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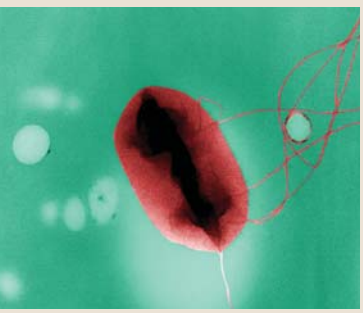

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Urinary Tract Infections in Active Component U.S. Armed Forces Women Before and After Routine Screening Pap Examination

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It has been suggested that Pap tests, when used as surrogate markers for routine pelvic examinations in asymptomatic women, may be associated with an increased short-term risk of urinary tract infections (UTIs). This retrospective cohort study used Defense Medical Surveillance System (DMSS) data from 2007 through 2013 to compare the incidence of UTIs in active component women before and after receiving a routine screening Pap examination. The pre-Pap (baseline) UTI incidence rate in this cohort was 105.9 per 1,000 person-years (p-yrs) compared to 129.8 per 1,000 p-yrs post-Pap; the rate ratio was 1.23 (95% CI: 1.18–1.27). The adjusted relative risk of UTI post-Pap was 1.14 (95% CI: 1.10–1.18) and the adjusted percentage of UTIs attributable to a Pap test in the post-exposure period was 12.2% (95% CI: 9.1–15.2). Routine Pap tests, when used as a surrogate marker for pelvic examination, may be a modifiable risk factor for UTI in active component U.S. military women.

In the U.S., routine preventive care visits for women often include a complete pelvic examination that consists of an external inspection, a speculum examination, and a bimanual examination.[1] There is disagreement as to whether the benefits of these screening pelvic examinations outweigh their potential risks. For example, the American College of Obstetrics and Gynecology notes that, although the balance of evidence neither supports nor refutes the value of performing annual complete pelvic examinations in low-risk asymptomatic patients, such annual exams are reasonable for women over the age of 21.[2] However, the American College of Physicians believes that the potential harms associated with screening pelvic examination exceed the available benefits and recommends against them.[3] It is important to note that this difference in perspective does not extend to cervical cancer screening, a well-established intervention that remains very strongly supported by both organizations.

Some of the potential harms cited for routine screening pelvic examinations include a delay in treatment due to a false negative exam, the harms of overdiagnosis and/or overtreatment (of pathology that would be clinically insignificant), and the harms of false positives and the potential risks associated with unnecessary additional diagnostic testing.[4] There are also potential harms associated with the procedure itself, including patient anxiety over the exam, pain related to the instrumentation, and a potential opportunity cost for other preventive medicine engagements (clinical time spent on a pelvic exam cannot be spent on other initiatives).[2,3] A recent pelvic examination has also been proposed as an independent risk factor for symptomatic UTI in women.[3,5,6]

An association between pelvic examination and UTI development is biologically plausible. Speculum examination/instrumentation and associated microtrauma may increase the risk of UTIs in a manner similar to sexual intercourse, a well-established independent risk factor for UTIs in women.[7] In the one available retrospective cohort study that examined this association, one additional UTI was diagnosed for every seven speculum examinations performed.[6] In that study, a routine Pap screening was used as a surrogate exposure for routine pelvic examination in an asymptomatic woman.

In 2008, a total of 9.8 million primary diagnoses of UTI were made in the U.S. with more than half of all the associated clinical encounters occurring in the outpatient/non-hospital-based ambulatory care setting.[8] A potential association between pelvic examination and UTIs in women is of public health significance. Specific to women, UTIs and associated symptoms represent about 2% of all family physician encounters and most of this burden occurs in otherwise healthy, premenopausal, sexually active individuals.[9] A cross-sectional telephone survey revealed that approximately one of nine adult female respondents endorsed UTI symptoms during the prior year and reported that the lifetime prevalence of physician-diagnosed UTIs exceeds 50%.[10]

UTIs also represent a significant burden for women in the U.S. military. During a 14-year surveillance period, 30.4% of women had at least one UTI diagnosed through a medical encounter resulting in a mean annual loss of 4,981 work days.[11] In women who deployed, the incidence of UTI increases from 70.3 per 1,000 person-years (p-yrs) (non-deployed, active component, all service) to 86.7 per 1,000 p-yrs (deployed, active component, female, all services).[11,12] As in the civilian population, rates of UTI in the U.S. military are highest among young and presumed sexually active women.[11]

With the exception of frequency of sexual activity, the major risk factors for UTIs in women tend not to be modifiable (younger age, history of recurrent infections, anatomic abnormalities, and immune deficiency/suppression).[5] From a public health perspective, routine pelvic examination in asymptomatic women may represent a potential target for primary prevention of UTIs and warrants further investigation.

