

Journal of Integrative Research & Reflection



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Cover art credit to Karissa Van Muyen, a Fine Arts student at the University of Waterloo. This piece was shot and manipulated by the artist as a part their photo series entitled *Submersion*.

We acknowledge that we work and learn on the traditional territory of the Attawandaron (Neutral), Anishnaabeg, and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, land promised and given to Six Nations, which includes six miles on each side of the Grand River.



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Welcome

Interdisciplinarity has become an increasingly popular buzzword in academia. It is posited, without elaboration, as a desirable process or state for education and research. But the term lacks specificity: Can it be practised from within traditional disciplines or does it call for a more radical upset of established structures? Does it refer to the products of research, the institutions which enable knowledge creation, or the social practices and identities that are formed within and around disciplines? More foundationally, what defines an academic discipline? Where are the epistemic boundaries that interdisciplinary work claims to transcend?¹ Do they exclude any knowledge housed outside of academic institutions; or, does interdisciplinarity suggest a possibility for new forms of research which attend to a greater range of ways of knowing about the world?

More often than not, the term seems to be used in a shallow sense—taking the products of disciplinary research and laying them side by side, without integrating the perspectives, aims, or methods of diverse ways of knowing. We created the *Journal of Integrative Research & Reflection* (JIRR) with the aim of facilitating deep, critical engagement with interdisciplinarity, in addition to ways of knowing informed by identity and lived experiences. As such, JIRR is a cross-disciplinary journal; we are interested in research and discussion across diverse domains of knowledge, not just those currently deemed credible by the academy. As a journal, JIRR provides an open-access platform for cross-disciplinary work done by undergraduate students be it applied research which employs multiple ways of knowing, creative projects that disrupt disciplinary boundaries, or theoretical work on cross-disciplinarity in undergraduate education. By providing this space, we hope to encourage young scholars to reflect critically on the methods, aims and paradigms of disciplinary and interdisciplinary projects. Through the creation of this journal, we are building a community of cross-disciplinarians across faculties, campuses and levels of expertise.

Work on JIRR began in winter of 2017 with a small team of Knowledge Integration students at the University of Waterloo. This team, now our Editorial Board, identified a gap in publishing opportunities for undergraduate students at our university. We recognized that undergraduate publishing creates value for students through encouraging them to engage with their work as scholars and allowing for learning about peer-review, a foundational structure of the academic research community. Cross-disciplinarity was a natural choice of focus for our journal. The Department of Knowledge Integration is a center of expertise in cross-disciplinarity, providing us with access to advisors and other information resources for developing the journal.

Our choice of focus for the journal presented unique challenges: there were few precedents for peer-reviewing and evaluating integrative cross-disciplinary work. The editorial team spent much of our first year developing an understanding of existing theory on cross and interdisciplinarity, including research from philosophy of science, pedagogy and social epistemology. We integrated these perspectives to create a unique, double-blind review process for cross-disciplinary projects. This includes an evaluation framework that accommodates for cross-disciplinary projects of a broad range of mediums and a peer review process that leverages our reviewers' diverse expertise and lev-

¹Krishnan, A., (2009). What are Academic Disciplines: Some observations on the Disciplinarity vs. Interdisciplinarity Debate. ESRC National Centre for Research Methods.

els of study. The process was also designed so as to provide training for inexperienced reviewers.

Our months of preparation paid off and we celebrated a very successful first edition. As a community building project, JIRR exceeded our expectations: over 60 people, including editors, authors, reviewers and advisors, from all levels of study and across Canada and the U.S., came together to realize our first edition. We received 20 submissions, of which eight were selected for publication (including the artwork depicted on our cover). Each of the articles explores a unique topic through multiple disciplinary lenses; some pieces also consider ways of knowing derived from social identity and stakeholder knowledge. We congratulate the authors for their talent and their dedication to a challenging project. The following works begin the process of interdisciplinary inquiry they do not answer the wicked questions posed above; but, their creation and development in collaboration with the JIRR team fostered countless discussions, between authors, editors, and reviewers, about the theory and practice of cross-disciplinarity. Through this process, we have come to recognize the challenge of creating work that steps outside of and reflects back on disciplinary research. This new understanding reinforces our belief in the importance of beginning conversation about these topics at the undergraduate level.

This edition of JIRR is our first step. We have created a roadmap, and illuminated countless opportunities for growth. In future years, we hope to expand our reach to more students in more schools around North America. And, to improve our communication around cross-disciplinarity, integration and social epistemology, in hopes that stronger communication of our vision will translate to submissions that engage more deeply with these concepts. We also aim to strengthen the JIRR community through creating more opportunities for connections between supporters.

We hope you enjoy reading our inaugural edition of the *Journal of Integrative Research & Reflection*, and that you return to follow the growth of our project, and community, for many years to come.

Sincerely,

A handwritten signature in black ink, appearing to read "Bronwyn McIlroy-Young". The signature is fluid and cursive, with a horizontal line extending from the end of the name.

Bronwyn McIlroy-Young,
Editor in Chief

JIRR gratefully acknowledges the support of the Waterloo Environment Students Endowment Fund and the Department of Knowledge Integration in the production of JIRR, with special thanks to Rob Gorbet for mentoring the Editorial Board from our journal's inception to its publishing. JIRR also thanks William Kirk Roy for helping us to navigate the peer review and publishing process. Finally, we would like to thank the Combining 2 Cultures 2018 conference for their assistance with JIRR outreach and their work towards our shared vision of promoting interdisciplinarity in undergraduate education.

Medical Service Trips in Nepal: A Short-Term Remedy with Long-Term Consequences

Parnika Godkhindi

Introduction

Nepal is known for having one of the poorest health systems in the world-it struggles with high rates of infant mortality and disease outbreaks (World Health Organization 1), which are only exacerbated by poor sanitation, malnutrition, and inadequate water supply (Ministry of Health & Population 45). The country's mountainous terrain and uneven population distribution isolate the rural areas, where the nation's poorest citizens live. Achieving universal and equitable health care has therefore been very difficult (Mishra et al. 3).

Despite foreign aid and bids by the gov-

ernment, there is little incentive for healthcare practitioners (HCPs) to work in the country's secluded rural regions (Zimmerman et al. 65). As a result, Nepal only has 0.67 doctors, nurses, and midwives per 1000 population (Ministry of Health & Population 4), which is significantly lower than the World Health Organization's recommendation of 2.3 doctors, nurses, and midwives per 1000 population. The country's per capita healthcare expenditure remains one of the lowest in the world, at just \$4.06 USD per annum as of 2014 (WHO 11). Many non-governmental organizations (NGOs) have endeavored to address the shortcomings in the Nepalese health-

care system, predominantly focusing their efforts in rural and remote areas. There are currently over 875 health-focused NGOs operating in Nepal (Karkee et al. 2). An increasing number of them are coordinating medical service trips (MSTs), in which individuals from the Global North participate in short-term health-related volunteering in the country (Citrin 12).

Whether MSTs are truly helping the Nepalese healthcare system is heavily contested, and there is limited empirical research on the impacts of MSTs on the local community. This paper will integrate theories from multiple disciplines to consider the potential benefits and consequences of short-term MSTs, as well as the unique socioeconomic determinants of health in Nepal. It will consult academic papers on development theory, in addition to interviews and lived experiences of individuals accessing healthcare in Nepal. Beyond analyzing the Nepalese health care system in isolation, this paper will also discuss the mentalities, financial motivations, political aims, and competitive factors that drive NGO development in Nepal. This qualitative overview will allow for a critical assessment of MST operations in the country, helping ascertain that MSTs in Nepal are doing more harm than good. Not only are they hindering development of the local healthcare system, they are also endangering the immediate health outcomes of their patients. Accordingly, more research is required to find structures of MSTs that will better serve Nepal's current health needs, while also contributing to its long-term developmental goals.

Brief History of Health Care in Nepal

Nepal is one of the poorest countries in the world, with great income inequality between the rich and the poor (Niraula 151). While wealthier citizens live close to urban centers, the majority of the population lives in remote and rural regions of the country, where subsistence farming is the predominant livelihood (Ministry of Agricultural Development 4). The people in these areas are of a diverse range of caste, lan-

guage, and religion. For such a small country, Nepal is remarkably varied in its landscape and demographics; this often introduces complexities when trying to implement any system-wide change.

To support development, Nepal has received aid from numerous countries, namely the United States, India, and China. However, political motives have been a major priority for these donors. After the Chinese revolution in 1946, the United States provided monetary aid to Nepal and heralded an anti-communist movement; due to its high levels of poverty and physical proximity to China, Nepal was deemed to be especially vulnerable to communism (Khadka 78). Although this influence from the U.S. helped Nepal sustain its monarchy, more Nepalese people began to support communism, leading to the formation of a national communist party in 1949 (Gul 30).

By the late 1970s, Nepal needed loans to sustain its fragile economy and pay back existing debt to Western countries, especially the U.S. (Regmi 192). The World Bank provided "tied aid", recommending that Nepal cut its government spending on public services like health care (193). In 1980, the International Monetary Fund provided further funding through its structural adjustment programs, which capped public expenditures and pushed for a greater focus on more "cost-effective" and "less political" strategies of health care, such as "vertical" and "disease-focused" interventions (Citrin 38), rather than those which addressed other determinants of health, like poverty or infrastructure. Accordingly, the government began to decrease its public health spending. As a result, there are fewer state-owned health enterprises than ever before, and the private health sector has grown considerably (Adhikari et al. 69).

Lack of funding and resources for the Nepalese health system can also be partially attributed to the People's War, a civil conflict that lasted from 1996 to 2006 (Baral and Heinen 2). Much of the conflict occurred in mountainous regions of the north, so the war's damage was primarily endured by rural folk, many of

whom were displaced from their homes (WHO 1). Today, Nepal is still suffering from the crumbling infrastructure and decimated roads that resulted from use of land mines during the war (Shneiderman and Turin 145).

After the People's War, the old autocratic government was replaced by a republic within a multi-party system (Poudyal 159), but concerns of political instability remained. Bearing in mind the risk of any future insurgencies, the country shifted the focus of its health policy towards decentralization and localization of medical technologies; this way, potential political unrest could only have a limited impact on the provision of health services (3). The government began to devolve its funds to local bodies to minimize risks (12), giving community organizations and NGOs more autonomy.

Nepal's Pluralistic Health System

Due to the previously mentioned economic liberalization policies and civil conflict, Nepal's health system is highly fragmented. Public health care receives limited funding, and the private health sector primarily serves urban centers (Saito et al. 818). Both public and private health care are subdivisions of "modern" or "Western" medicine, but other forms of medicine exist as well, including folk medicine (e.g. witch doctors, faith healers) and traditional medicine (e.g. Ayurveda, Homeopathy) (Subedi, "Primary Health Care" 323). In rural parts of the country, the latter are more widely used and trusted than modern forms of medicine; studies indicate that this is because they are "socially and culturally closer to the people, whereas modern health care has been criticized for being unacceptable and unsatisfying to most of the population" (Subedi, "Modern Health Services" 412). When dealing with an illness, patients want not only a cure, but also a meaning behind the experience of the sickness itself (413). While folk and traditional medicines serve both of these functions, modern medicine addresses only the first.

People in rural areas are also distrustful of lo-

cal HCPs because they believe that preferential treatment is given to those of a higher caste. In a case study at a rural health post, a respondent claimed that higher-caste, influential patients received "most of the time of the health post staff" as well as "free medicine", while the poor were simply directed to "buy from the shop" (Niraula 157). As a result, modern medicine and primary health care offered through health posts are generally seen as a "last resort", and over three-quarters of all ailments in the country are treated by the alternative systems (Subedi, "Modern Health Services" 413).

Moreover, modern medicine is less accessible than its alternatives, as the journey to health posts can be treacherous for rural folk. Nepal has "scattered rural roads networks," and the "rugged, harsh, and diverse" terrain in rural regions makes long travels dangerous (Bhandari 8). Land mines used during the People's War (Shneiderman and Turin 145), as well as the recent earthquake in 2015 left many roads irreparably damaged. Landslides are common occurrences (Petley et al. 40), and inclement weather puts travellers' safety at risk (Gentle and Maraseni 32).

Modern medicine is also the most expensive form of care, as the increased privatization of services has rendered health care and medications unaffordable for poorer individuals. They therefore rely on subsidized public institutions for the majority of their healthcare needs, but even the state-run health posts can be costly. Although universal public health care was introduced in 2007, it covers only basic health services and access to 40 essential drugs (Ministry of Health & Population 8). As a result, out-of-pocket healthcare expenses by individual households remain tremendously high, accounting for over 62.5% of the country's health financing (WHO 46). These user fees serve as another barrier to the use of modern medicine and equitable health care access in Nepal.

The locals' dislike of modern medicine at health posts, as well as difficult standards of living in rural areas, mean that HCPs are dis-

inclined to work in rural regions of the country. Privatization is also weakening the public health system, because a “brain drain” is occurring as educated citizens of the country are repelled from public service and are drawn towards working in the more lucrative private sector (Nichter 669). Consequently, public health services lack coordination, are inadequately sourced and understaffed, and have inefficient bureaucratic structures (Mishra et al. 1).

The Role of the NGO

The shortcomings of Nepal’s government-funded modern health system necessitate the operation of numerous health-oriented NGOs in the country. These NGOs vary in scope, structure, and size (Sherraden et al. 396), but are similar in aim: to better meet the medical needs of rural communities in Nepal. Increasingly, local NGOs are partnering with organizations from other countries to receive international volunteers, who then help provide care to Nepalese people. Especially popular are short-term medical service trips (MSTs), which allow foreign HCPs to travel overseas to the Global South and provide medical services for days or weeks at a time (Asgary and Junck 625). Medical professionals bring specialized skills and expensive equipment that can be very helpful to low-resource regions.

The most obvious benefits of MSTs are access to “highly-trained specialists” and “procedures not always possible within local infrastructure” (Green et al. 11). Specialized medical services can be offered in a timely manner, thereby saving citizens’ lives (Citrin 14). In addition, MSTs facilitate the exchange of knowledge and skills between local and foreign health workers, and thus have the potential to improve the quality of domestic care (Dixit et al. 414).

Implications of MSTs

One critique of MSTs is that an inherent power imbalance exists when NGOs operate within a country of the Global South. International volunteering can be considered a one-way

exchange of goods and services, in which the sending country is the sole provider, and the receiving country is the sole benefactor. Yet, “volunteering as ‘service’ tends to reinforce power differences between giver and receiver” (Lough and Oppenheim 198). This means that the host country largely has little to no control when an international NGO attempts to operate within it. As a result, the foreign NGO often has complete freedom when deciding where in the country to send its aid, and to whom to give it (Bauer 3). In Nepal, this has resulted in a clustering of volunteer positions and NGO health projects in popular tourist areas, due to their “exotic” allure and appeal (Citrin 52).

The localization of NGO projects within the same region further introduces problems. A case study in the Humla district of Nepal found that there was a complete lack of coordination between NGOs operating within the region, as they would avoid working with each other for want of more autonomy and control (Citrin 39). In consequence, health services were frequently duplicated, or they nullified each others effectiveness. This resulted in further fragmentation of health care delivery, diminishing the quality of care that was provided to individuals (40).

The supersaturation of NGOs in certain localities also perpetuates cycles of inequality in host communities, as the input of foreign capital takes pressure off the local government to invest in its health care. A case study conducted of MSTs in Ghana found that when deciding where to invest money to improve health care, the Ghanaian government first considered the number of existing NGO services already in the area, regardless of their quality (Green et al. 6). Given that Ghana and Nepal have similar health systems with medical personnel shortages in rural areas (Drislane et al. 325), similarly structured health insurance systems (Saleh 107), and influence from NGOs (48), it is not unreasonable to expect that the same phenomenon occurs in Nepal. As a result, having multiple NGO health projects operating within the same locality in Nepal only impedes health

development. Evidently, MSTs increase the host country's dependency on foreign humanitarian aid and are thereby weakening Nepal's health system (Asgary and Junck 627).

Moreover, the same case study of an NGO in the Humla district found that NGO projects tend to be "highly performative" because they are greatly publicized. There are often domestic and international film crews present, so NGO operations are frequently brought to public attention. It is not uncommon to find local politicians and prominent figures speaking at opening and closing ceremonies, idealizing what the NGO will accomplish (Citrin 45). Such displays continue unchecked because no formal systems currently exist which can evaluate the actual impact of MSTs. NGOs themselves are unmotivated to develop and conduct objective analyses of their operations-in part because this is logistically difficult, but mainly because NGOs run on funds from donors (Suchdev et al. 47). They feel pressure to prove the magnitude of their impact, and to do so positively in order to continue receiving donations. In an attempt to substantiate their work, NGOs resort to maximizing the number of patients seen, surgeries performed, and drugs administered (Bauer 8). However, donors are "unaware that these numbers mean little in the overall context of a poverty-driven health status," (9) since having access to health care does not automatically imply that an individual is 'healthy'.

The difference between 'health' and 'health care' is especially relevant in the Nepalese health system, where there is great emphasis on dispensing medication to outpatients (Citrin 57), as opposed to addressing the root causes of health problems. The current 'fee-for-service' system lacks regulation and encourages pharmacists and local HCPs to over-prescribe medications; after all, the more medicines are sold, the more money they will make. Because drugs are short-term interventions that are costlier to deliver and easier to market to patients, they are more profitable (Maru and Uprety). Therefore, medications discourage longitudinal and preventive approaches

to medicine.

When MSTs administer as many drugs as possible to prove their efficacy, this only perpetuates the short-sighted, problematic obsession with drugs in Nepal. It encourages what Whyte et al. call a "medicalization of health": when medicine is used to "solve the problems that should be addressed in other ways" (5). In fact, the prospect of free medicine is the very reason that many rural patients make the long journey to NGO health camps. Citrin suggests that at rural health posts, medications are "symbolic" of more than a cure: they provide an opportunity to connect with people who care and can "confirm and legitimize sickness and bodily discomfort," thereby providing underprivileged people with hope (47). However, this weakens the local health system, as it fosters locals' glorification of Western approaches to medicine. Although modern medicine is often considered the "last resort" in Nepal's pluralist health system (Subedi 323), the allure of foreign medicine is enough to attract locals' attention. Then, the Western paradigm "competes with, rather than supports, local health strategies," (Bauer 4) as local residents place more faith in the health care provided by a foreign HCP than a local HCP. They will wait for the next arrival of free health care from an MST, rather than consulting local medical personnel for even a minimal cost.

Not only do local citizens distrust local health workers, but the 'Western savior complex' also causes many international volunteers on MSTs to underestimate their local counterparts (Roberts 1491). This misunderstanding may stem from the fact that many local health workers in Nepal are "female community health volunteers" (FCHVs) who do not have traditional medical degrees (Khanal et al. 256). Even so, FCHVs are competent and key to local health centers (Khatri et al. 1). They provide services that would elsewhere be undertaken by professional HCPs, including childbirth assistance, medication distribution, and provision of emergency contraception (Panday et al. 9). Moreover, local health care professionals do have medical degrees

and extensive training (Dixit and Marahatta 16). When these local HCPs are undermined and underestimated, both by local patients and foreign volunteers, they become disheartened. Many may choose to leave rural areas and practice in regions without NGO operations (Bauer 4), rendering certain areas further depleted of health resources and in need of more foreign volunteers.

A Short-Term Remedy

Health camps in Nepal have long been regarded as solely short-term establishments. During the People's War, Maoists raided health posts, evicted NGOs, and antagonized health projects (Singh 1499). Land mines were planted throughout the countryside, which destroyed roads and hindered the distribution of medicines, as well as access to rural health posts. Because of the constant threat, health posts increasingly adopted short-term approaches to health care provision (Citrin 40), limiting their ability to effectively provide continued care for patients. This temporary role of health posts is also presenting itself in the operations of MSTs, which range from just one week to three months in duration (Citrin 12). However, this short-term approach to health care encourages the previously mentioned obsession with medication (57), and promotes immediate solutions to complex problems. Such a mindset poses many threats to the wellbeing of patients, diminishes the quality of treatment, and hinders system development.

Studies indicate that long-term volunteer placements are more conducive to 'capacity development,' which is the improvement of a country's ability to achieve its own development objectives over time. Placements lasting several months or longer are better able to foster equitable partnerships between the sending organization and host (Schech et al. 363), as they allow for more collaboration and input from the local community. Since there are more opportunities for all stakeholders to contribute and have their say, long-term volunteering is more capable of equalizing the power imbalance inherent in international volunteerism (Sherraden et al.

401).

In contrast, short-term placements are more one-sided, less efficient, and interruptive of continual service. They encourage more paternalistic provision of care, as "when people do not expect meaningful future interactions, they easily justify taking advantage of the other party," even subconsciously (Lough and Oppenheim 204). Short-term volunteering has been shown to clearly benefit the volunteers, but impacts on the host community are less clear (Sherraden et al. 405). From reviewing the evidence, it is clear that the short-term nature of MSTs only exacerbates their associated risks, further indicting them.

