Chapter 18

HEALTH CARE FOR WOMEN IN MOBILIZATION AND DEPLOYMENT

LISA KEEP, MD, MPH

L. Keep; Lieutenant Colonel, Medical Corps; Residency Director, General Preventive Medicine Residency, Walter Reed Army Institute of Research, Silver Spring, MD 20190-7500

INTRODUCTION

There is a long history of individual women or small numbers of women in the US military. It has not been until recently, though, that women have been present in larger proportions and fully integrated into the services, including in jobs with greater exposure to hardship and combat. From a medical standpoint, this change has meant that medical needs particular to women must be met in garrison, on deployment, and on redeployment. The new roles filled by women make the logistics of providing appropriate supplies and equipment and trained health care personnel wherever women may be in the theater more challenging than in the past. In addition, women as a population may have somewhat different risk factors than men for adverse outcomes such as injury or posttraumatic stress disorder. Knowledge of such differences could lead to changes in equipment or training to minimize the risk. Because the integration of large numbers of women has been such a recent phenomenon, little is known about many of the factors that may affect the health of deployed women. Most of the studies that have been done have focused on populations that were accessible to study, such as those in initial entry training, rather than deployed populations. This chapter attempts to summarize both what is known about factors influencing the health and health care of women in mobilization and deployment and what remains to be studied. If the reader wants more specific information, a CD-ROM containing lectures and videos on common problems in obstetrics and gynecology and references, including manuals, treatment protocols, and Department of Defense Instructions, is now available.[1] It includes information on treatment of refugees and prisoners of war and includes telephone numbers to military hospital obstetrics and gynecology clinics and labor and delivery decks to allow users to contact expert help at any time. Forms needed to document care can be printed, and a correspondence course covering the contents of the CD-ROM and which grants Continuing Medical Education credit is included.

Most of the issues regarding health on deployment concern both men and women. However, because women constitute an increasing proportion of the military and because the female's social circumstances, anatomy, and physiology may relate to the military environment differently than the male's, the Committee on Defense Women's Health Research was convened in 1995 under the auspices of the Institute of Medicine of the National Academy of Sciences. Its mission was to advise the US Army Medical Research and Materiel Command on gaps and strengths in current research relating to the health and performance of military women and to provide guidance on establishing research funding priorities. Factors affecting health care while deployed that were identified by the Committee included austere conditions, harsh geography and weather, primitive housing and sanitary facilities, potential for limited supplies and difficult access to health care personnel or facilities, and exposure to diseases and prophylactic medications and immunizations. Potential military health hazards identified by the Committee included fuels and lubricants, pesticides, dust, smoke, obscurants, electromagnetic radiation (eg, laser range finders and target designators; radio-frequency, microwave, and millimeter-wave communications; electronic warfare equipment) and chemical warfare defense using prophylaxis with drugs.[2] While the differences between men and women regarding these factors and potential military health hazards are fewer than are the similarities, there are issues for which differences are significant enough to warrant consideration or for which differences may exist but data are insufficient to either confirm or refute any hypothesis.

DEMOGRAPHICS

In 1997, the approximately 200,000 women on active duty constituted approximately 14% of the US force.[2,3] There were roughly 140,000 women in the Reserve Component in 1995, constituting 16% of the Reserve force.[2] Projections are that women may constitute 20% of the active duty force in the near future.[2,4] By contrast, women constituted 2% of the force in 1972.[4] In 1995, there were approximately the same proportion of female officers as enlisted in each service. Among officers, 61% were in either health care or administrative primary occupations. Among enlisted women, 49% held primary occupations in functional supply/administrative or health care fields.[2] The distribution of all women between services in 1995 is shown in Figure 18-1, their racial distribution is shown in Figure 18-2, and their age distribution is shown in Figure 18-3. In 1997, women were disproportionately single (44%) compared to men (37%) on active duty.[3] Women were also disproportionately single parents: 11% versus 2.6% for men.[5]

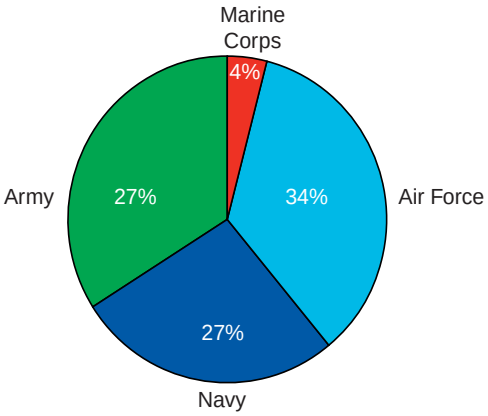

Fig. 18-1. Distribution of All Active Duty Females by Service, 1995.
Source: Committee on Defense Women's Health Research, Institute of Medicine. *Recommendations for Research on the Health of Military Women*. Washington, DC: National Academy Press; 1995: 8.

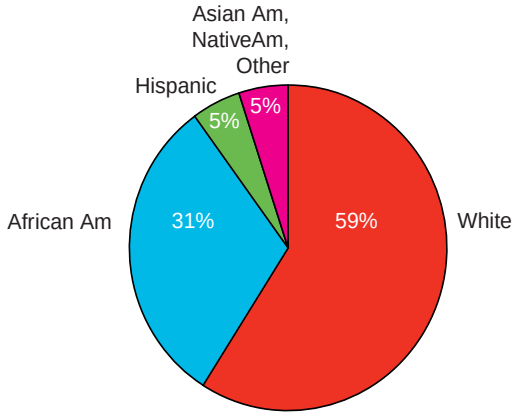

Fig. 18-2. Distribution of All Active Duty Females by Race and Ethnic Group, 1995.
Source: Committee on Defense Women's Health Research, Institute of Medicine. *Recommendations for Research on the Health of Military Women*. Washington, DC: National Academy Press; 1995: 8.

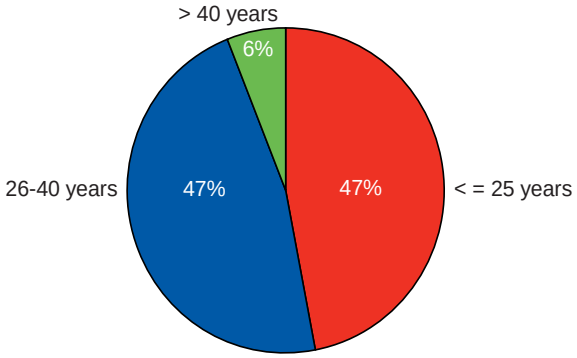

Fig. 18-3. Distribution of All Active Duty Females by Age, 1995.
Source: Committee on Defense Women's Health Research, Institute of Medicine. *Recommendations for Research on the Health of Military Women*. Washington, DC: National Academy Press; 1995: 9.

