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The Prevalence of Low Back Pain: A Systematic Review of the Literature from 1966 to 1998

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Summary: A systematic literature review of population prevalence studies of low back pain between 1966 and 1998 was conducted to investigate data homogeneity and appropriateness for pooling. Fifty-six studies were analyzed using methodologic criteria that examined sample representativeness, data quality, and pain definition. Acceptable studies were assessed for homogeneity and appropriateness for pooling. Thirty were methodologically acceptable. Of these there were significant differences in study design, patient age, mode of data collection, potential temporal effects, and prevalence results. Point prevalence ranged from 12% to 33%, 1-year prevalence ranged from 22% to 65%, and lifetime prevalence ranged from 11% to 84%. A limited number of studies were left for analysis, making the pooling of data difficult. A model using uniform best-practice methods is proposed. **Key Words:** Prevalence—Epidemiology—Low back pain—Pooling—Methods.

Low back pain is an important health problem in Western industrialized nations (17) and in the rest of the world (18). Although the economic and public health effects of low back pain appears to be increasing, epidemiologic research into the problem is in a formative stage, particularly when compared with cancer, infection, and cardiovascular malfunction (2). In the past 25 years, interest in the prevalence of low back pain has increased, presumably because of its cost to industry and society.

Prevalence is a useful measure of the extent of the problem in the population. Prevalence measures how many persons have the problem at a given time, which can be at any specified point (point prevalence) or in a past period such as 1 week, 1 month, 1 year, or a lifetime (11). Prevalence snapshots over time may give temporal information showing whether low back pain is increasing.

Assessing or comparing prevalence studies of back pain can be problematic because of various definitions of the low back, the severity of the problem (14), and what constitutes an episode of low back pain (3,15). Furthermore, period prevalence studies may be biased by poor recall and incomplete response (14). Other methodologic flaws that bias studies include identifying and accounting for differences between sample population(s) and the target population as well as difficulties in accurately determining the general quality of reported data (12).

Nevertheless, accurate prevalence estimates are needed to serve as a basis for etiologic studies and health-care evaluation and to assess the effect of low back pain in general populations (14). Such studies are practical, inexpensive, and useful for measuring the extent of low back pain in the population (1).

A systematic review of world prevalence studies may permit us to gauge the range of low back pain prevalence from various countries and, where possible, pool data for westernized and developing countries. A systematic approach provides the basis for determining whether low back pain is increasing with time. Methodologic assessment of studies also provides the basis for making recommendations with respect to a preferred best-practice method of conducting prevalence studies. Such a review is presented here.

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METHODS

Literature Review

An extensive systematic literature review was undertaken. Inclusion of only English research papers in the literature review is likely to introduce a systematic error (bias) that could threaten the validity of the review (13). Accordingly, the search was conducted without language restrictions using the following databases and sources. These were searched between 1966 and 1998: Medline, HealthRom Version 5.1, Cochrane Systematic Reviews, Osh-Rom, Cinahl, Current Contents, First Search, key texts, and references found in the articles of the original search. The search was performed using the following key indexing terms: back pain, low back pain, and backache individually and combined with each of the following terms: epidemiology, prevalence, incidence, questionnaires, population surveillance, data collection, sampling studies, cross-sectional studies, and health surveys. This resulted in 27 specific combinations for the search.

Inclusion Criteria

Inclusion criteria for the systematic review were studies of the occurrence of pain in the back (specifically encompassing the low back) in an adult general population or in subsets of an adult population such as entire counties, cities, or towns. Studies of narrow population subsets such as workers and pregnant women were excluded.

General Criteria

The following general criteria were tabulated from each study: western or developing country (20), author and year of publication, mode of data collection (questionnaire, interview, or examination), type of population, patient age, final sample size, response rate, broad classification of back pain definition (back, low back, hips, and legs), other specifications used in the survey (such as stiffness, severity, and disability), recall periods for pain, point prevalence, 1-year period prevalence, lifetime prevalence, other prevalence classifications, and the provision of confidence intervals.

This part of the review allowed identification of all reported general population studies of low back pain and a summary and comparison (if possible) between them.

Methodologic Criteria

In addition to the review of the general criteria just described, a more critical and detailed analysis of these population studies was conducted to determine the homogeneity of data. This analysis was performed using criteria specified by Lebouef-Yde and Lauritsen (12) that I subsequently modified (Table 1). This method uses three methodologic tests containing 12 individual criteria for prevalence studies. They examine representativeness of the target population, data quality, and definition of the low back pain problem.

Another independent reviewer with training in systematic reviews (Dr. Alison Hogg) also reviewed the 56 studies that were subsequently identified using the 12 criteria. This method adds strength to the reliability of the quality analysis. Where a difference of opinion occurred between reviewers in interpretation, a discussion and consensus approach was used.

Pooling of Data

Before data are pooled from different studies, it is desirable to examine key elements for homogeneity of data (6,7,10). The minimum criteria for data pooling in this review were methodologic acceptability plus similarity in

TABLE 1. *Three methodological tests containing 12 individual criteria for prevalence studies*

A. Is the final sample representative of the target population?
   1. At least one of the following must apply in the study: an entire target population, randomly selected sample, or sample stated to represent the target population.
   2. At least one of the following: reasons for nonresponse described, nonresponders described, comparison of responders and nonresponders, or comparison of sample and target population.
   3. Response rate and, if applicable, drop-out rate reported.

