The Future Is Coming!

Is “One Health” Ready?

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SEAOHUN 2018 International Conference
One Health Academic Challenges: Preparing today’s workforce to combat tomorrow’s challenges
Is Our “One Health” Vision Ready for the Future??

As we consider the role of OH – is our vision for OH incorporating the challenges to be faced in the world of “tomorrow”?

- What are future trends?
- What are their likely consequences?
- What are the implications for One Health?
Consider the Future Through Seven Lenses –2050

• Population Change
• Urbanization
• Economic Growth
• Globalization
• Feeding the Future
• Environmental Change
• AI

And what do they mean for OH?
Population Growth
## The World’s Most Populous Nations

<table>
<thead>
<tr>
<th>Country</th>
<th>2017</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>1.34bn</td>
<td>1.66bn</td>
</tr>
<tr>
<td>China</td>
<td>1.41bn</td>
<td>1.36bn</td>
</tr>
<tr>
<td>Nigeria</td>
<td>190.89m</td>
<td>410.64m</td>
</tr>
<tr>
<td>United States</td>
<td>324.46m</td>
<td>389.59m</td>
</tr>
<tr>
<td>Indonesia</td>
<td>263.99m</td>
<td>321.55m</td>
</tr>
<tr>
<td>Pakistan</td>
<td>197.02m</td>
<td>306.94m</td>
</tr>
<tr>
<td>Brazil</td>
<td>209.29m</td>
<td>232.69m</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>164.67m</td>
<td>201.93m</td>
</tr>
<tr>
<td>DR Congo</td>
<td>81.34m</td>
<td>197.40m</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>104.96m</td>
<td>190.87m</td>
</tr>
</tbody>
</table>
AN URBAN WORLD

This graphic depicts countries and territories with 2060 urban populations exceeding 100,000. Circles are scaled in proportion to urban population size. Hover over a country to see how urban it is (percentage of people living in cities and towns) and the size of its urban population (in millions).
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Urban Population
- Greater than 75%
- 50% - 75%
- 25% - 50%
- Less than 25%

- United States: 152M
- Brazil: 111M
- Russia: 105M
- China: 302M
- India: 220M
- Japan: 75M

1990
AN URBAN WORLD

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Urban Population
- Greater than 75%
- 60% - 75%
- 25% - 60%
- Less than 25%

PROJECTED
AN URBAN WORLD

This graphic depicts countries and territories with 2050 urban populations exceeding 100,000. Circles are scaled in proportion to urban population size. Hover over a country to see how urban it is (percentage of people living in cities and towns) and the size of its urban population (in millions).

Urban Population
- Greater than 75%
- 50% - 75%
- 25% - 50%
- Less than 25%

2050

China 1038M
India 875M
Pakistan 199M
Nigeria 210M
Bangladesh 126M
Viet Nam 56M
Philippines 101M
Indonesia 190M
Japan 81M
Russia 163M
United States 355M
Brazil 204M
Mexico 113M

PROJECTED
Surging Household Wealth
Global Purchasing Power – The World Is Getting Wealthier

World Gross Domestic Product (GDP) by Region Expressed in Purchasing Power Parity, Reference Case, 1990-2030

Notes: GDP figures are the unweighted average of the forecast annual growth rates of the economies within each region between 2016 and 2030. GDP growth is measured at constant prices.
Sources: International Monetary Fund World Economic Outlook (October 2015 and January 2016); A.T. Kearney analysis
Globalization
We are Increasingly More Mobile

Air Travel

<table>
<thead>
<tr>
<th>Region</th>
<th>2014 Traffic (billions)</th>
<th>Added Traffic 2015–2034 (billions)</th>
<th>Annual Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Asia</td>
<td>0.3</td>
<td>0.9</td>
<td>6.2</td>
</tr>
<tr>
<td>Within China</td>
<td>0.7</td>
<td>0.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Within North America</td>
<td>0.4</td>
<td>0.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Within Europe</td>
<td>0.3</td>
<td>0.7</td>
<td>3.3</td>
</tr>
<tr>
<td>Middle East-Asia</td>
<td>0.2</td>
<td>0.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Europe-Asia</td>
<td>0.2</td>
<td>0.3</td>
<td>5.1</td>
</tr>
<tr>
<td>North Atlantic</td>
<td>0.1</td>
<td>0.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Within Latin America</td>
<td>0.2</td>
<td>0.3</td>
<td>6.6</td>
</tr>
<tr>
<td>Transpacific</td>
<td>0.1</td>
<td>0.3</td>
<td>4.4</td>
</tr>
<tr>
<td>CIS-International</td>
<td>0.1</td>
<td>0.3</td>
<td>4.2</td>
</tr>
<tr>
<td>North America-Latin America</td>
<td>0.1</td>
<td>0.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Europe-Latin America</td>
<td>0.1</td>
<td>0.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Africa-Europe</td>
<td>0.1</td>
<td>0.3</td>
<td>4.7</td>
</tr>
</tbody>
</table>

World traffic growth: 4.9%
World GDP growth: 3.1%
We are Increasingly More IT Connected