GENERAL HEALTH CARE NEEDS AND UTILIZATION

Few studies have been done on health care needs and utilization among women service members, but there are data to support that they use health care more often than their male counterparts and for different complaints. A large 1997 prospective outpatient morbidity study was done among US soldiers serving in South Korea and at Fort Lewis, Wash.[6] South Korea is considered by some to represent a "semideployed" environment. The study captured outpatient data for approximately 6,500 women and 28,000 men. Women were found to access clinics at rates approximately twice that of men even after standardization for age, race, rank, level of civilian education, and type of unit (weekly clinic visits per 1,000 population for females: South Korea 116.8, Fort Lewis 103.4; for males: South Korea 59.7, Fort Lewis 60.4). This rate ratio did not change significantly even after excluding sex-specific diagnoses. Women in South Korea had clinic utilization rates 10% greater than that of their Fort Lewis counterparts, resulting in an additional 11 visits per 1,000 per week. The category with the highest proportion of visits was "injuries and other orthopedic conditions" for all but women at Fort Lewis, for whom "medical illness" conditions prevailed. Clinic visit rates for the injuries category for both sexes were roughly equal, unlike the results found in most other studies. Injuries accounted for more than 40% of all visits for men at either location but for women at either location, injury visits accounted for less than 25% of all visits.

GYNECOLOGIC CARE, SEXUALLY TRANSMITTED DISEASES, SEXUAL RISK BEHAVIORS, AND PREGNANCY

Gynecologic care, sexually transmitted diseases, sexual risk behaviors, and pregnancy are interrelated and constitute the area of greatest difference between deployed men and women since they are related to our most significant biological differences.

Gynecologic Care

The need for routine gynecologic care is an area of women's health during deployment that requires significant resources. A review of women's health needs during the Persian Gulf War by Murphy and colleagues[4] showed that, although men and women had similar complaints in general, 20% to 25% of women's outpatient visits were for gynecologic complaints. The most common reasons for gynecologic visits were requests for oral contraceptives, fungal vaginitis, and abnormal menses (thought to be primarily related to stress and discontinuation of oral contraceptives). Few women required hospitalization for gynecologic complaints. The most common reason for a woman to be evacuated out of theater was pregnancy. Another common reason was for evaluation of abnormal cervical cytology for Papanicolaou (Pap) smears for which results were not available before deployment. (There was no colposcope in-theater, so those needing evaluation were sent to Germany.)[7]

A 1998 Navy study of sailors on four ships stationed on the east coast of the United States surveyed 1,154 volunteers drawn from those who were present for duty on the day of the study.[8] Women reported attending sick call significantly more often than men (189 vs. 117 visits per week per 1,000 personnel). Non–sex-specific reasons for attending sick call were generally similar and were most often for a cold, sore throat, cough, headache, or accident or injury. The female-specific reasons reported for attending sick call were requests for oral contraceptives, vaginal discharge or yeast infection, menstrual cramps, menstrual irregularity, pregnancy check, and Pap smear. Eleven percent of these women reported having been unable to obtain their usual form of birth control during deployment.

Adequacy of Training and Supplies

A Navy study of health care providers' perceptions of shipboard women's health care showed that 56% of the 32 health care providers (all representing different ships) thought their clinics were understaffed, though 91% reported having an Authorized Medical Allowance List (AMAL) designed specifically for women at sea and 81% reported adequate pregnancy testing supplies.[9] Their primary recommendation for improvement was to increase the amount and types of birth control available. They also reported insufficient budgets (47%) and AMALs (44%). Suggestions for improvement of AMALs included increased supplies of injectable depo-medroxyprogesterone acetate (Depo-Provera), a greater variety of oral contraceptives, and more accurate pregnancy and sexually transmitted disease (STD) testing kits. Sufficient obstetrics and gynecologic training was reported by 81%, and 75% reported having ample female-specific diagnostic equipment. However, there was a statistically significant difference between medical officers and Independent Duty Corpsmen (IDC) or senior enlisted corpsmen regarding their evaluation of the sufficiency of their training in obstetrics and gynecology, with medical officers expressing greater confidence in their level of training.

Potential problems related to these issues can be anticipated and many of them prevented. Health care providers who deploy and who can be expected to care for women should be trained to provide a basic, minimum level of routine gynecologic care. Medications, supplies, and equipment should be on hand or ordered before deployment, and the literature can provide guidance on specific items and planning factors.

Medications

Deploying service members should carry a 6- to 12-month supply of personal medications, and this should reflect consideration of the potential need for contraception and nonsteroidal antiinflammatory drugs for treatment of menstrual cramps. Self-treatment packs issued to women before deployment for treatment of fungal vaginitis and urinary tract infection (UTI) may be considered. Some authorities suggest that supplies of Depo-Provera may be given to the service member to be carried, then administered by medical personnel.[10] Since spotting and intermenstrual bleeding are common, however, this method of birth control may not be tolerated if started just before deployment. Note should be taken that six 28-day oral contraceptive pill (OCP) cycles do not equal 6 calendar months; a minimum

of 7 cycles of OCPs may be necessary to ensure a sufficient supply until the medical logistic system can be expected to supply refills of routine medications.[10] Even though a woman may not anticipate having sexual intercourse while deployed, she should be cautious about discontinuing her oral contraceptives, as the subsequent possible increase in menstrual flow and cramping may cause her to seek medical evaluation.

Birth Control

Methods of birth control other than the above-mentioned oral contraceptive pills and Depo-Provera may be particularly convenient for some deployed women. These include Norplant, a continuous-release levonorgestrel product contained in six matchstick-sized (34 mm x 2.4 mm) silicone rubber tubing capsules, which are implanted under the skin of the arm and which provide protection for 5 years; and the intrauterine device (IUD), which can last for up to 10 years. A common reason Norplant users request removal of the device is frequent and irregular menstrual spotting, so users should be informed of this possibility before implantation. If implantation is carried out shortly before deployment and the woman becomes dissatisfied with the method, access to a physician with experience in removal could be problematic while she is deployed. Placement of the rods under the skin of the upper arm may interfere with comfortable wear of the rolled Battle Dress Uniform sleeve. Not all service members will be appropriate candidates for an IUD, since it is associated with increased rates of pelvic inflammatory disease, especially in those who are not in permanent monogamous sexual relationships. Those in monogamous relationships that follow one after another are also at increased risk of pelvic inflammatory disease. It should be kept in mind that the social forces and stress of deployment may result in situations in which service members have unanticipated sexual relationships. None of the above-mentioned methods provide protection against sexually transmitted diseases. Barrier methods of birth control, which do provide such protection, can be used in addition to these methods, but the service member must carry all supplies and should be aware that extremes of temperature during storage can decrease the integrity of latex. Used alone for prevention of pregnancy, barrier methods have higher failure rates than do IUDs or hormonal methods.

Drug Interaction and Metabolism

As with any drug, there may be adverse events associated with drugs commonly used by women. Incidence of candidal vaginitis increases after use of antibiotics such as doxycycline, which may be used as an antimalarial. Antimicrobials may also reduce the effectiveness of oral contraceptives in a small subset of women.[11] It may be advisable to recommend use of an additional method of birth control, such as a barrier method or abstinence, while the woman is taking antimicrobials.

There are incomplete data on the effects and interaction of sex, ethnicity, and menstrual cycle on drug metabolism. Drugs of interest include those more likely to be used by military personnel (eg, those for chemical or biological defense, antimalarials) or used frequently in military women (eg, OCPs, antifungals, analgesics). The Committee on Defense Women's Health Research recommended research in these areas,[2] but until such research is conducted health care practitioners should consider the possibility that there may be such effects in women that could change the bioavailability of medications.

