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16. Abstract <p>It has been the policy of the Federal Aviation Administration to medically certify individuals, for a variety of flying privileges, who have a medical deficiency or disease, provided it can be determined that such action does not compromise air safety. During recent years, for example, standards have been relaxed with respect to contact lens use and medication allowed for control of hypertension.</p> <p>This descriptive epidemiologic study presents the point prevalence of pathology among active airmen as of January 1, 1984, by major body system and for other selected pathologies of interest within the major body systems. Data were obtained from active computer files maintained by the Aeromedical Certification Branch of the Civil Aeromedical Institute in connection with the certification program.</p> <p>Cardiovascular, eye, and abdominal pathologies represent the most prevalent medical conditions among active airmen (5.9%, 4.4%, and 4.0% respectively). Hypertension is the most frequently occurring cardiovascular condition. Of particular interest is the current certification of 263 airmen who have undergone coronary artery bypass. Some 324,986 active airmen (45%) require correction for some visual deficiency. Of this total, 20,355 are contact lens wearers. History of kidney stones is the most common genitourinary/abdominal finding.</p> <p>Prevalence of pathology among active civil airmen, while still considerably less than among the general population, is increasing due to current and past emphasis on relaxation of regulatory requirements when consistent with safety.</p>			
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HEALTH EXAMINATION FINDINGS AMONG ACTIVE CIVIL AIRMEN

INTRODUCTION

The Federal Aviation Administration (FAA) and its predecessors have been charged with the responsibility for medical certification of all United States and some international civil airmen since 1927. Each airman must hold a current medical certificate of the appropriate class to validate any pilot certificates he or she may possess. As of January 1, 1984, 715,858 active airmen were medically certified. Federal Aviation Regulations require that physical examinations must be performed at 6-month intervals for air transport pilots, annually for other commercial pilots, and at 2-year intervals for private pilots.

The Aeromedical Certification Branch of the Civil Aeromedical Institute (CAMI), located in Oklahoma City, Oklahoma, is the central screening facility and repository within the FAA for collection, processing, adjudication, investigation, and analyses of medical data generated by the aeromedical certification and related regulatory programs.

Medical certification criteria have changed dramatically in favor of the airman during recent years as a result of the evolution of aviation medicine and increased efforts in the area of aeromedical research. A primary function of CAMI is to identify and provide substantive data in support of current medical criteria in the furtherance of aviation safety as well as provide a better service to the airman. It has been the policy of the FAA to medically certify individuals, for a variety of flying privileges, who also have medical deficiency or disease, provided it can be determined that such action does not compromise air safety. During recent years, for example, standards have been relaxed with respect to contact lens use and medication allowed for control of hypertension.

This descriptive epidemiologic study presents the point prevalence of pathology among active airmen as of January 1, 1984, by age, class of medical certificate, major body system, and other selected pathologies of interest within the major body systems. The study updates previous studies of a similar nature with respect to current prevalence of disease among airmen.

METHODS

Physical examinations to detect medical conditions which could incapacitate a pilot or otherwise adversely affect pilot performance are given by some 7,696 designated aviation medical examiners (AME's), most of whom are physicians in private practice. Military applicants receive their examinations at 536 designated military facilities. Reports of these examinations from throughout the world are forwarded to the Aeromedical Certification Branch in Oklahoma City.

Federal Aviation Regulations, Part **67**, specify that a medical certificate will be denied if an applicant has an established medical history or clinical diagnosis of any of the following conditions:

1. A personality disorder that is severe enough to have repeatedly manifested itself by overt acts.
2. A psychosis.
3. Alcoholism, unless there is established clinical evidence, satisfactory to the Federal Air Surgeon, of recovery, including sustained total abstinence from alcohol for not less than the preceding 2 years. "Alcoholism" means a condition in which a person's intake of alcohol is great enough to damage physical health or personal or social functioning, or when alcohol has become a prerequisite to normal functioning.
4. Drug dependence.
5. Epilepsy.
6. A disturbance of consciousness without satisfactory medical explanation of the cause.
7. Myocardial infarction.
8. Angina pectoris.
9. Coronary heart disease that has required treatment or, if untreated, that has been symptomatic or clinically significant.
10. Diabetes mellitus, requiring insulin or other hypoglycemic drug for control.

