological laboratories overestimates antimicrobial resistance. [23, 27, 28] Indeed, the European recommendations for antimicrobial resistance surveillance stated that generating rates of resistance based on indiscriminate samples from ambulatory patients would lead to an overestimate of the rates of resistance.[29] This has been demonstrated in a recent study in which *E. coli* in UTIs showed higher susceptibility to antibiotics in solicited samples collected with a specific protocol than in routine samples.[23] Consequently, a recommendation of empirical antibiotic therapy for UTIs based on the results of an epidemiological study conducted with a systematic collection of urine samples would be more appropriate than a recommendation based on laboratory passive reporting. Thus, the main interest of our study was to estimate, on a national scale, relevant antimicrobial resistance rates among women seen by GPs for a presumed UTI.

In 2003–2006, the ARESC found resistance rates of *E. coli* isolated from uncomplicated UTIs to be 17.6% for cefuroxime and 8.3% for ciprofloxacin in different European countries. In France, the rates were 10.7% and 1.6%, respectively.[11] Resistance rates to ciprofloxacin exceeded 10% in Italy, Russia, Spain and Brazil. More recent data from ECO-SENS II (2007–2008) found resistant rates of *E. coli* isolated from UTIs at 1.2% for cefotaxime and 3.9% for ciprofloxacin in different European countries.[25] In our study, we observed lower rates for cefuroxime (2%), cefotaxime (1.9%) and ciprofloxacin (1.9%).

Only six ESBLE were identified from our samples (1.6%). Previously reported estimates in France varied from no ESBL isolates among women visiting their GP for presumed UTI in 2008[30] to 1.83% of urine samples in a study based on passive surveillance.[23, 31] Even if it is not possible here to detect a potential increase in the incidence of ESBL related to UTIs, the fact that such bacteria are present in clinical samples of patients living in the community represents a real warning. The high rate of resistance to trimethoprim/sulfamethoxazole or high proportion of MDR *E. coli* also constitutes warnings. Comparing our results with those of the ARESC study, trimethoprim/sulfamethoxazole resistance increased by seven points,

almost reaching the threshold of 20%.[11] This threshold represented the resistance prevalence at which the agent is no longer recommended for empirical treatment of acute cystitis.[32] In addition, the proportion of MDR *E. coli* based on the ECDC definition doubled compared with the ARESC data, in which the same definition was used for MDR.[11, 19]

For other antibiotics, resistance rates were at the expected levels: low for fosfomycin and nitrofurantoin and high for amoxicillin. The 38% resistance rate to ampicillin was very close to the French ARESC results (39%), and thus the highest rate in Europe (except the Netherlands).[11] The activity of amoxicillin is dramatically reduced; this antibiotic cannot be used for empirical treatment of uncomplicated cystitis. Empirical antibiotics could be fosfomycin or nitrofurantoin with susceptibility rates, in our study at 100% and 99.6%, respectively. These rates were estimated in other European or American countries from 92% to 100%.[11, 25, 33]

We are confident in our estimation of the actual antimicrobial resistance in UTI among outpatients because of our use of a systematic collection of urine samples for all women visiting their GP for presumed UTIs and taking into account the sampling design. The sampling design and the post-stratification has corrected the bias due to drop-outs and geographical repartition. Another strength of the study was the centralised urine analysis. Finally, the prospective and standardised collection of data limited recall and information bias.

The results of the present study should be interpreted taking into account the fact that the population of the study were women visiting their GP for presumed UTI. The study does not take into account women with UTI who do not consult a GP (e.g., visit to another specialist, self-medication or spontaneous healing). Indeed, a US study estimated that only 50% of UTIs had a medical visit.[34] Such data are not available in France. Another limitation is the

lack of results regarding pivmecillinam. This drug was not available in France at the time of the study and thus was not tested in the laboratory.

Our results show that active surveillance of resistant UTIs in the community is required to complete passive surveillance and healthcare-associated surveillance. ESBL had been found in our community population and even though the rate was low, it represents a warning and confirms that studies such as the one presented here should be repeated.

Competing interests: none

The authors declare that they have no competing interests.

Authors' contributions

LR, SM, SV, TB, BC and TH conceived and designed the experiments. LR, SM, RB and BH performed the experiments. SV, SM, AB, LR and YLS analysed the data. LR, SV, SM, AB, YLS, BH, TB, BC and TH wrote the paper.

Acknowledgements

We thank all the GPs and their patients. We thank Pr Richard Bonnet, National reference centre for ESBL for ESBL analysis.

Funding

Authors report grants from The French Institute for Public Health Surveillance (Institut de veille sanitaire, InVS), grants from Health General Direction of France (DGS), grants from Corporate foundation GPM, grants from French Urology Association during the conduct of the study. They had no role in the study design, data collection, analyses, decision to publish or preparation of the manuscript.