Sexually Transmitted Diseases and Sexual Risk Behaviors

Because of their generally young age (and corresponding maturity level) and because of their often sudden popularity in a population that is 85% male, women service members, particularly those in the lower enlisted ranks, are at risk for STDs and unintended pregnancy. The results of the few studies that have been done to quantify sexual risk behaviors may help health care providers to plan interventions. A survey of 594 unmarried in-processing female US Army recruits showed that although 87% reported having had vaginal sex, 26% reported a previous pregnancy, and 14% reported a previous STD infection, almost 41% of respondents used condoms "never," "rarely," or "occasionally."[12] Recruits who reported using alcohol were significantly less likely to report using condoms and were more likely to report a higher total number of sexual partners. Twenty-nine percent of the respondents reported "rarely" or "never" receiving pelvic examinations, and 19% reported receiving "occasional" pelvic examinations. Forty-five percent of the respondents reported that they would feel embarrassed to ask a health care provider about STDs even though 88% of these reported being sexually active. "Friends" were reported as the most common source of sex education. Asked about STD prevention methods with casual sex partners, 42% were nonresponders, 16% reported "no method," and 36% reported using a condom or a condom with spermicide. Almost 47% of respondents did not consider themselves to be at risk for contracting an STD.

Among a convenience sample of 104 US Army recruits presenting to the gynecology clinic for an appointment[13], 29% reported using no method of birth control, 29% reported using a condom, and 43% reported using oral contraceptives. Thirty-four percent reported the combined set of risk factors of more than one lifetime sexual partner, a new sexual partner in the last 6 months, and not using a condom.

Among 165 ship- and shore-based Navy women surveyed[14], 41% did not use any method of protection against STDs and 48% used a condom. Fifty-eight percent reported not worrying about getting an STD, but 72% reported worrying about their ability to have their partner use a condom.

Actions

Periodic routine predeployment checks, such as Soldier Readiness Checks, could mandate periodic pelvic and breast exams to ensure that these are done and that results are known before deployment. Since the Persian Gulf War, newer methods of cervical screening (eg, automated cytologic testing, fluid-based monolayers, human papillomavirus DNA testing, cervicography, Polarprobe optoelectronics) have become available and are likely to change patient management. These changes may make it possible to obtain more definitive diagnoses more quickly so that the burden of following up indeterminate Pap smear results will be either reduced or eliminated.

As part of a program to reinforce health and safety measures to all service members in the predeployment period, information about and access to effective methods of birth control and STD prevention can be provided. Ideally, information about sexual decision-making could be offered on a routine basis, since time for such education might be too short in the predeployment period. Pregnancy testing should be offered just before deployment to those who think they could possibly be pregnant. Female service members should be informed that there are known and unknown risks to the fetus from a variety of sources during deployment. The only ways to absolutely protect a fetus from these risks are either to not become pregnant or to detect the pregnancy before deployment and so avoid deploying (Figure 18-4).

Mandatory predeployment pregnancy testing for all women may not be cost-effective. Some time limit would have to be set such that the mandatory test would be conducted "x" or fewer days before departure. Deployment dates often change more than once before actual departure, so multiple tests might be required to satisfy the time requirement. Some units, especially those not collocated with other elements of their larger unit, travel from their home stations to other locations before deploying, often spending a number of weeks at the new site. Testing might be required before departure from each station, increasing costs. Because of the duty positions women hold, some units have far more than the tri-service average of females, and repeated absence for testing by such a large percentage of the unit could adversely affect predeployment preparation. There are women who are not sexually active or who either use an effective method of birth control or have been sterilized; the likelihood of pregnancy in these women is low to nonexistent, but they could well be included in any such mandatory pregnancy testing program. Any testing program can miss those who become pregnant after the test but before deployment. In addition, some of those redeployed

Fig. 18-4. There are known and unknown infectious, toxic, and environmental risks to the fetus during deployment. The possible risks for this soldier include heat injury and prophylaxis against malaria or chemical weapons. Photo source: Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 88-04612.

because of pregnancy become pregnant in-theater. Given the results of the above studies regarding sexual risk behaviors, the possibility must be conceded that not all of those who would be at risk of being pregnant would recognize their situation or take the initiative to obtain the pregnancy test. Formal studies of the cost-effectiveness of predeployment pregnancy testing would be welcome.

Pregnancy

Unplanned Pregnancy

One of the concerns identified by the Defense Advisory Committee on Women in the Services (DACOWITS) in 1994 was for the effects of unplanned pregnancy on the individual woman, on military women as a whole, and on the unit.[2] Unplanned pregnancy in an unmarried service member presents her with difficult decisions on such issues as termination of the pregnancy, adoption, single motherhood, and marriage. Each of these decisions affects the child as well as the mother. The emotional burden on the mother of aborting her child or giving it up for adoption may be significant. Military life can be challenging for single service members even without children; the responsibility of caring for children adds enormously to this challenge. For all of these reasons, unplanned pregnancy has significant effects on the individual involved. Because pregnancy is such a visible condition, because it may be regarded by unit members as voluntary or intentional, and because it impacts significantly on a woman's deployability and sometimes on her ability to fully perform in her primary occupation for most of a year, it can affect unit morale and readiness. Some may view women as less useful service members or resent the special treatment of pregnant women.

Clark and colleagues[15] studied pregnant soldiers presenting for prenatal care at Fort Lewis, Wash. The authors found that junior enlisted women had the highest percentage of unintended pregnancies in this population. Rank was strongly associated with other factors that themselves are associated with higher rates of unplanned pregnancy, such as age, marital status, and education level. They state that "…rank may be used…as an easily available surrogate marker…for identification of soldiers at greatest risk of unintended pregnancy."[15p447] Among those whose pregnancies were unintended, 62% did not use contraceptives and 38% experienced contraceptive failure. The most common reasons for not using contraception were adverse effects of contraceptives, not planning to have sex, and not believing they would become pregnant. Lack of access to care was not given as a reason for not using contraceptives in this study, though this factor may vary by branch of service, duty location, or type of unit. The methods employed by those using contraceptives were not the most effective methods and required "motivation and consistency,"[15(p448)] in the words of the authors. The study recommends five strategies developed by the Institute of Medicine to reduce unintended pregnancy (Exhibit 18-1).

Classes to educate women, especially those in the lower enlisted ranks, and to discuss issues surrounding sexual decision making, methods of birth control, the consequences of unintended pregnancy, and STD prevention could be offered periodically or at the time of each transfer to a new duty station, perhaps with an additional class or classes offered when a unit is notified it may be deploying. In-processing procedures could include offering women the opportunity to be seen by a health care provider, which would allow them to obtain advice, contraceptives, or the Pap smear that can be required before prescription of hormonal contraceptives. Any such program to prevent unintended pregnancies and STDs should be designed to include its evaluation for effectiveness.

