

**APPENDIX M**  
**Hematologic Evaluation**

B M-1.  
Dependent Variable-Covariate Associations for Hematologic Evaluation

Dependent Variable	Level	Age			p-Value	Race		p-Value
		Born >1942	Born 1923-1941	Born <1922		Black	Nonblack	
RBC (discrete)	Abn. Low	(n=955)	(n=1,247)	(n=84)	<0.001*	(n=137)	(n=2,149)	0.001
	Normal	2.3%	4.2%	11.9%		8.0%	3.4%	
	Abn. High	96.8%	94.6%	86.9%		85.4%	95.8%	
	(continuous)	0.9%	1.2%	1.2%		6.6%	0.7%	0.012
		—	r=-0.141	—	<0.001	$\bar{x}=5.03$	$\bar{x}=4.94$	
WBC* (discrete)	Abn. Low	(n=954)	(n=1,247)	(n=84)	0.189	(n=137)	(n=2,148)	<0.001
	Normal	7.4%	5.8%	3.6%		19.0%	5.6%	
	Abn. High	87.4%	88.2%	94.0%		78.8%	88.7%	
	(continuous)	5.1%	6.0%	2.4%		2.2%	5.7%	<0.001
		—	r=-0.003	—	0.871	$\bar{x}=6.05$	$\bar{x}=6.83$	
Hemoglobin (discrete)	Abn. Low	(n=955)	(n=1,247)	(n=84)	0.004	(n=137)	(n=2,149)	<0.001
	Normal	3.8%	3.7%	9.5%		13.9%	3.3%	
	Abn. High	95.6%	94.2%	89.3%		85.4%	95.2%	
	(continuous)	0.6%	2.1%	1.2%		0.7%	1.5%	<0.001
		—	r=-0.063	—	0.002	$\bar{x}=15.19$	$\bar{x}=15.70$	
Hematocrit (discrete)	Abn. Low	(n=955)	(n=1,247)	(n=84)	0.498*	(n=137)	(n=2,149)	<0.001*
	Normal	1.8%	2.2%	3.6%		7.3%	1.7%	
	Abn. High	98.2%	97.5%	95.2%		92.7%	98.0%	
	(continuous)	0.0%	0.3%	1.2%		0.0%	0.2%	0.002
		—	r=-0.052	—	0.013	$\bar{x}=44.36$	$\bar{x}=45.24$	

TABLE M-1. (continued)

## Dependent Variable-Covariate Associations for Hematologic Evaluation

Dependent Variable	Level	Age			Race		
		Born >1942	Born 1923-1941	Born <1922	p-Value	Black	Nonblack
MCV (discrete)	Abn. Low	(n=955) 1.4%	(n=1,247) 1.2%	(n=84) 0.0%	0.002	(n=137) 10.2%	(n=2,149) 0.6%
	Normal	91.1%	86.3%	84.5%		81.8%	88.6%
	Abn. High	7.5%	12.5%	15.5%		8.0%	10.7%
		—	r=0.139	—	<0.001	$\bar{x}=88.57$	$\bar{x}=91.63$
	(continuous)						<0.001
MCH (discrete)	Abn. Low	(n=955) 0.8%	(n=1,247) 0.5%	(n=84) 0.0%	0.002	(n=137) 5.1%	(n=2,149) 0.3%
	Normal	93.8%	89.8%	89.3%		90.5%	91.5%
	Abn. High	5.3%	9.7%	10.7%		4.4%	8.1%
		—	r=0.117	—	<0.001	$\bar{x}=30.38$	$\bar{x}=31.82$
	(continuous)						<0.001
MCHC (discrete)	Abn. Low	(n=955) 0.0%	(n=1,247) 0.0%	(n=84) 0.0%	—	(n=137) 0.0%	(n=2,149) 0.0%
	Normal	100.0%	100.0%	100.0%		100.0%	100.0%
	Abn. High	0.0%	0.0%	0.0%		0.0%	0.0%
		—	r=-0.052	—	0.013	$\bar{x}=34.25$	$\bar{x}=34.70$
	(continuous)						<0.001
Platelet Count (discrete)	Abn. Low	(n=955) 0.1%	(n=1,246) 0.5%	(n=84) 1.2%	0.422 <sup>b</sup>	(n=137) 0.0%	(n=2,148) 0.4%
	Normal	98.2%	97.0%	96.4%		98.5%	97.4%
	Abn. High	1.7%	2.5%	2.4%		1.5%	2.2%
		—	r=-0.086	—	<0.001	$\bar{x}=258.39$	$\bar{x}=262.40$
	(continuous)						0.433

