

RAISING HEALTH CONSCIOUSNESS UTILIZING “UNNATURAL CAUSES” SERIES AS STIMULUS

An Interactive Qualifying Project Report

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by

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Introduction

Health maintenance is an increasingly important policy area in today's global society. It is well known that many third-world countries are in need of social and health programs that provide them with even basic protection from infectious ailments, such as from viruses and bacteria. What is not well known, however well documented, is the growing problem that the US faces in healthcare. According to The World Factbook (1), as of 2007 the United States has fallen to 45th in life expectancy at birth, the chief statistic used to determine quality of healthcare in a country. This rank is below far poorer countries just as Jordan, Israel, and Puerto Rico. Nobody knows the exact or entire reason for this particularly low rank on a key health indicator, but some correlations provide revealing clues and the US public was about to see them in the form of a documentary series. I conducted a study in February of 2008 of the series' impact on an introductory sociology class at WPI.

The video series is entitled *Unnatural Causes: Is Inequality Making Us Sick?* (2), and provides a partial explanation for the poor health standing of the US. This eight episode documentary series, which will air on PBS in March and April, shows through facts and example that health and inequality within the US highly correlated by exploring the health consequences of the unusually great degree of inequality tolerated by the USA compared to other modernized nations. They suggest and support through evidence that factors associated with social class are plaguing the national health. Statistics are revealed layer by layer, with each video focusing on a different issue. They cite inequality in location, social status, wealth, and employment, among others, as primary determining factors of the health of individuals in different categories of risk of death and disease. According to their website (3), "UNNATURAL CAUSES sheds light on mounting evidence that demonstrates how work, wealth, neighborhood conditions and lack of access to power and resources can actually get under the skin [of humans] and disrupt human biology as surely as germs and viruses."

Project Sponsors

This project has three major sponsors. The first is the social science department at WPI, also including sociologists from Holy Cross and Assumption colleges, who wish to determine if the *Unnatural Causes* video series could serve as a primary source in a proposal for a new sociology class entitled “Social Inequality and Health”. This class is of particular interest to the social science and policy studies departments because it would fill a void in the WPI curriculum by introducing a “policy relevant social problem area as the context in which to explore questions of Race, Ethnicity and Social Class.” Support by the sample was positive for this type of course, and is indicative of its potential success. Some members of the class felt that the biomedical and biochemical majors and the premedical students by themselves would assure the success of a social science course with this theme.

The second sponsor is the developer of the medical device Aerovax, Jose Gomez-Marquez. Jose has a personal interest in bolstering health consciousness and health-related project activity at WPI in order to obtain students interested in working on the design and administration of Aerovax and related devices for third world application. The medical device is designed to improve the delivery of vaccination to impoverished areas of the world, especially those areas that would be otherwise completely unreachable. For example, a lack of electricity for refrigerating the types of liquid vaccines required by hypodermic injection technology is a constraint in tropical climate areas where ice is not naturally available. The stimulus in this study is video materials not designed to increase interest in international health questions, but still seem to do so indirectly. Therefore, the Aerovax effort may not benefit from this study directly, but my theory is that raising domestic health awareness will end up raising international health awareness as well. This project addresses this question indirectly but will not focus on determining the success of this strategy of encouraging interest in international health. Raising interest in domestic health is enough to be considered a valuable consciousness altering educational resource with implications for the projects program and the social science curriculum.

The third sponsor for this project is Student Pugwash (4), which expressed interest in turning the official release of *Unnatural Causes* into a nation-wide Pugwash event. They are interested in the results of this project partly to determine the probability of success of this event designed to raise voter relevant policy issues on the eve of an election. However, Student Pugwash USA (SPUSA) also has a continuing interest in how to run consciousness-raising events. The methods by which one can best carry out a short-term consciousness-raising event that later leads to action like voting, participating in a project, or joining a movement is a core concern of the organization. In this case, the issue is whether they should gather the students to view the actual video materials and discuss them briefly or set up a forum for people who have already seen them privately and conduct full-scale hour-long discussions. Students at WPI are looking to take the reins of this opportunity and hold an event at the time of the PBS broadcast of the videos. My report of my experiences with the video and student sample will be used to gain insight into how to organize the event, and conduct the discussion to follow. My assessment of the written reactions, and the range of impact they represent will shape the planning committee's discussion.

Project Goals

The primary goal of this project was to determine the effectiveness of *Unnatural Causes* as a resource for consciousness-raising about health issues that could then be addressed in health-related undergraduate projects, of either domestic or international theme. One of the chief desires of the sponsors of this project was to answer the question “Is *Unnatural Causes* useful enough as a springboard to recruit students to undertake health projects and to build a class around it, or to incorporate it into an existing project preparation class?” Since WPI already has a mandatory undergraduate project in which one is to explore the field of technology and society interactions, there exists a vehicle for acting on the results of being consciousness-raised on the issue. Jose Gomez-Marquez has recruited students at WPI to work on the medical device Aerovax designed for third world application. He is currently involved in designing courses at MIT and Harvard that are intended as consciousness-raising events, and has been asked to present on his work in a Harvard Public Health Class. At MIT, a more ambitious plan is being developed in the form of a three-course experimental curriculum series that is funded by a grant.