Vaccines and Pregnancy

Women and men in deployable status should have their immunization status screened routinely and immunizations updated accordingly. In most instances, therefore, a woman will have already been

EXHIBIT 18-1

FIVE STRATEGIES TO REDUCE UNINTENDED PREGNANCIES

1. Improve knowledge about contraception and reproductive health
2. Increase access to contraception
3. Address feelings, attitudes, and motivation associated with contraception and avoiding unintended pregnancies
4. Evaluate the results of any programs designed to prevent unintended pregnancies
5. Stimulate research

Reprinted with permission from *Military Medicine: International Journal of AMSUS*: Clark JB, Holt VL, Miser F. Unintended pregnancy among female soldiers presenting for prenatal care at Madigan Army Medical Center. *Mil Med*. 1998;163:444–448.

immunized before pregnancy occurs. At the time for immunizations to be updated, there is a small chance that a woman will be in the early stages of pregnancy and unaware that she is pregnant. Risk of serious adverse effects from vaccines, even live vaccines, are primarily theoretical. In some cases, a vaccine may even be recommended in pregnancy because the disease the vaccine prevents carries more risk to the fetus than does the vaccine. The military regulation governing immunizations and chemoprophylaxis says the following about immunizing females of childbearing age:

> A pregnancy screening test is not routinely required prior to administering vaccines or toxoids, including live virus vaccines, to females of childbearing age. Take the following precautions to avoid unintentional immunization during pregnancy:
>
> Ask if pregnant. If the answer is "yes" or "maybe" exclude from immunization or refer for evaluation. If the answer is "no," immunize. If a live virus vaccine is administered, counsel the individual to avoid becoming pregnant for three months and document in the health record.[16p3–4]

Drugs and Pregnancy

If a female service member is diagnosed as pregnant in a theater of operations, immediate consideration must be given to the potential effects of maternal medications on the fetus. The woman may be taking certain medications for operational reasons so consideration must also be given to the effect of stopping or prohibiting use of such medications. For example, if the service member is on flight status or is deployed to certain geographic areas, she may be taking doxycycline as an antimalarial, and this drug can adversely affect fetal bones and teeth. While this prophylactic medication should be discontinued immediately, the service member will have to be housed in such a way as to protect her from potential exposure to mosquitoes to ensure that she is not infected with malaria while awaiting evacuation. If there is a threat of biological or chemical weapon use in the theater, the service member must be counseled on whether to use any available prophylactic medication while awaiting evacuation. This topic is too broad for thorough coverage in this format, and the clinician should consult standard texts or seek expert consultation for such cases.

Infections and Pregnancy

Some infections, such as malaria, rubella, and toxoplasmosis, result in higher rates of morbidity and mortality in pregnancy (see chapters in Section 6: Infectious Diseases of Concern). The female service member may be at higher risk of exposure to agents causing such diseases in a deployed setting, and the clinician should keep this possibility in mind.

URINARY TRACT INFECTIONS

UTIs are more common among women than men and may be more common in the field. There may be no latrine facilities available and privacy may be minimal. In such conditions, some women will wait as long as possible before urinating. Maintaining a full bladder increases risk for UTI. Some women will intentionally dehydrate themselves to avoid urinating. Such dehydration puts them at risk for heat or cold injury. Educating women about UTIs and the risks associated with dehydration, providing latrines with privacy if possible, and educating women about field-expedient methods to avoid exposure of the body during urination are actions that can be taken to decrease the risk of UTI and dehydration. Simple measures such as using a urinary diversion device, donning a poncho to use as a privacy screen while squatting outdoors, or urinating while inside a tent or other field-expedient enclosure into a ziplock bag, coffee can, or other container for later disposal can be effective in affording some privacy to women while urinating. Urinary diversion devices are funnel-like devices that allow a woman to urinate through the trouser fly while standing.

PRIVACY

Although military women prefer privacy for elimination functions, they may also prefer to be housed with their unit in the field rather than in a separate women's area. One concern identified by DACOWITS was "avoidance of artificial separations for women, eg, overconcern for special female facilities."[2(p30)] Men's concerns for privacy or their desire not to be close to women in their living quarters should be given equal consideration.

PERSONAL HYGIENE

Information can be provided to women on personal hygiene in the field and may help reduce the number of cases of vaginitis and UTI. Army Community Health Nurses and their equivalent in the other services, family practitioners, nurse practitioners, obstetrician-gynecologists, and others can assist with such training. The information can include advice to

- use unscented products (eg, soaps, sanitary pads) because perfumes can cause chemical vaginitis
- use tampons and sanitary pads without deodorant or baking soda (these can alter vaginal pH),
- use tampons with cardboard applicators (plastic applicators can abrade vaginal mucosa; dirty hands can soil tampons without applicators before insertion),
- change tampons and pads frequently,
- clean pubic area with unscented wet wipes if showers are not available, and
- wear loose-fitting trousers.[10]

There is no medical need for special shower facilities for women or for more frequent showers for women. If shower facilities are available, women may prefer to shower more frequently than men. Maintenance of good personal hygiene in both sexes reduces the incidence of skin disease caused by extended contact with filth. Since the dermatological diagnostic category typically has one of the highest rates of outpatient visits, provision of showers or other facilities that encourage personal hygiene may decrease such visits and improve service member health.

ERGONOMICS, INJURY, AND FITNESS

Ergonomics

Another of the concerns identified by DACOWITS regarded the fit of uniforms, boots, and masks. The Committee on Defense Women's Health Research found in 1995 that the risk of injury may be higher for women using clothing, equipment, tools, protective gear, and prescribed methods designed for men (Figure 18-5). Data on this subject are incomplete, and the Committee recommended further research on anthropometric data for sizing and design to fit a variety of body shapes, differences in thermal balance when wearing body heating and cooling systems, and endurance when loads are mounted in different configurations on various body locations.[2]

Fig. 18-5. Every day, female soldiers use gear designed for their male counterparts such as load-carrying equipment and weapons (**a**), parachute harnesses (**b**), and gas masks (**c**). It is unclear whether use of clothing and equipment by women that was designed for use by men leads to increased rates of injury or other adverse outcomes.
Photo sources: (a) Department of Defense photograph. Operational Medicine and Fleet Support Division, Bureau of Medicine and Surgery, Department of the Navy. *Operational Obstetrics and Gynecology: The Health Care of Women in Military Settings*. 2nd ed. CD-ROM. Washington, DC: DN; 2000. NAVMEDPUB 6300-2C. Image "Field Gear." (b) Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 87-02152. (c) Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 92-06818.

Factors in women that can adversely affect thermoregulation relative to men include generally higher surface-to-mass ratio, higher percentage of body fat, and lower maximal aerobic power. A 1992 review of temperature regulation in women[17] stated that "[t]here is little support for the theory that gender affects thermoregulatory ability if all factors that independently and/or collectively affect thermoregulation, such as maximal aerobic power, state of training, or heat acclimation, are controlled."[17p201] It also noted that "during light exercise in hot environments, little difference is seen in exercise core temperature during different menstrual cycle phases."[17p205] However, there is an upward shift in the temperature set-point of about one half of one degree (0.4°C, 0.7°F) during the luteal (post-ovulatory) phase of the menstrual cycle, and this shift seems to delay onset of sweating and cutaneous vasodilation. There are also changes in fluid volume control with menstrual phase, which can affect thermoregulation. These temperature and fluid shifts may be statistically significant, but whether they are clinically significant for the work performance of female service members remains unclear.

A small study compared oxygen uptake ($\dot{V}O_2$) and heart rate in men and women performing nine occupational tasks in both standard military uniform and chemical protective ensemble (CPE; ie, M-17 mask and chemical protective clothing).[18] It showed that tasks requiring mobility across a distance, such as load carriage or lift and carry, resulted in significant increases in both $\dot{V}O_2$ and heart rate among both men and women wearing the CPE. Stationary tasks (eg, lifting and lowering) resulted in no differences in $\dot{V}O_2$ or heart rate between the two clothing conditions in either men or women. The meager data available indicate that the similarities between men and women are greater than the differences regarding work effort while wearing the CPE. More studies must be done, however, before conclusions can be drawn.