The short length of MSTs makes it easy to conflate volunteering overseas with going on a brief holiday. As it is, volunteer placements in Nepal can easily be misconstrued to serve as a cheap alternative to a 'vacation'-the proximity of the Himalayas is attractive to those who want to go backpacking or seek spiritual enlightenment. Nepal is often romanticized and exotified, so it is the perfect 'destination' for people looking to "do good" while travelling (Citrin 53). Consequently, international volunteers usually underestimate the hardships of life in the country, and do not realize exactly what they are signing up for beforehand (Asgary and Junck 626). In a qualitative study of an NGO called PHASE Worldwide, international medical volunteers indicated that they felt "contextually naïve" in Nepal, despite having received "comprehensive pre-placement briefings and documents, and having had contact with previous volunteers" (Elnawawy et al. 331). Considering only a fraction of sending organizations bother to brief their volunteers at all, most international volunteers lack cultural understanding and are unprepared for the conditions in which they will be working.

This lack of cultural awareness can make it difficult for international volunteers to properly communicate with their patients. Nepal is incredibly diverse, and while the only official language is Nepali, there are 123 native languages

(Central Bureau of Statistics 164). There is considerable variation in language, even between neighbouring villages, so international volunteers rarely have a grasp of the local dialect. Although local HCPs may be present to help with translation, this is inconvenient and only slows down the health post's operations (Green et al. 11). As a result, even when a patient is clearly confused, it is not uncommon for foreign HCPs to rush them along in order to see as many patients as possible (Bauer 8). However, clear communication is very important in effective health care, as misunderstandings can lead to misdiagnosis or incorrect treatment (5). The language barrier also makes it difficult to obtain informed consent from the patient, putting patient autonomy at risk (Roberts 1492).

Furthermore, short-term MSTs are troubling because they do not demand accountability from foreign HCPs. Since the visits are brief, patients have very little opportunity to interact with the volunteers; their time together is further shortened by the volunteers' rushing to see as many patients as possible. Unless ailments can be treated entirely in one visit, short-term MSTs leave little to no opportunity for continuity of care. As a result, foreign HCPs do not follow up with the patients they have seen and are consequently not held accountable for the services they provide. This burdens the local healthcare system with providing follow-up care, should any complications arise once the volunteers are gone (Asgary and Junck 626). Therefore, MSTs can place significant stress on local health workers, rather than helping them.

The main concern regarding short-term MSTs is that they do nothing to tackle the root cause of poor health in Nepal. Poor health outcomes are merely a symptom of much more complex systemic issues—poverty, education, and culture are just a few of the many determinants of health (Chapman 19). Since MSTs are temporary and do not involve long-term initiatives to contribute to development, they are simply “band-aid” solutions. For instance, volunteers serving in the Karnali district of Nepal shared

concerns that they were not making any real contributions to improving Nepalese health, saying, “I can't help but wonder if I'm treating hunger pains here,” and, “How do I tell people that their chronic pain comes from a life of chronic work, which they can't stop because their livelihood depends on it?” (Citrin 56). Such examples demonstrate the impermanence of any treatments offered by foreign HCPs on MSTs. Even when they want to, volunteers are unable to involve themselves with activities that will spark long-lasting change in the area.

The “Better Than Nothing” Mentality

If there are so many drawbacks and risks associated with MSTs, why do they continue to operate so widely? Commonly, the role of MSTs is justified with the argument that any health care is “better than nothing,” even if it is not of the highest quality (Bauer 5). Without a doubt, the health services provided by international volunteers have saved countless lives (Asgary and Junck 629). However, it is likely that just as many lives have also been hurt by MSTs. The “better than nothing” mentality is damaging, as it introduces double standards in the quality of care provided to patients in Nepal. This makes it easy to sidestep regulations and encourages international volunteers to make risky or unethical decisions in the name of saving as many lives as possible. Coupled with the inherent power imbalance, this can be quite dangerous for Nepalese patients, as many blindly trust foreign HCPs and do not doubt what they are told.

For instance, many sending organizations will accept any and all applicants to volunteer with them. Global health electives have become increasingly popular in universities, so medical students—and even undergraduate students—will volunteer on MSTs (Asgary and Junck 625). They are often asked to perform services for which they have absolutely no training, such as “delivering babies, suturing wounds, or pulling teeth” (McCall and Iltis 290). Common motives to volunteer abroad generally have little

to do with helping the local community; many MSTs are advertised to students as an opportunity to gain clinical experience, or as something ‘unique’ to add to a resume (Projects Abroad Inc.). Practicing medicine without proper training would be unthinkable in the Global North, but the “better than nothing” principle justifies it in low-resource settings. This puts patients at risk, undervaluing life when it exists in poorer settings.

Even professionally-trained foreign HCPs may not have the skills required to practice in Nepal, and volunteers may feel pressured to perform services with which they are unfamiliar. There is a big difference between practicing medicine in a wealthy region, and in a poor setting like Nepal. In remote regions of the country, there is limited access to “paper, medication...or reliable power and water” (Bauer 4), let alone advanced medical technology. Yet, Western medical practice is highly reliant on technological aid for diagnosis and treatment (Giordano et al. 31), so HCPs without the clinical skills specific to low-resource health care may find it difficult to provide services as thoroughly as they would at home.

Despite the scarcity of resources, foreign HCPs often use diagnostic tests and tools excessively, as they are generally unfamiliar with local ailments and want to “rule out” as many medical conditions as possible in the shortest amount of time (Hozo and Djulbegovic 548). Doing so wastes resources in a setting with already low supplies. Moreover, it can harbour contentious relationships between the volunteers and local HCPs, who view the former as being insensitive to the value of medical resources (Elnawawy et al. 332). While long-term international volunteers may adapt their skills to a new environment over time, volunteers on short-term MSTs do not have the opportunity to do so and are therefore more likely to be wasteful in their practice.

In addition, if volunteers are unfamiliar with the social and living conditions of rural Nepal, there can be unforeseen consequences of

the treatments they administer: for example, ibuprofen given to treat stomach ulcers causes internal bleeding without adequate water or food (Bjarnason et al. 1832); prosthetic hips are life-altering for Nepalese people, who are accustomed to squatting (Dupuis 434); antibiotics can sometimes trigger unexpected allergic reactions (Llor and Cots 1349); and anti-diarrhea medications are counterproductive when taken with contaminated water (Werner 22). Moreover, medicine bottles with labels in a foreign language are risky in the Nepalese culture, which highly encourages sharing (Montgomery 97).

A foreign HCP’s lack of awareness of local conditions can, in extreme cases, even lead to death. Citrin recounts the example of a Nepalese woman that died after undergoing deworming surgery, all because a foreign HCP decided that the donated blood did not have to be tested beforehand (Citrin 55). In this case, the volunteer’s unfamiliarity with the region led to an unnecessary death; she failed to recognize that blood verification is essential in a country with rising rates of HIV/AIDS. In another instance, a local patient received a deadly infection after being operated on in an unsterile room (58). These fatal mistakes were catalyzed by negligence and the “better than nothing” mentality, which encouraged volunteers to make decisions with harmful repercussions.

Conclusions

As explored in this report, short-term MSTs and international volunteering hinder the development of the Nepalese health care system. They can discourage government investment in the health sector, worsen job prospects for local health workers, and fuel the “medicalization” of health care. Their short duration encourages a paternalistic relationship between the sending and host countries, ethical double standards, and subpar provision of care. The aid given can, at best, be considered a “band-aid solution” to the greater, multilayered problems that are afflicting the overall Nepalese health care system.

Normally, the drawbacks of MST operations

in Nepal could be weighed against the benefits of getting life-saving medical care to underprivileged people that desperately need it. However, the incompetence of the international volunteers, accompanied by a lack of cultural and social awareness, exposes patients to numerous unforeseen complications-some of which are fatal. Given the great difficulties that locals endure to travel to the NGO health posts, it is crucial that MSTs fulfill their promise of healing, rather than hurting, their patients.

If MSTs are not properly fulfilling their main goal of providing immediate relief to rural folk in Nepal, and are hurting long-term development, should we completely avoid them? It is undeniable that countless people in Nepal rely on foreign medical assistance for survival. Stopping MST operations would endanger these lives, and bring other ethical concerns into question. At the same time, continuing MST projects in their current state, while knowing of their potential harms to the Nepalese health system, is unacceptable.

Accordingly, future research should consider

developing guidelines and “best practices” for NGOs facilitating MSTs in Nepal. To better inform changes in NGO policy, there is a need for more empirical research that qualitatively or quantitatively measures the impacts of MSTs. It is therefore vital that NGOs begin to collect data to transparently monitor their operations. In addition, long-term service trips (lasting for several months at a time) should be popularized over short-term trips to mitigate the lack of cultural awareness and accountability. Furthermore, MSTs should focus on capacity building by emphasizing knowledge transfer and professional development, as opposed to technical and clinical assistance. These recommended MST structures can more effectively serve a countrys immediate healthcare needs, while simultaneously working towards achieving its developmental goals (Schech et al. 362). There may be no “perfect recipe,” but international medical volunteerism in Nepal must ultimately be reformed so that it better helps the people it aims to care for.

About the Author

My name is Parnika, and I recently completed my first year in the Arts and Science program at McMaster University. I have an interest in global health and sustainable development. This piece about medical service trips in Nepal is a response to the emerging trend of undergraduate students ‘voluntouring’ overseas, with the aim of strengthening their applications to medical school. I hope that this work sheds light on what is an overall complex and multi-layered topic.

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The Value of Interactional Expertise: Perceptions of Laypeople, Interactional Experts, and Contributory Experts

Maytal Perlman

Introduction

In their book *Rethinking Expertise*, sociologists Harry Collins and Robert Evans lay out a framework for classifying expertise which they dub “The Periodic Table of Expertise” (Collins & Evans, 2007). They envision the table to take the form of a ladder, with each rung representing a different level of specialist expertise (Collins & Evans, 2007). Collins and Evans revise pre-existing concepts of this “ladder of expertise” by including a rung called “interactional expertise.” Interactional expertise is the second highest rung on the ladder. It is the level immediately below “contributory expertise”, which comprises the

highest level of specialist knowledge and is populated by PhDs, MDs and the like. According to Collins and Evans, interactional experts are proficient in the language of a specialist domain, but they do not actively practice the science of that domain.

In this paper I will take a deeper look at how interactional experts are likely to be perceived by themselves and by others. In doing so, I will uncover what I believe are shortcomings of the “interactional expertise” label. In particular, I argue that Collins and Evans do not account for the limitations of interactional expertise caused by the way contributory experts and laypeople

perceive the value and credibility of interactional experts. In Section 1, I provide an overview of Collins and Evans' framework for classifying expertise and outline the definition of interactional expertise as conceived by Collins and Evans. In Section 2, I analyze how interactional expertise is assessed and by whom. I examine the operational definition of interactional expertise employed by Collins and Evans, as well as a more inclusive operational definition proposed by Kathryn Plaisance and Eric Kennedy. In doing so, I argue that because laypeople cannot measure interactional expertise, the label is limited in its ability to bridge the gap between science and society. In Section 3, I explore the relationship between contributory experts and interactional experts, considering the potential for tensions to arise due to each party overestimating the value of their respective expertise. I continue with a discussion on the merits of a contributory expert. Then, in Section 4, I discuss the relative merits of interactional experts, and claim that while contributory experts can also possess interactional expertise, they cannot provide the same value as solely interactional experts. I argue that the solely interactional expert can have a different approach to a problem within a discipline because of their lack of contributory expertise in that discipline. I compare this claim to a similar account of the value of differing perspectives seen in design-thinking. In Section 5, I explore how the unique abilities of an interactional expert might lead the interactional expert to inflate the value of their expertise relative to that of the contributory expert. Finally, I conclude that optimizing how interactional expertise is perceived by laypeople, interactional experts, and contributory experts is a critical step towards realizing the full benefits of the interactional expertise concept.

Section 1

In their book, Collins and Evans introduce the "Periodic Table of Expertise", a framework for classifying different levels of expertise and knowledge (Collins & Evans, 2007). According

to Collins and Evans, there are five levels of specialist expertises, and they can be viewed as the five rungs of a "ladder of specialist expertises". The highest rung on Collins and Evans' "ladder of specialist expertises" is "contributory expertise." Contributory expertise is the kind of expertise associated with those practicing science at its core, such as individuals with PhDs and researchers. Contributory experts have progressed through a five stage model of expertise acquisition, going from novice to advanced beginner, competence, proficiency, and finally to expertise (Collins & Evans, 2007). As a contributory expert, the individual has embodied the skills and internalized the content of the science (Plaisance, 2015). These experts not only contribute to the knowledge in their field, but practice alongside other experts at the core of the discipline. This "enculturation" is fundamental for acquiring the tacit knowledge that must be understood as a contributory expert (Collins & Evans, 2007). In their book, Collins and Evans introduce a new level of expertise, "interactional expertise" which lies immediately below contributory expertise. Interactional expertise is expertise in a disciplinary language, without expertise in the corresponding disciplinary practice (Collins & Evans, 2007). The interactional expert can speak the language of a discipline with the same fluency as the contributory expert, but without actually practicing the skills of the discipline. Interactional expertise does not require the acquisition of a formal degree. Rather, it is achieved by enculturation in the community of a discipline, without complete immersion in the physical aspects of the community (Collins & Evans, 2007).

The addition of interactional expertise as a level of specialist expertise was the product of a desire to better classify knowledge and expertise. The concept of interactional expertise was born out of Collins and Evans' experiences as sociologists immersed in other specialist domains (Collins & Evans, 2007). In their work, they not only collaborate with people of different disciplinary backgrounds, but delve deep into the

language of a discipline such that, in speech, they are indistinguishable from the experts with whom they are working (Collins & Evans, 2007). Essentially, Collins and Evans have each acquired interactional expertise, and recognized a gap in existing expertise classification systems (Collins & Evans, 2007). They identified that they possessed a thorough knowledge of a discipline (in addition to the one in which they were originally trained); which had previously not been recognized as significant. In developing a framework for expertise that included interactional expertise, Collins and Evans aimed to address the gap they had identified between “primary source knowledge” and “contributory expertise” (Collins & Evans, 2007). By creating a new level of expertise, Collins and Evans shed light on the importance of interactional expertise and its unique properties.

Section 2

Collins and Evans’ development of the interactional expertise label is most successful in attesting value to the knowledge of individuals that are fluent in the language of a specialist domain without practicing the skills of the domain. Likewise, the biggest limitation of the interactional expertise label is its lack of far-reaching credibility. When a hopeful interactional expert is acquiring their expertise, they undergo a progression from “interview” to “discussion” to “conversation” with the contributory expert (Collins & Evans, 2007). They incrementally learn more and more of the language until the contributory expert willingly converses with the interactional expert about the practice of their science (Plaisance, 2015), and is even receptive to critical comments from the interactional expert (Collins & Evans, 2007). When discoursing with experts who were not involved in helping the interactional expert gain their expertise, they must still have their expertise validated by the individuals or groups with whom they are interacting. Moreover, while the interactional expert may be considered credible within the inner circle of the domain in which they have

interactional expertise, this does not translate into credibility amongst laypeople farther down the ladder.

Collins and Evans discuss passing an “imitation game” as the marker of a true interactional expert (Collins & Evans, 2007). To succeed, an interactional expert must demonstrate their fluency in the language of a discipline by proficiently answering domain-specific questions posed by a judge such that the judge identifies the individual as a contributory expert. This method for determining interactional expertise is challenged by Kathryn Plaisance and Eric Kennedy in their 2014 paper wherein they build upon Collins and Evans’ framework to develop a more pluralistic account of interactional expertise (Plaisance & Kennedy, 2014). The authors critique Collins and Evans’ adherence to the imitation game as the defining measure of interactional expertise. Plaisance and Kennedy posit that in limiting the operational definition of interactional experts to those that pass the imitation game, Collins and Evans exclude certain individuals or groups that possess relevant interactional expertise in keeping with the original operational definition of interactional expertise as having “enough expertise to interact interestingly with participants and carry out a sociological analysis” (Collins & Evans, 2002). Plaisance and Kennedy therefore argue for a pluralistic account of interactional expertise, operationally defined by the interactional expert’s ability to interact interestingly with contributory experts (Plaisance & Kennedy, 2014).

Both operational definitions, however, require the evaluator to have contributory expertise. The judge in the imitation game and the person who identifies instances of “interact[ing] interestingly” must have contributory expertise in the domain of interest in order to do so. This runs counter to one of the primary objectives of interactional expertise, namely, to increase the uptake of scientific knowledge and mediate between scientific communities and important stakeholders (Plaisance & Kennedy, 2014). If the concept of interactional expertise is to re-

alize its full potential, then individuals with less expertise than an interactional expert (and therefore contributory expert) must be able to assess the credibility of an interactional expert.

As it stands, interactional experts may be trusted by laypeople based on their affiliation with contributory experts. If the interactional expert's credibility is contingent on their association with contributory experts, this can add an additional layer of complexity to the relationship between interactional expert and contributory expert.

Section 3

In their book, Collins and Evans discuss how the different specialist expertises relate to one another in terms of their transitivity: on the "ladder of specialist expertises", those at higher rungs inherently have the expertise of all the rungs below them as well (Collins & Evans, 2007). While they establish the transitivity of the levels of expertise, they do not touch on the relationship between experts at different levels. Most lacking is a discussion of the relationship between interactional experts and contributory experts. Such a discussion is crucial because the identity of an interactional expert (and therefore the definition of interactional expertise) hinges on that of the contributory expert. Thus, the inner workings of this relationship are of utmost importance as they in turn reveal both the triumphs and shortcomings of the interactional expertise label.

The relationship between a contributory expert and an interactional expert within a domain has the opportunity to be, and often is, mutually beneficial. However, tensions may arise between the two as a result of inflated valuations of expertise. As mentioned earlier, the contributory expert has traditional formal, training such as a doctorate, and has spent years moving up the academic ranks to achieve this accreditation. Alternatively, the interactional expert has informal experience in the specialist domain. Given the contributory expert's formal expertise in the domain of interest, they might value their own

form of expertise more highly than that of the interactional expert. This may be further exacerbated in the case of an interactional expert that is not also a contributory expert in another specialist domain. Interactional experts in this category may already be from marginalized groups, and therefore may have their relevant expertise further under-valued by the contributory expert (Plaisance & Kennedy, 2014). However, to a certain extent, the contributory expert's valuation may be reasonable, and it is important to remember that "it is the contributory experts not the interactional experts who define and develop the content of the language that the interactional expert tries to master" (Collins & Evans, 2007). The contributory experts are the ones actually *doing* the science, and while interactional experts can *talk* about the science, they cannot practice it (Collins & Evans, 2007).

Section 4

In establishing the interactional expertise label, Collins and Evans recognize the value of interactional experts and their role as specialists in a discipline. By definition, interactional experts cannot perform the work of contributory experts, but it is equally important to note that many contributory experts are not doing the work of interactional experts. The contribution of interactional experts is made possible by their inherent interactive and reflective abilities, skills which are not always shared by contributory experts (Collins & Evans, 2007). According to Collins and Evans, "interactive abilities" are interpersonal skills that enable an individual to communicate and interact with others. Alternatively, "reflective abilities" are the contemplative, critical thinking skills that are vital for an interactional expert's analysis. The importance of these abilities with regards to the efficacy of the interactional expert can be understood through Collins and Evans' analogy of the interactional expert as a coach. When instructing the player how to perform an action, the coach/interactional expert must have strong interactive abilities if they

are to effectively communicate tacit knowledge to the player/contributory expert (Collins & Evans, 2007). Interactive ability is the mechanism by which interactional experts articulate tacit knowledge to the contributory expert. This task lies solely in the hands of the interactional expert, who has all the tacit knowledge of the contributory expert, but can still access the rules and facts that are inaccessible to the contributory expert, in the same way that an experienced driver often cannot recall how they drove to work.

Another advantage of the interactional expert is that they have a different perspective to think critically about the problems facing the domain of interest. Collins and Evans state that one of the basic principles of their table is that individuals possessing higher levels of expertise also possess the expertise of all the preceding levels (Collins & Evans, 2007). Therefore, contributory experts must also possess interactional expertise, though their interactional expertise can be either latent or realized (Collins & Evans, 2007). According to Collins and Evans, a solely interactional expert in a field can add the same value as a contributory expert in that field who also has realized interactional expertise (Collins & Evans, 2007). While both individuals may be considered to possess interactional expertise in that field, I disagree that they can add the same value as interactional experts. Someone with only interactional expertise in a specific field has a distinct epistemic perspective from someone with both contributory expertise and realized interactional expertise in the same field. While they are both fluent in the language of the discipline, they may speak different dialects that signify where they were “raised”, and where they learned the language. The solely interactional expert did not receive the same training as the contributory and interactional expert. They were not taught the same ideologies, and were not “raised” with the same disciplinary norms passed down to the contributory-and-interactional expert via formal education. For this reason, the solely interactional expert can

have a different approach to a problem within a discipline resulting from their lack of contributory expertise in that discipline.

The added value of differing perspectives is encountered in design-thinking as well. In his book *Glimmer*, Warren Berger collaborates with top designer Bruce Mau to share how design can improve our lives and transform the world (Berger, 2009). According to Berger, the act of questioning basic assumptions can lead to true innovation. Along with questioning assumptions, reframing familiar problems in unconventional ways can lead to meaningful solutions (Berger, 2009). These two design principles rely on the relative “ignorance” of the designer compared to the client. Without the depth of tacit knowledge tying them down, the designer is able to look at a problem without subconscious assumptions getting in the way of a solution. Paula Scher is quoted in *Glimmer* as saying that “if you’re trying to find a new way to think about something that makes it better, it can actually hurt you to have too much experience in that milieu - because you understand the expectations too well. And that can cause you to edit your possibilities based on what you already know ‘doesn’t work’” (Berger, 2009). In the case of expertise, it is because the interactional expert isn’t *doing* the science that they are in a position to challenge *why* the contributory expert is doing something in a certain way, and may then be able to use their objectivity to find a better way to do said task. One may be inclined to object the application of this principle to interactional experts, because by definition interactional experts are just as fluent in the language of a discipline as the contributory experts are, and therefore they *do* know the background knowledge. While they do have more disciplinary knowledge than the designers Berger describes, they have no experience actually performing the actions of that discipline, thereby making this principle applicable.