This series focuses on bringing student participants through some of the steps of the development process for a device such as Aerovax. The first course focuses on consciousness-raising students, the second involves the students being assigned to a specific project with an overseas sponsor, and in the third one they will travel to the site of application to meet directly with the sponsor and conduct field tests. The first of these courses, then, is critical to the success of the program as it is the recruitment area for the following courses. Thus, consciousness-raising about public health becomes a strong theme in 3 radically different academic contexts and a potential new resource is required. However, its theme is focused domestic health issues and the sponsors are focused instead on international areas. Could they use these new materials and forward their goals all while adopting a whole new dimension to their courses?

It is one thing to demonstrate that others are dying of preventable diseases elsewhere and enlist students to help them by finding affordable ways to do what we do here. It is a whole different matter, however, to point out that many of the same problems exist in your own country and indeed that you yourself may be at risk or know people who are. By questioning the structure and practices of your own familiar health care system and acknowledging its flaws and failures one is much more likely to come up with something culturally appropriate and innovative for third world application.

Thus, the hypothesis for this question was that *Unnatural Causes* can indeed be effectively utilized as an educational resource in a variety of settings. As it turns out, this project generated only a small amount of statistical evidence supporting the claim that the video series increases overall interest in health (both domestic and international) as a social issue. This is mostly due to the limited number of participants in the project. However, qualitatively through discussion and examination of these participants, I have come to the conclusion that this series has really turned heads and made many people rethink healthcare. In terms of health-related project interest at WPI, almost 60% of the sample that participated in the project reported becoming either much more or somewhat more interested in undertaking such a project, while only 3% of the sample reported being less interested in a project focused on health after participation in the study.

A secondary goal of this project was to see if the use of *Unnatural Causes* would be enough by itself to increase student demand for and participation in health-related projects at WPI. Since WPI is a project-oriented school with a large number of centers around the world already, it is not difficult to imagine fielding teams to address a number of pressing health issues around the world over the next few years. The students would do the work required, receiving academic credit for their effort rather than income, which would help to control project costs. The WPI project could be done for both domestic and international ends, either through examining poor-health countries in order to determine what needs to be accomplished to improve their situation or extremely healthy modernized countries in

order to determine what they've done right and which practices the US should adopt. Thus, WPI could make a significant difference in addressing unmet healthcare needs at home and abroad, where the existing market-based system has led to important social policy areas being neglected for lack of demand from people who can actually afford the products and services needed.

The majority of the introductory sociology students who participated in this study reported that it was likely that they would, or would like to, complete their IQP abroad. In a way this is unfortunate, because it would be more effective for Aerovax-like projects to be worked into the on-campus project program than the overseas program which is driven by agencies and companies in the receiving country rather than by the WPI research agenda. However, over time the overseas program could evolve along the lines of the described MIT system, which instead begins with unmet needs identified by third world providers. Local WPI initiative would be needed to design projects that compare US and Europe practices systematically to improve the US system. Perhaps US agencies could sponsor projects to be carried out in Europe.

In any case, progress towards the goal of motivating students to actually participate in projects of this type will not be evident until long after this study has been completed. MIT's new project system will not be active until next year and WPI has so far made no commitment to continue even the Aerovax Project that ran this year again next year, even which would be an opportunity for only six students and not a potential three or four dozen. It is far from creating other opportunities in both the domestic or global projects program. Hence I can estimate the potential for such programs now, and the degree to which it would increase if a suitable academic setting could be found, or founded, in which to use the *Unnatural Causes* video series at WPI.

The ideal context would be a course explicitly committed to the projects program with both on-campus and project center opportunities noted and updated annually. Second best would be a new

course that is strictly devoted to this subject with both a domestic theme covered by the videos and internationally themed comparative materials that could be found in suitable text. In this context, students who share this interest could meet, form teams, propose projects, and seek suitable faculty advisors within the organization of a single class. The third choice would be a second version of the introductory sociology course taught so as to emphasize domestic social problems in which a third to half of the course dealt with social class, housing, race, and health (utilizing these videos). The other half could deal with crime, deviance, gender inequality, the crisis in public education, the environment, and security concerns. This may or may not lead to more project activity, but at least projects like the Aerovax effort would be much more likely to be appreciated and sought after if they are also listed as possibilities within the projects program.

Thus, I am claiming that even a consciousness-raising program of the third kind which never even mentions international third world issues would result in more recruits for such projects and generate substantial interest in any such future projects developed by the WPI global program, in modernized or developing nations, to compare US practices and health outcomes to those of other nations. However, with an investment in a course-length orientation program tied to the projects program, this could become something much more substantial involving twenty to thirty project teams per year, each with two to three students. This would be a significant accomplishment by WPI, and I will attempt to support this claim using proxy indicators obtained by this project.