Injuries

Most of the data on injuries in military women focus on the basic training or initial entry environment (Figure 18-6). A 1997 review[19] of the patterns and risk factors for exercise-related injuries in all military women found that level of aerobic fitness is a primary risk factor for exercise-related injury in both women and men, with higher levels of fitness associated with lower injury rates. The review also noted that basic training injury rates are generally 1.5 to 2 times higher in women than in men.

Fig. 18-6. Activities like running and marching can cause overuse injuries. Women, such as these Marine Corps recruits, are at higher risk of overuse injuries than are men. Photo source: Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 84-11808.

A study[20] among Army basic trainees showed that though women's relative risk for injury was 2.1 times that of men, multivariate analysis revealed that female sex was no longer predictive of injuries, but physical fitness, particularly aerobic fitness, remained significant. The authors concluded that women enter training less physically fit relative to both their own fitness potential and to men. Women, however, made much greater improvements in fitness than men, indicating that remedial training for those who enter training less fit could potentially reduce both total injuries and the difference in risk of injuries between men and women.

Overuse injuries, rather than acute injuries, are more common in women than in men and tobacco may be one risk factor. A study[21] found that recruits who reported smoking at least one cigarette in the month before beginning basic training had significantly higher rates of any injury during basic training than those who did not. Thirty-five percent of both women and men reported having smoked at least one cigarette in the month prior to basic training, but only women had significantly higher rates of overuse injury. A 1994 study[22] in an all-male infantry unit also found cigarette smoking to be an independent risk factor for injury.

A 1999 prospective study[23] of all female trainees at the Marine Corps Recruit Depot (MCRD), Parris Island, SC; the Navy Recruit Training Command (RTC), Great Lakes, Ill; and the Marine Corps Officer Candidate School (OCS), Quantico, Va, showed

that most (32% to 45%) of the visits for a new health problem were for musculoskeletal disorders. Musculoskeletal injuries occured in 44% of female recruits at MCRD, 37% of female recruits at RTC, and 62% of female officer candidates at OCS. The most common category of musculoskeletal injury in all three populations was overuse injury. Stress fractures were diagnosed in about 6% of recruits at MCRD, 4% of recruits at RTC, and almost 10% of OCS candidates. Comparison data for males at the sites were not available.

The Institute of Medicine's Subcommittee on Body Composition, Nutrition, and Health of Military Women of the Committee on Military Nutrition Research recommended that female recruits either undergo a structured fitness program before entry into basic or initial entry training or a similar program within basic training.[24] The program would be designed to start at a lower level of activity and gradually increase so that stressed bones would have time to remodel before stress fractures occur. Fitness Training Units operate in Army basic training, and a 1998 study[25] showed that the Unit appeared to be effective in reducing injuries and increasing training success in women, but the authors recommended modifications for male participants to improve outcomes. The other services use similar units to improve fitness before releasing recruits to initial entry training.

A study[26] of injury among male and female Army parachutists found that though women jump under less hazardous conditions than men, they have a higher risk of serious injury. This result could be because women were more likely to be in a cadet or student status than men, but the study did not address this issue. Based on data reported to the US Army Safety Center during a 10-year period, women jumped more often than men in daylight and in static-line, nontactical environments and were more likely to have had their injury caused by an improper parachute landing fall, which are all consistent with cadet or student status. It is also possible that the design of the parachute and harness results in more injuries in females than in males. However, over the course of the 10-year period, women's injury rates dropped more than, and in fact began to approach, men's injury rates. It can be speculated that this was because women gained experience and proficiency, but no data are available on which to base a conclusion. Further research is needed to answer questions regarding the relationship of injury in military women to flexibility, body composition, tobacco and alcohol use, anatomic and biomechanical characteristics, and level of training and experience.

Hospitalizations for sports and physical training injuries were studied using the Total Army Injury and Health Outcomes Database (TAIHOD).[27] The rate (number of injuries per 10,000 person-years) of such injuries was approximately twice as high among men as among women, the opposite of the rate usually found in studies of the basic training environment. The study's authors note, however, that a major limitation of the study was the lack of data on level of exposure of the subjects to each activity; the denominator for rates was person-time on active duty. The body parts most commonly injured by both men and women were the knee and ankle. Among men, basketball and football were associated with the highest hospitalization injury rates. Among women, "other" sports—those not included in specific categories, such as running and volleyball—were associated with the highest hospitalization injury rates. In the specific sport categories, physical training and basketball posed the greatest risks. A study[28] using data accessed through the Defense Medical Surveillance System showed that females were 28% more likely to have injury-related outpatient visits but 35% less likely to be hospitalized for injury than males.

A study of musculoskeletal-related disability among Army personnel used data from the US Army Physical Disability Agency database and was restricted to cases from 1990 to 1994 in which the soldier was found unfit for duty and either separated from service or temporarily or permanently retired.[29] Musculoskeletal disability rates were reported by Military Occupational Specialty (MOS) (cases/1,000 in the MOS during the same time period). Among the 20 MOSs with the highest musculoskeletal disability rates for women, women's rates significantly exceeded men's in 15. The authors recommend prospective studies of job type and musculoskeletal disability.

Fitness and Job Performance

How the physical strength and fitness of military women affect job performance in the field is a controversial topic. The Committee on Defense Women's Health Research noted that the repeal of the Combat Exclusion Law opened up many new and dangerous jobs to women. Some of these jobs may have high requirements for strength and endurance, but the physical fitness testing programs in the Armed Forces relate to general health, physical fitness, or appearance, not to specific job performance.[30] Physical fitness has three components: muscular strength, muscular endurance, and cardiopulmonary fitness.[31]

Strength distribution curves for Army men and women overlap least when comparing absolute strength, with overlap increasing when adjusted for body mass and reaching near-parity when adjusted for fat-free body mass. The quantity of muscle mass differs between men and women, resulting in differences in absolute strength, though relative strength is approximately equal. On average, female soldiers weigh 20% less and have 10% more body fat and 30% less fat-free body mass than male soldiers.[31] Performance on tasks reflective of muscle strength that have relevance to military jobs, such as lifting, pulling, pushing, and carrying loads, is related to fat-free mass but is related little if at all to the proportion of body fat (Figure 18-7).[30,31]

Similarly, women and men have been shown to have essentially equal muscular endurance when exercising at a given percentage of maximal strength.[31] For any given absolute load, however, the average woman will use a greater percentage of her maximum strength than the average man and will therefore fatigue faster.

Cardiopulmonary fitness or aerobic power is measured by maximal oxygen uptake, $\dot{V}O_2$max. Women have a lower $\dot{V}O_2$max than equally trained men because of men's greater fat-free mass and women's greater body fat, lower hemoglobin levels, and lower cardiac output. Among Army basic trainees, the female-to-male $\dot{V}O_2$max ratio was 0.63 in absolute terms and 0.75 when adjusted for body weight. Among cadets at the US Military Academy, the ratios were 0.67 and 0.82, respectively.[31]

Figure 18-7. Airmen load a missile onto an F-15 Eagle aircraft. Differences in absolute strength between men and women are related to fat-free body mass; women's absolute strength is typically less than men's, but when adjusted for fat-free body mass, it is approximately equal. Photo source: Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 90-09800.