METHODS

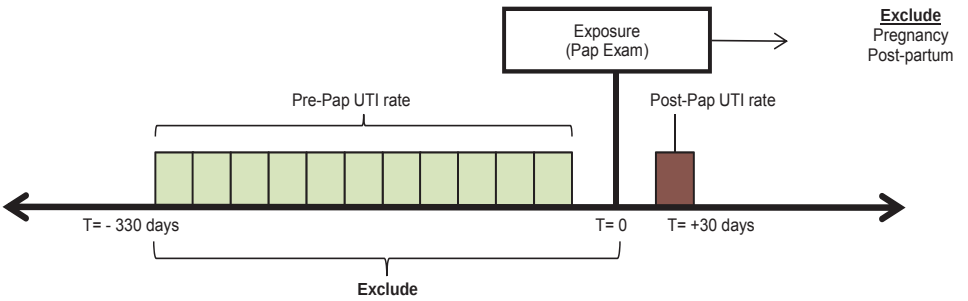
The surveillance population included all active component women in the Army, Navy, Air Force, Marine Corps, and Coast Guard. The surveillance period was 1 January 2007 through 31 December 2013. All data used to determine incident cases were derived from records of both ambulatory encounters and hospitalizations routinely maintained in the Defense Medical Surveillance System (DMSS).

This study used a retrospective cohort before-and-after design **(Figure 1)**. Screening Pap examination was used as a surrogate exposure for a routine pelvic examination in an asymptomatic woman. Rates of UTI in the 11 months pre-Pap were compared to rates of UTI in the 30 days following the exam. The exposure was defined by the presence of an ICD-9 code for a routine Pap screening examination (ICD-9: V76.2, V76.47, V15.89) in any diagnostic position of a service woman's health record. Women who were pregnant (V22.x, V23.x, 630.x–679.x), or who gave birth (V24.x or V27.x) in the 11 months before the identified exposure were excluded. Also excluded were women who did not have at least 11 months of documented military service, who had more than one encounter meeting exposure criteria in 11 months, and those who were diagnosed with UTI on the same day as Pap screening (presumed symptomatic UTI at time of exposure). For the cohort of women who were identified as having undergone a Pap test, health records were searched for the outcome variables of interest during the 11 month pre-Pap, and 1 month post-Pap periods.

The primary outcome measure was UTI defined by the recording of ICD-9 code: 599.0, 595.0, 597.80, or 595.9 (UTI unspecified, acute cystitis, non-sexually transmitted urethritis unspecified, and cystitis unspecified) in the primary or secondary diagnostic position of an inpatient or outpatient encounter. Individuals could have multiple incident UTI episodes recorded during the baseline period; however, each incident episode had to occur at least 30 days after any prior episode (i.e., 30 days of person-time were censored after each UTI encounter during which time women were considered not to be at risk of a new incident UTI). Sexually transmitted infections (STIs) were defined by the recording of either an inpatient or outpatient encounter for chlamydia (099.41 or 099.5), gonorrhea (098.0x, 098.1x, 098.4x, or 0.98.8x), or syphilis (091.x–097.x), in any diagnostic position, or a confirmed reportable medical event for these same conditions.

Incidence rates were calculated for UTI and STI in the time periods before and after Pap smears by dividing the number of cases of UTI or STI by the corresponding calculated person-time. Rate ratios with 95% confidence intervals (CIs) allowed comparisons of relative frequency. Poisson regressions (unadjusted, fully adjusted, and parsimonious models) were used to determine relative risk. All analyses were performed using SPSS version 22.0.

FIGURE 1. Retrospective cohort, before and after exposure (Pap screening examination) study design



RESULTS

During the surveillance period, a total of 322,862 screening Pap encounters were identified among service women eligible for inclusion in this analysis. Consistent with the general age distribution of active component female service members, 86.9% of all exams were performed on women aged 20–39 years **(Table 1)**. There were 30,357 incident diagnoses of UTI identified in the pre-exposure period resulting in a baseline UTI incidence rate of 105.9 per 1,000 p-yrs aggregated over the surveillance period. UTI incidence declined with increasing patient age from 208.2 per 1,000 p-yrs among

FIGURE 2. Annual numbers of care encounters for screening Pap tests, active component service women, U.S. Armed Forces, 2007–2013

