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June 1998

UNE Working Papers in Economics No. 45

Editor Brian Dollery

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*ISSN 1321-9081 ISBN 1 86389 499 3

OBESITY COST-OF-ILLNESS STUDIES: A REVIEW OF THE LITERATURE

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This paper reviews the cost-of-illness studies for obesity. The medical literature has demonstrated that obesity is an independent risk factor for a number of medical conditions including diabetes mellitus, hypertension, coronary heart disease, elevated cholesterol levels, depression, musculoskeletal disorders, gall bladder disease, and several cancers. Since these conditions can be costly to treat, obesity clearly has substantial economic impacts. Epidemiological estimates of the aggregate economic costs associated with specific obesity-related diseases for the United States indicate that the annual burden to society totals in the billions, representing between 5.5 and 7.8% of total health care expenditure. Although cost estimates attributable to obesity differ across studies, the one common result is that the costs associated with obesity are substantial from a health policy perspective. The objective of this paper is to identify and review the obesity cost-of-illness literature, address study limitations, and identify key areas for future economic research. This review indicates that the economic burden of obesity has generally been estimated using a prevalence-based cost-of-illness framework. Areas for future research include: (i) estimating the economic burden of obesity using an incidence-based cost-of-illness framework, and (ii) modeling the association between health care expenditure and the level of obesity using individual-level data such as medical and pharmacy claims data.

INTRODUCTION

Epidemiological surveys indicate that between 20 and 50% of the U.S. population is overweight.[1] The medical literature has clearly demonstrated that obesity is an independent risk for a variety of medical conditions including diabetes mellitus,

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hypertension, coronary heart disease (CHD), elevated cholesterol levels, depression, musculoskeletal disorders, gall bladder disease, and several cancers.[2-5] Since these conditions can be costly to treat, obesity clearly has substantial economic impacts. Estimates of the aggregate economic costs associated with specific obesity-related diseases have demonstrated that the annual burden to society totals in the billions of dollars, representing between 5.5 and 7.8 percent of total health care expenditure in the United States.[4]

The problem obesity is of great importance from a health policy perspective because the prevalence of the condition in the population and the substantial costs associated with the treatment of medical conditions linked to obesity. The objective of this paper is to identify and review the cost-of-illness studies for obesity and to identify future economic research areas.

BACKGROUND ON OBESITY

Obesity is defined as an excess amount of body fat or adipose tissue and is often expressed as the body mass index.[6-7] Accurate estimates of obesity or adiposity require sophisticated techniques that utilize expensive and specialized equipment.[3,6] Consequently, weight-for-height indices are the most commonly used indicators of obesity in clinically based research.[6] The body mass index (BMI) is defined as the weight in kilograms divided by height in meters squared. A number of BMI categories have been developed to create operational definitions of obesity. For example, the National Center for Health Statistics in the U.S. defines overweight as a BMI greater than or equal to the 85th percentile of men and non-pregnant women. Severe overweight is defined as a BMI greater than or equal to the 95th percentile.[2,6] More specifically, men are classified as overweight when their BMI is greater than or equal to 27.8, and they are judged to be severely overweight when their BMI is greater than or equal to 31.1. For women, the corresponding cut-off points for overweight and severely overweight are BMI scores of 27.3 and 32.3, respectively.[2,6] However, the most commonly cited BMI categories are those that have been developed by the World Health Organization (WHO) were individuals with a BMI in excess of 30 are classified as obese.[1]

Obesity has been identified as an independent risk factor associated with a number of medical conditions including diabetes mellitus, hypertension, coronary heart disease, elevated cholesterol levels, depression, musculoskeletal disorders, gall bladder disease, and several cancers.[2-5] Furthermore, it has been noted that these medical conditions are at least partly caused by obesity and according to Sjöström "it is well known that obesity-related risk factors are reduced by weight reductions."[7]

METHODS

The obesity cost-of-illness studies were identified using a computerized literature search (MEDLINE®) of publications in the English language between 1990 and 1997. This search method was supplemented by reviewing the reference section of each paper retrieved to identify other studies not included in the MEDLINE® database. The key words used in the search criteria included cost(s), obesity, and cost-of-illness.

