Module 202

[The following is a (lightly edited) transcript of the recorded lecture for Module 202 of the PatentX course. The recording of the lecture itself is available through https://ipxcourses.org. Stripped of the accompanying slides and other visual materials, the transcript will likely be hard to follow. It is not intended to be a free-standing document. Rather, its purpose is to assist students, who have already watched the lecture, when reviewing the material.]

Hello, I'm Terry Fisher. This is the second in a series of lectures that examines ways in which management of pharmaceutical products could help alleviate the global health crisis. In the first of the lectures, I examined the crisis itself, the seriousness of the threats to health in developed countries, but even more so in low and middle-income countries.

In the second lecture, this one, I'll be examining a family of potential solutions to the crisis that can be grouped under the general heading of "Improving Pharmaceutical Markets." In the next lecture, the third in the series, I will discuss ways in which intellectual property law might be deployed more effectively to address the crisis. Then in the fourth of the lectures, I will examine alternative incentive systems and regulatory systems -- as yet another possible approach to alleviation of the crisis.

As the material on your screen already indicates, I'll be using, to illustrate and guide the argument, a mind map, which contains an outline of the argument. I will also make available on the homepage for the course, various versions of this mind map, which will allow you at your leisure to explore topics in more detail. The map in its full-blown form contains lots of footnotes and references to sources that you might find helpful in elaborating the arguments and testing criticisms of each of them.

Without further ado, let's start. The premise of this family of approaches to the global health crisis is that there exists a surprisingly large set of situations in which safe and effective drugs capable of preventing or curing infectious diseases and non-communicable diseases already exist, authorized manufacturers of those drugs stand ready to sell them to the residents of developing countries, funds are available to cover such sales -- and yet for some reason, the sales are not being consummated.

What I'll be discussing for the balance of this lecture, are ways of overcoming the impediments that prevent the consummation of these sales. Doing so creates the potential for benefiting all parties. First and most obviously, the residents of developing countries who suffer from the ailments at issue will be helped. At a minimum, their misery will be alleviated. In some instances, their lives will be saved.

In addition, at the opposite end of the chain, the pharmaceutical firms who first developed and are now manufacturing and selling the drugs at issue will benefit from augmented sales, not

enormously, but enough to make it worth their while. Most of the other intermediaries between the pharmaceutical firms and the patients will also benefit.

Another way of describing this family of situations is they involve opportunities for win-win-win outcomes.

There are five types of situations of this sort itemized on your screen. We'll begin with regulatory approval. Surprisingly often, the reason why the residents of low and middle-income countries cannot gain access to drugs that would make their lives better is that the regulatory authorities in those countries have not yet approved them for distribution. I'm going to shift here to some slides and show you an example of this distressing situation.

This is a complex chart that was created by a group of scholars affiliated with the Gates Foundation, published in 2016. It's been anonymized because of the circumstances under which the data were gathered. What it describes is the pace at which applications for approval of an important HIV drug were submitted and then assessed in various countries. At the top of the screen, “SRA A” and “SRA B”, are thinly-veiled anonymizations of the Food and Drug Administration in the US and the EMA in Europe.

As you can see, the red triangle identifies the dates on which an application for market authorization was submitted to each of those agencies. The green triangle indicates when the application at issue was approved. Applications to the SRAs were submitted early on and authorization was quickly forthcoming, strongly suggesting that there was no doubt concerning the safety and efficacy of the drug in question.

All of the other rows in the chart, the 21 NRAs, represent the national regulatory authorities in a representative subset of African countries. The first thing you notice from the chart is that applications for market authorization were not submitted at the same time as the FDA and the EMA. Rather, there was a delay in submissions -- at a minimum of a couple of months – in a few instances, three or four years.

Equally important and perhaps more susceptible of correction, the regulatory processes in almost all of the countries (the possible exception here is NRA N) took substantially longer than it took in the United States and Europe -- despite the fact that one would think that the regulatory authorities could capitalize on the reviews that are completed in the United States or Europe. The last three rows in the diagram indicate that the regulatory process as of the time of the article's publication had not yet been completed.

Indeed, NRA J in the middle of the chart indicates that one of those regulatory processes had been underway for many years. The net effect of this pattern is that access to this life-saving HIV drug was very substantially delayed in a large number of African countries.

Africa is not alone in this regard. Similar delays can be found in Latin America and low and middle-income countries in Southeast Asia.