However, certification is possible despite the existence of one of the above disqualifying medical conditions if special issuance is granted after extensive medical review by FAA and consultant specialists. The primary considerations in such cases are history, prognosis, and potential risk of sudden or insidious incapacitation. It is appropriate to note, however, that airmen with disqualifying conditions are issued medical certificates with special medical and operational restrictions that allow for control of risk.

Automated medical record files maintained by the Aeromedical Certification Branch provided the source data for the study. The files utilized contain only the most recent application for medical certification from an airman within the past **3** years. Pathology detected by previous medical examinations is brought forward to the current automated medical file in order to maintain as complete a history as possible. While this file contains records for a total of **3** years, a medically certified airman is considered "active" for a maximum of **24** calendar months following his or her most recent FAA medical examination; i.e., regardless of the class of medical certificate originally issued, it is valid for third-class airman purposes for a period of time up to **24** calendar months unless otherwise limited or recalled by the **FAA**.

Prevalence data **were** automatically produced from the automated files described above. Prevalence data in this population are expected to be somewhat conservative since problems have been experienced in the acquisition of complete and accurate histories from pilots with a job, hobby, or aircraft investment to protect.

Prevalence data are obviously a function of incidence and duration of diseases; therefore, one would not expect the more immediately lethal diseases

to be represented to the same extent as less serious diseases of longer duration. Additionally, airmen with more serious health problems are likely to be denied medical certification and would not become eligible for study. These data do, however, indicate the relative importance of various diseases among airmen, even though conservative in some instances, and provide insight concerning potential health problem interaction with the aviation environment. Since general population literature prevalence data are limited with respect to some of the diseases reported on in this study, some further benefit is expected in that regard.

RESULTS AND DISCUSSION

Diseases of the cardiovascular system are the most frequently observed diseases among active airmen. As expected, hypertension is the greatest contributor to the total prevalence rate. However, as may be seen in Table 11, the prevalence of hypertension is only a fraction of that which would be expected in an unscreened population. The low prevalence of hypertension in this population is due to higher than usual upper limit cutoffs for assignment of a hypertensive diagnosis among airmen (170/100 for applicants for second- and third-class certification, and only slightly more stringent for class one applicants). More severely hypertensive airman applicants are also excluded from this population due to the type or dosage of medication required for control. Diuretics and some beta-blockers in low dosage are currently allowed for hypertension control. Clearly, this excludes many hypertensive applicants requiring larger doses or combinations of drugs for effective control.

Heart murmurs, including functional or physiologic murmurs, account **for** over **16** percent of all heart conditions observed to exist among active airmen.

Reference to Tables **I** and **II** indicates that eye diseases are the next most prevalent medical problems among active airmen (excluding lens correction). While representing a serious threat to air safety if not recognized and treated by adequate correction, most eye pathology **is** relatively innocuous. Of the 715,858 active airmen as of January **1**, 1984, some 45 percent (324,986) required lens correction **for** some visual deficiency. **Of** this total, 20,355 are known contact lens wearers. Additionally, 4,437 airmen are certified to fly with blindness or absence of an eye (which includes visual acuity worse than 20/200 uncorrected in either **eye**). Serious incapacitation during flight is possible should corrective lenses become dislocated and temporarily unavailable during a critical phase of flight. Considerable research effort has been and will continue to be devoted to this important area of potentially health-related pilot dysfunction.

Prevalence of abdominal diseases is third in total body system importance. Specific diseases making major contributions include current hernias, history of kidney stones, and uncomplicated ulcers.

Major body system prevalence rates for neuropsychiatric and bone and **joint diseases are approximately equal at 14.1 and 12.1 per 1,000 airmen** respectively. Within these systems no single disease entity makes a contribution significant enough to deserve separate mention. Both major body systems contain 30 to 40 distinct disease categories, with each making minor contri'butions totaling the approximate 12-14 per 1,000 rate for the major body system.

