A conversation with Professor Michael Eddleston and Dr. Leah Utyasheva, May 18, 2017

Participants

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- Dr. Leah Utyasheva – Human Rights Expert, RUSMPI – Institute on Migration Policy
- Elie Hassenfeld – Co-Founder and Executive Director, GiveWell
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Note: These notes were compiled by GiveWell and give an overview of the major points made by Professor Michael Eddleston and Dr. Leah Utyasheva.

Summary

GiveWell spoke with Professor Michael Eddleston of the University of Edinburgh and Dr. Leah Utyasheva of RUSMPI – Institute on Migration Policy to investigate the possibility of making a GiveWell Incubation Grant to enable Professor Eddleston and Dr. Utyasheva to create the Centre for Pesticide Suicide Prevention (CPSP). Conversation topics included the effect of pesticide bans on suicide rates over time in Sri Lanka and CPSP's plans for its work in Nepal and India.

Effect of pesticide bans on suicide rates over time in Sri Lanka

- Between 1984-1995, many pesticide suicide deaths occurred outside of hospitals. This is likely because the pesticides that were available were class Ia and Ib organophosphorus pesticides (classified as "extremely hazardous" and "highly hazardous," respectively, by the World Health Organization (WHO)), which typically killed people before they could make it to a hospital. If people are treated within 15-45 minutes of ingesting class I organophosphates, they can sometimes be saved; however, people do not often make it to the hospital this quickly in rural Asia, and many patients who are treated within this time period ultimately die in the hospital due to complications. For example, the case fatality of parathion (a class Ia pesticide) can be as high as 40% in places with a good medical system (e.g. Munich, Germany).
- In 1995, the last class Ia and Ib pesticides available in Sri Lanka were banned. This was followed by a temporary increase in the use of endosulfan in suicide (which is in a lower WHO toxicity class, but has a high case fatality) until it was banned in 1998. By 2003, there had been a reduction in the total number

of suicides nationally but no significant reduction in the number of pesticide suicide deaths in hospitals. This is likely because the pesticides available after 1995 were slower acting, which meant that more people survived long enough to get to a hospital.

- Starting in 2002, the main pesticides that were used for suicide in Sri Lanka were fenthion, dimethoate, and paraquat.
    - Professor Eddleston is not aware of a treatment for paraquat after it has been ingested. The case fatality of patients who come to a hospital after reportedly ingesting paraquat is 40-60%. The true case fatality rate is higher because many of the patients who survive have only put the pesticide in their mouth and spat it out without swallowing.
    - Improved hospital treatment of patients who ingested dimethoate and fenthion reduced case fatality to 24-25% for dimethoate and 16% for fenthion. The majority of people who died after ingesting these pesticides died after they got to a hospital.
    - During this period, there was little that could be done to reduce case fatality further by improving hospital management of poisoned patients because a) people who ingested potent pesticides died before they got to a hospital, b) there were no good treatments for paraquat poisoning, c) dimethoate and fenthion poisoning were already being managed well in hospitals.
- Fenthion, dimethoate, and paraquat were banned via phased bans from 2008-2011, which led to a reduction in case fatality.
- Chlorpyrifos, which has a relatively low case fatality rate of about 6%, was banned in 2013 for reasons unrelated to suicide. This ban resulted in an increase in case fatality as chlorpyrifos was replaced with profenofos, which has a case fatality rate of about 12%. Improvements in hospital management of poisoned patients have not been able to prevent the rise in case fatality resulting from the use of more lethal pesticides, which supports the notion that improved medical management has a relatively minor impact compared to pesticide regulation.

Non-pesticide suicide by poisoning

Paracetamol poisoning

In the last 10-15 years, young women have switched to taking paracetamol for suicide attempts. The case fatality of young women from pesticide suicide in the 1990s and 2000s was relatively low because they are more likely to take a small amount (possibly because of lower intent to die). The frequency of self-poisoning may be rising as more people switch from pesticides to paracetamol.

Oleander poisoning

In about 1980, people in Jaffna, Sri Lanka started ingesting oleander (*Cascabela thevetia*) seeds for suicide. Use of oleander approached its peak in 1985-1987 in the area where Professor Eddleston subsequently worked, remained at its peak in 1995, and began falling in the late 2000s. The case fatality of oleander poisoning is about 4-5%, as compared to the 30-40% case fatality of class I pesticides. Professor Eddleston thinks yellow oleander wasn't responsible for a large proportion of suicides.