B. Quality of the data?
   4. Were the data primary data of low back pain or was it taken from a survey not specifically designed for that purpose?
   5. Were the data collected from each adult directly or were they collected from a proxy?
   6. Was the same mode of data collection used for all subjects?
   7. At least one of the following in the case of a questionnaire: a validated questionnaire or at least tested for reproducibility.
   8. At least one of the following in the case of an interview: Interview validated, tested for reproducibility, or adequately described and standardized.
   9. At least one of the following in the case of an examination: Examination validated, tested for reproducibility, or adequately described and standardized.

C. Definition of low back pain (LBP)
   10. Was there a precise anatomic delineation of the lumbar area or reference to an easily obtainable article that contains such specification?
   11. Was there further useful specification of the definition of LBP, or question(s) put to study subjects quoted such as the frequency, duration or intensity, and character of the pain. Or was there reference to an easily obtainable article that contains such specification?
   12. Were recall periods clearly stated: e.g., 1 week, 1 month, or lifetime?

the description of pain (back pain or low back pain), qualifying specification for the pain, sex, age, and the recall period. It was anticipated that data would be divided between western and developing countries.

RESULTS

Fifty-six studies meeting the inclusion criteria were identified and are listed in the Appendix.

General Criteria

All of the 56 studies were examined and tabulated using the general criteria noted previously (Table 2). The studies were reported between 1969 and 1998 using a mixed mode of data collection including questionnaires, interviews, examinations, and telephone interviews. Of the 56 studies, 11 (20%) were conducted in developing countries and only 8 (16%) were published in the first half of the time period studied (1966 to 1982). The age ranges selected were all from adult populations; however, some studies included adolescents and others evaluated specific age groups. Sample sizes varied from 314 to 54,000, and 45 (80%) of the studies quoted a response rate ranging from 49% to 100%, with a mean of 81%.

Thirty-three (60%) of the studies used the primary term *low back pain* as the descriptor for the broad classification of pain; the rest used *back pain.*

A vast array of additional specifications was used in the studies. Some recorded the frequency, intensity, and duration of attacks, whereas others reported work disability, health-care utilization, clinical tests, activity levels, function, radiographic findings, participation in sports, and bed rest.

Recall periods varied from the present to lifetime recollection. This yielded a full array of prevalence data, with lifetime prevalence most commonly provided (in 26 [46%] of the studies).

Ranges for point prevalence were 0% to 33%, 1-year prevalence ranged from 10.3% to 65%, and lifetime prevalence ranged from 13.8% to 84%, with other prevalence rates also varying considerably. Ten (18%) of the studies used confidence intervals or quoted a standard error. When developing countries were separated from western countries, there were insufficient data to make any comparison.

Methodologic Examination

The results of the methodologic examination of each study are listed in Table 3. Thirty studies (54%) reached the subjective 75% pass level for methodologic acceptability. There was a natural separation between unacceptable and acceptable studies in their methodologic score (very few studies scored between 70% and 80%), with only two studies (references 36 and 38 of Appendix) scoring between 70% and 80%. All acceptable studies scored 80% or higher. Only five studies scored the maximum 100% (Appendix 1 references 2,10,20,23,43). The average score for all studies was 75%; for those acceptable, the average was 86%; and for those unacceptable, it was 61%.

The most common deficiencies identified in all the studies were

- Inadequate definition of low back (75%)
- Questionnaire not tested adequately (71%)
- Inadequate interview (45%)
- Poor responder/nonresponder description (38%)
- Inadequate examination (37%)
- No response rate given (21%)
- Recall periods not specified adequately (20%)

Even in the methodologically acceptable studies there was consistent weakness, with only 36% offering a precise anatomic definition of the lumbar area for their sample population.

Data Pooling

All of the methodologically acceptable studies were divided by broad classification of low back pain and are listed in Table 4 to show their general criteria. It should be noted that all studies that used the label *back pain* failed to identify which part of the back was involved. It may be that in these studies other parts of the spine, such as the neck, were included. Furthermore, these nine studies lack homogeneity generally, so accordingly I did not try to pool the data.

Twenty-one studies used the label *low back pain.* One study (Appendix reference 15) qualified respondents only if they had pain for most days during a 2-week period. Predictably, prevalence rates in this study were considerably less than all others in the low back pain section. Therefore, it cannot be compared directly with the other studies.

Two studies (Appendix references 24 and 51) studied women or men exclusively and thus were excluded. The age-standardized sex distribution was not clear in the other studies. This lack of standardization may effect homogeneity.

After exclusions, 7 studies (references 2,4,10,20,23,37, and 48 of Appendix) remained with point prevalence data (the age distribution for these studies is shown in Figure 1), 8 studies (references 4,20,23,31,33,37,43, and 53 of Appendix) remained with 1-year prevalence data (Fig. 2), and 12 studies (references 4,8,10,12,20,22,23,31,33,41,48,