Section 5

In discussing the relative merits of interac-

tional and contributory expertise, it is worth exploring potential complexities that arise in the relationship between interactional and contributory experts as a result of each expert's perception of the other and valuation of the other's expertise. The contributory expert, in keeping with Collins and Evans illustration of a "ladder of expertises", can easily view their expertise as more valuable than that of individuals lower down the ladder, specifically interactional experts. The concept of interactional expertise is defined by the interactional expert's inability to do something that the contributory expert can: practice the science of the specialist domain. However, after proposing that the interactional expert is able to add value in a way that the contributory expert cannot, I now explore the potential implications of this re-weighted interactional/contributory expert relationship. In doing so, I do not intend to assign static value judgements to interactional or contributory expertise. Rather, I examine the range of ways in which interactional and contributory experts perceive each other's expertise. In doing so, I identify opportunities to further develop the concept of interactional expertise in a way that addresses and responds to possible tensions between the two groups.

As previously noted, the contributory expert may over-estimate the value of their expertise based on their formal training and experience practicing the science of the domain. Likewise, the merits of possessing only interactional expertise may cause the interactional expert to inflate the value of their expertise relative to that of the contributory expert. This idea is supported by the findings of a 2007 study on the identities of creative workers in advertising agencies (Hackley & Kover, 2007). Authors Chris Hackley and Arthur Kover interviewed copywriters from several advertising agencies in New York and described how several interviewees "identified themselves as members of an elite whose role it is to use their fine judgment as creative individuals to inspire consumers" (Hackley & Kover, 2007). Hackley and Kover note that cre-

atives assume they understand advertising better than the account managers, even though those in other departments may undermine the professional legitimacy of creative work (Hackley & Kover, 2007). In the same way that the unique skillset of creative workers in advertising has led to elitism amongst certain creative workers, there is a risk of interactional experts developing similar attitudes. Although, this may not be a major cause of concern because the merits of interactional expertise and other integrative skills are less frequently recognized compared to those of highly specialized expertise. However, if a contributory expert's inflated valuation of their own expertise can be traced back to their disciplinary training, then we must also be cautious not to nurture a similar sentiment in interdisciplinary training that heavily values interactional expertise. The inflated valuations of expertise of both interactional experts and contributory experts can threaten the interactional/contributory expert relationship, and in turn the success of the concept of interactional expertise as a whole.

Conclusion

The concept of interactional expertise is instrumental in legitimizing the expertise that individuals acquire as a result of enculturation in a specialist domain without practicing the science of that domain. Interactional experts are uniquely positioned to bridge gaps between science and society; however, this ability is limited by the inability of laypeople to identify interactional expertise. Laypeople cannot serve as the judge in Collins and Evans' imitation game, nor can they necessarily determine whether an individual has "interact[ed] interestingly" with contributory experts. Thus, laypeople may perceive a subject's interactional expertise only through their association with contributory experts. This dependence on contributory experts for determining interactional expertise has the potential to complicate the relationship between the two types of experts. This relationship is already layered and complex due to the ways contributory experts and interactional experts each determine

the value of their own expertise. Contributory experts, as the highest ranking experts, may inflate the value of their expertise relative to interactional experts, who do not have traditional, recognized accreditation nor do they actually practice the science of the discipline. However, interactional experts add value in other ways, including by providing different perspectives not influenced by experience *doing* the science. As such, there is also the potential for interactional experts to inflate the value of their expertise relative to that of contributory experts. While not necessarily realized in all contexts, these possibilities are important to consider as the concept

of interactional expertise continues to develop, especially because the success of interactional expertise is closely connected to the success of the relationship between interactional and contributory experts. Moving forward, Collins and Evans' framework can be improved upon by further addressing the nuances of the interactional expert and contributory expert relationship. Moreover, improving how interactional expertise is perceived by laypeople, interactional experts, and contributory experts is a critical step towards realizing the full benefits of the interactional expertise concept.

About the Author

Maytal Perlman is a student in the Knowledge Integration program at the University of Waterloo. Her academic interests include philosophy of science, health sciences, collaborative design, and drama & speech communication. Maytal is interested in exploring how design and collaboration practices can be used to improve patient care and healthcare outcomes. She began working on this piece as a student in Dr. Kathryn Plaisance's class "The Nature of Scientific Knowledge". Maytal's discussion on the concept of interactional expertise and how its value is perceived by various stakeholders is applicable to any specialist domain, and was inspired by her own experiences receiving an interdisciplinary education. She was motivated to publish in this journal because JIRR provides a space to engage in academic conversation that is not only interdisciplinary in nature, but directly concerns the study and practice of interdisciplinarity.

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The Deterrent Effects of Corporate Punishment: Restoring the Broken Image of the Pharmaceutical Industry

Emily Wong

Introduction

Over three hundred million people live in the United States, home of the world's largest healthcare industry. In the United States, \$300 billion a year is spent on prescription drugs alone, and that number is rising. Despite the undisputed fact that pharmaceutical companies have made significant contributions to health care and in improving quality of life for patients, they are regularly critiqued as one of the least trusted industries, next to the nuclear industry,

in public opinion surveys.² Numerous pharmaceutical companies commit crimes severe enough to be ranked in the top 100 corporate criminals list.³ However, when it comes time to prosecute them, their punishments are a mild reprimand for their crimes. Medications, and the industry that governs their development, the pharmaceutical industry, are human creations made to improve and extend our natural health boundaries and quality of life. However, what happens when too much power is extended to a technolog-

²David Taylor, "The Pharmaceutical Industry and the Future of Drug Development", *Pharmaceuticals in the Environment*, 2015, 1-33.

³Mokhiber, Russell, and Robert Weissman. "Top 100 Corporate Criminals of the 1990s." *Mother Jones*, Mother Jones, 28 June 2017, www.motherjones.com/politics/1999/09/top-100-corporate-criminals-1990s/.

ical system* that holds control of our most basic and vital human rights, namely that of health and life? Pharmaceutical companies are often deemed as the “thugs” of the medical industry because, like giant banks on Wall Street, they are accepted as too big to fail.⁴ Like many pharmaceutical companies, Pfizer abuses the power granted by the structure of the healthcare system to illegally commercialize products at the expense of a patient’s wellbeing without taking full responsibility of their actions when caught. This injustice causes societal implications, and all participants that ought to be “winners” benefitting from this technological system (e.g. patients, doctors, pharmaceutical companies, and the healthcare industry) instead secure more losses, ultimately becoming “losers” of the system. However, solutions in restoring the image of the pharmaceutical industry can generate the necessary stubborn change.

This Investigation seeks to explore the negative societal implications of limited regulation in unethical criminal acts of pharmaceutical giants and potential solutions to increase public trust in Big Pharma. It does this by drawing on literature from medical history, philosophy, and sociology. This piece integrates ideas from these disciplines by utilizing the ideas of an experienced physician and health journalist, an emeritus sociology professor interested in socio-technological systems, and an interdisciplinary Harvard philosophy and technology studies professor to better understand the ramifications of America’s self-destructive health care system and generate potential solutions to remedy its grave impacts on society.

**Note: the term technological system is used throughout this piece because medication and drugs are considered to be pieces of technology with the practical purpose of treatment, care, and promotion of health. The pharmaceutical industry is a system that employs drugs and medications, as is in large part a participant of the health care system.*

Background

Pfizer researches, develops, and produces vaccines and medications over a range of medical disciplines, including the widely known little blue pill, Viagra. The global pharmaceutical giant was established and produced its first product in 1849⁵ and has since accumulated over \$4 billion in fines.⁶ Pfizer’s fourth settlement over illegal marketing activities was the largest portion of the \$4 billion. An historic \$2.3 billion settlement resolved the civil and criminal allegations in fraudulent marketing for the painkiller Bextra, and other drugs including the antipsychotic Geodon, the antibiotic Zyvox, and the antiepileptic Lyrica.⁷ As of 2009, this settlement was the largest criminal charge of any kind imposed in the United States.⁸

Bextra was identified as part of a radical class of painkillers known as cyclooxygenase 2 (COX-2) inhibitors, at twenty times the price of ibuprofen, but intended to be safer than generic drugs.⁹ In 2001, Bextra was proposed to hit the market as an acute pain treatment after surgery. The U.S. Food and Drug Administration (FDA) approved Bextra for menstrual cramps and arthritis but deemed it unsafe at higher doses for acute surgical pain and for pa-

⁴Drew Griffin and Andy Segal, “Feds Found Pfizer too big to nail”, CNN Health, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

⁵Pfizer Inc., “Pfizer Company History”, <http://www.pfizer.com/about/history/all>

⁶Pfizer Inc. and Subsidiary Companies, “Pfizer 2010 Financial Report”, 2010, 66-68, <http://www.pfizer.com/files/annualreport/2010/financial/financial2010.pdf>.

⁷Office of Public Affairs, “Justice Department Announces Largest Health care fraud Settlement in Its History”, The United States Department of Justice, September 2, 2009, <https://www.justice.gov/opa/pr/justice-department-announces-largest-health-care-fraud-settlement-its-history>.

⁸“The Case Against Pfizer”, The Federal Bureau of Investigation, September 2, 2009, https://archives.fbi.gov/archives/news/stories/2009/september/pfizer_settlement_090209.

⁹Mark Ratner, “Pfizer settles largest ever fraud suit for off-label promotion”, Nature Biotechnology 27 (2009): 961-962.

tients at high risk of heart attacks. With billions in profit at stake, Pfizer and its partner, Pharmacia, neglected the approval of the FDA and employed teams of sale managers across the country to market Bextra to health care professionals.¹⁰ To further incentivize prescription orders from doctors, a multimillion dollar budget intended for medical education was used instead to illegally pay doctors as promotional speakers and consultants for Bextra and other drugs.

The act of promoting drugs for unapproved uses is called “off-label marketing” and it is judged as a criminal offence because it can severely harm the lives of patients, especially those with dire health conditions.¹¹ Even knowingly so, CNN Special Investigations Unit reported that a scripted sales pitch from Pfizer was emailed to sales representatives in Florida which condoned sales up to a 40 mg dose, twice what the FDA deemed to be safe.¹² In court, Pfizer pleaded that, “the company’s intent was pure”.¹³ However, when Bextra was taken off the market in April 2005, “more than half of its \$1.7 billion in profits had come from prescriptions written for uses the FDA had rejected.”¹⁴ Consequently, while the intent behind producing Bextra was to provide another alternative to improve the lives of patients suffering from pain, marketing Bextra at harmful unapproved dosages only harms these patients. If more than half of the earnings from Bextra came from off-label marketing, it is hard to believe Pfizer promoted Bextra with the patient’s best interest in mind.

The Conviction and Settlement

The number of patient lives put at risk increased with every sale of Bextra. Considering this was Pfizer’s fourth settlement over fraudulent marketing, the punishments for their crimes should logically increase in severity to cripple the company enough such that they learn their lesson. However, with the following complicated legalities of the case, Pfizer escaped severe corporate punishment and even had difficulties bearing the requirements of their favorable resolution.

Any company convicted of serious health care fraud faces automatic exclusion from Medicare and Medicaid as the one of harshest forms of corporate punishment. Doing so will prevent a company from collecting compensation for the products it provides to Medicare and Medicaid. Prosecutors tried convicting Pfizer with the automatic exclusion clause that would lead to Pfizer’s collapse. However, Pfizer’s general counsel, Amy Schulman, urged: “the vast majority of our employees spend their lives dedicated to bringing truly important medications to patients and physicians in an appropriate manner.”¹⁵ Therefore, in consideration of the Pfizer employees not involved in fraudulent activity, patients relying on Pfizer products through Medicare and Medicaid, and the losses for Pfizer shareholders, Pfizer was given an exception from the automatic exclusion condition.¹⁶ For redemption for all prior cases of fraudulent marketing, Pfizer was given a fourth chance.

Instead of imparting a criminal charge upon Pfizer, prosecutors agreed to charge Pfizer

¹⁰Mark Ratner, “Pfizer settles largest ever fraud suit for off-label promotion”, *Nature Biotechnology* 27 (2009): 961-962.

¹¹Erin Janssen, “Pfizer Settlement Makes History”, *Journal of Health Care Compliance*, December 2009, 33-36.

¹²Drew Griffin and Andy Segal, “Feds Found Pfizer too big to nail”, *CNN Health*, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

¹³Drew Griffin and Andy Segal, “Feds Found Pfizer too big to nail”, *CNN Health*, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

¹⁴Drew Griffin and Andy Segal, “Feds Found Pfizer too big to nail”, *CNN Health*, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

¹⁵Gardiner Harris, “Pfizer Pays \$2.3 Billion to Settle Marketing Case”, *The New York Times*, September 2, 2009, <http://www.nytimes.com/2009/09/03/business/03health.html>.

¹⁶Drew Griffin and Andy Segal, “Feds Found Pfizer too big to nail”, *CNN Health*, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

through its subsidiary, Pharmacia & Upjohn Co. Inc. A subsidiary corporation is defined as one in which a generally larger company, known as the parent corporation owns all or most of its shares. As the owner of the subsidiary, the parent corporation controls the activities of the subsidiary. Instead of a merger, forming a subsidiary may be more beneficial to the parent company because the approval of the stockholders is not required and the parent owns a controlling interest with a smaller investment. The parent and subsidiary remains as separate legal entities and the subsidiary may produce goods and services completely different from those produced by the parent company.¹⁷ Pfizer owns Pharmacia & Upjohn Co. Inc. through inheritance in owning Pharmacia & Upjohn LLC which owns Pharmacia & Upjohn CO. LLC which then owns Pharmacia & Upjohn Co. Inc. If Pfizer was the parent, the company charged with the subsidiary is the greatgreat-grandson.¹⁸ Pharmacia & Upjohn Co. Inc. was incorporated on March 27, 2007 in Delaware. This was the same day when federal prosecutors and Pfizer lawyers battled it out, which led to Pfizer pleading guilty for a bribery case a few years prior to the Bextra case. Thus, Pharmacia & Upjohn Co. Inc., the protective bodyguard against criminal charges for Pfizer was born. The bribery case ended with Pharmacia & Upjohn Co Inc. pleading guilty for Pfizer, and Pharmacia was excluded from Medicare while Pfizer was free to commercialize through federally funded health programs. The same pattern was observed in the Bextra case. Pharmacia pleaded guilty without ever having

sold a single pill or dosage of Bextra, while Pfizer was still permitted to sell its products to federally funded health programs. The subsidiary was nothing more than a shell company protecting Pfizer when it got caught in hot waters.¹⁹ Since Pharmacia's sole function was to take criminal pleas for Pfizer, the impact of corporate punishment was severely minimized.

Pfizer paid almost \$1.2 billion for Bextra but Pharmacia & Upjohn Co. Inc. was responsible for the rest.²⁰ Together, the fees total to \$2.3 billion, a record fine for any crime.²¹ Preceding the Bextra case, \$1.2 billion was the largest sum the federal government has ever collected, until together, Pharmacia and Pfizer nearly doubled it. However, to put the money into perspective, even the total \$2.3 billion collected amounts to less than three weeks of sales at Pfizer.²² Therefore, although \$2.3 billion seems like devastating debt to pay, for a pharmaceutical giant like Pfizer, it may simply be spare pocket change. Harvard Medical School health science researcher and attorney, Aaron Kesselheim, worries that "settlements for fraud should do more than punish a particular company...it should send a message to the industry about what are-or are not-reasonable practices...there's a big question as to whether these settlements actually do that."²³ Corporate punishment is meant to serve as a deterrent against criminal misconduct, but the punishment for Pfizer was essentially halved because they did not take full responsibility for their crime. Instead, Pfizer created an imaginary friend to take the fall for them.

¹⁷ "Subsidiary." The Free Dictionary, Farlex, legal-dictionary.thefreedictionary.com/subsidiary.

¹⁸ Drew Griffin and Andy Segal, "Feds Found Pfizer too big to nail", CNN Health, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

¹⁹ David Tippie, "Collapse of Drugs Due to Wellness" (Lulu Com, 2010), 12

²⁰ Office of Public Affairs, "Justice Department Announces Largest Health care fraud Settlement in Its History", The United States Department of Justice, September 2, 2009, <https://www.justice.gov/opa/pr/justice-department-announces-largest-health-care-fraud-settlement-its-history>.

²¹ "The Case Against Pfizer", The Federal Bureau of Investigation, September 2, 2009, https://archives.fbi.gov/archives/news/stories/2009/september/pfizer_settlement_090209.

²² Gardiner Harris, "Pfizer Pays \$2.3 Billion to Settle Marketing Case", The New York Times, September 2, 2009, <http://www.nytimes.com/2009/09/03/business/03health.html>.

²³ Mark Ratner, "Pfizer settles largest ever fraud suit for off-label promotion", Nature Biotechnology 27 (2009): 961-962.

While Pfizer was settling the improper marketing of Bextra and the three other medications involved, the company was also in the midst of bearing the expenses for marketing fraud with regards to the epilepsy drug, Neurontin, from 2004,²⁴ and federal charges in illegal promotion of the growth hormone, Genotropin, from 2007.²⁵ The Bextra scandal of 2009 was simply their fourth off-label marketing fraud, but it was not their last. In 2011, Pfizer was ordered to pay federal charges for illegally marketing the bladder drug Detrol.²⁶ With the settlements of Detrol and Bextra being only 2 years apart, it is safe to conclude Pfizer did not learn their lesson from punishments prior to Bextra, and they certainly did not learn their lesson after, either. Illegal advertisement and marketing are the only crimes considered in this report, but Pfizer's list of crimes under product safety, fixed pricing, bribery settlements, tax evasion, and more, are not short either. Mike Loucks, the federal prosecutor who oversaw the Bextra investigation worries that "the money is so great, dealing with the Department of Justice may be 'just the cost of doing business.'"²⁷

As part of Pfizer's Bextra settlement, and in exchange for continual participation in Medicare, Medicaid, and other federal health care programs, a five-year expansive corporate integrity agreement (CIA) was made between the U.S. Department of Health and Human Services to monitor future marketing activities.²⁸ The

CIA included ongoing review procedures and risk assessment. Pfizer pledged to create risk mitigation plans for every pharmaceutical product manufactured and an independent review organization (IRO) to evaluate product development and its promotions. Evidence of breach of the CIA can lead to the exclusion from participation of federal health programs which would most likely collapse the company. To cure an incompliance breach, Pfizer must comply to a firm monetary penalty at upwards of \$5,000 per day the CIA agreement is broken. The government used the Bextra settlement to set forth an example of the rigorous government investigations and settlements for Pfizer's peers in the pharmaceutical industry.²⁹

When the FDA tried to comply with Pfizer, warning them to report serious and unexpected side effects from produced drugs already on the market, Pfizer said they would collaborate with the FDA and "assured optimal surveillance and reporting of post marketing adverse events."³⁰ However, the FDA later cited several reporting lapses and even granted the company a waiver for 60 days to account for any complaints of Bextra which Pfizer simply ignored.³¹ Therefore, not only did Pfizer bear a minimal punishment in committing numerous fraudulent crimes, but they proved to have difficulty in adhering to their punishment as well. As a result, not only did other pharmaceutical companies learn how to evade drastic corporate punishment, they

²⁴ "Settlement Agreement", The United States Department of Justice, May 5, 2011,

https://www.justice.gov/sites/default/files/usaoedpa/legacy/2011/05/05/cephalon_settlementagreement.pdf.

²⁵ Executive Office for United States Attorneys, "Health Care Fraud", United States Attorney's Bulletin, January 2009, 8-7

²⁶ Office of Public Affairs, "Pfizer to pay \$14.5 Million for Illegal Marketing of Drug Detrol", The United States Department of Justice, October 21, 2011.

²⁷ Drew Griffin and Andy Segal, "Feds Found Pfizer too big to nail", CNN Health, April 2, 2010, <http://www.cnn.com/2010/HEALTH/04/02/pfizer.bextra/>.

²⁸ Erin Janssen, "Pfizer Settlement Makes History", Journal of Health Care Compliance, December 2009, 33-36 <http://search.proquest.com.proxy2.cl.msu.edu/docview/228005472/fulltextPDF/EC510EF85949489APQ/1?accountid=12598>.

²⁹ Office of Public Affairs, "Justice Department Announces Largest Health care fraud Settlement in Its History", The United States Department of Justice, September 2, 2009, <https://www.justice.gov/opa/pr/justice-department-announces-largest-health-care-fraud-settlement-its-history>.

³⁰ Gardiner Harris, "Pfizer Pays \$2.3 Billion to Settle Marketing Case", The New York Times, September 2, 2009, <http://www.nytimes.com/2009/09/03/business/03health.html>.

³¹ Gardiner Harris, "Pfizer Pays \$2.3 Billion to Settle Marketing Case", The New York Times, September 2, 2009, <http://www.nytimes.com/2009/09/03/business/03health.html>.

learned punishments do not have to be taken seriously.

