

The Effect of Three Pregnancy Related Policy Changes on Risk of Gestational and Postpartum Musculoskeletal Injury

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- This research protocol was reviewed and approved by the institutional review board at the Uniformed Services University of the Health Sciences in accordance with all applicable Federal regulations governing the protection of human subjects research.
- The authors and research team have no conflicts of interest to disclose
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Musculoskeletal Injuries in the Military

- Musculoskeletal injuries (MSKI) are the most common reason for ambulatory health care visits among Active Duty Service Members (ADSM)¹
- They represent the number 1 reason for²
 - Duty-limiting profiles
 - Medical evacuation from combat theaters
 - Early medical discharge from the military
- MSKI injuries pose a threat to military readiness³



Image taken from: <https://genevausa.org/press-release/the-geneva-foundation-leads-new-9-8m-research-program-to-revolutionize-military-musculoskeletal-injury-management/>

Challenges of Being Pregnancy When Active Duty

- Pregnancy is the second most common reason for Limited Duty Days among Army Soldiers⁴
- Challenges accessing perinatal care^{5,6}
- Limited and/or fragmented care options⁵
 - Sometimes requiring drive times of 45-60 minutes⁶
- There are differences in maternal health outcomes when comparing direct and purchased care^{6,7}
 - Direct care is associated with lower odds of cesarean sections, acute maternal morbidities, but higher odds of gestational diabetes, hypertension, and post-delivery complications

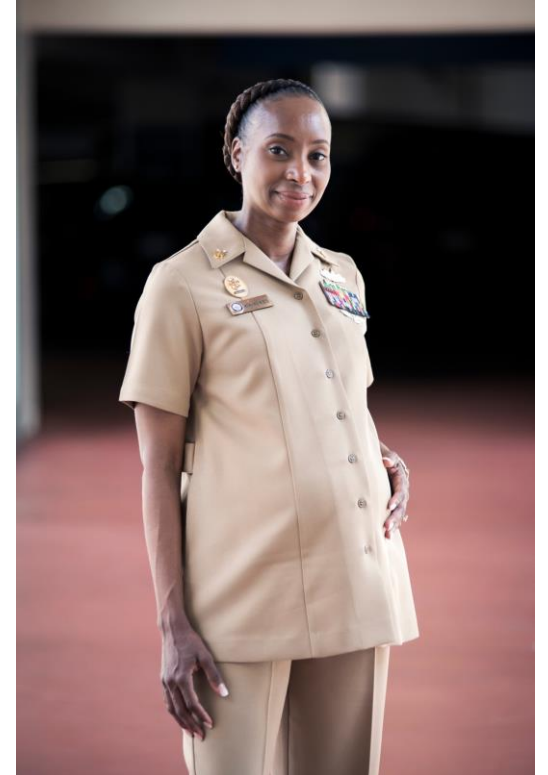
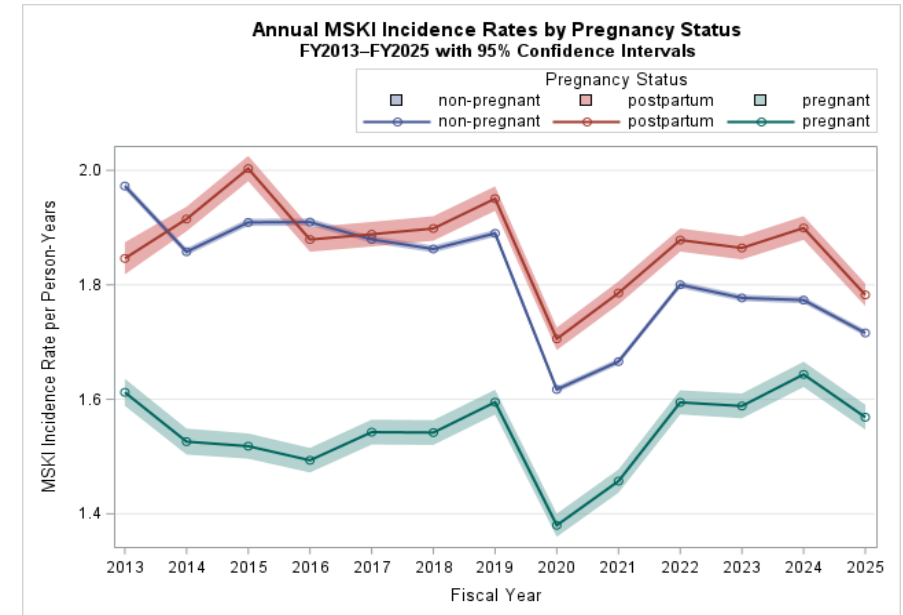


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Risk of MSKI while Pregnant

- Little is known about the risk of MSKI for US ADSW who are pregnant
- Elite athletes may be at increased risk for stress fractures in the postpartum period⁸
 - Calcium loss through breastfeeding time period
 - Return to intense training following a period of reduced training load
- In Canadian military, a higher proportion of women who have had a child have a repetitive strain injury compared to women who have not had a child⁹

Learn more about this topic at the Military Women's Health Research Session on **Thursday 6 Aug 2026 in Coastal B45!**



