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M. WHITE
F. GARLAND
C. GARLAND
E. SHAW
E. GORHAM

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NAVAL HEALTH RESEARCH CENTER

P.O. Box 85122
SAN DIEGO, CALIFORNIA 92138

NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND
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Malignant Melanoma in US Navy Personnel

Martin R. White, MPH¹, Frank C. Garland, PhD^{1,2}, Cedric F. Garland, DrPH², Eddie Shaw, BA,¹ Edward D. Gorham, MPH¹

¹ Occupational Medicine Department, Naval Health Research Center, San Diego, CA

² Department of Community and Family Medicine, University of California, San Diego

Melanoma is the second most common form of cancer after testicular cancer in males in the US Navy. A wide range of occupations with varying exposures to sunlight and other possible etiologic agents occur within the Navy. In order to target possible preventive strategies this study was done to identify occupational groups which may be at excess risk of melanoma. One hundred seventy-six confirmed cases of melanoma were ascertained in active-duty white male enlisted Navy personnel during 1974-84. Individual occupations and occupations grouped by review of job descriptions into three categories of sunlight exposure: indoor, outdoor, or both were investigated. Compared to the US population personnel in indoor occupations had a higher age-adjusted incidence rate of melanoma, 10.6 per 100,000 ($p=0.06$). Persons working in occupations which required spending time both indoors and outdoors had the lowest rate of 7.0 per 100,000 ($p=0.06$). Two single occupations were found to have elevated rates of melanoma: Aircrew Survival Equipmentman, SIR = 6.8 ($p<0.05$); and Engineman, SIR = 2.8 ($p<0.05$). However, occupations with similar job descriptions had no cases of melanoma or no excess risk. Recent laboratory studies have shown that vitamin D can suppress growth of malignant melanoma cells in tissue culture. A mechanism is proposed in which vitamin D inhibits previously initiated melanomas from becoming clinically apparent.

The epidemiology of cutaneous malignant melanoma is paradoxical. Sunlight, particularly ultraviolet sunlight, has been suspected of causing melanoma because of the relationship of sunlight to other skin cancers and the ability of ultraviolet light to alter DNA (1-4). While the epidemiology of melanoma is complex, the complexities have not arisen from conflicting study results. Epidemiologic studies of individuals have been remarkable for the similarity of their findings. Studies have shown that light skin pigmentation, a tendency to freckle, and light hair color are associated with increased risk of melanoma (5-8). Perhaps unexpectedly, studies also find that melanoma does not occur more frequently on the areas of the body most often exposed to sunlight (4,9,10); that indoor occupations are at higher risk than outdoor occupa-

tions (11-14); and that high lifetime exposures to sunlight have been shown to decrease risk of melanoma (6,15,16). Also, studies of geographic patterns of melanoma occurrence in Europe have found higher incidence rates of melanoma in populations living in sunlight deprived higher latitudes (17-19). Placing these findings in a theory of etiology has perplexed investigators. The paradox has arisen because, if sunlight is a cause of melanoma, the findings regarding sunlight exposure are not what would be expected.

Occupational studies may help clarify the role of sunlight as a cause of this disease. The Navy has a large population working in occupations with widely varying exposures to sunlight and other possible etiologic agents (20). For these reasons, we conducted a study of the occurrence of melanoma in the Navy.

Methods

The Naval Health Research Center (NHRC) maintains a Service History File from data supplied by the Naval Military Personnel Command that contains basic demographic and occupational history information for active-duty enlisted Navy personnel (20). A count of person-years contributed by enlisted personnel by age, race, sex, and occupation for the 11-year period 1974-84 was done.

The Naval Health Research Center also maintains a computerized Inpatient Follow-up Data System which contains all hospitalizations, deaths, and Medical Board and Physical Evaluation Board findings for all active-duty enlisted personnel for the same period (20). These medical data are provided by the Naval Medical Data Services Center in Bethesda, Maryland.

Cases included all enlisted white male personnel who had a diagnosis of cutaneous malignant melanoma, (International Classification of Diseases, Ninth Revision, Code 172) during the period January 1, 1974 to December 31, 1984 (21). Confirmation of the diagnosis was made either by obtaining the original medical record from the treating hospital or from the National Personnel Records Center in St. Louis, Missouri, where medical records are sent for archival storage or by obtaining a corroborating Medical or Physical Evaluation Board (which usually consists of two or more physicians including a specialist in the particular disease). Age-specific and age-adjusted incidence rates were calculated for all enlisted white male active-duty Navy personnel (4,072,502 person-years), and compared with rates provided by the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute (22). Occupations were grouped at the begin-

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ning of the study into indoor, outdoor, or both by review of Navy job descriptions (23,24). Groupings are shown in Appendix A.