Tables

Table 1: Distribution of pathogens in positive urine culture

	n	Estimated proportion (% [95%CI])*
Enterobacteriaceae	369	90.8 [86.1–95.6]
Escherichia coli	331	82.8 [77.0–88.6]
Proteus mirabilis	16	4.3 [1.6–7.1]
Klebsiella pneumoniae	7	2.1 [0.3–3.9]
Citrobacter koseri	7	1.8 [0.4–3.2]
Klebsiella oxytoca	5	0.6 [0.1–1.1]
Enterobacter aerogenes	1	0.2 [0.0–0.5]
Enterobacter cloacae	1	0.2 [0.0–0.5]
Raoultella planticola	1	0.1 [0.0–0.4]
Others	52	9.1 [4.4–13.9]
Staphylococcus saprophyticus	24	5.6 [2.8–8.3]
Enterococcus faecalis	15	4.6 [4.0–8.9]
Streptococcus agalactiae	7	2.0 [0.2–3.8]
Staphylococcus aureus	3	1.3 [0.0–3.0]
Staphylococcus haemolyticus	1	0.7 [0.0–2.2]
Pseudomonas aeruginosa	1	0.4 [0.0–1.3]
Gardnerella vaginalis	1	0.2 [0.0–0.7]

***** Estimated proportion with the sampling design and 95% confidence intervals (CIs)

n: size in the study population

Table 2: Resistance rates among 331 *Escherichia coli* from urinary tract infection of women over 18 visiting a French GP in 2012–2013

	S		I		R	
	n	**Estimated proportion (% [95%CI])***	***n***	**Estimated proportion (% [95%CI])***	***n***	**Estimated proportion (% [95%CI])***
Amoxicillin	215	62.0 [55.5–68.9]	0	0.0	116	38.0 [31.1–44.5]
Amoxicillin/clavulanate	307	91.3 [87.9–94.6]	12	5.2 [2.1–8.4]	12	3.5 [1.5–5.5]
Cefuroxime	323	98.0 [96.4–99.7]	0	0.0	8	2.0 [0.3–3.6]
Cefotaxime	323	98.1 [96.5–99.7]	2	0.4 [0.0–0.9]	6	1.5 [0.1–3.0]
Ceftazidime	323	98.1 [96.5–99.7]	5	1.0 [0.0–2.1]	3	0.9 [0.0–2.1]
Carbapenems	331	100.0	0	0.0	0	0.0
Fosfomycin	331	100.0	0	0.0	0	0.0
Nitrufurantoin	328	99.6 [99.0–99.9]	0	0.0	3	0.4 [0.0–1.0]
Nalidixic acid	311	94.6 [92.1–97.1]	3	0.7 [0.0–1.7]	17	4.6 [0.2–7.1]
Ofloxacin	312	94.9 [92.6–97.3]	8	2.3 [0.8–3.8]	11	2.8 [1.1–4.4]
Ciprofloxacin	323	98.1 [96.5–99.7]	2	0.4 [0.0–0.9]	6	1.5 [0.1–3.0]
Aminoglycoside	327	98.7 [97.0–99.9]	0	0.0	4	1.3 [0.0–3.0]
Trimethoprim/sulfamethoxazole	278	81.9 [75.9–88.0]	2	0.3 [0.0–0.7]	51	17.8 [11.7–24.0]

***** Estimated proportion with the sampling design and 95% CI

n: size in the study population; C3G: cephalosporin third generation; S: susceptible; I: intermediate; R: resistant)

330

331 **Table 3: Resistance rates among 331 *Escherichia coli* from urinary tract infection of**

332 **women over 18 visiting a French GP in 2012–2013, according to age**

	All women (*n* = 331)		**Women <65 years old (*n* = 273)**		**Women ≥65 years old (*n* = 58)**	
	n*	**Estimated proportion (% [95%CI])****	***n****	**Estimated proportion** (% [95%CI])**	***n****	**Estimated proportion** (% [95%CI])**
Amoxicillin	116	38.0 [31.1–44.5]	95	38.4 [30.8–46.0]	21	34.2 [19.8–48.7]
Amoxicillin/clavulanate	24	8.7 [5.4–12.1]	20	9.1 [5.2–13.0]	4	6.5 [0.0–15.3]
Cefuroxime	8	1.9 [0.3–3.5]	6	1.4 [0.2–2.6]	2	4.9 [0.0–13.1]
Cefotaxime	8	1.9 [0.3–3.5]	6	1.4 [0.2–2.6]	2	4.9 [0.0–13.1]
Ceftazidime	8	1.9 [0.3–3.5]	6	1.4 [0.2–2.6]	2	4.9 [0.0–13.1]
Carbapenems	0	0.0	0	0.0	0	0.0
Fosfomycin	0	0.0	0	0.0	0	0.0
Nitrufurantoin	3	0.4 [0–1.0]	2	0.3 [0.0–0.8]	1	1.1 [0.0–3.3]
Nalidixic acid	20	5.4 [2.9–7.9]	15	4.5 [1.9–7.1]	5	10.5 [1.1–19.9]
Ofloxacin	19	5.1 [2.7–7.4]	14	4.1 [1.9–6.4]	5	10.5 [1.1–19.9]
Ciprofloxacin	8	1.9 [0.3–3.5]	6	1.8 [0.3–3.3]	2	2.8 [0.0–6.9]
Aminoglycoside	4	1.3 [0.0–3.0]	2	0.6 [0.0–1.4]	2	5.2 [0.0–15.8]
Trimethoprim/sulfamethoxazole	53	18.1 [12.0–24.1]	40	16.7 [10.5–22.9]	13	25.6 [11.6–39.6]