Policies Designed to Support Pregnant and New ADSW Mothers

- Increased maternity leave
 - 6 weeks to 12 weeks
- Increasing the number of days to return to body composition standards
 - 180 days to 365
- Allowing ADSW to delay pregnancy notification to command
 - 12 weeks to 20 weeks
 - Requirement: It is safe to delay notification and does not interfere with work duties

Objective

- Evaluate the risk of MSKI before and after each policy change
- Hypothesis: Risk of MSKI will decrease following each policy change

Methods: Included Population

- **Population:** ADSW between 2013-2025
- **Data Source:** Military Health System Data Repository (MDR)
- **Time Period:** Two year before the policy and two years after the policy specific to each branch were included

Methods: Definition of Pregnancy and Postpartum

- ICD 9 and 10 codes identified pregnancy
- Information from linked infants was used when available
- Codes were grouped using standardized time frames to separate pregnancies
- Start of pregnancies was estimated using gestation age codes and other specific health care visits that are strongly tied to specific stages of pregnancy
 - If no codes or visits were in the record, a standard amount of time was used
- Each pregnancy outcome, regardless of type, was assigned a 365 day postpartum period
- Could be censored if a second pregnancy started or the ADSW left active duty service

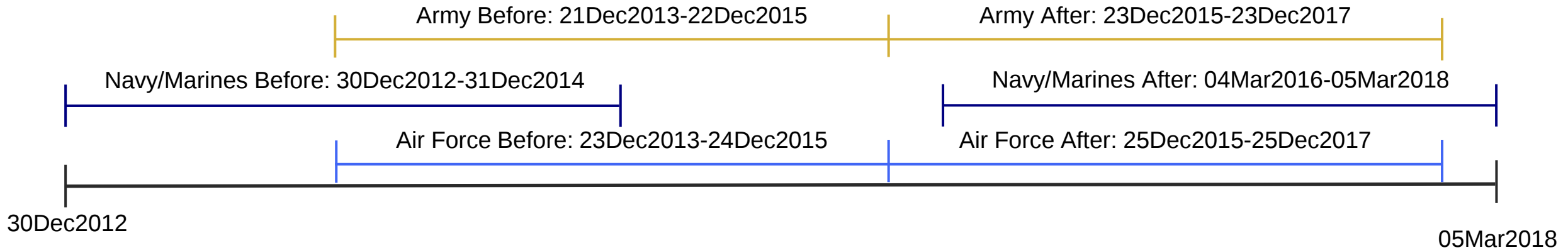
Methods: MSKI Definition

- MSKI were categorized using a variation of the Hando Matrix¹⁰ using ICD-9 and ICD-10 codes
 - Limited changes were made to help account for the transition from ICD-9 to ICD-10
- Initial visits and follow up visits for MSKIs were identified
 - MSKI classified into 6 body regions and tracked separately:
 - 1) Head and Neck 2) Spine and Back 3) Torso 4) Upper Extremity 5) Lower Extremity 6) Other
- Individuals were eligible for another incident injury after 60 days had passed without an injury code appearing in their health care record

Methods: Statistical Analysis

- **Negative Binomial Regression**
 - **Outcome:** Count of total MSKIs in time period
 - **Exposure:** Before or after policy change
 - **Covariates:**
 - Branch of Service (reference = Army)
 - Rank (reference = Senior Enlisted)
 - Marital Status (reference = Married)
 - Race/Ethnicity (reference = White)
 - **Person-Time**
 - Required minimum of 30 days
 - Postpartum maximum follow up is 365 days
 - Pregnancy maximum follow up is 295 days