Using SEER rates, Standardized Incidence Ratios (SIRs) and 95% confidence limits were calculated for all naval occupations having at least one case of melanoma. Age-adjustment was done using the indirect method, a technique selected because the number of cases in some categories was not sufficient to provide the stability of rates appropriate for the use of direct age-adjustment (25). Confidence limits were calculated using the Poisson distribution (25).

Results

A total of 176 confirmed cases of cutaneous malignant melanoma were included in the study. Diagnoses were confirmed either through review of the original medical records (N = 95) or by Medical or Physical Evaluation Board findings (N = 81). Five cases listed with a hospitalization of melanoma on computer files were excluded because review of original medical records showed no diagnosis of melanoma.

The average annual age-adjusted incidence rate for melanoma in US Navy enlisted white males was 9.5 per 100,000

person-years, a rate not significantly different from the US SEER population rate of 9.2 per 100,000 (Table 1). Age-specific rates also closely paralleled those from the US SEER population.

Increasing duration of service appeared to have no effect on the incidence of melanoma. The age-adjusted average annual incidence rate of 9.7 per 100,000 for those with 11 or more years of service was close to that of personnel with fewer than two years of service, 10.1 per 100,000 (Table 2).

Compared to the US SEER population, personnel in indoor occupations had a higher age-adjusted incidence rate of melanoma, 10.6 per 100,000 ($p=0.06$). Outdoor workers had a non-significant lower risk of 9.4 per 100,000. Persons working in occupations which required spending time both indoors and outdoors had the lowest rate of 7.0 per 100,000 ($p=0.06$) (Figure 1).

In all occupational groups combined, melanoma occurred most frequently on the trunk (2.0 per 100,000 person-years) (Figure 2). The rate was statistically significantly elevated on the trunk in outdoor personnel (3.9 per 100,000 person-years, $p<0.05$). Rates were universally low on commonly sunlight exposed areas (range: 0.02 on the lip to 0.52 on the neck and scalp).

TABLE 1

Average annual age-specific incidence rates for cutaneous malignant melanoma per 100,000, active-duty enlisted Navy personnel and United States SEER population, white males, 1974-84.

Age (years)	Navy personnel			SEER average annual incidence rate†
	Population at risk	No. of cases	Average annual incidence rate*	
17-19	705,432	10	1.4	1.0
20-24	1,767,202	45	2.6	2.6
25-29	679,509	38	5.6	5.1
30-34	439,894	26	5.9	7.6
35-39	341,651	42	12.3	9.7
40-44	95,347	10	10.5	12.0
45-49	24,998	3	12.0	15.6
50-61	8,341	2	24.0	17.7
Unknown	10,128	0	- - -	
Total	4,072,502	176		
Crude average annual rate			4.3	- - -
Average annual age-adjusted rate††			9.5	9.2

* Navy incidence rates based upon first hospitalization for cutaneous malignant melanoma, International Classification of Diseases, Ninth Revision, Code 172 (21).

† United States population rates were provided by the Surveillance, Epidemiology and End Results (SEER), Incidence and Mortality Data: 1973-1981 (22).

†† Adjusted by the indirect method using truncated (17 to 61 years of age) age-specific incidence rates provided by SEER and applied to the Navy population.

TABLE 2

Age-adjusted average annual incidence rates for cutaneous malignant melanoma per 100,000 by duration of service, active-duty enlisted Navy personnel, white males, 1974-84.

Duration of service	Person-years at risk	No. of cases	Age-adj. rate*
0.0-1.9	1,288,909	27	10.1
2.0-3.9	1,000,560	35	11.5
4.0-6.9	596,657	17	6.7
7.0-10.9	408,398	23	8.7
11.0+	767,850	74	9.7
Unknown	10,128	0	-
Total	4,072,502	176	9.5

* Age-adjusted by the indirect method using truncated (17 to 61 years of age) age-specific incidence rates provided by the Surveillance, Epidemiology and End Results (SEER) and applied to the Navy study population (22).