What can be done about this? Well, the most obvious and perhaps important of the potential responses to this distressing state of affairs is to alleviate the financial constraints under which many of these regulatory authorities currently operate. One of the reasons that they are so slow in processing applications is that they don't have the staff or financial resources necessary to be more expeditious. Increasing funding for the regulatory authorities could accelerate the process and save a lot of lives.

Less obvious but equally important, we collectively could strive to standardize the dossiers required for regulatory approval. We've already done this (as you know from earlier portions of the course) with respect to the submission of applications for patent protection. The Patent Law Treaty and the Patent Cooperation Treaty, in combination, have resulted in substantial standardization of applications for patent protection.

We could and should achieve similar standardization with respect to dossiers for regulatory approval. Initiatives of this are already underway in many parts of the world, including Africa and Latin America. They can and should be accelerated. The result would be to reduce the delays in regulatory approval.

To be sure, not always is the delay in processing an application by developing countries attributable to lack of resources or confusing and non-standardized dossiers. In some instances, the regulatory authorities properly take into account a mismatch between the populations selected for the clinical trials underpinning the applications and the populations in their own countries. Even more non-obvious but important reform would be to nudge the pharmaceutical firms who are seeking approval to be more refined in constructing their clinical trials to anticipate this issue.

What does nudge mean? Well, one possibility would be each developing country could condition approval of trials conducted upon their own populations upon demonstration that the participants were selected in a way that would include a representative sample of the country's own residents.

A fourth approach anticipates an issue I'm going to be discussing in more detail later in the lecture. One of the ways in which we could address this general problem is to increase usage of voluntary licenses by pharmaceutical firms to generic manufacturers. Such licenses could include a connection between, on one hand, the prices at which the generic drugs produced under the license are made available to citizens of the country and, on the other hand, how rapidly regulatory approval goes forward. Now, that suggestion is probably mysterious at this juncture, but I hope it becomes more clear (if not uncontroversial) later in the presentation.

All right, that is the first of the opportunities for win-win-win responses to the global health crisis. As you can see, I hope, expediting regulatory approvals in low and middle-income countries would clearly benefit the residents of those countries and, by expanding the markets available to the manufacturers of the pharmaceutical products, increase, at least modestly, their profits.

The second family consists of efforts to mitigate the third of the dimensions of the global health crisis that I discussed in the first lecture. That dimension consists of the extraordinary prevalence, especially though not exclusively in low in middle-income countries, of falsified and substandard drugs. As we saw there, the human cost of the distribution of these is huge. To take just one example, roughly 122,000 children under the age of five die each year because they consume substandard antimalarials.

How could we mitigate this problem? The most important strategy would be to increase the machinery we use to detect and then purge the market of these falsified and substandard drugs. There are a bunch of these technologies available now. For example, branded anti-counterfeiting systems include mPedigree and Sproxil.

I'm going to describe another initiative that my colleague Ruth Okediji and I have been developing for a few years now, not with the view of persuading you that it is the best possible approach, but rather to illustrate the opportunity for saving some lives through this general approach -- sometimes known as post-market surveillance.

We call this system, SAQAN, an acronym for Southern African Quality Assurance Network. Several institutions are collaborating in the creation of this venture. The first is Global Access in Action, a branch of the Berkman Center for Internet & Society at Harvard. The principal figures in GAIA are Ruth Okediji, Professor Margo Bagley of Emory Law School, and Professor Padmashree Gehl Sampath teaching at the University of Johannesburg.

The second organization involved is Mission for Essential Drugs and Supplies (commonly known as MEDS), which is a faith-based non-profit organization, based in Nairobi, Kenya -- a remarkably effective institution for distributing high-quality medicines throughout East Africa. The Representative of the organization who leads their initiative with respect to SAQAN is Nelson Mandela.

The third organization consists of the ministries of health in participating countries. Thus far, two countries have participated in pilot versions of this system: Namibia and Malawi, where the lead person is Cliff Mwale.

The fourth is InnoSpectra, which is a manufacturer of devices that can be used to assess the composition of various products, including food and medicines.

The next is the London School of Hygiene & Tropical Medicine.

The next is the Infectious Diseases Data Observatory.

Last but not least is the World Health Organization, which is currently sponsoring a deployment of this system as part of the educational programs of schools of pharmacy in several African universities.

On your screen is a picture of the technology that underlies the system.

