Naval Health Research Center

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RISK OF HUMAN IMMUNODEFICIENCY VIRUS (HIV) SEROCONVERSION IN U.S. NAVY PERSONNEL FOLLOWING VISITS TO FOREIGN PORTS

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BETHESDA, MARYLAND

SUMMARY

Problem:

The Navy visited over 680 foreign ports during 1986-1990 in all continents and many islands of the world. HIV (human immunodeficiency virus-I) rates vary widely worldwide, and are high in many areas visited by the Navy.

Objective:

To assess the risk of HIV infection following visits to the 100 most frequently visited foreign ports by the U.S. Navy.

Approach:

The Naval Health Research Center in San Diego, California maintains records of all HIV ELISA and Western blot tests given in the Navy. These were used along with career histories and ship movement information to examine the relationship of visits to foreign ports with risk of HIV seropositivity and seroconversion. All visits to a port and total time in each port during the study period were examined. HIV seropositive personnel were matched on occupation, homeport, year tested, age, race, and sex. Risk was assessed using odds ratios as an estimate of relative risk.

Results:

A total of 2,272 seropositive personnel, including 813 seroconverters, were matched to 20,325 seronegative active-duty controls on age, race, sex, occupation, home port, and year of test. The ten most commonly visited ports were: Subic Bay, Philippines; Yokosuka, Japan: Diego Garcia; Sasebo, Japan; Naples, Italy; Guam; Roosevelt Roads, Puerto Rico; Rota, Spain; Bahrain; and Augusta Bay (Sicily), Italy.

Conclusions:

Despite the high endemicity of HIV seropositivity in many areas of the world visited by the U.S. Navy, no statistically significant elevated risk for visiting a foreign port was found. While there was no apparent increased risk of HIV infection following a visit to a foreign port, the possibility of a particular individual acquiring an HIV infection at a foreign port cannot be ruled out.

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Risk of Human Immunodeficiency Virus (HIV) Seroconversion in U.S. Navy Personnel Following Visits to Foreign Ports

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The Navy visited over 680 foreign ports during 1986-1990 in all continents and many islands of the world. HIV (human immunodeficiency virus-I) seroprevalence rates vary widely worldwide, and are high in many areas visited by the Navy. The Naval Health Research Center in San Diego, California maintains records of all HIV ELISA and Western blot tests given in the Navy. These were used along with career histories and ship movement information to examine the relationship of visits to foreign ports with risk of HIV seropositivity and seroconversion. A total of 2,272 seropositive personnel, including 813 seroconverters, were matched to 20,325 seronegative active-duty controls on age, race, sex, occupation, home port, and year of test. The risk of HIV infection following visits to the 100 most frequently visited foreign ports was assessed. All visits to a port and total time in each port during the study period were examined. Estimated relative risks (odds ratios) of seropositivity and seroconversion associated with visits to foreign ports showed no ports associated with a statistically significant excess risk of HIV infection for Navy personnel.

Over 680 foreign ports in nearly all the major continents and many islands around the world are visited by Navy ships. On the continent of Africa, for example, one of these ports is Mombasa, Kenya which serves seven different African countries which range deep into the interior of Africa. HIV infection (HIV-I) is common in some of the populations surrounding this port, with as many as 35 percent of transportation workers in the area of Mombasa reported as HIV seropositive (1).

Considerable variation in prevalence of HIV seropositivity, however, has been reported among African countries. No HIV seropositive individuals were identified in 536 sexually-active heterosexuals of both sexes (including 202 female prostitutes) on the coast of Sudan (2). This low rate is in marked contrast to the high seroprevalence of HIV in other sub-Saharan African countries (3) including reports of high seroprevalence in the port of Dar es Salaam, Tanzania (4). The rate of HIV seropositivity in Africa is apparently on the increase. In Nairobi, HIV seroprevalence in prostitutes rose from 4 percent in 1981 to 61 percent in 1985 (5).

Other areas of the world visited by the Navy with reportedly high rates of AIDS, and presumably high rates of HIV infection, include the Caribbean, particularly Haiti, the Bahamas, and Barbados (6); and some areas of Latin America, such as Brazil (6). In contrast, very low rates of AIDS have been reported for several major port countries in the Western Pacific (6) such as Japan, Malaysia, and the Philippines.

The Naval Health Research Center maintains an HIV Central Registry which contains records of all HIV ELISA and Western blot tests given and a career history file which contains demographic and duty station information. This file was expanded for this study to include all visits to foreign ports as determined from duty station assignments and ship movement information. The risk of HIV infection following visits to the 100 most frequently visited foreign ports was assessed by comparing the port visits of HIV seropositive personnel with those of personnel of similar age, race, sex, occupation, and home port, but who were HIV seronegative according to ELISA testing during the same year.

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Methods

ELISA testing and Western Blot confirmation.

The Naval Health Research Center in San Diego, California, maintains computerized files of the results of ELISA tests for the presence of antibodies to HIV for all persons in the Navy, and of Western blot confirmed HIV-seropositive persons identified from all Navy sources of testing, including service-wide, blood donor, and clinic screening. This system has been described previously (7).

Navy-wide testing began in the first quarter of 1986. Many individuals had several tests during 1986-1989 as a result of routine screening, testing of personnel serving in units deployable overseas, or testing of health care providers (8). Re-testing allowed identification of seroconverters, i.e., persons with an initial negative test followed by a positive test.

During 1986-1989, rosters of individuals tested were completed at 26 medical treatment facilities that performed ELISA tests. Names, identification numbers, and dates of birth of persons receiving tests were provided to the Naval Health Research Center (and to the Reportable Disease Database [RDDB] of the Defense Eligibility Enrollment Reporting System, Monterey, California), by Biotech, Inc. and North American Biologicals, Inc., which performed the tests. Identifying information was matched against the Naval Health Research Center career history file for verification of identity and to obtain demographic information. This file contains detailed individual demographic and service history information obtained from the Naval Military Personnel Command, in Washington D.C.

Records of all HIV seropositive personnel were entered into the HIV Central Registry at the Naval Health Research Center. Before entry into the registry, all seropositive individuals were confirmed by the Navy Bureau of Medicine and Surgery and the Naval Health Research Center as having two positive paired ELISA tests (from the same blood collection) followed by at least one positive Western blot assay or a positive recombinant DNA enzyme immunoassay. Individuals in the study were required to have at least two of three bands present at p24, gp41, and gp120/160, a positive recombinant DNA enzyme immunoassay, or a positive immunofluorescent antibody assay (IFA). An additional 21 individuals (including 1 seroconverter) in the study population had Western blots with band elevations at p24 or gp41 only.

ELISA testing for HIV antibody in serum or plasma was done using a human T-cell lymphotropic virus type III (HIV-I) enzyme-linked immunosorbent assay test kit (Abbott Laboratories, North Chicago IL) from January to November, 1986; and a human T-cell lymphotropic virus type III (HIV-I) ELISA test kit (Virgo Electro-Nucleonics, Columbia MD) after that date. Western blot assays were performed by Biotech Research Laboratories, Rockville MD; recombinant DNA enzyme immunoassays were performed by Cambridge Biosciences Corporation, Worcester MA.

Active-duty enlisted men in the U.S. Navy who became Western-blot positive for the first time between January 1, 1986 and June 30, 1990 were defined as seropositive. HIV seroconverters were defined as HIV seropositive (Western-blot confirmed) personnel who had a documented negative ELISA or who entered service after October 1985, when a negative ELISA became mandatory for entrance into service.

Data Sources.

The Naval Health Research Center (NHRC) HIV Central Registry contains results of all HIV tests performed. The NHRC career history file contains detailed career history information for all active-duty personnel including demographics, occupation, and duty station assignments. Ship deployment information from the Chief of Naval Operations for the period January 1, 1980 - June 30, 1990 was linked by NHRC for this study to individual records in the career history files.

Study design.

Because of previously observed associations of age, race, and sex with risk of HIV infection (7), cases and controls were matched on these characteristics. They were also matched on occupation, home port, and year tested. The following were the matching categories:

- age (grouped as: 17-19, 20-22, 23-25, 26-28, 29-31, 32-34, 35-37, 38-40, 41-43, 44-46, and 47+ years);
- race (white, black, other (Oriental, Philippine, or American Indian));
- sex;
- home port (Appendix 1);
- occupational risk group (17 groups, Appendix 2); and
- year tested.

Only complete matches were accepted. Only visits to foreign ports which occurred before the dates of the first positive test for cases and the matching negative test date for controls were included in the analysis. The term "visit" as used in this report refers to all types of port calls. All port calls were included because an opportunity for a shore visit could have occurred during port calls involving maintenance and other activities. Multiple visits to the same port during the study period were summed, yielding port-days (e.g., 3 visits for 4 days each counted as 12 port-days).

Analyses were performed separately for all HIV seropositive individuals and HIV seropositive individuals with a previous negative test (seroconverters). Separate analyses were performed for all visits, those of three or more port-days, and those of ten or more port-days.