RESULTS

An initial search of the medical and pharmaceutical literature identified 14 studies.[4,8-20] Since our primary interest was in identifying and reviewing obesity cost-of-illness studies, we excluded those economic studies that either assessed the costs of alternative obesity treatment options[14-15] or estimated the cost of obesity using a method other than cost-of-illness evaluation.[16] In addition, we also excluded studies that reviewed previously reported findings.[17-20] Consequently, seven obesity cost-of-illness studies were identified that met the inclusion criteria for review. A summary of the characteristics of these studies is presented in table 1. The categories in table 1 include: (i) author/country, (ii) BMI criteria used to define obesity, (iii) principal findings, and (iv) results.

It should be noted that the studies presented in table 1 estimate the costs attributable to obesity within a prevalence-based cost-of-illness framework. A prevalence-based cost-of-illness approach identifies the costs incurred during a given year to individuals with a particular disease.[4,21] According to Coldtiz[4] a prevalence-based cost-of-illness evaluation is well suited to estimating the economic burden of an acute medical

condition on an annual basis. However, this approach does not quantify the long-term consequences of diseases such as obesity. Consequently, an incidence-based cost-of-illness evaluation would be more appropriate. This particular approach estimates the lifetime costs of cases diagnosed in a given year.[4,21] Drummond indicates that this approach is more "demanding in terms of data, since it requires estimates to be made of disease progression."[21] However, incidence-based cost-illness estimates also provide "a baseline against which new therapy interventions can be assessed."[21] The seven prevalence-based cost-of-illness studies identified in this paper are reviewed below.

Direct and Indirect Costs Associated with Obesity

The first analysis of the economic cost of obesity was performed by Colditz[4] in the United States. Colditz[4] analyzed the following obesity-related medical conditions including non-insulin-dependent diabetes mellitus (NIDDM), gall bladder disease, cardiovascular disease (CVD), hypertension, and some cancers. The cost of treating each of these medical conditions attributable to obesity was calculated by assuming that a given amount of the disease (such as CVD) was diagnosed amongst obese individuals of which a certain proportion is attributable to obesity. For instance, Colditz[4] assumes that 27% of CVD is diagnosed in obese individuals, and among these obese individuals, 70% of CVD is attributable to obesity. Therefore, 19% of the estimated aggregate costs of treating CVD in the United States can be attributable to obesity. The estimated costs attributable to obesity were $22.2 billion for CVD, $2.4 billion for gall bladder disease, $1.9 billion for cancer, $1.5 billion for hypertension, and $11.5 billion for NIDDM. The total cost attributable to obesity for these medical conditions was $39.9 billion, which "represents 5.5% of the total cost of illness in 1986."[4] However, Colditz[4] indicates that this is a conservative estimate and that inclusion of other diseases such as musculoskeletal disorders could raise this estimate to 7.8%. In a follow-up study, Wolf and Colditz[8] revised the previous calculations[4] to estimate that the direct costs of treating obesity were $45.8 billion in 1990 or 6.8% of U.S. health care expenditure. Furthermore, Wolf and Colditz also estimated the indirect costs associated with lost productivity and mortality to be $23 billion in 1990.[8]

Impact of Weight Gain on the Cost of Obesity

The social and economic effects of weight gain in U.S. adults aged 18 and over has been examined by Wolf and Colditz.[9] In their analysis of earlier work[4,8] they address the following questions: (i) at what body weight do we implement preventative weight gain strategies?, and (ii) what are the direct costs associated with weight gain? The authors also examined the indirect costs associated with obesity. Specifically the impact of obesity on restricted-activity, bed days, and work loss days was analyzed.

The population attributable risk percent (PAR%) was used to estimate the proportion of obesity-related diseases within the following BMI categories: (i) 23-24.9, (ii) 25-29, and (iii) greater than or equal to 30. Within this framework, the direct and indirect costs associated with NIDDM, coronary heart disease (CHD), hypertension, and gall stones at three different levels of BMI were estimated. It is significant that the estimated direct costs associated with NIDDM and CHD are directly attributable to increases in weight gains. For weight gains of 5-10 kg, 11-19.9 kg, or greater than or equal to 20 kg the estimated costs of NIDDM increased by $1.56, $4.61, and $6.88 billion, respectively. The estimated costs of CHD of $2.99 and $4.76 billion for the two lower weight gain categories were as expected but the relatively lower cost of $4.2 billion for the highest gain may reflect a higher death rate.[9]

The results for this study are consistent with the conclusion that direct costs rise with increases in BMI. A similar relationship was also observed for indirect cost estimates, although these estimates may be confounded by smoking status and pre-existing illness. This study suggests that a healthy body weight appears to be a BMI less than 25, and that weight gain should be kept to less than 5 kg throughout a lifetime.[9]

Cost of Obesity in Europe, Australia, and New Zealand

The cost of obesity has also been estimated for a number of European countries. Seidell[10] also used a prevalence-based approach to report that the direct cost of treating obesity in The Netherlands. It was estimated that the cost of treating obesity amounted to about 1 billion Dutch guilders, approximately 4% of the total Dutch health care cost.

