

## Foot Problems in the US

### *The 1990 National Health Interview Survey*

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The National Health Interview Survey (NHIS), designed and conducted by the National Center for Health Statistics (NCHS), has long been a useful source of information on the health status of the civilian noninstitutionalized population of the US. In 1990, interviews were conducted with 46,476 households, comprising 119,631 individuals. As in the past, each individual (or in the case of children under 18 years, an appropriate adult proxy) was asked a series of questions on the following topics: incidence of acute conditions, prevalence of chronic conditions, episodes of injury during the previous year, limitation of activity due to chronic conditions, and use of medical services, including physician contacts and short-stay hospitalizations.

In December 1991, the government issued a publication in which it released preliminary estimates on each of these topics. The publication is part of a continuing series of reports used by policy analysts, academicians, and health professionals to assess trends in the incidence and prevalence of specific medical disorders.<sup>1</sup> The information was used to judge the extent to which those disorders are being treated, and to identify the types and numbers of professionals involved in the provision of treatment.

Levy,<sup>2</sup> in 1992, provided a useful summary of the government's estimates, based on the 1990 NHIS, with respect to three conditions of special interest to podiatrists: bunions, ingrown toenails and other toenail problems, and corns and calluses. These, it should be noted, are the only conditions routinely addressed in the survey that relate uniquely to the foot.

Within the government, the Division of Medicine in the Health Resources and Services Administra-

tion recognized the need to learn more about foot care in general, and about the specific foot care needs of the American public, than can be learned from the questions, normally asked by the NHIS. The Division's interest in these matters stems from the fact that it currently supports, or has recently supported, programs designed to bolster the training of podiatrists. Aware that the continued support of such programs rests on the availability of more complete information on foot disorders in general, the Division entered into an agreement with NCHS to add to the 1990 NHIS a special supplement dealing exclusively with the foot. These extra questions go beyond the basic survey instrument in several major respects.

They cover not only the conditions addressed in the core survey instrument, ie, bunions, toenail problems, and corns and calluses, but the following additional problems as well: foot infections, including athlete's foot, other fungal infections, and warts; flat feet or fallen arches; clubfoot; foot and toe deformities such as hammer toe, claw toe, and missing toes; injuries of the foot (sprains, strains, and fractures); and arthritis of the toes.

They address the following issues not addressed elsewhere in the NHIS survey: 1) Were the foot problems you experienced serious enough to warrant treatment? 2) Were they treated and, if so, by what type of practitioner (podiatrist, orthopedic surgeon, or other medical doctor)? In what setting (doctor's office, outpatient clinic, or home)? 3) Was treatment, if provided, covered by health insurance? 4) If the problems you experienced were serious enough to warrant treatment but were not treated, why not?

A comprehensive analysis of these issues, based on the almost 120,000 responses to the podiatry supplement received, was commissioned by the Division of Medicine and published in November 1992.<sup>3</sup> This article highlights the findings of that re-

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port. It consists of two major parts. In the first part, Basic Study Findings, the authors present the results of an analysis of the NHIS data tape furnished by the NCHS. In the second part, Sources of Probable Underestimation, the authors identify several features of the data that indicate that some of the estimates developed in each of the three major study domains (incidence, prevalence, and treatment) may be severely understated.

## Basic Study Findings

### Incidence and Prevalence

With respect to the incidence and prevalence of foot problems, respondents were asked if they, or a member of their family, had trouble with their feet in the past 12 months (incidence), and if they had the problem now (prevalence). The results of these inquiries are summarized in Table 1 for each of the nine foot problems listed in the podiatry supplement plus two additional items (bone spurs and nerve damage) which, although not listed, received a fair number of mentions as other.

The three most common foot problems in the United States are ingrown toenails and other toenail problems, foot infections, and corns and cal-

luses. Each of these items "troubled" (the term used in the survey instrument) over 11 million civilian noninstitutionalized Americans in 1990.

Of these problems, corns and calluses were by far the most prevalent, ie, the least likely to have gone away or been cured. Over nine million of the 11.2 million persons troubled by corns and calluses during the past year had the problem at the time of interview, a prevalence-to-incidence ratio of 83%. The corresponding ratios for toenail problems and foot infections were 65% and 55%, respectively.

