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DUNMAN HIGH SCHOOL

Preliminary Examination

Year 6

Higher 3 Economics

9808/1

Paper 1

23 September 2016

Additional Materials:
Writing Papers

1430 – 1745
3 hours 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name and Civics Class in the spaces provided on the answer paper.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions

Section B

Answer **two** questions

Write your answers on the separate writing paper provided.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **7** printed pages including this cover page.

[Turn over

Section A

Answer **all** questions in this section.

1 Antibiotic resistance on the rise

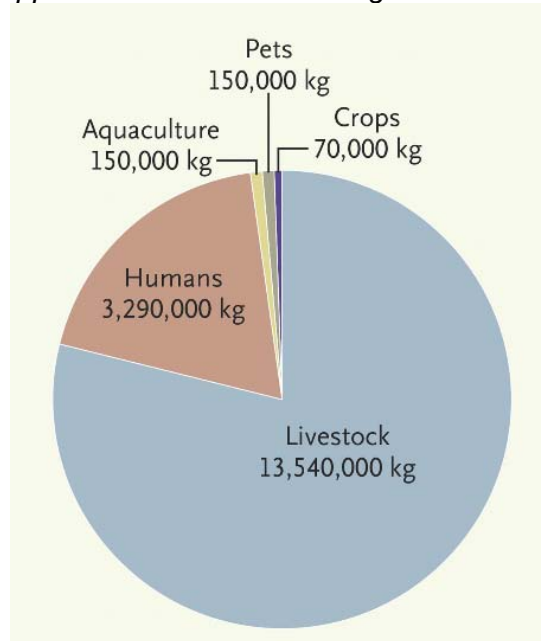
Extract 1: Preserving Antibiotics, Rationally

We all take it for granted that drugs will be available to treat us when we get sick. The fact is, however, that drugs are failing and right now people are sick with bacterial diseases that cannot be treated by any drug known to man. The logic behind this rise of antibiotic resistance is that since antibiotics kill the bacteria that are susceptible to them, only the resistant bacteria survive. So, it would seem, every time we prescribe antibiotics we create a selective pressure that favours antibiotic-resistant bacteria, allowing them to grow in number and eventually take over the bacterial population. Consequently, when people get sick with the diseases that these bacteria cause, antibiotics no longer work.

One reason we're seeing so many new, resilient bacterial strains is that we're overusing the antibiotics we already have. A total of 51 tons of antibiotics are consumed daily in the United States alone, so the selective pressure in favour of resistant pathogens is strong.

Estimated Annual Antibiotic Use in the United States

Data are shown as approximate numbers of kilograms of antibiotics used per year.



The main use of this invaluable resource is rather disappointing: approximately 80% of antibiotics in the United States are consumed in agriculture and aquaculture. Such promiscuous use of antibiotics is not surprising: non-pharmaceutical-grade antibiotics are typically priced at approximately \$25 per kilogram, and there is little regulation or oversight of their use.

Why are so many antibiotics used in farms? Three main reasons. First, antibiotics are often used to treat diseases and infections among animals. Second, antibiotics are often used to *prevent* the animals from getting sick in the first place. On large industrial farms, for example, livestock are often packed together in tight quarters, making them prone to infection and disease. Small daily doses of antibiotics can boost their immune systems and ensure survival. Then there's a third, more controversial reason: feeding small, frequent

doses of antibiotics to cattle, pigs and chickens can help promote growth and improve feed efficiency. (In other words, the animals need to eat less food to reach a given weight.)*

The US Food and Drug Administration, in 2012, issued nonbinding guidance to farmers recommending that they avoid using antibiotics as animal-growth promoters. In Europe, the use of antibiotics for growth promotion in animals has been banned.

Is a ban the right approach? There are many challenges. A ban would necessitate the monitoring of actual use. The range of uses of antibiotics is wide, and their value varies substantially. Barring all uses of a given type of antibiotic is inefficient. Besides, a ban would increase production costs of farmers. The resultant increase in food prices would be felt disproportionately by poor Americans.