Societal Consequences

When a Fortune 500 company with severe fraudulent activity escapes with minimal corporate punishment, negative outcomes can be anticipated. The following outlines arguments of how this injustice and the structure of the healthcare system causes all participants (e.g. patients, doctors, pharmaceutical companies, and even the healthcare industry at large) to become “losers” to this technological system.

The CIA agreement was designed to foster transparency of illegal medical promotions from health care professionals. However, without company compliance, monetary incentives are too numerous and complicated to track down. To capture a service fee like patient consulting is easy, but for travel fees ancillary to research services may only be stated in an expense report system or a logistics vendor.³² Pharmaceutical companies capitalize on the financial ambiguity to pay doctors under the table for promotional talks, speaker programs, research programs, and even to conduct unethical clinical trials. However, even doctors accepting bribes cannot bear all the faults of the corrupt industry either. When a patient receives a prescription from a physician, they trust that the doctor has done extensive research about the drug. However, bad clinical trials are regularly erased from the report presented to doctors for the drug of interest. Doctors spread their time thinly, in between treating patients and updating themselves on the latest medical practices. They do their best in fulfilling the expectation to do in-depth research on every drug they prescribe but faulty research data makes this task difficult. When health care professionals promote a drug, they trust that their medical expertise conviction will provide more benefit or relief to the patient than harm,

but sometimes the result cannot be all the fault of the doctor.³³

In a different perspective, pharmaceutical companies may not be exploiting power, instead the power is extended to them by the structure of the healthcare system. Thus, problems may lie in the structure of the healthcare system itself. The medical system is developed to nurture one’s health. Typically, participants of the system such as hospitals and pharmaceutical companies should also have the same chief commitment. However, pharmaceutical companies are structured and run as businesses. The purpose of the medical system conflicts with the purpose of a business. The intent of a business is to generate maximum profits by creating a product better than the competition. The pharmaceutical industry must juggle the responsibilities of the health care industry and its financial survival. In instances where the truth hinders product marketing, it may be of more interest to the company to prioritize the survival of the company and contemplate about the quality or harm of its products thereafter. Ideally, pharmaceutical companies try to fulfill the purpose of a business simultaneously with the purpose of medicine, but realistically, one may be prioritized over the other.³⁴

One may also argue there is only one winner in this corrupt system, Pfizer; it is the only member of this system securing profits. The power of the company is simply too large for lawsuits to affect their business. The profits the company earns from unethical activities such as off label marketing are only reimbursed fractionally from these settlements. However, the company does also bear social costs, especially the respect of their name. Undeniably, pharmaceutical companies have created numerous beneficial products devised to help improve the quality of life for patients. Yet, in public opinion surveys, they are regularly critiqued as one of the least trusted in-

³²Mark Ratner, “Crossing the line”, *Nature Biotechnology* 28 (2010): 1232-5

³³Ben Goldacre, “Bad Pharma How Drug Companies Mislead Doctors and Harm Patients”, February 2013, chapter 1 and 6

³⁴Rudi Volti, *Society and Technological Change*. Worth Publishers, 2017.

³⁵David Taylor, “The Pharmaceutical Industry and the Future of Drug Development”, *Pharmaceuticals in the*

dustries next to the nuclear industry.³⁵ Like any business, the public is the industry's consumer and source of profit. If the public continually disproves of a company's ethical conduct, there may be other companies that produce similar products which the public, as consumers, will naturally explore as alternatives, and eventually, Pfizer's loyal customers will abandon the perilous company for products of a more honorable company.

Technological institutions, like the pharmaceutical industry, and inventions, like medications, are built with the intent of providing a better quality of life for society. However, in evading corporate punishment and harming millions, Pfizer is an example of how a technological system may exploit power within a society and warrants a re-evaluation of the true winners and losers of this technological system.³⁶

Ideally, all participants of this medical industry ought to benefit from one another. Pharmaceutical companies, like Pfizer, can commercialize medications aimed at improving a set of patient symptoms derived from the best recommendation of a doctor. Patients get better because their doctors prescribe a safe and suitable medication for their needs, and the pharmaceutical company can turn a profit from their reliable product. Everyone in the system wins. However, patients do not get the help they seek because doctors are prescribing harmful medications made by pharmaceutical companies with narrow financial concerns. Patients do not get better. The vow of a doctor practicing medicine, to provide the best care for their patient, is broken. The profits of the pharmaceutical company are returned in government settlements and their tarnished name. The reputation of the pharmaceutical industry sustains irreparable damage. Everyone in the system loses. Thus, in such a complex system of medicine, regulation and ethical reform should be established for pharmaceutical companies to restore the "winners and

losers" imbalance of the healthcare system and public faith of the industry.

Solutions to Restoration

The pharmaceutical industry retains a bad reputation in the public eye, and often with reason, as exhibited from the events of the Bextra case. However, restoring this reputation can evoke necessary change in unethical corporate practices and still support the company's bank account. A corporation's reputation is an intangible asset as valuable as the company's worth. With a good reputation, a company can fully capitalize on its commercial goods while satisfying consumer demands. A pharmaceutical company's reputation would depend on the experience that patients have had with the company's manufactured drugs and how the company is portrayed in media and by word of mouth. Only 34% of patient groups surveyed from Europe and North America believed major drug companies had good reputation.³⁷ The drug industry has complicated and conflicting roles in improving the lives of patients while maximizing profits to fund further research and satisfy shareholders. Often, the pressure of how well their stock performs puts the needs of patients secondary. There is no cure-all to revitalize an industry's reputation, it takes time and a collective effort towards change. The following offers some steps to take in repairing this image.

One method to rebuild the pharmaceutical industry's reputation is to induce an ethical reform to put the needs of patients first. Medicine was primarily developed for patients, not profits. Major drug companies can collaborate with patient organizations to bridge the communication gap between patient needs and listen to ways to comply to them. Rather than promoting specific products, this fosters trust in the company. Programs that build bonds with patients and their physicians is a good place to start because physicians hear the patient's needs directly. As an

Environment, 2015, 1-33.

³⁶Rudi Volti, *Society and Technological Change*. Worth Publishers, 2017.

³⁷Mark Kessel, "Restoring the pharmaceutical industry's reputation", *Nature Biotechnology* 32 (2014): 983-990

example, teaching patients about health issues, like the harmful effects of when drug regimens are not followed, provides a more constructive educational experience than marketing products to patients. Companies can develop adherence programs for the drugs they produce to assist in educating patients. Pfizer developed a social media campaign in 2014 launching the hashtag #FOGO, “fear of getting old”, to nurture the Pfizer brand. Rather than promoting a product, Pfizer simply stimulated conversations with the public to listen to their worries. By refocusing on patient needs, the company caters to its biggest stakeholder, the consumers. A restaurant known for its great service will naturally attract more customers. If a pharmaceutical company is strongly committed to provide customers/patients exceptional care, generating profits will follow. Serving the needs of neglected patient groups, offering drugs with long term needs instead of short term health benefits, making drugs reasonably priced, and eliminating misleading marketing of drugs are a few demands the public has for the industry. To convince the public that pharmaceutical companies care about them is no easy task, but not impossible. It will require a sense of urgency on an industry-wide basis.³⁸

The public also worries that drug companies have no regard for patient safety. Implementing data transparency to ensure patient safety and generate honest conversations between health care professionals and drug companies is one way to combat this fear. Pharmaceutical companies are known to only publish successful research data and deleting the negative clinical trials. Understandably company trade secrets in formulating their drugs must remain confidential to generate profits for their products, but there are no excuses in withholding patient safety data. Publishing all clinical data will drastically improve clinical decisions and ties back to the point of focusing on care of patients

rather than marketing drugs to them. Transparency also changes behavior. ProPublica is a publicly accessible website that tracks promotional payments to health care professionals. Drug companies have been forced to enter their data into the database after numerous legal cases were lost. After industry payments to doctors have become more visible, such payments started to decline. Data transparency, such as annual financial reports and publishing negative clinical trial data, will promote patient safety, reduce unethical practices, and restore Big Pharma’s good name.³⁹ Brand reputation is a valuable asset. If the pharmaceutical industry invests in its reputation with the same care as it does its other assets, positive change will certainly ensue.

No one individual, one patient, one doctor, one company, can induce this change in America’s healthcare system. A collected effort from all participants will only guarantee this stubborn but necessary restoration. It starts from the ground up: if pharmaceutical companies take initiatives towards ethical reforms to prioritize the needs of patients before their financial reports then patients and the public will be less skeptical of the drug industry, and trust and profits will naturally rise. The improvement of data transparency builds a stronger bridge of trust between health care professionals and pharmaceutical companies. Physicians can rely on the research of the drug and naturally further support a high-quality product without the extra illegal expenses of paying doctors as promotional speakers for the company. These potential solutions can restore the imbalance of “winners and losers”, and help reduce immoral practices within the healthcare system, an industry intended to support and improve the value of our lives.

Take Away

Drug companies, like Pfizer, have lost their prestige in the public eye due to numerous du-

³⁸Mark Kessel, “Restoring the pharmaceutical industry’s reputation”, *Nature Biotechnology* 32 (2014): 983-990

³⁹Ben Goldacre, “Bad Pharma How Drug Companies Mislead Doctors and Harm Patients”, February 2013, 334-379

bious practices. Questionable practices such as illegally marketing drugs at harmful dosages, bribing health care professionals, evading corporate punishment at the time of prosecution, and reluctance in adhering to the terms of corporate punishment, are some examples seen in the Bextra case that gave the pharmaceutical industry its bad name. Although drug companies have made many mistakes in the past, it is never too late to change. Steps in repairing the reputation of the pharmaceutical industry, like putting the needs of patients first and promoting data

transparency, benefits both the public and the company. While listening to the demands of the public and fostering public safety, the company attracts more consumers by nurturing its brand and improving its relationship with the public. However, reputational change takes time and require industry wide effort. The public's trust in big pharma will worsen if a collected effort to fix fundamental problems is not made which would continue to harm the health of the public and the industry.

About the Author

Hi I'm Emily! I recently graduated with a Bachelors of Science in Biochemistry Molecular Biology in Lyman Briggs at Michigan State University. My research interests align very closely to that of Briggs in fields such as history, philosophy, and sociology (HPS) of science and applying that to new technological systems and applications such as the highly controversial topic of CRISPR, artificial intelligence, and military drones. In the future, I would also like to delve into research in hard science fields such as DNA replication, cloning, and genetic epidemiology. I wrote my submission after an HPS class had exposed me to America's broken healthcare system and the limitations of fixing dubious traditions within the system. It made me realize how little the public knows about what goes on behind the scenes of an industry intended to nurture and foster health. I wanted to publish my work in JIRR to inform others about what I had discovered and for others to use and build upon my ideas as well. I believe knowledge sharing is vital for all fields of research to continue to flourish and expand. I believe a journal like JIRR is a great initiative and I hope it continues for years to come to give undergraduates a voice and a chance to share our passions with one another.

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Stolen Trophies: Hunting in Africa Perpetuates Neo-Colonial Attitudes and is an Ineffective Conservation Tool

Meghan Bird

Trophy hunting is the sport of tracking and killing a wild animal with desirable traits, such as large antlers on deer, to mount the remains as a symbol of the hunt's success (Sexton). In America, approximately eleven percent of men and one percent of women partake in some form of hunting (Simon 19); this totals nearly 39 million individuals. Of those hunters, 18,500 hunt in Africa each year (Lindsey et al. 881). Enticing these hunters are the claims of trophy hunting organizations, such as *Safari Club International* and *Sportsmen for Fish and Wildlife*, who "promote and defend... the role that hunters and hunting organizations have played in protecting wilderness and wildlife" (Simon 17). Considering the massive industry that trophy hunting has become in recent decades (Simon 19), an important question to ask is; does trophy hunting actually have a positive effect on wildlife conservation in Africa? This paper argues that trophy hunting in Africa is not an effective tool for conservation. In fact, the trophy hunting industry is rife with mismanagement and corruption, harmful to animal populations, and grounded in colonial systems that have marginalized, and continue to marginalize local African populations. This argument is integrative as it combines the knowledge of numerous disciplines: the fields of

anthropology, ecology, economics, ethology, history, indigenous studies, literature studies, and political science are all addressed, among others. A variety of ways of knowing are also incorporated into this argument, including traditional indigenous and analytical ways of knowing. Inquiry and discussion-based study was also employed during argument construction. This argument is established in four major steps. First, the foundations of the trophy hunting industry are analyzed, with references to early indigenous ways of knowing, colonial literature, and neo-colonial theory. Second, knowledge of animal behaviour, as well as data regarding quotas and mismanaged funds is presented in an effort to deconstruct misconceptions surrounding trophy hunting as a tool for generating revenue. Subsequently, the establishment of game reserves, the poaching industry, and modern social movements in North America are discussed to illustrate further nuances surrounding the trophy hunting industry. Lastly, propositions for future improvements to the industry are made, by pointing to the case of Namibia, where trophy hunting has benefited locals, animal populations, and the Namibian economy.

Foundations of African Trophy Hunting

The history of trophy hunting in Africa does not begin with American hunters, but with the colonization of African nations. African people have had a harmonious relationship with nature for centuries; many native African communities have “a complex, symbolic world developed around hunting and its products” (Beinhart et al. 62). Singers would praise the powers of wild animals, on which they relied for survival (62). The San people of South Africa are just one example of many; they “depended on hunting, gathering plants, and foraging...[and] ate fifty-five different animal species” (Beinhart et al. 59). This balanced relationship that many African people had with their environment is very different from the relationship that European colonists had with nature when they settled the coast of Africa in the nineteenth cen-

ture (59). Colonists exploited the riches of nature at astounding rates, largely through the exportation of one ‘natural resource’: ivory (58). Through the exportation of ivory, colonists benefited economically, which encouraged further penetration of the African continent (58, 59). Ivory was also a symbol of wealth in many Victorian-era English homes, and was used to make piano keys, billiard balls, and “carved ornaments” (67). There was such a demand for ivory products, and the symbolic value associated with their possession, that one African port alone demanded “the slaughter of 25,000 [elephants]” (67) to meet the desire for ivory products in the nineteenth century. This colonial narrative illustrates how the tradition of non-indigenous peoples hunting in Africa was founded on exploitation and conquest. Unfortunately, this narrative has changed little since colonial times.

As can be seen from Africa’s colonial history, trophy hunting is, in its nature, about power. For centuries it was marketed as “an armed confrontation between the human world and the untamed wilderness” (Whittle 197). Famous novelist and hunter Ernest Hemingway highlights this imperialist mentality in his novel, *The Green Hills of Africa*:

... never fire a shot unless I saw a better head than this one in back,

And instead of trailing that sable bull, gut-shot to hell, all day,

I’d lie behind a rock and watch them on the hill side and

See them long enough so they belonged to me forever (Hemingway 62).

This literary reference illustrates how hunting mentalities permeated throughout, and were largely accepted in various aspects of Western society in the early 20th century when this Hemingway classic was first published. Unfortunately, this perception of trophy hunting led to

hunters viewing their environment as a playground, with “indigenous populations only as guides. . . and the fauna as trophies to be won and displayed as symbols of hunting prowess” (Whittle 196). Even as early as the fifteenth century, Englishmen recognized that usurping power was an aspect of hunting. This can be seen from the noblemen who would ride through the countryside on horseback, passing peasants who were banned from hunting due to their lower social status (Cartmill 773). Today’s hunters who travel to Africa continue to express this symbolic lust for power, manifested in neo-colonial actions. The word neo-colonialism was coined by Ghana’s first president and anti-colonialist, Nkrumah: “The essence of neocolonialism is that the state which is subject to it is, in theory, independent and has all the outward trappings of international sovereignty. In reality its economic system and thus its political policy is directed from outside” (Antwi-Boateng 177). The way in which trophy hunting usurps power from nature began to be noticed by the public in recent decades, leading to an increased opposition to hunting among Europeans and North Americans (MacDonald et al. 266). In response to this opposition, hunting organizations, such as the *Safari Club International*, attempted to shift the dialogue surrounding trophy hunting. This has resulted in an increased focus on conservation and responsibility for the environment (Simon 17). Nonetheless, the power narrative remains in the hunting industry, with colonial traditions serving as a backbone for its endeavours. Kenneth MacDonald, from the University of Toronto, discusses this phenomenon at length: “This contemporary reworking of a colonialist ethic of conservation relies rhetorically on a discourse of global ecology, and on ideological representations of a resident population as incapable environmental managers, to assert and implement an allegedly scientifically and ethically superior force better able to respond to assumed degradation” (MacDonald 259). MacDonald explains that the trophy hunters who travel to Africa subscribe to the patronizing be-

lief that the fees they pay to hunt are helping African locals take care of the wildlife they cannot take care of themselves. However, one could argue that had it not been for the exploitation of African wildlife since the colonization of African nations, there would not be a need for conservation in Africa in the first place.

African Trophy Hunting and Conservation

In 2014, the *Dallas Safari Club*, a Texas-based hunting outfitter, held a fundraiser for conservation efforts in Namibia. One of the ways in which the outfitter accumulated funds was through the auctioning of a permit to shoot a critically endangered African black rhinoceros (Pearce 4). At the time, less than 4000 African black rhinoceroses existed in the world (Christ). The purchaser of the permit, an American father of two daughters, named Corey Knowlton, paid nearly \$450,000 for the permit (Pearce 4). Since Knowlton was only allowed to kill an elderly male rhinoceros, well past reproductive age (Christ), in the eyes of many, this fundraiser was a perfect example of utilizing the hunting industry as a tool for conservation. Unfortunately, this example is a testament to the complete ineffectiveness of trophy hunting as a means for conservation.

In the trophy hunting industry, shooting a young, female, or reproductively viable animal is often illegal (Lindsey et al. 882). Hunters are typically only allowed to kill senior males. However, few hunters understand the complex behaviours and social structures of species that make the deaths of older males devastating to entire populations. In elephants, for example, the eldest males in a population often acts as role models to younger individuals. They carry information about migration patterns and family history that is vital to the survival of the community (Chancellor). A study recently completed by biologist, Victor Muposhi and colleagues analyzed changes in animal behaviour due to the presence of hunters. The results showed that wildlife species develop mechanisms to evade trophy hunting disturbances, such as reducing reproduction, suppressing immunity, and decreas-

ing population growth (Muposhi 6). Trophy hunting may also induce nutritional stress and reduce animal resilience to parasitic infections and disease (6). This study, as well as the other examples provided, shows that North American trophy hunters are clearly not aware of, or choose to ignore the negative impacts they are having on wildlife in Africa. This can be seen even more clearly when one considers the customs of trophy hunters to hunt animals with ‘desirable traits’, such as long tusks and thick manes. Evolutionary biologists are aware of the dangerous practice of ‘selectively harvesting’ certain characteristics, as it has led to a decline in phenotypic traits in animal populations (Muposhi 7). A decrease in these traits can negatively impact populations, since many of the characteristics most desired by hunters are necessary for animal mating practices, self-defence, and survival (Nelson 65).

Regulations regarding the age and gender of a hunter’s kill are just one example of ineffective regulations in the trophy hunting industry. Quotas, which are put in place to prevent over-hunting, are another equally ineffective example. Though seemingly well-intended, quotas are often based on unreliable population estimates (Baker 313). Such was the case in Tanzania. In 1995 a newspaper reported that the large cat quota of 124 animals, given to the Tanzania Game Tracker Safaris, regarded “areas which do not have [cats] in the first place” (Baker 314). Failure to provide accurate hunting quotas is often caused by a lack of resources, which is a common problem among African wildlife departments (Lindsey et al. 880). As well, the high influx of North American hunters travelling to Africa has created “pressure for increased quotas and smaller hunting areas” (881). According to an article published in the *Journal of Sustainable Tourism* in 2010, the past several years have seen “a proliferation of hunting companies all vying for blocks in which to satiate their clients’ appetite for hunting” (Baker 315). Consequently, numerous hunting parties are active in the same area, leading to an exponential increase in the number of animals killed for trophies (316-17).

When it comes to trophy hunting and conservation, the so-called ‘elephant in the room’ is the question of generated revenue; how much income is accumulated from the trophy hunting industry, and where does it go? The average trophy hunt costs an American client between \$12,500 for a water buffalo to \$125,000 for an endangered white rhinoceros (Azzentine). The majority of clients who can afford to pay these fees are disproportionately white, middle-aged, conservative, higher-income clients (Simon 22), and they are often shrouded in the belief that their money is not only funding their own adventure, but also furthering conservation efforts (Cartmill 784). Unfortunately, this belief is mere myth, which can be seen by the fact that trophy hunting revenue rarely goes solely towards conservation efforts (Baker 311). According to statistics published in the *Journal of Sustainable Tourism* in 2010, 40% of the money accumulated from initial fees paid by American hunters goes towards African governments (311), and this is a more liberal estimate. Of that 40%, a possible 10% goes towards so-called ‘conservation efforts’ (311). This small sum of money is rarely adequate, as the 12,000 square miles of hunting area in Tanzania alone require 600 million dollars of investment each year (312). And according to American lion biologist, Craig Packer, “You’re not going to get that [much money] shooting lions” (Chancellor). Peter Lindsey and colleagues from Cape Town, South Africa agree: “. . . Trophy hunting frequently fails to generate enough income to manage wildlife land effectively, typically generating only \$138-1,091/km² in gross income” each year (Lindsey et al. 297). The chances of this income actually serving conservation efforts are further lessened, as the industry is undermined by corruption in a vast majority of African countries (298). This allows for “unscrupulous operators to continue accessing and depleting hunting areas at the expense of more conservation-minded industry players” (297).