Foot injuries, which affected 5.6 million Americans in 1990, were a distant fourth in terms of incidence and much lower in terms of prevalence. The associated prevalence-to-incidence ratio was 32%, ie, only about one third of those troubled by foot injuries had the problem at the time of interview. Acute conditions, quite naturally, have lower prevalence-to-incidence ratios than those that are chronic.

Flat feet, in fifth place with 4.6 million mentions, had a prevalence-to-incidence ratio of 95%, the highest of all foot problems noted. Bunions and arthritis of the toes, only slightly behind in terms of incidence, 4.4 and 3.9 million, respectively, had prevalence-to-incidence ratios in the vicinity of 90%.

These figures, aggregate in nature, convey the overall magnitude of any given foot problem but offer no insight as to how the problem varies by

Table 1. Incidence and Prevalence of Foot Problems in the US, 1990

Problem	Persons Who Reported Having Had This Problem in the Past 12 Months		Persons Who Reported Having This Condition Now	
	Number (in millions)	Rate Per 1,000 Population	Number (in millions)	Rate Per 1,000 Population
Ingrown toenails or other toenail problems	11.3	46	7.3	30
Foot infection, including athlete's foot, other fungal infections, and warts	11.3	46	6.2	25
Corns or calluses	11.2	45	9.2	36
Foot injury (sprain, strain, fracture, or dislocation)	5.6	23	1.8	7
Flat feet or fallen arches	4.6	19	4.4	18
Bunions	4.4	18	3.8	16
Arthritis of toes	3.9	16	3.5	14
Toe and joint deformities (hammer toe, claw toe, missing toes)	2.5	10	2.2	9
Bone spurs	0.95	4	0.67	3
Nerve damage to foot	0.23	0.9	0.17	0.7
Clubfoot	0.16	0.6	0.13	0.5
Others	2.7	11	2.2	9
Total number of conditions reported	58.8	239	41.6	170
Unduplicated number of persons involved	43.1	175	31.7	129

age, race, or gender. Those details are furnished in Tables 2 and 3 for each of the eight most commonly reported foot conditions separately and for all foot problems combined.

Females reported toenail problems more commonly than males, and Caucasians more commonly than blacks (Table 2). The incidence of toenail problems increases rapidly with age (Table 3).

Men reported foot infections twice as often as women, and Caucasians almost twice as often as blacks. Except for the very young, age does not appear to be a factor.

Women suffer from corns and calluses twice as often as men, and blacks about 30% more often than Caucasians. As with toenail problems, the incidence of corns and calluses increases rapidly with age. Foot injuries were reported with roughly equal frequency by females and males, but more commonly by Caucasians than blacks. Injuries peak between the ages of 18 and 44 years but decline thereafter.

Flat feet were more commonly reported by blacks than Caucasians and were roughly evenly divided between males and females. Among adults, there is little variation by age. Bunions are five

times as common among females as males but are evenly divided between Caucasians and blacks. As with other chronic conditions, the incidence of bunions rises sharply with age.

Arthritis of the toes was reported twice as often by females as males, and about 30% more often by Caucasians than blacks. Again, the condition rises sharply with age. Deformities of the toe or joint, defined in the survey instrument as "including hammer toe, claw toe, and missing toes," are twice as common among females as males, and twice as common among Caucasians as blacks. After a slow start, their incidence begins to accelerate at middle age.

Foot problems were more commonly reported by females than males, and by Caucasians than blacks. Incidence climbs with age: persons 65 years or older display roughly twice the rate of foot problems as those between the ages of 18 and 44 years, with roughly one in every three elderly persons suffering from foot problems of one form or another.