Methods: Maternity Leave Policy Change

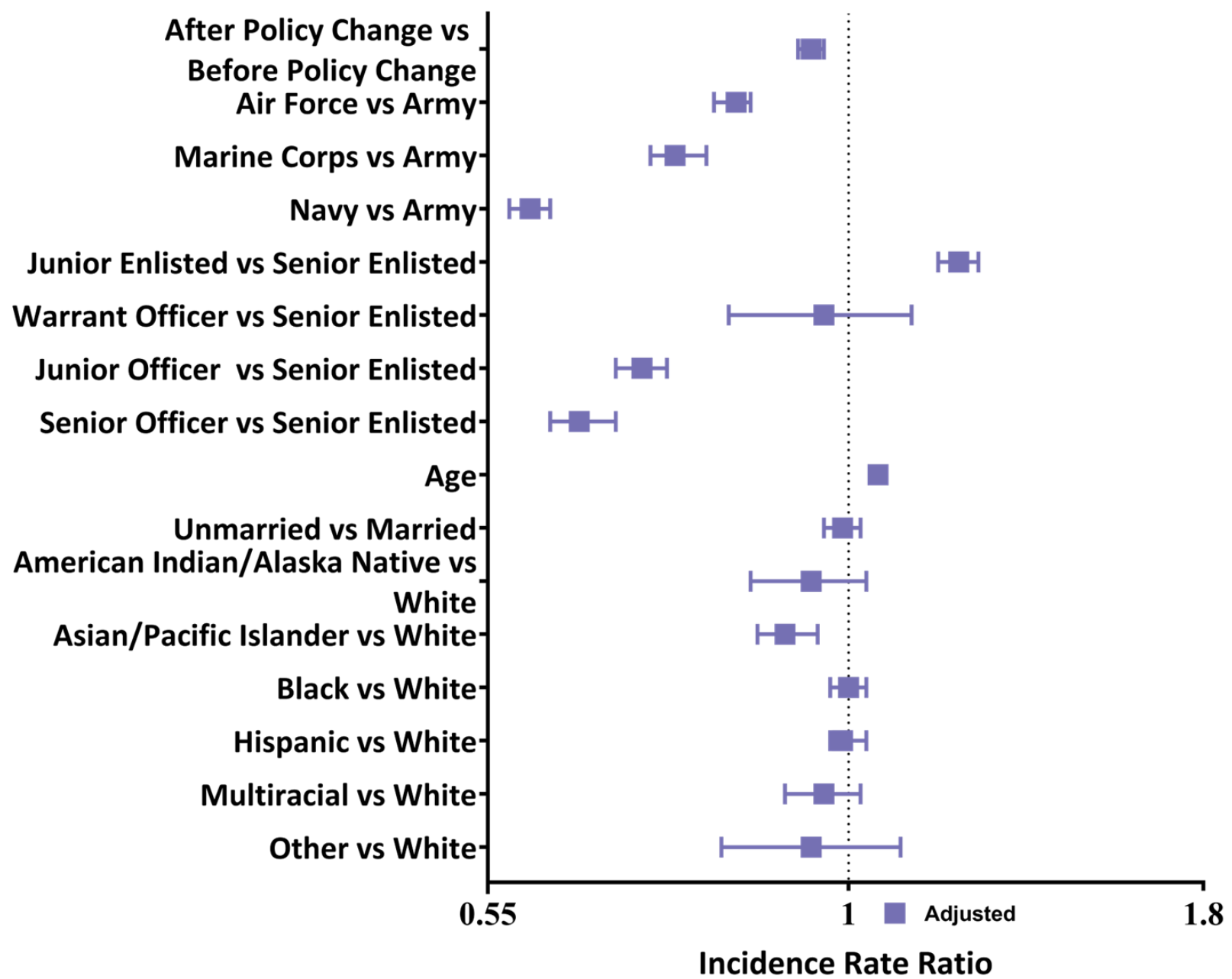


- 1 year postpartum for pregnancies ending in a live birth
- Each time period is 732 days
- Specific time period represents the last two years of **6 week** of maternity leave and first two years of **12 weeks** of maternity leave
- For Navy/Marines, the time period when the Navy/Marines had 18 weeks of maternity leave is excluded