As mentioned earlier, the trophy hunting industry is attempting to change the way the

public views hunting for sport. Jon Wemple, president of the Western Montana branch of Safari Club International, clearly subscribes to the narrative of hunting as a means of conservation: “I am reminded of the importance of preserving our hunting heritage. [When] species [are] nearly lost... the true conservationists (hunters) step up to the plate” (Simon 17). If trophy hunters claim they are capable of ‘stepping up to the plate’ then they must, and soon. Trophy hunting outfitters, clubs, African governments, and American clients must take concrete steps to improve the sustainability and transparency of the hunting industry. Otherwise, the treasured lions, rhinoceroses, gazelles, and elephants of the African savannah will remain only on the walls of trophy hunters’ living rooms.

African Trophy Hunting’s Impact on Rural African Communities

Many conservation efforts have the contorted view that Africa must be preserved as a pure, unadulterated “state of Eden” (Hubschle 431). However, trying to preserve ecosystems in a pristine state to save wildlife is impractical when local African communities are living in poverty (Baker 307). In the history of dramatic conflicts between white men and nature in Africa, it can be argued that the groups of individuals who have suffered the most are not endangered animal species, but human native populations. According to Annette Hubschle, in the nineteenth century, game reserves were designed to provide “free from all human interference, a sanctuary in which certain species of wildlife could prosper” (431). This meant that indigenous property, hunting rights, and ancestral burial grounds were not considered when protected areas were declared (431). In the twenty-first century, with the spread of the ‘trophy hunters as environmentalists’ mentality, native populations continue to be oppressed in the name of conservation. In Mozambique in 2001, for example, a new conservation area was declared; however, the land allocated for wildlife protection was home to 27,000 people and their cattle (431). Ultimately, “in-

ternational experts recommended that the new conservation area would be more attractive to tourist operators if the villages were resettled” (432). This meant that thousands of people were forced to find new homes, to make “space for wild animals” that did not yet live there but were to be reintroduced into the area (433). In many cases, trophy hunters encourage indigenous displacements, such as this instance in Mozambique. Hunters who are involved in conservation in Africa want their money to go towards creating new protected lands, as they believe this will ensure the existence of hunting ranges and animal specimens in the future (Macdonald 283). However, these efforts are neo-colonial in nature when arranged from abroad without considering the livelihoods of locals. These situations worsen further when the leaders in conservation projects subscribe to the notion that the local populations are ‘primitive’ and unable to care for the wildlife on their own land without the money and assistance of foreigners (MacDonald 267). These neo-colonial conservation practices are incredibly significant yet become even more consequential when one considers that they may be perpetuating the infamous poaching industry.

It is a well-known fact that trophy hunters are opposed to poaching, which is the illegal hunting of wild animals, commonly to sell animal products, such as rhinoceros’ horns abroad (Lindsey et al. 297). The vast majority of the North American public is opposed to poaching. The deaths of giraffes, lions, and elephants are often advertised as global catastrophes, despite the fact that most Americans have little understanding of these animals beyond the pages of children’s books or the metal bars of a zoo exhibit. Poaching is one of the leading causes of animal endangerment worldwide (Beinhart et al. 62), yet the practice is widely misunderstood. Few trophy hunters recognize the deeply entrenched connection between hunting and poaching. A Mozambican local described this relationship in regards to rhinoceros poaching; “This [rhinoceros poaching problem] is because of con-

ervation. They say that we need those things [rhinoceroses]. They are nice. Some of the white people here treat them like their friends. They value the rhino more than black human beings” (Hubschle 440). The current system of conservation in Africa involves the creation of new conservation regions at the expense of local populations, as could be seen in Mozambique in 2001. This system fosters a poaching industry; rural Africans, who have been relocated to living on the fringes of conservation areas, are enticed to illegally hunt and sell animals, as this is the only economic opportunity available to them (434). Another native Mozambican describes why he and other members of his displaced community are involved in poaching; “We are using rhino horn to free ourselves” (436). This entire system is backed by North American trophy hunters who are unaware of the consequences of their conservation-minded actions. This was made clear when prospective trophy hunting clients were surveyed, and 86% were more willing to purchase a hunt if local communities would benefit (Lindsey et al. 360).

As has been discussed, the hunting industry in Africa is plagued with problems and rooted in neo-colonialism. Hunters’ newfound interests in conservation are contradictory, and often serve only to improve their own public- and self-image, as well as ensure that hunting for sport will exist in the future. Many non-hunting North Americans have begun to recognize the dangers of the trophy hunting industry. In 2015, the cracks in the hunting industry were opened wide for the public to see when an American dentist illegally killed a radio-collared lion, named Cecil. This event was broadcasted widely by American media outlets; however, “Much of the media discourse... [was] emotional and polarized, focusing on animal welfare and debating the value of hunting as a conservation tool” (Lindsey et al. 296). Though this occasion brought trophy hunting into the eye of the public, it resulted only in so-called ‘animal-lovers’ and high-profile celebrities crying for the arrest of the hunter who killed Cecil, and an outright ban on trophy

hunting around the world. Comprehension of the hunting industry was completely lacking, which could be seen from the fact that discussions regarding native populations, who are the most affected by the hunting industry, were non-existent (296). Nonetheless, the conversation continues today, with millions of signatures on *Change.org* petitions calling for a variety of measures to be taken regarding the trophy hunting industry. One petition, entitled “United Nations: BAN Trophy Hunting. STOP Poachers. END Imports” (Pivoroto), is intended to be sent to Secretary-General of United Nations, António Guterres. However, it is riddled with grammatical errors, hunting stereotypes, and a complete lack of understanding of what trophy hunting entails. This petition raises an important question; what right do people in the West have to try to change other countries? The very foundation of why trophy hunting is harmful is because it is rooted in neo-colonial practices. However, is it not a form of neo-colonialism to attempt to enforce laws and regulations on African industries from abroad? Felix Marnewecke, a professional hunter and guide in Africa, asks this question: “who gives anyone the right, sitting in another continent, to preach to us how we should manage our wildlife?” (Chancellor). This leads to an important discussion; what can be done to improve the trophy hunting industry in Africa?

Possibilities for Improving the Trophy Hunting Industry in Africa

When Namibia achieved independence from South Africa in 1990, game populations were at historic lows (Martin). In an effort to encourage a rebound in both wildlife and nonhunting-related tourism, the new government organized rural populations into communities to control vast areas of land, which were restocked with game. Each community was vested with the right to manage its own wildlife resources (Martin). Naidoo et al. investigated the benefits of the hunting industry on seventy-seven communal conservancies in Namibia between 1998 and 2013 and found that trophy hunting can benefit

both locals and wildlife (Naidoo 628). Namibia's method of conservation, which is centred around local indigenous communities, supplies salaries for conservation employees, money for community projects, and meat to local families when an animal is hunted (632). Between the years of 2011 and 2013, hunting generated \$5.41 million dollars in revenue for Namibian locals (636).

Namibia demonstrates that trophy hunting can improve the wellbeing of local human and animal populations in Africa. However, this is only possible when conservation organizations neglect the current utilitarian approaches to wildlife protection that "favour the rich, powerful, and foreign at the expense of local communities" (Naidoo 629). For this to occur, North American trophy hunters must abandon their neo-colonial ideologies of Africa. Wildlife must no longer be seen merely as trophies, but as living organisms in a dynamic environment. The African continent must not be seen as some sort of unadulterated 'Eden' (Hubschle 440), but as a complex set of ecosystems, interwoven with many nations, each of whom have their own desires, leaderships, and histories. Indigenous peoples must also be viewed in a different light, no longer as just guides in the hunt (Whittle 196), or mere obstacles to conservation. Instead, they must be treated as human beings and included in the trophy hunting narrative. After all, they are often the best suited to protect and care for the lands and wildlife of Africa, for it is what many indigenous communities have been doing for thousands of years (Beinhart et al. 59). Though the trophy hunting industry is clearly riddled with flaws, the potential for fostering a more sustainable industry exists. With "scientifically determined wildlife population estimates, comprehensive quotas which are enforced, reputable and honest outfitters, transparent and accountable revenue collection and disbursement mechanisms, competent management and oversight of the industry, and fair distribution of proceeds at the local level" (Baker 319), trophy hunting can become a tool for conservation. Though above all else, it is crucial for

trophy hunters to become more educated about the implications of their involvement in African affairs. It is only then that they should use their voices and put their money toward bettering their sport.

Many of these suggestions for improving the hunting industry can be seen in the case of Namibia, where trophy hunting has had positive impact on animal populations, indigenous peoples, and the economy. Through the adoption of community-based natural resource management (CBNRM), rural communities and conservation efforts have been funded and developed by the trophy hunting industry (Nelson and Agrawal 558). According to Nelson and Agrawal, "The premise underlying CBNRM reforms is that sustainable management is most likely where local users are able to manage and extract benefits from natural resources" (558-559). In fact, "CBNRM efforts are a response to the reality that many cases of rural resource degradation occur because centralized management regimes in African states are often de facto open access regimes" (559). Namibian policymakers have found that "vesting local users with rights to manage, use or own resources is... a key corrective" to these centralized management systems which have been proven so problematic in the past, and continue to damage countless African nations (559). The case of Namibia illustrates that CBNRM reforms are a powerful tool for indigenous peoples to be engaged with their land once again. In this way, CBNRM reforms help to combat neo-colonial attitudes and the power narrative that exists in the trophy hunting industry.

Conclusion

In the vast majority of cases, the modern trophy hunting industry in Africa, and its model for addressing issues in wildlife conservation, are ineffective. The rules and laws surrounding hunting are poorly regulated, and many are based on miscalculations and misunderstandings of animals and their behaviours. Hunting revenue frequently funds corrupt governments,

as opposed to furthering conservation efforts. Even when conservation efforts are practiced, they frequently come at the cost of displacing local indigenous populations. The majority of these issues are rooted in colonial systems, which have evolved into modern neo-colonial behaviours that hinder the trophy hunting industry's success.

However, this does not mean that there is no hope for improvements. Aldo Leopold, ecologist and hunter in the early twentieth century, is admired by many modern-day trophy hunters (Simon 20). Leopold believed that the greatest threat to conservation is the trophy hunter who, in order to enjoy his sport, feels the need to "possess, invade, [and] appropriate" (30). Instead,

Leopold recommended, "the weaker interests of trophy hunters should be subordinated to humanity's stronger interests in wilderness preservation and... the 'biotic right' of other[s] to exist in their natural states" (Simon 25). This is incredibly relevant to the twenty-first century trophy hunting industry in Africa. Today, if trophy hunters see the wellbeing of others, both humans and animals alike, beyond their own self-interests, they can abandon their neo-colonial tendencies. When this occurs, the trophy hunting industry may become a powerful force in the protection of wildlife, while allowing local African populations to have autonomy over, and thrive in, the savannah they call home.

About the Author

Meghan Bird is a student of McMaster University's Interdisciplinary Arts and Science program. This past year, she completed the first year of her undergraduate education and spent much of her time exploring interdisciplinary writing, both within and outside her academic studies. Her writing and research interests are vast, and include history, politics, indigenous studies, animal behaviour and ecology, environmental studies, and psychology. Meghan was inspired to write this piece after an encounter with members of the trophy hunting community at a family wedding in 2016. She began researching the trophy hunting industry in an attempt to understand the psychology behind hunting, as well as whether trophy hunting can benefit African ecology and economics. Meghan published in the University of Waterloo's Journal of Integrative Research and Reflection because she was interested in further exploring and applying her interdisciplinary academic studies outside of her undergraduate program.

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Assessing How the Zika Virus Induces Apoptosis and Cell Disruption in Neural Precursor Cells, and Societal Impacts of Zika: A Review

Meng Ji

Introduction

The Zika virus (ZIKV) is a Flavivirus that was first isolated in rhesus macaque monkeys in 1947 (Huang et al., 2016; Quammen, 2016). Flaviviruses are a genus of single-stranded RNA viruses that can cause common ailments such as Yellow Fever, Dengue Fever, Japanese Encephalitis, and West Nile virus (WNV) (Centers for Disease Control and Prevention [CDC], 2017). The ZIKV is a recent headline due to its associations with several neurological disorders. Upon initial infection, symptoms are mild, and can include headaches, fevers, muscle and

joint pain, and rashes (Quammen, 2016; CDC, 2017). In 2015, an outbreak of Zika infection in Brazil drew researchers' attention to the virus (Huang et al., 2016). The outbreak concurred with births of babies with microcephaly, a congenital condition characterized by small head sizes. ZIKV-related microcephaly has been related to abnormal brain development, resulting in mild to extreme physical and cognitive health consequences (Huang et al., 2016).

In 2007, more than a hundred cases of ZIKV infections were found on Yap, a small island in the Southwestern Pacific. Two years later, the

virus had found itself a new location in Northeastern Brazil. ZIKV spread rapidly in Brazil once established, and then throughout Latin America and the Caribbean (WHO, 2017; Ventura et al., 2016). Due to the perplexing number of babies born with smaller than normal heads coinciding with the rapid spread of ZIKV infection, ZIKV and microcephaly were declared public health emergencies in February of 2016 by the World Health Organization (WHO) (Huang et al., 2016).

ZIKV is primarily a concern for pregnant women, however, if the epidemic is not dealt with, sickness from infection can yield crippling wage loss for individuals and their families; the spread of the epidemic can result in economic disruption. This paper will focus on the target neural cells in the brain and how pathogenesis of ZIKV causes abnormal brain development. Moreover, the consequences of ZIKV and microcephaly in vulnerable populations will be discussed, with included recommendations for the prevention of infection. The paper will do so by primarily drawing from current literature from the microbiology and virology fields, and sociology and economics. Together, this cross-disciplinary review will bring to light the economic and societal impacts an epidemic can leave behind, and emphasize the need for improvement to public health infrastructure.

What is ZIKA?

Under the Baltimore classification system for viruses, which categorizes viruses depending on their genome type (DNA or RNA) and their method of replication, Zika is a Group IV positive single stranded RNA virus of the *Flaviviridae* virus family (Huang et al., 2016; CDC, 2017). ZIKV is an arbovirus, as it is transmitted by insects, specifically, the *Aedes* mosquito that was originally found in tropical or subtropical zones, but now exists on all continents except Antarctica (Huang et al., 2016). Members of the *Aedes* genus have previously played a large role in viral transmissions. Species *Aedes aegypti* and *Aedes albopictus* have been recognized to

be a primary vector for ZIKV (CDC, 2017). It was not until 2007 that ZIKV became recognized as a disease causing pathogen (Posen et al., 2016). ZIKV now joins the list of viral TORCH pathogens because it disturbs the development of the embryo, where TORCH stands for toxoplasmosis, other, rubella virus, cytomegalovirus, and herpes simplex virus (Ming et al., 2016; Garcez et al., 2016). TORCH factors often compromise proper brain development *in utero* because these pathogens can cross the blood-placental barrier and cause congenital defects, such as microcephaly and associated, or other, cognitive disabilities (Ming et al., 2016).

ZIKV is related to many other flaviviruses such as the DENV, Japanese Encephalitis, and WNV (Huang et al., 2016; CDC, 2017). Flaviviruses are assembled of its genomic viral RNA, a lipid membrane, and three main structural proteins (capsid (C), premembrane (M), and envelope (E) protein), as shown in Figure 1 (Speer and Pierson, 2016). ZIKV's RNA genome encodes seven nonstructural proteins, proteins that become expressed in infected cells but not incorporated into the virion particle, and three structural proteins which are incorporated in the virion particle. The encapsulation protein is a considerable structural protein encoded by ZIKV: it encodes an envelope glycoprotein (Env) that is responsible for host cell surface recognition and binding (Speer and Pierson, 2016; Cox et al., 2015). Env binds to the host cell's endosomal membrane to initiate clathrin-mediated endocytosis. Once inside the host cell, ZIKV assembles at the endoplasmic reticulum and moves anterograde towards the Golgi Apparatus. Infected cells often secrete a nonstructural protein 1 (NS1), which aid in viral replication and infection of further cells (Speer and Pierson, 2016).

The target cells of the ZIKV appear to be the neural precursor cells (NPCs) in the brain, inducing cell death and reduced proliferation of NPCs.

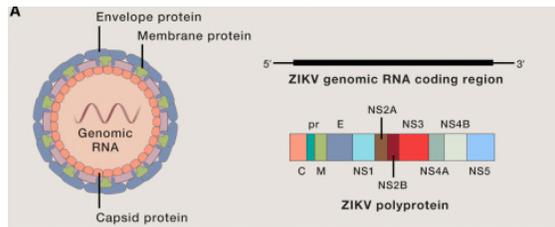


Figure 1. Zika Virus structure displaying genome and coded proteins – ZIKV genome consists of single stranded RNA. Genome encodes three structural proteins (premembrane (M), envelope (E), capsid (C)) and seven nonstructural proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, NS5). Includes map of ZIKV genomic coding regions (Li et al., 2016).

Neural Precursor Cells (NPCs)

Neural precursor cells (NPCs) are pluripotent stem cells that have the ability to differentiate into three main cell types that make up the human central nervous system (CNS): astrocytes, neurons, and oligodendrocytes (Ming et al., 2016). During neurogenesis, NPCs undergo either symmetric proliferative cell division or asymmetric differentiative cell division. Once NPCs perform differentiation into neurons and glial cells, they start building the neocortex of the brain, which covers the exterior of the two brain hemispheres. The neocortex makes up approximately two-thirds of the total brain mass and is involved in higher learning. Some of the neocortex functions include sensory perception, generation of motor commands, spatial reasoning, conscious thought, and language (Florio and Huttner, 2014).

ZIKV-Related Microcephaly

Microcephaly is a congenital condition characterized by a decreased brain circumference resulting in a smaller than normal head (Garcez et al., 2016; Cohen, 2016; Ventura et al., 2016). The smaller head circumference (Figure 2) is usually 2 standard deviations below the mean for the sex and age of the child (Ventura et al., 2016). When an infant is born with a head 3 standard deviations below the mean, it is con-

sidered to be severe microcephaly and there is a higher risk of death. Microcephaly can occur alone or with other brain abnormalities such as vision problems, hearing loss, developmental delays, and motor problems (Cauchemez et al., 2016; CDC, 2017). Microcephaly can range from mild to severe and thus, the related problems will range from mild to severe and are often lifelong (Cauchemez et al., 2016). The CDC (2017) reports that microcephaly has a range of causes. Some babies may acquire a mutation in their genes, alcohol consumption during pregnancy can induce it, and certain infections during the mother’s pregnancy may also increase the risk of microcephaly (CDC, 2017). As previously mentioned, ZIKV and microcephaly were declared public health emergencies by the WHO in early 2016, when the two coincided during the Brazil outbreak (Ventura et al., 2016). Infants with microcephaly were reported among many mothers infected with ZIKV during pregnancy. This led to the CDC (2017), among other scientists, to proclaim that there was enough evidence to conclude that ZIKV infections during pregnancy, especially if the mother becomes infected during the first trimester, may cause microcephaly, among other brain defects. The first trimester of pregnancy appears to be more vulnerable to brain malformations than the second or third trimesters, as this is when brain development is at a maximum, and the risk of brain malformations decreases as the fetus matures. Honein et al. (2017) found that in a study of 442 completed pregnancies, 6% had a baby with evidence of a ZIKV-related defect, primarily microcephaly, whereas among women infected with ZIKV during the first trimester, 11% had a child with a birth defect.

In ZIKV-related microcephaly, there is an increased level of apoptosis of NPCs and cortical progenitor cells (Garcez et al., 2016). Other researchers say that ZIKV preferentially infects and induces an apoptotic response in NPCs as well as astrocytes, oligodendrocyte precursor cells, and microglia. Retallack et al. (2016) adds that, upon infection, cell lines stemming

from the primary NPCs demonstrate a more active apoptotic response. Because there is a deficiency of NPCs due to apoptosis, less neurons are made for the brain resulting in a smaller than normal cortex, precipitating the cognitive and physical impairments of microcephaly (Vogel, 2016). Wu et al. found that many genes that regulate the cell cycle were significantly reduced upon ZIKV infection (Nguyen et al., 2016). The cell cycle genes that were infected were frequently interrupted and led to slower cell growth. This slower cell growth could also contribute to microcephaly (Vogel, 2016). Generally, ZIKV seems to downregulate the cell cycle while upregulating apoptosis of cells of the CNS (Ming et al., 2016; Nguyen et al., 2016).

Microcephaly currently has no cure and the only treatment options depend on severity. Infants with microcephaly will often need lifelong routine check-ups to monitor their health and development (CDC, 2017). Some health complications of microcephaly were mentioned previously, but more could include facial distortions, hyperactivity, seizures, and problems with balance and coordination (Mayo Clinic Staff, 2017). Such health consequences may result in lower educational achievements and career objectives due to their shortfall of mental and physical capabilities. Furthermore, infants with microcephaly are believed to have a decreased life expectancy due to their brain impairment (Coghlan, 2016). Depending on the degree of severity, some babies will need more intensive care and treatment throughout their life to manage their health. Early intervention programs are available to support coping parents such as speech therapy, physical therapy, and seizure medications (Mayo Clinic Staff, 2017).