TABLE M... (continued)

## Dependent Variable-Covariate Associations for Hematologic Evaluation

Dependent Variable	Level	Occupation			p-Value
		Officer	Enlisted Flyer	Enlisted Groundcrew	
RBC (discrete)	Abn. Low	(n=870) 4.0%	(n=382) 4.2%	(n=1,034) 3.3%	0.281
	Normal	95.4%	94.8%	95.2%	
	Abn. High	0.6%	1.0%	1.6%	
(continuous)		$\bar{x}=4.88$	$\bar{x}=4.94$	$\bar{x}=5.00$	<0.001
WBC* (discrete)	Abn. Low	(n=870) 7.5%	(n=381) 5.8%	(n=1,034) 5.7%	0.248
	Normal	87.9%	89.0%	87.9%	
	Abn. High	4.6%	5.2%	6.4%	
(continuous)		$\bar{x}=6.34$	$\bar{x}=7.09$	$\bar{x}=7.05$	<0.001
Hemoglobin (discrete)	Abn. Low	(n=870) 4.0%	(n=382) 4.4%	(n=1,034) 3.7%	0.913
	Normal	94.6%	93.7%	95.0%	
	Abn. High	1.4%	1.8%	1.4%	
(continuous)		$\bar{x}=15.57$	$\bar{x}=15.73$	$\bar{x}=15.73$	0.002
Hematocrit (discrete)	Abn. Low	(n=870) 1.7%	(n=382) 2.9%	(n=1,034) 2.0%	0.414*
	Normal	98.0%	96.6%	97.9%	
	Abn. High	0.2%	0.5%	0.1%	
(continuous)		$\bar{x}=44.82$	$\bar{x}=45.43$	$\bar{x}=45.41$	<0.001

TABLE M-1. (continued)  
Dependent Variable-Covariate Associations for Hematologic Evaluation

Dependent Variable	Level	Occupation			p-Value
		Officer	Enlisted Flyer	Enlisted Groundcrew	
MCV (discrete)	Abn. Low	(n=870)	(n=382)	(n=1,034)	0.122
	Normal	0.8%	0.8%	1.7%	
	Abn. High	88.2%	86.6%	88.9%	
	(continuous)	11.0%	12.6%	9.4%	<0.001
		$\bar{x}=91.87$	$\bar{x}=92.03$	$\bar{x}=90.87$	
MCH (discrete)	Abn. Low	(n=870)	(n=382)	(n=1,034)	0.037
	Normal	0.2%	0.5%	1.0%	
	Abn. High	90.7%	90.0%	92.6%	
	(continuous)	9.1%	9.4%	6.4%	<0.001
		$\bar{x}=31.93$	$\bar{x}=31.89$	$\bar{x}=31.51$	
MCHC (discrete)	Abn. Low	(n=870)	(n=382)	(n=1,034)	—
	Normal	0.0%	0.0%	0.0%	
	Abn. High	100.0%	100.0%	100.0%	
	(continuous)	0.0%	0.0%	0.0%	<0.001
		$\bar{x}=34.73$	$\bar{x}=34.63$	$\bar{x}=34.65$	
Platelet Count (discrete)	Abn. Low	(n=869)	(n=382)	(n=1,034)	0.757 <sup>b</sup>
	Normal	0.4%	0.8%	0.2%	
	Abn. High	97.7%	96.6%	97.7%	
	(continuous)	2.0%	2.6%	2.1%	<0.001
		$\bar{x}=256.16$	$\bar{x}=261.16$	$\bar{x}=267.57$	

TABLE II-<sub>2</sub> (continued)