TABLE 2. *General criteria*

Study	Country	Year	Collection mode	Population type	Age (yr)	Final sample size	Response %	Broad classification of LBP	Other specifications	Recall periods	Point prev. %	1 yr. %	Lifetime prev. %	Other prevalence %
1	Nepal†	1984	I	Rural Village	>18	646	99	BP or Neck	Pain or stiffness	LT			18.4	
2*	Sweden	1988	Q	General	55	575	69	LBP	Pain drawing	1 d	12			
3	Algiers†	1992	I	General	>15	6956	81‡	LBP	Disability	30 d				9.1
4*	Denmark	1982	Q & E	General	30, 40, 50 & 60	928	82	LBP	Pain, trouble	1 d, 1 yr, LT	13.7	45	62	Cum. 1 yr. Incidence = 6
5	Sweden	1981	I	General	16–74	45,000	80	BP	ICD Chap 8	"Long term +"				6.0
6	Canada	1985	I	General	>25	32,000	?	BP	Serious problem	"Long term +"				6.9
7*	Sweden	1996	I	General	>76	563	95	BP and hips	Mild or severe	1 yr		*27, 16		*Mild 27, *severe 16
8*	Sweden	1989	Q	General	18–84	827	82	LBP	Intensive effect	<1 m, 1–6 m, >6 m LT			31.3	<1 m = 8, 1–6 m = 3, >6 m = 20
9*	Denmark	1991	I	General	>15	4753	80	BP and loins	Also very bothered	<2 w, >6 m				12, 18
10*	Canada	1998	Q	General	20–69	1131	55§	LBP	Chronic pain Q. + pain grades	D, 6 m, LT	28.7		84	6 m = 71.4
11*	USA	1996	TI	General	>21	8067	79	BP	Disabling	1 yr		11.5		
12*	Thailand†	1998	I	3 rural villages	15+	2455	99.7	LBP	Disability	7 d, LT			11	7d = 4
13*	USA	1984	I, E	General	25–74	6913	?	BP	Lasting 1 month	LT			17.2	
14*	Indonesia†	1992	I	General	>14	3504	96	LBP	Limited movement	?				Rural 15, urban 22
15*	USA	1987	I, E	General	>25	10,404	?	LBP	Most days for 2w	1 d, 1 yr, LT	6.8	10.3	13.8	
16	India†	1975	I	Jungle Pop.	15–44	450	?	BP	None	?	0			0
17	Pakistan†	1998	I	3 localities	15+	1997	95	LBP	Legs, spine, movement	"current" but unclear				19.5
18*	Denmark	1980	Q	General	20–54	517	72	BP	Severity, frequency, work	LT			63	
19*	Norway	1997	Q	General	20–79	11,780	59§	LBP	Multiple health scales, legs	1 m				21.6
20*	Denmark	1996	Q	General	38	481	83	LBP	Nordic questionnaire	LT, 1 yr, "current"	16–21	60–65	68–71	Males–females
21	Australia	1974	I	General	>18	3885	85	LBP or legs	None	3 yrs				3 yr prevalence = 18
22*	Finland	1987	Q, I, E	General	>30	7217	90	LBP	Outcome, pain effects	1 m, LT			75	1m = 21
23*	UK	1996	Q	General	25–64	3184	76§	LBP	VAS, disability, >1d	1 d, 1 yr, LT	19	39	59	Annual incidence: 4.7
24*	Sweden	1969	I	Female General	15–71	692	?	LBP	Tiredness	LT			49	
25	Sweden	1989	Q	General	50–70	445	49§	LBP	>6 weeks duration					6.3
26	Yugoslavia†	1985	I	General urban	>20	1999	100	LBP	Inability to work	1 d, LT	16.5		50	
27	Finland	1982	I	General	>5	17,000	93	BP	None	?				7.1
28*	Norway	1978	I	General	>20	966	?	BP	Activity, bed rest, work	LT			57	

TABLE 2.—(*Continued*)

Study	Country	Year	Collection mode	Population type	Age (yr)	Final sample size	Response %	Broad classification of LBP	Other specifications	Recall periods	Point prev. %	1 yr. %	Lifetime prev. %	Other prevalence %
29*	UK	1993	I, E	General	43	3262	61	BP	Clinical signs, severe pain	1½ yrs				18m = 23
30	NZ	1991	TI	General	>15	314	?	LBP	Nature of pain	1d, 1w, 1yr, LT	17.8	64.7	79.0	1w = 33.4
31*	Hong Kong	1995	I	General	>18	652	80§	LBP	Disability	1 yr, LT		22.1	39.7	>4w = 16.7
32	England	1969	I & E	General	>35	1522	82	BP or legs	Radiograph, DJD	Present, LT	15.2		36	
33*	Denmark	1996	Q	General	30–50	1370	69§	LBP	Tender, stiff	1 yr, LT		54	64	
34	Canada	1985	I	General	>15	?	?	BP	Serious trouble with back or spine	?				4.4%
35	Canada	1996	Q & I	General	16–64	38,540	88§	BP	"disability", "serious trouble"	Long term				7.80
36	Philippines†	1985	Q & I	Rural community	>15	1675	84	LBP	Disability	1d	7.4			
37*	UK	1994	Q & I	General	>16	6000	80	LBP	Disability & work, health care	1 d, 1 yr	14	37		
38*	England	1997	Q.E.	3 diverse areas	18+	483	59	LBP	Legs, SF36	d, m, 1 yr, LT	16	48	62	m = 30
39*	USA	1994	I	General	>65	3097	80	BP	Function level	1 yr		28.3		
40	USA	1973	I	General	18–64	1135	94	BP	Surgery, brace often is bothered	LT			18.0	
41*	England	1995	Q	General	>18	4501	59	LBP	None	1 m LT			59	1 m = 39
42	Oman†	1992	I	General	>16	920	90	BP	Joint mobility	?				M = 42, F = 25
43*	Iceland	1989	Q	General	16–65	627	73.5	LBP	Nordic questionnaire	1 w, 1 yr		55		1 w = 25f, 36 m
44	Germany	1990	Q	General	25–74	4285	85	BP, neck	Joint problems	Today/present, 1 yr	33		39	
45	USA	1985	Q, I	General	>18	2792	?§	BP	Occupational demand	1 yr		18.0		
46	Finland	1988	Q. I. E.	General	>30	7217	90	LBP	Disability	LT			75	
47*	Australia	1995	I	General	All	54,000	92§	BP	Disk disorder, spine curvature, sciatica	2w, >6 m				2w = 2.6, 6 m = 2.7
48*	Belgium	1994	I	General	>15	3829	86§	LBP	Work status, sports	Current, LT	33		59	
49	USA	1986	TI	General	>18	1254	?	BP	Activities	LT			56	
50	Australia	1993	TI	General	>15	614	53	BP or legs	Care seeking	Current	14.7			
51*	Sweden	1982	Q. I.	Men, general	40–47	716	76	LBP	Defined, various	LT			61	
52	Finland	1982	Q	General	40–64	2268	93	LBP or legs	Other symptoms	1 year		18		
53*	UK	1992	Q	General	20–59	2667	59	LBP	Disability	1 yr, LT		36	58	
54	Philippines†	1991	I	Village pop.	>15	915	?	LBP or hips, legs & spine	Movement	Current? but unclear				11.3
55*	Tokelau NZ	1987	I	General	>15	811	100	LBP	Arthritis	Current but unclear				9.5
56	China†	1994	Q	General two cities	20–64	9249	88	LBP	Function/arthritis	Current but unclear				North: 27.8M, 42.5F South: 12.1M, 14.1F

