New algorithm can help spot illicit online pharmacies

Reviewed by James Ives, M.Psych. (Editor) Aug 28 2020

Consumers are expected to spend more than $100 billion at online pharmacies in the next few years, but not all of these businesses are legitimate. Without proper quality control, these illicit online pharmacies are more than just a commercial threat, they can create serious health threats.

In a study, a team of Penn State researchers report that an algorithm they developed may be able to spot illicit online pharmacies that could be providing customers with substandard medications without their knowledge, among other potential problems.

"There are several problems with illicit online pharmacies," said Soundar Kumara, the Allen E. Pearce and Allen M. Pearce Professor of Industrial Engineering. "One is they might put bad content into a pill, and the other problem is they might reduce the content of medicine, so, for example, instead of taking 200 milligrams of a medication, the customers are only taking 100 milligrams -; and they probably never realize it."

Besides often selling sub-standard and counterfeit drugs, illicit pharmacies may provide potentially dangerous and addictive drugs, such as opioids, without a prescription, according to the researchers, who report their findings in the Journal of Medical Internet Research**,** a top-tier peer-reviewed open-access journal in health/medical informatics. The paper, "Managing Illicit Online Pharmacies: Web Analytics and Predictive Models Study," can be accessed here**.**

The researchers designed the computer model to approach the problem of weeding out good online pharmacies from bad in much the same way that people make comparisons, said Kumara, who is also an associate of Penn State's Institute for Computational and Data Sciences.

> *"The essential question in this study is, how do you know what is good or bad -; you create a baseline of what is good and then you compare that baseline with anything else you encounter,*

> *which normally tells you whether something is not good."*
>
> *Soundar Kumara, Associate, Penn State Institiute for Computational and Data Sciences*

"This is how we recognize things that might be out of the norm. The same thing applies here. You look at a good online pharmacy and find out what the features are of that site and then you collect the features of other online pharmacies and do a comparison."

Hui Zhao, associate professor of supply chain and information systems and the Charles and Lilian Binder Faculty Fellow in the Smeal College of Business, said that sorting legitimate online pharmacies from illicit ones can be a daunting task.

"It's very challenging to develop these tools for two reasons," said Zhao. "First is just the huge scale of the problem. There are at least 32,000 to 35,000 online pharmacies. Second, the nature of online channels because these online pharmacies are so dynamic. They come and go quickly -; around 20 a day."

According to Sowmyasri Muthupandi, a former research assistant in industrial engineering and currently a data engineer at Facebook, the team looked at several attributes of online pharmacies but identified the relationships between the pharmacies and other sites as a critical attribute in determining whether the business was legitimate, or not.

"One novelty of the algorithm is that we focused mostly on websites that link to these particular pharmacies," said Muthupandi. "And among all the attributes we found that it's these referral websites that paint a clearer picture when it comes to classifying online pharmacies."

She added that if a pharmacy is mainly reached from referral websites that mostly link to or refer illicit pharmacies, then this pharmacy is more likely to be illicit.

Zhao said that the algorithm the team developed could help consumers identify illicit online pharmacies, which are estimated to represent up to 75%

of all online drug merchants. As an added danger, most consumers lack the awareness of the prevalence and the danger of these illicit pharmacies and consequently use the site without knowing the potential risks, she said.

The researchers said a warning system could be developed that alerts the consumer before a purchase that the site may be an illicit pharmacy.

Search engines, social media, online markets, such as Amazon, and payment or credit card companies could also use the algorithm to filter out illicit online pharmacies, or take the status of the online pharmacies into consideration when ranking search results, deciding advertising allocations, making payments, or disqualifying vendors.

Policy makers, government agencies, patient advocacy groups and drug manufacturers could use such a system to identify, monitor, curb illicit online pharmacies and educate consumers.

According to Muthupandi, for future work, researchers may want to consider expanding the number of websites and attributes for analysis to further improve the algorithm's ability to detect illicit online pharmacies.

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