I want to emphasize the outset that we are not committed to any aspect of this particular technology. This just happens to be the set of devices that in combination have proven to be most efficacious thus far. Most certainly in the future, other, better technologies will emerge.

The two devices that, in combination, make this system possible consist of a near-infrared scanner, and an associated generic smartphone, which is loaded with custom software originally developed by the organization, “Global Good,” which has been funded by Bill Gates. Also contained in the smartphone is a database, which consists of a library of the spectral profiles of authentic medicines.

Here's how you use this combination of devices. Imagine you are an inspector going out to the field. You locate a pharmacy, and you ask to test some of their pills for authenticity.

The first thing you do is turn on the devices. Second, you select a pill to be scanned and you then determine the type of drug that the pill purports to be.

Then you enter the brand name in the menu that appears on the screen of the smartphone. Next, you use the camera located in the smartphone to photograph the packaging. This photograph is automatically dated and geo-tagged, which helps the system keep records of the outcomes of the tests.

Next, you place the pill on the scan head -- which is that little window on top of the scanner.

Then you press "Scan" and the device examines the chemical composition of the pill through this near-infrared procedure and then compares it to the profile of an authenticated version of the drug that the pill in question purports to be. If they match, the device reads, "Match found," and you approve the drug. If they don't match, then a red image appears on the screen and you'll know there's a problem with the drug in question.

All right, that's the procedure. The records of these scans are then downloaded and aggregated. The data produced in this fashion can be used to generate a map of hotspots, which will then guide further deployment of the inspectors. In addition, an important part of SAQAN is an agreement on the part of each participating country to share, in a secure environment, their data with the health ministries in other participating countries.

The advantages of this method are, first, it's fast. It takes less than a minute to complete this process. Second, it's inexpensive. Each of these combinations of devices can perform tens of thousands of scans. The marginal cost of each one is quite small. The training of inspectors requires only a few hours. We've done this in collaboration with health ministries in several countries and Africa already.

Next, it enables quick, random tests of pharmacies and distributors. Here are some photographs of testing we did in Malawi. Next, each participating country benefits from the data gathered in other participating countries. Next, the data can be used both to purge the

healthcare system of falsified drugs and to inform selection of and negotiations with suppliers in the future and, therefore, to cut down on the rate at which bad drugs enter the system.

Finally, to anticipate an issue we will get to again later in the lecture, it facilitates local production of medicines and vaccines.

Returning to our chart, here are the potential benefits of systems of this general sort -- of which SAQAN is just one example.

Most obviously, it saves lives by reducing the frequency with which children and adults consume medicines that are bad for them.

Next, it increases faith in western medicine because people don't consume drugs and then not get better.

Next, it reduces the burdens on the public health budgets of low and middle-income countries by offering them an inexpensive way to purge the system of bad drugs.

Finally, perhaps least obviously but most relevant to securing general participation in such a program, it prevents the corrosion of the reputations of all pharmaceutical manufacturing firms because the public at large is not led to believe mistakenly that their drugs are bad.

All right, that's the second of the five families of approaches.

The third of the five families of reform proposals in this general category consists of facilitating the practice of differential pricing. To explain how this might work requires a bit of background.

Differential pricing, also known as price discrimination, consists of charging different prices for access to the same good or service or (somewhat more subtly) charging different consumers different prices for different versions of a good or service when the variation cannot be explained by differences in the cost of those versions.

Until recently, differential pricing was relatively uncommon, but its frequency in the economy as a whole is gradually increasing. Firms interested in using this general strategy are able to do so only if they can satisfy four requirements. There are a few exceptions to this list, but it's a reasonably good guide to the availability of differential pricing.

First, the firm in question has to have market power in the relevant field.

Next, it has to be able to restrict the ability of purchasers of the drugs at low prices from reselling them to potential purchasers, who otherwise would be obliged to pay higher prices. That's known as arbitrage.

Third, the buyers of the good or service in question must be heterogeneous.

Last but not least, there must be some mechanism available to the firm of differentiating among the buyers. There are three different ways in which that differentiation is commonly achieved.

The first, known as first-degree differential pricing, arises in circumstances in which the seller of the good or service has very good information concerning the wealth or ability and willingness to pay of individual buyers. The second, often referred to as versioning, arises when the company in question offers the good or service in different forms and charges different prices for them. The classic example is first-class versus coach-class airline tickets.

