Veterinary medicine has the responsibility of ensuring the health & safety of domestic & wild animals & increasingly of environmental health.

Make up of the profession

93,306 veterinarians in US in 2010

Supported by ~ 75,000 veterinary technicians

28 veterinary schools in U.S., 5 in Canada, + 3 offshore schools

Produced 2,765 new graduates in 2012
• NAS Report; 2007 to 2012

• “Workforce Needs in Veterinary Medicine”

• Conclusions

• There is little evidence of widespread workforce shortages in veterinary medicine

• There is a difference between true workforce shortages and unmet needs for veterinary positions

• Societal needs for veterinary expertise are substantial and growing
• Academia ~ 4,000 faculty. **Academia is in trouble!**
  – Precipitous decline in state funding  >  $200 million cut
  – jeopardizes the profession’s future to serve societal needs
  – Declining research support & declining #s of students in research training. **This has to change!**
  – #s are inadequate to replace retiring faculty, meet needs in industry, state diagnostic labs, federal research labs, public health, & regulatory agencies.
    • USDA competitive grants program ~ $400 million
    • NIH funding, only 5 schools have significant NIH funding
      – Total is $171 million
• The cost of Veterinary Education is unsustainable

• Return on investment for veterinary education is at a crisis point

  -- *The profession may be at risk of lowering the quality of student applicants & quality of veterinary education*

  -- Student debt; 2011 Avg $142,613

  -- Starting salary, 2011, Avg. $66,469

@ 6.8% interest rate & 10 yr payoff = $18,000 yr

  $48,469 is left
Veterinary education is the most expensive education in all the health science

- Costs in excess of $66,000/yr per student
- Support comes from state budgets
- No Federal support
- Students must be practice ready at graduation
- Schools maintain clinical teaching facilities in a wide variety of species & are very expensive to operate
• Schools/colleges must work together to share resources & cut costs

• Greater use of distance education, webinars,

• More public/private partnerships
  – Centers of Excellence in dairy, swine, beef & poultry medicine

• Increase emphasis on epidemiology, biostatistics, computer modeling, infectious diseases, immunology, food animal health & productivity, public health & environmental health
Companion animal practice > 47,000 DVMs

- Practitioners are increasing in numbers & dominate veterinary curricula, but demand is flat & the profession has no realistic strategy for assessing future demand.

- Building such a strategy requires national data on consumer demand, the economics of private practice, the role of veterinary technicians in the provision of care and the implications for the profession of the growth in accredited and non-accredited schools both inside and outside the United States.
• **Industry** 3,218 DVM/PhDs &/or Board Certification

– True shortages as veterinary academia is not training sufficient #s of PhDs. Implications for human health.

– Veterinarians with research training are needed in:

– basic & preclinical research, pathology, clinical pathology, toxicology, pharmico kinetics, lab. animal medicine – for both human & vet. pharma.

– Some industry support for residency training in pathology & clinical pathology
Veterinarians in public practice

Total in 2010, **4,428** (~3% of profession)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>USDA</td>
<td>1,809</td>
</tr>
<tr>
<td>DOD</td>
<td>853</td>
</tr>
<tr>
<td>HHS</td>
<td>322</td>
</tr>
<tr>
<td>DOI</td>
<td>34</td>
</tr>
<tr>
<td>DHS</td>
<td>7</td>
</tr>
<tr>
<td>EPA</td>
<td>3</td>
</tr>
<tr>
<td>State governments</td>
<td>~ 1,500</td>
</tr>
<tr>
<td>USAID</td>
<td>0</td>
</tr>
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</table>
Veterinarians working in public practice have a long and distinguished history of contributions to human and animal health that is largely unrecognized by the American public.

The role of veterinary medicine in public practice is changing & increasing in importance:

- Increasing number of new & re-emerging infectious diseases,
- 70% are zoonotic & of wildlife origin.
• The impact is global resulting in increased burden on public health systems, economic losses, & food insecurity
• Wildlife populations are at risk due to disease events, the effects of contaminants in their environment, decreased genetic diversity & habitat loss.
• HP-AI epidemic illustrated the need for better communication between veterinary, medical & environmental scientists in zoonotic disease control
• More progress could be made if the professions worked together in multidisciplinary teams ➔ ONE HEALTH
• NAS & 2009 GAO report on public health workforce needs:
  • # of veterinarians working for the federal government has declined by 40% since 1990
  • numbers in state public health services has remained static or declined.
  • Meanwhile responsibilities have increased
  • Federal Government lacks a comprehensive understanding of the sufficiency of its veterinary workforce.
The Committee was troubled by the state of the veterinary workforce in the public sector. Long standing job vacancies, a looming wave of retirements, declining programmatic support for animal research & reports of too few key positions raise questions about the Government's ability to achieve its mission of ensuring food safety and of responding and preventing infectious diseases of animals and humans.
• U.S. Dept. of Agriculture
  – Animal & Plant Health Inspection Service, 695 DVMs
    • Diagnosis, control, eradication of animal diseases in U.S. including wildlife
    • Emergency responses to FAD incursions to US
    • Working in international teams monitoring imports
    • Enforcing Animal Welfare Act