Risk was assessed using the odds ratio as an estimate of relative risk, and 95 percent confidence limits were calculated to assess statistical significance (9-12). There were up to ten controls per case. Because of the large number of ports assessed, the Bonferroni correction for multiple

comparisons (13) was also used. Therefore, the significance level associated with the confidence intervals reported was $p < 0.0005$. No ports had relative risks (odds ratios) higher or lower than 1.0 at the $p < 0.05$ level or at the more conservative significance level yielded by the Bonferroni correction. A matched pairs analysis was also performed (11).

Results

There were 2,272 HIV seropositive individuals identified during the study period, of which 813 were seroconverters, and 20,325 controls.

There were 38,830 visits to 682 foreign ports by U.S. Navy ships during January 1986 through June 1990. The one hundred foreign ports with the most visits were determined and selected for analysis. These ports accounted for 34,448 (89 percent) of the 38,830 visits to foreign ports (Table 1 and Appendix Table 3). The ten most commonly visited ports were: Subic Bay, Philippines; Yokosuka, Japan; Diego Garcia; Sasebo, Japan; Naples, Italy; Guam; Roosevelt Roads, Puerto Rico; Rota, Spain; Bahrain; and Augusta Bay (Sicily), Italy.

There were more visits to ports in the Pacific than the Atlantic region (Appendix Table 4). The most common reason for a visit was maintenance, followed by miscellaneous calls, and inspections in port (Appendix Table 5).

Several possibly confounding variables were examined. There were 20 homeports (Appendix Table 1), and risk was seen to vary by homeport (not shown). Therefore, cases and controls were matched on home port. HIV seropositivity also varied by occupation (Appendix Table 2), so occupations with similar HIV seroprevalence rates were grouped into 17 categories of similar size, and cases and controls were matched by these categories.

Overall, there were no ports with a statistically significant excess risk of HIV infection at the $p < 0.05$ level. Relative risks of seropositivity associated with visits to foreign ports were generally less than 1.0 (Table 2). Relative risks of seroconversion associated with visits to foreign ports were also generally less than 1.0 (Table 3). When analyses were restricted to visits which lasted for three or more port-days, and for ten or more port-days, as for all visits, there were no ports with statistically significant excess risk of HIV infection (not shown).

There were no statistically significant positive associations with seropositivity (Table 2) or seroconversion (Table 3) and port visits for the geographic areas of: Africa and the Middle East; Europe; the Caribbean; Japan, Asia, the South Pacific and elsewhere in the Western Hemisphere; Central and South America; and Canada. A matched-pairs analysis using one matched control per case provided similar results (not shown).

Discussion

Despite the high endemicity of HIV seropositivity in many areas of the world visited by Navy ships (5,6,14) no statistically significantly elevated risk for visiting a foreign port by Navy personnel was found. The pattern which emerged was one of generally lower risk in Navy personnel who visited foreign ports. This was true for visits to areas of the world where HIV infection was common and areas where it has been reported to be rare.

Although this study used a nested case-control design, the biases due to selective recall, assessment of exposure, or survivorship, which can occur in case-control studies (15), are unlikely to have occurred with the universally and routinely collected information regarding port visits used in this study. The use of cases and controls with similar identifiable risk characteristics, including occupation and home port, decreased the possibility of emergence of an indirect association of visits to foreign ports and HIV infection.

The generally low relative risks associated with visits to foreign ports suggest that risk of acquisition of HIV infection while at sea or in foreign areas was less than in home ports. This may be due to differences between home and foreign ports in the occurrence of high-risk behaviors or to the effects of a reduction in risk during time at sea associated with visiting foreign ports. Information regarding behaviors associated with risk of acquisition of HIV infection has not been routinely collected in the Navy, so an assessment of these differences is not possible.

Reports of the acquisition of other sexually-transmitted diseases such as gonorrhea reflect the considerable sexual activity which occurs during travel to foreign countries (16). Much of this sexual activity is presumed to be heterosexual, often involving prostitutes. Heterosexual contacts generally may not carry the same high degree of risk of HIV infection reported to be associated with homosexual contacts (17). However, in the Caribbean, where risk of acquisition of HIV infection was seen to be low for Navy personnel, heterosexual transmission of HIV infection among the population is common (6), and a history of a contact with a prostitute of the opposite sex has been reported as a risk factor for AIDS in Haitian immigrants (18).

While there is no apparent increased risk of HIV infection following a visit to a foreign port, the possibility of a particular individual acquiring infection at a foreign port cannot be ruled out. Viral typing studies (19) of seropositive individuals known to have visited an area of high HIV endemicity, such as Mombasa, Kenya, may shed light on this possibility.

Table 1. Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

> 3,000 visits

1. Subic Bay, Philippines
2. Yokosuka, Japan

1,000 - 3,000 visits

3. Diego Garcia
4. Sasebo, Japan
5. Naples, Italy
6. Guam
7. Roosevelt Roads, Puerto Rico
8. Rota, Spain

500 - 999 visits

9. Bahrain
10. Augusta Bay, Italy
11. Hong Kong
12. Palma, Spain
13. Singapore
14. Gaeta, Italy
15. La Maddalena, Italy
16. Haifa, Israel

300 - 499 visits

17. Buckner Bay, Japan
18. Pusan, South Korea
19. Toulon, France
20. Charlotte Amalie, Virgin Is.
21. Phattaya, Thailand
22. Chinhae, South Korea
23. Guantanamo Bay, Cuba
24. Malaga, Spain
25. Okinawa, Japan

200 - 299 visits

26. Nassau, Bahamas
27. Masirah, Oman
28. P'ohang, South Korea
29. Marseilles, France
30. Fremantle, Australia
31. Holy Loch, Scotland
32. Esquimalt, Canada
33. Cartagena, Spain
34. Panama (all parts)
35. Bermuda

100 - 199 visits

36. Mombasa, Kenya
37. Cagliari, Italy
38. Athens, Greece
39. Vancouver, Canada
40. Alexandria, Egypt
41. Halifax, Canada
42. Kinred Beach, Japan
43. Portsmouth, England
44. Barcelona, Spain
45. Villefranche, France
46. Catania, Italy
47. Inchon, South Korea
48. Palermo, Italy
49. Muscat, Oman

75 - 99 visits

50. Cannes, France
51. Mazatlan, Mexico
52. Gibraltar
53. Taormina, Italy
54. Djibouti
55. Monaco
56. Sydney, Australia
57. Antalya, Turkey
58. Ao Phuket, Thailand
59. Karachi, Pakistan
60. Genoa, Italy
61. La Spezia, Italy
62. Christiansted, Virgin Is.
63. Leghorn, Italy
64. Trieste, Italy
65. Tangier, Morocco
66. Lisbon, Portugal

50 - 74 visits

67. Rio de Janeiro, Brazil
68. Freeport, Bahamas
69. Benidorm, Spain
70. Manila, Philippines
71. Soudha, Greece
72. Acapulco, Mexico
73. Izmir, Turkey
74. Kiel, Germany
75. Alicante, Spain
76. Ibiza, Spain
77. Beirut, Lebanon
78. Frederiksted, Virgin Is.
79. Valencia, Spain
80. Tunis, Tunisia
81. Glasgow, Scotland
82. Cartagena, Colombia
83. Numazu, Japan
84. San Juan, Puerto Rico
85. Fujaira, United Arab Emirates
86. Messina, Italy
87. Saipan, Pacific Islands
88. Bridgetown, Barbados
89. Plymouth, England
90. Ra's Al Hadd, Oman

< 50 visits

91. Manta, Ecuador
92. Penang, Malaysia
93. Callao, Peru
94. Istanbul, Turkey
95. Montevideo, Uruguay
96. San Remo, Italy
97. St. Martin, Netherlands Antilles
98. Valparaiso, Chile
99. Recife, Brazil
100. Montego Bay, Jamaica

Table 2. Relative risk of HIV seropositivity by ever having visited a foreign port, by region and port, active-duty U.S. Navy enlisted personnel, January 1986-June 1990.*