*Methodologically acceptable.
†Developing nation.
‡Percentage of households.
§Studies giving confidence intervals or standard error.
BP, back pain; d, day; E, examination; I, interview; LBP, low back pain; LT, lifetime; M, month; Q, questionnaire; TI, telephone interview; w, week; yr, year.

TABLE 3. *Methodologic criteria*

Criterion / Study	1	2	3	4	5	6	7	8	9	10	11	12	Total score %	MA
1	CF	CF	CF	CF	CNF	CF	NA	CNF	NA	CNF	CNF	CF	60	
2	CF	CF	CF	CF	CF	CF	CF	NA	NA	CF	CF	CF	100	#
3	CNF	CF	CNF	CF	CNF	CF	NA	CF	NA	CNF	CF	CF	60	
4	CF	CF	CF	CF	CF	CF	CNF	NA	CF	CF	CF	CF	91	#
5	CF	CNF	CF	CNF	CF	CF	NA	CNF	NA	CNF	CF	CNF	50	
6	CF	CF	CNF	CF	CNF	CF	NA	CF	NA	CNF	CF	CF	70	
7	CF	CF	CF	CF	CNF	CF	NA	CF	NA	CNF	CF	CF	80	#
8	CF	CNF	CF	CF	CF	CNF	CF	NA	NA	CF	CF	CF	80	#
9	CF	CF	CF	CF	CF	CF	NA	CF	NA	CNF	CF	CF	90	#
10	CF	CF	CF	CF	CF	CF	CF	NA	NA	CF	CF	CF	100	#
11	CF	CF	CF	CF	CF	CF	NA	CF	NA	CNF	CF	CF	90	#
12	CF	NA	CF	CF	CF	CF	NA	CF	NA	CNF	CF	CF	88	#
13	CF	CF	CNF	CF	CF	CF	NA	CF	CF	CNF	CF	CF	82	#
14	CF	CF	CF	CF	CF	CF	NA	CF	NA	CNF	CF	CNF	80	#
15	CF	CF	CNF	CF	CF	CF	NA	CF	CF	CNF	CF	CF	82	#
16	CNF	CNF	CNF	CF	CNF	CNF	NA	CNF	NA	CNF	CNF	CNF	10	
17	CF	CNF	CF	CF	CF	CF	NA	CF	NA	CNF	CF	CNF	70	
18	CF	CF	CF	CF	CF	CF	CNF	NA	NA	CNF	CF	CF	80	#
19	CF	CF	CF	CF	CF	CF	CF	NA	NA	CNF	CF	CF	90	#
20	CF	CF	CF	CF	CF	CF	CF	NA	NA	CF	CF	CF	100	#
21	CF	CNF	CF	CF	CF	CF	NA	CNF	NA	CNF	CF	CF	70	
22	CF	CF	CF	CF	CF	CF	CNF	CF	CF	CNF	CF	CF	83	#
23	CF	CF	CF	CF	CF	CF	CF	NA	NA	CF	CF	CF	100	#
24	CF	CF	CNF	CF	CF	CF	NA	CF	NA	CNF	CF	CF	80	#
25	CF	CNF	CF	CF	CF	CF	NA	CNF	NA	CF	CNF	CF	70	
26	CF	CF	CF	CF	CF	CF	NA	CNF	NA	CNF	CNF	CF	70	
27	CF	CF	CF	CF	CF	CF	NA	CF	NA	CNF	CNF	CNF	70	
28	CF	CF	CNF	CF	CF	CF	NA	CF	NA	CNF	CF	CF	80	#
29	CF	CF	CF	CF	CF	CF	NA	CF	CF	CNF	CF	CF	91	#
30	CF	CNF	CNF	CF	CF	CF	NA	CNF	NA	CNF	CF	CF	60	
31	CNF	CNF	CF	CF	CF	CF	NA	CF	NA	CF	CF	CF	80	#
32	CF	CNF	CF	CF	CF	CF	NA	CNF	CNF	CNF	CF	CF	64	
33	CF	CF	CF	CF	CF	CF	CF	NA	NA	CNF	CF	CF	90	#
34	CF	CNF	CNF	CNF	CNF	CF	NA	CF	NA	CNF	CF	CNF	40	
35	CF	CF	CF	CF	CF	CF	CNF	CNF	NA	CNF	CF	CNF	64	
36	CF	CNF	CF	CF	CF	CF	CNF	CNF	NA	CF	CF	CF	73	
37	CF	CF	CF	CF	CF	CF	CNF	CF	NA	CF	CF	CF	91	#
38	CF	CNF	CF	CF	CF	CF	CNF	NA	CNF	CF	CF	CF	73	
39	CF	CF	CF	CF	CF	CF	NA	CNF	NA	CNF	CF	CF	80	#
40	CF	CNF	CF	CF	CF	CF	NA	CNF	NA	CNF	CF	CF	70	
41	CF	CF	CF	CF	CF	CF	CNF	NA	NA	CF	CNF	CF	80	#
42	CF	CNF	CF	CF	CF	CF	NA	CNF	NA	CNF	CF	CNF	60	
43	CF	CF	CF	CF	CF	CF	CF	NA	NA	CF	CF	CF	100	#
44	CF	CNF	CF	CF	CF	CF	CNF	NA	NA	CNF	CF	CF	70	
45	CF	CNF	CNF	CNF	CF	CF	CNF	CNF	NA	CNF	CNF	CF	36	
46	CF	CNF	CF	CF	CF	CF	CNF	CNF	CNF	CNF	CF	CF	58	
47	CF	CF	CF	CNF	CF	CF	NA	CF	NA	CNF	CF	CF	80	#
48	CF	CF	CF	CF	CF	CF	NA	CNF	NA	CNF	CF	CF	80	#
49	CF	CF	CNF	CF	CF	CF	NA	CNF	NA	CNF	CF	CF	70	
50	CF	CF	CF	CF	CNF	CF	NA	CNF	NA	CNF	CF	CF	70	
51	CF	CF	CF	CF	CF	CF	CNF	CF	NA	CNF	CF	CF	82	#
52	CF	CNF	CF	CF	CF	CF	CNF	NA	NA	CNF	CF	CF	70	
53	CF	CNF	CF	CF	CF	CF	CNF	NA	NA	CF	CF	CF	80	#
54	CF	CNF	CNF	CF	CF	CF	NA	CF	NA	CNF	CF	CNF	60	
55	CF	CF	CF	CF	CF	CF	NA	CF	NA	CNF	CF	CNF	80	#
56	CNF	CNF	CF	CF	CF	CF	CF	NA	NA	CNF	CF	CNF	60	
Total %	93	62	79	93	88	96	39	55	63	25	88	80	75%av	54%