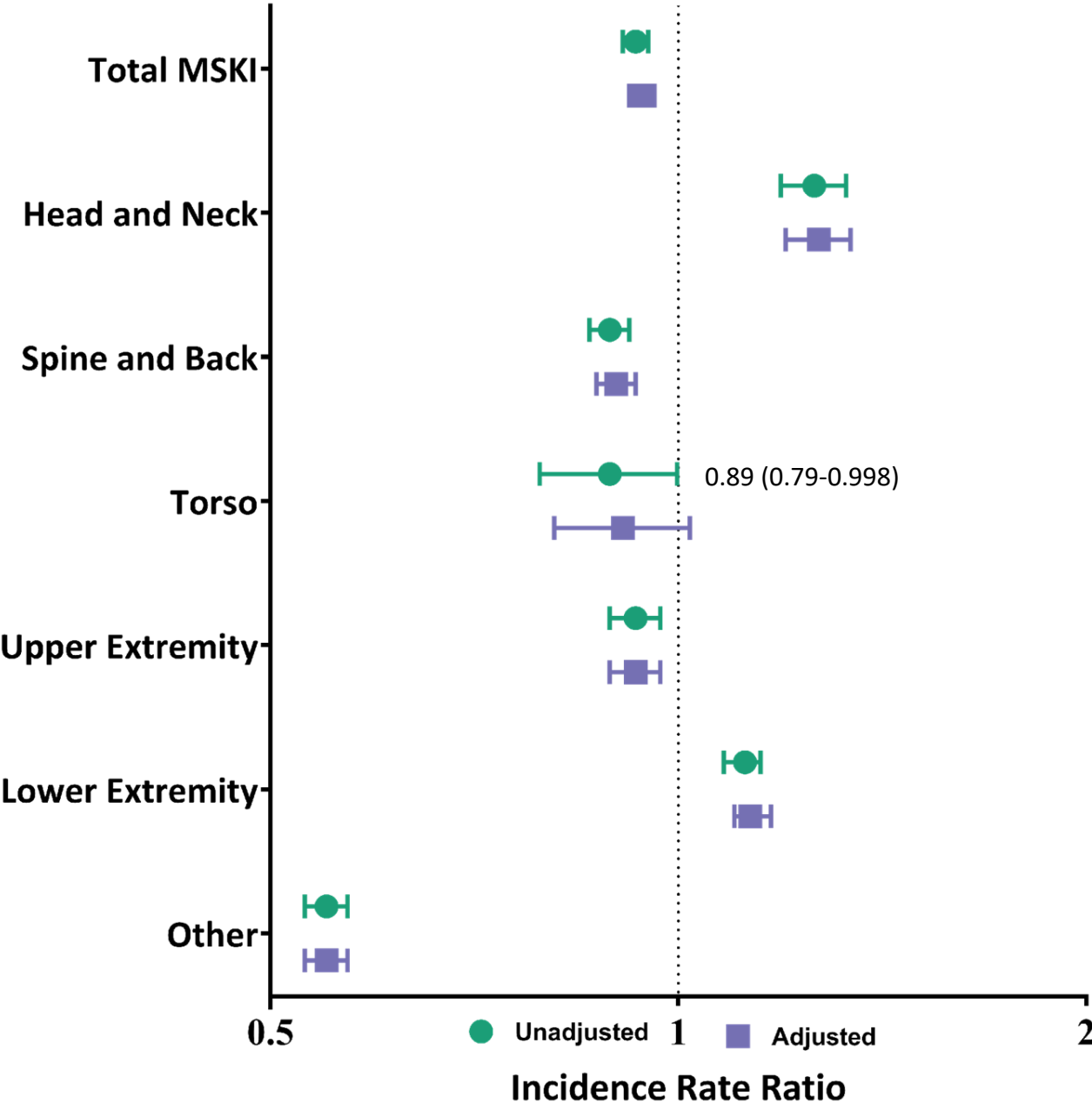
Results: Maternity Leave

Covariate	Before (n = 27,369)	After (n = 27,342)	Covariate	Before (n = 27,369)	After (n = 27,342)
Total MSKI, Median (IQR)	1 (0-3)	1 (0-2)	Age, Median (IQR)	27 (23-31)	26 (23-31)
Branch of Service, n (%)			Race/Ethnicity, n (%)		
Air Force	7,677 (28.1%)	7,625 (27.9%)	American Indian/Alaska Native	452 (1.7%)	361 (1.3%)
Marine Corps	2,233 (8.2%)	2,143 (7.8%)	Asian/Pacific Islander	1,687 (6.2%)	1,695 (6.2%)
Navy	7,408 (27.1%)	8,006 (29.3%)	Black	7,282 (26.6%)	7,087 (25.9%)
Army	10,051 (36.7%)	9,568 (35.0%)	Hispanic	3,775 (13.8%)	4,621 (16.9%)
			Multiracial	1,153 (4.2%)	1,100 (4.0%)
			Other	156 (0.6%)	208 (0.8%)
			White	12,864 (47.0%)	12,270 (44.9%)
Rank, n (%)			Marital Status, n (%)		
Junior Enlisted	12,405 (45.3%)	12,208 (44.7%)	Unmarried	6,366 (23.3%)	5,708 (20.9%)
Senior Enlisted	10,134 (37.0%)	10,055 (36.8%)	Married	21,003 (76.7%)	21,634 (79.1%)
Warrant Officer	145 (0.5%)	144 (0.5%)			
Junior Officer	3,372 (12.3%)	3,372 (12.3%)			
Senior Officer	1,313 (4.8%)	1,313 (4.8%)			

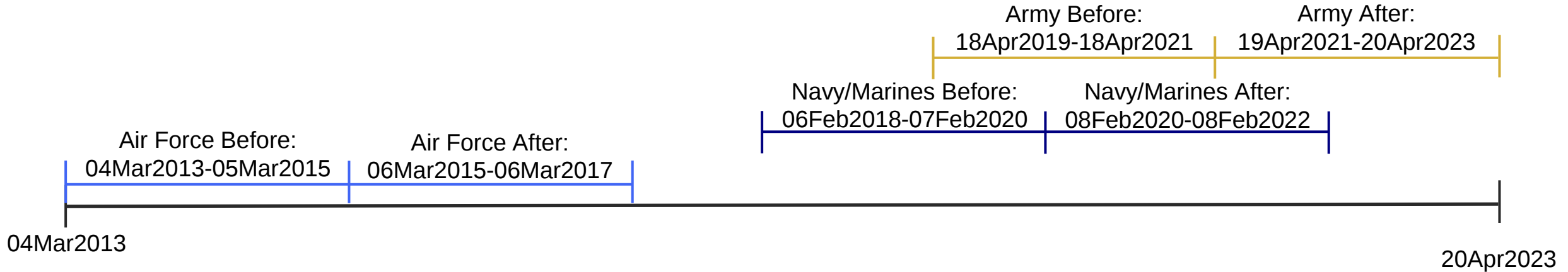
IRR of MSKI after Maternity Leave Policy Change



