Psychosocial Bias in the Diagnosis of Obesity

Peter Franks, MD, Larry Culpepper, MD, and John Dickinson, MD
Rochester, New York

This study explores demographic and psychosocial variables associated with the assignment of the diagnosis of obesity in a family medicine residency model practice. Three groups of adult patients seen during 1978 were studied: a random sample of active patients, patients diagnosed as obese during 1978, and those never diagnosed as obese. While the prevalence of true obesity (greater than 20 percent above ideal body weight) was similar for men (58 percent) and women (47 percent), more women were diagnosed (222 women vs 87 men) and were more likely to be diagnosed within a year of entering the practice (42 percent women vs 10 percent men). Diagnosed obese women were older, had more psychological problems, and visited the practice more often than nonobese women. Diagnosed obese men were older, more frequently had psychological problems, visited the practice more often, and were more likely to be married than nonobese men. Undiagnosed obese men, however, had fewer psychological problems than nonobese men. The results suggest that physician education should address problems with diagnostic labeling and that researchers should anticipate subtle selection biases in retrospective studies when sampling methods depend on diagnosis.

A great deal of attention is focused on the denominator problem in family medicine research.[1-4] Numerator data, such as diagnostic profiles, are assumed to be easily and reliably obtained. However, the validity of research based on a computerized data base is also dependent on the accuracy of recording such numerator data.[5] Bias in diagnostic recording is of particular interest in family medicine research, as much investigation is devoted to interaction among symptomatic, psychosocial, and organic problems. Eisenberg[6] has suggested that the characteristics of the patient (such as social class, income, ethnic background, sex, physical appearance, and "social worth"), the physician, the physician-patient relationship, and the physician's professional relationships, all influence the assignment of diagnoses.

Two examples of research from the Rochester

From the Department of Preventive, Family and Rehabilitation Medicine, University of Rochester, and Highland Hospital, Rochester, New York. Requests for reprints should be addressed to Dr. Peter Franks, Family Medicine Program, 885 South Avenue, Rochester, NY 14620.

0094-3509/82/040745-06$01.50

Family Medicine Program illustrate this potential problem. Barton et al[7] reported that there is an association between psychological problems and back pain, but in a study in Rochester no such association was found.[8] That these conflicting reports occur may be due to differences in diagnostic behavior. If a patient presents with both psychological problems and back pain but is coded only as depressed (that is, back pain is coded only when there are no associated psychological problems), then a study of back pain will reveal low incidence of associated psychological problems. Conversely, if a physician suspects and codes depression in patients with back pain, then an association between the two diagnoses will be exaggerated.

Bias in diagnostic recording may also occur with organic diagnoses. Froom et al[9] reported that in family practice otitis media is seen less frequently in families with three or more children than in smaller families. This surprising finding may be explained by factors other than a true difference in disease incidence. Perhaps mothers of smaller families, being more anxious, are more likely to bring their children to physicians for upper respiratory tract infections and pressure their physicians to do something, perhaps leading to an overdiagnosis of otitis media.

It is usually impossible to determine whether patients recorded as having a given diagnosis are a selected subgroup of those with the problem. Furthermore, if diagnosed patients represent a selected subgroup, then the factors affecting selection are difficult to ascertain. The present study represents an attempt to explore these questions by studying psychosocial factors associated with diagnosed and undiagnosed obesity. Since height and weight are recorded on nearly all adult patients in the study practice at the Rochester Family Medicine Program (FMP), it is possible to obtain relatively unbiased samples of those who are diagnosed as obese and of those who are obese but not diagnosed.

The study has two phases. In the first, the prevalence of obesity in the study practice was defined. In the second, patients diagnosed as obese and recorded as such in the computerized morbidity index were compared with those patients who were obese but had never been diagnosed and with those who were not obese. It was hypothesized that the coding of obesity as a diagnosis would be affected by complex social and psychological interactions between physician and patient and that these interactions would be different for male and female patients.

Methods

Definition of Obesity

Patients' heights were measured without shoes. Weights were measured with indoor clothing. For the purposes of this study, obesity was defined as 20 percent or more above the mean ideal body weight. This criterion identifies both the population at increased risk of mortality[10,11] and the overweight group on standard tables of desirable weights used in the FMP office.[12] To facilitate computer analysis of the data, the body mass index (weight ÷ height^2) was calculated.[13] For men, 20 percent above the mean ideal body weight corresponds to a body mass index of 26 kg/m^2, for women, 25 kg/m^2.