An economically rational solution is to impose a user fee on the nonhuman use of antibiotics. Every use of antibiotics increases selective pressure, thus undermining the value for other users. (A perfect fee would be calibrated to the extent of antibiotic resistance caused by each use; a practical fee would be based on the volume of antibiotics used.)

Source: New England Journal of Medicine 2013; 369:2474-2476 December 26, 2013

Extract 2: The tragedy of antimicrobial resistance: achieving a recognition of necessity

Antimicrobials (antibiotics) provide almost instant gratification in the form of infectious disease cure. Resistance is an unavoidable adverse consequence of antimicrobial use.

Antimicrobial resistance is essentially a conservation problem arising from the natural tendency to prefer immediate to long-term rewards, even when the latter are of greater value.

The invention of antimicrobials created an exploitable and potentially finite microbial susceptibility resource. The growing resistance paradigm that threatens this resource can be represented by the game theory scenario referred to as the 'Prisoner's Dilemma'. There are also other public goods games which illustrate one of more aspects of the resistance appears to be a more nuanced Prisoner's Dilemma known as the 'Tragedy of the Commons'.

A number of features of the antimicrobial resistance problem make it almost a tragedy of the commons exemplar. There is a lag period before a commons becomes limited. In the same vein, in the years following the discovery of penicillin, the difficulty in obtaining sufficient amounts of the drug ensured that overuse did not occur. When we learned to produce antimicrobials in large fermentation vats, and through chemical synthesis, supply became, for all intents and purposes, unlimited and a tragedy set in. Using antimicrobials, even in the most remote chance of an infection, was perceived to be beneficial as it is in the short term. According to Hardin, the paradigm is best applied to those examples for which there is no technical solution. Developing new drugs has proved to be too slow to accommodate the escalating rate of resistance. Other technologies for fighting resistance are emerging at an even slower rate. Thus, although there may be changes with time, at present, the problem of resistance does not have a feasible technological solution now.

The World Health Organisation (WHO) has compiled a global strategy for resistance containment, which aims to reduce selective pressure by curtailing irrational antimicrobial use, to prevent the spread of resistant organisms, and to encourage the development of new antimicrobials.

Education of all stakeholders is one of the most commonly advocated resistance control strategies. Hardin states that education can 'counteract the natural tendency to do the wrong thing'.

Early solutions to the tragedy of the commons have focused on coercive, state-managed solutions or incentive-driven privatisation. A role for privatisation in antimicrobial conservation has yet to be seriously exploited. Presently, innovators have a short period to market each new drug aggressively before patent expiration. Patients only take an antimicrobial drug for a short period, limiting total sales. Development of antimicrobial resistance further reduces the profit potential for antimicrobials. Thus the current patent structure provides little incentive to develop much needed antimicrobials and no incentive to conserve them.

Hardin's idea of coercion was not brute force but rather pre-agreed coercive laws or taxes. For example, imposing an individual cost to access to the commons, such as an antimicrobial use levy could serve as a more effective means than outright prohibition. In countries where antimicrobial use is regulated, National Health Services or Health Insurance could elect to reimburse the cost of diagnosis but not of antimicrobial chemotherapy.

Currently prescription drug legislation provides an inadequate shield for the susceptibility commons, even in countries where these laws are enforced. Further protection could potentially be gained by tightening prescriber access to antimicrobials, so that these drugs can only be ordered in very specific situations. This creates a 'Quis custodiet ipsos custodies?' or 'Who shall watch the waters themselves?' problem. Gatekeeper cheating is not the only barrier to curtailing use because in well-regulated countries, patients frequently go around the law – by pressuring their prescribers or by seeking drugs from unofficial and unorthodox sources such as pet stores, illegal internet distributors or other countries.