Variations in the frequency of foot problems by geography and income were explored as well. Table 4 shows the reported incidence of foot problems by census region (Northeast, Midwest, South,

**Table 2. Number of Persons Per 1,000 Who Reported Having Specific Foot Problems in the Past 12 Months, by Gender and Race, 1990**

Problem	Total US	By Gender		By Race	
		Male	Female	Caucasian	Black
Toenail problems	46	42	49	48	33
Foot infections	46	61	31	49	28
Corns and calluses	45	30	60	45	58
Foot injuries	23	23	22	24	15
Flat feet	19	19	18	18	25
Bunions	18	6	29	18	17
Arthritis of toes	16	10	22	17	13
Toe and joint deformities	10	6	14	11	5
All foot problems combined	175	163	186	182	144

**Table 3. Number of Persons Per 1,000 Who Reported Having Specific Foot Problems in the Past 12 Months, by Age, 1990**

Problem	Age (yr)							
	Under 5	5-17	18-24	25-44	45-64	65-69	70-74	75 and Over
Toenail problems	5	20	39	44	59	78	94	123
Foot infections	5	44	45	52	52	55	46	41
Corns and calluses	*	5	23	48	72	90	105	125
Foot injuries	3	22	36	28	21	17	14	10
Flat feet	7	14	20	20	23	25	24	23
Bunions	*	2	8	14	29	44	47	66
Arthritis of toes	*	1	3	7	30	47	68	88
Toe and joint deformities	2	3	4	6	16	24	39	41
All foot problems combined	26	100	148	179	229	281	316	336

\*Statistically unreliable; fewer than ten observations in the sample.

or West), metropolitan/nonmetropolitan area designation, and family income. To eliminate differences because of age, all of these numbers have been age-adjusted. The Northeast has a much lower rate of persons with reported foot problems (143/1,000) than any other region. Of the four types of geographic areas considered, farm areas have the lowest rate of persons with reported foot problems (160/1,000) and nonfarm nonmetropolitan areas the highest (181/1,000). Metropolitan areas, both central city and noncentral city, are at or near the nationwide average of 175/1,000.

The incidence of foot problems decreases markedly with family income, declining from 217/1,000 for those with incomes under \$10,000 to 175/1,000 for those with incomes over \$50,000. A striking phenomenon is noted, however, for those who failed (or refused) to report their income: their reported rate of foot problems (125/1,000) is substantially lower than that of any other group, leading to the conjecture that individuals who failed to report their family income may have held back on other data elements as well, including the nature and extent of any foot problems they might have.

Table 5 shows the age-adjusted incidence and prevalence rates for all foot problems combined, by gender and race. Not only are these rates substantially lower for males than females (163/1,000 versus 186/1,000 in terms of incidence, 112/1,000 versus 145/1,000 in terms of prevalence), the ratio of prevalence to incidence is lower as well: 69% for males as opposed to 78% for females. The latter finding suggests that the foot problems of females are more likely to be chronic, ie, less likely to be corrected over the course of the year, than those of males.

As for race, the reported incidence and prevalence rates are lower for blacks than they are for Caucasians: 144/1,000 as opposed to 182/1,000 in terms of incidence, 115/1,000 as opposed to 133/1,000 in terms of prevalence. The prevalence-to-incidence ratio, however, is higher: 79% for blacks, 73% for Caucasians. The latter phenomenon stems, to some extent, from the fact that blacks are somewhat less likely than Caucasians to seek and receive treatment.

### Treatment and Nontreatment

Not all respondents troubled by foot problems necessarily sought treatment. Those who reported that their problems had not yet gone away or been cured were asked by the interviewer if they regarded their current problem(s) as "severe or serious enough to consider getting professional care." Substantial percentages replied in the affirmative.

Those who did were then asked if they had received "professional health treatment . . . during the past 12 months." Again, large percentages said "Yes." These percentages are summarized in Table 6. As before, numbers are presented for the nation as a whole, then subdivided by various demographic and geographic factors.

**Gender.** Of those who regarded their current foot problems as serious enough to consider getting care, both genders received care during the preceding 12 months at roughly the same rate, approximately 55%. However, because males reported fewer problems than females to begin with (163/1,000 as opposed to 186) and were less likely to regard their problems as serious (31% as opposed to 39%), their care rate per thousand was

**Table 4. Number of Persons Per 1,000 Who Reported Having Had One or More Foot Problems in the Past 12 Months, by Selected Geographic Variables and Income in the US, 1990\***

Total US	175
Northeast	143
Midwest	181
South	184
West	184
Metropolitan - central city	173
Metropolitan - noncentral city	174
Nonmetropolitan, nonfarm	181
Nonmetropolitan, farm	160
Family income (\$)	
Less than 10,000	217
10,000-19,999	189
20,000-34,999	182
35,000-49,999	176
50,000 or more	175
Income not reported	125

\*The figures for each population segment are age-adjusted to match the age distribution of the US as a whole.