IRR of MSKI after Maternity Leave Policy Change



Methods: Body Composition Policy Change

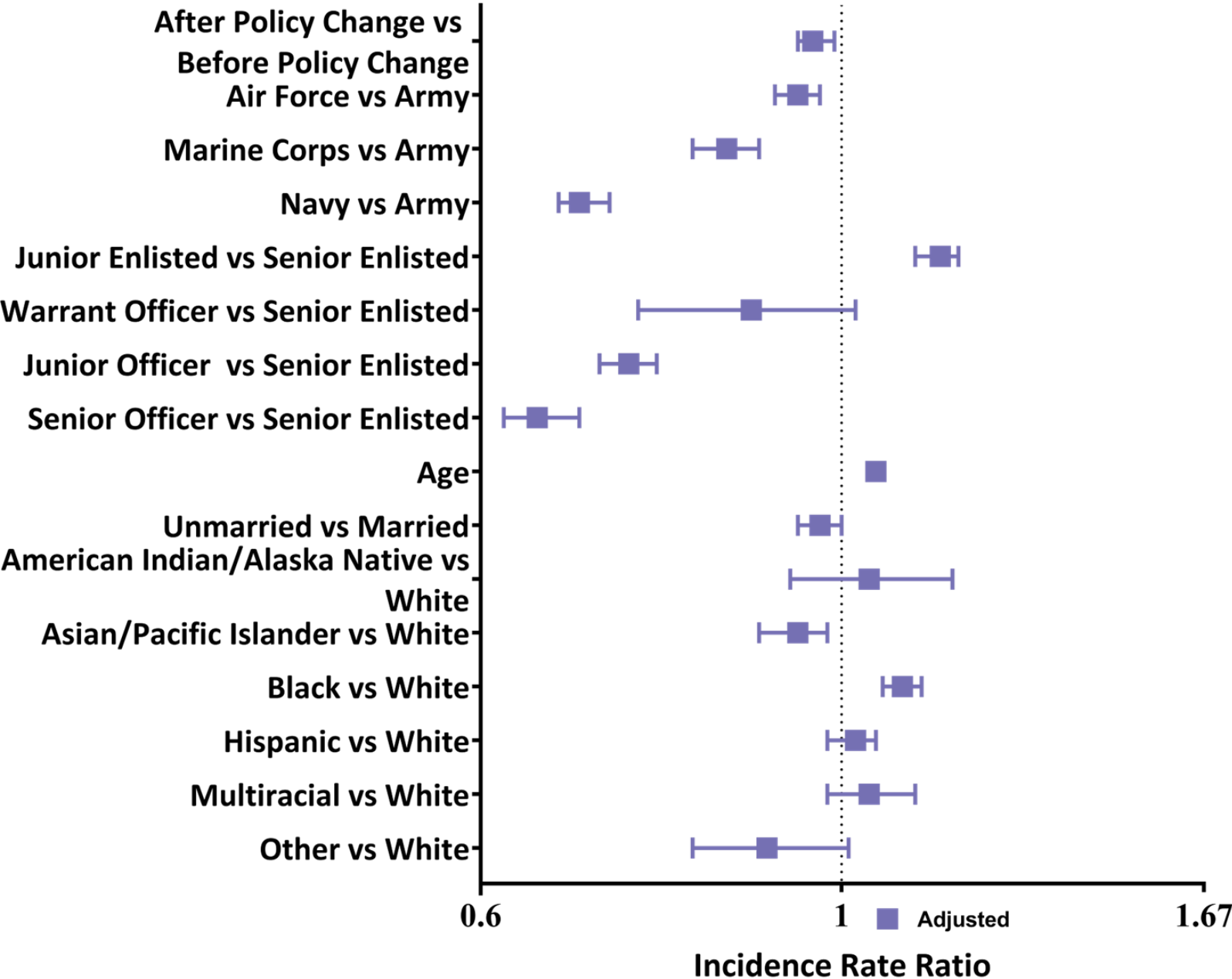


- 1 year postpartum for pregnancies ending in a live birth or stillbirth
- Each time period is 732 days
- Specific time period represents the last two years of when women had **180 days** to return to body composition standards following birth and the first two years of when women had **365 days** to return to body composition standards following birth

