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VETERINARY MANPOWER NEEDS IN MINNESOTA, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA AND WISCONSIN

Nasser A. Aulaqi, Dale K. Sorensen
and E. Hunt McCauley

Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

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VETERINARY MANPOWER NEEDS IN MINNESOTA, NEBRASKA, NORTH DAKOTA, SOUTH DAKOTA AND WISCONSIN

by

Nasser A. Aulaqi,[1] Dale K. Sorensen[2] and E. Hunt McCauley[3]

INTRODUCTION

The College of Veterinary Medicine at the University of Minnesota was established in 1947 as a result of: (1) the needs of the livestock industry and pet owners for veterinary medical services; (2) the need for research in diseases of animals; and (3) the desires of students for opportunities to study veterinary medicine. Since Wisconsin, North Dakota, South Dakota and Nebraska, states in the economic area of Minnesota, do not have veterinary schools, the College has served as a regional center of veterinary medical education. The admissions policy of the College restricts admission to students who are residents of Minnesota or states with which Minnesota has contractual agreements to provide veterinary medical education. In 1970 the Regents of the University of Minnesota approved a plan to expand the enrollment of the College by increasing the entering class from 65 to 120 students. Reasons for planning the enrollment expansion were: (1) 60 to 65 graduates per year would not be able to meet veterinary medical manpower needs for the region. (2) Admission of 65 students per year did not

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[1] Nasser A. Aulaqi is an Assistant Professor, Department of Agricultural and Applied Economics, Institute of Agriculture, Forestry and Home Economics.

[2] Dale K. Sorensen is Professor and Chairman, Department of Large Animal Clinical Sciences, College of Veterinary Medicine.

[3] E. Hunt McCauley is an Assistant Professor, Department of Large Animan Clinical Sciences, College of Veterinary Medicine.

adequately meet the demands of students to study veterinary medicine. (3) With increased faculty numbers and improved facilities which would accompany expanded enrollments the educational programs of the College could be improved. (4) The expanded enrollment program would allow the University of Minnesota better to assume its full role as a regional veterinary medical education center.

The main objective of this study was to assess the current and future demand and supply of veterinarians in this region (Minnesota, North Dakota, South Dakota, Wisconsin and Nebraska).

ASSESSMENT OF EXISTING SITUATION

Several studies have concluded that there has been and continues to be a shortage of veterinarians in the United States, both at the state and national level. A study by the National Academy of Sciences[1] estimated that the U.S. will need 41,895 veterinarians by 1980 and only 38,000 veterinarians will be supplied, creating a net shortage of 3,895. An Iowa study[2] concluded that Iowa has enough veterinarians at the present time (1974) to meet about 85 percent of its veterinary manpower requirements for large animal practice. Other studies have also concluded that the market for veterinarians in the United States is characterized by an excess of demand over supply.[3,4,5]

DATA AND METHODS

Several models can be utilized to study veterinary manpower needs. These range from simple human and animal population ratios to the highly complex models such as system analysis models. The shortage of data on existing veterinary manpower and the restrictions of the

system analysis models, make the use of these models unproductive. Thus, we decided to use population ratios as the tool for assessing the veterinary manpower requirements. This model has been used extensively by researchers in the health service field primarily because it is easy to use and understand.

In this study, population ratios are used to project future veterinary manpower needs on the basis of recent and historical trends. The approach assumes the following:

1. Livestock of a given species and class utilize services at the same rate.
2. Veterinarians have the same productivity rates per unit of time.

Veterinarians are engaged in a wide range of professional activities. For the purpose of this study the types of activity are classified as follows: large animal practice, small animal practice, academic, government, and other. Data for the study were obtained from a variety of sources. The number of veterinarians by practice-type was obtained from the American Veterinary Medical Association (AVMA) Directory. Livestock population data was obtained from the USDA Agricultural Statistics Yearbook. Human population data were obtained from the Statistical Abstracts of the United States Bureau of Census.

VETERINARY MANPOWER REQUIREMENTS BY EMPLOYMENT CATEGORIES

Large Animal Practice

Large animal practitioners are primarily involved in the treatment and prevention of disease in food animals such as cattle, swine and

sheep.[4/] The demand for large animal veterinarians is influenced by the number of animals, type of animals, magnitude of animal and/or zoonotic disease problems, and the economic conditions, such as the value of livestock at a given period.

In order to assess the demand for large animal veterinarians, we need first to develop a procedure by which we can combine different classes and species of livestock into equivalent livestock units, because the type of animals raised in an area determines the demand for veterinary services. An FAO/WHO Expert Panel on Veterinary Education(6) first proposed the use of standard "livestock units" to represent the total number of animals or poultry of different species. This system allows for different utilization rates of veterinary medical services for various animal species, and it can be adjusted based on conditions existing in a state or country. A Canadian veterinary manpower study(7) used this system and suggested the following livestock equivalents as presented in Table 1.

Table 1. Livestock Equivalent Units. The Relative Amount of Veterinary Service Required by Each of the Various Classes of Livestock and Poultry

Dairy	5.0
Beef	1.0
Pig	0.25
Sheep	0.25
Poultry	0.001

[4/] Horses are not considered in the large animal practice section because of the lack of reliable data on the number of horses in the five-state area. Thus, large animal veterinarians are used interchangeably with food animal veterinarians.

Since it is reasonable to assume that the levels and magnitude of disease problems in Canada are not substantially different from those in the United States, we applied the same relative weights in this study except in the case of dairy cattle where a value of 4 was used.

Table 2 presents the mean number of livestock units per large animal practitioner in each of the five states for 1969 to 1975.

Between 1969 and 1975 the utilization rate of veterinarians has increased substantially in Minnesota and Wisconsin but has increased only slightly in Nebraska, North Dakota and South Dakota. The results in Table 2 indicate a wide disparity of utilization of large animal practitioners. For example, in 1975 Minnesota had a utilization rate of 27.16 thousand livestock units per practitioner, whereas in North Dakota the number of livestock units per veterinarian was more than 46 thousand. There are no comprehensive data on the level of disease problems in each of the five states, but veterinary professionals doubt there is a substantial difference to actually account in any significant way for the disparity in utilization rates.

Tables 3 through 8 present the projected requirements for large animal veterinarians at different levels of utilization rates. The tables also give livestock projections on the basis of the rate of growth over the period 1969-1975. Only a modest growth is projected for livestock because of the fact that the number of sheep and dairy cattle was projected to decrease from present levels.

Table 2. Large Animal Practice: Number of Livestock Units Per Veterinarian by State, 1969 and 1975

State	Livestock Units* (000's) 1969	1975	Large Animal Veterinarians** 1969	1975	Utilization Rate (000's) 1969	1975	Percent Annual Change in Utilization Rate 1969-1975
Minnesota	8,998	9,343	281	344	32.02	27.16	2.5%
Nebraska	7,937	8,309	198	229	40.09	36.28	1.7%
North Dakota	2,724	3,223	55	69	49.53	46.71	1.0%
South Dakota	5,786	6,194	116	134	49.88	46.22	1.17%
Wisconsin	12,219	12,584	281	354	43.48	35.55	3.0%

* Livestock units computed by multiplying the total number of livestock and poultry by the relative utilization values, dairy cattle 4., beef cattle 1., pigs .25, sheep .25 and poultry .001.