In another study, Lévy and associates[11] estimated the economic cost of obesity for France. In this study, obesity was defined as a BMI greater than or equal to 27. A prevalence-based cost-of-illness model was used and the direct costs and indirect costs were estimated in this analysis. Direct costs included personal health care, hospital care, physician services, and drugs, and the indirect costs were measured as lost output due to "cessation or reduction of productivity caused by morbidity and mortality."[11]

The method used by Lévy et al[11] was similar to that of Wolf and Colditz[8-9] and population attributable risk percentages were used to estimate the costs of obesity-related diseases in 1992 French Francs. The direct cost of obesity for France in 1992 was estimated at 11.89 billion Francs while the indirect cost estimate was 0.577 billion Francs. These obesity-related costs represent approximately 2% of the total health care costs in France.

Segal et al[12] have reviewed the Australian direct health care costs associated with obesity. The Australian Institute of Health and Welfare estimated that, in 1989, obesity and obesity-related diseases were responsible for 50,931 hospital admissions, 433,165 hospital bed-days, 3.1 medical consultations, 6.7 millions pharmaceutical prescriptions, and 164,903 referrals to health practitioners. Again population attributable risk percentages were used to estimate the cost of diseases such as NIDDM, gall stones, CHD, hypertension, breast cancer, and colon cancer that are directly attributable to obesity. The costs attributable to obesity in 1989 was estimated to be $A395 million. However, Segal et al indicate that this figure is an underestimate "as about 15% of total health expenditure is not captured in the categories costed by the model."[12]

In 1997, Swinburn et al[13] estimated the costs attributable to obesity in New Zealand. As with the previous studies, this New Zealand study was designed to estimate the costs of obesity-related diseases such as diabetes mellitus, coronary heart disease, hypertension, post-menopausal breast cancer, and colon cancer. The costs associated with these medical conditions were then "multiplied by the population attributable risk

factor for obesity for each condition"[13] using the method described by Segal et al.[12] The results suggest that the costs attributable to obesity totalled $NZ135 million, representing approximately 2.5% of total health care expenditure.

DISCUSSION

Following a review of the obesity cost-of-illness literature it is important to consider the main points from these studies. To begin with, these studies used a prevalence-based cost-of-illness framework to estimate the costs attributable to obesity. The costs attributable to obesity have been estimated by multiplying the total cost in each disease area (such as diabetes mellitus and hypertension) by the population attributable risk percent. Although it is difficult to make comparisons across the different studies, it is clear that the costs attributable to obesity are a substantial proportion of total health care expenditure. The available data from several countries indicated that the costs attributable to obesity are between 2-7% of total health care expenditure.[4,8-13]

However, it should be noted that these studies have several limitations. For instance, different BMI criteria have been used to define obesity. Studies emanating from the U.S.[4,8-9] use the National Center for Health Statistics criteria for defining obesity while studies conducted in The Netherlands, Australia, and New Zealand use the WHO criteria for defining obesity.[10, 12-13] Therefore, estimates of the economic burden of obesity are influenced by the selection of the BMI criteria for defining obesity. Consequently, the use of different BMI cut of points also makes it difficult to make comparisons across the different studies.

A similar argument can also be made for the selection and/or inclusion of the obesity-related risk factors. In other words, estimates of the costs attributable to obesity could well be influenced by the selection of obesity-related medical conditions such as diabetes mellitus or hypertension. In fact, exclusion of medical conditions attributable to obesity would underestimate the overall economic burden of this disease.