Overcoming Strength Limitations

Physical training may be able to overcome some of the differences in these three components of physical fitness between the average man and the average woman. Progressive resistance training can result in increases in muscular strength and aerobic exercise, and training can result in increases in $\dot{V}O_2$max. The lower the initial state of training or fitness, the more potential there is for improvement. Such improvements in muscular strength and endurance and in cardiopulmonary fitness may enable women to adequately perform many physically demanding jobs.[31,32]

Changes in aerobic power and muscle strength were measured in male and female cadets attending the US Military Academy between 1979 and 1982.[33] The authors conclude that even given a 2-year experience in similar training programs and with similar social, cultural, and environmental factors, the gap in aerobic power and muscle strength did not narrow significantly. On arrival, women scored at the high end of the "good" category of the American Heart Association's cardiorespiratory fitness classification, whereas men far exceeded the lower limit of the "high" category. Females, but not males, significantly increased their $\dot{V}O_2$max after the initial 6-week training program in which all cadets participate. Among men, change in $\dot{V}O_2$max seemed to be related to level of fitness and activity before arrival; those who were most fit lost $\dot{V}O_2$max over the 6-week period, while those who were least fit gained. Both males and females significantly reduced their maximum heart rate and percent body fat. Additional measurements were taken before and after the second summer training program and after the second academic year. Percent body fat had returned to initial values in both men and women. $\dot{V}O_2$max among females decreased over the course of the second academic year, possibly due to time lost from training because of injury. Lean body mass increased, but maximal isometric strength showed no change. Among males, $\dot{V}O_2$max and lean body mass increased significantly over the 2-year period, as did strength of the upper torso (arm and shoulder) and leg extensors. For all strength measures, women averaged 30% to 40% lower than males.

The influence of physical fitness training on the manual material-handling capability of female sol-

diers was evaluated in a small study published as a technical report in 1996[34] and in the peer-reviewed literature in 1997.[35] The women underwent a progressive resistance and aerobic training program over 14 weeks. The training program did not include any specific material-handling tasks. The time required was about 1 hour per day, 5 days a week. The program was effective in improving manual material handling such that those who completed the program met the lifting qualifications for 15 to 21 additional MOSs, depending on the assumptions used about lift height. However, carrying requirements were ignored. Road-march times were improved to a level of statistical significance, representing a decrease in time of about 1.5 minutes over 5 km of flat paved road.

Other methods that may allow women to perform physically demanding military tasks include self-pacing (if the task allows), redesigning the task to reduce the physical demands, modification of the task through use of performance aids (such as stretcher-carry harnesses), and use of teamwork (Figure 18-8). When allowed to self-pace while backpacking with equal loads, both men and women maintained the same relative exercise intensity of 45% of $\dot{V}O_2max$, though women were walking at a lower speed.[31]

A July 1993 General Accounting Office report titled "Women in the Military: Deployment in the Persian Gulf War" concluded that "[o]verall, the unit commanders and focus group participants gave primarily positive assessments of women's performance in the Persian Gulf War."[36(p2)] But it was also noted that "[s]ome people expressed concerns about women's physical strength capabilities; however teamwork was frequently cited as a way physical strength limitations were overcome for both women and men."[36(p3)] This concept was supported by a study of team lifting in military personnel.[37] As might be expected, individual males and all-male lifting teams could lift more than individual females or all-female lifting teams; mixed-sex teams could lift weights that were intermediate between the male and female maximums. The major limitation of team-lifting is the potential loss of a lifting partner, particularly in a combat environment, when such a situation might leave an average female ineffective in the lifting task until another partner is available.

If none of these methods proves satisfactory for a particular task, then a performance standard could be used as a screen to be sure that only those either already capable of a task or likely to be trainable to be so are permitted to do it.

Fig. 18-8. As can be seen in this photograph of Air Force medical personnel assisting simulated casualties during a mass casualty evacuation drill, use of teamwork is one way to allow women to perform physically demanding military tasks.
Photo source: Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 84-05647.

Fitness Standards

In the late 1970s, a system was developed to establish occupationally-related, sex-neutral physical fitness standards.[38] A list of physically demanding tasks for each MOS was compiled, and MOSs were grouped into five clusters with similar physical demands for both muscular strength and aerobic capacity (rated as low, medium, or high for each category). From each cluster, the four to six most demanding tasks were selected. For each task, actual weights lifted and distances moved were verified and the actual energy or force required to perform these tasks to standard was measured. The 8-hour average energy cost rate was converted to the necessary aerobic capacity to perform the task, allowing for sufficient reserve to permit recovery and repetition. The standard was then established in liters per minute of oxygen consumption for aerobic demand and weight and distance for strength demand. This standard was then converted to two sets of physical fitness standards, one to be used as an entrance qualification and one for retention. This system was never used (Figure 18-9).

In 1981, the Women in the Army Policy Review Group repeated this task analysis and MOS grouping but based grouping primarily on lifting requirements.[39,40] A set of physical fitness tests, called the Military Enlistment Physical Strength Capacity Test (MEPSCAT), was developed by the US Army Research Institute of Environmental Medicine, Natick,

Fig. 18-9. Task-specific, sex-neutral standards for accession and retention in various military occupational specialties have been developed but never put into effect. If they were, potential resentment of females for not "carrying their load" in physically demanding jobs would be diminished or eliminated.
Photo source: Department of Defense photograph. Defense Visual Information Center. *Women in the U.S. Armed Forces*. CD-ROM. March Field, Calif: DVIC; 1998. Image 85-04882.

Mass, to use for screening new accessions for MOS classification. A study was done to validate the MEPSCAT using the Policy Review Group's MOS task analysis as a basis for the job-related tasks (eg, lift, carry, push, pull). A single measure of lifting capacity was the best predictor of job performance as defined by success on the job-related tasks, though the authors caution that their study has significant limitations and recommend a system that sounds similar to the one developed in the late 1970s and described above.[38] Although the lifting test was given to all soldiers entering the Army for several years, the standard was not used to determine eligibility for any MOS, and the effectiveness of the test was never evaluated. It has since been eliminated.[31]

A Navy study[41] showed that Physical Readiness Test scores can be used to predict performance of carry-and-lift tasks representative of general shipboard work, though the authors recommend that critical carry-and-lift task parameters be defined before their method is used for job screening or selection. Studies have shown poor correlation between the Army Physical Fitness Test and lifting and load carriage.[42]

This topic remains politically charged. Among the recommendations of the Committee on Defense Women's Health Research regarding fitness was for research on scientific methods to assess fitness and then to use these assessments as a basis for fitness standards. (This topic is also addressed in the Nutrition section below.) The Subcommittee on Body Composition, Nutrition, and Health of Military Women recommended

> development of task-specific, gender-neutral strength and endurance tests and standards for use in the determination of placement in MOSs that require moderate and heavy lifting. Additional fitness programs should be created and enforced to develop and maintain the strength, endurance, and flexibility required by these MOSs.[43(p14)]

It remains unclear how further research would be helpful absent the political will to implement programs based on the results.