	Region and port	Number of cases		Number of controls		Relative risk	95 Percent confidence interval *	
		Visiting	Not visiting	Visiting	Not visiting		Lower	Upper
	Africa							
1.	Mombasa, Kenya	165	2,107	1,466	18,859	1.0	0.7	1.4
2.	Alexandria, Egypt	76	2,196	694	19,631	1.0	0.6	1.5
3.	Tangier, Morocco	25	2,247	265	20,060	0.8	0.4	1.7
4.	Tunis, Tunisia	24	2,248	291	20,034	0.7	0.4	1.5
5.	Djibouti	10	2,262	196	20,129	0.5	0.1	1.4
	Total	300	11,060	2,912	98,713	-	-	-
	Middle East							
1.	Muscat, Oman	25	2,247	224	20,101	1.0	0.5	2.1
2.	Masirah, Oman	176	2,096	1,646	18,679	1.0	0.7	1.3
3.	Haifa, Israel	150	2,122	1,479	18,846	0.9	0.7	1.2
4.	Antalya, Turkey	31	2,241	319	20,006	0.9	0.4	1.7
5.	R'as Al-Hadd, Oman	27	2,245	296	20,029	0.8	0.4	1.6
6.	Istanbul, Turkey	27	2,245	326	19,999	0.7	0.4	1.5
7.	Bahrain	60	2,212	767	19,558	0.7	0.4	1.1
8.	Fujaira, United Arab Emirates	4	2,268	53	20,272	0.7	0.1	3.8
9.	Izmir, Turkey	13	2,259	172	20,153	0.7	0.2	1.8
10.	Beirut, Lebanon	9	2,263	181	20,144	0.4	0.1	1.4
	Total	522	22,198	5,463	197,787	-	-	-
	Europe							
	Spain							
1.	Benidorm	60	2,212	601	19,724	0.9	0.6	1.4
2.	Ibiza	15	2,257	158	20,167	0.8	0.3	2.2
3.	Palma	231	2,041	2,407	17,918	0.8	0.7	1.1
4.	Rota	188	2,084	2,241	18,084	0.7	0.6	1.0
5.	Malaga	81	2,191	1,039	19,286	0.7	0.5	1.0
6.	Barcelona	40	2,232	523	19,802	0.7	0.4	1.2
7.	Alicante	7	2,265	100	20,225	0.6	0.2	2.4
8.	Cartagena	23	2,249	378	19,947	0.5	0.3	1.1
9.	Valencia	6	2,266	211	20,114	0.3	0.1	1.0
	Total	651	19,797	7,658	175,267	-	-	-
	Italy							
1.	Cagliari	24	2,248	219	20,106	1.0	0.5	2.1
2.	Naples	291	1,981	2,807	17,518	0.9	0.7	1.2
3.	Leghorn	48	2,224	476	19,849	0.9	0.5	1.5
4.	Genoa	32	2,240	321	20,004	0.9	0.5	1.7
5.	Sicily (all ports)	280	11,080	3,027	98,598	0.8	0.7	1.0
6.	San Remo	16	2,256	183	20,142	0.8	0.3	1.9
7.	La Maddalena	19	2,253	234	20,091	0.7	0.3	1.7
8.	Gaeta	74	2,198	945	19,380	0.7	0.4	1.1
9.	Trieste	46	2,226	624	19,701	0.7	0.4	1.1
10.	La Spezia	10	2,262	140	20,185	0.6	0.2	2.0
	Total	840	30,968	8,976	275,574	-	-	-
	United Kingdom							
1.	Holy Loch, Scotland	12	2,260	99	20,226	1.1	0.4	3.1
2.	Portsmouth, England	79	2,193	833	19,492	0.8	0.6	1.3
3.	Plymouth, England	7	2,265	149	20,176	0.4	0.1	1.6
4.	Glasgow, Scotland	0	2,272	12	20,313	0.0	-	-
	Total	98	8,990	1,093	80,207	-	-	-

Table 2.— *Continued*— Relative risk of HIV seropositivity by ever having visited a foreign port, by region and port, active-duty U.S. Navy enlisted personnel, January 1986-June 1990.*

Region and port	Number of cases		Number of controls		Relative risk	95 Percent confidence interval *	
	Visiting	Not visiting	Visiting	Not visiting		Lower	Upper
All Other Europe							
1. Lisbon, Portugal	42	2,230	333	19,992	1.1	0.6	2.0
2. Athens, Greece	66	2,206	644	19,681	0.9	0.6	1.4
3. Gibraltar	31	2,241	305	20,020	0.9	0.5	1.8
4. Kiel, Germany	30	2,242	296	20,029	0.9	0.5	1.8
5. Cannes, France	57	2,215	566	19,759	0.9	0.5	1.5
6. Monaco	55	2,217	547	19,778	0.9	0.5	1.5
7. Soudha, Greece	13	2,259	132	20,193	0.9	0.3	2.4
8. Toulon, France	153	2,119	1,569	18,756	0.9	0.6	1.2
9. Villefranche, France	46	2,226	495	19,830	0.8	0.5	1.4
10. Marseilles, France	60	2,212	674	19,651	0.8	0.5	1.3
Total	553	22,167	5,561	197,689	-	-	-
Caribbean							
1. Bridgetown, Barbados	35	2,237	361	19,964	0.9	0.5	1.6
2. Frederiksted, Virgin Islands	7	2,265	81	20,244	0.8	0.2	2.9
3. Freeport, Bahamas	16	2,256	194	20,131	0.7	0.3	1.8
4. Bermuda	40	2,232	493	19,832	0.7	0.4	1.3
5. Charlotte Amalie, Virgin Islands	140	2,132	1,730	18,595	0.7	0.5	1.0
6. Christiansted, Virgin Islands	19	2,253	248	20,077	0.7	0.3	1.6
7. Roosevelt Roads, Puerto Rico	130	2,142	1,735	18,590	0.7	0.5	0.9
8. Nassau, Bahamas	83	2,189	1,137	19,188	0.6	0.4	1.0
9. Guantanamo Bay, Cuba	57	2,215	901	19,424	0.6	0.3	0.9
10. San Juan, Puerto Rico	12	2,260	197	20,128	0.5	0.2	1.5
11. St. Martin, Netherlands Antilles	8	2,264	173	20,152	0.4	0.1	1.4
Total	547	24,445	7,250	216,325	-	-	-
Japan							
1. Numazu	14	2,258	121	20,204	1.0	0.4	2.8
2. Buckner Bay	77	2,195	699	19,626	1.0	0.6	1.5
3. Yokosuka	161	2,111	1,500	18,825	1.0	0.7	1.3
4. Sasebo	177	2,095	1,667	18,658	0.9	0.7	1.3
5. Okinawa	35	2,237	423	19,902	0.7	0.4	1.4
6. Kinred Beach	6	2,266	111	20,214	0.5	0.1	2.0
Total	470	13,162	4,521	117,429	-	-	-
Asia and South Pacific							
1. Manila, Philippines	49	2,223	379	19,946	1.2	0.7	2.0
2. Ao Phuket, Thailand	34	2,238	279	20,046	1.1	0.6	2.1
3. Phattaya, Thailand	149	2,123	1,320	19,005	1.0	0.7	1.4
4. Fremantle, Australia	198	2,074	1,755	18,570	1.0	0.8	1.3
5. Pusan, South Korea	183	2,089	1,671	18,654	1.0	0.7	1.3
6. P'ohang, South Korea	54	2,218	496	19,829	1.0	0.6	1.6
7. Subic Bay, Philippines	447	1,825	4,139	16,186	1.0	0.8	1.2
8. Singapore	264	2,008	2,530	17,795	0.9	0.7	1.2
9. Hong Kong	270	2,002	2,642	17,683	0.9	0.7	1.1
10. Penang, Malaysia	22	2,250	230	20,095	0.9	0.4	1.9
11. Karachi, Pakistan	62	2,210	663	19,662	0.8	0.5	1.3
12. Diego Garcia	154	2,118	1,634	18,691	0.8	0.6	1.1

Table 2.— *Continued*— **Relative risk of HIV seropositivity by ever having visited a foreign port, by region and port, active-duty U.S. Navy enlisted personnel, January 1986-June 1990.***

Region and port	Number of cases		Number of controls		Relative risk	95 Percent confidence interval *	
	Visiting	Not visiting	Visiting	Not visiting		Lower	Upper
Asia and South Pacific, continued							
13. Inchon, South Korea	26	2,246	290	20,035	0.8	0.4	1.6
14. Sydney, Australia	29	2,243	341	19,984	0.8	0.4	1.5
15. Chinhae, South Korea	46	2,226	617	19,708	0.7	0.4	1.1
16. Saipan, U.S. Trust, Pacific Islands	2	2,270	32	20,293	0.6	0.1	5.6
17. Guam	70	2,202	820	19,505	0.8	0.5	1.2
Total	2,059	36,565	19,838	325,687	-	-	-
Central and South America							
1. Acapulco, Mexico	40	2,232	374	19,951	1.0	0.5	1.7
2. Cartagena, Columbia	25	2,247	293	20,032	0.8	0.4	1.6
3. Rio de Janeiro, Brazil	22	2,250	296	20,029	0.7	0.3	1.4
4. Mazatlan, Mexico	23	2,249	325	20,000	0.6	0.3	1.3
5. Manta, Ecuador	7	2,265	107	20,218	0.6	0.2	2.2
6. Panama (all ports)	34	2,238	473	19,852	0.6	0.3	1.2
7. Recife, Brazil	5	2,267	82	20,243	0.5	0.1	2.6
8. Valparaiso, Chile	7	2,265	134	20,191	0.5	0.1	1.7
9. Montevideo, Uruguay	6	2,266	116	20,209	0.5	0.1	1.9
10. Callao, Peru	5	2,267	108	20,217	0.4	0.1	1.9
Total	174	22,546	2,308	200,942	-	-	-
Canada							
1. Esquimalt	56	2,216	681	19,644	0.7	0.4	1.2
2. Vancouver	74	2,198	995	19,330	0.7	0.4	1.0
3. Halifax	26	2,246	364	19,961	0.6	0.3	1.3
Total	156	6,660	2,040	58,935	-	-	-

* Confidence intervals were based on the Bonferroni technique in order to account for multiple comparisons. The alpha probability used was 0.05/100, or 0.0005.