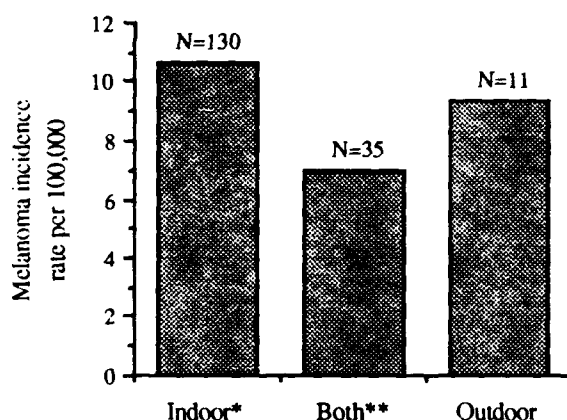


Figure 1. Average annual age-adjusted incidence rate for melanoma by work category, active-duty enlisted Navy personnel, white males, 1974-84

* Significantly higher than the U.S. SEER population at the $p=0.06$ level

** Significantly lower than the U.S. SEER population at the $p=0.06$ level

To determine whether a particular occupational group showed higher rates than would be expected based on the US SEER population rates, standardized incidence ratios (SIRs) and 95% confidence limits were calculated for each occupation with one or more cases of melanoma. Two occupations showed statistically significantly high SIRs: Aircrew Survival Equipmentman, SIR = 6.8 ($p<0.05$); and Engineman, SIR = 2.8 ($p<0.05$) (Table 3).

Discussion

Sunlight exposure

In this study, as in others, outdoor workers were at lower risk of melanoma than indoor workers, and workers with both outdoor and indoor exposures had even lower risk. Cumulative exposure to sunlight has been shown by several investigators to decrease risk of melanoma (6,15,16). Melanoma, with the exception of lentigo malignant melanoma, has been shown to be unassociated with solar elastosis of the nearby skin (26). This clinical finding suggests, as do epidemiologic findings, that cumulative exposure to the sun does not increase risk of melanoma or that individuals who exhibit elastosis are otherwise protected from the disease. Absence of exposure to the sun is common in persons not showing solar elastosis and in indoor office workers.

Colson (27) and Frampton (28) have found specific vitamin D receptors in cultured human melanoma cells and have shown that vitamin D has a dose-dependent inhibitory effect on the growth of these cells in tissue culture. Vitamin D receptors have also been described in other human cancer cell lines, and inhibition of growth by vitamin D has been reported for several cell lines of human breast and colon cancer (28-30). Growth inhibition by vitamin D and increases in cell differentiation have also been reported for cultured human myeloid leukemia cells and rat osteogenic sarcoma cells (31-34).

Previtamin D is made in the epidermis and dermis during exposure to ultraviolet sunlight and immediately begins to isomerize to vitamin D (35). Individuals who work for long periods of time indoors have been shown to produce low levels of vitamin D (36,37).

It is proposed here that low levels of vitamin D (either locally available in skin or circulating in plasma) allow melanomas which were previously initiated by sunlight exposure to develop into clinically apparent disease in continually sunlight deprived individuals. The line of reasoning for this hypothesis comes from the results of this study, long-standing epidemiologic findings by other investigators, and recent laboratory findings.

Studies of mice injected with malignant melanoma cells and exposed to ultraviolet light (and presumed to have higher levels of circulating vitamin D) have shown exposed animals to have a 33% increased lifespan (16.5 weeks compared to 12.0 weeks in UV-B unexposed controls)(38). DeLuca and Ostrem have reviewed the role of vitamin D and cancer and conclude that "the vitamin D hormone suppressed growth of melanoma cells in culture..."(39). These findings indicate a recently recognized property of vitamin D which may explain the persistent finding of decreased risk of melanoma in outdoor workers.