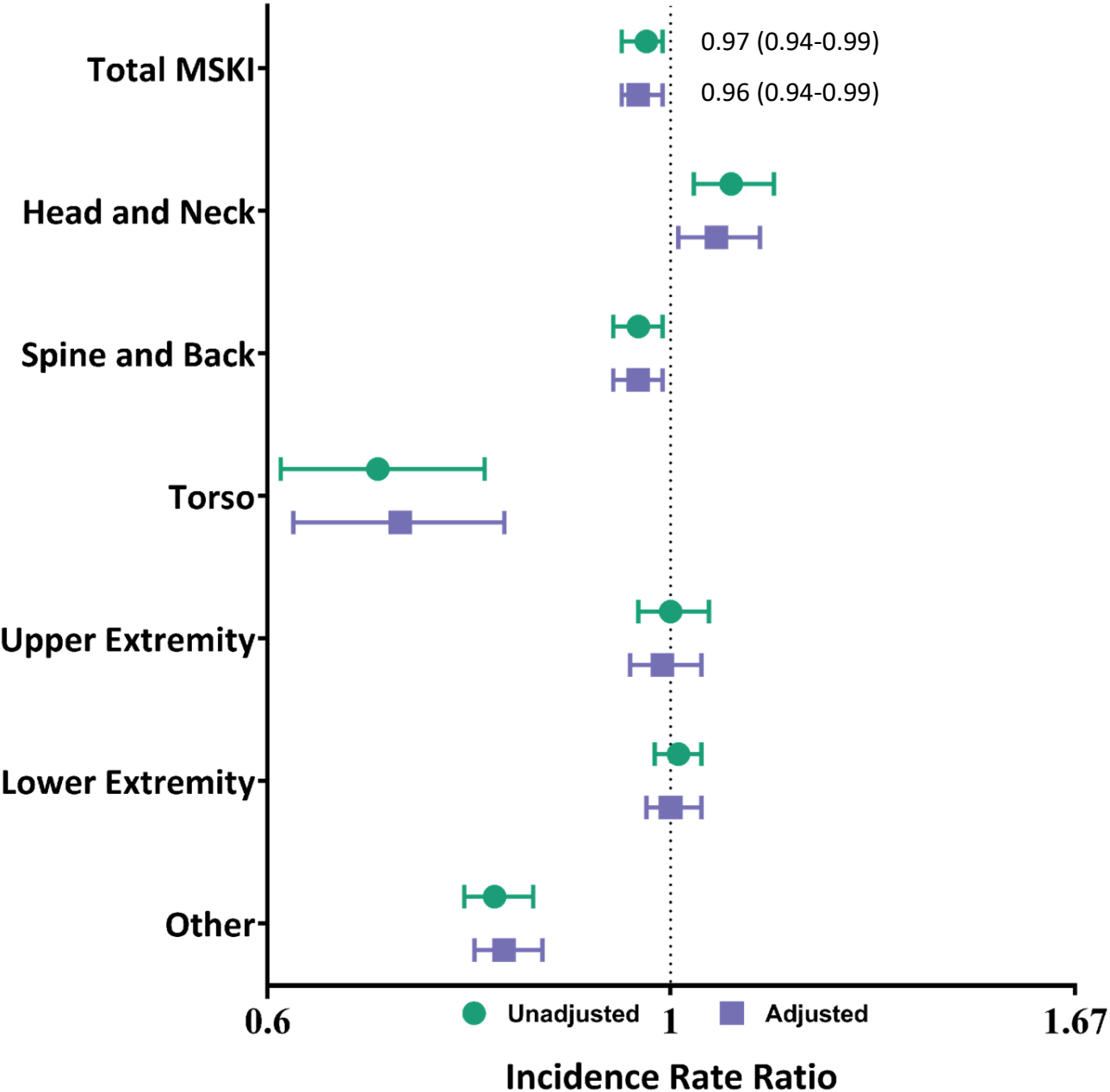
Results: Body Composition

Covariate	Before (n = 28,654)	After (n = 28,548)	Covariate	Before (n = 28,654)	After (n = 28,548)
Total MSKI, Median (IQR)	1 (0-2)	1 (0-2)	Age, Median (IQR)	26 (23-31)	27 (23-31)
Branch of Service, n (%)			Race/Ethnicity, n (%)		
Air Force	8,191 (28.6%)	7,560 (26.5%)	American Indian/Alaska Native	315 (1.1%)	284 (1.0%)
Marine Corps	2,238 (7.8%)	2,297 (8.1%)	Asian/Pacific Islander	1,738 (6.1%)	1,780 (6.2%)
Navy	8,173 (28.5%)	8,480 (29.7%)	Black	7,664 (26.8%)	7,053 (24.7%)
Army	10,211 (35.1%)	10,211 (35.8%)	Hispanic	4,675 (16.3%)	5,476 (19.2%)
			Multiracial	1,130 (3.9%)	1,134 (4.0%)
			Other	279 (1.0%)	392 (1.4%)
			White	12,853 (44.9%)	12,429 (43.5%)
Rank, n (%)			Marital Status, n (%)		
Junior Enlisted	12,295 (42.9%)	11,830 (41.4%)	Unmarried	6,066 (51.0%)	5,828 (20.4%)
Senior Enlisted	11,481 (40.07%)	11,481 (40.1%)	Married	22,588 (78.8%)	22,720 (79.6%)
Warrant Officer	137 (0.8%)	161 (0.6%)			
Junior Officer	3,293 (11.5%)	3,459 (12.1%)			
Senior Officer	1,448 (5.1%)	1,448 (5.1%)			

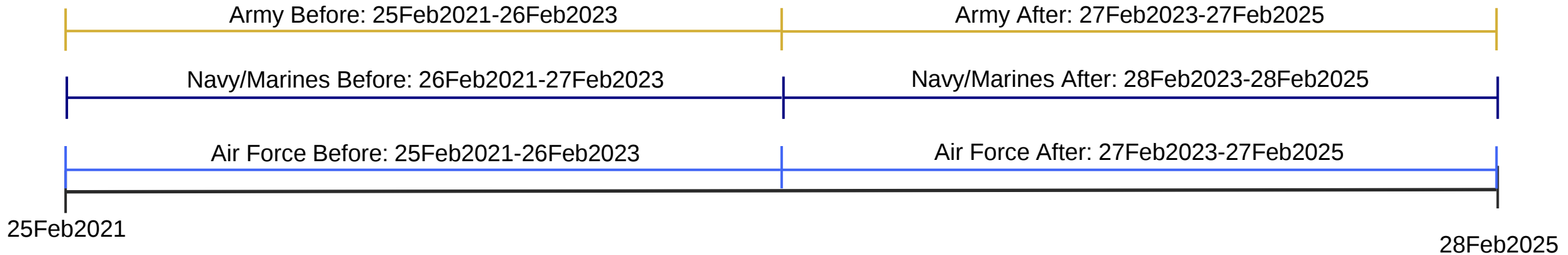
IRR of MSKI after Body Composition Policy Change