Background

This project stemmed from an IQP with Hilary Stinnett involving testing of the Aerovax product described above with Jose Gomez-Marquez as project manager. The original project was to determine the safety and effectiveness of a prototype that was being designed and built, and to determine the social implications of implementing the device in the third world. This meant researching potential cultural conflicts regarding the device itself and its attempted method of implementation. The IQP as it was originally planned was never completed due to unfortunate circumstances regarding team coordination, acquiring of essential materials, and an overall lack of solid direction at a time when a new plan of action needed to be devised in order to save the original objective. As that window of opportunity closed, a “Plan B” formed that refocused the IQP entirely into a cultural study, dropping the laboratory aspect of the project. The project essentially became a literature review on third world culture and pre-industrial concepts of disease, and how Aerovax would appear from this perspective. I personally lost interest in it, but my partner completed the project effectively on her own. More detailed information regarding the original project and why it failed to happen can be found in Appendix A.

Materials and Methods

Test Sample

The sample test-bed for this project was an intro-level sociology class entitled “*Introduction to Sociology and Cultural Diversity*”. The class consisted of 51 students. Because social science classes are required of all students, there was an equal spread of majors, years, and even genders. Though some students had evident ethnic backgrounds suggesting recent immigration in the last few generations, almost all reported themselves as American when asked for their country of origin in an optional survey specifically designed for the project.

The Discussions

The project was conducted in a series of discussions, the first of which was during normal class time. After that, participants had to come to a special event scheduled outside of class. Each of these discussions took approximately fifty to sixty minutes. The participating group first watched a 28 minute video from the series *Unnatural Causes*, and then discussed the major topics in the video for the rest of the session. Participants were asked to write a two to three page response paper to each video that could be handed in later. They were invited to see others as well and get extra credit for writing reaction papers to them as well.

As noted, the first of these discussions was held during one of the class sessions. This discussion was the only one held during class time, and mandatory for the 36 students present that day. Class participation grade would be based on their review papers of an episode of *Unnatural Causes* entitled “Place Matters” and the discussion that followed could be mentioned in the paper. I led the discussion with the help of Nathan Krach, a Student Pugwash leader. Students were assigned the response paper for homework and the instructor viewed it as proof of their attendance, since he was away at a conference that day. I had much more elaborate plans for coding in and assessing those reviews. Also,

those absent were allowed to borrow the episode or sit in on a different episode and review that instead. In the end, I had over forty reviews to assess. This episode was chosen because it was reported by the creators to be the most influential stand-alone episode that was filmed at the time of the showing. Based on the reaction papers, it certainly seemed to have an impact.

Once a week after the first discussion, an hour before class, another discussion was held. Participation in these sessions was optional. Extra credit was available as long as a response was written and turned in. Students interested in health were encouraged to attend by being offered a chance to become “health ministers” for a country they would represent in a model UN-style role-playing game that was to be conducted towards the end of the class. The videos would be their “briefings” as a replacement of the papers other ministers would need to read in order to prepare for the game. Attendance for these optional discussions was still light, generally in the range of one to six people. Four videos in total were shown during the course of the project, including the “mandatory” one during class time. The videos were shown in this order: “Place Matters”, “Bad Sugar”, “Becoming American”, and “Not Just a Paycheck”. If anyone viewed all the videos shown and submitted a comparative reaction paper to the series, it could replace their lowest test or book review score. We thought that around five students would exercise this option, but in the end, no overall review papers were submitted. This was surprising due to the length some students went to in order to view all of the videos.

Surveys and Documents

Prior to the beginning of the project, as part of a class exercise, students were asked to report their overall interest in health and availability to attend out-of-class activities. They were asked to report their interest as “not at all interested”, “slightly interested”, “somewhat interested”, and “very interested”, and to disclose the times out of a given list in which they would be free. The out-of-class showing plan was based on the students’ responses, but even with half of the class interested and available, the maximum number of students for any time slot was only 12, which is only 23% of the class. Fewer than half those theoretically available were making the effort, despite incentives and excellent reviews of the first video. Clearly, this kind of program cannot be an optional add-on to a course, but must be a part of it.

Prior to the first discussion, two documents and a general survey were passed out to the class. The survey gathered basic demographic information, including gender, age, major/year, religion, and country of origin. Additionally, background health questions were asked. These included prior exposure to health-related topics in an academic setting, first or second-hand experience with what they considered serious health-related issues, and overall interest in health and undertaking health-related projects for credit. Students were informed that they were not obligated to fill out the survey, and that Professor Wilkes, the class’s teacher, would have no knowledge of the information disclosed on the survey while the class was in session, if ever. Names were required in order to correlate information that would be received via survey during the project with reviews of the videotape; however, confidentiality was maintained using assigned numbers in the place of names, and I am the only person in possession of the key between the names and numbers.

Two documents were distributed to the class as part of the program. One was the official flier for *Unnatural Causes* that describes the series, and the other was an informational pamphlet regarding the project and its relevance to participating students. The pamphlet described each of the videos and the

opportunities that students had to earn extra credit, either in the class or as a special additional 1/6th ISP that would be advised by Professor Wilkes. The pamphlet also described the possibility of participating in a health IQP led by Jose Gomez-Marquez the next year. There were inquiries but no takers for an independent study on the health issue.