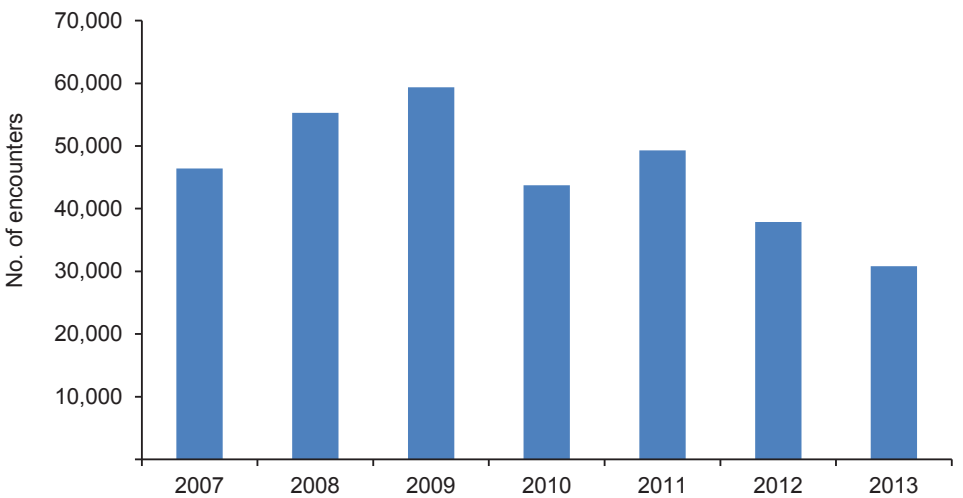


TABLE 1. Frequency counts of screening Pap examinations (exposures), active component, U.S. Armed Forces, 2007–2013

	Year of Pap examination							Total
	2007	2008	2009	2010	2011	2012	2013	
Total	46,397	55,278	59,353	43,712	49,287	37,849	30,806	322,682
Age group								
<20	1,239	1,466	1,561	828	595	191	73	5,953
20–24	14,563	16,934	18,040	12,210	14,743	11,637	9,150	97,277
25–29	12,796	15,454	16,959	12,716	14,926	11,486	8,675	93,012
30–34	7,053	8,703	9,408	7,242	8,157	6,455	5,617	52,635
35–39	5,612	6,579	6,943	5,180	5,380	4,019	3,683	37,396
40–44	3,330	3,975	4,245	3,480	3,466	2,652	2,245	23,393
45-49	1,291	1,562	1,566	1,411	1,403	1,003	943	9,179
50+	513	605	631	645	617	406	420	3,837
Race/ethnicity								
White, non-Hispanic	23,203	27,044	28,996	21,486	23,869	18,379	14,765	157,742
Black, non-Hispanic	13,206	15,526	16,784	12,202	13,846	10,182	8,301	90,047
Hispanic	4,709	6,075	6,490	4,865	5,620	4,353	3,700	35,812
Other	5,279	6,633	7,083	5,159	5,952	4,935	4,040	39,081
Marital status								
Single	19,121	22,487	24,238	17,522	19,855	16,322	13,309	132,854
Married	21,623	25,809	27,458	20,351	22,629	16,549	13,509	147,928
Unknown	5,653	6,982	7,657	5,839	6,803	4,978	3,988	41,900
Rank								
Jr Enlisted (E01–E04)	16,294	19,701	21,870	14,735	18,296	14,280	10,962	116,138
Sr Enlisted (E05–E09)	20,799	24,032	24,641	15,624	18,864	15,542	13,161	132,663
Jr Officer (O01–O04)	7,568	9,367	10,430	10,818	9,898	6,581	5,369	60,031
Sr Officer (O05–O10)	1,293	1,592	1,725	1,708	1,526	1,081	993	9,918
Warrant Officer (W01–W04)	443	586	687	827	703	365	321	3,932
Service								
Army	17,020	22,463	26,051	22,730	24,263	12,665	10,857	136,049
Coast Guard	994	1,136	992	918	834	841	789	6,504
Air Force	18,235	19,297	19,791	10,981	13,567	13,277	9,916	105,064
Marine Corps	1,554	2,034	2,331	1,881	2,442	2,238	1,773	14,253
Navy	8,594	10,348	10,188	7,202	8,181	8,828	7,471	60,812

TABLE 2. Pre-exposure frequency counts and incidence rates of urinary tract infection (UTI), active component, U.S. Armed Forces, 2007–2013