The third of the methods for differentiating among buyers, known as third-degree differential pricing, involves the use of some criterion that, roughly speaking, divides wealthy from poorer potential customers. Examples would include student discounts or senior citizen discounts employed by a variety of organizations (including museums) to set different prices for the different groups.

That's a quick review of the background of differential pricing. Now, we turn to the use of this technique in the area of pharmaceutical products. It quickly becomes apparent that pharmaceutical firms are unusually well-positioned vis-a-vis differential pricing. Ordinarily, patents and data exclusivity rules do give them market power. Their buyers of their products are typically heterogeneous, at least in respect of their wealth and income.

Increasingly, pharmaceutical firms are able to differentiate among customers using one or another of the techniques just summarized. Their ability to control arbitrage to prevent resales is a more complex question involving technical issues in patent law. It is this variable that we can imagine adjusting going forward so as to facilitate or curb the use of differential pricing.

As a rough generalization, pharmaceutical firms should be in a position to engage in differential pricing extensively. In other words, to charge very different prices for their drugs to different subsets of consumers. They do some of the time, but less often than one would expect. In particular, there is less use of differential pricing by pharmaceutical firms in the context of international potential differentiation.

The prices charged by most pharmaceutical firms in various countries of the world do differ, but not as frequently as one would expect on the basis of general considerations of economic theory. Why? Well, the principal explanations are listed on your screen. First, some countries, particularly in Europe but not exclusively in Europe, limit the availability of firms to engage in differential pricing by imposing price controls.

More subtly, some countries, again, most often in Europe, use indices for their price controls that tie prices charged domestically to the prices the firms charge in other countries. When the referenced countries include developing countries, the unintentional but serious side effect is to discourage the pharmaceutical firms from lowering prices there -- out of fear of forfeiting a portion of their more lucrative markets in Europe.

A non-obvious additional factor that limits differential pricing more than one might expect is that, in many developing countries (South Africa would be an example), there is a high degree of inequality of wealth. The result is that pharmaceutical firms have opted to continue to charge high prices in those jurisdictions despite the fact that the average wealth of the residents is low -- because they hope to exploit the small but not insignificant subset of those residents who are quite wealthy.

Another factor that limits the beneficial impact of lower prices in developing countries through differential pricing is that retailers and distributors often absorb the benefit of lower prices by charging high margins.

Last but not least, firms that might be inclined to lower prices in developing countries are discouraged from doing so out of fear that the visibility of how low the prices might be to residents in the United States will cause American consumers and politicians to criticize them and to acquiesce in the imposition of more price controls -- as we have seen most recently in the United States in the suspension of the longstanding prohibition on the negotiation of lower prices by Medicare.

Okay, so differential pricing by pharmaceutical firms occurs but not as often as one might expect. The potential benefit to residents of developing countries of greater use of this general strategy is probably, by now, apparent. If the pharmaceutical firms could be persuaded more often to lower the prices of drugs for poor residents and poor countries, then those drugs would be more readily available to the people who desperately need them. How might pharmaceutical firms be encouraged or nudged to do so?

One possibility would be to reduce the factors that cause pharmaceutical firms to hesitate currently to reduce prices in poor countries. This is known as inter-country differential pricing. Here are some examples listed in your screen. The impediments to parallel importation (meaning the impediments that the law creates to purchasing drugs in poor countries at low prices and then importing them into richer countries) could be strengthened. That strengthening would, in turn, make the firms more willing to lower prices in poorer parts of the world.

Next, the perverse effects of the reference systems I summarized a minute ago that are discouraging the firms from lowering prices in poor countries, could be alleviated by removing such references. This is a potential reform largely in the hands of lawmakers in Europe, not the United States.

Finally, developing countries could more sharply curtail the profit margins of their own distributors and intermediaries.

Okay, less obvious but equally promising as a technique for increasing usage of this strategy would be to encourage the firms to differentiate, not just different countries, but also different subgroups within each country. One way of doing so is to capitalize on the fact that in many

(not all) developing countries, poor residents rely primarily on the public healthcare system while richer residents tend to rely disproportionately on private healthcare systems.

Knowing this, the firms could, more often than they currently do, charge different prices to different purchasers. Private hospitals could be charged more and public hospitals could be charged less.

Another example of a possible deployment of this strategy would be to capitalize on the already existing systems in many developing countries of community health workers. What are community health workers?