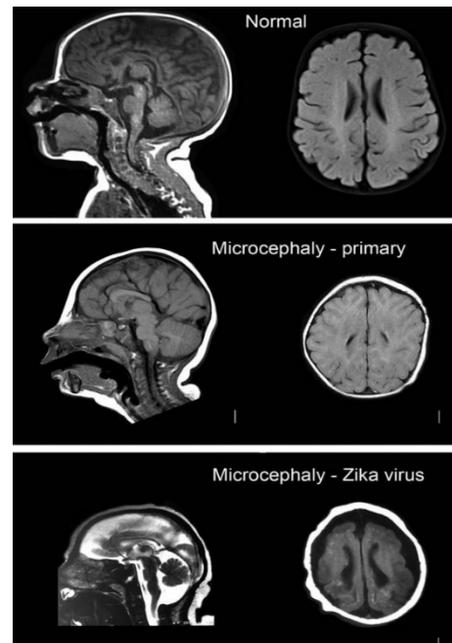


Figure 2. ZIKV infected brain causing microcephaly – Comparison of brain of a baby that has developed normally (top), brain of a baby with primary microcephaly (middle), and brain of a baby whose mother was infected with ZIKV (bottom). The bottom picture demonstrates a severe reduction in brain circumference (Kader, 2016).

ZIKV Targets

The scientific consensus on the primary targets of ZIKV are cortical NPCs while neurons are less susceptible (Li et al., 2016; Retallack et al., 2016; Tang et al., 2016). However, NPCs, radial glial cells, astrocytes, oligodendrocyte precursor cells, and microglia in humans all seem to eventually succumb to ZIKV (Retallack et al., 2016). To determine what cell types were infected in the fetal brain, Li et al. (2016) used apical and basal progenitor transcription factors that play a role in embryonic development, to verify NPCs as being the primary target in mice brain. Apical progenitor cell markers (Sox2 and Pax6), basal progenitor cell marker (Tbr2), and immature neuron markers (Tuj1 and Dcx) were

used to identify the NPC cell type while their nuclei were stained with DAPI, after injection of ZIKV into embryonic mice brains. Sox2, Pax6, and Tbr2 were positive for infection whereas the immature neuron markers were negative. This corroborates the consensus that the ZIKV primarily affects NPCs, by suppressing the differentiation ability of apical and basal progenitor cells (Li et al., 2016; Retallack et al., 2016).

In one study, slices of cortical human brain tissue from organotypic cultures were exposed to 3 different ZIKV strains. After 3-4 months of fetus conception, high rates of viral infection can be seen in the ventricular and subventricular zones (VZ and SVZ) of the tissue culture where NPCs are primarily located. The infection was contained to mainly the VZ and SVZ with evidence of increased apoptosis in that area as NPCs become vulnerable to cell death and reduced proliferation when infected (Retallack et al., 2016). When NPCs on the VZ and SVZ are infected and undergo cell death, this gives rise to improper neurogenesis of the subgranular zone of the hippocampus, an area responsible for learning and memory (Li et al., 2016). This cell death could be a contributor of the cognitive deficiencies associated with microcephaly. Consequently, when comparing the 3 ZIKV strains, similar margins of infection against NPCs were observed across all 3. The infected tissue culture was observed again at 4.5 months after conception: the cortical plate (CP) and subplate (SP) where mature neurons and post-mitotic cells migrate to, were observed to have a higher infection rate throughout. Glial markers GFAP and Sox2 identified a significant infection rate in astrocytes within the CP (Retallack et al., 2016). These results indicate that post-mitotic cells, such as neurons, eventually become vulnerable to infection (Li et al., 2016).

After the 2015 Zika outbreak in Brazil, the Brazilian ZIKV strain was isolated and infected into mice. Observation through transmission electron microscope showed overt signs of viral assembly in NPCs and eventually neurons (Cugola et al., 2016). The amount of viral particles

rapidly increased over time in NPC and neuronal cultures, suggesting that ZIKV particles are efficient replicators (Cugola et al., 2016; Retallack et al., 2016).

Cell Cycle Disruption and Cell Death

When ZIKV infects host cells, the virus hijacks the cell's own machinery to quickly replicate its own viral DNA in order to disrupt the host's cell cycle, or slow it down, and then kill the cell (Vogel, 2016). It is suggested that ZIKV inhibits NPCs from exiting the cell cycle, and subsequent differentiation and proliferation. Infection not only leads to suspension of pluripotent stem cells in S phase, but proliferating NPCs exhibit a much longer S phase than those ready for differentiation. Dysregulation of the normal cell cycle is believed to be a contributing factor to microcephaly among other brain abnormalities (Boeuf et al., 2016; Li et al., 2016).

Several experiments have been conducted after the Brazilian epidemic to try and understand how ZIKV and microcephaly are related. Mice model experiments confirmed that the viral particles breached the cell cycle of NPCs, as well as slowing their progression (Boeuf et al., 2016; Huang et al., 2016). To find out the cause for microcephaly in mice, Huang et al. (2016) tested for apoptosis marker Cleaved Caspase 3 (CC3) in brain cells using antibody-CC3 for staining. Pervasive CC3 apoptosis activation was found throughout the brain, with the occipital cortex and hippocampus having a significantly higher density (Huang et al., 2016). Embryonic mice brains showed greater density of CC3 apoptosis in the intermediate zone (IP) and CP before cell death (Huang et al., 2016). In another study, ZIKV infection led to increased cell death via Caspase 3 activation in a culture of human NPCs just 3 days after initial infection (Tang et al., 2016; Cugola et al., 2016). Consequently, microcephaly and other brain abnormalities resulted as a repercussion. Death of cortical NPCs and decreased neuronal production from viral invasion are direct contributors to microcephaly, and positive staining of CC3 apoptosis showed great

evidence that ZIKV induced this cell death pathway (Garcez et al., 2016; Huang et al., 2016).

Clear indications of abnormal brain development such as microcephaly were also observed in neurosphere models (Cugola et al., 2016; Garcez et al., 2016). A neurosphere is a plated culture system composed of floating clusters of neural stem cells from the brain area of interest. Neurospheres are commonly used to observe 3D cell growth *in vitro* (Jessberger et al., 2008). Mock-infected and ZIKV-infected neurospheres were generated by growing NPCs in suspension. Upon examination of the ZIKV-infected model, the neurospheres showed abnormal growth characteristics and cell detachment, and grew significantly smaller, whereas the mock-infected stem cells generated healthy, round neurospheres (Figure 3A, 3B) (Cugola et al., 2016; Garcez et al., 2016). Most of the ZIKV-infected neurospheres were apoptotic and died after a couple of days (Figure 3D). It was further observed that viral particles had become bound to the host's membranes and gained entry into the mitochondria of infected cells. Overall, this appropriately suggests that ZIKV induces apoptosis in human NPCs and impairs proper brain formation (Garcez et al., 2016).

Generally, in ZIKV-induced microcephaly, there is a pattern of NPC deficiency from the virus interrupting its cell cycle by inhibition of the cell's exit, and causing a cell death pathway, ultimately leading to less neurons produced for proper cortex development. A dire consequence as mentioned before, is microcephaly. Microcephaly patients often exhibit a significantly smaller brain, and with that comes brain impairments that affect motor, visual, hearing, and cognitive functions, depending on severity (Garcez et al., 2016).

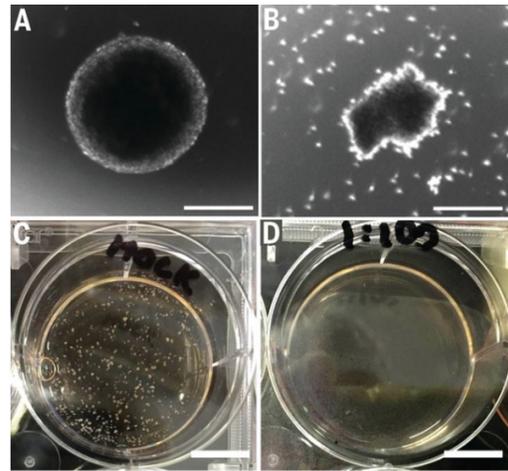


Figure 3. ZIKV alters morphology and halts growth of neurospheres – A) A control neurosphere with normal spherical morphology after 3 days *in vitro* (IV). B) A ZIKV-infected neurosphere with abnormal cell morphology and cell detachment after 3 days IV. C) Mock-infected medium plate containing normal spherical neurospheres after 6 days IV. D) ZIKV-infected medium containing very few surviving neurospheres after 6 days IV (Garcez et al., 2016).

AXL Receptor

As mentioned before, ZIKV directly infects NPC during fetal brain development to cause cell cycle dysregulation and apoptosis (Li et al., 2016). Research shows that NPCs express a protein that aids in ZIKV entry and infection. Axl, a tyrosine kinase receptor that is encoded by the Axl gene, is expressed in human NPCs (Meertens et al., 2016; Robbins & Bender, 2016). Axl belongs to the TAM (Tyro3, Axl, Mertk) family of receptor tyrosine kinases and is involved in clearance of dead cells from apoptosis and regulation of innate immunity in humans (Meertens et al., 2016). The Axl receptor is highly abundant in the fetal cerebral cortex, where ZIKV-susceptible cells are expressed. NPCs, radial glial cells, astrocytes, microglia all express Axl in the fetal brain (Boeuf et al., 2016; Li et al., 2016; Ming et al., 2016). TAM receptors generally sustain cell growth and survival. Moreover, analysis of the

TAM genes reveal that they play a crucial role in maintaining cortical NPCs survival, proliferation, and differentiation. For example, mice lacking in *Axl* and *Mertk* caused early cell differentiation and migration of NPCs in the SVZ. This can alter the course of cells during fetal development to result in a large array of unwanted defects (Ji et al., 2014).

Recent studies have suggested that the *Axl* receptor is the route of entry for ZIKV infection in humans (Richard et al., 2017). *Axl* has previously been identified as an entry point for DENV, a virus with similar properties to ZIKV. DENV is also an arbovirus transmitted by the *Aedes* mosquito genus of the flavivirus family. DENV fever has similar symptoms to ZIKV which can include muscle and joint pain, rashes, headaches and fevers, however, there seems to be no connection to microcephaly in DENV (Patterson et al., 2016). The ZIKV virion gains entrance into the host by binding Gas6 (Figure 4), a TAM ligand for *Axl* (Meertens et al., 2016; Ming et al., 2016). Gas6 recognizes and binds to a phosphatidylserine molecule on the viral envelope (E) protein. Gas6 then binds to its respective *Axl* receptor on the host. This bridges the entry of the flavivirus into the host's *Axl* protein. Recent studies concluded that TAM ligand Gas6 is pertinent for ZIKV infection through the *Axl* receptor. In one study, human microglial cells (CHME3) were treated with the viral strain ZIKVHD78. When TAM ligands were omitted from the culture, ZIKV infection levels drastically declined in CHME3 cells whereas restoration of Gas6 reinstated the high levels of ZIKV infection (Figure 5), as measured by levels of apoptosis (Meertens et al., 2016).

From here on, ZIKV enters *Axl*-expressing cells through clathrin-mediated endocytosis (Meertens et al., 2016; van der Schaar et al., 2008). Clathrin-mediated endocytosis (CME) is a pH-dependent pathway using clathrin-coated vesicles to internalize ligands bound to receptors on the target cell's plasma membrane (Karp, 2013). CME appears to be the route of entry used by the majority of the flaviviruses

(Fernandez-Garcia et al., 2016; van der Schaar et al., 2008). In a 2008 study, DENV particles diffused from the membrane to join a clathrin-coated pit. DENV particles mature whilst moving through the cytoplasm until membrane fusion allows the viral genetic material to be released. To find out if ZIKV could enter independently of CME, Meertens et al. (2016) treated CHME3 with short interfering RNA to interfere with clathrin triskelion assembly on the vesicle. Recruitment of dynamin-2 proteins and clathrin heavy chains were inhibited in order to interfere with CME to see if ZIKV's entry was affected. After 48 hours, immunoblotting showed that ZIKV entry was strongly impaired. Likewise, treatment of cells with chemical and molecular inhibitors of CME severely incapacitated the DENV entry into mosquito cells (van der Schaar et al., 2008).

Researchers infected astrocytes in the presence of a non-activating antibody specific for the extracellular domain of *Axl*. The results concluded that blocking the *Axl* receptor appears to stall viral replication, however, interference with the internal kinase activity still allowed for astrocyte infection. This suggests that *Axl*'s extracellular domain plays a role in infection (Retallack et al., 2016). Moreover, ZIKV binds Gas6 more efficiently than WNV or DENV and therefore, *Axl* is a significant factor for infection on fetal NPCs, astrocytes, and microglia. ZIKV's ability to bind Gas6 and enter through *Axl* may help explain why other flaviviruses cannot cross the fetal bloodstream to cause microcephaly (Richard et al., 2017). Decoy receptors for *Axl* have been constructed in an attempt to protect from flavivirus infection. One engineered decoy is the MYD1 receptor with a high affinity for Gas6. Results showed that MYD1 blocked ZIKV upon infection and cells such as microglia and astrocytes were protected. Further research is being conducted on *Axl* interference, but it is important to know that solely targeting *Axl* could take a toll on innate immunity (Meertens et al., 2016). Likewise, intercepting *Axl* has been linked to overproduction of inflammatory

cytokines, promotion of microglia activation, and eventual death of NPCs. Therefore, blocking the Axl protein may slow down viral replication, but breach of normal protein function may have dire consequences (Nowakowski et al., 2016).

Ultimately, it is suggested that ZIKV particles enter host cells via clathrin-vesicles through tyrosine kinase receptor Axl, and are dynamin-2 dependent as well as TAM ligand dependent (Meertens et al., 2016).

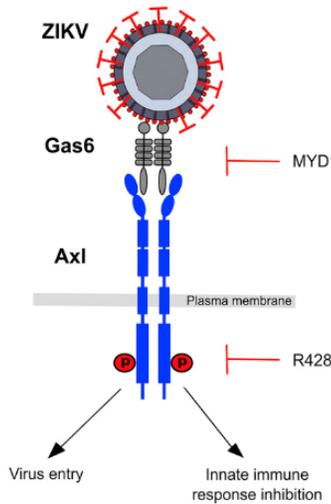


Figure 4. ZIKV binds to a TAM ligand ZIKV enters the cell by binding Gas6, an Axl ligand. Gas6 recognizes and binds to a phosphatidylserine molecule on the virus envelope (Meertens et al., 2016).

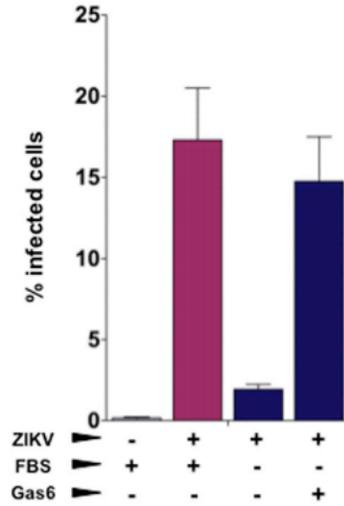


Figure 5. CHME3 cells were challenged with ZIKV in DME medium alone or containing hGas6. Pink is control. Without Gas6 as a ligand, % of infected cells were substantially decreased, as opposed to 15% infected cells with Gas6 present.

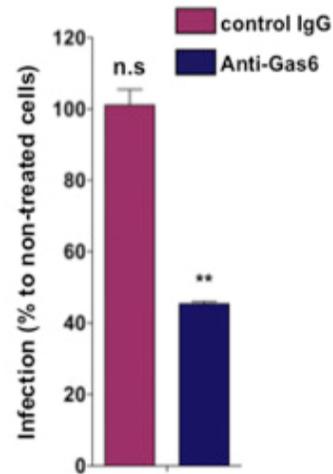


Figure 6. Astrocytes were treated with Anti-Gas6 ligand or control IgG and infected with ZIKV. Using anti-viral protein antibodies, it can be seen that infection % declined when treated with Anti-Gas6 ligand.

Retinoic Acid

A recent study suggests that microcephaly from ZIKV may not just be caused by down-regulation of the cell cycle and upregulation of apoptotic genes. Retinoic acid (RA) is a small molecule that acts as an active ingredient in vitamin A. RA binds to its receptors (RAR and RXR) on certain genes' promoter regions to upregulate expression of genes that coordinate proper development of the neural tube, and other essential embryological functions. Dysregulation of RA signaling can cause brain malformations and defects, such as microcephaly (Kumar et al., 2016). For instance, previous studies where interception of RA signaling with glyphosate herbicides produced teratogenic effects on *Xenopus laevis* embryos, of the African aquatic frog family (Paganelli et al., 2010). RA has a significant role in building the posterior-dorsal and forebrain, therefore, disruption in the RA expression pathways from viral invasion can precipitate abnormalities in the developing brain, such as microcephaly (Kumar et al., 2016).

Since ZIKV is an RNA virus, it utilizes reverse transcriptase to synthesize a complementary DNA strand from cDNA, which is then integrated into the host's genome. Kumar et al. (2016) hypothesizes that the virus inserts repeats of a consensus sequence (5' -AGGTCA- 3') into the host's brain cells in order to disrupt the normal RA pathway. Results of the study showed that there was greater chance for microcephaly if the ZIKV strain contained the consensus sequence in its genome. Furthermore, a ZIKV strain with more sequence repeats appeared to be more fatal, causing congenital brain deformities, such as severe microcephaly. Nonetheless, the authors of the study noted that a higher number of consensus repeats could be due to a large reading frame length in the virus, and thus, further research is needed to investigate if RA signaling disruption is a common cause for brain defects.

Societal and Economic Impacts of the ZIKV Epidemic

Outbreaks of ZIKV bring a host of societal and economic burdens, and demonstrate moral failures in the community. The epidemic highlights numerous flaws in the public health infrastructure, notably in poorer countries such as Brazil. Certain demographics are more vulnerable to the virus due to the innate social and economic inequalities of the healthcare system, as well as climate change. During the H1N1 Influenza outbreak in 2009, wealthier countries received vaccines before those in immediate need because they had had preexisting contracts with manufacturing companies, even though their populations were at lower risk (Gostin and Ayala, 2017). The ZIKV costed the world billions and left its mark on the economy in many countries, especially in South America and the Caribbean (Zagorski, 2016).

The patterns of spread of ZIKV highlighted the reality that poorer families bear much of the consequences. In Brazil, families that reside in poorer parts of the country are more susceptible to ZIKV exposure and infection due to the crowded urban living conditions, insufficient and unkempt sewage systems, and pools of standing water swarming with possible infectious mosquitoes. In the United States, ZIKV has appeared in states with inadequate and expensive healthcare, where many lower-class citizens cannot afford it, or they are unable to access these basic healthcare resources (Sered, 2016). This can lead to symptoms of disease being left untreated and may possibly precipitate into further health consequences. Consequently, healthcare for millions of undocumented immigrants in the US is denied and many governors refuse to expand the insurance plan under the Affordable Care Act (Gostin and Hodge Jr., 2016). Pregnant women are especially among the neglected population of lower class citizens that cannot access basic healthcare resources. Poorer women often have longer waits for virus testing, bloodwork, maternal, and other health services. Since Brazil prohibits abortion, women are forced to

either obtain a dangerous "back-alley" abortion, which can lead to severe injury or even death, or bear a child with the possibility of it having microcephaly, and the long-term impairments that accompany it (Gostin and Ayala, 2017; Sered, 2016). Additionally, it is believed that at least 6% of ZIKV-infected mothers will miscarry or have stillborn deliveries, whilst surviving babies will have a 13% chance of microcephaly (Gostin and Hodge Jr., 2016). Inaccessibility to appropriate healthcare for pregnant women and poorer population groups further focuses on the societal and economic inequalities that ZIKV has brought to the surface (Gostin and Ayala, 2017).

Alternatively, the increase in global temperatures enhances the vulnerability of mosquito-borne diseases, such as flaviviruses DENV, ZIKV, and WNV (Sered, 2016). The global changes in temperature, precipitation, and humidity can escalate the mosquitoes' reproduction rates and the number of blood meals they must take, and prolong their breeding season, ultimately leading to an increase in the spread of diseases they can carry. Mercer (2016) mentions that each of those climate change factors may result in more humans being exposed to mosquitoes and therefore mosquito-borne illnesses.

The World Bank estimated that the ZIKV epidemic cost the world about US \$3.6 billion in 2016. This number includes the costs of direct expenditures, productivity loss, loss from death, and the impacts of virus avoidance.

Firstly, direct expenditures are the costs to directly treat and combat the disease, such as payment for extra doctors and nurses, drugs and treatment fees, and ultrasounds of pregnant woman to monitor the development of the fetus. (Zagorski, 2016). Former United States President, Barack Obama, allocated \$1.8 billion towards response programs for the ZIKV outbreak: \$828 million was given to the CDC and \$210 million was given to the US Department of Health to address ZIKV complications (Lee et al., 2017). As of August 2016, the CDC had

already spent most of its funding and was requesting additional funding, as the virus had appeared in Florida. Furthermore, an additional \$81 million was relocated from biomedical research for antipoverty and health care programs, to research of ZIKV vaccinations (Tavernise, 2016).

Productivity loss comes from the inability to work, and therefore the sickly lose out on paid work as well as contribution to the workplace (Constenla et al., 2016; Zagorski, 2016). While there is no considerable economic impact if only a handful of the population are affected by ZIKV, it is much more potent when the epidemic spreads and causes mass panic such that productivity costs can escalate. The World Bank estimates that four million people would have been infected in 2016 with roughly 20% of the four million become sick. In Latin America and the Caribbean, that would account for 750,000 people to lose out on about one week's worth of paid work (Zagorski, 2016).

