

# Evaluating the economic and noneconomic impacts of the veterinary medical profession in Michigan

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By any standard, the veterinary profession is dynamic and complex, encompassing professionals working in such varied fields as the military, basic research, and private clinical practice. Veterinarians make critical contributions to society by providing clinical expertise for the preservation and management of animal health. In addition, veterinarians play important roles involving enhancement of food safety and public health, regulation of live animal export and trade, and enrichment of the human-animal bond.

Michigan is not unique in benefitting from the enormous breadth and depth of the veterinary profession. However, the profession's impact is often poorly recognized and easily overlooked. This situation is particularly unfortunate when the veterinary profession seeks outside support to facilitate training of future veterinarians, to perform the research required for scientific advancement of the profession, to disseminate information for the public good, and to develop and implement legislation to protect animal and human health.

Previous studies have sought to estimate the economic impact of certain aspects of human or veterinary medicine in various locations. For example, Christianson and Faulkner<sup>1</sup> estimated the local economic impact of rural human medical hospitals by considering salary and nonsalary expenditures; estimated economic multipliers were used to account for direct and indirect effects. A similar study was conducted by Lichty et al<sup>2</sup> to estimate the regional economic impact of human health services. To avoid excluding indirect effects, a computer simulation was conducted. In addition to monetary measures, this study estimated the impact of human health services on level of employment, as did a study by Weisgrau and McDowell<sup>3</sup> that focused on human health in rural communities. In addition to these, numerous and varied studies of the economic impact of human medicine have been conducted.

Not surprisingly, fewer studies of the economic impact of veterinary medicine have been conducted. A study was completed that estimated the impact of the

University of Pennsylvania School of Veterinary Medicine on income and employment in Pennsylvania.<sup>4</sup> Qualitative impacts of the school were also discussed, including effects on public health and quality of life for pets and pet owners. In contrast, Oregon State University enumerated direct expenditures and employment for its veterinary school in 1992.<sup>5</sup> In addition, a general description of epizootic diseases diagnosed at the university was included, as was a listing of the estimated monetary value of some of the animals treated by university clinicians. Most recently, a study was conducted in California that assessed the total number of veterinarians in the state and the size of the state's general population.<sup>6</sup> Projections were made regarding the percentage of veterinarians in the general population under alternative enrollment policies at the University of California, Davis School of Veterinary Medicine; however, broader estimates of employment or economic impact related to the veterinary profession in California were not included.

To our knowledge, studies that systematically evaluate the broad economic and noneconomic impacts of the veterinary medical profession have not been conducted. Therefore, the purpose of the study reported here was to fully document the economic and noneconomic impacts of the veterinary medical profession on the state of Michigan.

## Methods

In general, the study was conducted as a cross-sectional descriptive study, using data from 1995. To fully capture the economic and noneconomic impacts of the veterinary medical profession, it was necessary to employ quantitative and qualitative measures. In addition, direct and indirect contributions of the veterinary medical profession to society were considered.

**Quantitative methods**—To estimate the direct contribution of the veterinary medical profession to Michigan's economy, statewide expenditures in various sectors of the profession were summarized in 2 categories: salaries and wages, and all other in-state expenditures. These categories were selected to facilitate use of separate personal income and output multipliers. Individual sectors of the veterinary medical profession that were considered included private practice, industry, academia, and government.

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For private practices, salaries and wages of all veterinarians (owners and nonowners) and staff were included. Payroll taxes, most of which are paid to the federal government, and the cost of drugs and medical supplies (most pharmaceutical and veterinary medical supply companies are located outside Michigan) were excluded from the other expenditures category. Salaries, wages, and other expenditures were estimated, using state-specific data on the number of veterinarians by type of employment,<sup>7</sup> regional data on professional incomes of veterinarians by type of employment, and national data on expenditures by practice type.<sup>8</sup> Resulting numbers were compared with those available from the **Michigan Veterinary Medical Association (MVMA)**<sup>9</sup> to obtain subjective validation.