** The number of large animal veterinarians was computed as follows. It was assumed that the AVMA data on number of veterinarians by practice type only represent about 87 percent of the total number of practitioners in any given practice activity. Furthermore, it was assumed that veterinarians engaged in mixed practice spend 70 percent of their time in large animal practice and 30 percent in small animal and equine practice. This seems to be a reasonable assumption in light of the fact that the study area is a major livestock producing region.

***Utilization rate is the average number of livestock units per large animal veterinarian.

Table 3. Projected Requirements of Veterinarians for Large Animal Practice at Various Levels of Livestock Units Per Veterinarian in Minnesota

Year	1975	1980	1985	1990
Livestock Units	9,343,000	9,776,000	10,502,000	10,929,000
Thousand Livestock Units/Veterinarian				
30.00	311	326	350	364
27.16*	344**	360	387	402
25.00	374	391	420	437
23.83	392	410**	441**	459**
20.00	467	489	525	546
15.00	623	652	700	729
10.00	934	978	1,050	1,093

* 27.16 thousand livestock units per veterinarian was the actual ratio in 1975 in Minnesota.

**Underlined number is the projected requirements for veterinarians in the years specified based upon the same rate of increase in utilization rate to 1980 as was experienced from 1969 to 1975. After 1980 a constant rate of utilization was assumed.

Table 4. Projected Requirements of Veterinarians for Large Animal Practice at Various Levels of Livestock Units Per Veterinarian in Nebraska

Year	1975	1980	1985	1990
Livestock Units	8,309,000	8,720,000	9,321,000	9,650,000
Thousand Livestock Units/Veterinarian				
40.00	208	218	233	241
36.28*	229**	240	257	266
35.00	237	249	266	276
33.24	250	262**	280**	290**
30.00	277	291	311	322
25.00	332	349	373	386
20.00	415	436	466	483
15.00	554	581	621	643

* 36.28 thousand livestock units per veterinarian is the actual ratio in 1975 in Nebraska.

**Underlined number is the projected requirement for veterinarians in the specified years based upon the same rate of increase in utilization rate to 1980 as was experienced from 1969 to 1975. After 1980 a constant rate of utilization was assumed.

Table 5. Projected Requirements of Veterinarians for Large Animal Practice at Various Levels of Livestock Units Per Veterinarian in North Dakota

Year	1975	1980	1985	1990
Livestock Units	3,223,000	3,883,000	4,815,000	5,422,000
Thousand Livestock Units/Veterinarian				
50.00	64	78	96	108
46.71*	69**	83	103	116
45.00	72	86	107	120
44.39	73	87**	108**	122**
40.00	81	97	120	136
35.00	92	110	138	155
30.00	107	129	161	181
25.00	129	155	193	217
20.00	161	194	241	271
15.00	215	259	321	361

* 46.71 thousand livestock units per veterinarian is the actual ratio in 1975 in North Dakota.

**Underlined number is the projected requirement for veterinarians in the specified years based upon the same rate of increase in utilization rate to 1980 as was experienced from 1969 to 1975. After 1980 a constant utilization rate was assumed.

Table 6. Projected Requirements of Veterinarians for Large Animal Practice at Various Levels of Livestock Units Per Veterinarian in South Dakota

Year	1975	1980	1985	1990
Livestock Units	6,194,000	6,690,000	7,358,000	7,752,000
Thousand Livestock Units/Veterinarian				
50.00	124	134	147	155
46.22*	134**	145	159	168
45.00	138	149	164	172
43.54	142	154**	169**	178**
40.00	155	167	184	194
35.00	177	191	210	221
30.00	206	223	245	258
25.00	248	268	294	310
20.00	310	335	368	388
15.00	413	446	491	517

* 46.22 thousand livestock units per veterinarian is the actual ratio in 1975 in South Dakota.

**Underlined number is the projected requirement for veterinarians in the specified years based upon the same rate of increase in utilization rate to 1980 as was experienced from 1969 to 1975. After 1980 a constant utilization rate was assumed.

Table 7. Projected Requirements of Veterinarians for Large Animal Practice at Various Levels of Livestock Units Per Veterinarian, Wisconsin, Selected Years

Year	1975	1980	1985	1990
Livestock Units	12,582,000	13,138,000	13,857,000	14,325,000
Thousand Livestock Units/Veterinarian				
40.00	315	330	353	368
35.55*	354**	371	397	414
35.00	360	377	403	421
30.34	415	435**	465**	486**
30.00	419	440	471	491
25.00	503	528	565	589
20.00	629	660	706	737
15.00	839	880	941	982

* 35.55 thousand livestock units per veterinarian is the actual ratio in 1975 in Wisconsin.

**Underlined number is the projected requirement for veterinarians in the years specified based upon the same rate of increase in utilization values to 1980 as was experienced from 1969 to 1975. After 1980 a constant utilization rate was assumed.

Table 8. Projected Requirements of Veterinarians for Large Animal Practice, Combined Five States of Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin

Year	Projected Requirements
1975	1130
1980	1348
1985	1463
1990	1535

It is difficult to assess accurately the requirements for veterinarians because it is almost impossible to come up with accurate projections of utilization rates. Utilization rates could change substantially in the future as a result of many factors, such as productivity and efficiency of veterinarians, use of paramedical personnel, and changes in socio-economic conditions. All these factors will tend to obscure accurate predictions of future veterinary manpower requirements. On the other hand, the results presented in Tables 3 through 8 may be of some help in making decisions if they represent valid assumptions.

Projected requirements for large animal practitioners were determined on the basis of the 1969-75 historical trend in utilization rates (underlined figures in the tables). An analysis of these utilization rates shows that the use of veterinarians in Minnesota and Wisconsin was significantly greater than in Nebraska, North Dakota and South Dakota. In view of current economic trends in livestock production, it

was assumed that the increased utilization rate which occurred from 1969 to 1975 would not continue to 1990. It was predicted that the utilization rate would remain initially the same from 1975 to 1980; it is not possible to predict at this time the utilization rates for the period 1980 to 1990. Historically, utilization rates have always increased. One would therefore assume that they should continue to increase, at least to some extent, if veterinary services are available and of high quality. The assumption that utilization rates will reach a plateau is thus extremely conservative. It can be pointed out that the current national utilization rate (1976) for large animal practice is one veterinarian for 31,428 livestock units. A conservative assumption is that, after 1980, the rate of increase will remain the same. These projections are based on past utilization patterns and do not necessarily represent any optimal manpower requirements.

While it can be argued theoretically that any given livestock unit should be provided the same level of veterinary service as any other, this is not true in practice. For example, the utilization rate in North Dakota is a little more than one-half that of Minnesota. There are many factors that influence demand and cause the disparity between perceived need and actual demand. These include income, ignorance of animal health needs, health care attitudes, knowledge and source of health care information, and physical accessibility to veterinary services. The wide disparity of utilization rates among the five states is partly due to the fact that livestock owners in states like North and South Dakota are less accessible geographically to veterinary services than owners in the other states. Furthermore, the attitudes

of ranchers towards the use of veterinary services may be very different from those of dairy farmers. One should realize, however, that the low utilization rates indicate a real shortage of large animal veterinarians. The amount of shortage cannot be accurately stated unless we specify an optimal rate of utilization. The development of a rate of optimal utilization must be normative, since we have to make a subjective judgment concerning the quantity of veterinary service an animal ought to receive in order to achieve or maintain a given state of health.