TABLE I. PATHOLOGY PREVALENCE AMONG ACTIVE AIRMEN
BY AGE AND MAJOR BODY SYSTEMS
(Rate per 1,000)

Body System	Age (Years)					Total
	<30	30-39	40-49	50-59	> 59	
ENT	42.9	61.4	56.9	64.9	110.9	44.4
ENT	2.2	5.2	10.0	19.6	40.3	9.0
Respiratory	1.1	2.2	3.2	5.7	8.3	2.9
Cardi ascular	25.9	41.0	72.7	115.6	169.9	59.4
Abdominal (GI, GU, etc.)	13.7	32.0	53.3	73.3	109.0	40.2
Neuropsychiatric	8.5	13.8	18.6	19.0	18.5	14.1
B es and Joint	3.9	8.6	14.6	24.8	38.6	12.1
Muscles	0.5	1.4	2.2	3.6	5.5	1.8
Miscellaneous	30.6	41.2	48.7	59.1	64.6	43.1

TABLE II TEN MOST PREVALENT CONDITIONS AMONG ACTIVE AIRMEN
BY AGE
(Rate per 1,000)

Disease	Age (Years)					Total
	< 30	30-39	40-49	50-59	> 59	
Hypertension	7.0	17.9	40.2	68.2	87.0	29.4
Wears Contact Lenses	28.6	37.9	23.7	15.3	14.4	27.7
Scar Fever	12.7	16.5	16.2	10.1	10	14.6
Kidney Stones	3.0	11.0	18.6	20.2	21.3	22.0
Heart Murmur	11.4	9.3	7.6	8.8	16.8	9.9
Hernia	1.2	0.1	9.0	16.0	27.2	7.0
Blindness or Absence of Eye	2.0	0.9	8.2	10.0	15.5	6.0
History of Neoplasm	1.1	3.3	6.2	10.0	31.0	6.0
Asthma	5.6	6.2	5.1	4.8	4.6	5.5
Uncomplicated Ulcer	2.6	5.1	7.3	8.4	9.0	5.4

The "miscellaneous" category of disease includes endocrinopathies, skin diseases, drug usage by type, allergies, tropical diseases, and general systemic conditions. Nearly one-third of all disease observed in this category was "hay fever." Other major contributors to this category included antihistamine drug usage, asthma, diabetes controlled by diet, and hypothyroidism.

The ten most prevalent diseases observed among active airmen are presented in Table 11. Diseases found to increase with age include hypertension, kidney stones, hernia, blindness or absence of an eye, history of neoplasm, and uncomplicated ulcer. Diseases demonstrating a trend of decrease with age included contact lens use, hay fever, and asthma. Heart murmurs were most common among young and older ages with lower prevalence among the middle ages.

These age/disease findings are consistent with expectation except for the decreasing prevalence of hay fever with age, which may be due to underreporting.

Disease is most prevalent among third-class (general aviation) airmen and least prevalent among classes one and two airmen (professional pilots) (see Figure 1). Since the professional pilot undergoes a more thorough and rigid examination and is subjected to stricter standards by the FAA as well as employers, one must assume that these results reflect the effects of more thorough early screening out of problem medical cases which results in less subsequent disease among the remaining group. Possibly medical history (which would lead to disease detection) is being masked to a greater extent among the professional-category pilots. Certainly the incentive is great, both monetary and otherwise, for the latter hypothesis.

The prevalence findings of this study and previous research efforts involving the airman population or segments thereof are generally similar with respect to major body systems presenting the highest prevalence rates; i.e., cardiovascular, eye, and abdominal (1-3). However, as seen in Figure 2, prevalence rates are higher than those in previous studies for most major body systems partially due to the fact that prevalence, by definition, is an accumulation of disease at a point in time and would be greater in a given population at successive measurements for nonlethal diseases. The second consideration with regard to increased prevalence rates surely has to do with the fact that medical requirements have been relaxed over recent years to allow airmen to continue flying with various medical problems not previously acceptable. A possible additional factor having to do with the increase in prevalence seen in this study has to do with a rather dramatic decrease in population since the previous study. It seems likely that the residual population are more "hard core" aviators, many of whom may have accumulated pathology over the **years**. Large and statistically significant increases in age-specific cardiovascular pathology were observed in comparing this study with the **1980** study. This difference is largely attributable to an increased number of hypertensives in the population resulting from a relaxation of allowable medications and combinations.

Sizable increases in age-specific **rates** for abdominal pathologies were also observed in this study over the previous study. **No** single explanation, however, accounts for this latter observation other than that speculated earlier.