Table 3. Relative risk of HIV seroconversion by ever having visited a foreign port, by region and port, active-duty U.S. Navy enlisted personnel, January 1986-June 1990.*

	Region and port	Number of cases		Number of controls		Relative risk	95 Percent confidence interval *	
		Visiting	Not visiting	Visiting	Not visiting		Lower	Upper
	Africa							
1.	Djibouti	6	807	44	6,949	1.2	0.3	5.4
2.	Mombasa, Kenya	61	752	478	6,515	1.1	0.7	1.8
3.	Alexandria, Egypt	38	775	307	6,686	1.1	0.6	2.0
4.	Tunis, Tunisia	9	804	85	6,908	0.9	0.3	3.1
5.	Tangier, Morocco	11	802	113	6,880	0.8	0.3	2.5
	Total	125	3,940	1,027	33,938	-	-	-
	Middle East							
1.	Fujaira, United Arab Emirates	4	809	30	6,963	1.1	0.2	7.4
2.	Antalya, Turkey	21	792	172	6,821	1.1	0.5	2.4
3.	Haifa, Israel	68	745	588	6,405	1.0	0.6	1.6
4.	Istanbul, Turkey	12	801	106	6,887	1.0	0.3	2.9
5.	Muscat, Oman	11	802	100	6,893	0.9	0.3	2.9
6.	Masirah, Oman	47	766	428	6,565	0.9	0.5	1.6
7.	Bahrain	31	782	299	6,694	0.9	0.5	1.7
8.	Izmir, Turkey	7	806	80	6,913	0.8	0.2	3.0
9.	Beirut, Lebanon	3	810	45	6,948	0.6	0.1	4.6
10.	R'as Al-Hadd, Oman	0	813	0	6,993	-	-	-
	Total	204	7,926	1,848	68,082	-	-	-
	Europe							
	Spain							
1.	Ibiza	10	803	58	6,935	1.5	0.4	5.0
2.	Palma	106	707	896	6,097	1.0	0.7	1.5
3.	Malaga	34	779	304	6,689	1.0	0.5	1.8
4.	Rota	77	736	736	6,257	0.9	0.6	1.4
5.	Alicante	5	808	48	6,945	0.9	0.2	4.7
6.	Barcelona	16	797	170	6,823	0.8	0.3	2.0
7.	Benidorm	27	786	287	6,706	0.8	0.4	1.6
8.	Cartagena	15	798	177	6,816	0.7	0.3	1.9
9.	Valencia	3	810	88	6,905	0.3	0.0	2.3
	Total	293	7,024	2,764	60,173	-	-	-
	Italy							
1.	Leghorn	24	789	177	6,816	1.2	0.5	2.5
2.	Naples	127	686	973	5,020	1.1	0.8	1.6
3.	Gaeta	34	779	283	6,710	1.0	0.5	2.0
4.	Sicily (all ports)	133	3,932	1,107	33,858	1.0	0.7	1.4
5.	Trieste	24	789	201	6,792	1.0	0.5	2.2
6.	San Remo, Italy	7	806	59	6,934	1.0	0.2	4.2
7.	Genoa	16	797	136	6,857	1.0	0.4	2.6
8.	La Maddalena	8	805	71	6,922	1.0	0.3	3.6
9.	Cagliari	17	796	152	6,841	1.0	0.4	2.4
10.	La Spezia	6	807	69	6,924	0.7	0.2	3.3
	Total	396	10,986	3,228	94,674	-	-	-
	United Kingdom							
1.	Holy Loch, Scotland	2	811	19	6,974	0.9	0.1	12.3
2.	Portsmouth, England	26	787	259	6,734	0.9	0.4	1.8
3.	Plymouth, England	2	811	53	6,940	0.3	0.0	4.0
4.	Glasgow, Scotland	0	813	3	6,990	-	-	-
	Total	30	3,222	334	27,638	-	-	-

Table 3.— *Continued*— Relative risk of HIV seroconversion by ever having visited a foreign port, by region and port, active-duty U.S. Navy enlisted personnel, January 1986-June 1990.*

	Region and port	Number of cases		Number of controls		Relative risk	95 Percent confidence interval *	
		Visiting	Not visiting	Visiting	Not visiting		Lower	Upper
	All Other Europe							
1.	Soudha, Greece	6	807	42	6,951	1.2	0.3	5.7
2.	Toulon, France	78	735	586	6,407	1.2	0.7	1.8
3.	Lisbon, Portugal	14	799	105	6,888	1.1	0.4	3.1
4.	Athens, Greece	23	790	181	6,812	1.1	0.5	2.4
5.	Villefranche, France	22	791	190	6,803	1.0	0.4	2.2
6.	Marseilles, France	42	771	371	6,622	1.0	0.5	1.7
7.	Gibraltar	13	800	118	6,875	0.9	0.3	2.7
8.	Cannes, France	32	781	306	6,687	0.9	0.5	1.7
9.	Monaco	19	794	207	6,786	0.8	0.3	1.8
10.	Kiel, Germany	11	802	123	6,870	0.8	0.3	2.3
	Total	260	7,870	2,229	67,701	-	-	-
	Caribbean							
1.	Frederiksted, Virgin Islands	6	807	41	6,952	1.3	0.3	5.9
2.	Christiansted, Virgin Islands	8	805	67	6,926	1.0	0.3	3.8
3.	San Juan, Puerto Rico	5	808	42	6,951	1.0	0.2	5.4
4.	Nassau, Bahamas	37	776	389	6,604	0.8	0.4	1.5
5.	Roosevelt Roads, Puerto Rico	55	758	587	6,406	0.8	0.5	1.3
6.	Bermuda	13	800	141	6,852	0.8	0.3	2.2
7.	Charlotte Amalie, Virgin Islands	59	754	641	6,352	0.8	0.5	1.3
8.	Guantanamo Bay, Cuba	26	787	286	6,707	0.8	0.4	1.6
9.	Freeport, Bahamas	6	807	72	6,921	0.7	0.2	3.2
10.	Bridgetown, Barbados	8	805	98	6,895	0.7	0.2	2.6
11.	St Martin, Netherlands Antilles	4	809	81	6,912	0.4	0.1	2.6
	Total	227	8,716	2,445	74,478	-	-	-
	Japan							
1.	Buckner Bay	25	788	254	6,739	0.8	0.4	1.8
2.	Sasebo	45	768	510	6,483	0.7	0.4	1.3
3.	Yokosuka	39	774	456	6,537	0.7	0.4	1.3
4.	Kinred Beach	3	810	51	6,942	0.5	0.1	4.1
5.	Numazu	2	811	40	6,953	0.4	0.0	5.5
6.	Okinawa	3	810	61	6,932	0.4	0.1	3.4
	Total	117	4,761	1,372	40,586	-	-	-
	Asia and South Pacific							
1.	Sydney, Australia	28	785	165	6,828	1.5	0.7	3.1
2.	Karachi, Pakistan	26	787	189	6,804	1.2	0.6	2.5
3.	Fremantle, Australia	71	742	546	6,447	1.1	0.7	1.8
4.	Subic Bay, Philippines	150	663	1,318	5,675	1.0	0.7	1.4
5.	Diego Garcia	66	747	601	6,392	0.9	0.6	1.5
6.	Manila, Philippines	12	801	111	6,882	0.9	0.3	2.7
7.	Pusan, South Korea	69	744	666	6,327	0.9	0.6	1.4
8.	Phattaya, Thailand	54	759	531	6,462	0.9	0.5	1.5
9.	Singapore	83	730	816	6,177	0.9	0.6	1.3
10.	Ao Phuket, Thailand	13	800	134	6,859	0.8	0.3	2.3
11.	Guam	23	790	237	6,756	0.8	0.4	1.8
12.	Hong Kong	89	724	927	6,066	0.8	0.5	1.2
13.	P'ohang, South Korea	18	795	200	6,793	0.8	0.3	1.8

Table 3.— *Continued*— Relative risk of HIV seroconversion by ever having visited a foreign port, by region and port, active-duty U.S. Navy enlisted personnel, January 1986-June 1990.*

