

## Answers to Case Study questions

### Questions

1. Why is AMR important to societies?
  - Students could start off by explaining the AMR acronym. The increasing resistance of bacteria to antibiotics has major adverse implications for human health worldwide. Diseases will: be more difficult to treat with existing antibiotics; last longer; increase death rates. Health care costs will rise and economic performance will deteriorate. It could result in falls in standards of living and quality of life.  
See <https://comaware.net/2018/03/12/antibiotic-resistance-health-pharmaceutical-and-economic-implications/>;  
<http://www.fao.org/3/a-i7138e.pdf>; and <http://www.who.int/en/news-room/fact-sheets/detail/antimicrobial-resistance>
  
2. Which areas of the world will suffer most deaths due from AMR? Why should that be the case?
  - By examining the global map embedded in the case, students will note that the most badly affected, both in terms of absolute numbers and rates will be countries in Asia and Africa, followed by Latin America. Least affected will be the richer countries of North America, Europe, Australia, and New Zealand.
  - Consumption of antibiotics in poorer countries is on the increase. Controls on antibiotic consumption are likely to be looser in poorer countries resulting in easier access to antibiotics and their overconsumption. Health care systems in poor countries will be less developed than in richer countries and less able to cope with the diseases resulting from AMR.  
For up-to-date information on AMR, students could be referred to the WHO website at <https://amrcountryprogress.org/>. There is map of the world and a list of questions which students can pose e.g. on country progress towards establishing an action plan for AMR—the map changes in response to the question.
  
3. Explore the implications for the worst hit areas were no effective steps be taken to deal with AMR in terms of:
  - a) health care costs
    - The health care costs of dealing with AMR associated diseases will spiral due to increased demand for care, extra investigations of patients' conditions, the need in the absence of effective antibiotics, to change surgical and other procedures and practices (these would require money to be spent training staff), and longer stays in hospitals. Many poor countries would be unable to meet these increased costs of health care.
  
  - b) tourism in those areas most affected by AMR

- Tourism is likely to be adversely affected in regions suffering high levels of diseases resulting from AMR. Countries in Asia, Africa, and Latin America earning large sums from international tourism could find that tourists are reluctant to visit for fear of catching infections such as TB, malaria, and HIV. This would cause a fall in their income from tourism. Students might note the danger that tourists might pick up antibiotic resistant diseases and take them back to their home countries.

For an overview of global progress on AMR, see

<http://www.fao.org/3/ca0486en/CA0486EN.pdf>

4. Discuss the implications of the increase in drug resistant infections for the pharma industry as regards:
  - a) its existing range of antibiotic products
    - The rise in AMR diseases will increasingly make existing antibiotics obsolete with impacts on pharmaceutical industry growth, revenues, and profits. Given this situation it would be surprising for the industry to encourage farmers to use fewer antibiotics given the effects of that on their sales.
  - b) its R&D strategy?
    - Some students could argue that pharma firms, if it is serious about meeting the challenges of AMR, needs significant changes to their R&D strategies and to the monies allocated to those programmes. The industry could take advantage of the various public programmes being established to deal with AMR (see the report at the Schroders website below).

See

<https://www.schroders.com/en/sysglobalassets/digital/insights/2017/pdf/sustainable/anti-microbial-resistance/final-farm-to-pharma-article.pdf>

5. Why is the pharma industry not developing new antibiotics to deal with drug-resistant infections?
  - As the case suggests, it is not in the economic interests of the industry to spend lots of time, effort and money developing new antibiotics. The costs are high because they are not easy to discover or develop, and revenues are likely to be low because they would be used only sparingly. Some students might see this as a dislocation conflict between private gain and the public good.

See <https://www.forbes.com/sites/quora/2017/08/18/why-pharmaceutical-companies-arent-in-a-rush-to-address-increasing-antibiotic-resistance/#2f02b8364d3a>

6. What would the effects be on farmers were governments to legislate against overuse of antibiotics or impose substantial taxes on these drugs?

- Legislation banning overuse would need to be effectively monitored and enforced which would be difficult in poor countries lacking the resources and capability to do that. Effective legislation would cause farmers to reduce the use of antibiotics and find other ways of keeping their animals healthy e.g. giving each animal more space which are likely to increase their costs.
- The response of farmers to taxes on antibiotics would depend on the level of price increase caused by the tax and their ability to pay. Substantial taxes could cause some farmers to reduce the use of antibiotics while others might go out of business. The response would be influenced by farmers' ability to pass taxes in the form of higher prices to customers—this is likely to be difficult given that prices of some agricultural products on the world market are determined by supply and demand. Farmers selling direct to giant supermarket chains might also run up against fierce resistance to price increases.

See [http://www.bristol.ac.uk/media-library/sites/social-community-medicine/documents/social-science-and-amr/7\\_Coast\\_AMRworkshop\\_22April.pdf](http://www.bristol.ac.uk/media-library/sites/social-community-medicine/documents/social-science-and-amr/7_Coast_AMRworkshop_22April.pdf)