	Year of Pap examination														Pre-exposure total	
	2007		2008		2009		2010		2011		2012		2013			
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	4,601	109.6	5,098	104.0	5,747	109.8	4,039	105.1	4,587	105.1	3,533	105.1	2,752	100.2	30,357	105.9
Age group																
<20	257	231.4	246	188.4	313	226.0	132	179.9	96	181.8	41	242.2	18	277.1	1,103	208.2
20–24	1,853	141.0	2,045	136.7	2,231	140.9	1,514	142.0	1,803	138.2	1,411	136.8	1,100	135.0	11,957	138.9
25–29	1,203	103.8	1,358	99.4	1,554	104.2	1,128	101.2	1,358	103.0	1,025	100.8	764	99.1	8,390	101.8
30–34	620	97.1	661	85.3	767	92.0	559	87.5	650	89.9	518	90.2	414	82.7	4,189	89.4
35–39	354	69.5	434	74.0	485	78.7	370	80.6	370	77.4	286	79.6	264	80.0	2,563	76.8
40–44	211	69.8	234	65.8	285	75.4	234	76.1	200	64.7	176	74.4	127	63.2	1,467	70.2
45-49	77	65.7	85	60.8	81	58.1	72	57.3	76	60.6	63	69.9	48	56.6	502	61.0
50+	26	55.7	35	64.9	31	55.0	30	52.2	34	62.0	13	35.8	17	44.7	186	54.1
Race/ethnicity																
White, non-Hispanic	2,416	115.1	2,644	110.2	2,923	114.2	2,032	107.7	2,302	108.8	1,757	107.6	1,365	103.7	15,439	110.2
Black, non-Hispanic	1,194	99.8	1,297	94.2	1,560	105.3	1,128	105.2	1,198	97.8	910	100.7	691	93.4	7,978	99.8
Hispanic	485	113.9	564	104.6	589	103.1	431	100.6	535	107.5	395	102.2	358	108.4	3,357	105.6
Other	506	105.9	593	100.8	675	108.1	448	98.5	552	104.5	471	107.4	338	93.7	3,583	103.2
Marital status																
Single	1,928	111.4	2,073	104.1	2,381	111.5	1,570	102.0	1,829	103.9	1,484	102.4	1,190	100.3	12,455	105.6
Married	2,058	105.1	2,321	101.0	2,546	104.8	1,826	101.7	2,036	101.4	1,493	101.3	1,177	97.5	13,457	102.2
Unknown	615	120.4	704	114.4	820	122.2	643	126.4	722	120.4	556	126.7	385	108.9	4,445	120.2
Rank																
Jr Enlisted (E01–E04)	2,226	151.5	2,445	140.3	2,868	149.1	1,939	150.5	2,259	139.5	1,787	141.4	1,311	134.5	14,835	144.3
Sr Enlisted (E05–E09)	1,790	95.0	1,927	90.4	2,084	95.9	1,302	94.8	1,509	90.0	1,240	89.6	1,041	88.6	10,893	92.3
Jr Officer (O01–O04)	482	70.2	623	74.6	661	71.5	666	69.6	704	80.7	435	74.3	342	71.3	3,913	73.3
Sr Officer (O05–O10)	71	60.4	66	46.2	77	50.0	81	53.4	62	45.4	43	44.3	39	43.7	439	49.4
Warrant Officer (W01–W04)	32	79.6	37	71.0	57	94.0	51	69.9	53	86.6	28	87.0	19	66.3	277	79.6
Service																
Army	1,793	116.5	2,016	101.0	2,455	106.9	2,130	106.8	2,358	110.6	1,291	115.4	1,009	104.2	13,052	108.4
Coast Guard	118	131.4	134	133.6	107	123.0	110	135.1	95	128.2	97	130.7	75	107.4	736	127.6
Air Force	1,753	106.2	1,840	107.7	1,971	112.7	1,006	104.2	1,224	101.0	1,216	102.8	866	98.0	9,876	105.6
Marine Corps	148	105.2	211	116.7	277	134.7	182	109.8	227	104.1	205	103.0	167	105.7	1,417	111.8
Navy	789	101.4	897	97.7	937	104.1	611	96.1	683	93.6	724	92.0	635	95.2	5,276	97.4

[a]Rate per 1,000 person-years

TABLE 3. Post-exposure frequency counts and incidence rates of urinary tract infection (UTI), active component, U.S. Armed Forces, 2007–2013