For the industry sector, the salaries and wages category included only wages paid in Michigan to veterinarians designated by the AVMA<sup>8</sup> as having been employed by industry. Other in-state expenditures by industry were estimated as a set proportion of all private practice expenditures on drugs and medical supplies. The proportion was determined by approximating the percentage of gross income that animal health pharmaceutical firms spent on sales and marketing.<sup>10,11</sup>

For academia, information on expenditures was obtained directly from the Michigan State University College of Veterinary Medicine and the Association of American Veterinary Medical Colleges. An approach similar to that described for private practices was used.

For government, all expenditures by the state were assumed to have taken place within Michigan. Information was obtained directly from the Michigan Department of Agriculture, Animal Industry Division for state government, and from the USDA, Animal and Plant Health Inspection Service and Food Safety and Inspection Service for federal government.

In addition to monetary expenditures, the number of jobs associated with the veterinary medical profession was of interest, because it provided an indicator of the number of people whose livelihoods were derived directly from the profession. Estimates of total employment for the veterinary medical profession were obtained from the US Census Bureau.<sup>12</sup>

Statewide spending and employment related to the veterinary medical profession stimulates the general economy. For example, each dollar that pet owners spend on veterinary health care is allocated to salaries, wages, or other expenditures by the practitioner. Employees, in turn, take their incomes and spend money on items such as food, clothing, entertainment, or other goods and services. By purchasing these items, money is provided to other sectors of the economy for allocation to salaries, wages, and other expenses. In this fashion, money spent in a veterinary practice ultimately leads to increased employment and profitability in the construction, entertainment, retail, and agricultural sectors (among others). In other words, production and employment outside the veterinary profession are increased to meet this higher demand, which creates more jobs and income. This phenomenon is referred to as the multiplier effect.

Personal income, output, and employment multipliers for application to the veterinary medical profession were derived by use of economic development soft-

ware developed by researchers in the federal government and at the University of Minnesota.<sup>a</sup> This software, called IMPLAN, actually performs an input-output simulation of the economy in each state and county in the United States. In doing so, IMPLAN estimates multipliers for virtually all sectors of the economy. These multipliers were then used in this study to estimate the total (ie, direct and indirect) impact that the veterinary medical profession had on the economy in Michigan.

**Qualitative methods**—In a qualitative sense, the primary direct impacts of the veterinary medical profession are related to 3 general areas: sustaining the human-animal bond through preservation of companion animal health and longevity, promoting food safety and quality through progressive management of livestock health, and supporting human and animal health research by maintaining the health and productivity of laboratory animals. These factors were considered separately by reviewing available published data and reports. In addition, the foremost indirect impacts of the veterinary medical profession were considered to be associated with production of healthy livestock for Michigan animal agriculture, maintenance of healthy pets to support the pet food industry, and maintenance of healthy horses to provide a reliable means for pursuing a popular form of recreation in Michigan.

## Results and Discussion

**Quantitative results**—During 1995, there were an estimated 740 private veterinary practices in Michigan employing approximately 1,408 veterinarians. In these practices, approximately \$103 million was expended on wages and salaries, and another \$96 million was spent in Michigan on practice expenses. During the same year, an estimated 85 veterinarians were employed by industry in Michigan, accounting for approximately \$8 million in salaries and wages. In addition, industry spent approximately \$36 million in support of drugs and medical supplies marketed in Michigan.

In academia, approximately 143 veterinarians were employed in Michigan during 1995. Expenditures for salaries and wages were estimated to be \$20 million, and costs of supplies and services purchased in Michigan were \$12 million. Approximately 41 veterinarians were employed by federal and state governments in Michigan during 1995. Government expenditures for salaries and wages for these veterinarians and their support staffs were approximately \$4 million, and costs of supplies and services purchased in Michigan during this period were approximately \$0.6 million.