Community health workers are a response to a distressing but persistent problem, namely the limited availability of doctors, nurses, and midwives in poor countries. Frequently, as you can see from this map, such medical professionals are hard to find in poor countries. The best response to the state of affairs would, of course, be to increase the availability of doctors, nurses, and midwives by augmenting the availability of professional training systems in those jurisdictions.

Lacking such reforms, many jurisdictions have come to rely on semi-professional health workers, now commonly known as health workers. These are laypersons who typically live in the areas they serve, are primarily based in the community. They belong to a formal health system. They perform tasks related to healthcare delivery and they have received some organized training but typically do not have formal certifications.

There are a lot of these. They're common in Sub-Saharan African countries and in some countries in Latin America and Southeast Asia. They perform a wide variety of diagnostic and educational services for poor residents. They also prescribe and deliver drugs addressing common and relatively easily-diagnosed ailments. The way in which this network could be combined with differential pricing should by now be apparent.

The pharmaceutical firms could charge community health worker systems, lower prices than they charge to other populations in the countries in question. One of the reasons why this is a promising approach is that the community health worker systems have very strong incentives to prevent arbitrage -- in other words, to prevent diversion of the drugs they obtained cheaply into other portions of the relevant markets -- because they would undoubtedly be punished for acquiescing in such diversion by being deprived of their lower prices.

This is one among many strategies that could be employed to increase the use of differential pricing to make more drugs more readily available to the port.

The fourth of the strategies in this family has come to be known as voluntary licensing. A simplified description of how most drugs are distributed in developed countries follows:

The pharmaceutical firm that holds the intellectual property rights to the drug in question either manufacturers copies itself or (increasingly now) enters into a contract with a contract

manufacturer, which produces pills or copies of the biologic, and then sells them to distributors who, if they receive permission from the relevant regulatory agency (the FDA and EMA would be common examples), sells them to patients in the country.

(As viewers of this lecture are undoubtedly aware, the way in which these simple principles are practiced in the United States and other developed countries is much more complex than this simple diagram would suggest, but the essence of the marketing system is as described on the screen.)

That this approach does not work well for low and middle-income countries has now been apparent for many years. A gradually growing subset of pharmaceutical firms are attempting to alleviate this problem by executing so-called voluntary licenses with generic manufacturers to sell drugs at affordable prices in poor countries. Here is a similarly simplified explanation of how this typically works.

The pharmaceutical firm (now, a licensor) executes a voluntary license agreement to a generic company. Most often, currently, the generic is located in India, China, or Brazil. (In our diagram here, we're going to include two voluntary licenses for reasons that will become apparent in a minute.) Those generic firms manufacture and sell (for relatively low prices) drugs -- to government purchasers in poor countries, but also for some of the reasons I just suggested, to private purchasers.

The government purchaser delivers the drugs to distributors, which have to obtain permission from a regulatory agency analogous to the FDA or the EMA. If they do so, they will deliver the drugs to patients. Private purchasers (like private hospital chains) do much the same thing.

Now, an important supplement to this strategy, used increasingly often by sophisticated licensors, is to introduce into the low and middle-income country branded versions of the same drug. The branded versions compete with and discipline the prices of the generic drugs. Patients as a result have a choice of a variety of forms of the drugs in question.

As the brown lozenge at the bottom of this chart indicates, in some instances, particularly when the low or middle-income country in question is especially poor, the government purchaser must obtain supplementary funding from either a developed country government or an NGO.

Now, to make this system work effectively, it's critical that all of the key stakeholders agree to the terms of the deals. Who are the key stakeholders? Well, first and most importantly, the pharmaceutical firm that owns the intellectual property rights in question.

Next, the generic manufacturers who have to agree to the voluntary licenses. Less obviously but equally important is the government of the low and middle-income country in question. That includes both the health services that purchases them and the regulatory agency that assures the drugs are safe and efficacious.

Finally, in some instances, the funders.

Okay, that, roughly speaking, is how a voluntary license works. The organization that pioneered the use of this technique is the Medicines Patent Pool.

A single pharmaceutical firm has been especially aggressive in a good sense in the deployment of this strategy. That's Gilead. Rather than describe Gilead's initiative here, I will be including in the set of recorded materials for this module, a description of how the Gilead system was established, refined over time, and generalized by the two executives who pioneered it, Clifford Samuel and Claudio Lilienfeld. I won't continue analyzing the potential of this strategy in this recorded lecture, but rather we'll encourage you to watch their presentation.