## **Dependent Variable-Covariate Associations for Hematologic Evaluation**

Dependent Variable	Level	Lifetime Cigarette Smoking History				Current Cigarette Smoking				p-Value
		0	>0-10	>10	p-Value	0 Non-smoker	0 Former Smoker	>0-20	>20	
RBC (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,030)	0.003	(n=624)	(n=905)	(n=390)	(n=367)	0.218
		2.6%	2.5%	5.2%		2.6%	4.2%	5.1%	3.0%	
		96.2%	97.2%	93.4%		96.2%	95.1%	93.3%	95.6%	
	(continuous)	Abn. High	1.3%	0.3%	1.5%	1.3%	0.7%	1.5%	1.4%	<0.001
		—	r=-0.033	—	0.111	—	r=0.093	—	—	
		—	—	—	—	—	—	—	—	
WBC* (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,029)	<0.001	(n=624)	(n=905)	(n=390)	(n=366)	<0.001
		9.4%	6.7%	4.4%		9.3%	8.7%	1.8%	0.6%	
		90.1%	88.6%	86.6%		90.2%	89.3%	84.4%	85.5%	
	(continuous)	Abn. High	0.5%	4.8%	9.0%	0.5%	2.0%	13.8%	13.9%	<0.001
		—	r=0.309	—	<0.001	—	r=0.510	—	—	
		—	—	—	—	—	—	—	—	
Hemoglobin (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,030)	0.008	(n=624)	(n=905)	(n=390)	(n=367)	<0.001
		4.2%	3.3%	4.2%		4.0%	4.9%	4.6%	0.8%	
		95.4%	95.9%	93.4%		95.5%	94.5%	93.6%	94.6%	
	(continuous)	Abn. High	0.5%	0.8%	2.4%	0.5%	0.7%	1.8%	4.6%	<0.001
		—	r=0.070	—	<0.001	—	r=0.247	—	—	
		—	—	—	—	—	—	—	—	
Hematocrit (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,030)	0.791*	(n=624)	(n=905)	(n=390)	(n=367)	0.088*
		2.1%	1.7%	2.2%		1.9%	2.3%	3.1%	0.5%	
		97.8%	98.1%	97.5%		97.9%	97.5%	96.9%	98.9%	
	(continuous)	Abn. High	0.2%	0.2%	0.3%	0.2%	0.2%	0.0%	0.5%	<0.001
		—	r=0.087	—	<0.001	—	r=0.265	—	—	
		—	—	—	—	—	—	—	—	

TABLE M-1. (continued)  
Dependent Variable-Covariate Associations for Hematologic Evaluation

Dependent Variable	Level	Lifetime Cigarette Smoking History				Current Cigarette Smoking				p-Value
		0	>0-10	>10	p-Value	0 Non-smoker	0 Former Smoker	>0-20	>20	
MCV (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,030)	<0.001	(n=624)	(n=905)	(n=390)	(n=367)	<0.001
	Normal	1.8%	1.0%	1.1%		1.6%	1.0%	2.0%	0.3%	
	Abn. High	95.2%	88.0%	84.2%		95.4%	90.6%	80.3%	78.8%	
	(continuous)	3.0%	11.1%	14.8%		3.0%	8.4%	17.7%	21.0%	<0.001
	—	r=0.164	—	<0.001	—	r=0.216	—	—	—	
	Abn. Low	—	—	—	—	—	—	—	—	
MCH (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,030)	<0.001 <sup>b</sup>	(n=624)	(n=905)	(n=390)	(n=367)	<0.001 <sup>b</sup>
	Normal	0.8%	0.3%	0.7%		0.6%	0.4%	1.3%	0.3%	
	Abn. High	96.3%	91.1%	88.7%		96.5%	93.5%	85.9%	83.9%	
	(continuous)	2.9%	8.6%	10.6%		2.9%	6.1%	12.8%	15.8%	<0.001
	—	r=0.136	—	<0.001	—	r=0.182	—	—	—	
	Abn. Low	—	—	—	—	—	—	—	—	
MCHC (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,030)	—	(n=624)	(n=905)	(n=390)	(n=367)	—
	Normal	0.0%	0.0%	0.0%	—	0.0%	0.0%	0.0%	0.0%	
	Abn. High	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	
	(continuous)	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	<0.001
	—	r=-0.077	—	<0.001	—	r=-0.080	—	—	—	
	Abn. Low	—	—	—	—	—	—	—	—	
Platelet Count (discrete)	Abn. Low	(n=625)	(n=631)	(n=1,029)	0.013 <sup>b</sup>	(n=624)	(n=904)	(n=390)	(n=367)	0.138 <sup>b</sup>
	Normal	0.3%	0.3%	0.4%		0.3%	0.3%	0.3%	0.3%	
	Abn. High	98.6%	98.1%	96.5%		98.6%	97.4%	97.4%	96.2%	
	(continuous)	1.1%	1.6%	3.1%		1.1%	2.3%	2.3%	3.3%	<0.001
	—	r=0.092	—	<0.001	—	r=0.097	—	—	—	
	Abn. Low	—	—	—	—	—	—	—	—	