Together, these 4 sectors of the veterinary medical profession spent \$135 million on wages and salaries and another \$144 million on supplies and services purchased in Michigan during 1995. Personal income and output multipliers were estimated to be 1.68 and 1.87, respectively. Therefore, the total contribution of the veterinary medical profession to Michigan's economy during 1995 was approximately \$496 million ( $\$135 \text{ million} \times 1.68 + \$144 \text{ million} \times 1.87$ ).

According to the US Census Bureau,<sup>12</sup> an estimated 5,333 people were employed in the veterinary medical profession in Michigan during 1995. This included

veterinarians and their support staffs. The employment multiplier was estimated to be 1.59. Therefore, the veterinary medical profession accounted for approximately 8,479 jobs in Michigan in 1995.

**Qualitative results**—Pets are an important part of the modern family,<sup>13</sup> and the bond between pets and their human families has received much attention. Although the present study was not designed to allow a comprehensive evaluation of the human-animal bond, evidence is available to suggest that pets can have a direct impact on the health and well-being of the individuals or families they contact.

Research has demonstrated that human-animal interactions can have sociologic and psychologic impacts that influence the quality of life of companion animal owners.<sup>14</sup> Many pet owners have emotional bonds with their pets that are not shared with family or friends.<sup>15</sup> Often a veterinarian is the only confidant for a pet owner in this regard. Companion animal ownership can have direct positive effects on human health,<sup>16</sup> and Hart,<sup>17</sup> through a review of the literature, presented clear evidence of the important contributions that animals make to physical and mental health of humans. The mere presence of an animal can facilitate relaxation and reduce blood pressure in humans.<sup>18</sup> Pet ownership has also been shown to be significantly associated with probability of survival for at least 1 year among patients admitted to a university coronary care unit.<sup>19</sup> In another study involving Medicare enrollees,<sup>20</sup> pet owners had significantly fewer physician contacts over a 1-year period than individuals who did not own pets. These examples of physical benefits of pet ownership are likely representative of psychological effects that are no less important to human well-being.

The distribution of the benefits of owning companion animals is quite widespread in Michigan. An estimated 2,038,320 households in Michigan owned pets during 1995,<sup>21,22</sup> and an estimated 5.3 million people lived in these households. By preserving the health and longevity of companion animals, veterinarians help maintain the reliability and integrity of the human-animal bond, thereby sustaining the attending physical and psychological health benefits. This represents a major contribution made by the veterinary medical profession to the people of Michigan.

The veterinary medical profession plays a critical role in preserving food safety and quality. During 1997, the USDA Food Safety and Inspection Service employed 22 veterinarians in Michigan who were responsible for regulating the safety of the food supply. In academia, the National Food Safety and Toxicology Center at the Michigan State University College of Veterinary Medicine conducts research and outreach programs in the area of food safety. Ultimately, the direct benefits of the Center's activities may not be fully realized for a number of years, but the Center represents a solid commitment to continued collaborative research in food safety.

Practicing veterinarians also have an impact on food safety and quality at the farm level in Michigan. Veterinarians play key roles in maintaining the health of livestock populations used for production of food for human consumption and in minimizing the risks

that livestock products containing potentially harmful drug residues or microbial contamination will be marketed. Through design and use of appropriate animal health management programs, veterinarians also help to decrease risks that microbial agents will develop resistance to antimicrobials. At state and national levels, Michigan veterinarians have been actively involved in development and implementation of quality assurance programs and other efforts to enhance the safety of foods of animal origin.

However, the veterinary profession has a substantial impact on human health beyond the human-animal bond and food safety and quality. Virtually all of the laboratory research conducted on human health involves laboratory animals, and these animals require veterinary care to maintain their health and productivity. In Michigan, numerous private firms, including Pharmacia & Upjohn, Parke-Davis, Warner Lambert, MPC, Charles River, Dow Chemical, Northern BioMed, Henry Ford Hospital, and Beaumont Hospital, conduct such research. These research activities have direct effects, in the form of enhanced human health, and indirect effects, in the form of economic activities that accompany the pharmaceutical and health care industries. For example, the 1994–1995 budgets of the Michigan State University and University of Michigan laboratory animal resource services were \$1.6 million and \$4.7 million, respectively. Manufacturing, marketing, and sales of the resulting pharmaceutical products have indirect impacts that are obviously much larger.