The prolonged availability of locally produced vitamin D in the skin on exposure to sunlight may help to explain why melanoma is not more common in normally exposed sites or when solar elastosis is present. Exposure to the sun may increase the initiation of melanoma in sunlight exposed sites but at the same time decreases the risk in these sites due to high vitamin D levels locally produced in the skin. The two factors counter-balance and commonly exposed sites are at no

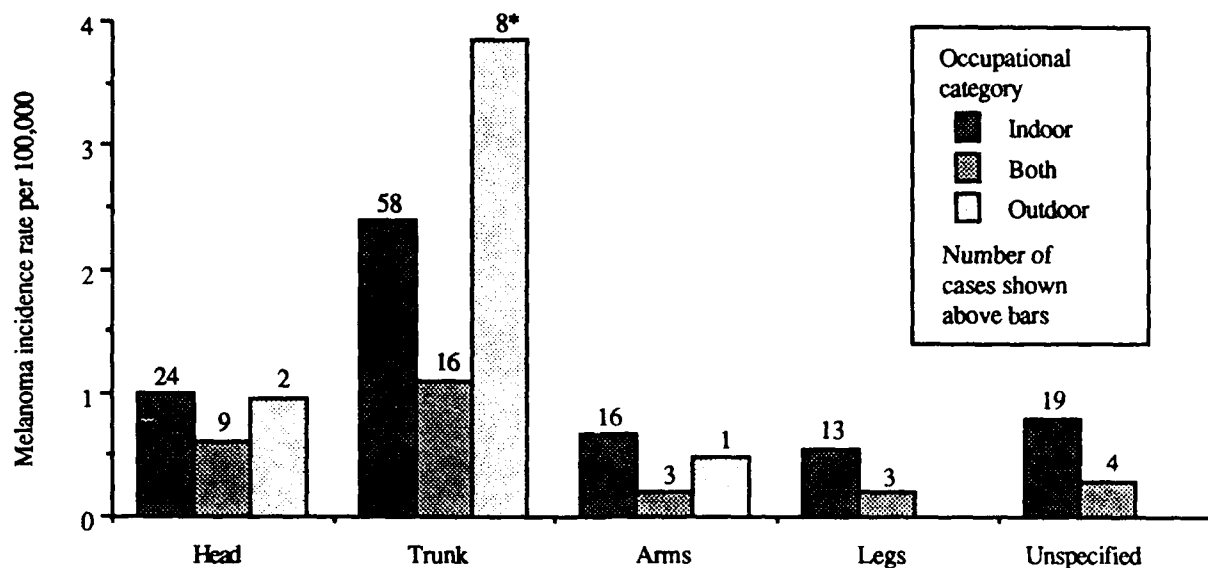


Figure 2. Melanoma occurrence by type of occupation and site, active-duty enlisted Navy Personnel, white males, 1974-84

* Significantly higher than indoor or both occupations at the $p < 0.05$ level

greater risk (or less risk) than commonly unexposed sites. Indoor workers may have high risk of melanoma at all sites due to deficient levels of vitamin D. Outdoor workers have intermediate risk of melanoma, because while they may have sufficient vitamin D levels, they also have a high probability of initiation from sunlight exposure. People working both indoors and outdoors may have the lowest risk of developing melanoma because they have the benefit of relatively high vitamin D levels, while at the same time having a lower probability of initiation from sunlight exposure than people working constantly outdoors.

The amount of ultraviolet light reaching the melanocyte varies by wavelength. Ultraviolet-B transfers its energy primarily in the uppermost layers of skin, allowing only about 10-25% to reach the depth of the melanocyte (40). Ultraviolet-A can penetrate deeper and about 40% can reach the level of the melanocyte (40). As much as 10 times the ultraviolet-A passes through the stratospheric ozone layers to the earth's surface as ultraviolet-B (40). These two factors suggest that at least 10 times as much ultraviolet-A is acting upon the melanocyte as ultraviolet-B and that ultraviolet-A may be more important in the initiation of melanoma than ultraviolet-B.

This study had one finding that appears to be unique to the Navy in regard to sunlight: persons in outdoor occupations had a significantly higher occurrence of melanoma on the trunk than did persons in indoor occupations or occupations with both exposures. Most studies have found that melanoma in persons occupationally exposed to sunlight is lower on normally unexposed sites such as the trunk. The Navy may have some unique exposure related to sunlight from behavior or clothing that may allow the transmittance of ultraviolet-A while almost entirely blocking transmittance of ultraviolet-B.