<sup>a</sup>High pooled with normal for chi-squared test.

<sup>b</sup>Low pooled with normal for chi-squared test.

\*Means transformed from natural logarithm scale; correlations based on natural logarithm versus covariate.

Note: Correlations (r) are based on total sample and are not category specific.

## Exposure Index-by-Covariate Interactions for Hematologic Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Exposure Index Contrast	p-Value
				Low	Medium	High		
RBC	Exposure Index-by- Age (Enlisted Flyer)	Born >1942	n	11	18	11	Overall	0.088
			Adj. Mean	5.011	4.816	5.056	M vs. L	0.109
			95% C.I.	(4.658, 5.364)	(4.512, 5.120)	(4.703, 5.409)	H vs. L	0.742
	Born 1923-1941		n	44	43	42	Overall	0.283
			Adj. Mean	4.947	5.013	5.076	M vs. L	0.411
			95% C.I.	(4.771, 5.123)	(4.848, 5.178)	(4.906, 5.246)	H vs. L	0.113
	Born <1922		n	0	2	0	Overall	—
			Adj. Mean	—	—	—	M vs. L	—
			95% C.I.	—	—	—	H vs. L	—

TABLE M-2. (continued)

## Exposure Index-by-Covariate Interactions for Hematologic Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Exposure Index Contrast	p-Value
				Low	Medium	High		
Hemoglobin	Exposure Index-by- Age (Enlisted Flyer)	Born >1942	n	11	18	11	Overall	0.006
			Adj. Mean	16.421	15.527	16.567	M vs. L	0.015
			95% C.I.	(15.378, 17.464)	(14.629, 16.425)	(15.525, 17.609)	H vs. L	0.713
	Born 1923-1941	n	44	43	42	Overall	0.231	
		Adj. Mean	15.412	15.735	15.884	M vs. L	0.249	
		95% C.I.	(14.798, 16.026)	(15.158, 16.312)	(15.292, 16.476)	H vs. L	0.096	
	Born <1922	n	0	2	0	Overall	—	
		Adj. Mean	—	—	—	M vs. L	—	
		95% C.I.	—	—	—	H vs. L	—	
Hemoglobin	Exposure Index-by- Lifetime Cigarette Smoking History	0 Pack-Years	n	40	37	23	Overall	0.792
			Adj. Mean	15.443	15.433	15.630	M vs. L	0.970
			95% C.I.	(14.983, 15.903)	(14.921, 15.945)	(15.075, 16.185)	H vs. L	0.543
	>0-10 Pack- Years	n	42	53	40	Overall	0.106	
		Adj. Mean	15.661	16.016	15.530	M vs. L	0.133	
		95% C.I.	(15.243, 16.079)	(15.602, 16.430)	(15.115, 15.945)	H vs. L	0.602	
	>10 Pack-Years	n	65	68	77	Overall	0.136	
		Adj. Mean	15.508	15.423	15.767	M vs. L	0.647	
		95% C.I.	(15.171, 15.845)	(15.096, 15.750)	(15.425, 16.109)	H vs. L	0.151	

TABLE M-2. (continued)