	Year of Pap examination														Post-exposure total	
	2007		2008		2009		2010		2011		2012		2013			
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	570	149.0	584	128.2	638	130.5	473	131.4	524	129.0	401	128.6	262	103.2	3,452	129.8
Age group																
<20	27	265.0	21	173.8	35	272.1	15	219.1	11	224.4	2	128.4	0	0	111	226.3
20–24	209	174.0	236	169.1	248	166.8	173	172.0	203	167.0	154	160.4	111	147.0	1,334	166.3
25–29	169	160.1	162	127.2	188	134.5	137	130.8	150	122.0	128	135.2	68	95.1	1,002	130.7
30–34	83	142.9	77	107.4	82	105.9	67	112.3	74	110.1	61	114.7	38	82.1	482	111.2
35–39	48	103.8	54	99.7	50	87.4	38	89.1	44	99.3	33	99.6	24	79.1	291	94.5
40–44	21	76.6	24	73.4	27	77.3	25	87.2	29	101.6	14	64.2	13	70.3	153	79.4
45-49	8	75.5	8	62.2	5	38.8	10	86.2	11	95.0	9	109.1	6	77.3	57	75.5
50+	5	118.1	2	40.1	3	57.8	8	150.4	2	39.4	0	0	2	57.8	22	69.6
Race/ethnicity																
White, non-Hispanic	303	158.5	284	127.5	342	143.1	230	130.0	257	130.8	203	134.0	130	106.8	1,749	134.6
Black, non-Hispanic	158	145.1	152	118.8	153	110.7	134	133.3	139	121.8	97	115.7	61	89.2	894	120.5
Hispanic	60	154.5	62	124.0	69	129.0	53	132.4	62	133.9	45	125.5	31	101.8	382	129.5
Other	49	112.6	86	157.1	74	126.9	56	131.7	66	134.4	56	137.5	40	120.1	427	132.5
Marital status																
Single	246	156.0	253	136.5	253	126.7	188	130.3	208	127.1	169	125.6	115	104.8	1,432	130.8
Married	245	137.5	241	113.3	292	129.1	230	137.2	232	124.4	180	132.0	106	95.2	1,526	125.2
Unknown	79	169.6	90	156.6	93	147.5	55	114.5	84	149.8	52	126.7	41	124.8	494	143.1
Rank																
Jr Enlisted (E01–E04)	261	194.2	273	168.0	321	178.1	229	188.5	249	165.0	190	161.4	118	130.5	1,641	171.4
Sr Enlisted (E05–E09)	227	132.4	236	119.2	238	117.2	130	101.0	194	124.8	152	118.7	107	98.7	1,284	117.5
Jr Officer (O01–O04)	68	109.0	69	89.5	73	85.0	92	103.3	64	78.6	49	90.4	32	72.4	447	90.4
Sr Officer (O05–O10)	9	84.5	2	15.3	2	14.1	14	99.7	8	63.8	6	67.3	3	36.7	44	53.9
Warrant Officer (W01–W04)	5	137.2	4	82.8	4	70.8	8	117.8	9	155.6	4	132.3	2	75.4	36	111.2
Service																
Army	215	153.3	254	137.2	300	139.7	264	141.0	291	145.5	147	140.8	118	131.8	1,589	141.7
Coast Guard	16	194.7	21	223.9	5	61.5	8	106.2	11	160.4	16	230.7	7	107.6	84	156.8
Air Force	204	135.7	189	118.9	222	136.2	114	126.1	123	110.1	119	108.8	66	80.8	1,037	119.8
Marine Corps	26	202.7	23	137.3	25	130.3	24	154.7	26	129.1	26	140.7	14	95.8	164	139.6
Navy	109	153.9	97	113.8	86	102.5	63	106.2	73	108.3	93	127.9	57	92.6	578	115.4

[a]Rate per 1,000 person-years

women younger than 20 years to 54.1 per 1,000 p-yrs for women older than 50 years **(Table 2)**. A pattern of decreasing UTI incidence with increasing military rank was also noted with the highest incidence among junior enlisted members (144.3 per 1,000 p-yrs) and the lowest among senior officers O05–O10 (49.4 per 1,000 p-yrs). There was a trend toward fewer identified routine Pap encounters annually across the surveillance period **(Figure 2)**.

The overall incidence of STI in the baseline period was 9.3 per 1,000 p-yrs. Similar to UTI incidence, STIs rates were inversely related to age ranging from 29.5 per 1,000 p-yrs among women younger than 20 years to 0.3 per 1,000 p-yrs for women older than 50 years. When stratified by age group, STI incidence was strongly correlated with UTI incidence (two-tailed Pearson, $r^2 = 0.96$) with the highest rates of both outcomes occurring in women younger than 20 years **(Figure 3)**. In this cohort, a considerable increase in number of STI diagnoses was observed in the 30 days following a Pap test when compared to baseline **(Figure 4)**.

The post-Pap UTI incidence rate was 129.8 per 1,000 p-yrs aggregated over the surveillance period, on the basis of 3,452 incident diagnoses over 26,589 p-yrs **(Table 3)**. When compared to the baseline UTI incidence, this represents a post-to-pre-exposure rate ratio of 1.23 (95% CI: 1.22–1.23). UTI incidence rate ratios post- versus pre-Pap smear were significantly greater than 1 for each of the covariates examined **(Figure 5)**.

Poisson regression yielded an unadjusted relative risk of incident UTI post Pap of 1.23 (95% CI: 1.18–1.27) when compared to the pre-Pap (baseline) period. When adjusted for age, race/ethnicity, marital status, Service rank, history of UTI in the pre-exposure period, history of STI in the pre-exposure period and calendar year of examination, Pap screening was associated with an increase in the short-term risk of UTI by 14% (95% CI: 10.1%–18.2%) **(Table 4)**. The final parsimonious model limited to a subset of co-variants with established significant univariate effects on UTI risk yielded similar results when compared to the fully adjusted model.

A positive history of UTIs during the pre-Pap period was the strongest risk factor for post-exposure UTI. After adjusting for this association, however, the relative risk of UTI remained significantly elevated. The adjusted attributable risk percentage for Pap examination on UTI diagnosis was 12.2% (95% CI: 9.1%–15.2%). In this cohort, approximately one out of every eight UTIs diagnosed in the 30 days following a routine screening Pap smear may be attributable to that examination.