The veterinary medical profession has additional indirect impacts in Michigan. Livestock and dairy production by animals under veterinary care generated a total of approximately \$1,227 million in revenue during 1995. Of this total, \$717 million was generated by the dairy industry, \$265 million was generated by the beef industry, \$185 million was generated by the swine industry, and \$60 million was generated by other livestock industries, including the shell egg, poultry, sheep, and other industries.<sup>23</sup> Similarly, the pet food industry generated an estimated \$99 million on food, products, and services in Michigan during 1995.<sup>24</sup>

An estimated 27,500 Michigan households owned a total of approximately 130,000 horses worth \$403 million during 1996.<sup>25</sup> Expenditures to support this population and the associated recreational activities were substantial. During 1990, horse owners spent an estimated \$256 million in operating expenses on a similarly sized equine population.<sup>26</sup> Additional expenditures were generated by the people who paid to watch equine exhibitions or wagered on their outcomes.

Although it would be inappropriate to claim that the veterinary medical profession could take credit for the total output of the livestock, pet food, and equine industries, the economic well-being of the businesses involved was directly related to the health and productivity of the associated animals. Even relatively small improvements in output or productivity that may have resulted from the improved efficiency that accompanies healthy animals would have had an enormous economic benefit in these sectors. In addition, progressive protection of animal health can serve as a critical form of risk management in animal industries.



## Summary

This study reaffirms the diversity and breadth of the veterinary profession. As it turns out, some of the furthest-reaching impacts of the veterinary medical profession were largely non-quantifiable.

The veterinary medical profession had a substantial direct economic impact in Michigan during 1995. The total economic contribution of the veterinary medical profession to Michigan during 1995 that was attributable to expenditures on salaries, supplies, services, and their multiplier effect was approximately \$500 million. In addition, the profession was associated with nearly 8,500 jobs (combined professional and lay positions).

The veterinary medical profession was also considered to have an impact on the prosperity of the livestock, equine, and pet food industries in Michigan, even though the economic contribution in these areas could not be directly quantified. Economic well-being of the individual businesses in these industries is directly related to the health and productivity of the associated animals, and improvements in output or productivity that accompany improved animal health likely carry substantial economic benefits in these sectors. In addition, progressive animal health management provides a crucial method of managing risk in the animal industries. Similarly, although the economic contribution could not be quantified, the veterinary medical profession enhances the safety and quality of human food through research, regulation, and quality assurance programs in livestock production, minimizing the risk of drug residues and microbial contamination.

During 1995, approximately 5.3 million Michigan residents benefitted from the physical, psychological, and emotional well-being that accompanies companion animal ownership. By preserving the health and longevity of companion animals, veterinarians sustain and enhance these aspects of the human-animal bond.

As Michigan enters a new century, it is likely that the state's veterinary medical profession will continue to make a highly valued societal contribution. Pets, equines, and food animals will continue to have prominent roles in Michigan for the foreseeable future, as will the human-animal bond, food safety, and medical research. Clearly, for economic and noneconomic reasons, it will be in the interest of the people of Michigan to seek opportunities to maintain and enhance the vitality of the state's veterinary medical profession.

It was our hope that results of this study would provide university administrators, legislators, MVMA executives, and others with information needed to justify the ongoing provision of public support for the veterinary medical profession. In addition, we expect that the results will supply useful material for public relations and marketing campaigns by the MVMA and the Michigan State University College of Veterinary Medicine and will provide the media with public interest stories to promote the veterinary profession. Although this study considered the economic and noneconomic impacts of the veterinary medical profession only in Michigan, the results can provide an important reference point for educators, policy makers, and legislators in other states. In addition, this study could serve as a methodologic model for veterinary

organizations in other states, or at the national level, to emulate.

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\*IMPLAN Professional, Minnesota IMPLAN Group Inc, Stillwater, Minn.

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