Region and port	Number of cases		Number of controls		Relative risk	95 Percent confidence interval *	
	Visiting	Not visiting	Visiting	Not visiting		Lower	Upper
Asia and South Pacific, continued							
14. Inchon, South Korea	9	804	116	6,877	0.7	0.2	2.2
15. Chinhae, South Korea	13	800	182	6,811	0.6	0.2	1.7
16. Saipan, U.S. Trust, Pacific Islands	1	812	16	6,977	0.5	0.0	20.0
17. Penang, Malaysia	4	809	68	6,925	0.5	0.1	3.1
Total	729	13,092	6,823	112,058	-	-	-
Central and South America							
1. Acapulco, Mexico	14	799	98	6,895	1.2	0.4	3.4
2. Panama	15	798	138	6,855	0.9	0.4	2.4
3. Rio de Janeiro, Brazil	13	800	124	6,869	0.9	0.3	2.5
4. Cartagena, Columbia	9	804	86	6,907	0.9	0.3	3.1
5. Recife, Brazil	3	810	30	6,963	0.9	0.1	7.2
6. Manta, Ecuador	4	809	42	6,951	0.8	0.1	5.1
7. Valparaiso, Chile	4	809	49	6,944	0.7	0.1	4.4
8. Montevideo, Uraguay	3	810	40	6,953	0.6	0.1	5.3
9. Mazatlan, Mexico	7	806	124	6,869	0.5	0.1	1.9
10. Callao, Peru	2	811	36	6,957	0.5	0.0	6.1
Total	74	8,056	767	69,163	-	-	-
Canada							
1. Esquimalt	20	793	216	6,777	0.8	0.3	1.8
2. Vancouver	29	784	356	6,637	0.7	0.3	1.4
3. Halifax	11	802	141	6,852	0.7	0.2	2.0
Total	60	2,379	713	20,266	-	-	-

* Confidence intervals were based on the Bonferroni technique in order to account for multiple comparisons. The alpha probability used wa 0.05/100, or 0.0005. (3.1)

Appendix 1. U.S. Navy Home Ports, January 1986-December 1989.

Boston MA; Brunswick ME; Charleston SC; Chicago IL; Jacksonville FL; Long Beach CA; Miami FL; New London CT; New Orleans LA; New York NY; Newport RI; Norfolk VA; Overseas Atlantic; Overseas Pacific; Pearl Harbor HI; Philadelphia PA; San Francisco CA; San Diego CA; Seattle WA; Washington DC.

Appendix 2. Occupational risk groups (based on crude HIV seropositivity rates), by occupations included, U.S. Navy active-duty personnel.

Group 1 (highest seropositivity rate): Legalman, Yeoman, Personnelman, Training device man, Illustrator-draftsman; Group 2: Hospital corpsman; Group 3: Religious program aide, Ship's serviceman, Musician, Journalist, Signalman, Mess management specialist; Group 4: Aviation maintenance administrationman, Storekeeper, Dental technician, Aviation storekeeper, Disbursing clerk; Group 5: Quartermaster, Data processing technician, Data systems technician, Intelligence specialist, Radioman; Group 6: Operations specialist, Electronic warfare technician, Photographer's mate, Boatswain's mate, Postal clerk, Missile technician, Aerographer's mate, Navy counselor; Group 7: Seaman; Group 8: Torpedoman's mate, Interior communications electrician, Lithographer, Aviation support equipment technician, Aircrew survival equipmentman, Fire controlman, Cryptologic technician; Group 9: Constructionman, Aviation boatswain's mate, Sonar technician, Electrician's mate; Group 10: Engineering aide, Boiler technician, Electronics technician, air controlman; Group 11: Aviation fire control technician, Aviation antisubmarine warfare operator, Instrumentman, Aviation electronics technician, Avionics technician, Gunner's mate, Aviation antisubmarine warfare technician; Group 12: Machinist's mate, Machinery repairman; Group 13: Aviation structural mechanic, Engineman, Weapons technician; Group 14: Aviation electrician's mate, Master-at-arms, Aviation ordnanceman, Fire control technician, Hull maintenance technician; Group 15: Aviation machinist's mate, Airman, Construction mechanic; Group 16: Fireman, Construction electrician, Gas turbine system technician, Ocean system technician, Equipment operator; Group 17 (lowest seropositivity rate): Builder, Damage controlman, Utilitiesman, Steelworker, Mineman, Opticalman, Aircraft maintenance technician, Molder, Patternmaker, Utilities constructionman, Equipmentman, Precision instrumentman.

Appendix Table 3. Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits		Foreign port	No. of visits
1.	Subic Bay, Philippines	5,614	51.	Mazatlan, Mexico	98
2.	Yokosuka, Japan	3,149	52.	Gibraltar	96
3.	Diego Garcia	1,825	53.	Taormina, Italy	96
4.	Sasebo, Japan	1,452	54.	Djibouti	92
5.	Naples, Italy	1,445	55.	Monaco	92
6.	Guam	1,233	56.	Sydney, Australia	92
7.	Roosevelt Roads, Puerto Rico	1,228	57.	Antalya, Turkey	89
8.	Rota, Spain	1,202	58.	Ao Phuket, Thailand	87
9.	Bahrain	946	59.	Karachi, Pakistan	87
10.	Augusta Bay, Italy	878	60.	Genoa, Italy	84
11.	Hong Kong	769	61.	La Spezia, Italy	84
12.	Palma, Spain	758	62.	Christiansted, Virgin Islands	83
13.	Singapore	717	63.	Leghorn, Italy	83
14.	Gaeta, Italy	589	64.	Trieste, Italy	77
15.	La Maddalena, Italy	528	65.	Tangier, Morocco	76
16.	Haifa, Israel	500	66.	Lisbon, Portugal	75
17.	Buckner Bay, Japan	497	67.	Rio de Janeiro, Brazil	72
18.	Pusan, South Korea	473	68.	Freeport, Bahamas	71
19.	Toulon, France	461	69.	Benidorm, Spain	69
20.	Charlotte Amalie, Virgin Islands	420	70.	Manila, Philippines	69
21.	Phattaya, Thailand	362	71.	Soudha, Greece	69
22.	Chinhae, South Korea	338	72.	Acapulco, Mexico	68
23.	Guantanamo Bay, Cuba	338	73.	Izmir, Turkey	68
24.	Malaga, Spain	319	74.	Kiel, Germany	68
25.	Okinawa, Japan	305	75.	Alicante, Spain	63
26.	Nassau, Bahamas	299	76.	Ibiza, Spain	61
27.	Al-Masirah, Oman	298	77.	Beirut, Lebanon	60
28.	P'ohang, South Korea	287	78.	Frederiksted, Virgin Islands	60
29.	Marseilles, France	275	79.	Valencia, Spain	59
30.	Fremantle, Australia	267	80.	Tunis, Tunisia	58
31.	Holy Loch, Scotland	264	81.	Glasgow, Scotland	57
32.	Esquimalt, Canada	245	82.	Cartagena, Colombia	55
33.	Cartagena, Spain	206	83.	Numazu, Japan	55
34.	Panama	256	84.	San Juan, Puerto Rico	55
35.	Bermuda	201	85.	Fujaira, United Arab Emirates	52
36.	Mombasa, Kenya	199	86.	Messina, Italy	51
37.	Cagliari, Italy	194	87.	Saipan, Trust Pacific Islands	51
38.	Athens, Greece	177	88.	Bridgetown, Barbados	50
39.	Vancouver, Canada	172	89.	Plymouth, England	50
40.	Alexandria, Egypt	170	90.	Ra's Al-Hadd, Oman	50
41.	Halifax, Canada	170	91.	Manta, Ecuador	47
42.	Kinred Beach, Japan	169	92.	Penang, Malaysia	47
43.	Portsmouth, England	153	93.	Callao, Peru	46
44.	Barcelona, Spain	150	94.	Istanbul, Turkey	46
45.	Villefranche, France	133	95.	Montevideo, Uruguay	46
46.	Catania, Italy	126	96.	San Remo, Italy	45
47.	Inchon, South Korea	105	97.	St. Martin, Netherlands Antilles	45
48.	Palermo, Italy	103	98.	Valparaiso, Chile	45
49.	Muscat, Oman	101	99.	Recife, Brazil	44
50.	Cannes, France	98	100.	Montego Bay, Jamaica	41