**Table 5. Incidence and Prevalence Rates Per 1,000 Persons of All Foot Problems Combined, by Gender and Race, 1990\***

	Incidence	Prevalence	Incidence Ratio (%)
Total US	175	129	74
Male	163	112	69
Female	186	145	78
Caucasian	182	133	73
Black	144	115	79

\*Estimates by race and gender are age-adjusted to match the age distribution of the US as a whole.

**Table 6. Treatment and Nontreatment of Foot Problems Per 1,000 Persons in the US, 1990**

	Persons Who Reported One or More Foot Problems in the Last 12 Months	Persons Who Still Have the Problem and Regard It as Serious Enough to Consider Getting Care (%)	Persons Who Received Care in the Past 12 Months (%)
Total US	175	62 (36)*	34 (55)
Gender			
Male	163	51 (31)	28 (54)
Female	186	73 (39)	40 (55)
Race			
Caucasian	182	65 (36)	36 (55)
Black	144	54 (38)	28 (51)
Census region			
Northeast	143	58 (41)	38 (65)
Midwest	181	66 (36)	34 (52)
South	184	83 (34)	31 (49)
West	184	60 (33)	33 (56)
Area designation			
MSA <sup>a</sup> - central city	173	64 (37)	35 (54)
MSA - noncentral city	174	63 (36)	35 (56)
Non-MSA, nonfarm	181	61 (34)	31 (52)
Non-MSA, farm	160	54 (34)	27 (49)
Family income (\$)			
Under 10,000	217	93 (43)	45 (48)
10,000 - 19,999	189	68 (36)	33 (49)
20,000 - 34,999	182	63 (35)	34 (53)
35,000 - 49,999	176	62 (35)	36 (58)
50,000 or more	175	82 (35)	37 (80)
Income not reported	125	44 (35)	24 (56)

\*Percentages in parentheses are with respect to the column immediately to the left.

<sup>a</sup>Abbreviation: MSA, Metropolitan Statistical Area.

substantially less than that for females, 28 as opposed to a nationwide average of 34 for both sexes combined and 40 for females alone. The latter differences are highly statistically significant.

**Race.** Although blacks with foot problems are slightly more likely than Caucasians to regard them as serious (38% as opposed to 36%), they are less likely to report foot problems in the first instance (144/1,000 as opposed to 182) and less likely to receive care once the need has been perceived (51% as opposed to 55%). As a result, the overall care rates (28/1,000 for blacks, 36/1,000 for Caucasians) differ significantly.

**Census Region.** A higher percentage of those in the Northeast who regarded their foot problems as serious (65%) received care than those in other regions. The comparable figure in the South is 49%. Both figures, compared with the nationwide average of 55%, are highly significant. As a consequence, the Northeast, which had the lowest reported rate of foot problems in the nation (143/1,000), had the highest rate of care received (38/1,000) and the South the lowest (31/1,000). These differences are statistically significant.

**Metropolitan/Nonmetropolitan Area.** The basic dichotomy here is between metropolitan areas, both central city and noncentral city, and nonmetropolitan areas, both farm and nonfarm. Whether expressed as a percentage or as a rate per thousand, the metropolitan and nonmetropolitan care rates differ significantly, whereas those between central city and noncentral city and between farm and nonfarm do not.

**Family Income.** Among those who regarded their current foot problems as serious, the percentage that received care during the preceding 12 months rose with income. For those with incomes under \$10,000, the percentage is 48%; for incomes over \$50,000, it is 60%, a statistically significant difference. Despite the lesser likelihood of receiving care, however, among persons with incomes under \$10,000 who perceive their problems as serious, their overall care rate is significantly greater than the nationwide average, 45/1,000, as opposed to 34. Among those with incomes over \$10,000, the care rate hovers between 33 and 37/1,000.