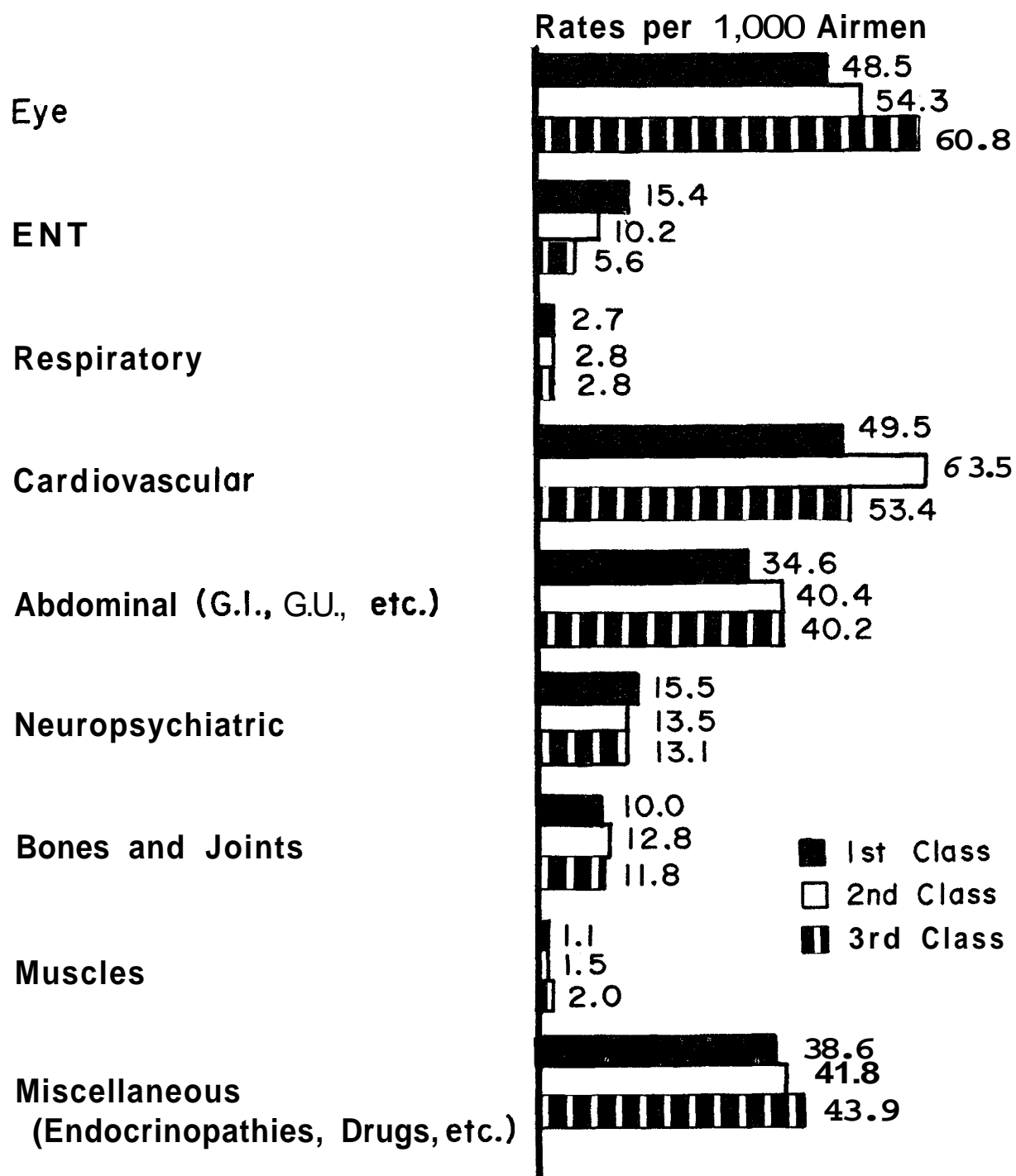


Figure 1. Disease prevalence among active airmen by system and class of medical certificate, 1984.