TABLE 4. Poisson regression model outputs of relative risk (RR) for urinary tract infection (UTI) diagnosis post-exposure

	Crude		Adjusted		Parsimonious	
	RR	95% CI	RR	95% CI	RR	95% CI
Model summary						
Pre-Pap	Ref	Ref	Ref	Ref	Ref	Ref
Post-Pap	1.23	1.18–1.27	1.14	1.10–1.18	1.14	1.10–1.18
Age group						
<20	3.78	3.27–4.38	1.07	0.91–1.25	1.08	0.92–1.27
20–24	2.55	2.22–2.92	1.08	0.93–1.25	1.08	0.93–1.25
25–29	1.88	1.64–2.16	1.04	0.90–1.21	1.04	0.90–1.21
30–34	1.65	1.43–1.89	1.03	0.89–1.20	1.03	0.89–1.20
35–39	1.41	1.23–1.63	1.00	0.87–1.17	1.00	0.86–1.16
40–44	1.28	1.11–1.48	1.01	0.87–1.17	1.01	0.87–1.17
45–49	1.12	0.96–1.32	1.00	0.85–1.17	0.99	0.85–1.17
50+	Ref	Ref	Ref	Ref	Ref	Ref
Race/ethnicity						
White, non-Hispanic	Ref	Ref	Ref	Ref	-	-
Black, non-Hispanic	0.90	0.88–0.93	0.97	0.94–0.99	-	-
Hispanic	0.96	0.93–0.99	0.99	0.95–1.02	-	-
Other	0.94	0.91–0.97	0.99	0.96–1.02	-	-
Marital status						
Single	Ref	Ref	Ref	Ref	Ref	Ref
Married	0.97	0.95–0.99	1.00	0.98–1.03	1.01	0.98–1.03
Other	1.13	1.10–1.17	1.05	1.01–1.08	1.05	1.02–1.09
Service						
Army	Ref	Ref	Ref	Ref	n/a	n/a
Coast Guard	1.17	1.09–1.26	1.04	0.97–1.11	n/a	n/a
Air Force	0.96	0.94–0.99	0.99	0.96–1.01	n/a	n/a
Marine Corps	1.03	0.97–1.08	0.97	0.93–1.03	n/a	n/a
Navy	0.89	0.86–0.92	0.98	0.95–1.01	n/a	n/a
Rank						
Jr Enlisted (E01–E04)	2.95	2.69–3.22	1.11	1.00–1.23	1.1	0.99–1.23
Sr Enlisted (E05–E09)	1.90	1.73–2.08	1.07	0.97–1.19	1.06	0.96–1.18
Jr Officer (O01–O04)	1.50	1.37–1.65	1.05	0.95–1.17	1.05	0.95–1.17
Sr Officer (O05–O10)	Ref	Ref	Ref	Ref	Ref	Ref
Warrant Officer (W01–W04)	1.65	1.43–1.91	1.09	0.94–1.27	1.09	0.94–1.26
History of UTI during the baseline period						
Negative	Ref	Ref	Ref	Ref	Ref	Ref
Positive	150.7	144.7–156.8	148.1	142.2–154.2	148.4	142.5–154.5
History of STI during the baseline period						
Negative	Ref	Ref	Ref	Ref	-	-
Positive	2.09	1.92–2.27	1.16	1.05–1.28	-	-
Year of Pap examination						
2007	1.12	1.08–1.18	1.04	0.99–1.08	-	-
2008	1.06	1.01–1.10	1.01	0.97–1.06	-	-
2009	1.11	1.06–1.16	1.04	0.99–1.08	-	-
2010	1.07	1.02–1.12	1.05	1.00–1.10	-	-
2011	1.07	1.02–1.12	1.02	0.97–1.06	-	-
2012	1.07	1.02–1.12	1.03	0.98–1.08	-	-
2013	Ref	Ref	Ref	Ref	-	-

CI=confidence interval; STI=sexually transmitted infection

EDITORIAL COMMENT

The annual trend toward fewer screening Pap tests across the surveillance period is in keeping with a change in U.S. Preventive Services Task Force recommendations toward performing fewer examinations among defined populations of women established to be at lower risk for cervical cancer. For example, between 2007 and 2011, Pap tests were recommended either annually or at 2- to 3-year intervals for women older than 30 years who had at least three consecutive annual Pap screenings that were documented as normal.[13] However, for the last 2 years of this study's surveillance period, the task force's recommendation changed to performing Pap smears only every 3 years for established low-risk women older than 21 years and every 5 years (when combined with additional measures such as human papillomavirus DNA testing) in similarly low-risk women older than 30 years.[14]

Despite using the same case definition as a previously published report on UTI incidence the U.S. Armed Forces, the baseline UTI incidence in this cohort (105.9 per 1,000 p-yrs) was notably higher than the previously reported rate among active component women (70.4 per 1,000 p-yrs).[11] Potential reasons for this discrepancy include using a different denominator (current study restricted calendar time to before and after a Pap examination) and different surveillance timeframes. Additionally, person-time in this study was censored by 30 days for each incident UTI diagnosis (subjects were not at risk of UTI during these periods) so that the amount of at-risk person-time used for these rate calculations was less than in the previous report.