A preference for the hard-line coercive approach derives from a desire to unify different tragedies. It remains to be seen whether strategies that work in small-scale common resource problems can be scaled up to global problems. In spite of the advantages that cheating proffers to the individual, human cooperative behaviour is highly developed. Because of the disconnect between action and consequence, indirect reciprocity would be more relevant to conserving antimicrobial susceptibility. Rewards for judicious antimicrobial consumers and prescribers, as well as those who reward them, could deter free-riders. Similarly, sanctioning non-cooperators might serve as a further disincentive for self-fish action. The threat of sanction is not sufficient; defectors must be punished in order for the situation in the commons to evolve towards majority cooperation.

Reputation might be one of the most straightforwardly invoked incentive, or sanction, to assist in resolving the tragedy. Among health professionals, reputation is key to wealth and personal value and is the basis for many prescriber-targeted interventions. Reputation can also be exploited at the institutional level, for example to encourage hospitals to mount costly infection-control interventions that could reduce the transmission of resistant organisms.

Coercive solutions break down if monitoring is incomplete or information is inaccurate. The better the information sharing, the easier it is to engage stakeholders. Leaders are persuaded to adopt rules in favour of long-term, relative to short term, gain when there are clear indicators of resource degradation, generally perceived to be accurate predictors of future harm or when leaders are able to convince others that a 'crisis is pending'. This builds upon Hardin's idea, that a 'recognition of necessity' is essential to start the process of 'mutual coercion, mutually agreed upon'.

Source: Okeke IN (2009) The tragedy of antimicrobial resistance: recognition of necessity. *Current Science*. Society-in-Science special section. 97 (11) 1564 -1572.

Extract 3: How Misaligned Incentives Influence Antibiotic Prescribing and Resistance

Emergence and spread of antibiotic resistance is engendered by inappropriate use of antibiotics, which occurs largely because of the misalignment of incentives for using and producing antibiotics. Problems with resistant bacteria are compounded by the fact that there are also impediments to the development of new antibiotics that could be effective against these resistant organisms. All these problems are systemic and require interventions at both the consumer and producer level to ensure the long-term efficacy of antibiotics

Studies have continually shown that the rate at which resistance emerges and spreads is strongly related to the total amount of drug usage. Thus, in this respect, antibiotics are similar to natural resources such as oil, water, fish, and forests: Usage “uses up” their effectiveness, diminishing them for future use. The greater the usage, the faster the resource is “depleted” (though antibiotics can be “renewed” through the introduction of new drug classes). Thinking about antibiotics in this manner provides a framework for considering the incentives that result in the overuse of antibiotics as well as under-investment in new drugs, and how to align incentives to improve the judicious use of antibiotics.

The rate at which new antibacterial agents have been introduced has fallen steadily for the last 40 years. One of the reasons for this is the high cost of bringing a new drug to market, a number that can exceed \$100 million. In addition to the cost and uncertainty of bringing a drug to market, revenues from antibiotics are generally less than “blockbuster” drugs. This disparity is largely because antibiotics are generally only taken for 7-10 days while drugs to treat chronic illness is taken for months to years.

While pharmaceutical companies have an incentive to sell as much of a drug as possible before their patent expires and generics enter the market, in theory doctors should only be prescribing antibiotics when they are clearly indicated. Unfortunately, this is not true.

A large fraction of antibiotic use in medicine continues to be inappropriate. Inappropriate treatment results from a number of factors:

- (i) patient expectations/demand for antibiotics;
- (ii) possibility of malpractice lawsuits for not prescribing an antibiotic;
- (iii) time pressure on visit length (e.g., it is easier and faster to write a prescription than to explain to a patient why they do not need antibiotics); and
- (iv) uncertainty of diagnosis (i.e., it can be difficult to diagnose the cause of an infection).

For antibiotics, there are both positive and negative externalities. Despite the importance of antibiotics to medicine, patients and physicians rarely consider these externalities.