IRR of MSKI after Body Composition Policy Change



Methods: Pregnancy Notification Policy Change

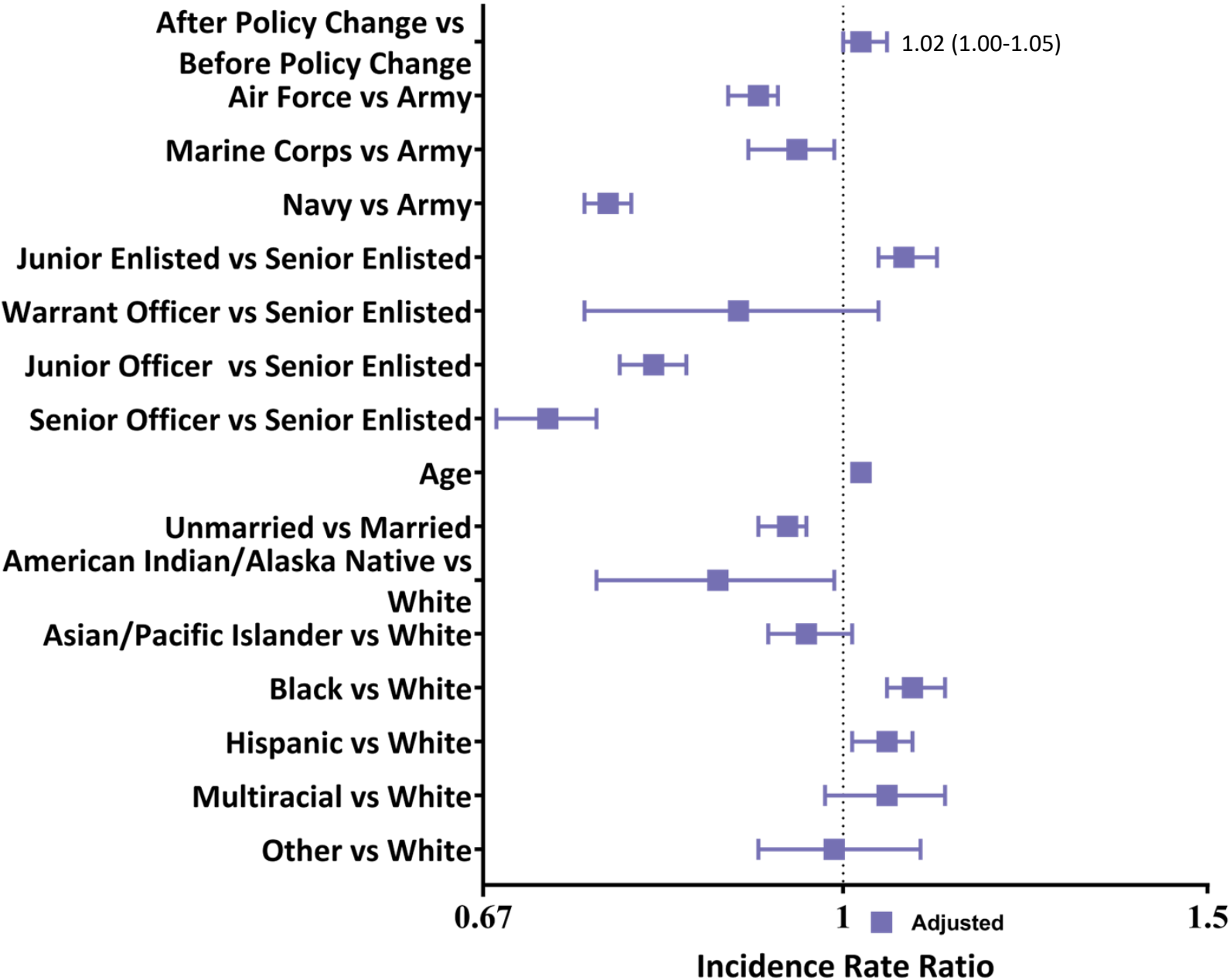


- Estimated start of pregnancy through end of pregnancy for pregnancies ending in a live birth or stillbirth
- Each time period is 732 days
- Specific time period represents the last two years of when women had **12 weeks** to notify command of their pregnancy and the first two years of when women had **20 weeks** to notify command of their pregnancy