Another limitation with the prevalence-based cost-of-illness literature is that these type of studies do not quantify the long-term consequences of chronic conditions such as

obesity. Therefore, an incidence-based cost-of-illness would be more appropriate. The principal advantage is that incidence-based estimates provide "a baseline against which new therapy interventions can be assessed."[21]

However, there is distinct lack of economic studies that attempt to model explicitly the association between the cost of medical care utilization (MCU) and obesity. In fact, there is only one study that uses individual-level data (from the 1987 U.S. National Medical Expenditure Survey) to examine the association between health care expenditures and the level of obesity for a sample of the U.S. population.[16] This study directly estimates the relationship between body mass and health care expenditures across a broad range of body mass values using individual-level data.[16] Within this context, the following questions were addressed: (i) how is body mass related to the probability of individual receiving health care services?, (ii) how is body mass related to an person's annual average heath care expenditure?, and (iii) what is the difference in health care costs between overweight individuals compared to those individuals who are at an "ideal" body mass?[16] The principal advantage in using individual-level data is that it allows the researcher to address a wider range of questions. Moreover, individual-level data can also provide a range of information such as personal characteristics and resource utilization that can often be useful in analysis.

Although cost-of-illness estimates may assist in "determining medical research priorities"[21] it is important to note that the use of regression analysis and individual-level data can provide useful information to health care providers. For instance, regression techniques can be used to evaluate drug utilization and expenditure patterns of obese individuals in a managed care setting. Furthermore, knowledge of the potential cost savings associated with weight loss would be of interest to those health care providers who want to minimize their costs.

CONCLUSIONS

In this review recent studies on the evaluation of the economic burden of obesity have been compared. To date, obesity cost-of-illness studies have used a prevalence-based cost-of-illness framework and clearly there is a need for economic evaluations to determine the costs attributable to obesity with an incidence-based cost-of-illness framework. Thus, from a health policy perspective further research is required.

Furthermore, it is suggested that future economic studies of obesity should make greater use of individual-level (or microeconomic) data to model the association between health care expenditures and the level of obesity as illustrated by Heithoff et al.[16]

REFERENCES

1. VanItallie TB. Worldwide epidemiology of obesity. Pharmacoeconomics. 1994; 5(Suppl.1):1-7.

2. VanItallie TB. Health implications of overweight and obesity in the United States. Annals of Internal Medicine. 1985; 103:983-988.

3. Bray GA. Pathophysiology of obesity. American Journal of Clinical Nutrition. 1992; 55:488S-494S.

4. Colditz GA. Economic costs of obesity. American Journal of Clinical Nutrition. 1992; 55:503S-507S.

5. Pi-Sunyer FX. A Review of long term studies evaluating the efficacy of weight loss in ameliorating disorders associated with obesity. Clinical Therapeutics. 1996; 18:1006-1035.

6. Lissner L. Causes, diagnosis and risk of obesity. Pharmacoeconomics. 1994; 5(Suppl.1):8-17.

7. Sjöström L. Impacts of body weight, body composition, and adipose tissue distribution on morbidity and mortality. In: Obesity: Theory and therapy, second edition, edited by Stunkard AJ, Wadden TA. New York: Raven Press; 1993:13-41.

8. Wolf AM, Colditz GA. The cost of obesity. Pharmacoeconomics. 1994; 5(Suppl.1):34-37.

9. Wolf AM, Colditz GA. Social and economic effects of body weight in the United States. American Journal of Clinical Nutrition. 1996; 63(Suppl.1):466S-469S.

10. Seidell JC. The impact of obesity on health status: some implications for health care costs. International Journal of Obesity. 1995; 19(Suppl. 6):S13-S16.

11. Lévy E, Lévy P, Le Pen C, Basdevant A. The economic cost of obesity: the French situation. International Journal of Obesity. 1995; 19:788-792.

12. Segal L, Carter R, Zimmet P. The cost of obesity. The Australian perspective. Pharmacoeconomics. 1994; 5(Suppl.1):45-52.

13. Swinburn B, Ashton T, Gillespie J et al. Health care costs of obesity in New Zealand. International Journal of Obesity. 1997; 21:891-896.

14. Martin L, Tan T, Horn J, et al. Comparison of the costs attached with medical and surgical treatment of obesity. Surgery. 1995; 118:599-607.

15. Dahms W, Molitch M, Bray A, et al. Treatment of obesity: a cost-benefit analysis of behavioral therapy, placebo and two anorectic drugs. American Journal of Clinical Nutrition. 1978; 31:774-778.