Individual occupations

In the Navy population two occupations were found to be at significantly elevated risk of melanoma: Aircrew Survival Equipmentman, SIR = 6.8; and Engineman, SIR = 2.8 ($p < 0.05$) (Table 3). Enginemen work primarily indoors and operate, service, and repair internal combustion engines that power some large ships and most of the Navy's small craft. Their work is usually done in areas where heat, engine exhausts, de-greasing solvents, and diesel and gas fuels are present. While this is an indoor occupation, there may be other factors besides sunlight of importance in this group. Hoover and Fraumeni have analyzed melanoma occurrence by county in the US and found higher risk of melanoma in counties with chemical industries (41). In studies of the Navy population by Garland and associates, Enginemen were found to have 2.6 times the risk for testicular cancer as the US SEER population (42). However, no increased risk in Enginemen was found for Hodgkin's disease or non-Hodgkin's lymphoma (43,44). Other occupations within the Navy which have similar work environments as Enginemen, such as Machinist's Mates and Boiler Technicians, had no cases of melanoma. The finding of a significantly increased risk for both melanoma and testicular cancer in Enginemen suggests that a more detailed study of this occupation is needed.

Aircrew Survival Equipmentmen usually work indoors (with occasional outdoor assignments) in a clean shop environment preparing and packing parachutes and maintaining clothing and other survival equipment. Other individual occupations with similar work environments (Aviation Storekeeper, Air Controlman and Aviation Maintenance Administrationman) had no cases of melanoma or had low rates (Appendix A). If occupational exposures were a major fac-

TABLE 3

Standardized incidence ratios (SIRs) with 95 percent confidence limits for cutaneous malignant melanoma for occupations with 4 or more cases, active-duty enlisted Navy personnel, white males, 1974-84

<u>Occupation</u>	<u>No. of cases</u>	<u>Population at risk</u>	<u>SIR</u>	<u>95% confidence limits</u>
Aircrew Survival Equipmentman	6	18,064	6.8	(2.5, 14.7)*
Aviation ASW Operator	5	32,051	3.2	(1.0, 6.7)
Engineman	10	79,963	2.8	(1.3, 5.1)*
Boiler Technician	9	108,363	2.1	(1.0, 3.9)
Aviation Boatswain's Mate	4	50,497	1.8	(0.5, 4.1)
Aviation Electrician's Mate	5	75,476	1.4	(0.4, 3.2)
Seaman Recruit	13	462,341	1.4	(0.8, 2.5)
Yeoman	7	79,498	1.4	(0.6, 3.0)
Aviation Structural Mechanic	9	142,165	1.3	(0.6, 2.6)
Hospital Corpsman	10	177,943	1.2	(0.6, 2.2)
Machinist's Mate	12	253,155	1.2	(0.6, 2.1)
Electrician's Mate	5	111,944	1.1	(0.4, 2.5)
Aviation Machinist's Mate	6	115,493	1.0	(0.4, 2.2)
Personnelman	3	52,077	1.0	(0.2, 2.5)
Sonar Technician	3	71,602	1.0	(0.2, 2.9)
Aviation Electronics Technician	4	105,394	0.9	(0.3, 2.0)
Operation Specialist	3	79,552	0.9	(0.2, 2.2)
Radioman	6	133,319	0.9	(0.3, 1.9)
Boatswain's Mate	4	78,888	0.8	(0.2, 1.9)
Electronics Technician	5	115,281	0.8	(0.3, 1.8)
All Navy occupations combined†	176	4,072,502	1.0	(0.9, 1.2)

* Significant at the $p < 0.05$ level.

† See Appendix B for the remaining occupations and their respective SIRs.

tor in the risk of melanoma, similar occupations would be expected to have similar risk; this does not appear to be the case.

Several potentially confounding variables, such as degree of skin pigmentation, and sunlight exposure during leisure time or prior to enlistment, were not controlled for in this study. As in all such studies, it is a basic assumption that these factors are not distributed in a systematically different way within broad occupational groups, or within single occupations. Dietary intake of vitamin D in the Navy population has not been assessed, but there is no reason to believe that it varies with occupational exposure to sunlight. There is also a concern when making comparisons of many occupational

groups that a single occupation may have a statistically significant SIR by chance alone. This possibility should be considered when assessing the importance of a single occupation having an excess risk in a study of this type.

Conclusions

The Navy occupations found to be at excess risk of melanoma, Engineman and Aircrew Survival Equipmentman, do not provide any clear pattern of the occurrence of this disease by occupation. Occupations with similar duties as these did not have an apparent excess of melanoma. Enginemen, however, have been found to have higher than expected risk of tes-

ticular cancer. This group may have unique or more intense exposures to substances which may increase the risk of both types of cancer. Enginemen need further in-depth studies to determine specific occupational exposures.