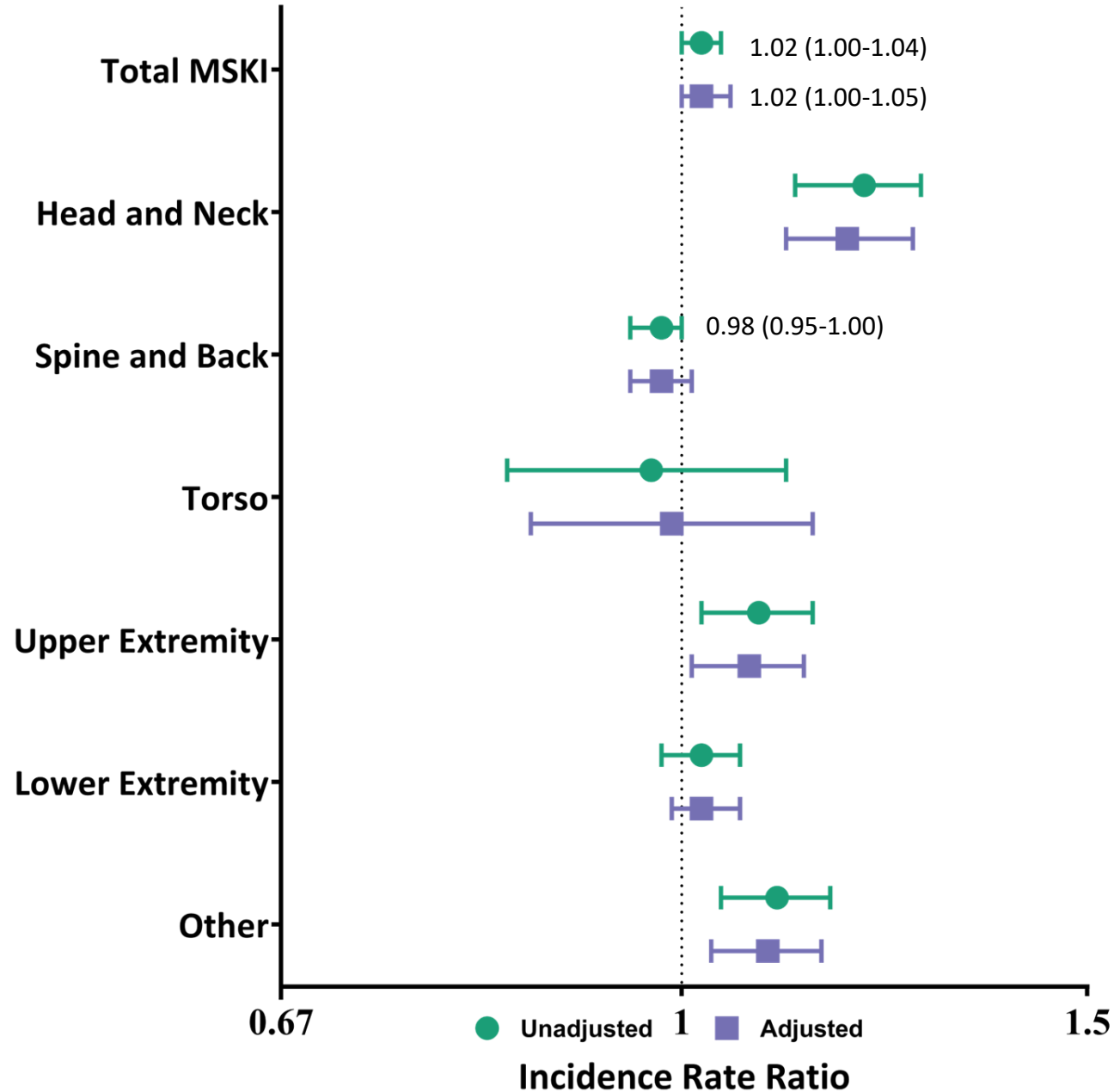
Results: Pregnancy Notification

Covariate	Before (n = 32,017)	After (n = 28,546)	Covariate	Before (n = 32,017)	After (n = 28,546)
Total MSKI, Median (IQR)	0 (0-2)	0 (0-2)	Age, Median (IQR)	26 (22-30)	26 (23-31)
Branch of Service, n (%)			Race/Ethnicity, n (%)		
Air Force	8,994 (28.1%)	8,194 (28.7%)	American Indian/Alaska Native	283 (0.9%)	226 (0.8%)
Marine Corps	2,403 (7.5%)	2,414 (8.5%)	Asian/Pacific Islander	1,805 (6.3%)	1,805 (6.3%)
Navy	9,314 (29.1%)	8,166 (28.6%)	Black	6,077 (21.3%)	6,077 (21.3%)
Army	11,306 (35.3%)	9,772 (34.23%)	Hispanic	7,076 (24.8%)	7,076 (24.8%)
			Multiracial	1,052 (3.7%)	1,052 (3.7%)
			Other	414 (1.45%)	414 (1.5%)
			White	11,896 (41.7%)	11,896 (41.7%)
Rank, n (%)			Marital Status, n (%)		
Junior Enlisted	15,183 (47.4%)	12,668 (44.4%)	Unmarried	9,275 (29.0%)	7,842 (27.5%)
Senior Enlisted	11,138 (34.8%)	10,137 (35.6%)	Married	22,742 (71.0%)	20,704 (72.5%)
Warrant Officer	156 (0.5%)	143 (0.5%)			
Junior Officer	4,030 (12.6%)	4,046 (14.2%)			
Senior Officer	1,510 (4.7%)	1,552 (5.4%)			

IRR of MSKI after Pregnancy Notification Policy Change



IRR of MSKI after Pregnancy Notification Policy Change



Conclusion

- Increasing the allowed amount of maternity leave and the amount of time before returning to body composition standards is associated with decreased rates of total MSKI
 - Effect of policy change varies by body regions.
 - Head and Neck and Lower Extremity are increased following maternity leave policy, while head and neck are increased following increased duration to return to standards
- Delaying pregnancy notification is not associated with different rates of total MSKI
 - Head and Neck, Upper Extremity, and Other MSKI have increased rates of MSKI

Thank you!

Questions?

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IRR of MSKI after both
Maternity Leave and Body Composition Policy Change