Sources for information about which pesticides are being used

Information on which pesticides are used is typically gathered via a self-reported medical history. In Sri Lanka, Professor Eddleston and his colleagues also took blood samples from hundreds of patients poisoned with different pesticides to check whether the pesticide found in the blood matched the one in the self-reported history. They found that it matched in 80-85% of cases and concluded that self-reported histories are fairly reliable.

Checking availability of pesticides in pesticide shops

Several studies conducted by Professor Eddleston and others over the past few years have involved visiting pesticide shops to ascertain whether banned pesticides are available for sale. These include:

- A paper co-authored by Professor Eddleston comparing suicide rates in a district of Sri Lanka where fenthion and dimethoate had been banned with those in a district where they had not been banned. Professor Eddleston and a colleague visited all of the pesticide shops in the district where fenthion and dimethoate had been banned to verify that they were not being sold there. If CPSP works with governments of other countries to regulate pesticide sales, it will perform similar checks to ensure that the banned pesticides are not being sold.
- A study co-authored by Professor Eddleston on the effects of safer pesticide storage methods in Sri Lanka on the rate of pesticide suicide, which involved working with pesticide shops.
- A vendor study conducted by Manjula Weerasinghe in Sri Lanka. Mr. Weerasinghe has been working with pesticide vendors for the past four years. He has published a protocol for the study and has gathered data from the pesticide shops; no-one has published a list of the pesticides currently available for sale in Sri Lanka.

Professor Eddleston's involvement in pesticide regulation in Sri Lanka

In 2002, Professor Eddleston approached Sri Lanka's pesticide registrar with data on the three organophosphorus pesticides that were responsible for the majority of pesticide suicides at the time (fenthion, dimethoate, and chlorpyrifos) showing that fenthion and dimethoate had a much higher case fatality rate than chlorpyrifos. This

resulted in the ban on fenthion and dimethoate, which led to a reduction in case fatality in hospitals from 14% to 3%. Professor Eddleston also supported a ban on paraquat.

In addition to his work with the pesticide registrar, Professor Eddleston has written papers on the effect of pesticide bans in Sri Lanka to demonstrate the potential of this strategy to other countries.

Plans for work in Nepal

Timeline

- Within a month of beginning its work, CPSP would go to Nepal to meet with people to create a more detailed plan for its work there and begin training people to collect data.
- Within six months, it would:
    - Identify 3-4 hospitals across the country and look through their medical records to learn about current and past problems with pesticide poisoning and check whether there has been a detectable impact of existing pesticide bans on the rate of suicide.
    - Share this data with the pesticide registrar and help him decide which pesticides should be banned.
- Within 12-18 months, CPSP would ideally be moving toward creating legislation to ban pesticides that have been identified as responsible for the majority of deaths from pesticide poisoning.

It will likely take a few years for the bans to have their full effect on the suicide rate, though there may be a noticeable reduction in suicides within 3-6 months, depending on how lethal and how commonly used the banned pesticides are.

Scale of the problem

There are thousands of deaths per year from pesticide suicide in Nepal, although Professor Eddleston is not aware of existing data on the exact suicide rate. While this is a small percentage of total global suicides, it is a relatively high incidence and provides an opportunity for CPSP to quickly begin having an impact and demonstrate the efficacy of pesticide bans.

Plans for data collection

Two studies in Sri Lanka involved looking at paper copies of medical notes about deaths from pesticide poisoning and comparing the common pesticides used for suicide over time with the list of pesticides that were available for sale at a given time. These notes were sufficient to give an idea of which pesticides were most problematic and the impacts of pesticide bans. CPSP plans to use a similar strategy for data collection in Nepal. The pesticide registrar in Nepal has already banned some pesticides, so CPSP will check whether this is reflected in medical records

from before and after the bans. CPSP will also look in pesticide shops to see which pesticides are being sold and ask pesticide sellers which pesticides they have sold in the past. If it had additional funding, it could take blood samples from 1000 poisoned patients to check the accuracy of their self-reported histories, although it seems unlikely that this would yield a substantially different result than it did in Sri Lanka.