CF, criterion fulfilled; CNF, criterion not fulfilled; MA, methodologically acceptable; NA, not applicable.
Representativeness = columns 1 to 3.
Quality of data = columns 4 to 9.
Definition of low back pain = column 10 to 12.

TABLE 4. *General criteria of methodologically acceptable studies divided by low back pain (LBP) and back pain (BP)*

Study	Country	Publication year	Mode of collection	Population type	Age (yr)	Final sample size	Response rate %	Broad classification of LBP	Other specifications	Recall periods	Point prev. %	1 yr. prev. %	Lifetime prev. %	Other prevalence %
2	Sweden	1988	Q	General	55	575	69	LBP	Pain drawing	1 d	12			
4	Denmark	1982	Q & E	General	30, 40, 50 & 60	928	82	LBP	Pain, trouble	1 d, 1 yr, LT	13.7	45	62	Cum. 1yr. Incidence = 6
8	Sweden	1989	Q	General	18–84	827	82	LBP	Intensive affect	<1 m, 1–6 m, >6 m, LT			31.3	<1m = 8, 1-6 m = 3, >6 m = 20
10	Canada	1998	Q	General	20–69	1131	55‡	LBP	Chronic pain Q. + pain grades	D, 6 m, LT	28.7		84	6 m = 71.4
12	Thailand†	1998	I	3 rural villages	15+	2455	99.7	LBP	Disability	7 d, LT			11	7 d = 4
14	Indonesia†	1992	I	General	>14	3504	96	LBP	Limited movement	?				Rural 15, urban 22
15	USA	1987	I,E	General	>25	10,404	?	LBP	Most days for 2 w	1 d, 1 yr, LT	6.8	10.3	13.8	
19	Norway	1997	Q	General	20–79	11,780	59‡	LBP	Multiple health scales, legs	1 m				21.6
20	Denmark	1996	Q	General	38	481	83	LBP	Nordic questionnaire	LT, 1 yr, "current"	16–21	60–65	68–71	Males–females
22	Finland	1987	Q, I, E	General	>30	7217	90	LBP	Outcome, pain effects	1 m, LT			75	1 m = 21
23	UK	1996	Q	General	25–64	3184	76‡	LBP	VAS, disability, >1d	1 d, 1 yr, LT	19	39	59	Annual incidence: 4.7
24	Sweden	1969	I	Female General	15–71	692	?	LBP	Tiredness	LT			49	
31	Hong Kong	1995	I	General	>18	652	80‡	LBP	Disability	1 yr, LT		22.1	39.7	>4w = 16.7
33	Denmark	1996	Q	General	30–50	1370	69‡	LBP	Tender, stiff	1 yr, LT		54	64	
37	UK	1994	Q & I	General	>16	6000	80	LBP	Disability & work, health care	1 d, 1 yr	14	37		
41	England	1995	Q	General	>18	4501	59	LBP	None	1 m LT			59	1 m = 39
43	Iceland	1989	Q	General	16–65	627	73.5	LBP	Nordic questionnaire	1 w, 1 yr		55		1 w = 25f, 36 m
48	Belgium	1994	I	General	>15	3829	86‡	LBP	Work status, sports	Current, LT	33		59	
51	Sweden	1982	Q, I	Men general	40–47	716	76	LBP	Defined, various	LT			61	
53	UK	1992	Q	General	20–59	2667	59	LBP	Disability	1 yr, LT		36	58	
55	Tokelau, NZ	1987	I	General	>15	811	100	LBP	Arthritis	Current but unclear				9.5
7	Sweden	1996	I	General	>76	563	95	BP and hips	Mild or severe	1 yr		27,* 16*		mild 27,* severe 16*
9	Denmark	1991	I	General	>15	4753	80	BP and loins	Also very bothered	<2 w, >6 m				12, 18
11	USA	1996	TI	General	>21	8067	79	BP	Disabling	1 yr		11.5		
13	USA	1984	I, E	General	25–74	6913	?	BP	Lasting 1 month	LT			17.2	
18	Denmark	1980	Q	General	20–54	517	72	BP	Severity, frequency, work	LT			63	
28	Norway	1978	I	General	>20	966	?	BP	Activity, bed rest, work	LT			57	
29	UK	1993	I, E	General	43	3262	61	BP	Clinical signs, severe pain	1.5 yrs				18m = 23
39	USA	1994	I	General	>65	3097	80	BP	Function level	1 yr		28.3		
47	Australia	1995	I	General	All	54,000	92‡	BP	Disk disorder, spine curvature, sciatica	2w, >6 m				2w = 2.6, >6 m = 2.7