The final survey was conducted after all of the discussions had been carried out, towards the end of the class. Questions relating specifically to health-related IQPs and reactions to *Unnatural Causes* were asked. This time the survey was carried out anonymously, so basic demographic data was collected which included gender, major, and year. One item covered parents' occupation as an indication of social status, and major health problems the individual or family had faced were the subject of one question. Again, the students were told that the survey was optional and would not affect their grade in any way, but participation rates were none-the-less quite high.

Results and Discussion

Quantitative Data

One of the primary methods of determining the effectiveness of *Unnatural Causes* as an educational resource is to determine whether the videos caught the attention of the students. In the final survey, students were asked “On average, how surprised were you by the information conveyed by the *Unnatural Causes* video(s)?” Students that reported being surprised by the videos can be assumed to have become more aware of the issues relating to the information. For most of the students, who only saw the video “Place Matters” this issue deals with residence location relating to wealth, status, and ultimately health. Only about 25% of the sample reported *not* being surprised by the video, indicating that a large majority of the group was at least a little affected and therefore more aware of the issues addressed (Figure 1).

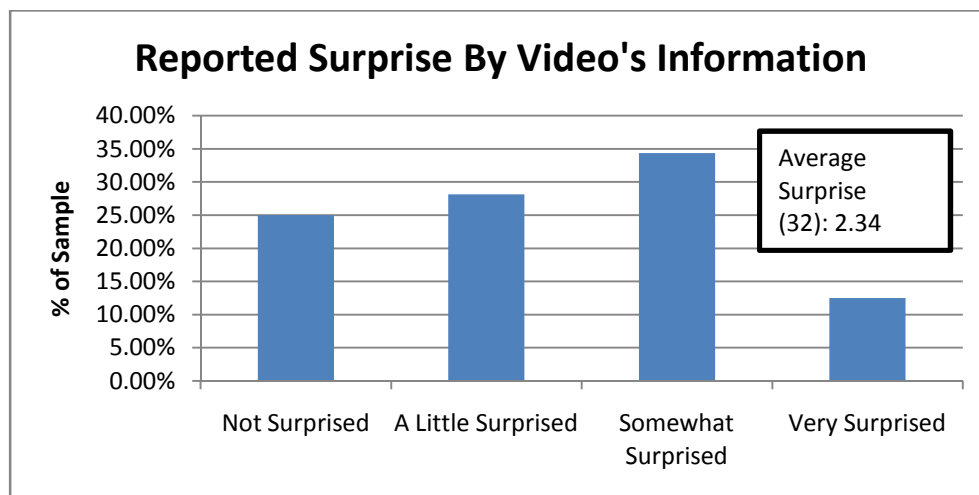


Figure 1 - Reported level of surprise from the videos when asked “On average, how surprised were you by the information conveyed by the *Unnatural Causes* video(s)?”

In order to further address the degree to which these videos were getting the students’ attention, a comparison was made between the quality of writing in the responses to “Place Matters” with the quality of writing in the responses to two specific books, “The Arab Mind” and “What Went Wrong?”,

which are both considered important thought-provoking books. Each student had been assigned to write a response to one of these two books. In both cases, a discussion in class had been conducted in similar manner to “Place Matters”. However, video reactions were written after discussion on all accounts, whereas in the case of the books it was more variable because some students wrote their reviews before much discussion was carried out or they missed the day the book was discussed. Some students were instructed to try to react to the book as they had experienced it, even though they participated in some class discussion before they wrote the review. It can be assumed that if, on average, the grades of the responses to “Place Matters” are significantly higher than those of the book responses, then the video is very powerful and therefore effective. Because the average grades of the responses to “What Went Wrong?” were significantly lower than that of “The Arab Mind”, each grade of the response to “What Went Wrong” was normalized by using the formula (*Normalized Grade = Original Grade * Arab Mind Average / Went Wrong Average*).

The results of this comparison are shown in Figure 2 below. After normalization, there was little difference in grades, although the average grade from “Place Matters” was slightly higher than the book reviews. The difference is not statistically significant. The finding indicates that the video was at least as revealing as “The Arab Mind” which set a high standard. The book is considered by many to be a very good educational resource. One Junior-year student called it “one of the two most important books he had read in college so far.” Clearly, grades for the video would have been much better than “What Went Wrong?” which is a more typical college reading that received mixed reviews. The information in the book is considered valuable, though some find the writing style confusing. In conclusion, this data suggests that Place Matters was seen as comparable to the best of the reading materials in the course.