16. Heithoff KA, Cuffel BJ, Kennedy S, Peters J. The association between body mass and health care expenditures. Clinical Therapeutics. 1997; 19:811-820.

17. Hughes D, McGuire A. A review of the economic analysis of obesity. British Medical Bulletin. 1997; 53:253-263.

18. West R. Obesity. Office of Health Economics Monographs on Current Health Issues, no 112. London: Office of Health Economics; 1994:38-43.

19. Gorstein J, Grosse R. The indirect cost of obesity. Pharmacoeconomics. 1994; 5(Suppl.1):58-61.

20. Hutton J. The economics of treating obesity. Pharmacoeconomics. 1994; 5(Suppl.1):66-72.

21. Drummond MF. Cost-of-illness. A major headache? Pharmacoeconomics. 1992;2:1-4.

Table 1: Prevalence-Based Obesity Cost-of-Illness Studies

Author(s)/ Country	*BMI criteria used to define obesity*	*Medical Conditions / Health Care Contacts attributable to obesity*	*Principal findings*	*Results*
Colditz[4] United States	BMI ≥ 28.7 (men) BMI ≥ 28.3 (women)	***Medical Conditions*** -NIDDM -Gall bladder disease -CVD -Hypertension -Cancers	Estimated costs attributable to obesity totaled $39.9 billion in 1986.	Costs associated with obesity represent 5.5% of U.S. health care expenditure.
Wolf & Colditz[8] United States	BMI ≥ 28.7 (men) BMI ≥ 28.3 (women)	***Medical Conditions*** - NIDDM - Gall bladder disease - CVD - Hypertension - Cancers - Musculoskeletal disorders	Estimated costs attributable to obesity totaled $45.8 billion in 1990.	Costs associated with obesity represent 6.8% of U.S. health care expenditure.
Wolf & Colditz[9] United States	BMI ≥ 28.7 (men) BMI ≥ 28.3 (women)	***Medical Conditions*** - NIDDM - CHD	Costs associated with NIDDM and CHD were attributable to increases in weight gains.	Study suggests that a healthy body weight appears to be a BMI < 25, and weight gains should be kept to < 5 kg throughout a lifetime.
Seidell[10] The Netherlands	BMI > 30	***Health Care Contacts*** - General practitioners - Medical specialists - Hospital Admissions - Medication	Costs of obesity were estimated at 1 billion Dutch guilders.	The costs associated with obesity were substantial, representing about 4% of Dutch health care costs.

Abbreviations: BMI = body mass index; NIDDM = non-insulin-dependent diabetes mellitus; CVD = cardiovascular disease; CHD = coronary heart disease.

Table 1 (Cont.): Prevalence-Based Obesity Cost-of-Illness Studies

Author(s)/ Country	*BMI criteria used to define obesity*	*Medical Conditions / Health Care Contacts attributable to obesity*	*Principal findings*	*Results*
Lévy et al[11] France	BMI ≥ 27	***Medical Conditions*** - Hypertension - Myocardial infarction - Angina pectoris - Stroke - Venous thrombosis - NIDDM - Hyperlipidemia - Gout - Osteoarthritis - Gall bladder disease - Colorectal cancer - Breast cancer - Genitourinary cancer - Hip fracture	The economic costs of obesity were estimated at 11.89 billion French Francs in 1992.	The costs associated with obesity corresponded to about 2% of French health care costs.
Segal et al[12] Australia	BMI > 30	***Medical Conditions*** - NIDDM - Gall stones - CHD - Hypertension - Breast cancer - Colon cancer	Costs attributable to obesity were estimated at 395 million Australian dollars.	Authors report that obesity accounts for 2% of total recurrent health expenditure in disease categories studied.
Swinburn et al[13] New Zealand	BMI > 30	***Medical Conditions*** - NIDDM - CHD - Hypertension - Gall stones - Breast cancer - Colon cancer	Costs attributable to obesity were estimated at 135 million New Zealand dollars.	Study reports that the costs associated with obesity represent about 2.5% of total health care costs.

Abbreviations: BMI = body mass index; NIDDM = non-insulin-dependent diabetes mellitus; CVD = cardiovascular disease; CHD = coronary heart disease.

UNE Working Papers in Economics

1. Baldry, J.C. and Dollery, B.E. 1992. *Investment and Trade Sanctions against South Africa in a Model of Apartheid.*

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