Small Animal Practice

Small animal veterinarians are engaged mainly in the treatment and prevention of diseases of cats and dogs. The number of small animal veterinarians for the five-state region is presented in Table 10 for the period 1969-1975. The figures indicate that there has been a substantial increase in the number of veterinarians providing pet health care services. The increase ranged from a low of 30 percent in Nebraska to a high of 52 percent in Wisconsin and North Dakota.

The increased number of small animal practitioners is primarily due to increased number of pets and utilization rates. It is estimated that dog ownership increased by more than 36 percent between 1964 and 1971. Cat ownership increased by about 13 percent during the same period. Data on ownership of cats and dogs in the United States were collected in 1971 by the Market Research Corporation of America (MRCA). Data from this study indicated that 38.1 percent of the households own at least one dog and 20.5 percent of the households own at least one cat. If we eliminate a double count of both dogs and cats, this means

that 48 percent of the households own at least one cat or dog. Table 9 shows the percentage distribution of dog and cat owning households by location.

Table 9. Pets by Location: Distribution of Dog and Cat Owning Households Classified by Location, 1971

Location	Household Distribution	Percent Proportion of Households Owning a Pet		Proportional Pet Population	
		Dog	Cat	Dog	Cat
Farms	5.2	67.2	49.2	9.2	12.5
Small Towns	24.3	38.0	22.3	24.2	26.4
Central Cities	35.3	30.9	13.2	28.6	22.7
Suburbs	35.3	41.1	22.7	38.1	38.4
	100	38.1	20.5	100	100

Source: MRCA data as quoted by Purvis, M. and Otto, D.M., "Household Demand for Pet Food and the Ownership of Cats and Dogs, An Analysis of a Neglected Component of U.S. Food Use," Staff Paper P76-33, Department of Agricultural and Applied Economics, University of Minnesota, Institute of Agriculture, Forestry and Home Economics, St. Paul, October 1976.

Since data on number of pets are not available on an annual basis, it will not be possible to project directly the number of small animal veterinarians on the basis of pet population. Instead, human population projections were used as a proxy to predict the future requirements for small animal veterinarians. Table 10 shows a comparison of human population per small animal veterinarian for 1969 and 1976.

Table 10. Small Animal Practice Analysis: Human Population Per Veterinarian, 1969 and 1975 in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin

State	Human Population* (000's)		Small Animal Practitioners**		Human Population Per Veterinarian (000's)	
	1969	1975	1969	1975	1969	1975
Minnesota	3758	3926	199	291	18.88	13.49
Nebraska	1474	1546	98	127	15.04	12.17
North Dakota	621	635	19	29	32.68	21.90
South Dakota	668	683	44	58	15.18	11.78
Wisconsin	4378	4607	173	263	25.31	17.52

* Human population data obtained from the Bureau of Census.

**Small animal practitioner numbers obtained from AVMA data.

The results in Table 10 indicate significant variations among the five states. North Dakota again shows the lowest utilization rate among the five states. Table 10 also shows that between 1969 and 1975 the ratios of human population per veterinarian decreased for all the five states, which reflects both an increase in utilization and increased number of pets.

Tables 11 through 16 present the projected requirements for small animal veterinarians at various levels of utilization rates. The underlined figures represent projected requirements on the basis of the annual growth in utilization rates during the period 1969 to 1975. It was assumed that from 1975 to 1980 the annual rate of growth in utilization rates will be only one-third as great and after 1980 it was assumed that no increase in utilization would occur.

Table 11. Projected Requirements of Veterinarians for Small Animal Practice at Various Levels of Population Per Veterinarian, Minnesota, Selected Years

Year	1975	1980	1985	1990
Population	3,926,000	4,065,000	4,207,000	4,354,000
Population Per Veterinarian*				
15,000	262	271	280	290
13,490*	291**	301	312	323
12,400	317	328**	339**	351**
12,000	327	339	351	363
10,000	393	407	421	435
8,000	491	508	526	544

* 13.49 thousand is the human population per small animal veterinarian in 1975 in Minnesota.

**Underlined numbers represent the projected number of veterinarians needed in selected years based upon projecting only one third of the increase in utilization rate which occurred during the period from 1969 to 1975 to 1980. After that time no increase in utilization rate was assumed.

Table 12. Projected Requirements of Veterinarians for Small Animal Practice at Various Levels of Population Per Veterinarian, Nebraska, Selected Years

Year	1975	1980	1985	1990
Population	1,546,000	1,608,000	1,672,000	1,741,000
Population Per Veterinarian*				
14,000	110	115	119	124
12,170*	127**	132	137	143
11,530	134	139**	145**	151**
10,000	155	161	167	174
8,000	193	201	209	218

* In 1975 human population per veterinarian was 12.17 thousand.

**Underlined numbers represent the projected number of veterinarians needed in selected years based upon projecting only one-third of the increase in utilization rate which occurred during the period 1969 to 1975 to 1980. After that time no increase in utilization rate was assumed.

Table 13. Projected Requirements of Veterinarians for Small Animal Practice at Various Levels of Population Per Veterinarian, North Dakota, Selected Years

Year	1975	1980	1985	1990
Population	635,000	648,000	661,000	674,000
Population Per Veterinarian*				
22,000	29	29	30	31
21,900*	29**	30	30	31
20,000	32	32	33	34
19,900	32	33**	33**	34**
18,000	35	36	37	37
16,000	40	41	41	42

* In 1975 human population per veterinarian was 21.9 thousand.

**Underlined numbers represent the projected number of veterinarians needed in selected years based upon projecting only one-third of the increase in utilization rate which occurred during the period 1969 to 1975 to 1980. After that time no increase in utilization rate was assumed.

Table 14. Projected Requirements of Veterinarians for Small Animal Practice at Various Levels of Population Per Veterinarian, South Dakota, Selected Years

Year	1975	1980	1985	1990
Population	683,000	700,000	714,000	728,000
Population Per Veterinarian*				
12,000	57	58	60	61
11,780*	58**	59	61	62
11,020	62	64**	65**	66**
11,000	62	64	65	66
10,000	68	70	71	73
8,000	85	88	89	91

* In 1975 human population per veterinarian was 11.78 thousand.

**Underlined numbers represent the projected number of veterinarians needed in selected years based upon projecting only one-third of the increase in utilization rate which occurred during the period 1969 to 1975 to 1980. After that time no increase in utilization rate was assumed.

Table 15. Projected Requirements of Veterinarians for Small Animal Practice at Various Levels of Population Per Veterinarian, Wisconsin, Selected Years

Year	1975	1980	1985	1990
Population	4,607,000	4,818,000	4,991,000	5,171,000
Population Per Veterinarian*				
18,000	256	268	277	287
17,520*	263**	275	285	295
17,010	271	283**	293**	304**
16,000	288	301	312	323
14,000	329	344	357	369
12,000	384	402	416	431

* In 1975 human population per veterinarian was 17.52 thousand.