NUTRITION AND WEIGHT

In spite of abundant supplies of food and nutrients in the United States, the diets of many American women are lacking in some nutrients. Female athletes have additional dietary requirements that are not always met, and some may also have disordered eating. Military women are similar to the general population from which they volunteer, have activity levels that may approach or equal those of athletes, and are subject to weight and body fat standards, so they may also be subject to the nutritional deficiencies of their civilian counterparts. The stress and altered level and schedule of activity during deployment may create additional nutritional requirements. Unfortunately, data on the nutritional status and needs of women on deployment are lacking. Most data derive from studies of women in initial entry training, since this population is more easily studied, but recruits may have similar nutritional needs to deployed women.

Nutrients

One 1993 study[44] at Fort Jackson, SC, was designed specifically to evaluate the nutritional intake of female soldiers during US Army Basic Combat Training. This study showed that the women in the study had suboptimal mean intake of vitamin B_6, folic acid, calcium, magnesium, iron, and zinc. Almost half of the soldiers had mean intakes of less than 60% of the Military Recommended Daily Requirement (MRDA) of calcium and folic acid. Some women in the study also had suboptimal consumption of total calories, protein, vitamin C, thiamin, riboflavin, niacin, vitamin B_{12},

vitamin A, and phosphorous. The authors reviewed data obtained from previous Army nutritional surveys that included women and found that these women consumed fewer total calories in the field compared with garrison settings and that intake of both macronutrients and micronutrients was suboptimal in the field. They also compared these data with national data for women ages 20 to 29 years of age, including the second National Health and Nutrition Examination Survey and the Continuing Survey of Food Intakes by Individuals for 1985. They found that the nutrient intakes for women in field settings and in their study were similar to those of the civilian population—both are deficient in some nutrients. This situation may put military women at more risk for undernutrition and underperformance than their civilian counterparts because increased physical activity results in increased requirements for some nutrients and adequate nutrition is important in achieving peak physical performance. In addition, nutrition early in life can affect health status later in life; variation in calcium nutrition during adolescence accounts for 5% to 10% of the difference in adult bone mass, but this difference itself accounts for 50% or more of the risk for hip fracture in later adulthood.[45]

Military rations must feed both male and female service members, but because their requirements for some nutrients (eg, total calories, calcium, iron) differ, it is difficult to design rations to meet all of these needs. For example, if a female service member's energy requirement is 2,400 kcal ("calories") and she is eating Meals, Ready-to-Eat (MREs), she would have to consume approximately 131% of her energy requirement to meet the calcium MRDA of 1,200 mg or 166% of her energy requirements to meet the iron MRDA of 18 mg.[43] In the study by King and colleagues[44], subjects who discarded more than 50% of any food item they had selected were asked to give a reason. The two most common reasons were "not hungry" and being "full." This finding may support the idea that some women may not be able to eat enough of military rations to ensure adequate nutrition. To increase calcium content, ultra–high temperature treated milk has been added to Tray Pack (T) Rations and dehydrated filled-milk products are being developed and will be added to the B Ration and MRE. MRE Pouch Bread is fortified with calcium and iron.[46]

MREs are fortified with vitamins and minerals, but fortification varies by food item. To ensure intake of the broad range of vitamins and minerals, service members should consume part of each item in the MRE. There is an average of 1,200 calories in an MRE. If service members are consuming only MREs, women should be encouraged to eat half of the MRE at each meal to provide an intake of 1,800 calories per day (see Chapter 17, Nutritional Considerations for Military Deployment, and Chapter 19, Environmental Medicine: Heat, Cold, and Altitude).

The Committee on Defense Women's Health Research recommended that further research be conducted on the acceptability and consumption of field rations and fluids in the field and on factors that affect intake, such as environmental conditions, menstrual status, and level of physical activity. They also recommended research on nutrient and fluid requirements for optimal performance of specific categories of jobs or tasks under both normal and extreme environmental conditions.[2]

Weight and Body Fat

Some service members, both male and female, use deployment or a field training exercise (FTX) as an opportunity to lose unwanted excess weight. The soldiers in the study mentioned above[44] participated in a 4-day FTX during Basic Combat Training. Though nutrient intake data were not collected during the FTX, a questionnaire was administered to all soldiers, male and female, on their return. Of the 153 soldiers, 85.5% reported that they ate less than their usual dining hall intake while in the field. Of the reasons for consuming less, the most common were "the food did not look good" (62.7%) and "I was not hungry" (49.7%), but 16.3% of these soldiers not yet out of Basic Combat Training answered "I wanted to lose weight." In a survey study,[8] 46% of women (vs. 26% of men) reported having lost weight during deployment, and 22% of women (vs. 13% of men) reported having gained weight during deployment. Service members who lose weight while in the field, whether intentionally or not, are at risk for undernutrition, which is itself a risk factor for heat and cold injury in the short term and for less than optimum performance and health in the long term. Some service members may also develop eating disorders, either as a reaction to stress or as a result of their attempts to meet retention weight and body fat limits, and women may be at higher risk for eating disorders. An Air Force study showed that weight standards in Air Force Instruction 40-502 allowed most men a maximum allowable weight equivalent to a body mass index (BMI) of 28, whereas the cutoff point for women is only a BMI of 25.[47] (BMI is weight in kilograms divided by the square of height measured in meters.) Female service members may resort to disordered eat-

ing to maintain these more-stringent standards. Registered Dieticians can assist service members, their commanders, and their health care providers in developing a plan to achieve the service member's desirable weight while maintaining adequate nutrition in a variety of settings, including the field, and on all matters regarding diet and nutrition.

Fitness and Body Fat

Though body fat is related to cardiopulmonary fitness and performance on tasks such as unloaded walking or running, it is less important in tasks such as load carriage or backpacking and unrelated to tasks of moving external weights, such as pushing, pulling, lifting, and carrying.[30] The most common physically demanding tasks in the Army are lifting and carrying (including load carriage, such as backpacking). There is little evidence that unloaded running ability relates to military performance, and in fact a correlation of only 0.16 was found between the 2-mile run time and a 20-km load carriage time.[42] It may take different body types to carry loads well and to run fast. Higher lean (or fat-free) body mass is associated with faster load carriage and with better performance on lifting, pushing, carrying, and exerting torque, and the associations are stronger for lean body mass than for percent body fat.[42] Some have suggested that there be a requirement for minimum lean body mass rather than maximum body fat for entry and retention on active duty.[30,42]

The Army's initial body fat standards, established in 1982, were based on estimates of body fat percent that correlated with desired levels of physical fitness as measured by $\dot{V}O_2$max. Subsequently, these measures were also found to correlate well with the 2-mile run standard. However, the result was that the body fat standard was based on a measure of aerobic fitness, excluded any measurement of muscular strength or endurance, and was unrelated to job performance or other objectively based need.[30]

The Subcommittee on Body Composition, Nutrition, and Health of Military Women recommended revision of the current two-tiered body composition (weight for height, then body-fat measurement) and fitness screen. The new system would emphasize fitness as measured by ability to pass the physical training test. Specific criteria would determine whether the service member would be returned to duty, referred to a fitness program, referred to a weight management program, or referred to both programs. The Subcommittee further recommended development of

> a single service-wide equation derived from circumference measurements for assessment of women's body fat, to be validated against a four-compartment model using a population of active-duty women or a population that is identical in ethnic and age diversity to that of military women.[43(p14)]

The Subcommittee believed that such an equation could result in changing the BMI cut-off values.