**Reasons for Nonreceipt of Care.** The survey instrument permitted respondents with foot prob-

lems who did not receive care in the preceding 12 months to cite up to nine reasons for the nonreceipt of care. A tenth category, other, was also permitted. For the purpose of this report, the ten categories were compressed to four: 1) severity subsided "Problem not severe," "Don't need care/problem cured"; 2) difficulty of access "No regular doctor," "Too much bother," "No transportation," "No time," "Office/hours not convenient"; 3) financial reasons. "Costs too much," "No health insurance/not covered"; and 4) other (or none).

As shown in Table 7, about one third of the reasons offered for nonreceipt of care fell into the Severity Subsidied category, another one third were Other or None, and the remaining one third were split, roughly evenly, between Difficulty of Access and Financial Reasons. This pattern held for virtually all population segments. Notable exceptions were as follows: 1) race. Blacks were more likely than Caucasians to cite financial reasons for the nonreceipt of care and less likely to report that the severity had subsided; 2) census region. Difficulty of access was most commonly cited in the Northeast and financial reasons in the South; and, 3) family income. Financial reasons were overwhelmingly the primary reason cited for

nonreceipt of care among the poor but were only rarely mentioned by the relatively affluent.

All of these exceptions are statistically significant. The basis for some of these differences is readily understandable; in other cases, further study may be needed to fathom the cause.

### The Role of Health Insurance

As previously noted, foot problems of one form or another afflicted one in six Americans (43.1 million persons) in the 12 months prior to interview. Of that number, 36% (15.3 million) regarded the problem, at the time of interview, as serious enough to consider getting care, and of that number, 55% (8.4 million) received care in the preceding 12 months. The percentage of individuals with insurance coverage varies between those who received care and those who did not, but not by as much as might be expected. Of those who received care, 73% were covered by health insurance. Of those who did not receive care, 65% were covered by insurance that would have paid for treatment; the remaining 35% were divided as follows: 24%, roughly two thirds, would have sought care had they been insured, 11% would not have sought care in any event.

Table 7. Reasons Offered for Nonreceipt of Care in the US, 1990\*

	Severity Subsidied (%)	Difficulty of Access (%)	Financial Reasons (%)	Other or No Reason (%)
Total US	36	18	20	34
Gender				
Male	38	18	18	33
Female	34	18	21	34
Race				
Caucasian	36	18	19	34
Black	30	16	28	33
Census region				
Northeast	35	22	14	38
Midwest	37	19	20	33
South	35	16	23	33
West	36	17	18	33
Area designation				
MSA* - central city	33	19	22	33
MSA - noncentral city	37	20	16	34
Non-MSA, nonfarm	35	14	25	33
Non-MSA, farm	35	19	15	35
Family income (\$)				
Under 10,000	26	14	40	29
10,000-19,999	30	13	34	33
20,000-34,999	35	20	19	35
35,000-49,999	38	21	9	39
50,000 or more	43	21	3	37
Income not reported	38	18	19	28

\*Percentages sum to more than 100%; some respondents offered more than one reason.

\*Abbreviation: MSA, Metropolitan Statistical Area.

Other findings relevant to health insurance, subdivided by gender and race, are presented in Table 8. No essential gender differences are seen but some racial differences are. Blacks with foot problems serious enough to seek care are less likely (61%) to be covered by health insurance than Caucasians (71%). By a factor of over four to one (18% to 4%), blacks are more likely to state that they would have sought care had they been insured; the comparable ratio for Caucasians is only two to one (10% to 5%). These findings are clearly linked to the previous observation that blacks are more likely than Caucasians to cite financial reasons for the nonreceipt of foot care.

These figures, it should be noted, are for all foot problems combined. Comparable estimates for specific foot disorders by themselves were hampered by the following limitation: the portion of the survey instrument pertaining to the receipt of treatment did not address each condition separately. Thus, if a respondent reported more than one foot problem, there was no way of knowing for which problem he or she was treated. Disaggregate analyses linking the receipt of care to the specific disorder treated could therefore be performed only for those individuals who reported one and only one foot problem. Unfortunately, multiple conditions were quite common (46% of those who reported toenail problems reported other foot problems as well, 48% of those who reported corns and calluses reported other foot problems as well, and so on), limiting the breadth of the analyses that could be performed.

#### Utilization by Provider Type

The podiatry supplement identified six potential providers of foot care: podiatrist, orthopedic specialist or surgeon, osteopathic physician, physical therapist, other (ie, nonorthopedist) medical doctor, and other health professional.