*Percentage of households.
†Developing nations.
‡Studies display confidence intervals or standard errors. D, day; E, examination; I, interview; LT, lifetime; m, month; Q, questionnaire; TI, telephone interview; w, week; yr, year.

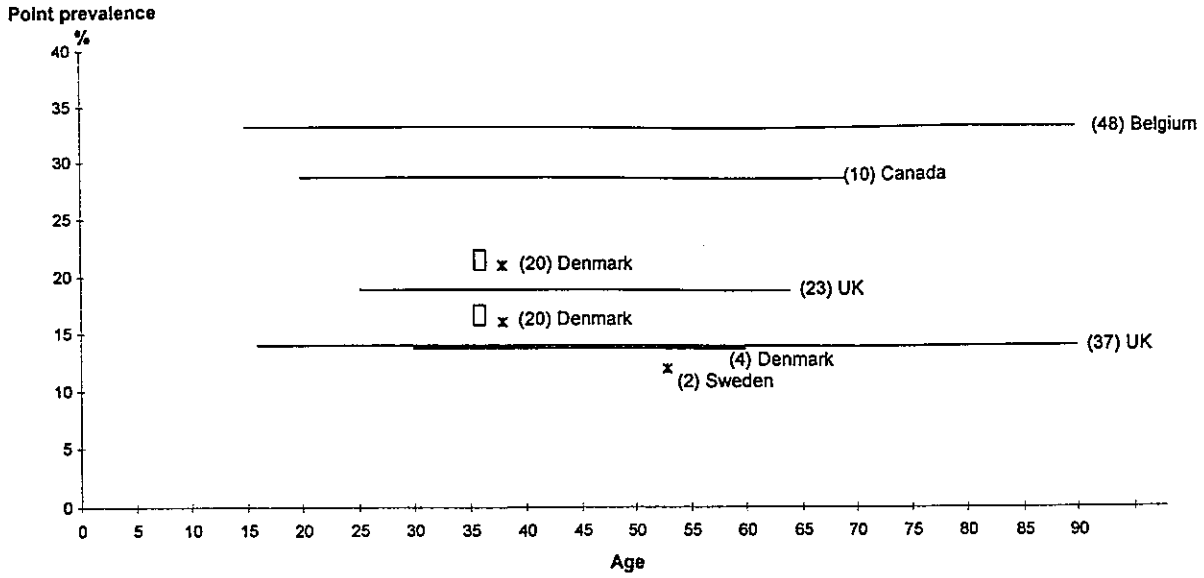

FIG. 1. Distribution of ranges of age and point prevalence in methodologically acceptable studies.

and 53 of Appendix) remained with lifetime prevalence data (Fig. 3).

Although some studies fulfilled the criteria set for data pooling, there are still considerable problems with pooling the data. There are significant age differences between studies, with age data available from most studies not divided into decades or other meaningful intervals. This, combined with other differences between studies such as the mode of data collection, possible temporal effects, and the limited number of countries left for analysis, made any further attempt to pool the data potentially misleading.

The range of data reported across the methodologically acceptable studies reflected the wide disparity in findings. Point prevalence ranged from 12% to 33%, 1-year prevalence ranged from 22% to 65%, and lifetime prevalence was 11% to 84%.

DISCUSSION

The results of this systematic review reveal substantial methodologic flaws in and variability between studies. An underlying assumption in combining multiple study results to arrive at a summary measure is that the differences are caused by chance alone (10). In this systematic review,