The Subcommittee recommended that in the postpartum period, women should be allowed up to 1 year to attain body weight standards as long as satisfactory progress is being made, a potential increase of 6 months for all four services. The Subcommittee also recommended that fitness testing should not be required for 180 days after delivery, an increase only for the Army of 45 days. Finally, the Subcommittee recommended an increase in the length of exemption from deployment after childbirth to 6 months from the current 4 months for all four services.

PSYCHOLOGICAL STRESS

With the rapid changes in the demographic make-up of the military since the 1970s, concern has arisen over the success in integrating women into a primarily male organization and the prevalence and effect on women of sexual harassment and posttraumatic stress disorder (PTSD). Further discussion of these topics appears in chapter 49, Psychological Aspects of Deployment and Reunion.

Sources of Stress and Coping Behaviors

The 1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel[48] included questions about mental health. The authors reported that about one in three military women and almost one-half of women in the Marine Corps reported experiencing high stress as women in the military. They further reported that stress associated with being a woman in the military was higher among "other" racial or ethnic groups, those with a high school education or less, younger personnel, unmarried personnel, and enlisted personnel. Comparable conclusions for men are not provided. Personnel of both sexes and from all services reported higher levels of stress from their military duties than from their personal lives. Among men responding to the survey, the most frequently mentioned sources of stress were being away from family (23.7%), deployment (17.1%), increases in work load (16.6%), financial problems (15.0%), and conflicts be-

tween military and family responsibilities (13.0%). For women, these were being away from family (21.1%), major changes in family, such as birth or death of a loved one (17.0%), increases in work load (15.9%), problems in work relationships (15.7%), and problems with supervisors (13.1%). The sources of stress on which men and women differed the most in this survey were deployment (men 17.1%, women 6.9%), changes in family (men 12.3%, women 17.0%), and personal health problems (men 4.0%, women 8.6%). For both men and women, the most frequently mentioned coping behaviors were thinking of a plan to solve the problem, talking to a friend or family member, and exercising or playing sports. Men chose "talk to a friend or family member" significantly less frequently than did women (men 69.7%, women 87.6%). Men were more likely to cope by having a drink (men 24.4%, women 16.8%). Women were more likely to cope by getting something to eat (men 45.5%, women 57.2%). The authors conclude that stress among women in the military may be related to work and family roles and from being female in a predominantly male environment. They suggest broadly disseminating to military women stress management techniques that address issues of coping in a male environment. These data may help noncommissioned officers, commanders, and health care providers identify and ameliorate sources of stress in service members.

A study was carried out in 1991 of sex differences in stress among combat support and combat service support soldiers deployed to the Persian Gulf during the Persian Gulf War.[49] The study was done during the deployment but after the end of the war. None of the volunteers had been in combat. The males were significantly older and more likely to be noncommissioned officers than the females. Three stress categories were studied: operational, personal, and anticipation of combat. Personal stress was the most highly correlated with psychological symptoms for both sexes, with no significant difference between the sexes. Hardiness, a measure of resilience, was associated with having fewer psychological symptoms for both sexes, with no significant difference. Women reported significantly higher stress from anticipation of combat.

The authors of a study among National Guard and Reserve personnel comparing those who did and did not deploy conclude that "ethnic minorities but not necessarily women may be more vulnerable to psychological risk." [50(p415)] They found that those who deployed and those of nonwhite race scored higher on the Beck Depression Inventory scale; that those who deployed scored higher on the Depression and Anxiety scales of the Brief Symptom Inventory; and that those who deployed and women scored higher on the Health Symptom Checklist.[50] Women's scores on the Health Symptom Checklist did not vary by deployment status, nor did women report greater symptoms of psychological distress than men or score higher on measures of PTSD symptomatology.

Sexual Harassment

Sexual harassment is an issue that has received increased attention as the proportion of women in the military has increased. A 1995 Army study[51] used self-report surveys on sexual harassment among combat support and combat service support soldiers at three Army posts. Subjects were administered the Sexual Experiences Questionnaire, which measures actual experiences rather than perceptions of harassment. Seventy-nine percent of females and 68% of males reported having experienced "gender harassment," such as sexist jokes or crude comments. Fifty-five percent of women and 38% of men reported experiencing unwanted sexual attention. Fifteen percent of women and 9% of men reported experiencing sexual coercion, imposition, or assault. After being given the Department of Defense definition of sexual harassment, "a form of sexual discrimination involving deliberate, repeated unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature," [51(p65)] 30% of women and 8% of men reported they had been sexually harassed. Reporting coercion was predictive of lower psychological well being for men. The only predictor of lower psychological well being for women was gender harassment.

Posttraumatic Stress Disorder

Some scientists have addressed the prevalence of PTSD symptoms in military populations and the relationship of sexual and nonsexual trauma to PTSD symptoms. One study of soldiers at six active duty Army posts used self-report questionnaire data and an algorithm to determine prevalence of PTSD symptoms. It showed that the current and lifetime prevalences of "potential PTSD" were higher in women.[52] Among all study participants, regardless of PTSD status, women reported a significantly higher number of PTSD symptoms than men. The overall prevalence of current symptoms was 6.7%, with 5% prevalence in men and 8.6% in women. Of those with "potential PTSD," women reported more sexual trauma and men reported more nonsexual trauma, but women's traumatic episodes were more likely to have occurred before their military service than men's. In the same study population, 22.6% of women re-

ported experiencing a completed rape, with 81.2% of these occurring before entry to military service.[53] Thirty percent of the women reported experiencing attempted rape and assault other than attempted rape, and 29% reported experiencing completed rape. Seventy-five percent reported that the sexual assaults occurred before they entered the service, with approximately 12% each reporting sexual assaults occurring only on active duty and both before and during active duty. The authors suggest that a history of attempted and completed rape in childhood may be more common among female soldiers than among civilian women and that sexual assault history should be elicited to permit appropriate care for any lingering physical or psychological effects.

A similar self-report survey of premilitary adult sexual victimization and aggression among Navy recruits revealed that 45% of the women reported being the victim of either attempted or completed rape and that 15% of the men reported perpetrating either attempted or completed rape.[54] The authors note that women who have been victimized and who are exposed to a variety of stressors, such as those that can occur during deployment, may have an increased need for certain medical and psychological services. They also note that a history of sexual aggression is predictive of future sexual aggression in nonmilitary populations and suggest that interventions among these men may be helpful.

The Committee on Defense Women's Health Research identified several avenues of research in the area of psychological stress during deployment.[2] These include possible sex differences in the nature, intensity, and optimal treatment of combat stress reaction or PTSD; phobias and other psychological effects related to the use of protective clothing and equipment; the impact of family issues such as separation from children and adequacy of child care; and methods of preparing women for the sex-specific aspects of captivity.

SUMMARY

Women make up an increasing proportion of active duty service members. More jobs with the potential for a variety of hazardous exposures are open to military women. Most of the issues regarding health during mobilization and deployment concern both men and women, and the similarities between men and women regarding potential military health hazards are greater than are the differences. However, there are differences significant enough to warrant consideration. It is important to understand the differences for many reasons. These differences must be taken into account to ensure that female service members receive the same quality of care as do males, even if the content of the care differs somewhat. A better understanding of all service members' capabilities and limitations will permit maximal use of those capabilities for the good of the service and the country while minimizing preventable harm to the individual. There remain many questions requiring additional research, and the current state of knowledge in this area will likely undergo significant change as data accumulate over time.

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