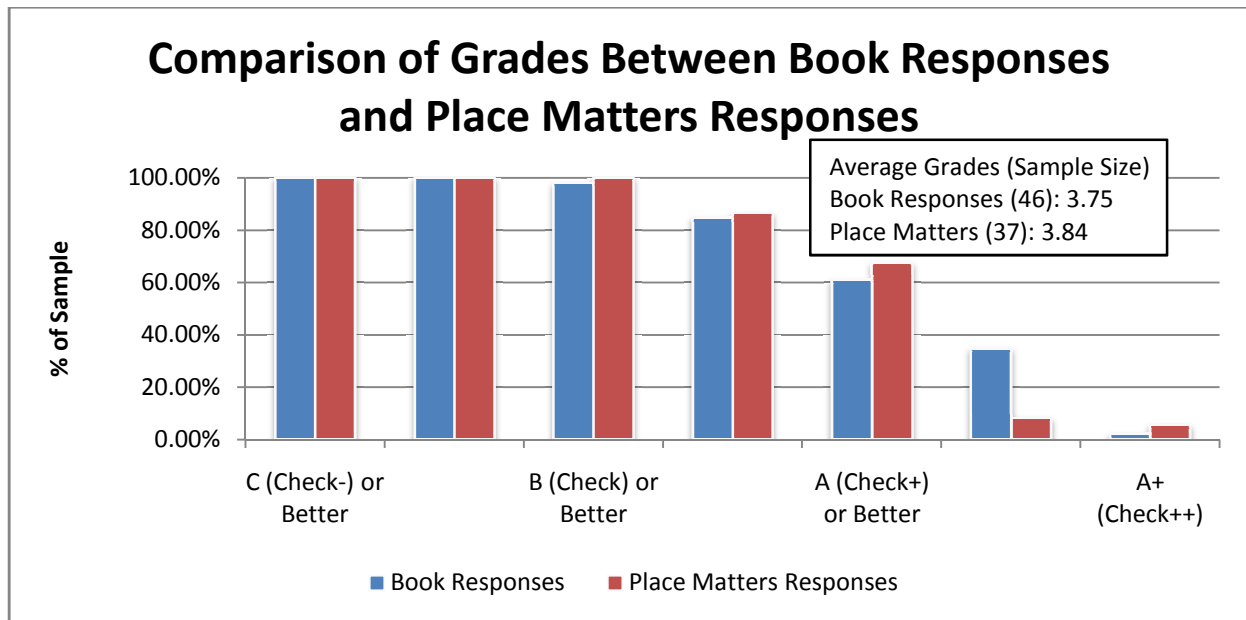


Figure 2 – Comparison of the grades from the responses of the Unnatural Cause episode “Place Matters” and the responses to book reviews, which consisted of “The Arab Mind” and “What Went Wrong?” Each student was assigned one of the two books to respond to based on what their role would be in a model UN event at the end of the course. European country (and Turkey) delegates read “What Went Wrong?” while Arab country delegates and “Arab experts” on the European delegations read “The Arab Mind”. Because of the difference in grades, the grades for “What Went Wrong?” were normalized to match “The Arab Mind”.

A strong correlation can be seen between the "Place Matters" (Recoded to a 3-point scale for quantities) reaction paper grades and “The Arab Mind” book review grades (Table 1). Those who received a high grade for one were likely to receive a high grade for the other, and vice versa. There is an inverse correlation between reviews for the "What Went Wrong?" grades and the "Place Matters" grades (Table 2), i.e. those who received high grades for one received low grades for the other. Two possible explanations for this relationship come to mind. The first is that "What Went Wrong?" and "Arab Mind" are quite different in their styles; "Arab Mind" and "Place Matters" have a similar way of challenging preconceptions and creating some cognitive dissonance. By contrast, “What Went Wrong?” does not challenge preconceptions, but rather provides support and detail for the prevailing Western views of Muslims. The better reviews of it needed to take a critical stance of the book. Those that did so

tended to do the same with the videos that were well documented and therefore difficult to attack in the same manner as the book. Hence, those video reviews were graded poorly. The second possible explanation is that the manner in which the students were assigned to each book played a part in the outcome. At the beginning of the course, students were asked to choose whether they would like to role-play European diplomats in the "Western" or European side in a conference between Middle Eastern and European countries, or whether they would like to challenge themselves and represent with the Middle Eastern nations in the conference.

Those that chose to be Europeans were assigned "What Went Wrong?" which deals with how 15th century European nations that could be considered relatively backward at the time managed to catch up to and then dominate the Middle East in terms of wealth and accomplishment, both cultural and scientific by the 19th century. Critical thinking of the author's arguments led to high grades because his argument is ethnocentric, meaning it involved judging Eastern nations by Western standards. Disagreement with the authors was not the mark of a strong paper for the reaction papers for "Place Matters", however, because the series deals with statistical data and numbers that are difficult to refute and argue against. Those that tried to argue based on conflicting personal experience or common sense argument generally submitted weaker papers.

Students that chose the Middle East were assigned "The Arab Mind" which delves into the perceptions of people, particularly Arabs, in the Middle East. Their perspective and opinions are far from what might be considered comfortable to most Western thinkers. However, the author is extremely knowledgeable and culturally relative. This creates a certain cultural dissonance that is difficult to argue against since the author knows so much and helps you see things from a historically grounded Arabian cultural perspective. It had great impact on its readers. This is very similar to the way that "Place Matters" hits you with surprising and urgent information. Indeed all of *Unnatural Causes* operates in this fashion. So, one was not called upon to see the problem with the author's arguments in either case, but

rather to see the implications of the changed perspective. Therefore, those who wrote good reviews of “The Arab Mind” were able to do the same thing with “Place Matters”. Both works are full of thought-provoking new information and are inspiring. Those who worked with “What Went Wrong?” were unable to utilize the same techniques, and were instead forced to employ a critical edge with one and buy into the argument of the other and see where it led; few students did both equally well.