Respondents were asked to identify which provider type was seen for the treatment of foot problems in the 12 months preceding the interview (multiple responses were permitted). Table 9 summarizes the results by gender, race, geography, and income. To facilitate comparisons, the numbers have been age-adjusted.

Nationwide, almost one half of the 34 persons per thousand who received foot care in the preceding 12-month period saw a podiatrist (47%), with nonorthopedist medical doctors a close second (42%). Orthopedic specialists were in third place (18%), followed by others (14%). (These percentages total naturally to more than 100%, since some respondents saw more than one provider type.)

Groups seen to visit podiatrists at above average rates (compared to the nation at large) include: females (52%), persons who live in the Northeast (65%), persons who live in metropolitan statistical areas (51%), and persons whose family income exceeds \$50,000 (52%).

Groups with below average visit rates to podiatrists include: males (39%), members of races other than black, Caucasian (24%), persons who live in the South (38%) or West (40%), persons who live outside of metropolitan statistical areas (35% if nonfarm, 30% if farm), and persons with incomes below \$10,000 (40%).

Some of these variations, especially those involving gender, are undoubtedly linked to variations in case mix. Unfortunately, as in the preceding section, analysis centering on specific foot disorders was hampered by the lack of problem-specific treatment data, ie, if an individual reported more than one foot problem, there was no way of knowing which problem was treated.

Table 10 shows the visit profile, by foot condition, for those respondents who reported only a single foot problem. Corns and calluses are the foot condition most likely to be treated by a podiatrist

Table 8. Health Insurance Coverage for Persons With Foot Problems in the US, 1990\*

	Male (%)	Female (%)	Caucasian (%)	Black (%)
Persons who were covered by health insurance	(70)	(70)	(71)	(61)
and received care	39	41	41	35
and didn't receive care	31	29	30	26
Persons who were not covered by health insurance	(30)	(30)	(29)	(39)
but received care anyway	15	14	14	16
didn't receive care, but would have had they been insured	10	11	10	18
didn't receive care but would not have sought it in any event	5	5	5	4

\*Percentages were rounded.

**Table 9. Foot Care Utilization by Provider Type in the US, 1990\***

	Percentage of Patients That Visited			
	DPMs (%)	Orthopedic Specialists (%)	Other MDs (%)	DOs, PTs, and Others (%)
Total US	47	18	42	14
Gender				
Male	39	16	48	15
Female	52	18	38	13
Race				
Caucasian	48	17	41	14
Black	45	20	45	12
Other	24	24	51	15
Census region				
Northeast	65	17	28	11
Midwest	45	17	44	17
South	38	19	48	12
West	40	20	47	16
Area designation				
MSA <sup>b</sup> - central city	51	18	37	14
MSA - noncentral city	51	18	39	13
Non-MSA, nonfarm	35	17	55	16
Non-MSA, farm	30	13	59	7
Family income (\$)				
Under 10,000	40	18	49	13
10,000-19,999	43	18	48	14
20,000-34,999	48	18	39	14
35,000-49,999	47	17	39	15
50,000 or more	52	17	38	13
Income not reported	49	18	43	13

\*Percentages exceed 100%; some respondents saw more than one provider type.

<sup>b</sup>Abbreviation: MSA, Metropolitan Statistical Area.

**Table 10. Foot Care Utilization by Provider Type for Selected Foot Problems, US, 1990\***

	Percentage of Patients Who Visited		
	DPMs (%)	MDs <sup>b</sup> (%)	DOs, PTs, and Others (%)
Toenail problems	70	29	9
Foot infections	29	62	17
Corns and calluses	84	15	4
Flat feet	51	46	13
Clubfoot	3 <sup>c</sup>	100	14 <sup>c</sup>
Toe and joint deformities	52	61	9 <sup>c</sup>
Bunions	70	39	3 <sup>c</sup>
Foot injuries	12	97	26
Arthritis of toes	16	85	15

\*Percentages exceed 100%; some respondents saw more than one provider type; percentages apply only to respondents who reported that foot condition alone, ie, had no other foot problems.

<sup>b</sup>Orthopedic specialists and "other" medical doctors combined.