Source: Eili Y. Klein (2013) How Misaligned Incentives Influence Antibiotic Prescribing and Resistance. Institute of Science for Global Policy.

Extract 4: How to Stop Overprescribing Antibiotics

Over the last few years, our research team has developed several new approaches to reducing unnecessary antibiotic prescribing, drawing on insights from behavioural economics and social psychology. These disciplines acknowledge that people do not always behave rationally and are strongly motivated by social incentives to seek approval from others and compare favourably to their peers.

In one study published a few years ago, we asked a group of doctors to place a signed poster in their exam rooms pledging to follow standard guidelines on antibiotic prescription. This tactic, which pressured doctors to act consistently with their own publicly stated commitments, reduced inappropriate prescribing 20 percentage points relative to doctors in a control group who displayed a poster with generic information about antibiotic use.

For our latest study, we tested new approaches to promoting more selective prescribing.

In one approach, doctors received a monthly email informing them of their performance relative to that of their peers. Those with the lowest inappropriate antibiotic prescribing rates were congratulated for being “top performers.” Doctors who were not top performers were told “You are not a top performer.” The email also included a personalised count of unnecessary antibiotic prescriptions and the count for a typical top performer. This “peer comparison” approach almost completely eliminated inappropriate prescribing.

In another approach, whenever doctors prescribed an antibiotic that was not clearly called for by the diagnosis, the electronic health record system asked them to provide a short “antibiotic justification note.” The note would be entered into the patient’s medical record and would be visible to others. Introducing this speed bump into the work flow, along with the prospect of social accountability, reduced the inappropriate prescribing rate.

Taken together, our studies suggest that simple and inexpensive tactics, grounded in scientific insights about human behaviour, can be extremely effective in addressing public health problems.

Source: Craig R. Fox and Jeffrey A. Linder (2016) How to Stop Overprescribing Antibiotics.
The New York Times.

Questions

- (a) Explain how economics, specifically Prisoner’s Dilemma and Tragedy of the Commons, contribute to the understanding of the causes of antibiotic resistance. [6]
- (b) Discuss alternative policies in the fight against rising antibiotic resistance from a commons point of view. [8]
- (c) Pharmaceutical companies and doctors are part of the solution to the problem of antibiotic resistance. Discuss alternative policies to align the incentives of pharmaceutical companies and doctors to reduce the overconsumption of antibiotics. [8]
- (d) For antibiotics, there are both positive and negative externalities. Assess the implications for policymakers when the same good produces both both positive and negative externalities. [8]

Section B

Answer **two** questions from this section.

2. If economics were a social science, practitioners would scrutinise meetings' minutes and try to observe as many meetings as possible. That is how the kind of fieldwork-based, "qualitative" social sciences, which economists like to discard as "soft" and unscientific, operate. However, this approach comes with serious methodological caveats, such as verifiability, selection bias or observer bias.

Adapted from *The Guardian*, 11 October 2015

Discuss how far you would agree that Economics is not a true science. [35]

3. Assess the impact of oligopolistic firms' strategic behaviour on profitability, efficiency and welfare. [35]

4. In exchanges between buyers and sellers, hidden actions and hidden information are particularly prevalent in some markets.

Discuss the extent to which market inefficiencies arising from hidden actions and hidden information should and can be countered by government policies. [35]

5. Discuss whether markets work only if people are motivated by self-interest. [35]

6. The increasing trend towards globalisation has led to the irrelevance of trade policies in the real world. Discuss. [35]

7. Africa has changed because it needs to. Aid is no longer Africa's only recourse; what the continent needs is less sympathy and more investment. Ten years ago almost all FDI went to resource-rich African economies. Today, this has changed and the most resource-intensive economies are working hard to diversify.

Evaluate the contributions of multinational enterprises to the emerging economies such as those in Africa. [35]

End of Paper