		Place Matters Grade (3 Point Scale)			Count	
		3.00	3.50	4.00		
The Arab Mind Grade	3.0	% within Arab Mind	33.3%	33.3%	33.3%	6
	4.0	% within Arab Mind	10.0%	10.0%	80.0%	10
	4.5	% within Arab Mind	.0%	.0%	100.0%	2
Total		% within Arab Mind	16.7%	16.7%	66.7%	18
Gamma = 0.769				Approx. Sig. = 0.014		

Table 1 - Crosstabulation between "The Arab Mind" book review grades and the "Place Matters" reaction paper grades.

		Place Matters Grade (3 Point Scale)			Count	
		3.50	4.00	5.00		
What Went Wrong Grade	2.0	% within What Went Wrong	.0%	100.0%	.0%	1
	3.0	% within What Went Wrong	16.7%	66.7%	16.7%	6
	4.0	% within What Went Wrong	30.0%	60.0%	10.0%	10
Total		% within What Went Wrong	23.5%	64.7%	11.8%	17
Gamma = -0.316				Approx. Sig. = 0.429		

Table 2 - Crosstabulation between "What Went Wrong?" book review grades and the "Place Matters" reaction paper grades.

It was the intention of the project to compare overall health interest before and after the discussions. Unfortunately, the format of the questions in the surveys conducted before and after the video do not allow for perfect comparison. Some interesting results came about the questions regarding health interest, however, regardless of whether they can be directly compared. As a preliminary data-check, gender and relative health interest at WPI were compared (Figure 3). Though an aspiration survey of High School Juniors in Worcester indicated that nationally women tend to be more than twice as interested in going into health related careers as men, once the scope of study is narrowed down to a

college such as WPI, the difference in interest about health becomes much smaller. The finding for this class was that the level of interest in health at WPI is nearly equal between the genders, if you look at the averages. The pattern suggests a somewhat greater interest among women than men because more females were “very” interested and none of the females reported not being interested at all. Some males had “no interest” in health, so at the extremes there were differences that produced a small average difference in health interest.

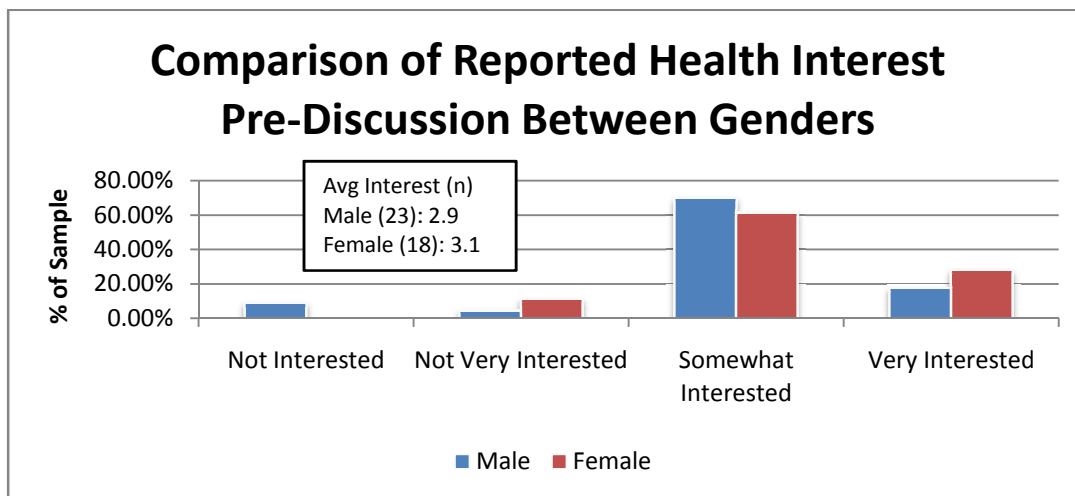


Figure 3 - Comparison of Reported Health Interest Pre-Discussion Between Genders.

The data collected regarding the potential interest in undertaking a health-related project at WPI is striking. The reported interest was split with half of the class claiming they would like to (or had already done so). This figure is not just balanced on average, but in detail; it produces a highly symmetrical bell curve. Roughly 60% of the sample reported that they would be either somewhat or very interested in completing a health-related project, indicating a strong demand for health-related IQPs and MQPs if consciousness-raised by materials like this video (Figure 4). Additionally, over 55% of the sample reported that their health-related project interest had increased due to seeing this video, and less than 4% reported their interest as decreased (Figure 5). This is a strong indication that *Unnatural Causes* (or at least the “Place Matters” part of it) is a powerful consciousness-raising resource.