<sup>c</sup>Statistically unreliable; fewer than ten observations.

(84%), followed by toenail problems and bunions (70% each). At the other end of the spectrum, clubfoot (3%), foot injuries (12%), and arthritis of the toes (16%) are the problems least likely to be treated by a podiatrist.

Again, it is emphasized that these problem-specific findings are based solely on respondents who

reported only a single foot problem; as noted previously, the design of the survey instrument precluded the study of utilization interactions involving provider types and foot conditions when more than one condition was reported.

## Sources of Probable Underestimation

There is the possibility, indeed the likelihood, that some of the estimates presented in the preceding sections may have been understated. With respect to the reported estimates of incidence and prevalence, there are at least two anomalies that cause the authors to believe these numbers may be low.

1) Respondents whose completed survey instrument failed to include income reported substantially fewer foot disorders than the population at large, 125/1,000, when age-adjusted, as opposed to an overall rate of 175/1,000. One is inclined to believe that those who fell in this category may have been less than fully cooperative in answering other questions as well. Since one sixth of all respondents failed to report their income, their disinclination, if that is the case, to answer all questions fully affects the resulting estimates of incidence, prevalence, and treatment appreciably. If one were to as-



sume, conservatively, that the true incidence of foot problems for nonreporters of income was the same as the next lowest figure reported in Table 4, 175/1,000 as opposed to 125, this adjustment alone would cause the estimated number of civilian non-institutionalized persons with foot problems in the US to increase by two million, from 43.1 million to 45.1 million, an increase of roughly 6% (Table 1).

2) Children from poorer families showed a much lower rate of foot disorders than those from more affluent families, despite the fact that in all other age groups, exactly the reverse was true: the poorer the respondent, the more likely they were to have foot problems. Since children under 18 years were not permitted to answer the survey instrument themselves, it is likely that the findings reflect the level of awareness of the proxy who responded for them. Lower income proxies may not be as aware of a child's foot problems as those from the middle class. This conjecture, if true, bespeaks the need for a second adjustment similar to the foregoing. Such an adjustment would add another two to three million to the number of civilian noninstitutionalized persons with foot problems. These two adjustments alone bring the original estimate of 43.1 million closer to 48 million.

Any attempt to estimate the total number of foot care visits, as opposed to persons with foot problems, is hampered by the following feature of the survey design: in an effort to streamline the interview process, not all persons with foot problems were asked to report the number of visits they had made in the preceding 12 months. In all, only about 37% of all respondents with foot problems, namely, those who at the time of interview regarded their problem as serious enough to consider getting care, were queried concerning their prior treatment history. While the visit rate associated with the remaining 63% may have been lower than average, the total number of visits involved could be high. If each of those individuals simply contributed one visit to the total (a pure guess), the resulting shortfall would approximate another 40%.

As in any survey of this nature, NHIS respondents were neither skilled clinical observers nor especially knowledgeable about health. As a consequence, from the standpoint of incidence and prevalence, at least some percentage of the foot

problems from which respondents suffered almost certainly went unreported either because they failed to recognize the problem or because, as in the case of diabetics with neurologic complications, they were unable to associate it with the foot. From the standpoint of utilization, at least some foot care visits may have been misattributed to the wrong provider type, ie, MDs referred to as podiatrists and *vice versa*.

Finally, there is this to consider. The interview process depends wholly on respondent recall. The percentage of individuals capable of accurately recalling how many visits they made in the past year is almost assuredly small.

Because of these factors, the authors have been careful in their presentations to focus largely, if not exclusively, on percentage differences among groups rather than on absolute totals. The 1990 NHIS remains a treasure trove of data not previously available to the podiatric community and to the health care community at large. Notwithstanding the limitations noted above, the findings of the survey should be recognized as advancing appreciably the state of knowledge in some very important areas, chiefly those involving race, age, gender, geographic, and income differences. Findings pertaining to the reasons for nonreceipt of care, and in particular the role of health insurance, are also considered a vital addition to the previous store of knowledge.

Those who designed the survey are to be commended for their foresight and ability. Some anomalies involving less than a complete response are to be expected in a survey of this magnitude and complexity; they should simply be recognized for what they are and appropriate caution taken in the interpretation of the results.

## References

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