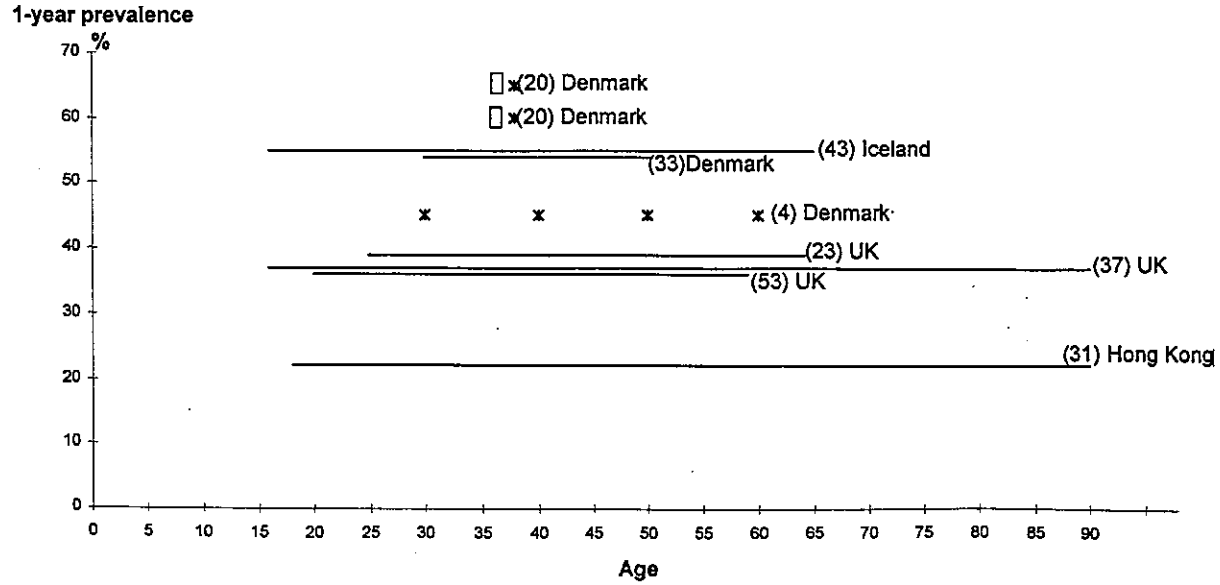

FIG. 2. Distribution of ranges of age and 1-year prevalence in methodologically acceptable studies.

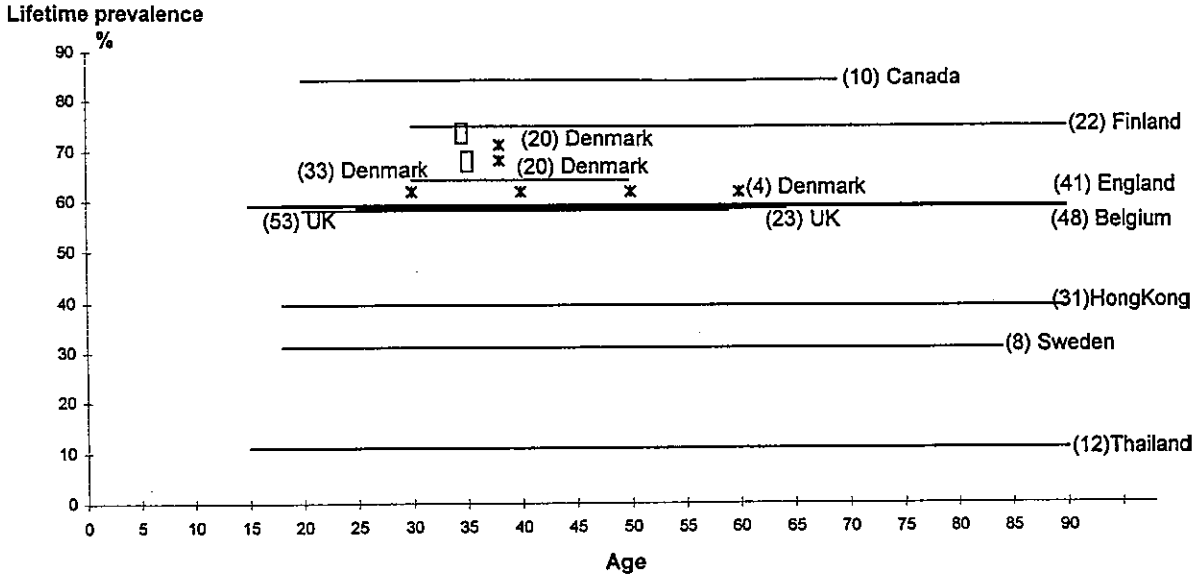

FIG. 3. Distribution of ranges of age and lifetime prevalence in methodologically acceptable studies.

the differences between studies do not appear to be by chance alone.

This variability precluded any meaningful pooling of data, comparison between countries, and review of any temporal change within a population in which there were multiple data sets. This finding is consistent with a similar review of Nordic studies by Lebouef-Yde and Lauritsen (12).

The finding that few studies were conducted in developing countries must be addressed, because more studies in developing nations may shed light on any real difference between western and developing nations, as suggested by Volinn (18).

With only 16% of studies published in the first half of the study period, it is clear that interest in studying low back pain prevalence is increasing.

Generally, the results show a wide range of prevalence rates even within the same country. Variation in prevalence between countries may reflect a true difference or a difference in the study populations.

Differences in study populations may bias any attempted comparison. Such differences can occur when the populations have significant variations in factors believed to effect low back pain prevalence. These factors are many, varied, and controversial, and they include history of back injury, patient age, job satisfaction, emotional distress, heavy physical occupation, prolonged sitting or standing, vibration, smoking, obesity, height, physical fitness, sex, anthropometry, lumbar mobility, trunk strength, and radiographic structural abnormalities (16).

Although the inclusion of all these factors is not necessary to determine prevalence in an individual population, they are desirable to make a reasonable comparison between studies. Accordingly, they should, when practical, be included in the instruments of measurement.

This systematic review shows widespread deficiencies in the reliability and validity of the instruments of measurement (questionnaires, interviews, and examinations). More work needs to be done to find reliable and valid instruments to measure back pain prevalence.

Lebouef-Yde and Lauritsen (12) propose the use of a standardized Nordic questionnaire (9), whereas Cassidy et al. (5) used the Chronic Pain Questionnaire (19). Notwithstanding the language and cultural differences among countries, review of these instruments shows that in modified form they could provide the basis of a questionnaire for generic use in prevalence studies. Future research is required to develop and test such an instrument.

Age is an important criterion for comparison and pooling. Age standardization among studies was not possible because of a lack of data. Future studies should provide data with age-specific prevalences.