Several hypotheses unrelated to the Pap examination itself may explain some of the observed increased risk of UTI diagnosis post-Pap. Some women may have consented to submit to a urinalysis as a part of their clinical encounter. Because such testing is generally not indicated for asymptomatic women, the contribution of such "incidental" diagnoses on the overall incidence of UTIs in this cohort is likely to be small. Conversely, additional testing at the time of cervical cancer screening (such as cervical swab collection for STI testing) is commonplace and may explain a considerable amount of the increase in STI diagnoses post-Pap observed in this cohort.

Routine Pap tests may also represent a surrogate marker for sexual activity (a known independent risk factor for UTI development). This might occur, for example, if women tended to schedule routine pelvic examinations in conjunction with STI screening related to a new sexual partner.[6] In 2011, however, the Department of Defense Health Related Behaviors Survey of Active Duty Military Personnel revealed that a majority (67.9%) of married and unmarried active component U.S. military did not report a new sexual partner in the last 12 months.[15] Although it remains possible that a minority of women undergo Pap examination along with STI screening because of a new sexual partner, this is

unlikely to account for a significant number of encounters in this cohort.

Interpretation of the analyses in this report is subject to some limitations. First, diagnoses of interest were ascertained from administrative coding data based on individual health records. Miscoded clinical encounters will affect the accuracy of the available data. Second, the UTI case definition required a single clinical encounter that met the specified criteria and did not require confirmation. This type of case definition (sensitive at the potential expense of reduced specificity) may overestimate incidence. Third, concurrent use of medications at the time of the encounter was not assessed. Women who were taking antibiotics at the time of their Pap examination or during the baseline period may have decreased the risk for UTI. Finally, there are a number of independent risk factors for UTI development that were not excluded from the study or adjusted for in the analysis (e.g., women who are catheter dependent, have neurologic or anatomic abnormalities affecting the genitourinary tract, have depressed immune responses). Given the healthy worker effect, the medical fitness requirements for active component U.S. Armed Forces, and the large sample size investigated, the contribution of these less common UTI risk factors in this specific study population is expected to be low.

There are several strengths of this report. The numbers of Pap examinations

FIGURE 3. Relationship between incidence rates of sexually transmitted infection (STI) and urinary tract infection (UTI) diagnoses in the pre-exposure (baseline) period, by age group aggregated over 2007–2013

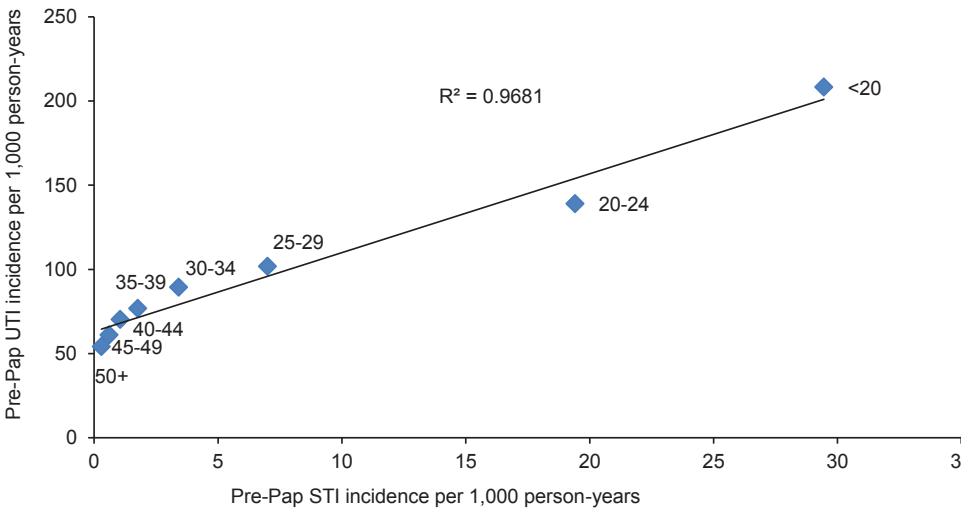


FIGURE 4. Comparison of sexually transmitted infection (STI) and urinary tract infection (UTI) incident rate ratios post- versus pre-exposure, 2007–2013