Three study samples were drawn from the active adult patient population at the University of Rochester Family Medicine Program. The active patient population comprised 12,000 patients whose socioeconomic status and age-sex distributions reflected those of the population in Rochester, New York.[14,15]

Prevalence Group

A sample of 100 male and 100 female patients over the age of 18 years was randomly selected from all active charts. Through chart review, the height, weight, socioeconomic status (based on census tract[16]), and age of each patient was determined. Using the body mass index, the prevalence of true obesity was measured, and its relationship to socioeconomic status and age examined.

Diagnosed Obese Group

A computer list of all patients over the age of 18 years with a diagnosis of obesity in 1978 was generated. For each patient, age, socioeconomic status, sex, the presence of diagnosed psychological

and family problems, and the number of visits per year were recorded. The charts of these patients were then audited to determine height, weight, and marital status of each patient and the sex of the diagnosing provider. An attempt was also made to determine whether the physician or patient initiated the diagnosis of obesity.

Nonobese and Undiagnosed Obese Group

A 14 percent random sample of all patients over the age of 18 years who had never been diagnosed as obese but who had made at least one visit in 1978 was generated by the computer. A chart review was again performed on a random subsample of 200 men and 200 women to obtain information comparable with that obtained for the diagnosed obese group. On the basis of the definition of obesity used in this study, these patients were divided into two groups: the obese but undiagnosed, and the nonobese.

Data Analysis

Data were coded and entered into an IBM 370 computer and analyzed using the SAS[17] statistical package. Analyses were performed using chi-square (or Fisher's exact) and Pearson product moment correlation tests.

Results

Prevalence Group

In this sample, mean age for women was 36 years (SD, 16.8) and for men was 38 years (SD, 15.8). The mean body mass index (BMI) for women was 25.4 kg/m^2 (range, 16 to 48 kg) and for men was 26.5 kg/m^2 (range, 18 to 46 kg). Forty-seven percent (95 percent confidence interval, 37 to 57 percent) of women, and 58 percent (95 percent confidence interval, 48 to 68 percent) of men were obese in this sample. For women there was no association between socioeconomic status or age and obesity. In men, age correlated positively with both the presence of obesity ($r = 0.35$, $P > .001$) and the degree of obesity ($r = 0.34$, $P > .001$), but there was no relationship between socioeconomic status and obesity.

Diagnosed Obese Group

A total of 87 men and 222 women made at least one visit during 1978, at which time obesity was identified as a problem. Thus, although the prevalence of obesity is slightly higher in men, obesity was twice as likely to be diagnosed in women. For women with diagnosed obesity, the BMI ranged from 22 to 63 kg/m^2. Six percent were below 25 kg/m^2 and thus did not meet the criterion for true obesity. For men with diagnosed obesity, the BMI ranged from 20 to 49 kg/m^2, with 7 percent below the study criterion of 26 kg/m^2. Fifty-two percent of women had been obese in 1977, 6 percent became obese in 1978, and 42 percent were new patients in 1978. For men, 83 percent were obese prior to 1978, 7 percent became obese, and 10 percent were new patients. Thus, among obese patients who were new to the practice, women were more likely to have a diagnosis of obesity.

It was not possible to determine reliably whether the patient or the physician initiated the diagnosis of obesity. There was no association between the sex of the diagnosing provider and the sex of the patient. Thirty-three percent of patients with a diagnosis of obesity by female physicians were men, and 29 percent of patients with a diagnosis of obesity by male physicians were men ($\chi^2 = 0.4$, $P > 0.1$).

Nonobese and Undiagnosed Obese Group

Among the 400 patients never having a diagnosis of obesity, heights were not available on 12 women (6 percent) and 25 men (12 percent). Of the remaining 363, 39 percent of men and 25 percent of women were obese. For both men and women, the maximum BMI was 35 kg/m^2.

Table 1 shows the psychosocial factors associated with obesity in women for all three groups. Psychological problems, an age over 40 years, and a high visit rate occur significantly more frequently in the population with a diagnosis of obesity compared with nonobese, the population with undiagnosed obesity occupying an intermediate ground.