Another important area that needs attention is the definition of low back pain. To ask a sample population "Have you ever had low back pain?" is likely to bring a high rate of positive responses, just as it would be expected if the population were asked "Have you ever had a headache?" Matters relating to the exact area of pain, the frequency of attacks, their duration, and the intensity need to be standardized. This will provide more meaningful data, as seen in the U.S. study by Deyo and Tsui-Wu (15), where the definition of the attack duration was "most days for 2 weeks," the lifetime prevalence is significantly less at 13.8% than in most other studies.

Recall bias occurs when episodes of low back pain in the past are forgotten, leading to an underestimate of the

prevalence of back pain. According to Carey et al. (4), lack of recall does occur as early as 4 months after an attack and patients also tend to underestimate the time since their last attack (forward telescoping). These biases need to be considered when any survey of low back pain is interpreted.

A few studies displayed confidence intervals or standard error statistics. Several of the 56 studies were based on large data sets published elsewhere. Perhaps these statistics were included in the original data and were not shown in the subsequent articles. It should also be noted that studies with large sample sizes and very high response rates do not require confidence intervals or standard error statistics. Nevertheless, confidence intervals generally should be a basic statistic described in any prevalence study.

Only three studies (references 5,23, and 41 of Appendix) appeared to undertake wave analysis on the returned mail responses. This method allows investigation of potential selective response bias, where those with low back pain may be over-represented in the first wave of responses, suggesting that sufferers are more likely to participate in the study. This method should become standard for cross-sectional low-back pain prevalence studies. Table 5 shows the recommended minimum desired criteria for any proposed prevalence study. This table also includes a list of suggested variables to include in the measurement instrument to assist comparisons among different study populations. The list is a guide only and is suited to a mailed survey. An examination method would allow expansion of the variables measured.

Standardization of the methods used in prevalence studies of low back pain should be a priority. This could be achieved by a consensus approach among appropriate researchers and involvement of stakeholder agencies. Adherence to an acceptable method would provide more useful data. Initially, contact with authors of back pain prevalence studies or reviews should be made to form an interest group for this task.

This review has several limitations. The method used to review the 56 studies is a valuable but imperfect instrument; the methodologic review instrument was devised by Lebouef-Yde and Lauritsen (12), who acknowledge that it was subjectively defined and that the 75% threshold for acceptability was set arbitrarily. Interestingly, the mean score for all studies in this review was 75%, and there was a natural separation between unacceptable and acceptable studies in their methodologic score (very few studies scored 70% to 80%), lending some weight to the arbitrary figure.

My review of their instrument has added another criterion relating to proxy reporting and the rewording of some criteria. Although this may have improved the instrument, it may be further improved by weighting of criteria, a consensus conference, and further testing.

TABLE 5. *Minimum criteria for prevalence studies of low back pain and minimum variables guide to assist comparison between different study populations*

A. The final sample should be representative of the target population
   1. At least one of the following should apply in the study: an entire target population, randomly selected sample, or sample stated to represent the target population.
   2. At least one of the following: reasons for nonresponse described, nonresponders described, comparison of responders and nonresponders, or comparison of sample and target population.
   3. Response rate quoted and, if applicable, dropout rate reported.

B. Quality of data
   4. The primary data of low back pain should be taken from a survey specifically designed for that purpose.
   5. The data should be collected from each adult directly and where possible not from a proxy.
   6. The same mode of data collection should be used for all subjects.
   7. At least one of the following in the case of a questionnaire: a validated questionnaire or at least tested for reproducibility.
   8. At least one of the following in the case of an interview: Interview validated, tested for reproducibility, or adequately described and standardized.
   9. At least one of the following in the case of an examination: Examination validated, tested for reproducibility, or adequately described and standardized.

C. Definition of *low back pain* (LBP)
   10. A precise anatomic delineation of the lumbar area should be offered to the population.
   11. Other useful specification of the definition of LBP, or question(s) should be put to study subjects including frequency, duration or intensity, and character of the pain.
   12. Prevalence recall periods should include as a minimum the present, 1-year, and lifetime.

D. General description of the method and results should include
   13. the time(s) when the study was conducted,
   14. the target population,
   15. the final sample size and wave analysis of responses,
   16. description of other specifications used in the study such as disability and stiffness, and
   17. the provision of confidence intervals around prevalence statistics.

E. Minimum variables guide to assist comparison between different study populations
   The instrument of measurement should include age; sex; job satisfaction; emotional distress; occupation type, history of prolonged sitting, standing, or subject to vibration; smoking; body mass index; physical fitness level; basic lumbar mobility; and history of back injury.

In this review, the two reviewers gave independent analyses of the articles and provided consensus when required; however, the study authors and publication details were not withheld from the reviewers. This can introduce reviewer bias. Furthermore, reviewer agreement statistics are not provided. It is also possible that despite efforts to obtain all relevant articles on the subject until the end of 1998, some studies may have escaped the search. Further-

more, because of time and logistic considerations, no attempts were made to contact the original authors of each study to elicit more detailed data. Each study was judged based on the published articles alone.

SUMMARY

A systematic review of the literature on the prevalence of low back pain reveals that of the 56 studies identified, only 30 were methodologically acceptable. There was considerable variation between studies, and methodologic flaws were common in most studies. Data pooling was not possible. Future studies of the prevalence of back pain should use a uniform best-practice method. Recommendations in this review could form the basis of best practice. Agreement on such methods may be further obtained through consultation and collaboration with interested authors and reviewers.

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APPENDIX

Fifty-Six Studies That Met the Inclusion Criteria

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