333 * *E. coli* were classified as being resistant when testing disclosed resistant or intermediate

334 susceptibility to a particular antimicrobial agent

335 ** Estimated proportion with the sampling design and 95% CI

336 *n*: size in the study population; C3G: cephalosporin third generation.

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339 **Table 4: Incidence rate of medical consultation for urinary tract infection (UTI) among**

340 **women over 18 years old in mainland France, 2012–2013**

341

	Estimated incidence [95%CI]*	**Estimated incidence rate per 100,000 ** [95%CI]***
Presumed urinary tract infection (UTI)	823,073 [623,614 – 1 040,532]	3,200 [2,400-4,000]
Presumed uncomplicated cystitis	*576,151 [436,530– 728,372]*	*2,200 [1,700-2,800]*
Presumed complicated UTI	*189,307 [143,431 – 239,322]*	*730 [550-930]*
Presumed uncomplicated Pyelonephritis	*50,234 [25,172-75,297]*	*194 [97-291]*
Confirmed UTI (positive urine culture)	626,046 [465,196 – 786,896]	2,400 [1,800-3,000]
Uncomplicated cystitis	*463,274 [344,245– 582,303]*	*1,800 [2,200-1,800]*
Complicated UTI	*125,209 [93,039 – 157,379]*	*480 [360-610]*
uncomplicated Pyelonephritis	*34,587 [14,075– 55,099]*	*134 [54-213]*
UTI due to *E. col*i	518,446 [381,981 – 654,911]	2,000 [1,500-2,500]
UTI due to FQ-resistant E. coli	*26,441 [19,481 - 33,400]*	*102 [75-129]*
UTI due to C3G-resistant E. coli	*9,850 [7,258 – 12,443]*	*38 [28-48]*
UTI due to ESBL E. coli	*8,295 [6,112 – 10,479]*	*32 [24-41]*

342 * Estimated size with the sampling design and 95% CI

343 ** Estimated incidence rate in general practice per 100,000 women over 18 in mainland France per

344 year

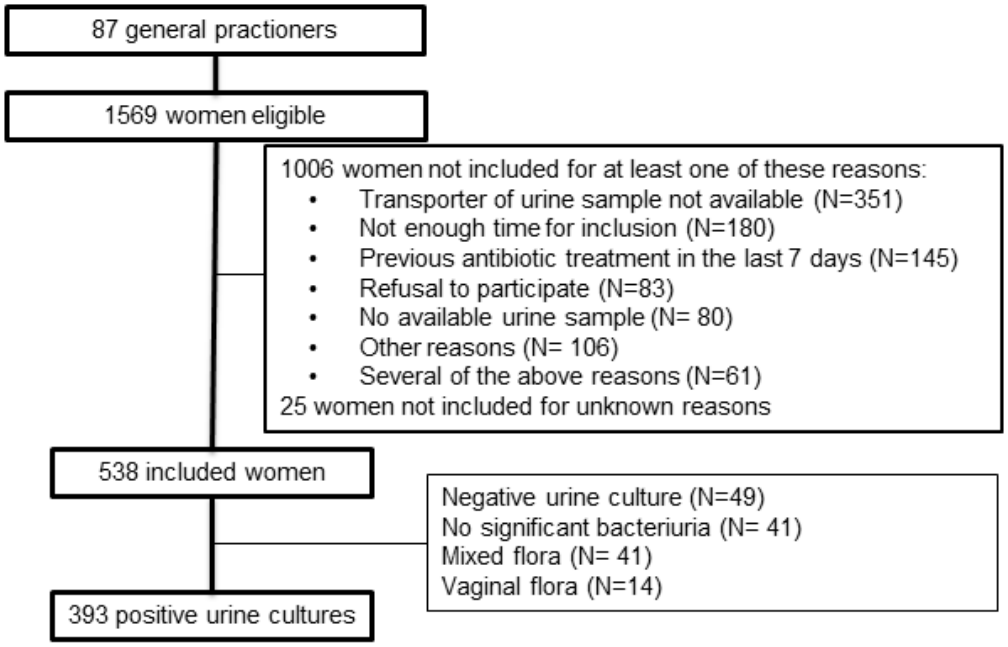
345 *E. coli: Escherichia coli* ESBL: Extended-spectrum β-lactamase; C3G: third generation cephalosporin;

346 FQ: fluoroquinolone.

347

348 Figure

349 Figure 1: Flow chart



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