**Underlined numbers represent the projected number of veterinarians needed in selected years based upon projecting only one-third of the increase in utilization rate which occurred during the period 1969 to 1975 to 1980. After that time no increase in utilization rate was assumed.

Table 16. Projected Requirements of Veterinarians for Small Animal Practice, Combined Five States of Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin

Year	Projected Requirements
1975	768
1980	847
1985	875
1990	906

These projections for the number of veterinarians needed for small animal practice are very conservative. In the United States the average human population per small animal veterinarian is approximately 15,577 at the present time. In the five-state area the utilization of veterinary service for pets and companion animals is slightly above the national average, but it is below that projected by the National Academy of Sciences study in 1972 which was one veterinarian for each 12,250 human population.

Government Service

Federal

The Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture is a major employer of veterinarians. The Meat and Poultry Inspection Division has the primary responsibility for inspection and quality control of meat and poultry at the local and state level. In 1970 new federal legislation made it mandatory that all meat and poultry slaughtered for public consumption

be inspected for wholesomeness to protect the consumer. The Veterinary Services Division is the regulatory veterinary agency with the responsibility to control and eradicate diseases of livestock. This agency works closely with the comparable state animal disease control agencies to carry out disease control programs and to enforce disease control regulations.

State

Each state government maintains an agency staffed largely by veterinarians to carry out regulatory programs designed to prevent and control diseases of livestock and poultry, including zoonotic diseases transmissible to man. The Veterinary Services Division of APHIS cooperates with state agencies in carrying out these programs.

Municipal

Municipal governments are not major employers at present, but a number of veterinarians do work in regulatory public health for large cities in the Departments of Health.

Other

Other government agencies such as the Food and Drug Administration do employ veterinarians but these do not constitute any significant numbers.

To assist in projecting the future requirements for veterinarians in government regulatory veterinary medicine, the current number of veterinarians is listed.

Table 17. Current Number of Veterinarians in Federal and State Regulatory Veterinary Medicine in the Five States

State	Federal Meat and Poultry Inspection	Federal Vet. Services	State Regulatory Vet. Med.	Total
Minnesota	56	9.5	15	80.5
Nebraska	52	8.0	7	67.0
North Dakota	5	7.5	2	14.5
South Dakota	7	7.0	6	20.0
Wisconsin	48	7.5	15	70.5
TOTAL	168	39.5	45	252.5

Disease control officials in federal and state governments estimate that the demand for veterinarians in government service will remain at about the present level for the next 15 years. They do not foresee any significant change in the total number unless new major disease problems in livestock develop. In the event that the federal government reduces the number of positions, it is anticipated that state governments will fund these positions. It should be noted that vacant positions usually exist in government service at all times. Projections for veterinary manpower requirements for government service will be at the current level to 1990.

Academic Veterinary Medicine

Institutions of higher learning employ many veterinarians to carry out the teaching, research and service missions of the institutions. These veterinarians are engaged in teaching professional

students, conducting animal disease or biomedical research, graduate education, continuing education, extension service, or diagnostic service. Veterinary science departments are located in Nebraska, North Dakota, South Dakota and Wisconsin. Minnesota has a veterinary college at the University of Minnesota. Animal health technology programs are located at Madison, Wisconsin, in the Vocational School at the University of Minnesota Technical College at Waseca, Minnesota, and in Nebraska.

In Table 18 the current number of veterinarians employed in academic veterinary medicine is listed.

Table 18. Current Number of Veterinarians in Academic Veterinary Medicine in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin

Institution	Faculty	Graduate Students*	Total
University of Minnesota	82	24	106
University of Minnesota - Waseca	2	0	2
University of Nebraska	18	0	18
North Dakota State University	9	0	9
South Dakota State University	8	0	8
University of Wisconsin	16	14	30
TOTAL	135	38	173

*Includes only funded graduate student training positions which are filled each year.

The future requirements of veterinarians for academic veterinary medicine are estimated on the basis of judgment of subjective factors. The following table lists these estimates.

Table 19. Projected Requirements for Veterinarians in Academic Veterinary Medicine in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin in Selected Years

Institution	Years			
	1975	1980	1985	1990
University of Minnesota	108	144	152	152
University of Minnesota - Waseca	2	2	2	2
University of Nebraska	18	23	25	27
North Dakota State University	9	10	12	15
University of North Dakota	1	1	1	1
South Dakota State University	8	9	10	11
University of Wisconsin*	30	48	57	64
TOTAL	176	237	259	272

*Includes only the expansion of the Department of Veterinary Science at the University of Wisconsin and does not include the veterinary faculty requirements if a school of veterinary medicine is established.

The projected requirements for additional veterinarians in teaching and research are as reliable as possible at the present time. Data for increases in Minnesota, Wisconsin and Nebraska represent tentative commitments already made by universities if funds can be obtained from legislatures or other sources. There has been a continuous demand for teaching and research in veterinary medicine and these are realistic projections at this time.

Other Fields of Veterinary Medicine

This group includes veterinarians engaged in the professional fields of public health, industry and military veterinary medicine. It includes veterinarians who become engaged in some form of business, usually, but not always, related to the animal or poultry industry, and the unknown and retired categories. Table 20 lists the current number of veterinarians in these categories according to the 1976 AVMA data.

Table 20. Current Number of Veterinarians in Public Health, Military Veterinary Medicine, and Other or Unknown Categories in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin in 1976

State	Public Health	Military Vet. Med.	Other or Unknown*	Total
Minnesota	11	12	35	58
Nebraska	2	4	13	19
North Dakota	0	2	6	8
South Dakota	2	1	13	16
Wisconsin	3	3	55	61
TOTAL	18	22	122	162

*Includes industrial veterinary medicine.

The number of veterinarians in these categories is not projected to increase significantly during the next four years.

The exception to this is industrial veterinary medicine. This group is the most poorly defined of any professional veterinary activity because it includes veterinarians working in animal health products,

human health products, animal feeds and various other industries. Many of them are involved in applied research in which they do experimental surgery, practice laboratory animal medicine, conduct toxicologic experimentation, conduct field investigations or work with customer relations. The duties are broad and depend upon the industry involved. It is difficult to establish a base from which to project future numbers. It is judged that the demand in this area is increasing each year as industry becomes informed of the broad capabilities of veterinarians.

In 1973 the Industrial Veterinarians Association conducted a survey of veterinarians employed in industry. Results of this survey revealed the following: Minnesota 21, Nebraska 33, North Dakota 0, South Dakota 2 and Wisconsin 21, for a total of 77 veterinarians. It is projected that this activity will demand an increase in veterinarians of from 10 to 20 percent during the next 14 years. Future projections are for 85 by 1980, 92 by 1985 and 101 by 1990. Table 21 shows the projected requirements for veterinarians in other fields of veterinary medicine. The only field in which an increased demand is projected is in industrial veterinary medicine which is included in the "other" category.