    • Findings of the GAO & NAS reports:
      • Difficulty recruiting, salaries not competitive
      • Competing with FSIS as better working conditions
      • Aging workforce, 30% retirements in near future
Food Safety Inspection Service 1068 DVMs

- Food safety and humane slaughter regulations at slaughter & processing operations,
- Public health risk assessment, & policy development
- GAO & NAS reports:
  - Difficulty recruiting veterinarians due to nature of work & remote locations
  - Uncompetitive salaries
- 2011, DVM shortages at 25 locations in 18 states
Ag. Research service  57 DVMs in 2008, 40 in 2011

- Conduct critical research on food safety, zoonotic diseases, and agricultural problems
- DVMs need to have PhD training. Too few qualified candidates
- Uncompetitive salaries
- USDA has appointed a Workforce Task Force to review and improve compensation
- USDA is also developing “One Health 2015” plan
US Dept. Health & Human Services 322

Food & Drug Administration 154

- Center for Veterinary Medicine 116 *Safety of food & drugs used in animals & foods from medically treated animals

- Food Safety Modernization Act 2011.
  - Gives FDA power to impose mandatory food recalls
  - HAACP analysis of food production system includes farm production & delivery systems
  - Impose good agricultural practice on farms
  - Enhanced tracking and record keeping, animal or facility ID
  - Will change food animal veterinary medicine

- Terminate feeding sub-therapeutic doses of antibiotics to farm animals
– **National Institutes of Health** 92
  • Management of lab animals & research

– **Centers for Disease Control** 90
  • Identify & control public health threats, research esp. at the human/animal interface
- Dept. of the Interior 24
  - US Geological Service 14
    - Wildlife disease identification & control
    - Clinical research & information on wildlife diseases in US & internationally
      - Fish & Wildlife Service 4
      - National Parks Service 4 (for 84 million acres)
- Veterinarians in State Wildlife Agencies 32
  - 19 states have wildlife veterinarians
  - several veterinary schools have wildlife programs
Location of state, federal, & university cooperative programs in wildlife health

Source, M. Friend, 2006
Wildlife & ecosystem health is increasingly important.

We do not know enough about the causes of emerging zoonotic diseases, the factors that enhance disease risks, and potential hot-spots for disease emergence.

Also need to recognize the importance of wildlife & environmental health, & sustainability of agriculture, especially in waste management.

Professions should work together to address these challenges & cooperate on “One Health” policy development.
Private food animal practice

1995 5,883 2007 5,090 decline of 14% in 12 years

Workforce is aging, 75% reduction in students entering the field

Declining surveillance & surge capacity for disease control & eradication. --

e.g. FMD outbreak limited to California (Carpenter et al 2011)

-- 22 day delay in diagnosis & control,
-- cost to U.S. economy ~ $69 billion
-- further $565 million loss for every additional hour of delay
Decline in veterinary workforce is due to dynamically changing livestock & poultry industries

Regional changes in the U.S. swine industry, 1992 - 1997

Source, USDA ERS
### Number of milk cows per veterinarian

**Wisconsin & California, 2007**

<table>
<thead>
<tr>
<th></th>
<th>AABP members</th>
<th>Milk cows</th>
<th>Dairies</th>
<th>Cows/dairy</th>
<th>Cows/vet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wisconsin</td>
<td>234</td>
<td>1,252,000</td>
<td>13,603</td>
<td>92</td>
<td>5,359</td>
</tr>
<tr>
<td>California</td>
<td>112</td>
<td>1,336,480</td>
<td>2,324</td>
<td>602</td>
<td>11,932</td>
</tr>
</tbody>
</table>

*Source, California Resource Directory 2007 California, Dept. of Agriculture & Wisconsin Ag. National Statistical Service, USDA*

With increasing size, farm staff take over more routine animal care. This can mean less direct veterinary oversight of animal health and has implications for disease control, surge capacity, and public health.
Food-animal concentrations in counties that have no veterinarians.

• Veterinary academia has been slow to respond to changing needs of the livestock & poultry industries

• Recommendation:
  – Food animal veterinary education should be reoriented towards systems thinking, production medicine & development of an integrated system of food animal health and welfare, food safety, and ecosystem health.
  – The farm must also remain profitable. Without this none of the above will be achieved
Industry consolidation has contributed to poverty in rural America.
• Profession needs to provide an inexpensive system of veterinary surveillance & health care delivery for rural America

• Nurse practitioners have an excellent history of meeting rural primary human health care needs.

• The veterinary profession should develop FA paraprofessionals to work in health care teams with consultant FA veterinarians who are located distantly.
• There should be greater collaboration, understanding, & sharing of veterinary & medical information at the local level as well as at the national level.