Our study and previous studies examined together suggest that sunlight both causes melanoma and prevents it. The apparent paradox is the result of two factors working in opposite directions. We are proposing here for the first time that sunlight initiates melanoma but that vitamin D produced locally in the skin and circulating in the blood plasma inhibits growth of malignant melanoma cells and prevents the appearance of clinical disease.

The results of this study and others which have found indoor workers at high risk of melanoma suggest that an occupational deprivation of sunlight leads to a vitamin D deficiency which in turn favors the development of melanoma. The worst situation would be exposure in childhood to high levels of sunlight (including episodes of sunburning) followed by an adulthood spent in an office. A high probability of initiation is present in childhood due to the vulnerability of rapidly growing germinal layers of infant and childhood skin to ultraviolet radiation. If, as adults, these individuals work in jobs with continuing exposure to sunlight, they are able to maintain high vitamin D levels and initiated lesions remain quiescent. If they work indoors where vitamin D production is low, the lesions become clinically apparent melanomas.

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Appendix A

Naval Occupations included in Indoor, Outdoor, or Both Categories of Sunlight Exposure. (occupational title and numeric designator shown).

Indoor occupations: Aerographer's Mate (7100), Air Controlman (6600), Aircraft Maintenance Tech (6080), Antisubmarine Warfare Tech (6310), Aviation ASW Operator (6400), Aviation Machinist's Mate (6200), Aviation Storekeeper (7300), Aviation Electrician's Mate (6800), Aviation Electronics Tech (6300), Aviation Machinist's Mate-Jet Engines (6206), Aviation Machinist's Mate-Recip/Engine (6205), Aviation Maintenance Administrationman (7400), Avionics Tech (6180), Boiler Tech (4000), Boilermaker (4020), Communications Yeoman (1701), Construction Mechanic (5500), Cryptologic Tech-Administration (1622), Cryptologic Tech-Collection (1655), Cryptologic Tech-Communications (1644), Cryptologic Tech-Interpretive (1666), Cryptologic Tech-Maintenance (1633), Cryptologic Tech-Technical (1611), Data Processing Tech (1900), Data System Tech (1010), Dental Tech (8300), Dental Recruit, DN APP, Dentalman (8300), Disbursing Clerk (2100), Electrician's Mate (4100), Electronics Tech (1000), Electronics Tech-Communications (1001), Electronics Tech-Radar (1002), Electronics Warfare Tech (350), Engineman (3800), Fire Control Tech (800), Gas Turbine System Electrician (4401), Gas Turbine System Mechanical (4402), Gas Turbine System Technician (4400), Hospital Recruit, Hospitalman (8000), Illustrator-Draftsman (3200), Instrumentman (1100), Intelligence Specialist (2300), Interior Communications Electrician (4200), Journalist (2600), Legalman (1750), Lithographer (3100), Machinery Repairman (3900), Machinist's Mate (3700), Mess Management Specials (2200), Mineman (900), Missile Technician (810), Molder (4700), Navy Counselor (1400), Ocean Systems Tech (450), Operations Specialist

(300), Opticalman (1200), Patternmaker (4600), Personnelman (1800), Postal Clerk (2700), Precision Instrumentman (1080), Radioman (1500), Ship's Serviceman (2490), Sonar Tech (400), Sonar Tech-Submarine (404), Sonar Tech-Surface (401), Storekeeper (2000), Torpedoman's Mate (Sub/Surf) (500), Trademan (7200), Yeoman (1700).

Outdoor occupations: Aviation Boatswain's Mate (6700), Aviation Boatswain's Mate-Launch/Recovery (6704), Boatswain's Mate (100), Builder (5600), Construction Electrician (5300), Constructionman (5080), Construction Recruit, Construction App (6000), Equipment Operator (5410), Signalman (250), Steelworker (5700).