There were 10% more students who sat up, took notice, and wanted to act on this new information by being a part of a health-related project. Further, the majority were saying that they were more interested in a subject that was already popular to begin with. However, the range of questions considered “health-related” was considerably broadened by the video. Health policy came to encompass civil rights, unemployment, and housing policy among many others dealing with social equality.

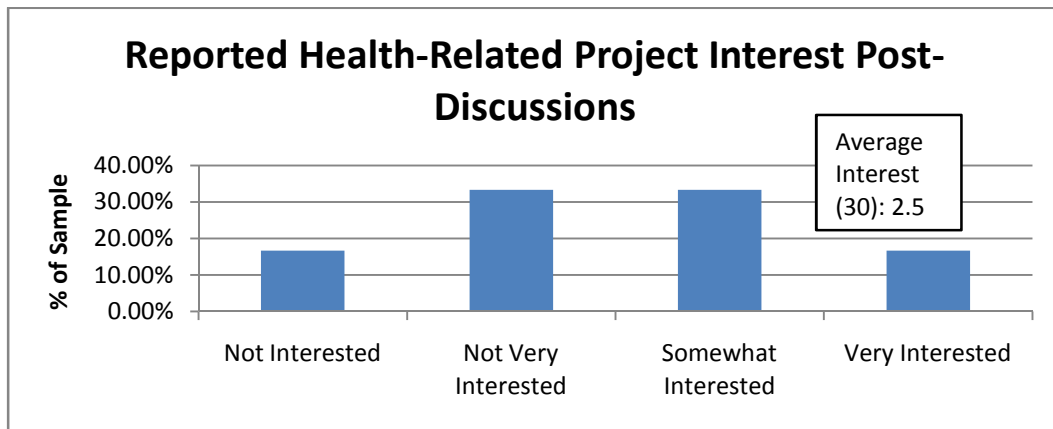


Figure 4 – Reported health-related project interest when asked the question “Assuming you were a freshman or sophomore who had not completed any major qualifying projects, how interested would you be in undertaking a project on a health-related topic, on campus or at a project center off campus, after taking this class?”

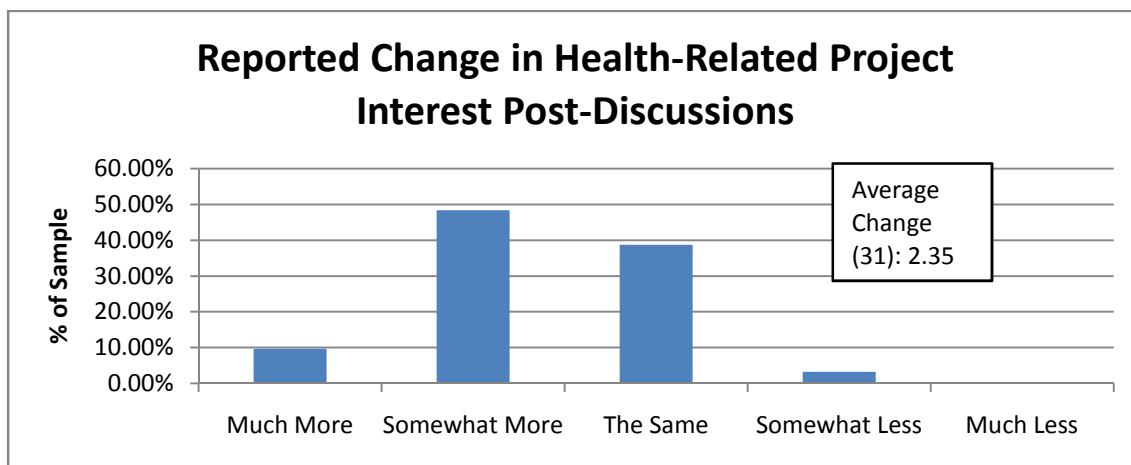


Figure 5 – Reported change in health-related project interest when asked the question “Is that more interested, the same, or less interested than you would have been about doing so before you took this class?”

Crosstabulation between health-related project interest increase and surprise by the videos suggests a strong correlation between those who were struck by the videos and those who became more interested in doing health projects while at WPI as a result (Table 3). This indicates that knowledge of health related topics and issues impacts one’s desire to deal with the problems in a hands-on fashion, and that *Unnatural Causes* is a very good vehicle for introducing these topics to the unaware. Also indicated by this comparison is that only those who were not surprised by the information contained within the videos were less likely to want to complete such a project at WPI, and that even those 26% reported being mostly unchanged in their likelihood of doing such a project. So while *Unnatural Causes* will definitely inspire some students, it is not likely to cause others to lose interest that they might have otherwise had. The correlation between “surprise” and wanting to do a related project is robust, with a gamma of 0.78.