Appendix Table 3.— *Continued*— Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits		Foreign port	No. of visits
101.	Salvador, Brazil	41	151.	Santo Domingo, Dominican Republic	24
102.	Puerto Cortes, Honduras	40	152.	Suez, Egypt	24
103.	Sattahip, Thailand	40	153.	Melbourne, Australia	23
104.	St. Georges, Grenada	40	154.	Abidjan, Ivory Coast	22
105.	Talcahuano, Chile	40	155.	Antwerp, Belgium	22
106.	Taranto, Italy	40	156.	Barbados, Netherlands Antilles	22
107.	Colombo, Sri Lanka	37	157.	Rosyth, Scotland	22
108.	La Guaira , Venezuela	37	158.	Syracuse, Italy	22
109.	Ashdod, Israel	31	159.	Trondheim, Norway	22
110.	Copenhagen, Denmark	36	160.	Wilhelmshaven, Germany	22
111.	Brisbane, Australia	35	161.	Bremerhaven, Germany	21
112.	Darwin, Australia	35	162.	Constanta, Romania	21
113.	Pollensa, Spain	35	163.	Edinburgh, Scotland	21
114.	Punta Arenas, Chile	35	164.	Male, Maldives	21
115.	Kingston, Jamaica	34	165.	Puerto Vallarta, Mexico	21
116.	Vieques, Puerto Rico	33	166.	Tromso, Norway	21
117.	Martinique, Netherlands Antilles	32	167.	Aalborg, Denmark	20
118.	Ocho Rios, Jamaica	32	168.	Auckland, New Zealand	20
119.	Dubai, United Arab Emirates	31	169.	Bergen, Norway	20
120.	Iskenderun, Turkey	31	170.	Den Helder, Netherlands	20
121.	Venice, Italy	31	171.	Puerto Belgrano, Argentina	20
122.	Beppu, Japan	30	172.	Cavalaire, France	18
123.	Brest, France	30	173.	Jubail, Lebanon	18
124.	Cebu, Philippines	30	174.	Willemstad, Netherlands	18
125.	Golcuk, Turkey	30	175.	Kalamai, Greece	19
126.	Pago Pago, American Samoa	30	176.	Port of Spain, Trinidad	18
127.	Tela, Honduras	30	177.	Puerto Monit, Chile	18
128.	Ad Dammam, Saudi Arabia	29	178.	St. Raphael, France	18
129.	Bunbury, Australia	29	179.	Victoria, Canada	18
130.	Curacao, Netherlands Antilles	29	180.	Shimoda, Japan	17
131.	Grand Cayman, Cayman Islands	29	181.	Ora Wan, Japan	16
132.	Kure, Japan	29	182.	Sorreisa, Norway	16
133.	Port Mahon, Spain	29	183.	St. Maxime, France	16
134.	Amsterdam, Netherlands	28	184.	Surabaya, Indonesia	16
135.	Geraldton, Australia	28	185.	Suva, Fiji	16
136.	Kagoshima, Japan	28	186.	Tinian, Trust Pacific Islands	16
137.	Aruba, Netherlands Antilles	27	187.	Antofagasta, Chile	15
138.	Maizur, Japan	27	188.	Hobart, Australia	15
139.	Mina Sulman, Bahrain	27	189.	Mogadiscio, Somalia	15
140.	Aarhus, Denmark	26	190.	Montserrat, Netherlands Antilles	15
141.	Dubrovnik, Yugoslavia	26	191.	Perth, Australia	15
142.	Oslo, Norway	26	192.	Ponta Delgada, Portugal	15
143.	Port Louis, Mauritius	26	193.	Puerto La Cruz, Venezuela	15
144.	Berbera, Somalia	25	194.	Riposto, Italy	15
145.	Eniwetok Atoll, Trust Pacific Islands	25	195.	Road Town, Puerto Rico	15
146.	Iwakuni, Japan	25	196.	St. Johns, Antigua	15
147.	Abu Dhabi, United Arab Emirates	24	197.	Zeebrugge, Belgium	15
148.	Antigua	24	198.	Albany, Australia	14
149.	Port Victoria, Seychelles	24	199.	Cozumel, Mexico	14
150.	Rotterdam, Netherlands	24	200.	Ensenada, Mexico	14

Appendix Table 3. – *Continued*— Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits		Foreign port	No. of visits
201.	Le Havre, France	14	251.	Kwajalein Island, Trust Pacific Islands	9
202.	Leith, Scotland	14	252.	Lae, Papua New Guinea	9
203.	Maracaibo, Venezuela	14	253.	Muroran, Japan	9
204.	Montreal, Canada	14	254.	Ominato, Japan	9
205.	Roseau, Dominica	14	255.	Pointe a Pitre, Guadeloupe	9
206.	Split, Yugoslavia	14	256.	Puerto Cabello, Venezuela	9
207.	St. Christopher, St. Christopher-Nevis	14	257.	Pulau Tioman, Malaysia	9
208.	Madiq Jubal, Saudi Arabia	13	258.	Rabaul, Papua New Guinea	9
209.	Hamburg, Germany	13	259.	Reyjavik, Iceland	9
210.	St. Tropez, France	13	260.	St. Johns, Canada	9
211.	Stockholm, Sweden	13	261.	Santa Isabel, Solomon Islands	9
212.	Almeria, Spain	12	262.	St.-Cyr-sur-Mer, France	9
213.	Bizerte, Tunisia	12	263.	Ulsan, Korea Republic	9
214.	Brunei Town, Brunei	12	264.	Algiers, Algeria	8
215.	Charlestown, St. Christopher-Nevis	12	265.	Bari, Italy	8
216.	Haakonsvern, Norway	12	266.	Cairns Harbor, Australia	8
217.	Limon, Honduras	12	267.	Cochin, India	8
218.	Lumut, Malaysia	12	268.	Duala, Cameroon	8
219.	Menton, France	12	269.	Esmeraldas, Ecuador	8
220.	Puerto Quetzal, Guatemala	12	270.	Finale Lagur, Italy	8
221.	Quebec, Canada	12	271.	Guayaquil, Ecuador	8
222.	R'as Al Khaimah, United Arab Emirates	12	272.	Kristiansand, Norway	8
223.	Castries, St. Lucia	11	273.	La Ceiba, Honduras	8
224.	Dakar, Senegal	11	274.	Lagos, Nigeria	8
225.	Fukuoka, Japan	11	275.	Noumea, New Caledonia	8
226.	Narvik, Norway	11	276.	Nukualofa, Tonga	8
227.	Rapallo, Italy	11	277.	Otaru, Japan	8
228.	Rijeka, Yugoslavia	11	278.	Port Moresby, Papua New Guinea	8
229.	Sousse, Indonesia	11	279.	Santos, Brazil	8
230.	Southhampton, England	11	280.	Songkhla, Thailand	8
231.	St. Vincent, Portugal	11	281.	Stirling, Australia	8
232.	Thailand (not otherwise specified)	11	282.	Toronto, Canada	8
233.	Theoule, France	11	283.	Torquay, England	8
234.	Tonga	11	284.	Truk Island, Trust Pacific Islands	8
235.	Apia, Western Samoa	10	285.	Ancona, Italy	7
236.	Al-Aqaba, Jordan	10	286.	Bombay, India	7
237.	Casablanca, Morocco	10	287.	Calvi, Italy	7
238.	Honaira, Solomon Islands	10	288.	Civitavecchia, Italy	7
239.	Jiddah, Saudi Arabia	10	289.	Conakry, Guinea	7
240.	Liverpool, England	10	290.	Frederikshaven, Denmark	7
241.	Monrovia, Liberia	10	291.	Ghent, Belgium	7
242.	Palau Islands, Italy	10	292.	Libreville, Gabon	7
243.	Isle of Portland, England	10	293.	Lome, Togo	7
244.	Punta Del Este, Uruguay	10	294.	Matadi, Zaire	7
245.	Santo Tomas, Guatamala	10	295.	Midway Islands, U.S.	7
246.	Bali, Indonesia	9	296.	Newcastle, England	7
247.	Belize	9	297.	Oranjestad, Netherlands Antilles	7
248.	Cork, Ireland	9	298.	Phillipsburg, Netherlands Antilles	7
249.	Hakodate, Japan	9	299.	Port-Au-Prince, Haiti	7
250.	Helsinki, Finland	9	300.	Port Madryn, Argentina	7