Indoor and outdoor occupations: Airman Recruit, An Apprentice, Airman (7800), Aviation Fire Control Tech (6520), Aviation Ordnanceman (6500), Aviation Boatswain's Mate-Aircraft Handling (6706), Aviation Boatswain's Mate-Fuels (6705), Aviation Structural Mechanic (6900), Aviation Structural Mechanic-Hydraulics (6902), Aviation structural Mechanic-Safety Equip (6903), Aviation Structural Mechanic-Structure (6901), Aviation Support Equipment Tech (7500), Aviation Support Equipment Tech-Electrical (7501), Aviation Support Equip Tech-Hyd/Struct (7502), Aviation Support Equip Tech-Mechanical (7503), Engineering Aid (5100), Equipmentman (5380), Fire Control Tech-Ballistic Missile (803), Fire Control Tech-Gun (801), Fire Control Tech-Surface Missile (802), Fireman Recruit, En Apprentice, Fireman (5000), Gunner's Mate (600), Gunner's Mate-Guns (604), Gunner's Mate-Missiles (601), Gunner's Mate-Tech (602), Hull Maintenance Technician (4300), Master-at-Arms (150), Musician (3000), Ocean Systems Tech Analyst (451), Ocean Systems Tech Maintenance (452), Photographer's Mate (7600), Quartermaster (200), Seaman Recruit, Apprentice, Seaman (3600), Utilitiesman (5800),

Antisubmarine Warfare Technician (SIR = 1.0, 0.0 - 4.1), Aviation Ordnanceman (SIR = 0.4, 0.0 - 1.6), Aviation Fire Control Technician (SIR = 1.3, 0.1 - 3.8), Aerographer's Mate (SIR = 1.3, 0.0 - 5.1), Trademan (SIR = 2.2, 0.2 - 6.3), Aviation Maintenance Administrationman (SIR 0.8, 0.0 - 3.3), Aviation Support Equipment Technician (SIR = 2.0, 0.2 - 5.9), Photographer's Mate (SIR = 1.0, 0.0 - 4.1), Airman Recruit (SIR = 0.3, 0.0 - 1.2).

Appendix B

Standardized incidence ratios and 95% confidence limits for Navy occupations with one to three cases of cutaneous malignant melanoma.

Quartermaster (SIR = 0.5, 0.0 - 2.0), Signalman (SIR 0.8, 0.0 - 3.1), Electronic Warfare Technician (SIR = 2.2, 0.2 - 6.4), Torpedoman's Mate (SIR = 1.1, 0.1 - 3.1), Gunners Mate (SIR = 0.3, 0.0 - 1.7), Fire Control Technician (SIR = 0.5, 0.1 - 1.8), Missile Technician (SIR = 1.3, 0.0 - 5.1), Data Systems Technician (SIR = 1.0, 0.0 - 4.0), Storekeeper (SIR = 0.6, 0.0 - 1.7), Mess Management Specialist (SIR = 0.5, 0.0 - 1.6), Ships Serviceman (SIR = 0.7, 0.0 - 3.0), Journalist (SIR = 2.7, 0.0 - 10.8), Lithographer (SIR = 5.3, 0.0 - 21.2), Machinery Repairman (SIR = 1.9, 0.2 - 5.5), Interior Communications Electrician (SIR = 0.9, 0.1 - 2.5), Hull Maintenance Technician (SIR = 0.6, 0.1 - 1.6), Gas Turbine System Technician (SIR = 2.3, 0.1 - 12.8), Fireman Recruit (SIR = 0.3, 0.0 - 1.1), Construction Electrician (SIR = 1.4, 0.0 - 5.8), Equipment Operator (SIR = 0.8, 0.0 - 3.4),

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19 ABSTRACT (Continue on reverse if necessary and identify by block number) Melanoma is the second most common form of cancer after testicular cancer in males in the U.S. Navy. A wide range of occupations with varying exposures to sunlight and other possible etiologic agents occur within the Navy. In order to target possible preventive strategies, this study was done to identify occupational groups which may be at excess risk of melanoma. One hundred seventy-six confirmed cases of melanoma were ascertained in active-duty white male enlisted Navy personnel during 1974-84. Individual occupations and occupations grouped by review of job descriptions into three categories of sunlight exposure: indoor, outdoor, or both were investigated. Compared to the U.S. population, personnel in indoor occupations had a higher age-adjusted incidence rate of melanoma, 10.6 per 100,000 (p=0.06). Persons working in occupations which required spending time both indoors and outdoors had the lowest rate of 7.0 per 100,000 (p<0.06). Two single occupations were found to have elevated rates of melanoma: Aircrew Survival Equipmentman, SIR = 6.8 (p<0.05); and Engineman, SIR = 2.8 (Continued on reverse side)					
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($p < 0.05$). However, occupations with similar job descriptions had no cases of melanoma or no excess risk. Recent laboratory studies have shown that vitamin D can suppress growth of malignant melanoma cells in tissue culture. A mechanism is proposed in which vitamin D inhibits previously initiated melanomas from becoming clinically apparent.