- **2020**: 7.6 Billion World Population, 50 Billion Connected Devices, 6.58 Connected Devices Per Person
- **2015**: 7.2 Billion World Population, 25 Billion Connected Devices, 3.47 Connected Devices Per Person
- **2010**: 6.8 Billion World Population, 12.5 Billion Connected Devices, 1.84 Connected Devices Per Person
- **2003**: 6.3 Billion World Population, 500 Million Connected Devices, 0.08 Connected Devices Per Person

Source: Cisco IBSG, April 2011
Feeding the Future
% Change in Consumption of Animal Products: 2000 - 2030
Environmental Change
How climate change could impact the world

- **250,000**
  - **DEATHS FROM DISEASE BY 2030**
  - Mainly due to malaria, malnutrition, diarrhoea and heat stress

- **7 million**
  - **DEATHS FROM AIR POLLUTION**

- **$2-4bn**
  - **COSTS BY 2030**

- **4°C**
  - **TEMPERATURE RISE**
  - Disrupting precipitation patterns and the frequency and intensity of some extreme weather events

- **Vector borne diseases**
  - Like malaria and dengue virus will increase with more humidity and heat

- **Pollution and pollen seasons will increase**, leading to more allergies and asthma

- **Hunger and famine will increase** as food production is destabilised by drought

Source: WHO
Credit: Rebecca Robinson/LSHTM
The most common pressures causing deforestation and severe forest degradation are large- and small-scale agriculture; unsustainable logging; mining; infrastructure projects; and increased fire incidence and intensity. New roads can have a small direct impact but a large indirect effect through opening up forests to settlers and agriculture. Poor forest management, destructive logging practices and unsustainable fuelwood collection degrade forests and often instigate an increasing spiral of degradation that eventually leads to deforestation (‘death by a thousand cuts’). Table 1 gives a summary of these pressures...
Artificial Intelligence
ARTIFICIAL INTELLIGENCE
Technology Landscape

- Neuromorphic Computing
- Autonomous Systems
- Deep Learning
- Neural Networks
- Pattern Recognition
- Natural Language Processing
- Chatbots
- Real Time Emotion Analytics
- Virtual Companions
- Real Time Universal Translation
- Thought Controlled Gaming
- Next Gen Cloud Robotics
- Autonomous Surgical Robotics
- Robotic Personal Assistants
- Cognitive Cyber Security
Implications
What are the Consequences

By 2050

• Global Population increase >2 billion, mostly Africa
• Nearly 70% will be urban
• Economies will be increasingly consumer driven
• Livestock production will more than double globally
• Increasing environmental impact
• Globally and intra-regionally connected
• AI will be transformative and disruptive
Consider Likely Impact on Zoonosis and AMR
Drivers of Zoonosis and AMR

Our results suggest that EID events are best predicted by the distribution of tropical forested regions, higher mammalian species richness, and variables relating to shifts in agricultural land use; and appear to occur more often in tropical regions. We identify specific areas and approaches where a research focus may identify more specific trends not apparent in our data.

**Results**

Variables in boosted regression tree models. After factoring out reporting effort (in the weighted model), evergreen broadleaf trees (median 7.6% of the model’s predictive power), human population density (6.9%), Global Environmental Stratification (climate) (5.9%), and mammal species richness (an aspect of biodiversity) (5.6%) had the largest relative influence over the distribution of EID events (Fig. 1). Across 1000 iterations of the model, no variables consistently emerged as much stronger predictors than others but an average ranking of predictor importance could be derived. Of the top predictors, evergreen broadleaf trees (representing tropical rainforests) exhibited an overall positive trend, human population density an overall negative trend, the Global Environmental Stratification (climate)

Source: USAID Predict/EcoHealth Alliance
The threat of viral outbreaks will grow rapidly…
Largely driven by population growth, wildlife encroachment, and globalization

1. EID: emerging infectious disease; only diseases with zoonotic emergence are included; Reference for graph: Allen et al. (2017) Nature Communications
Expanded Antimicrobial Use in Livestock

- Total consumption in the livestock sector in 2010 estimated at 63,151 tons
- Global antimicrobial consumption will rise by 67% by 2030
- It will nearly double in BRICS
- Poultry > pork: e.g. in Asia, chicken by 129%, pork 124% by 2030
Global Threat from Antimicrobial Resistance

Deaths attributable to antimicrobial resistance every year by 2050

- Europe: 390,000
- Asia: 4,730,000
- North America: 317,000
- Latin America: 392,000
- Africa: 4,150,000
- Oceania: 22,000
What are the Implications for One Health?
Is our “OH Workforce vision” aligned with the future”

- What skills does the future require?
- What is the organizational framework required to empower a future OH workforce?
- What policies need to be in place to enable the success of the Work Force?
- Are government and academic communities and their private sector counterparts planning for the future together?
The Role of a One Health Workforce

You ARE the “change agents” – bringing a new multisectoral vision and understanding to the challenges we face
“We can’t solve problems by using the same kind of thinking we used when we created them”

Albert Einstein