Appendix Table 3.— *Continued*— Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits		Foreign port	No. of visits
301.	Port Said, Egypt	7	351.	Oostende, Belgium	5
302.	Santa Cruz, Spain	7	352.	Port Antonio, Jamaica	5
303.	Stavanger, Norway	7	353.	Port Colborne, Canada	5
304.	Townsville, Australia	7	354.	Port Sudan, Sudan	5
305.	Wellington, New Zealand	7	355.	Puerto Castilla, Honduras	5
306.	Ajaccio, France	6	356.	Puerto Plata, Dominican Republic	5
307.	Akizuki, Japan	6	357.	Salerno, Italy	5
308.	Algeciras, Spain	6	358.	Santa Cruz, Spain	5
309.	Azores, Portugal	6	359.	Sayda, Lebanon	5
310.	Banjul, Gambia	6	360.	Tema, Ghana	5
311.	Bissao, Guinea Bissau	6	361.	Tengan, Japan	5
312.	Bodo, Norway	6	362.	Ulithi, Trust Pacific Islands	5
313.	Bonaire Island, Netherlands Antilles	6	363.	Vieux Fort, St. Lucia	5
314.	Capri Island, Italy	6	364.	Virgin Islands (not otherwise specified)	5
315.	Castro, Chile	6	365.	Windsor, Canada	5
316.	Cheju, South Korea	6	366.	Ayr, Scotland	4
317.	Cherbourg, France	6	367.	Bacolod, Philippines	4
318.	Djakarta, Indonesia	6	368.	Balearic Basin	4
319.	Falmouth, England	6	369.	Caracas, Venezuela	4
320.	Freetown, Sierra Leone	6	370.	Chittagong, Bangladesh	4
321.	Funchal, Portugal	6	371.	Cockburn Sound, Australia	4
322.	Greenock, Scotland	6	372.	Devonport, England	4
323.	Kingstown, St. Vincent	6	373.	Doha, Bahrain	4
324.	Menzel Bourguiba, Tunisia	6	374.	Douarenez, France	4
325.	Okpo, Korea Republic	6	375.	Gijon, Spain	4
326.	Ponape, Trust Pacific Islands	6	376.	Goteborg, Sweden	4
327.	Port Adelaide, Australia	6	377.	Harstad, Norway	4
328.	Puerto Aldea, Chile	6	378.	Jamaica, Netherlands Antilles	4
329.	Puerto Lempira, Honduras	6	379.	Largo, England	4
330.	Puerto Princesa, Philippines	6	380.	Loch Ewe, Scotland	4
331.	Sao Tome, Brazil	6	381.	London, England	4
332.	Shanghai, China	6	382.	Mackay, Australia	4
333.	Windsor, Canada	6	383.	Manzanillo, Mexico	4
334.	Zamboanga, Philippines	6	384.	Mejillones, Chile	4
335.	Alghero, Italy	5	385.	Napier, New Zealand	4
336.	Anguilla	5	386.	Ponce, Puerto Rico	4
337.	Ascension, Chile	5	387.	Porto, Portugal	4
338.	Basse Terre, Guadeloupe	5	388.	Praia, Cape Verde	4
339.	Bogen, Norway	5	389.	Quellon, Chile	4
340.	Bremen, Germany	5	390.	San Fernando, Philippines	4
341.	Brindisi, Italy	5	391.	Scapa Flow, Orkney Islands, England	4
342.	Canary Islands	5	392.	Sete, France	4
343.	Dublin, Ireland	5	393.	St. Margarets Bay, Canada	4
344.	Esbjerg, Denmark	5	394.	Tacloban, Philippines	4
345.	Fortaleza, Brazil	5	395.	Tauranga, New Zealand	4
346.	Fredrikstad, Norway	5	396.	Tomakomai, Japan	4
347.	Kuwait	5	397.	Vila, Vanuatu	4
348.	Legaspi, Philippines	5	398.	Wakkanai, Japan	4
349.	Lorient, France	5	399.	Ancon, Peru	3
350.	Nanoose Harbor, Canada	5	400.	Biarritz, France	3

Appendix Table 3.— *Continued*— Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits		Foreign port	No. of visits
401.	Bordeaux, France	3	451.	Bay of Bengal	2
402.	Cancun, Mexico	3	452.	Buenos Aires, Argentina	2
403.	Ch'ing-Tao, China	3	453.	Burnie, Australia	2
404.	Cobh, Ireland	3	454.	Caldera, Costa Rica	2
405.	Cotonou, Benin	3	455.	Campbeltown, England	2
406.	Dumagete, Philippines	3	456.	Cape Verde Islands	2
407.	Dundee, Scotland	3	457.	Cardiff, England	2
408.	Dunkerque, France	3	458.	Castellamare di Stabia, Italy	2
409.	El Ferrol, Spain	3	459.	Catalina, Canada	2
410.	Funafuti, Gilbert & Ellice Islands	3	460.	Chatham, England	2
411.	Gan, China	3	461.	Covenas, Colombia	2
412.	Gdansk, Poland	3	462.	Cuxhaven, Germany	2
413.	Golfe Juan, France	3	463.	Davao, Philippines	2
414.	Gustavia, Virgin Islands	3	464.	Dieppe, France	2
415.	Hachinoe, Japan	3	465.	Douglas, England	2
416.	Hammerfest, Norway	3	466.	Eregli, Turkey	2
417.	Hodeida, Yemen	3	467.	Eta Jima, Japan	2
418.	Iloilo, Philippines	3	468.	Exuma Sound, Bahamas	2
419.	Ischia, Italy	3	469.	Haugesund, Norway	2
420.	Khor Al Ami, Kuwait	3	470.	Ilo, Peru	2
421.	Kisimayu, Somalia	3	471.	Isle of Man, England	2
422.	Lagos, Portugal	3	472.	Iwo Jima, Japan	2
423.	Loch Striven, Scotland	3	473.	Jervis Bay, Australia	2
424.	Manus Island, Papua New Guinea	3	474.	Kerkira, Greece	2
425.	Marianas, Trust Pacific Islands	3	475.	La Napoule, France	2
426.	Nagasaki, Japan	3	476.	Langkawi, Malaysia	2
427.	Nice, France	3	477.	Larnaca, Cyprus	2
428.	Oran, Algeria	3	478.	Las Palmas, Spain	2
429.	Paita, Peru	3	479.	Lautoka, Fiji	2
430.	Palau, Italy	3	480.	Leixoes, Portugal	2
431.	Philippine Islands (not otherwise specified)	3	481.	Madras, India	2
432.	Pictou, Canada	3	482.	Malacca (Strait of), Malaysia	2
433.	Pisco, Peru	3	483.	Malmo, Sweden	2
434.	Porlamar, Venezuela	3	484.	Mariambia, Brazil	2
435.	Port Hedland, Australia	3	485.	Marmaris, Turkey	2
436.	Porto Torres, Italy	3	486.	Marshall Islands (not otherwise specified)	2
437.	San Andres, Colombia	3	487.	Medan, Indonesia	2
438.	Sharjah, United Arab Emirates	3	488.	Medronheira, Portugal	2
439.	St. John, Virgin Islands	3	489.	Monserat, Philippines	2
440.	St. Nazaire, France	3	490.	Mount Maunga, Japan	2
441.	St. Theodore, Greece	3	491.	Nanaimo, Canada	2
442.	Tabones, Philippines	3	492.	Natal, Brazil	2
443.	Trincomalee, Sri Lanka/Ceylon	3	493.	Nelson, New Zealand	2
444.	Trujillo, Honduras	3	494.	Newcastle, Australia	2
445.	Turku, Finland	3	495.	Nouakchott, Mauritania	2
446.	Whangarei, New Zealand	3	496.	Port Arthur, Canada	2
447.	Agadir, Morocco	2	497.	Pointe Noire, Congo	2
448.	Alassio, Italy	2	498.	Port Gentil, Gabon	2
449.	Antibes, France	2	499.	Port Vendres, France	2
450.	Bastia, France	2	500.	Porto Grande, Cape Verde Islands	2

Appendix Table 3.— *Continued*— Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits		Foreign port	No. of visits
501.	Portofino, Italy	2	551.	Cavite, Philippines	1
502.	Powell River, Canada	2	552.	Cayman Brac, Cayman Islands	1
503.	Pozzuoli, Italy	2	553.	Cesareo, Italy	1
504.	Puerto Cardon, Venezuela	2	554.	Chah Bahar, Iran	1
505.	Reggio Di Calabria, Italy	2	555.	Charlestown, Scotland	1
506.	Reunion Island, Reunion	2	556.	Charlottetown, Canada	1
507.	Rhodes, Greece	2	557.	Christmas Island, Australia	1
508.	Santa Cruz, Argentina	2	558.	Clark Air Base, Philippines	1
509.	San Salvador, Bahama Islands	2	559.	Colonia, Trust Pacific Islands	1
510.	Senzaki, Japan	2	560.	Coquimbo, Chile	1
511.	Sevastopolskaya, Soviet Union	2	561.	Corner Brook, Canada	1
512.	Skiathos, Greece	2	562.	Crotone, Italy	1
513.	Solomon Islands (not otherwise specified)	2	563.	Cruz Bay, Virgin Islands	1
514.	Syra, Greece	2	564.	Cubi Point, Philippines	1
515.	Terneuzen, Netherlands	2	565.	Deal, England	1
516.	Thessaloniki, Greece	2	566.	Devonport, Australia	1
517.	Tumaco, Colombia	2	567.	Diego Suarez, Madagascar	1
518.	Ud Jung, Indonesia	2	568.	Dumai, Indonesia	1
519.	Vlissingen, Netherlands	2	569.	Dunedin, New Zealand	1
520.	Volos, Greece	2	570.	Emden, Germany	1
521.	Wilmington, Netherlands	2	571.	Esperance, Australia	1
522.	Workington, England	2	572.	Fais Islands, Trust Pacific Islands	1
523.	Yap, Pacific Trust Islands	2	573.	Faeroe Islands, Denmark	1
524.	Zihuatanejo, Mexico	2	574.	Firth of Clyde, England	1
525.	Ad Dawhah, Qatar	1	575.	Flensburg, Germany	1
526.	Al Hoceima, Morocco	1	576.	Formia, Italy	1
527.	Alas, Indonesia	1	577.	Fredericia, Denmark	1
528.	Alberni, Canada	1	578.	Geelong, Australia	1
529.	Alesund, Norway	1	579.	Gela, Italy	1
530.	Anguar, Pacific Trust Islands	1	580.	Georgetown, Guyana	1
531.	Aomori, Japan	1	581.	Gisborne, New Zealand	1
532.	Argentia, Canada	1	582.	Gladstone, Australia	1
533.	Bahama Islands (not otherwise specified)	1	583.	Gove, Australia	1
534.	Baie Comeau, Canada	1	584.	Grimsby, England	1
535.	Bandol, France	1	585.	Hakata, Japan	1
536.	Banyuwangi, Indonesia	1	586.	Hillsborough Bay, Canada	1
537.	Bataan, Philippines	1	587.	Hilton, Canada	1
538.	Belawan-Deli, Indonesia	1	588.	Hiro, Japan	1
539.	Belem, Brazil	1	589.	Hiroshima, Japan	1
540.	Bell Bay, Australia	1	590.	Iraklion, Greece	1
541.	Beira, Mozambique	1	591.	Isola Di San Pie, Italy	1
542.	Beykoz, Turkey	1	592.	Isola Panarea, Italy	1
543.	Bluff Harbor, New Zealand	1	593.	King Sound, Australia	1
544.	Bonny, Nigeria	1	594.	Klang, Malaysia	1
545.	Brockville, Canada	1	595.	Koror, Trust Pacific Islands	1
546.	Burghead, Scotland	1	596.	Kosrae, Trust Pacific Islands	1
547.	Camp Garcia, Puerto Rico	1	597.	Kristansund, Norway	1
548.	Cape Haitien, Haiti	1	598.	Kuching, Malaysia	1
549.	Capo Teulada, Italy	1	599.	Kusadasi, Turkey	1
550.	Cavalla, Greece	1	600.	Kushiro, Japan	1