Table 2 shows the psychosocial factors associated with obesity in men. Men having their obesity diagnosed were more likely to have psychological and family problems, to be older and married, and

Table 1. Psychosocial Factors Associated with Obesity in Women (%)

Group	Married	High Socio-economic Status*	Aged over 40 Years	Psychological Problems	Family Problems	High Visit Rate**
Nonobese (n = 141)	48	40	28	17	5	31
Obesity undiagnosed (n = 47)	57	34	34	26	6	36
Obesity diagnosed (n = 222)	53	32	48	35	8	58
Significance†	0.5	0.3	0.0004	0.001	0.6	0.0001

*Socioeconomic status of 1 or 2 of a 5-point scale[14]
**More than four visits per year
†P value of chi-square, 2 *df*

Table 2. Psychosocial Factors Associated with Obesity in Men (%)

Group	Married	High Socio-economic Status*	Aged over 40 Years	Psychological Problems	Family Problems	High Visit Rate**
Nonobese (n = 107)	46	42	23	14	1	15
Obesity undiagnosed (n = 68)	72	51	39	9	0	15
Obesity diagnosed (n = 87)	71	39	56	33	7	36
Significance†	0.0005	0.3	0.0001	0.0001	0.003††	0.001

*Socioeconomic status of 1 or 2 of a 5-point scale[14]
**More than four visits per year
†P value of chi-square, 2 *df*
††Because two cells have expected counts less than 5, chi-square may not be valid. Fisher's exact test (2 × 2) of the difference between diagnosed and undiagnosed obesity, P = 0.016

to have a higher visit rate when compared with nonobese men. Although men with undiagnosed obesity were also more likely to be married, they had fewer psychological and family problems than nonobese men.

For both sexes, there was a significant positive correlation between the degree of obesity and the likelihood of obesity being diagnosed, and all patients with a BMI greater than 35 kg/m² received a diagnosis of obesity. This correlation (confounding factor) was removed by excluding patients whose BMI was greater than 35 kg/m². Tables 3 and 4 show the psychosocial factors associated with obesity (excluding those with BMIs greater than 35 kg/m²) in women and men, respectively. It can be seen that the relationship between psychosocial factors and obesity persist after controlling for this confounding factor.

Table 3. Psychosocial Factors Associated with Obesity in Women Excluding Those with Body Mass Index over 35 kg/m² (%)

Group	Married	High Socio-economic Status*	Aged over 40 Years	Psychological Problems	Family Problems	High Visit Rate**
Nonobese (n = 141)	48	40	28	17	5	31
Obesity undiagnosed (n = 47)	57	34	34	26	6	36
Obesity diagnosed (n = 146)	54	40	45	35	10	54
Significance†	0.5	0.7	0.008	0.003	0.3	0.0003

*Socioeconomic status of 1 or 2 of a 5-point scale[14]
**More than four visits per year
†P value of chi-square, 2 *df*

Discussion

These results suggest that, even with common problems such as obesity, physician diagnostic behavior is subject to a complex interaction of psychosocial and demographic factors. Although in this practice true obesity is more common in men, obesity for women is more likely to be diagnosed and to be diagnosed soon after entering the practice. Obesity in men is more likely to escape diagnosis. These results may be explained in part by the higher visit rate in women compared with men, since visit frequency was correlated with the diagnosis of obesity. This imbalance may also reflect a cultural preoccupation with obesity in the female sex. However, obesity presents a greater risk for morbidity and mortality among men.[10,11]

Obesity in patients of both sexes is more likely to be diagnosed if the patient is over the age of 40 years, whereas most physicians in this practice are under the age of 30 years. Since obesity is primarily a risk factor for morbidity and mortality only when it is long standing,[18,19] one might have expected that, from a preventive medicine standpoint, more attention would be paid to the diagnosis of obesity in younger patients.

For both sexes, the association between obesity and psychological problems is exaggerated in those who have obesity diagnosed. Men with undiagnosed obesity have fewer psychological and family problems than the nonobese men. The phenomenon of "jolly fat" has been reported in the literature.[20,21] Certainly the notion of the jovial, round Santa Claus is a Western cultural archetype.

The absence of any relationship between socioeconomic status and obesity in this study is at variance with most results reported elsewhere[22,23] and may be explained by the limited accuracy of the method used here to determine socioeconomic status.[16]

It should be noted that "diagnosis" refers to those diagnoses coded by the physician for computer entry. No attempt was made to determine how many diagnoses were made but not coded for the computer. This "diagnosed, but not coded" group may contain in the obesity example numerous young men who were diagnosed during their first visit. Conceivably, then, the results reported relate to a bias in coding rather than to diagnostic behavior.