Anticipated challenges to data collection

In Sri Lanka, Professor Eddleston and others had difficulty collecting comprehensive data sets because storage facilities were basic (e.g. some records of deaths had been eaten by rats). It is possible that similar difficulties with data storage may arise in Nepal.

Quality of cause of death data

Pesticide poisoning (in general) can be identified as a cause of death fairly reliably by police. It is more difficult to verify which specific pesticide was involved; this is usually done by consulting judicial, forensic, or medical records. This is more difficult when people don't make it to the hospital. People who don't make it to hospital are not counted in hospital statistics, so case fatality in the hospital is probably an underestimate of true case fatality.

Tracking the suicide rate over time

It is not clear whether Nepal has national data on suicides broken down by cause of death. If it does not have this data, CPSP may set up a surveillance system in 4-5 hospitals to track the pesticide suicide rate over time. This would involve employing someone to travel to each hospital, for example, one day per week to track the data over time. It is possible that demonstrating interest in pesticide suicide data may lead hospital staff to record the data more accurately.

Plans for work in India

Timeline

- Within the first month of working in India, CPSP would:
    - Visit Professor Eddleston's contacts in the Indian government who are involved in pesticide regulation to discuss the details of a potential collaboration to identify and ban hazardous pesticides.
    - Begin or continue discussions with the Christian Medical College (CMC) in Vellore, which works with a network of over 120 missionary hospitals in mainly rural areas across every state in India, about a potential collaboration. These discussions would involve making a plan to select 20 representative hospitals across rural parts of India and to train 4-5 people to collect data from the hospitals, local

coroners, and pesticide shops. Data the researchers would try to gather include:

- Current and past data on the number of patients admitted to hospitals with pesticide poisoning
- Current and past data on the number of deaths from pesticide poisoning occurring outside of hospitals
- Current and past data on which pesticides are responsible for deaths from pesticide poisoning
- How well the hospital data is recorded
- Which pesticides are available in pesticide shops

- Within the first six months, CPSP would like to have a network of at least 20 hospitals reporting data on these questions. CPSP expects to have a data manager within the CMC to receive and process data and send it to government officials in Delhi every couple of months once the hospitals begin reporting data.
- Within 12-18 months, CPSP hopes to have enough data to have a good understanding of current and past problems with pesticide poisoning. At this point, it would begin having meetings with government officials to discuss regulation of the pesticides that are responsible for the majority of recent deaths from pesticide poisoning.

Collaboration with the CMC hospital network

Professor Eddleston does not anticipate challenges to working with CMC and its hospital network. He has been working with CMC for the past six months to set up a poison advice system to serve the hospitals in its network, and about 30 of the hospitals have expressed interest in collaborating with CMC Vellore on its poison advice service. CMC has an excellent reputation in India and good relationships with the missionary hospitals in its network; many of CMC's students end up working as doctors in these hospitals. Additionally, the doctors Professor Eddleston has worked with in CMC believe that pesticide poisoning is an important problem.

Cluster randomized controlled trial

If CPSP identifies a few pesticides that are responsible for the majority of deaths from pesticide poisoning in India, it will try to conduct a cluster randomized controlled trial (RCT) to determine the impact of banning these pesticides on the rate of pesticide suicide and pesticide self-poisoning. The RCT would involve banning the relevant pesticides, or providing incentives for shop owners not to stock them, in half of 30-50 large areas and following up for 1, 2, or 3 years to track the number of deaths from pesticide poisoning in each area as well as the effect on both health and agricultural costs.

Cost of the RCT

The main expenses involved in the RCT would be related to follow-up, such as the cost of putting systems in place to identify all cases of pesticide poisoning in every area and to identify the specific pesticides used. In Sri Lanka, the cost to follow up with 225,000 people in a similar study was about £100,000 per year. A study involving 1 million people might cost up to $500,000 per year to collect high-quality data. The cost may vary depending on the incidence of pesticide suicide in the area; in an area with a high incidence, CPSP may be able to use smaller clusters to reduce the cost of the study. However, the study would need to involve enough areas to get a representative sample so that the results are applicable to the rest of India.

If CPSP decides to conduct an RCT, it would likely seek the main body of funds through a research grant application to a funder such as the Wellcome Trust.

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