• Poverty & endemic zoonotic diseases are increasing in rural America

• 20% of the population in parts of the Gulf coast live in extreme poverty

• Dengue fever, cystocercosis, toxacariasis, murine typhus, leishmaniasis, Chagas disease are increasing in incidence (Hotez, 2012)
At multiple levels, the collaborative concept of “One Health” can effectively address many of the changing needs of society. Veterinary medicine has much to offer & has the potential to significantly increase ‘public health services’

“Bang for the Buck”
Demographics; Population changes, 1990 to 2000

Available at: http://www.nationalatlas.gov/articles/people/a_popchange.html
Increase in size and efficiency of operations

Source, USDA, ERS
<table>
<thead>
<tr>
<th>Disease</th>
<th>Wildlife interface</th>
<th>Deaths human annual</th>
<th>Affected humans annual</th>
<th>Death &gt;1000 people</th>
<th>Affected &gt;1 million people</th>
<th>Animal impacts high</th>
<th>Farm intervention</th>
<th>Other (score = 1)</th>
<th>Total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal (zoonotic)</td>
<td>Important</td>
<td>1,000,000</td>
<td>800,000,000</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
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<tr>
<td>Leptospirosis</td>
<td>Very important</td>
<td>123,000</td>
<td>1,700,000</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
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<tr>
<td>Cysticercosis</td>
<td>Sometimes</td>
<td>50,000</td>
<td>50,000,000</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Tuberculosis (zoonotic)</td>
<td>Sometimes</td>
<td>100,000</td>
<td>554,500</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
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<tr>
<td>Rabies</td>
<td>Important</td>
<td>70,000</td>
<td>70,000</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>Severe</td>
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<tr>
<td>Leishmaniasis</td>
<td>Important</td>
<td>47,000</td>
<td>2,000,000</td>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
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<tr>
<td>Brucellosis</td>
<td>Sometimes</td>
<td>25,000</td>
<td>500,000</td>
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<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Echinococcosis</td>
<td>Not important</td>
<td>18,000</td>
<td>300,000</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>Important</td>
<td>10,000</td>
<td>2,000,000</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Q fever</td>
<td>Important</td>
<td>3,000</td>
<td>3,500,000</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
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<tr>
<td>Trypanosomosis (zoonotic)</td>
<td>Important</td>
<td>2,500</td>
<td>15,000</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Anthrax</td>
<td>Sometimes</td>
<td>1,250</td>
<td>11,000</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
Figure 4.6 Maps of all zoonotic emerging infectious disease events \((n = 202)\) stratified by potential variables of interest. Size of circles denotes number of events in each one degree grid cell, and colour denotes breakdown of events in terms of type of zoonotic host.
% under 50 | % 50 to 60 | % over 60

**FA Exclusive**
- 2001:
  - 64% under 50
  - 21% 50 to 60
  - 15% over 60
- 2010:
  - 50% under 50
  - 36% 50 to 60
  - 14% over 60

**FA Predominant**
- 2001:
  - 57% under 50
  - 30% 50 to 60
  - 13% over 60
- 2010:
  - 42% under 50
  - 37% 50 to 60
  - 21% over 60

**FA Mixed**
- 2001:
  - 68% under 50
  - 23% 50 to 60
  - 9% over 60
- 2010:
  - 57% under 50
  - 29% 50 to 60
  - 14% over 60
• it has been recognized that the lack of communication, insufficient appreciation of the duties of each actor, and the limited integration of plans of action between public health and animal health officers are the factors that contribute to the ineffective collaboration toward one goal.
Structural changes in the U.S. swine industry in the past 20 years

70% decline in # of operations

Operations (thousands)

Inventory (mil. head)

1 An operation is any place having one or more hogs on hand at any time during the year.

Source: USDA, ERS using data from USDA, NASS, January 2005.
Food Safety Modernization Act

• Review protocols:
  – Veterinarians – large producers – contract with vendor or processor. Employ veterinarian to do inspection and surveillance of farm records on, production, vaccinations, AB use, pesticides, fertilizer use. Will require some form of animal ID.
  
    Should include fruit & vegetables
    Cloud computing
  
  – Small producer – veterinarian contracts to set up & maintain records. Sold to farmer markets
• Increasing specialization in companion animal practice

  -- over 40% of new graduates go into internships & specialty residency programs.

• State budgets do not include support for internship and residency programs
NAS Committee Report raises concerns about farm consolidation and:

- the environment & sustainability of farming operations
- food safety, control of infectious diseases, & planning for surge capacity
  - e.g. FMD outbreak limited to CA
  - 22 day delay in diagnosis & control,
  - cost to U.S. economy ~ $69 billion (Carpenter et al, 2011)
Veterinary graduates entering food animal practice

![Graph showing the number of veterinary graduates entering food animal practice from 1989 to 2009. The graph includes data for Mix FA, LA - Pred, and LA - Ex.]