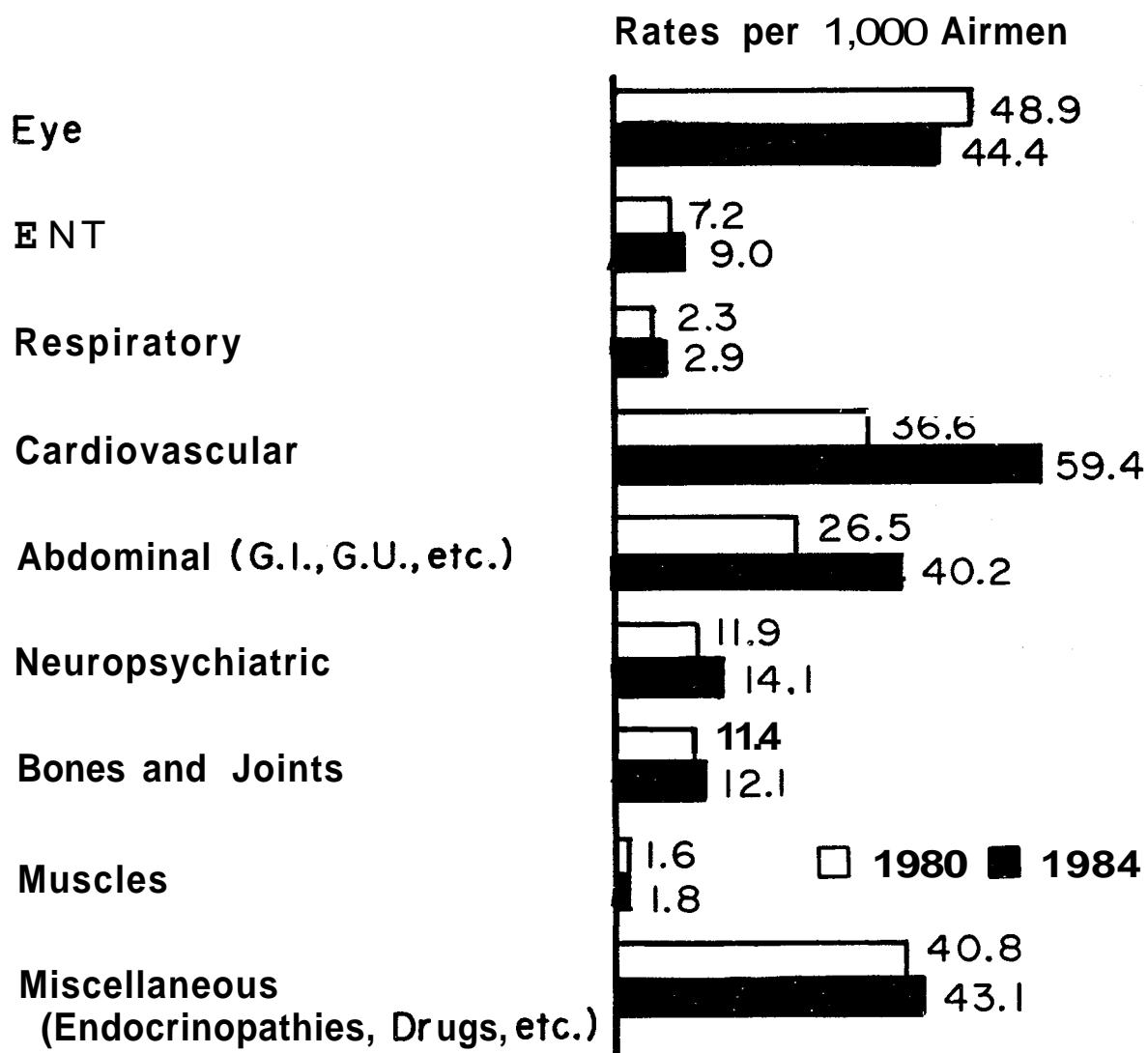


Figure 2. Comparison of disease prevalence among airmen by body system, 1980 versus 1984.

SUMMARY

Health findings in the active airman population are generally consistent with those that might be expected in the general U. S. population, except scaled to reflect lower prevalence due to prescreening and problems associated with accurate reporting of symptoms and history by pilots.

Cardiovascular diseases are highest in frequency of occurrence among active airmen. As expected, hypertension is the greatest contributor to cardiovascular disease prevalence.

Eye disease is the next most common problem among pilots with some 45 percent of all airmen requiring lens correction for some visual deficiency.

Abdominal disease prevalence is third in total body system importance. Major contributors to the category include current hernia conditions, history of kidney stones, and uncomplicated ulcers.

Overall, disease prevalence is greater among currently certified airmen than among previous groups studied. This increase in prevalence *is* probably a reflection of more liberal standards more than any other single factor. Through the years the trend has been toward relaxation of medical standards where possible when not resulting in a compromise of air safety,

The greater prevalence of disease observed among general aviation pilots compared with professional pilots likely reflects the impact of stricter standards and examination for professional pilots with some greater masking of disease and history among the professional pilots suspected. With the trend away from airline medical departments, possibly some increased vigilance in examination **of** professional pilots will be necessary.

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