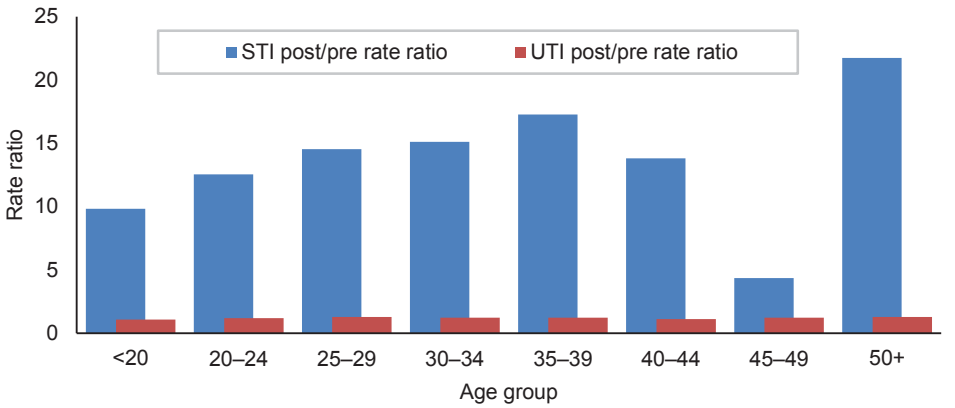
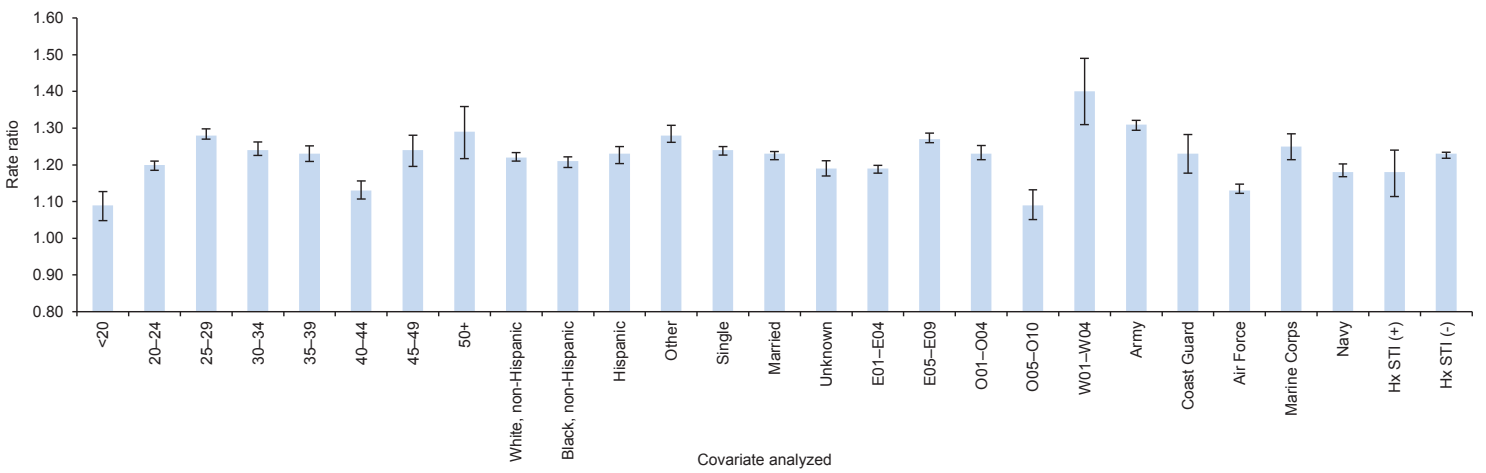


FIGURE 5. Post- versus pre-Pap exposure urinary tract infection (UTI) incidence rate ratios



analyzed were large (322,862) and the nature of the study ensured that individual-level data were available for each of the women before and after their Pap examinations. The use of internal controls in this manner has the benefit of helping to minimize the potential effect of unmeasured and/or unknown confounders on the outcome of interest. This study design also allowed specific adjustment for known confounders, including age, marital status, and previous STI and UTI histories among others. The post-exposure period was limited to 30 days rather than the 60-day post-Pap period used in Tiemestra's report.[6] The biological plausibility of a single short exposure (Pap test) contributing to UTI incidence is arguably strengthened when the at-risk period is more closely related in time to the exposure.

This analysis suggests that women are at greater risk of being diagnosed with a UTI in the month after a Pap smear than they are in the 11 months before it. In this study, Pap tests were used as a surrogate marker for pelvic examinations in asymptomatic women. Given the lack of consensus on whether these encounters provide a benefit to low-risk non-pregnant women, providers may wish to inform their patients of this potential increased risk of UTI following such exams. This information may serve as an additional data point in the shared patient-provider decision-making process that informs a woman's choice to receive a routine screening pelvic examination. In addition, this analysis supports a correlation between STI and UTI incidence in young women, and highlights that young women presenting with UTI symptoms may represent a potential higher-risk subgroup for STI.

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