Loss from death is the associated cost of infection. While the World Bank and forensic economists could not determine the value of a life, they included the costs that are necessary in order to make the society safer. Forensic economists looked to alternative studies in order to arrive at an estimate for the value of a life. For example, the US Transportation Department currently estimates that saving a life is worth over \$9 million when making decisions and rules about the safety of US roads, bridges, and tracks (Zagorski, 2016).

Lastly, disease avoidance is a large factor in the economic impact left behind by ZIKV, because the virus is active in many tourist countries, such as South America and the Caribbean. The Olympic Committee forecasted around 500,000 tourists to converge in Rio de Janeiro after it was announced that Brazil would host the 2016 Summer Olympics. However, if tourists avoided Brazil and the surrounding countries associated with the disease, there would be potential for billions of dollars to be lost without foreign fans and athletes being present (Zagorski,

2016). There is potential for reduced tourism revenues to reach over \$9 billion across three years, or 0.06% of annual gross domestic product (GDP). In that case, the Caribbean region would require additional support from the international community to brace the economic consequences of ZIKV (Lesser and Kitron, 2016; The World Bank, 2016). Similarly, after the Chikungunya and DENV outbreak between 2006-2008, the economic impact of three Asian economies was assessed. There was a 4% decline in tourism revenues, representing a loss of about \$11 million for Gujarat, \$82 million for Malaysia, and \$457 million for Thailand (Constenla et al., 2016).

The economic impacts of disease epidemics may not always be apparent and may be significantly underestimated, especially in diseases like ZIKV because there can be lifelong effects that are manifested. Since ZIKV usually does not pose a considerable mortality risk to infected adults, it is easy to overlook the full magnitude of its impact.

Impacts of ZIKV-Related Microcephaly

While there is no vaccine available for ZIKV, most infections are asymptomatic and self-limiting, often treatable with over-the-counter medicine, hydration, and rest (Rather et al., 2017). However, infections to pregnant women can implicate microcephaly, which is probably the most dramatic consequence for ZIKV-infected newborns. Children born with microcephaly are expected to have a shorter lifespan than the average person, with the implications of microcephaly ranging from mild to extreme. The reality is that babies born with microcephaly will, in most cases, require lifelong specialized care because the underdevelopment of their brain will have a significant effect on almost all aspects of their life. As previously mentioned, microcephaly has a range of effects from vision problems and hearing loss, to physical and cognitive delays (CDC, 2017). It is predicted that children diagnosed with microcephaly may have an IQ below 70 (Cugola et al., 2016). Other possible health complications of microcephaly

are speech delays, where the infant will take longer to learn and form words and sentences than that expected for their age. Speech therapy may be required in the future if this is the case. Children with microcephaly may develop difficulties with balance and coordination, therefore long-term physiotherapy may be required to assist them in swift use of their limbs (CDC, 2017). Because children with microcephaly may not reach their full cognitive and physical capacity, this puts them at a disadvantage, as they are less likely to attend school which results in lower educational achievement. Likewise, high unemployment rates have been linked to microcephalic adults (Boeuf et al., 2016). In the long run, resources of families caring for children with microcephaly will be depleted as they tend to their children's physical and developmental needs, such as glasses and hearing aids, physiotherapy costs, routine check-ups, therapists, and medication. Furthermore, the emotional toll of lifelong supervision of a child with microcephaly on the family can be demanding and devastating (CDC, 2017).

Conclusion

This review examined the recent outbreak of the Zika virus in Brazil that sparked the interests of researchers. Studies confirmed a link between ZIKV and microcephaly when the timing of the outbreak coincided with births of babies with smaller than normal heads. It was found that this flavivirus targets neural precursor cells that build the cortex of the brain. Specifically, NPCs during the first trimester seemed to be more susceptible to infection because this is the period where brain development is at a maximum. ZIKV appears to disrupt the cell cycle and induce an apoptotic response in NPCs, as can be seen in ventricular and subventricular zones of the brain. Recent studies show that a primary entry way for ZIKV is through tyrosine kinase receptor Axl, however, it is important to consider that blocking Axl can yield other severe complications. Moreover, it should be noted that recent research shows a small molecule called

retinoic acid also being involved in infection. It is hypothesized that ZIKV inserts repeats of a consensus sequence into the host cell to disturb the normal signaling pathways of RA. Finally, it is important to consider the economic and societal impacts that an epidemic such as ZIKV has left behind. Lower class citizens usually take the brunt of disease because they lack access to appropriate resources to treat the illness. These findings emphasize the need for public health authorities to provide relevant resources and funds to vulnerable groups that face the economic and class inequalities in society. In the meantime, ZIKV infection can be prevented by being aware when travelling to places where ZIKV is active, especially if pregnant. Figure 6 shows a number of countries where the virus is active. Also, preventative measures such as wearing long sleeves and applying insect repellent are important when in mosquito-rich areas.

Location	Number of confirmed cases by September 2016
Brazil	1911
Colombia	40
Martinique	12
USA	23
French Polynesia	8
Panama	5

Figure 7. ZIKV related microcephaly and other congenital syndromes of the CNS. Confirmed cases reported in 6 countries by September, 2016 (Rather et al., 2017).

Limitations and Future Directions

There are several notable limitations in this review. This review paper primarily focused on the scientific side of ZIKV pathogenesis, and its effect on neural precursor cells. More research could have been conducted on the social impacts of an infectious epidemic, especially in relation

to the Western world. This paper acknowledges that the consequences of ZIKV span across many disciplines, such as politics, microbiology, and economics, and there is not one solution from one branch of knowledge. However, it does not propose specific initiatives to resolve the issue.

In order to control and prevent future disease epidemics, it is crucial to recognize that this virus (along with other arthropod-borne viruses) is spread via mosquitoes. While there currently exists no vaccine for ZIKV, education on prevention is the best way to hinder mosquito bites. Intervention strategies from public health officials to limit mosquito breeding must be implemented. For example, in poorer parts of the world where ZIKV is active, proper sewage drainage systems and adequate water management systems should be implemented to limit reservoirs where mosquitoes can reproduce (Shankar et al., 2017; Rather et al., 2017). Infected or susceptible groups should be well educated on ZIKV’s mode of transmission to prevent infecting others (Shankar et al., 2017; Rather et al., 2017).

There are numerous pharmaceutical companies looking to create vaccines for the virus. Bharat Biotech in India has 2 vaccines in clinical trials. Following successful animal models, human trials should be launched to test the efficacy of vaccines. Moreover, one study showed that antibodies derived from the mother can be given to a fetus to stimulate short-term immunity. However, short-term immunity is not sufficient, and future research on discovering therapies that provide long-lasting immunity is required (Shankar et al., 2017). While ZIKV is not as big of a concern as it has been in the recent past, it is still necessary to continue surveillance for this devastating virus.

About the Author

My name is Meng and I'm from Rockwood, Ontario! I'm studying at the University of Guelph in the Bachelor of Arts and Sciences program. My arts specialization is Criminal Justice and Public Policy and science is Microbiology. After my degree, I'm interested in going into grad school for pathology, or infectious disease, or bioremediation. My article on the Zika virus was a topic I chose with my professor, John Vessey, a neuroscientist at Guelph studying neural precursor cells.

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The Blurring of Identity: Cochlear Implants and the Deaf Community

Zoé Bernicchia-Freeman

When American otologist William House invented the first cochlear implant in 1961, the hearing world rejoiced. Since then, implantation rates have steadily increased. As of five years ago, over 324,200 devices have been implanted worldwide (U.S. Department of Health & Human Services 2017). However, the invention and implementation of the cochlear implant have been very controversial in a group of deaf individuals known as the Deaf community. While the hearing world commonly views deafness as a handicap, this community considers it to be an enriching perspective on life. Moreover, the Deaf community celebrates their deafness. The

cochlear implant conflicts with Deaf pride, which does not view deafness as something that needs to be “fixed.”

A cochlear implant is a device that receives sound stimuli from the outside world and transmits it to the auditory nerve. It is composed of an external part (the speech processor and the transmitter) and an internal part (the implant). The speech processor sits on the outside of the head and uses small microphones to pick up sound. These sounds are then coded into signals by the processor and are sent to the transmitter, which is clipped onto the back of the ear. The transmitter sends the signals through the skin

to the implant, which converts them into electrical energy and stimulates nerve fibres in the cochlea. Once this process is complete, the brain can recognize the signals as sound (Cochlear Australia and New Zealand 2014). Cochlear implants do not restore regular hearing via the ear. Unlike standard hearing aids, they bypass the ear altogether and send sound signals directly to the brain (U.S. Department of Health & Human Services 2017). As a result, cochlear implants provide an electronic perception of sound that can be significantly different from regular hearing - patients often report that it takes years to adapt to the electronic feedback after their initial surgery, and as a result they have difficulty following group conversations and speaking on the telephone (Punch and Hyde 482-483). However, cochlear implants are celebrated in the scientific community because they allow deaf individuals to actually perceive sound, regardless of the quality of the sound.

Some proud members of the Deaf community believe that the cochlear implant is an attack on Deaf culture. On the other hand, members of the hearing world view the device as an opportunity for deaf individuals to overcome their “disability.” Irma Munoz-Baell and M. Teresa Ruiz summarize the crux of this debate: “two opposing perspectives of conceptualising deafness in contemporary society have been reported and discussed in scientific literature. The first one defines deafness as a pathological condition, while the second one regards deafness as a cultural identifier” (40). As a hearing individual who has been involved in the Deaf community, I have been exposed to both perspectives, and I take no side in this debate. Therefore, this work will not evaluate whether or not the device should be used; instead, it seeks to explore the impact of the device on the Deaf community and on the construction of Deaf identity. Literature will be drawn from various disciplines, including otology, psychology, Deaf culture, hearing culture, disability studies, and ethics. By integrating ideas from these disciplines, this work aims to provide a two-pronged investigation of

the cochlear implant debate. First, I will evaluate the historical roots contributing to the controversy of the debate by examining reasoning behind hearing and Deaf perspectives. Second, I will explore how cochlear implants are affecting Deaf youth. By giving deaf children and their parents the power to choose between the hearing world and the Deaf world, cochlear implants are blurring the picture of the typical Deaf identity. This topic is of great importance because the future of the Deaf community lies in the hands of these families. Therefore, it is crucial to track the social and psychological repercussions of cochlear implants as implantation rates continue to rise. The goal of this work is to investigate these repercussions and provide a fair evaluation for both sides of the cochlear implant debate. According to various global studies conducted in 2010, approximately 360 million individuals live with “disabling hearing loss” (World Health Organization 2018). However, it is important to note that this work will focus solely on deafness and Deaf culture in the Western world, as perceptions of deafness differ in developing areas (Penn et al. 131).

The first section of this paper will explore the historical roots of Deaf pride. This will provide insight into the Deaf perspective, and will help answer the following question: why are members of the Deaf community so opposed to cochlear implants?

Pride and identity are fundamental values of Deaf culture, and many academics insist that these values have been shaped by the community’s history of oppression. According to Paddy Ladd and Harlan Lane, this oppression can be compared to that of ethnic minorities. In their work “Deaf Ethnicity, Deafhood, and Their Relationship,” they write the following:

As with ethnic groups, much of [Deaf history] concerns oppression...In the beginning, we were dispersed and isolated, but then our people gathered and built our institutions; there was a Golden Age in which we flourished, followed by the dark ages of oppres-

sion; but we rose up victorious and recovered our lost values and prestige. (567)

According to Ladd and Lane, the Deaf community is currently living out their “Golden Age”: Deaf individuals finally have equal rights, are entitled to special education, and are free to communicate using manual language (World Federation for the Deaf 2011). Due to these newfound freedoms, elements of Deaf culture that were once repressed are now stronger than ever, and the Deaf community is driven by pride. “Being Deaf and allegiance to the group” is valued within Deaf culture (Ladd and Lane 566). Therefore, deafness is actually viewed in a positive light, and self-acceptance is crucial. Many believe that the rise of cochlear implants is jeopardizing this view. By implying that deaf individuals should be “fixed,” the implementation of the device contradicts the acceptance of deafness and further handicaps the community (Gauntlett 850).

The Deaf community’s journey towards acceptance has been long and arduous. For thousands of years, they were alienated or forced to conform to hearing norms. Therefore, the increase in cochlear implantation raises concerns that the community’s progress is being reversed. In “A History of Unequal Treatment: The Qualifications of Handicapped Persons as a ‘Suspect Class’ under the Equal Protection Clause,” Marcia Pearce Burgdorf and Robert Burgdorf Jr. describe the past oppression of the deaf in educational institutions:

Any person who deviated from the norms of what was expected of a pupil. . . was viewed as disruptive and burdensome and thus not suited for classroom instruction. . . . The result of this exclusion. . . was the removal of any incentive for educators to develop programs suited to the needs of such children. . . . It was not until the 1860’s that public school special education classes for deaf children were

initiated in [America]. (855)

Instead of making the education system accessible to all, students were excluded. The exclusion of deaf students placed the burden to adapt on the marginalized individuals rather than on the institutions. Links can be drawn between this past oppression and the impacts of cochlear implants today. Instead of enforcing the education of sign language, deaf people are encouraged to adapt to the hearing world by undergoing invasive surgery and speech therapy (Sparrow 144).

Discriminatory practices in education pale in comparison to the abhorrent treatment of deaf people dating back thousands of years. Burgdorf and Burgdorf write the following: “In Sparta, around 800 B.C., mentally and physically defective children were left on mountainsides or in pits to fend for themselves. Even enlightened Athenians put deaf children to death” (883). This cruel behaviour was approved by some of the most influential figures of the era, including Plato and Aristotle (M. Burgdorf and R. Burgdorf 884). In 355 B.C., Aristotle declared that “Those who are born deaf become senseless and incapable of reason” (Gallaudet University Press). These beliefs and practices remained prominent throughout the Middle Ages, when non-conforming individuals were either imprisoned or exiled from cities (M. Burgdorf and R. Burgdorf 884). It wasn’t until the mid 16th century that Aristotle’s beliefs were challenged. Physician Girolamo Cardano was the first documented individual to recognize the reasoning abilities of the deaf (Estonian Deaf Union 2010).

In his article “The Evolving Ethics of Cochlear Implants in Children,” John Lantos explains the two forms of education available to deaf children: manualism and oralism. Supporters of manualism believe that deaf children should learn sign language, while supporters of oralism believe that they should learn to speak and read lips. While many academics argue that a combination of manualism *and* oralism is optimal for a deaf child’s development, extreme oralists (like Alexander Graham Bell) were opposed to the teaching of sign language (Lantos

323). Supported by other well-known oralists and influenced by the ideas of social Darwinism, Alexander Graham Bell promoted the eugenics movement. He believed that deaf individuals could not contribute to society and even went so far as to encourage a ban on deaf-deaf marriages in order to eliminate deaf individuals from the gene pool (Lantos 323). In "Upon the formation of a deaf variety of the human race," Bell writes that "the production of a defective race of human beings would be a great calamity to the world" (217). While he himself was fluent in sign language, Bell believed that deaf children should learn to adapt to the hearing world instead of learning their own language. He suggested that sign language education encouraged inter-deaf marriage, which only perpetuated the "calamity" of deafness. According to Lantos, this history of oppression created a fear of oralism and can explain the Deaf community's response to the invention of cochlear implants: "They saw implants as a return to the philosophy of oralism and a rejection of sign language." (324).

Oralism is arguably the Deaf community's greatest adversary because it defines language as speech (Bauman 242). In her 1999 work *Lend Me Your Ear*, Brenda Bruggemann explores the perception of deafness: "Language is human; speech is language; therefore deaf people are inhuman and deafness is a problem" (11). Much like the exclusion of deaf children in schools, oralism supports the idea that the "disabled" Deaf community should adapt to the hearing world. However, when pondering disability as a concept, many academics reach the conclusion that it is merely a cultural construct (Branson and Miller 3). In *Damned for Their Difference: The Cultural Construction of Deaf People as Disabled*, Jan Branson and Don Miller write the following:

In a Deaf community, a hearing person who cannot sign is disabled, handicapped. . . Conditions categorized in our society as petit mal epilepsy, autism, and blindness may be associated in another so-

ciety with intense spirituality and accepted as evidence of superiority. Appearances and behaviors are interpreted within cultural contexts. "The disabled" are not a natural but a cultural construction. (Preface xi)

Following Branson and Miller's logic, cochlear implants could be perpetuating these interpretations by encouraging the deaf to be more like hearing people. This reinforces the construction of the Deaf identity as inferior.

Ladd and Lane's comparison of deaf experience to the oppression of ethnic minorities allows for significant connections to be drawn between works on Deaf identity and the construction of difference. In Frantz Fanon's work *Black Skin White Masks*, he writes: "I came into the world imbued with the will to find a meaning in things, my spirit filled with the desire to attain the source of the world, and then I found that I was an object in the midst of other objects" (82). While Fanon is referencing race in his work, his thoughts on the "inferiority complex" can be similarly applied to the inferiority imposed upon the Deaf community. When born into deaf families, it is natural for deaf children to initially assume that deafness is the norm. If surrounded by a rich community, they are raised in the centre of Deaf culture. It is only once they venture out into the hearing world that they discover the drawbacks of their "condition" (Sparrow 138). When words like "disabled" and "handicapped" are used to describe deaf children, inferiority is forced upon them, and they are not free to discover their own identities. Approximately 90% of all deaf children are born into hearing families, so this inferiority complex begins at birth (U.S. Department of Health & Human Services 2016).

Now that we have gained some historical insight on the Deaf perspective, we can turn our attention towards ongoing implications of cochlear implants. The following section will explore the effects of the device on youth, their parents, Deaf identity, and the future of the Deaf community.

There are two categories of hearing loss in children: congenital and acquired. Congeni-

tal hearing loss is present at birth and can be the result of premature births, birth complications, maternal infections, maternal drug abuse, genetic factors, and more. Acquired hearing loss is developed throughout childhood and can be caused by postpartum infections and diseases, injuries, loud noise exposure, perforated eardrums, and other traumatic events (Healthy Hearing 2017). This myriad of factors indicates that hearing loss in youth is not uncommon. Consequently, many children are candidates for cochlear implant surgery.

By the year 2000, American children as young as 12 months of age began receiving implants (U.S. Department of Health & Human Services 2017). This is a critical age for development. According to the Ontario Ministry of Children and Youth Services, the most critical time for a child to cultivate language and communication skills is under the age of three (2016). Therefore, parents are rushed to make life-altering decisions regarding the future identities of their deaf children.

In his work “Cochlear implants, the Deaf culture, and ethics: A study of disability, informed surrogate consent, and ethnocide,” Glenn Hladek explores the complexities of these decisions by questioning the rights of parents to determine their child’s identity. While parental versus state rights in life-threatening scenarios are heavily discussed in medical literature, Hladek writes that “the debate directed toward non-life threatening conditions... is either assumed (parental authority) or paternalistic (medical or court authority), and provides little guidance for moral analyses of the question of not only who decides, but also how they decide” (31). If the parents are hearing, the Deaf community finds parental authority regarding cochlear implantation problematic. They believe that the parents lack perspective and are most likely unaware of the existence of the Deaf community. Therefore, “a hearing person’s interest conflicts with the deaf child’s best interest” (Hladek 38). A main concern for the community is that deaf children will grow up with implants, and will never bother to learn sign language since they can experience

sound. This limits their future interactions with the Deaf community and deprives them from the benefits of learning sign language (Mellon et al. 171).

According to Hladek, the community understands that these decisions can ultimately only be made by parents. Nonetheless, it is crucial that parents are made aware of the Deaf perspective (Hladek 38). The community suggests that there should be a Deaf adult acting as a third party, in order to offer parents this perspective. Regarding “proxy consent,” Hladek states that there is legal precedent for the involvement of a disinterested third party when decisions must be made on behalf of “non-competent” individuals (38). However, it is important to keep in mind that this third party would be biased and would advocate for the Deaf community, most likely opposing the implantation (Hladek 39).

The Deaf community is one that individuals are born into, and whether or not they embrace the culture, all individuals with hearing loss have the lifelong potential to join the group. Therefore, the community considers every deaf newborn as part of their family (Hladek 42). While these values are supportive and inclusive, Hladek further explores the complexity of this issue by presenting an alternative idea: “Each deaf child is considered a means to the culture’s ends, that is survival of the culture, not the child’s own end. The deaf child exists to fulfil the culture’s hopes and dreams, not necessarily the child’s hopes and dreams” (42). Due to the rise of cochlear implants, “ethnocide” has become a concern for Deaf culture. Hladek states that the community may be valuing the survival of its culture over the wellbeing of its individuals (42). This is problematic to academics like Dena Davis, who writes in “Genetic Dilemmas and the Child’s Right to an Open Future” that “the autonomy of the individual is ethically prior to the autonomy of the group” (11).