## Exposure Index-by-Covariate Interactions for Hematologic Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Exposure Index Contrast	p-Value
				Low	Medium	High		
Hematocrit	Exposure Index-by- Age (Enlisted Flyer)	Born >1942	n	11	18	11	Overall	0.003
			Adj. Mean	47.165	44.303	47.469	M vs. L	0.007
			95% C.I.	(44.197, 50.133)	(41.747, 46.859)	(44.503, 50.435)	H vs. L	0.788
	Born 1923-1941	n	44	43	42	Overall	0.268	
		Adj. Mean	44.841	45.492	46.165	M vs. L	0.420	
		95% C.I.	(43.071, 46.611)	(43.828, 47.156)	(44.458, 47.872)	H vs. L	0.106	
	Born <1922	n	0	2	0	Overall	—	
		Adj. Mean	—	—	—	M vs. L	—	
		95% C.I.	—	—	—	H vs. L	—	
Hematocrit	Exposure Index-by- Lifetime Cigarette Smoking	0 Pack-Years	n	40	37	23	Overall	0.694
			Adj. Mean	44.506	44.636	45.211	M vs. L	0.863
			95% C.I.	(43.241, 45.771)	(43.228, 46.044)	(43.686, 46.736)	H vs. L	0.405
	>0-10 Pack- (Enlisted Groundcrew)	n	42	53	40	Overall	0.169	
		Adj. Mean	45.392	46.330	45.083	M vs. L	0.172	
		95% C.I.	(44.174, 46.610)	(45.124, 47.536)	(43.873, 46.293)	H vs. L	0.672	
	>10 Pack-Years	n	65	68	77	Overall	0.091	
		Adj. Mean	45.086	44.900	45.992	M vs. L	0.737	
		95% C.I.	(44.086, 46.086)	(43.928, 45.872)	(44.977, 47.007)	H vs. L	0.092	

TABLE M-2. (continued)

## Exposure Index-by-Covariate Interactions for Hematologic Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Exposure Index Contrast	p-Value
				Low	Medium	High		
Platelet Count	Exposure Index-by- Race	Black Non-smoker	n	0	2	1	Overall	—
			Adj. Mean	—	—	—		
			95% C.I.	—	—	—		
	Exposure Index-by- Current Cigarette Smoking History (Enlisted Flyer)	Black Former Smoker	n	1	1	1	Overall	—
			Adj. Mean	—	—	—		
			95% C.I.	—	—	—		
	Black Current Smoker >20	Black Current Smoker >20	n	0	1	1	Overall	—
			Adj. Mean	—	—	—		
			95% C.I.	—	—	—		
	Nonblack Non-smoker	Nonblack Non-smoker	n	9	8	9	Overall	0.087
			Adj. Mean	230.34	269.97	239.02		
			95% C.I.	(206.56, 254.12)	(244.74, 295.20)	(215.17, 262.87)		
	Nonblack Former Smoker	Nonblack Former Smoker	n	20	23	23	Overall	0.317
			Adj. Mean	249.55	274.96	259.08		
			95% C.I.	(225.50, 273.60)	(252.40, 297.52)	(236.56, 281.60)		

TABLE b ... (continued)

## Exposure Index-by-Covariate Interactions for Hematologic Variables

Variable	Interaction (Occupation)	Stratification	Statistic	Exposure Index			Exposure Index Contrast	p-Value
				Low	Medium	High		
Platelet Count (cont.)	Nonblack Current Smoker >0-20	n	9	11	10	10	Overall	0.080
		Adj. Mean	321.29	296.61	252.57	252.57	M vs. L	0.410
		95% C.I.	(279.49, 363.09)	(257.83, 335.39)	(212.39, 292.75)	292.75)	H vs. L	0.028
	Nonblack Current Smoker >20	n	16	17	8	8	Overall	0.145
		Adj. Mean	299.57	257.09	301.29	301.29	M vs. L	0.079
		95% C.I.	(266.86, 332.28)	(225.35, 288.83)	(255.56, 347.02)	347.02)	H vs. L	0.953

—P-value not given due to cells with zero frequency; sparse cell counts preclude presentation of summary statistics.