Appendix Table 3.— *Continued*— Foreign ports by number of ship visits, U.S. Navy, January 1986 to June 1990.

	Foreign port	No. of visits
601.	Larvik, Norway	1
602.	Launceston, Australia	1
603.	Lubeck, Germany	1
604.	Luzon, Philippines	1
605.	Majunga, Madagasgar	1
606.	Majuro Atoll, Pacific Trust Islands	1
607.	Makassar, Indonesia	1
608.	Manama, Bahrain	1
609.	Margate, England	1
610.	Marsaxlokk, Malta	1
611.	Mutsamudu, Comoro Islands	1
612.	Mayaguez, Puerto Rico	1
613.	Mersin, Turkey	1
614.	Milford Haven, England	1
615.	Mina Al Fahal, Kuwait	1
616.	Mina Jebel Ali, United Arab Emirates	1
617.	Mindoro, Philippines	1
618.	Mitsuhama, Japan	1
619.	Mokpo, South Korea	1
620.	Mormugao, India	1
621.	Moroni, Comoro Islands	1
622.	Mykonos, Greece	1
623.	Namsos, Norway	1
624.	Nelson, Canada	1
625.	Ngatik, Trust Pacific Islands	1
626.	Nouhadibou, Mauritania	1
627.	Nyhamn, Sweden	1
628.	Oita, Japan	1
629.	Olbia, Italy	1
630.	Onslow, Australia	1
631.	Osaka, Japan	1
632.	Padang, Indonesia	1
633.	Pangkor, Malaysia	1
634.	Playa De Fajardo, Puerto Rico	1
635.	Ponza, Italy	1
636.	Poro, Philippines	1
637.	Port Alberni, Canada	1
638.	Port Kembla, Australia	1
639.	Port Lincoln, Australia	1
640.	Port Lyttleton, New Zealand	1
641.	Port Pothuau, France	1
642.	Portland, Australia	1
643.	Porto Vecchio, France	1
644.	Prince Rupert, Canada	1
645.	Puerto Barrious, Guatemala	1
646.	Puerto Galvan, Argentina	1
647.	Rade De Hyeres, France	1
648.	Ramsund, Norway	1
649.	Rarotonga, Cook Islands	1
650.	Riva, Italy	1
651.	Roatan, Honduras	1
652.	Safaga, Italy	1
653.	Salinas Bay, Mexico	1
654.	Salinas, Ecuador	1
655.	San Jose, Guatemala	1
656.	San Lorenzo, Honduras	1
657.	Sao Vicente, Cape Verde Islands	1
658.	Scalea, Italy	1
659.	Setubal, Portugal	1
660.	Sfax, Tunisia	1
661.	Shuaiba, Kuwait	1
662.	Siderno, Italy	1
663.	Sierra De Retin, Spain	1
664.	Skagen Harbour, Denmark	1
665.	Socotra Isla, Yemen	1
666.	St. George, Bermuda	1
667.	St. Johns, Newfoundland	1
668.	Stirling, England	1
669.	Sur, Lebanon	1
670.	Tarawa	1
671.	Tejn, Denmark	1
672.	Terracina, Italy	1
673.	Thurso, England	1
674.	Timaru, New Zealand	1
675.	Tobi Island, Trust Pacific Islands	1
676.	Tokyo, Japan	1
677.	Trapani, Italy	1
678.	Tynemouth, England	1
679.	Valdivia, Chile	1
680.	Veracruz, Mexico	1
681.	White Beach, Japan	1
682.	Whyalla, Australia	1

Appendix Table 4. Number of ship visits* by region, division, and duration, 100 major foreign ports, U.S. Navy, January 1986 - June 1990.

Region	Division	No. of visits	Duration of visit in days										
			1	2	3	4	5	6	7	8 - 13	14 - 20	21 - 27	28 +
Pacific	Western	15,737	4,150	2,128	1,548	1,335	1,585	610	497	1,627	771	313	1,173
	Northeast	583	71	116	135	158	61	30	5	6	0	0	1
	Indian	3,105	520	349	357	341	307	270	191	398	154	52	166
	Southeast	138	13	21	40	29	21	6	4	4	0	0	0
	All	19,563	4,754	2,614	2,080	1,863	1,974	916	697	2,035	925	365	1,340
Atlantic	Northwest	791	124	191	264	142	30	11	12	13	4	0	0
	Mediterranean	8,536	985	1,184	1,068	1,001	625	543	401	1,672	723	115	219
	Caribbean	2,539	960	619	485	219	98	36	22	52	32	4	12
	Northeast	1,869	430	339	356	224	152	70	35	95	66	12	90
	Persian Gulf	946	224	163	129	86	78	51	43	125	9	26	12
	South	204	16	32	43	40	29	12	5	26	1	0	0
	All	14,885	2,739	2,528	2,345	1,712	1,012	723	518	1,983	835	157	333
	Total	34,448	7,493	5,142	4,425	3,575	2,986	1,639	1,215	4,018	1,760	522	1,673

* All types of shore-specified port calls.

Appendix Table 5. Ty, : of operation by duration, 100 major foreign ports, U.S. Navy, January 1986 - June 1990.

Type of operation	No. of visits	Duration of visit in days							
		1	2	3	4	5	6 - 9	10 - 13	14 +
Involving port calls									
Minor maintenance	7,863	1,618	1,215	881	705	659	1,428	681	676
Other maintenance	7,950	1,377	613	516	471	461	1,395	1,201	1,916
Miscellaneous	7,710	2,616	1,761	973	685	449	698	270	258
Inspections in port	4,777	1,149	763	901	802	671	423	51	17
Visits	3,833	312	651	1,024	829	606	383	19	9
Inport training	290	88	46	43	21	41	16	23	12
Support services in port	392	91	13	5	13	7	37	53	173
Marine training	52	13	6	5	5	13	8	2	0
Training inspections	73	12	11	17	4	6	7	5	11
Other training	78	17	16	16	10	10	5	2	2
Public affairs in port	30	7	0	3	3	2	14	0	1
Other									
Transit at sea	151	46	13	16	8	29	15	8	16
Operation at sea	333	60	13	4	5	9	28	59	155
Other at sea	916	87	21	21	14	23	20	21	709
Total	34,448	7,493	5,142	4,425	3,575	2,986	4,477	2,395	3,955

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13. ABSTRACT *(Maximum 200 words)*

The Navy visited over 680 foreign ports during 1986-1990 in all continents and many islands of the world. HIV (human immunodeficiency virus-I) seroprevalence rates vary widely worldwide, and are high in many areas visited by the Navy. The Naval Health Research Center in San Diego, California maintains records of all HIV ELISA and Western blot tests given in the Navy. These were used along with career histories and ship movement information to examine the relationship of visits to foreign ports with risk of HIV seropositivity and seroconversion. A total of 2,272 seropositive personnel, including 813 seroconverters, were matched to 20,325 seronegative active-duty controls on age, race, sex, occupation, home port, and year of test. The risk of HIV infection following visits to the 100 most frequently visited foreign ports was assessed. All visits to a port and total time in each port during the study period were examined. Estimated relative risks (odds ratios) of seropositivity and seroconversion associated with visits to foreign ports showed no ports associated with a statistically significant excess risk of HIV infection for Navy personnel.

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