The fifth and last of the members of this family of reform proposals -- fostering local production -- is perhaps best understood as a complement to or refinement of voluntary licensing.

Returning to our slide here, in the standard form of voluntary licensing, the intellectual property holder issues the license to a generic firm that could be located anywhere in the world. Most often, it will be located in, as I've mentioned, India, China, or Brazil.

A modified form of this strategy would be for the licensor to issue these licenses only to generic firms located in the country in question. For example, suppose that a firm wanted to increase the distribution of a particular drug in South Africa. Instead of relying on an Indian manufacturer, it could issue a voluntary license to a South African manufacturer.

Why would this be a good idea?

The argument against the use of this strategy is that it creates a risk that the prices of the drugs that eventually reach the patients will be higher than necessary. Minimizing the prices that reach the patients requires issuing licenses to manufacturers who can credibly promise to produce the drugs at the lowest possible prices regardless of where they're located. This creates a presumption against restricting to local manufacturers' access to voluntary licenses.

Why, despite this threshold presumption, might we consider relying on this strategy? There are two main arguments in favor of local production and they're quite different in character.

The first involves industrial policy. As is well-known, the availability of high-paying and high-skilled jobs in most developing countries is quite limited. If we wanted to augment the availability of such jobs, one way of doing so would be to increase pharmaceutical manufacturing in those jurisdictions. This consideration matters a great deal to the governments of most developing countries. Because, as I've indicated just a minute ago, their participation in deals of this sort is often, as a practical matter, essential to realizing them, all of the other players, including the pharmaceutical firms, ought to be sensitive to this consideration of industrial policy.

The second reason is that there are advantages in terms of public health of locating the manufacturers locally. One of those is that the drugs can frequently get into the mouths of

people who need them faster than would be the case if they're manufactured in India, China, or Brazil -- because they're less likely to be held up or delayed in the customs system.

Another potential benefit to public health of local manufacturing is that the scourge of falsified and substandard drugs is attributable, to a significant extent, to stockouts. In the typical case, what happens is a pharmacy runs out of, say, a malaria drug or a tuberculosis drug and unable to obtain renewed supplies through authorized channels. The pharmacy then turns to the black market to fill the gap, and the black market, as one might expect, has disproportionate numbers of falsified drugs in it. Local manufacturers are likely to be able to either prevent or respond to such stockouts much more quickly and, therefore, to reduce reliance on the black market.

One more variation on this theme recognizes that, over time, the ability of a low or middle-income country to respond effectively to new pandemics or other health challenges will be increased if it has a vibrant local manufacturing capability. A long-run benefit of local production is that it builds up the ability of the country to respond to future challenges more flexibly and quickly. These arguments remain controversial, but let's assume for the moment that you find them persuasive.

We then turn to the question of how governments might encourage pharmaceutical firms to favor local manufacturers. One way of doing so would be to catalyze the technology transfers that are often necessary to empower local manufacturers to make the drugs in question by, for example, standardizing technology transfer agreements or by funding joint ventures between pharmaceutical firms and local manufacturers.

Another approach, less obvious, would capitalize on the fact that pharmaceutical firms (especially but not exclusively in Germany) have discovered that an effective way of transferring technology is through apprenticeships -- in other words, to accept into the sophisticated manufacturing plants used by the firms in developed countries, a person is willing and interested in learning the skills necessary to produce them locally. Governments and NGOs funding research can increase reliance on apprenticeship programs of this sort by simply making participation in them a condition of the grants that they give to the recipients. Developing countries can use a different lever.

Finally, often nowadays, developing countries are the locations of the clinical trials used to demonstrate the safety and efficacy of drugs. Clinical trials require permission from the governments of the countries where they're deployed. The governments in, for example, the countries shown on this map could add to the conditions they insist upon, a requirement that the firms at issue agree in advance to accept apprentices from local manufacturing firms if the drug in question proves viable.

Okay, so this concludes our tour of ways in which, through refinement, adjustment, and improvement of the markets for pharmaceutical products, we could benefit all of the stakeholders in this ecology. Pharmaceutical firms would make more money. Generic manufacturers would increase their footprints. Most importantly, the poor residents of low and

middle-income countries would get more vaccines and drugs at lower prices. In the next lecture, I'll turn to a somewhat more controversial, possible response to the global health crisis. Those consist of ways in which intellectual property law, both in developing countries and in developed countries, might be modified to further increase access to crucial medicines.