Table 21. Projected Numbers of Veterinarians Needed in Public Health, Military Veterinary Medicine and Other or Unknown Categories in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin in Selected Years

State	Years 1975	1980	1985	1990
Minnesota	58	60	62	65
Nebraska	46	49	51	53
North Dakota	8	9	10	11
South Dakota	16	17	18	19
Wisconsin	61	63	65	68
TOTAL	189	198	206	216

SUMMARY OF PROJECTED REQUIREMENTS FOR VETERINARIANS

The projected requirements for veterinarians in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin until 1990 are given in Tables 22 - 27. These are based upon the estimates of the total requirements for each of the major employment categories of large animal practice, small animal practice, government service, academic, industry and miscellaneous. The basis for these estimates in each category has previously been discussed.

Table 22. Projected Requirements for Veterinarians in Minnesota in 1975 to 1990

Employment Category	Years 1975	1980	1985	1990
Large Animal Practice	344	410	441	459
Small Animal Practice	291	328	339	351
Government Service	81	81	81	81
Academic Institutions	110	146	154	154
Other*	58	60	62	65
TOTAL	884	1,025	1,077	1,110

*"Other" includes military veterinary medicine, public health, industrial veterinary medicine, retired and other miscellaneous fields.

Table 23. Projected Requirements for Veterinarians in Nebraska in 1975 to 1990

Employment Category	Years 1975	1980	1985	1990
Large Animal Practice	229	262	280	290
Small Animal Practice	127	139	145	151
Government Service	67	67	67	67
Academic Institutions	18	23	25	27
Other*	46	49	51	53
TOTAL	487	540	568	588

*"Other" includes public health, military veterinary medicine, industrial veterinary medicine, retired and other miscellaneous fields.

Table 24. Projected Requirements for Veterinarians in North Dakota in 1975 to 1990

Employment Category	Years 1975	1980	1985	1990
Large Animal Practice	69	87	108	122
Small Animal Practice	29	33	33	34
Government Service	15	15	15	15
Academic Institutions	10	11	13	16
Other*	8	9	10	11
TOTAL	131	155	179	198

*"Other" includes public health, military veterinary medicine, industrial veterinary medicine, retired and other miscellaneous fields.

Table 25. Projected Requirements for Veterinarians in South Dakota in 1975 to 1990

Employment Category	Years 1975	1980	1985	1990
Large Animal Practice	134	154	169	178
Small Animal Practice	58	64	65	66
Government Service	20	20	20	20
Academic Institutions	8	9	10	11
Other*	16	17	18	19
TOTAL	236	264	282	294

*"Other" includes public health, military veterinary medicine, industrial veterinary medicine, retired and other miscellaneous fields.

Table 26. Projected Requirements for Veterinarians in Wisconsin in 1975 to 1990

Employment Category	Years 1975	1980	1985	1990
Large Animal Practice	354	435	465	486
Small Animal Practice	263	283	293	304
Government Service	71	71	71	71
Academic Institutions	30	48	57	64
Other*	61	63	65	68
TOTAL	779	900	951	993

*"Other" includes public health, military veterinary medicine, industrial veterinary medicine, retired and other miscellaneous fields.

Table 27. Projected Requirements for Veterinarians in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin in 1975 to 1990

Employment Category	Years 1975	1980	1985	1990
Large Animal Practice	1,130	1,348	1,463	1,535
Small Animal Practice	768	847	875	906
Government Service	254	254	254	254
Academic Institutions	176	237	259	272
Other*	189	198	206	216
TOTAL	2,517	2,884	3,057	3,183

*"Other" includes public health, military veterinary medicine, industrial veterinary medicine, retired and other miscellaneous fields.

SUPPLY OF VETERINARIANS

Our analysis of the supply of veterinarians for this region takes into consideration current numbers, immigration and veterinarians who will be added by graduation from the University of Minnesota and other veterinary colleges. The model used in this analysis also considers the factors of attrition before graduation, death, dropouts, retirement and changes of career objectives.

Present Veterinary Population

The present number of veterinarians in the major employment categories for Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin is given in Table 28.

Table 28. Estimated Current Number of Veterinarians in Major Employment Categories for Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin

Employment Category	States				
	Minn.	Nebraska	N. Dakota	S. Dakota	Wis.
Large Animal Practice	344	229	69	134	354
Small Animal Practice	291	127	29	58	263
Government Service	81	67	15	20	71
Academic Institutions	110	18	10	8	30
Other*	58	46	8	16	61
TOTAL	884	487	131	236	779

*"Other" includes military veterinary medicine, public health, industrial veterinary medicine and other miscellaneous fields.

The basis for these estimates is as follows: For large animal and small animal practice, 1976 AVMA directory data were used. Since it is recognized that not all veterinarians respond to this AVMA questionnaire, these numbers were adjusted to reflect more accurately the total number. It was estimated that the AVMA directory inventory represented only 87% of the total number of veterinarians.[5/] For the number of veterinarians in government service and academic institutions, an actual count was obtained from the two employer groups. In the case of the "other" category, AVMA directory data were utilized and adjusted with data obtained from the Industrial Veterinarians Association. These data are as reliable as is possible to obtain at this time and they accurately reflect the current veterinary populations in these states.

Projected Supply of Veterinarians

The next step in determining the supply of veterinarians for the region is to project the potential number of DVMs to be added to the veterinary manpower pool each year. These graduates will come primarily from the University of Minnesota, since it is the only school in the five states. Table 29 shows the potential number of students graduating from the University of Minnesota from 1976 to 1990 assuming that the entering class is expanded to 100 students in 1978 and to 120 students in 1979 and thereafter.

5/This estimate was obtained from AVMA office and comparisons done on data of veterinarians in Minnesota with AVMA directory data suggesting that this number is reasonably valid.

Table 29. The Potential Number of Students Graduating From the University of Minnesota to be Added to the Veterinary Manpower Pool, 1976 to 1990*

Year	Number of Graduates	Year	Number of Graduates	Year	Number of Graduates
1976	73	1981	100	1986	120
1977	68	1982	120	1987	120
1978	73	1983	120	1988	120
1979	80	1984	120	1989	120
1980	80	1985	120	1990	120

*Assumes the College of Veterinary Medicine at the University of Minnesota expands its entering class to 100 students in 1978 and 120 students in 1979.

A second important source of veterinarians is residents of these states who are enrolled in other veterinary colleges in the United States. A significant number of these individuals return to their states of residence following graduation. The following table shows the current and projected enrollment of students who are residents of Nebraska, North Dakota, South Dakota and Wisconsin in veterinary colleges in the United States.

Of interest for regional veterinary medical education and for the potential supply of new graduates in the five-state region is the number of residents of Nebraska, North Dakota, South Dakota and Wisconsin admitted to midwest veterinary colleges[6/] other than the University of Minnesota during the period 1972-76. Table 31 shows data for these states.

6/ Includes the veterinary colleges in Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Missouri and Oklahoma.

Table 30. Current and Projected Student Enrollment of Residents of Nebraska, North Dakota, South Dakota and Wisconsin in Veterinary Colleges Other Than the University of Minnesota

Institution	Years 1976	1977	1978	1979	1980	Total
Iowa State University	14	17	18	22	22	93
Kansas State University	19	8	9	11	8	55
Oklahoma State University	2	1	7	7	3	20
University of Missouri	6	4	1	5	0	16
Colorado State University	9	0	2	3	0	14
Michigan State University	3	4	2	0	0	9
University of Illinois	1	2	1	0	3	7
Purdue University	2	1	2	1	0	6
TOTAL	56	37	42	49	36	220

Table 31. Number of Residents of Nebraska, North Dakota, South Dakota and Wisconsin Admitted to Midwest Veterinary Colleges* During the Period 1972-76

State	Years of Admission 1972	1973	1974	1975	1976
Nebraska	25	19	17	28	21
North Dakota	6	5	10	15	14
South Dakota	11	6	9	9	8
Wisconsin	26	28	26	22	17
TOTAL	68	58	62	74	60

*Includes the veterinary colleges in Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Missouri and Oklahoma.