Retrospective research is a highly efficient means of exploring relationships between diagnoses and other variables.[24] When the criteria for recording the diagnosis are not known, however, the results of such research can be misleading. It has become commonplace in family medicine research to use a computerized diagnostic data base as a starting place for exploring the relationship between a diagnosis and other variables. This approach results in a highly selected sample, but more importantly, the extent of any bias cannot

Table 4. Psychosocial Factors Associated with Obesity in Men Excluding Those with Body Mass Index over 35 kg/m² (%)

Group	Married	High Socio-economic Status*	Aged over 40 Years	Psychological Problems	Family Problems	High Visit Rate**
Nonobese (n = 107)	46	42	23	14	1	15
Obesity undiagnosed (n = 68)	72	51	39	9	0	15
Obesity diagnosed (n = 68)	73	43	60	32	7	35
Significance†	0.0005	0.4	0.0001	0.0006	0.0009††	0.0019

*Socioeconomic status of 1 or 2 of a 5-point scale[14]
**More than four visits per year
†P value of chi-square, 2 *df*
††Because two cells have expected counts less than 5, chi-square may not be valid. Fisher's exact test (2 × 2) of the difference between diagnosed and undiagnosed obesity P = 0.016

be determined. Studies exploring relationships among psychosocial variables appear to be at particularly high risk for this type of numerator error. In such instances, reliable research results may require prospective studies for which the criteria for diagnosis can be explicitly defined.

References

1. Bass M: Approaches to the denominator problem in primary care research. J Fam Pract 3:193, 1976
2. Kilpatrick SJ: On the distribution of episodes of illness: A research tool in general practice. J R Coll Gen Pract 25:158, 686, 1975
3. Robertson D, Schofield T: Comparison of methods of determining the denominator for morbidity in primary care. Presented at 9th Annual Meeting of North American Primary Care Research Group, Incline Village, Nev, March 17-20, 1981
4. Cherkin DC, Berg AO, Phillips WR: In search of a solution to the primary care denominator problem. J Fam Pract 14:301, 1982
5. Anderson JE: Reliability of morbidity data in family practice. J Fam Pract 10:677, 1980
6. Eisenberg JM: Sociologic influences on decision-making by clinicians. Ann Intern Med 90:957, 1979
7. Barton JE, Haight RO, Marsland DW, Temple TE Jr: Low back pain in the primary care setting. J Fam Pract 3: 363, 1976
8. Becker LA, Karch FE: Low back pain in family practice: A case control study. J Fam Pract 9:579, 1979
9. Froom J, Mold J, Culpepper L, Boisseau V: The spectrum of otitis media in family practice. J Fam Pract 10: 599, 1980
10. Lew EA, Garfinkel L: Variations in mortality by weight among 750,000 men and women. J Chronic Dis 32: 563, 1979
11. Build and blood pressure study, 1959. Soc Actuaries 1:1, 1959
12. New weight standards for men and women. Stat Bull Metropol Life Insur 40:1, 1969
13. Khosla T, Lowe CR: Indices of obesity derived from body weight and height. Br J Prev Soc Med 21:122, 1967
14. Froom J: An integrated medical record and data system for primary care. Part 1: The age-sex register: Definition of the patient population. J Fam Pract 4:951, 1977
15. Froom J, Culpepper L, Kirkwood R, Boisseau V: An integrated medical record and data system for primary care: Part 4: Family information. J Fam Pract 5:365, 1977
16. Franks P, Boisseau V: Educational status and health. J Fam Pract 10:1029, 1980
17. Helwig JT, Council KA (eds): SAS Users Guide, 1979 ed. SAS Institute, Raleigh, NC, 1979
18. Cook L: Relationship of blood pressure, smoking habit, relative weight and ECG abnormalities to incidence of major coronary events: Final report of the Pooling Project (The Pooling Project Research Group). J Chronic Dis 31: 201, 1978
19. Stamler R: Weight and blood pressure: Findings in hypertension screening of one million Americans. JAMA 240:1607, 1978
20. Crisp AH, McGuiness B: Jolly fat: Relation between obesity and psychoneurosis in general population. Br Med J 1:7, 1975
21. Kittle F, Rustin R, Dramaix M, et al: Psycho-socio-biological correlates of moderate overweight in an industrial population. J Psychosom Res 22:145, 1978
22. Garn S, Clark D: Trends in fatness and the origins of obesity. Ad Hoc Committee to review the ten-state nutrition survey. Pediatrics 57:443, 1976
23. Noppa H, Bengtsson C: Obesity in relation to socioeconomic status: A population study of women in Goteborg, Sweden. J Epidemiol Community Health 34:139, 1980
24. Cole P: The evolving case control study. J Chronic Dis 32:15, 1979