Links can be drawn between Hladek’s observations and acclaimed philosophical theories put forth by William A. Galston and John Stuart Mill. In his work “Two Concepts of Liberalism”,

Galston writes that “the liberty not to be coerced into, or trapped within, ways of life” must be defended (522). With respect to the issue of cochlear implants in youth, this logic could be used to argue that failing to implant a child would be trapping them within the Deaf community. Not all deaf individuals decide to identify as culturally Deaf, and these children could miss out on the opportunity to be raised in the hearing world. Furthermore, Mill vouches for individual liberty and argues that having a multitude of options available produces the best outcome for any individual. In *On Liberty*, he writes:

But different persons also require different conditions for their spiritual development; and can no more exist healthily in the same moral, than all the variety of plants can in the same physical, atmosphere and climate. The same things which are helps to one person towards the cultivation of his higher nature are hindrances to another. . . Such are the differences among human beings. . . unless there is a corresponding diversity in their modes of life, they neither obtain their fair share of happiness, nor grow up to the mental, moral, and aesthetic stature of which their nature is capable. (63)

According to Galston and Mill, the optimal scenario would be one where a deaf child grows up with as many options as possible and is not limited to either of the two worlds. Therefore, why not just let children grow up without implants, immerse them within the Deaf community, and let them make their own decision about the implant once they have acquired the Deaf perspective? This could resolve the controversy of parental choice and let children choose their own identities. Unfortunately, the reality is not so simple. Much of the audiological literature states that the earlier a child receives an implant, the better chance they have of adapting successfully to the device (Marschark 214). Therefore,

waiting for children to age and make their own decisions could unintentionally limit them to the Deaf world. By blurring the typical image of the Deaf identity and introducing all of these complexities, the rise of cochlear implantation is influencing the future livelihood of the Deaf community and its culture.

Once a child receives an implant, it is crucial to track their social development. How is their identity affected as they age? Renée Punch and Merv Hyde studied the social participation of children and adolescents with cochlear implants by conducting interviews with the children, their parents, and their teachers. Their goal was to evaluate the psychosocial factors affecting youth with implants. Fifty individuals were interviewed, and the results across the three groups “displayed commonalities” (Punch and Hyde 474). Punch and Hyde published a summary paper of their research, including key quotations from select interviews and the following overview of their results:

Some children had little contact with other deaf children (with or without cochlear implants) despite parents and teachers perceiving such contact beneficial. Children attending schools where there were other deaf children valued friendships with both deaf and hearing peers. Adolescence was a particularly difficult time for some as they struggled with feelings of self-consciousness about their deafness and external cochlear implant equipment and worries around friendships, dating, and their future place in the world. (474)

One mother said that her daughters, who both received implants when they were toddlers, were very social children. However, they began to experience difficulties interacting with their peers as they grew. The mother’s reasoning for this change in behaviour was that as girls age, they begin to “talk a lot more and play less” (Punch and Hyde 481). Despite having received the im-

plants nearly a decade earlier, the young girls had difficulties with oral communication as they approached the age of ten. Other parents reported that their children had difficulties using telephones, even though the children had received implants at a very young age (Punch and Hyde 482). This illustrates that cochlear implants do not “fix” deafness, which is a common misconception. As I explained at the very beginning of this paper, cochlear implants do not restore regular hearing. A deaf person with a cochlear implant is still technically deaf because they have not regained the physical ability to hear with their ears. This is what allows adult Deaf individuals with implants to remain active in the community and continue to identify as culturally Deaf. However, if an individual with a successful implant chooses not to be involved in the community and does not use sign language to communicate, they could consider themselves hearing instead. Rupert Gauntlett argues that there also exists a scenario where cochlear implantation could result in a lack of identity altogether. In “Cochlear implantation is controversial among deaf people,” Gauntlett writes that “children with cochlear implants will fall into the group who are neither deaf nor hearing, unable to be fully integrated into a hearing world but set apart from the vibrant culture of deaf people” (850). Therefore, an individual with a cochlear implant could identify as hearing, Deaf, or neither. These technicalities make the discovery and assertion of one’s identity even more challenging and could partly explain the conclusions drawn from Punch and Hyde’s interviews with adolescents. The rise of cochlear implants has caused identity in the Deaf community to become fluid - as children grow into teenagers, they begin to question their identities as semi-Deaf and semi-hearing individuals.

Punch and Hyde wrote that some participants treasured friendships with both deaf and hearing peers (474). It is therefore possible for the cultures to merge successfully, thus improving the lives of these children by expanding their social circles. However, in order to rem-

edy the barriers between both communities, we must first overcome our “narrative of disability” (Crouch 16). This narrative encourages hearing people to view themselves as superior to the deaf. In response, the Deaf community argues that they are unique - not inferior. When attempting to break down these barriers, the community is often faced with “audism”. The term “audism” was coined by Tom Humphries in 1975 and refers to “discrimination against the deaf” (Bauman 239).

According to Richard Eckert and Amy Rowley, audism is a unique kind of discrimination that manifests itself in different forms: “overt audism”, “covert audism”, and “aversive audism” (108). Any policies or practices that actively exclude deaf individuals are considered overt audism, whereas instances when discriminatory behaviour is hidden or concealed are considered covert audism. Aversive audism, on the other hand, is the *unintentional* denial of discriminatory behaviour. Eckert and Rowley state that an aversive audist may romanticize Deaf culture while maintaining the belief that all deaf individuals wish to be “assimilated” into the hearing world (109). Some members of the Deaf community view the creation of the cochlear implant as a manifestation of aversive audism, because while it was created to do “good”, it was also created with the intention of making deaf people “normal.” This implies that deafness is a problem in the first place, and that hearing people are taking it upon themselves to “fix” it, which can be perceived as condescending notions of supremacy.

Audism is directly linked to the inferiority complex discussed in the previous section, and further perpetuates the societal construction of deaf disability. It affects how the hearing world perceives the deaf, which in turn impacts how the deaf perceive themselves. According to Eckert and Rowley, the deaf and hearing worlds will not be able to achieve integration until this audistic mentality is eradicated (124). Unfortunately, this will not occur as long as these two worlds remain opposing forces. To achieve true integra-

tion, barriers between the communities must be dissolved, and differences between the deaf and the hearing should be celebrated. While their abilities differ, their potential to communicate and learn is equal; deafness is **not** a learning disability. Regarding the debate between oral and signed language, Robert A. Crouch writes that “the deaf child no less than the hearing child has all the requisite skills that will enable her to achieve a different, but no less human, expressive potential” (18). Each community is rich in its own unique way and neither community is superior.

A deaf teenager interviewed by Punch and Hyde discussed her ability to interact with both hearing and deaf peers at school. Her school had a support system in place for deaf students and the communities were encouraged to mix: “my deaf friends sign, my hearing friends talk to me” (485). In another interview, a mother described the impact that meeting other implanted children had on her son: “and he suddenly realized there were... other kids his age... with the implant... and I think that it was a bit more accepting for him” (484). When a child with an implant is given the proper support, the results can be beneficial and rewarding. Therefore, in an attempt to step away from the dichotomy of deaf versus hearing, I propose that we focus on a third possible identity: deaf youth with cochlear implants. As implantation rates continue to rise, the number of deaf children growing up with the device will rise as well. Why not build a community where deaf children with implants can unite, instead of having to choose between both worlds? This third community could begin to bridge the gap between the deaf and the hearing. I have met deaf children with implants, and while they are grateful for the opportunity to perceive sound, the majority of them struggle with asserting their identity. In this environment, youth with implants could learn about the Deaf community while still being members of the hearing world. They would be free to discover their own identities and explore the many

opportunities offered by both cultures.

A cochlear implant is merely an object, which, in itself does not challenge the different ways in which its users choose to identify. It is not the device, but its implementation that is problematic. By being viewed as a way to “fix” the deaf, the implant is driving the two communities even further apart. I have met Deaf individuals who have told me that they would never receive a cochlear implant, because they see the device as a betrayal against their culture and identity. Further, these individuals feel betrayed by other members of the Deaf community who choose to receive the implant. Therefore, the audistic mentality behind the device is driving individuals *within* the community apart as well.

In conclusion, it is clear that cochlear implants are here to stay. In fact, as you read this paper, audiologists and innovators around the world are developing and refining the latest cochlear model. Fighting the use of the device is counterproductive; statistics suggest that its implantation rates will continue to rise, regardless of its social implications (U.S. Department of Health & Human Services 2017). Therefore, whether the technology is embraced or not, it is the mentality behind its creation and implementation which must be changed. Cochlear implants should be used to increase communication between the deaf and the hearing by allowing deaf individuals to overcome barriers in the “abled” world we inhabit today. However, cochlear implants should only be employed to facilitate meaningful interactions between both worlds - they should **not** be seen as a reparative measure to “cure disability.” We have seen throughout history that this mentality is extremely harmful to the Deaf community. Moreover, if we are successful in changing this mentality, cochlear implants could actually help the Deaf community combat audism by finally giving them a platform to spread awareness in the hearing world.

About the Author

I am currently a student in the Arts & Science program at McMaster University, and I am hoping to pursue a Combined Honours degree in History. My research interests (other than History) include Bioethics, Philosophy, Physics, Literature, and Linguistics. When I started studying American Sign Language, I had no idea that I would be exposed to such an incredibly rich and beautiful culture. Over the past year, I've been mentored by members of the Deaf community, and it has been a very eye-opening experience. Being exposed to Deaf perspectives has made me question how I view the world, and has made me redefine my own interpretation of "disability". I decided to write this paper because I found the cochlear implant debate fascinating, but also because I wanted to raise awareness. If anything, I hope that this piece sparks discussion on the subject. The lack of awareness regarding deafness in the hearing world is astounding. Deaf issues deserve a platform in the hearing world, now more than ever.

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Racism in the Harry Potter Series

Kaitlin Ollivier-Gooch

The cultural phenomenon of the Harry Potter series is one that affected the lives of an entire generation. Countless young adults today were raised alongside Harry Potter, Hermione Granger, and Ron Weasley, learning as they learned. J.K. Rowling accomplished something with her novels that most authors cannot: she created characters that truly grew with the readers. The characters came up against problems of friendship and romance, and wrestled with the concept of death throughout the novels; and, as they dealt with these problems, the readers did too.

One of the prevailing issues dealt with in the Harry Potter novels is racism. There is a very clear othering of many groups in this se-

ries; however, the most prominent example by far is the Muggles. Any wizard in the novel who is not Muggle-born or raised by Muggle parents expresses racist tendencies towards Muggles. Despite the fact that the intentions of their actions are spawned from different mentalities, both the 'good' and the 'bad' wizards in the novels are racist, whether expressed through the colonial concept of Orientalism or the negative feelings of xenophobia. The books show that the lines that delimit racist thought and action are not clear, and that being racist is not something for only the 'bad guys'. It also shows readers that racism, while obviously worse when it stems from hatred, is not something that is exclusive to villains in books or in real life, it can affect

stereotypically good characters as well.

Orientalism is a concept that came from the exploration of foreign cultures. It is defined as an outsider's interpretation of the Orient (Eastern Asia), showing a stereotyped version of the Orient and embodying a colonialist perspective. Orientalism emphasizes the Orient as being different from the West; "a place of romance, exotic beings, haunting memories and landscapes, remarkable experiences" (Said, 1978). It comes from western societies, such as England, as a way to separate themselves from the Orient's cultures and peoples, exoticizing them and seeing them as backwards and uncivilized. While traditionally used to describe the portrayals of the Orient in Western culture, this concept echoes the way that wizards treat and view Muggles in the Harry Potter novels. By applying a concept used in anthropology to review both the novels and literature written on the Harry Potter series, this paper looks more in depth into the themes behind Harry Potter. Most wizards portrayed in the books see Muggles as exotic, less advanced humans who are miraculous in their way of managing to live their lives and accomplish day to day tasks without the use of magic.

The most prominent of the orientalist in the novels is Arthur Weasley. Throughout the novels, he is depicted "as the bewildered British intellectual explorer, both infinitely curious and confused as to the workings of the Muggle world" (Lamb, 2015). He is seen as endearing to the readers, used as comedic relief at times as he is "continually mis-pronouncing the key word to the non-wizarding technology: electricity" (Lamb, 2015). Mr. Weasley is an official at the Ministry of Magic, working in the Misuse of Muggle Artefacts Office. He is championed as one of the most Muggle-sympathetic wizards in the wizarding world, and yet he cannot grasp the concept of the telephone, nor can he do much better than pronounce electricity "eckeltricity" (Rowling, 2000) throughout the novels. Mr. Weasley might be "crazy about everything to do with Muggles" (Rowling, 1998), but he also underestimates their intelligence a number of times

throughout the novels. He states that "[Muggles will] go to any lengths to ignore magic, even if it's staring them in the face" (Rowling, 1998), and when explaining Portkeys (objects that can be used to transport individuals from one place to another) he clarifies that they are charmed out of "unobtrusive things, obviously, so Muggles don't go picking them up and playing with them stuff they'll just think is litter" (Rowling, 2000). This illustrates the way that wizards see the Muggles as allowing magic to happen by being ignorant of the more intelligent, purposeful magical world around them. The fact that the person who is the most interested in Muggles, enough to build his career around it, does not understand Muggles in the slightest indicates the way the rest of the wizarding world feels towards Muggles. Mr. Weasley exoticizes the very people he is supposed to be working to protect, mirroring the view of Western colonizers towards their colonies in the Orient.

Like Arthur Weasley, most of the good or neutral wizards view Muggles in an orientalist lens. At the Quidditch World Cup (a large, magical sporting event), the gathering of wizards together takes place in a Muggle campground, so the wizards dress up in 'Muggle clothing' to appear inconspicuous in case any non-wizarding folk are around (Rowling, 2000). When Harry, Hermione and the Weasleys arrive at the campground, they are greeted by a man wearing "a tweed suit with thigh-length galoshes; his colleague, a kilt and a poncho" (Rowling, 2000); very poorly crafted outfits out of Muggle clothing. Wizards are the minority in the world, with knowledge of both the magical and non-magical worlds, and therefore it should not be difficult for those who do not openly oppose Muggles to spend time gaining an understanding of their 'exotic' cultures and customs without having to interact with Muggles. Particularly customs around the way they dress, which are easy to explore through observation, thus eliminating any worry of exposing magic to the Muggles.

Even the Ministry of Magic exists largely to keep magic from non-magical beings, and "the

wizard's superior abilities and intellect combined with the ineptitude and ignorance of the Muggles" (Lamb, 2015) is what allows the Ministry to, seemingly, do its job successfully. When Cornelius Fudge, the Minister for Magic, speaks to the Muggle Prime Minister about the return of Voldemort, the villain in the novels, it is shown just how much the wizards know about the nature of the attacks and how determined the Muggles are to ignore the presence of magic in their world. Bridges breaking, hurricanes happening in West Country, and mysterious murders are baffling to the Muggle Prime Minister, but he explains them the only way he knows how, the non-magical way, until Fudge tells him the truth (Rowling, 2005). The wizards know exactly what is happening to the world around them, but the Muggles are confused, and their Prime Minister can barely grasp the truth even when it is explained to him. This scene shows the power dynamic between the 'ignorant' Muggle and the 'all-knowing', and sympathetic, wizard. The intentions of most wizards towards Muggles are well-meaning for the most part. However, any wizards who openly despise Muggles are viewed by the main character, and therefore by the readers as an extension of the point of view, as being 'evil' or 'bad'.

Those who do not see Muggles as exotic, blissfully ignorant beings, are the wizards who treat muggles like animals. To these wizards, Muggles are not their equals and therefore deserve to be treated like lesser beings. These pure-blood families, families whose members are all witches and wizards without marrying Muggles, Muggle-borns, or half-bloods, are represented throughout the novels by Draco Malfoy who "acts as a mouthpiece for his parents' pure-blood views, rationalizing his racist ideology and his ambition to learn the Dark Arts as 'sensible'" (Lamb, 2015). The use of the word Mudblood, "a really foul name for someone who is Muggle-born" (Rowling, 1998), by Draco Malfoy and other wizards "who think they're better than everyone else because they're what people call pure-blood" (Rowling, 1998) is an insult and it

is clear by the way the other characters in the books react to the word. It is a word used to demean Muggle-borns and belittle their abilities and right to exist in the magical world. The only reason for it being that the pure-bloods believe that they are superior and likely fear that their magic is being taken beyond them to those who are not worthy of it.

Xenophobia is a fear or dislike of the customs, dress, etc., of people who are culturally different from oneself. The term can be applied to the views of pure-bloods in Harry Potter. They believe they are better than Muggles and Muggle-borns, but it is clear that even the well-meaning wizards do not understand the culture of Muggles. This would be a natural progression from not understanding the Muggles, to fearing the culture that the pure-blood wizards do not understand, and then acting out against it; and there are many examples in the novels. One such example is the Black family that lives in a house surrounded on either side by Muggles in the heart of London, yet when Andromeda Black married a Muggle-born, she was struck off the family tree and disowned. The Black's house-elf clearly hates Muggle-borns and half-bloods, referring to members of the Order of the Phoenix, a secret society created to fight Voldemort and his followers, as "Mudbloods and traitors and scum" (Rowling, 2003), while the late Walburga Black's moving portrait literally screams, "stains of dishonor, filthy half-breeds, blood traitors, children of filth" (Rowling, 2003) at the members, making it clear how this pure-blood family loathed their neighbours. There exist numerous real events which parallel the series' exploration of this pure-blooded perspective of fearing and hating different cultural groups.

Perhaps the most famous example of racism and xenophobia in modern history is manifested through Hitler and his regime in Germany. Hitler had an ideal race of people with which he wanted to populate the world, and Voldemort had very much the same idea. A contributing factor to the rules they create both are based in the fear of their ideal race dying out. In fact,

they both differentiated based on blood status (Wente, 2015). The Slytherin house, one of the four houses that students at Hogwarts School of Witchcraft and Wizardry can be placed into for the duration of their studies, is especially concerned about blood purity, with members of the house, Draco in particular, bragging about blood status and shunning those not from pure-blood families. As early as the first novel, Draco tells Harry that Hogwarts should “keep it in the old wizarding families” (Rowling, 1997). Voldemort, who is a Slytherin as well, desires “to establish a pure-blood ruling class and subject Muggles to hard labor” (Wente, 2015). Hitler thought he could “purge the German blood pool” (Wente, 2015) because he saw an Aryan society as perfect and thought that the Jewish people were corrupting their country. Both of these leaders sought to purify their worlds and wished to create a lasting change to their cultures.

The most prominent way that Voldemort tried to affect change for future generations is by changing the curriculum at Hogwarts. Originally, Muggle Studies was an orientalist class about how Muggles go about their lives without magic and was taught from “the wizarding point of view” (Rowling, 1999), which was the reason Hermione, a Muggle-born, took the class. It would be an important class if it was not taught in such a biased fashion. It can be assumed that Muggle Studies was not very insightful into the Muggle world, as Arthur Weasley likely took the class and he still has very little grasp on Muggle culture. To create biased views in the wizarding community of the future; because of Voldemort’s influence, Muggle Studies becomes a mandatory class that teaches “how Muggles are like animals, stupid and dirty, and how they drove wizards into hiding by being vicious toward them, and how the natural order is being re-established” (Rowling, 2007) by Voldemort’s rule. Muggle Studies in a Voldemort controlled world taught students to hate and fear Muggles as much as Voldemort and his pure-blood followers do, corrupting their views with the intent of turning them into future Death Eaters (Volde-

mort’s followers). This mimics the way that anti-Semitism was taught in German schools. Hitler used schools to regulate the knowledge of the youth in Germany, molding the kids into future Nazis through class content and youth groups (Wente, 2015). Both Hitler and Voldemort wished to remake the future of their respective worlds into what they viewed as pure and strong, and both of them did this by targeting the education of the future members of those worlds: children.

The Harry Potter series shows the nuances of racism and how such nuances are manifested by people without the readers having to experience it themselves. The novels manage to parallel the unpleasant reality of racism and the power it holds over populations. Through the inclusion of Muggles, and especially Muggle-born wizards, the books are used as a cultural commentary on what happens in the real world to real people. The novels instill an understanding of how racism can climax in the worst way possible: through the deaths of Muggles, along with many characters that we care about who are fighting to protect them; however, the readers never have to experience racism themselves. The ambiguity of many of the characters in the novels and indeed the ambiguous racist acts themselves help “to illustrate for children the nuances of right and wrong, good and evil” (Rosado, 2015) by not allowing them to be black and white concepts in this series. Showing the humanity of clearly racist characters such as Voldemort and Draco Malfoy, along with the hidden racist past of Dumbledore, tears apart what the readers “[assume] about characters based solely on behavioral patterns and their resultant expectations” (Rosado, 2015). Ideally, the lack of clear borders between blatant and subtle racism, along with the morally ambiguous characters, will help teach the readers of these novels that racism is a real problem that comes in many forms. As well as the idea that getting a better, and truer, understanding of a culture is the best way to go about avoiding these negative results, whether those results are the Orientalism of the

pro-Muggle wizards or the open xenophobia of Voldemort, his followers, and millennia of pure-blood wizards. Translating this lesson into the real world helps promote a better understanding of how to avoid racially charged acts.

The Harry Potter novels address racism in two forms throughout the series, Orientalism and xenophobia. The continuous spectrum between good and evil is demonstrated through the ambiguous nature of the subtle and obvi-

ous forms of racism used by both moral sides in the novels. This all comes together to show readers that racism is not inherently linked with evil forces both fictional and in real life, but it can also be perpetuated by characters that are stereotypically good. Ideally, this will lead to the readers not tolerating racism in the future and understanding the different ways that oppression can be enacted on groups of people.

About the Author

I am a student at the University of Waterloo, where I am double majoring in Knowledge Integration and Anthropology with a minor in Psychology. My interests lie in exploring people from different angles. I wrote this submission for a class, taking advantage of my professor letting me combine the subject of the Harry Potter books with my own interests in anthropology. I wanted to publish with JIRR because I believe there is a huge benefit to looking at something with different points of view, and the journal celebrates that.

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