To estimate the potential supply of veterinarians coming from residents of Nebraska, North Dakota, South Dakota and Wisconsin, Table 32 was developed. Several assumptions were made: 1) That the state of Wisconsin would have 20 additional places per year in veterinary colleges other than the University of Minnesota. This figure reflects the number of students that some officials in Wisconsin believe are necessary in order to provide adequate veterinary manpower for Wisconsin, if the University of Minnesota accepts 35 Wisconsin residents in each class when enrollment is expanded to 120 students per class. 2) That North Dakota would have 10 additional places per year in veterinary colleges other than the University of Minnesota and that five places would be reserved for North Dakota at the University of Minnesota. North Dakota had 15 residents in veterinary colleges in 1975 and 14 in 1976. This assumption maintains the status quo for North Dakota. 3) That South Dakota would also maintain the status quo with 10 additional places in veterinary colleges other than the University of Minnesota. Currently South Dakota has no places in veterinary medicine at the University of Minnesota. In 1975 nine residents were admitted to other colleges of veterinary medicine and in 1976, eight. 4) That Nebraska would maintain the status quo with 10 additional places in veterinary colleges other than the University of Minnesota, and that 15 places for residents of Nebraska would be reserved at the University of Minnesota. In 1975 there were 28 residents of Nebraska admitted to veterinary colleges and in 1976 there were 21, so a total of 25 places would enable Nebraska to maintain the status quo.

Table 32 shows the potential number of residents of Nebraska, North Dakota, South Dakota and Wisconsin graduating from colleges of veterinary medicine in the midwest other than the University of Minnesota.

Table 32. Potential Number of Graduates From Colleges of Veterinary Medicine Other Than the University of Minnesota Who Are Residents of Nebraska, North Dakota, South Dakota and Wisconsin

Year	Number of Graduates	Year	Number of Graduates	Year	Number of Graduates
1976	56*	1981	50**	1986	50
1977	37*	1982	50	1987	50
1978	42*	1983	50	1988	50
1979	49*	1984	50	1989	50
1980	36*	1985	50	1990	50

* Based upon actual students currently enrolled.

**Assumes Wisconsin will have 20 places, North Dakota 10 places, Nebraska 10 places and South Dakota 10 places in addition to students admitted to the University of Minnesota when the class is expanded to 120 students.

The basic methodology in estimating total active supply of veterinarians was to estimate the flow of graduates into the active supply and then to estimate the losses to the existing work force. The assumption was made that the major flow of graduates would come from residents of the five-state area attending veterinary colleges in the midwest and that the number of graduates locating in these states would follow a historical trend. During the five-year period from 1972-76 a total of 71 percent of the graduates of the College of Veterinary Medicine at the University of Minnesota located in the states of Minnesota, North

Dakota, South Dakota and Wisconsin, with 38 percent in Minnesota and 22 percent in the adjacent states. These percentages have remained similar for the past 20 years. In view of this history it was estimated that approximately 75 percent of each graduating class would locate in the five-state area. "Graduating class" included the number of graduates from the College of Veterinary Medicine at the University of Minnesota and the graduates of other midwest veterinary colleges who are residents of the states of Nebraska, North Dakota, South Dakota and Wisconsin. Using 75 percent instead of 70 percent is perhaps an optimistic projection but it was the intent of this study to be conservative and realistic.

Another assumption made was that there would be attrition between admission and graduation. During the past five years at the University of Minnesota College of Veterinary Medicine the attrition rate averaged 3.3 percent. In the calculation only 3.0 percent was used for attrition rate. Again we may be overestimating the supply since previous data cited by the National Academy of Science study indicated that 7.0 percent was a realistic figure. The attrition rate may have been lower in recent years due to higher scholastic averages of students being admitted to veterinary schools.

An annual loss due to retirement of 1.8 was used. This adjustment assumes an active professional life of 39 years, with the average veterinarian entering the profession at age 26 and retiring at age 65.

Using standard age-dependent mortality tables, attrition due to death was estimated to be 1.1 percent, assuming that veterinarians do not live longer than other members of the work force.[4]

It was assumed that 0.1 percent of the veterinarians leave the profession each year. Although we do not have accurate data on this loss, other studies have assumed 0.1 percent, which seemed a reasonable assumption.

Most studies include another factor in determining available veterinary medical manpower. We also recognized that veterinarians are not always continuously engaged in providing veterinary medical services. Some male or female veterinarians spend short periods of time in activities not related to veterinary medicine. Some female veterinarians take time off from professional activities to raise families. This factor does not remove the veterinarian from the supply pool as do the dropout factors, but it does cause the veterinarian to be temporarily unavailable. To determine the active available veterinary manpower supply it is necessary to estimate the percentage of available veterinarians who are active in providing veterinary medical services. Other studies have estimated that the percentage of all veterinarians who are available to provide veterinary service ranges from 85 to 95 percent. Data on the number of veterinarians inactive for short periods of time are not available. A percentage to adjust for this factor was estimated at 2 percent of the new graduates only and not the total existing work force.

In summary, the following adjustments are made to estimate the flow of graduates into the active supply and to estimate the losses to the existing work force.

Graduate Supply

1) Assumed that 75 percent of graduates would locate in the five-state area.
2) Assumed that the attrition rate before graduation would be 3 percent.
3) Assumed that 2 percent of graduates would become unavailable for veterinary practice.

Existing Work Force

1) Assumed an annual retirement loss of 1.8 percent.
2) Assumed an annual death loss prior to retirement of 1.1 percent.
3) Assumed an annual dropout rate of .1 percent.

Immigration of Graduates From Veterinary Colleges Outside the Midwest

One final factor which needs to be considered in determining veterinary medical manpower is that of immigration of veterinarians who are graduates of veterinary colleges other than midwest veterinary colleges or are not residents of these states. As previously stated, veterinarians tend to move to states where economic opportunities exist. In the past very few graduates of schools from other parts of the United States have located in the five-state area. Using data provided by the AVMA on the college of graduation of AVMA members in the five-state region, it was determined that the origin of veterinarians in each state was predominantly veterinary colleges in the midwest where residents of the state were accepted. For example, 78.5 percent of the veterinarians in North Dakota graduated from the University of Minnesota, Kansas State University, Iowa State University, Colorado

State University, Michigan State University or Oklahoma State University. In South Dakota 83 percent of the veterinarians graduated from the six veterinary colleges in Minnesota, Kansas, Colorado, Iowa, Missouri and Oklahoma. In Wisconsin 84 percent of the veterinarians graduated from eight veterinary colleges in adjacent midwest states that accepted Wisconsin residents. These data suggest that less than 20 percent of the veterinary manpower in these states has been supplied by immigration of veterinarians from other parts of the country or foreign countries.

Estimates of Veterinary Supply

With these assumptions it is possible to estimate the veterinary manpower needs of the five-state area. The following tables provide information on the supply-demand projections to 1990.

Table 33. Estimate of the Supply and Demand of Veterinarians for Minnesota, Nebraska North Dakota, South Dakota and Wisconsin for the Period 1976 to 1990

Year	Existing Veterinary Manpower	New Available Veterinary Manpower*	Estimated Migration of Veterinary Manpower**	Annual Loss of Existing Veterinary Work Force***	Total	Projected Veterinary Requirements ****	Projected Shortage or Surplus of Veterinarians
1976	2517	0	0	0	2517	2517	0
1977	2517	67	17	76	2525		
1978	2525	72	17	76	2538		
1979	2538	83	20	76	2565		
1980	2565	73	19	76	2581	2884	(303)
1981	2581	112	26	78	2641		
1982	2641	119	28	79	2709		
1983	2709	119	28	80	2776		
1984	2776	119	28	83	2840		
1985	2840	119	28	85	2902	3057	(155)
1986	2902	119	28	87	2962		
1987	2962	119	28	88	3021		
1988	3021	119	28	90	3078		
1989	3078	119	28	92	3133		
1990	3133	119	28	94	3186	3183	3

* New available veterinary manpower is the number of new graduates each year from the University of Minnesota and the residents of the five states attending other midwestern veterinary colleges, assuming a 3 percent attrition from admission to graduation, that 2 percent of the graduates would be unavailable for practice and that 75 percent would locate in the five-state area with 38 percent of the graduates from the University of Minnesota locating in Minnesota.

** Estimated migration of veterinary manpower is the number of veterinarians graduating from other veterinary colleges in the U.S., Canada or other foreign countries locating in the five-state area. Also includes residents of the five-state area who had graduated from the University of Minnesota or other midwestern veterinary colleges previously and are returning to the area.

*** Annual loss due to retirement, death and dropouts was calculated at 3.0 percent.

****Based upon assumptions used in this study.

Table 34. Estimate of the Supply and Demand of Veterinarians for Minnesota for the Period 1976 to 1990

Year	Existing Veterinary Manpower	New Available Veterinary Manpower*	Estimated Migration of Veterinary Manpower**	Annual Loss of Existing Veterinary Work Force***	Total	Projected Veterinary Requirements ****	Projected Shortage or Surplus of Veterinarians
1976	884	0	0	0	884	884	0
1977	884	26	7	27	890		
1978	890	28	7	27	898		
1979	898	30	8	27	909		
1980	909	30	8	27	920	1025	(105)
1981	920	37	9	28	938		
1982	938	44	11	28	965		
1983	965	44	11	29	991		
1984	991	44	11	30	1016		
1985	1016	44	11	30	1041	1077	(36)
1986	1041	44	11	31	1065		
1987	1065	44	11	32	1088		
1988	1088	44	11	33	1110		
1989	1110	44	11	33	1132		
1990	1132	44	11	34	1153	1110	43

* New available veterinary manpower is calculated on the assumption that 38 percent of the graduates from the University of Minnesota will locate in Minnesota and that the attrition rate of students will be 3 percent between admission and graduation and that 2 percent of graduates will be unavailable for practice.

** Estimated migration of veterinary manpower is the number of veterinarians graduating from other veterinary colleges in the U.S., Canada or other foreign countries locating in Minnesota. Also includes previous graduates of the University of Minnesota or other midwestern veterinary colleges returning to this area.

*** Annual loss due to retirement, death and dropouts was calculated at 3.0 percent.

****Based upon assumptions used in this study.

Table 35. Estimate of the Supply and Demand of Veterinarians for Nebraska for the Period 1976 to 1990

Year	Existing Veterinary Manpower	New Available Veterinary Manpower*	Estimated Migration of Veterinary Manpower**	Annual Loss of Existing Veterinary Work Force***	Total	Projected Veterinary Requirements ****	Projected Shortage or Surplus of Veterinarians
1976	487	0	0	0	487	487	0
1977	487	13	3	15	488		
1978	488	12	3	15	488		
1979	488	20	5	15	498		
1980	498	15	4	15	502	540	(38)
1981	502	18	4	15	509		
1982	509	18	4	15	516		
1983	516	18	4	15	523		
1984	523	18	4	16	529		
1985	529	18	4	16	535	568	(33)
1986	535	18	4	16	541		
1987	541	18	4	16	547		
1988	547	18	4	16	553		
1989	553	18	4	17	558		
1990	558	18	4	17	563	588	(25)

* New available veterinary manpower is calculated on the assumption that 75 percent of the residents of Nebraska graduating from veterinary colleges will locate in Nebraska and that the attrition rate of students admitted will be 3 percent, that 2 percent of graduates will be unavailable for practice and that in 1978 and after, Nebraska will have 25 places in colleges of veterinary medicine.

** Estimated migration of veterinary manpower is the number of veterinarians graduating from other veterinary colleges in the U.S., Canada or other foreign countries locating in Nebraska.

*** Annual loss due to retirement, death and dropouts was calculated at 3.0 percent.

****Based upon assumptions used in this study.

Table 36. Estimate of the Supply and Demand of Veterinarians for North Dakota for the Period 1976 to 1990

Year	Existing Veterinary Manpower	New Available Veterinary Manpower*	Estimated Migration of Veterinary Manpower**	Annual Loss of Existing Veterinary Work Force***	Total	Projected Veterinary Requirements ****	Projected Shortage or Surplus of Veterinarians
1976	131	0	0	0	131	131	0
1977	131	4	1	4	132		
1978	132	7	2	4	137		
1979	137	11	3	4	147		
1980	147	10	3	4	156	155	1
1981	156	11	3	5	165		
1982	165	11	3	5	174		
1983	174	11	3	5	183		
1984	183	11	3	5	192		
1985	192	11	3	6	200	179	21
1986	200	11	3	6	208		
1987	208	11	3	6	216		
1988	216	11	3	6	224		
1989	224	11	3	7	231		
1990	231	11	3	7	238	198	40

* New available veterinary manpower is calculated on the assumption that 75 percent of the residents of North Dakota graduating from veterinary colleges will locate in North Dakota and that the attrition rate of students admitted will be 3 percent, that 2 percent of the graduates will be unavailable for practice and that in 1978 and after, North Dakota will have 15 places in colleges of veterinary medicine.

** Estimated migration of veterinary manpower is the number of veterinarians graduating from other veterinary colleges in the U.S., Canada or other foreign countries locating in North Dakota.

*** Annual loss due to retirement, death and dropouts was calculated at 3.0 percent.

****Based upon assumptions used in this study.

Table 37. Estimate of the Supply and Demand of Veterinarians for South Dakota for the Period 1976 to 1990

Year	Existing Veterinary Manpower	New Available Veterinary Manpower*	Estimated Migration of Veterinary Manpower**	Annual Loss of Existing Veterinary Work Force***	Total	Projected Veterinary Requirements ****	Projected Shortage or Surplus of Veterinarians
1976	236	0	0	0	236	236	0
1977	236	4	1	7	234		
1978	234	7	1	7	235		
1979	235	7	1	7	236		
1980	236	6	1	7	236	264	(28)
1981	236	7	1	7	237		
1982	237	7	1	7	238		
1983	238	7	1	7	239		
1984	239	7	1	7	240		
1985	240	7	1	7	241	282	(41)
1986	241	7	1	7	242		
1987	242	7	1	7	243		
1988	243	7	1	7	244		
1989	244	7	1	7	245		
1990	245	7	1	7	246	294	(48)

* New available veterinary manpower is calculated on the assumption that 75 percent of the residents of South Dakota graduating from veterinary colleges will locate in South Dakota and that the attrition rate of students admitted will be 3 percent, that 2 percent of the graduates will be unavailable for practice and that in 1978 and after, South Dakota will have 10 places in colleges of veterinary medicine.

** Estimated migration of veterinary manpower is the number of veterinarians graduating from other veterinary colleges in the U.S., Canada or other foreign countries locating in South Dakota.

*** Annual loss due to retirement, death and dropouts was calculated at 3.0 percent.

****Based upon assumptions used in this study.

Table 38. Estimate of the Supply and Demand of Veterinarians for Wisconsin for the Period 1976 to 1990

Year	Existing Veterinary Manpower	New Available Veterinary Manpower*	Estimated Migration of Veterinary Manpower**	Annual Loss of Existing Veterinary Work Force***	Total	Projected Veterinary Requirements ****	Projected Shortage or Surplus of Veterinarians
1976	779	0	0	0	779	779	0
1977	779	20	5	23	781		
1978	781	18	4	23	780		
1979	780	15	3	23	775		
1980	775	12	3	23	767	900	(133)
1981	767	39	9	23	792		
1982	792	39	9	24	816		
1983	816	39	9	24	840		
1984	840	39	9	25	863		
1985	863	39	9	26	885	951	(66)
1986	885	39	9	27	906		
1987	906	39	9	27	927		
1988	927	39	9	28	947		
1989	947	39	9	28	967		
1990	967	39	9	29	986	993	(7)

* New available veterinary manpower is calculated on the assumption that 75 percent of the residents of Wisconsin graduating from veterinary colleges will locate in Wisconsin and that the attrition rate of students admitted will be 3 percent, that 2 percent of the graduates will be unavailable for practice and that in 1978 and after, Wisconsin will have 55 places in colleges of veterinary medicine.

** Estimated migration of veterinary manpower is the number of veterinarians graduating from other veterinary colleges in the U.S., Canada or other foreign countries locating in Wisconsin.

*** Annual loss due to retirement, death and dropouts was calculated at 3.0 percent.

****Based upon assumptions used in this study.

CONCLUSIONS

The estimate of the supply of and the demand for veterinarians for the five-state region is summarized in Table 33 and for each individual state in Tables 34 through 38. Under the assumptions used in this study it is apparent that even if the University of Minnesota expands its class size to 120 students it will only provide a supply of veterinarians to meet the projected requirements for veterinarians for 1990. It should be noted that after 1980 the supply gradually catches up with the demand. The reason for this is that after 1980 no increase in utilization rates of veterinary service was projected despite the long historical trend of an annual increase in the utilization of veterinary service. The data suggest that the five-state area will have a shortage of veterinarians until 1990, when the increased supply of veterinarians from the University of Minnesota will correct this shortage. There appears to be some variation among the states in regard to projected shortages or surplus with the states of Wisconsin, Nebraska and South Dakota still having projected deficiencies in veterinary manpower by 1990, and Minnesota and North Dakota having a slight surplus. The number of graduates from other colleges of veterinary medicine in the United States locating in the five-state area is also important for supply. At the present time between 16 and 22 percent of the veterinarians in North Dakota, South Dakota and Wisconsin immigrated into these states from other regions of the country or foreign countries. It was decided, based upon historical trends, that approximately 20 percent of the veterinary manpower in the future would probably be supplied by other schools. The economic opportunities

would probably largely dictate what percentage of the total work force would come from this source.

Another factor not taken into consideration when estimating the supply of veterinarians is the growth in numbers of animal technologists or technicians. Veterinarians are now able to employ well trained paraprofessional personnel who can extend veterinary medical services. The extent to which veterinary technical support will affect the requirements for veterinarians is difficult to project. We did not believe it possible to estimate it accurately so a factor was not included into the calculation. It was estimated that during the next 10 to 15 years it may reduce the need for veterinarians by five to ten percent. In view of the conservative procedures used in projecting the demand for veterinarians, these two factors may cancel out.

In attempting to draw conclusions or to evaluate the estimates of the supply and demand for veterinarians, it is useful to discuss the assumptions of this study. A conservative approach was used in projecting the demand for veterinarians, and an optimistic approach in estimating the supply of veterinarians. A prime assumption made is that the demand for veterinary medical services will continue to increase. The major challenge is to project accurately the magnitude of the increase. It was thought that projecting the same rate of increase in utilization of veterinary services to 1980 as actually occurred during the period 1969 to 1975 for large and small animal practice was realistic. After 1980 a constant rate of utilization was assumed because it was thought more difficult to estimate it accurately.

Recognizing that the utilization rate may well continue to increase, we have taken a conservative viewpoint here. With the model we have presented it is possible to project the requirements for veterinarians for large or small animal practice at different utilization rates. Therefore, depending on the utilization rate selected, one can estimate any level of demand based only on human and animal population.

SUMMARY OF OBJECTIVES AND CONCLUSIONS

The primary objectives of this study were to assess the current and future supply and demand of veterinarians in Minnesota, Nebraska, North Dakota, South Dakota and Wisconsin. To accomplish these objectives it was necessary to obtain an accurate inventory of veterinarians for this five-state area. It was also necessary to develop a model, based on stated assumptions, to project the future requirements of veterinarians for all professional activities. The approach used provides the opportunity for projecting a range of demands for large and small animal practitioners. The major conclusions of this study are:

1. The demand for veterinarians in the five-state area will increase in the next 14 years.
2. The historical trend of increasing numbers of veterinarians and increasing utilization of veterinary services will continue, but the rate of increase will decline from its current level.
3. The projected supply of veterinarians for the five-state region from this College and other midwestern veterinary colleges is inadequate to meet projected requirements.

4. Expansion of enrollments at the College of Veterinary Medicine, University of Minnesota, to a class size of 120 students is needed to meet minimum projected demands for veterinary manpower.
5. If 75 percent of the residents of these states who graduate from veterinary colleges locate in the region and enrollments at the University of Minnesota are expanded to 120 students per class, then approximately 20 percent of needed veterinary medical manpower must be supplied by immigration of graduates of other veterinary medical schools.

RECOMMENDATIONS

The College of Veterinary Medicine, University of Minnesota, must be recognized and developed as a regional and national resource.

The planning and development of veterinary medical education programs to insure opportunities for careers in veterinary medicine for residents of all states and to insure an adequate supply of graduates to meet the demands of society should occur on a regional basis. Responsibilities for development of veterinary medical education must be shared by government, leaders in higher education, the veterinary medical profession and consumers of veterinary medical services. Leaders in veterinary medical education in the five states should develop a coordinated regional plan for veterinary medical education. Given the high costs of establishing new schools of veterinary medicine, it seems that the need for additional manpower in this region can be better met by increasing the class size at the University of Minnesota to 120 students.

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