		Q4a: Reported surprise from video series				Count	
		not at all	a little	somewhat	very surprised		
Q1b: Reported change in project interest	much more	% within 1b	.0%	.0%	.0%	100.0%	3
	somewhat more	% within 1b	13.3%	26.7%	53.3%	6.7%	15
	the same	% within 1b	41.7%	33.3%	25.0%	.0%	12
	somewhat less	% within 1b	100.0%	.0%	.0%	.0%	1
Total		% within 1b	25.8%	25.8%	35.5%	12.9%	31
Gamma = -0.775					Approx. Sig. = <0.001		

Table 3 – Crosstabulation of reported change in project interest and reported surprise from the video series. All participants also reported having seen at least one video from the series.

A crosstabulation of the change in project interest at WPI with interest in health projects reported after the experiment suggests that the videos inspired those that were originally not interested before watching the video series (Table 4). The majority of those who reported no change in interest were already interested in completing a health-related project at WPI to begin with. *Unnatural Causes* has proven to be effective at increasing the interest of those that did not previously have any. This raises the

question about whether the best use of it in a general class drawing people who have not followed the issue and are most likely to be shocked and/or surprised, or in a class devoted to the subject that will serve those least likely to be surprised but go further in detail for the knowledgeable audience.

The reaction of a pre-med in the introductory sociology class is revealing on this question. She expressed concern that there seemed to be no other place in the curriculum at WPI that would have exposed her to these materials had she not by chance ended up in this experiment. Clearly, there are reasons to find a clearly labeled spot for these materials in the curriculum other than simply to motivate project work. However, the case for a brief exposure in an unexpected place is easy to make if one’s goal is to build up a project program.

			1 a: Reported interest in a health project post-discussions				
			not at all	a little	somewhat	very interested	Count
Q1b: Reported change in project interest	much more	% within 1b	.0%	33.3%	33.3%	33.3%	3
	somewhat more	% within 1b	7.1%	50.0%	21.4%	21.4%	14
	the same	% within 1b	25.0%	16.7%	50.0%	8.3%	2
	somewhat less	% within 1b	100.0%	.0%	.0%	.0%	1
Total		% within 1b	16.7%	33.3%	33.3%	16.7%	30
Gamma = -0.261					Approx. Sig. = 0.268		

Table 4 - Crosstabulation of reported change in project interest and reported surprise from the video series.

The students in this class (which was advertised as a Europe/Middle East comparative modernization course) reported that they were more likely to complete a project abroad rather than on-campus. Roughly 70% of the sample reported that they were very likely to go, likely to go, or had already gone abroad for their IQP (Figure 6). When combined with the results above, this strongly suggests that a considerable portion of the student body would like to go abroad in order to complete a health-related IQP or MQP. There was no strong leaning in either direction reported regarding preferences in studying international or domestic health issues that suggests that demand will be high for those going to Europe or Namibia and studying health via on-campus projects as well. This could

indicate that the health awareness raising effects of these videos are not limited to domestic issues, which is interesting since the videos clearly had a domestic focus. There were some international comparisons made in the larger *Unnatural Causes* series, particularly “Not Just a Paycheck”, but not at all in “Place Matters” which was the video one that the most WPI students saw.

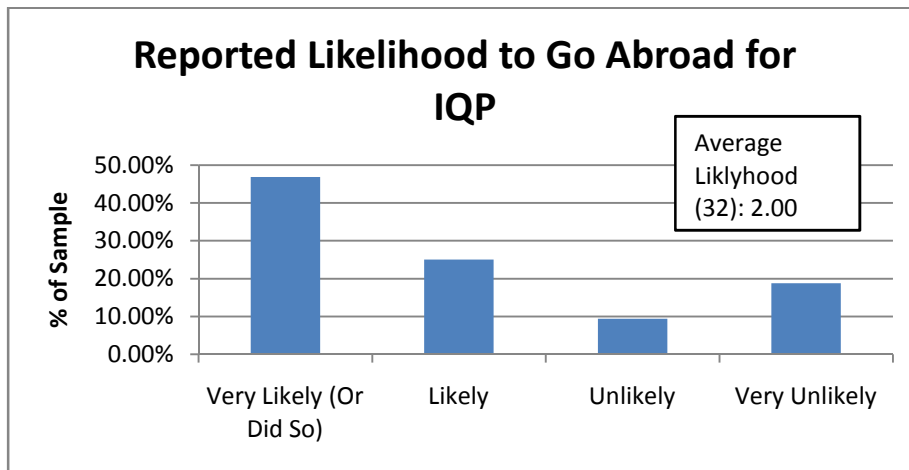


Figure 6 - Reported likelihood to go abroad when asked the question “How likely is it that you will do (or have done) an IQP at an off campus project center?”

Students did not seem to have a preference for taking a domestic health-oriented introductory sociology class over an international non-health policy class similar to the one they had taken (Figure 7). The class divided relatively evenly in favor for each of the three choices: domestic, no preference, and international. It is relevant to consider, however, that this class enrolled in a international-related course when they had other social science choices available. It is likely then that these students have a higher-than-average interest in international affairs than the WPI student body as a whole. Clearly, there is sufficient demand at WPI for a class on this subject; and one that utilizes *Unnatural Causes* as the foundation of its topics selections is likely to have considerable impact, serve the premed program, and have spinoff effect for the projects program as well.

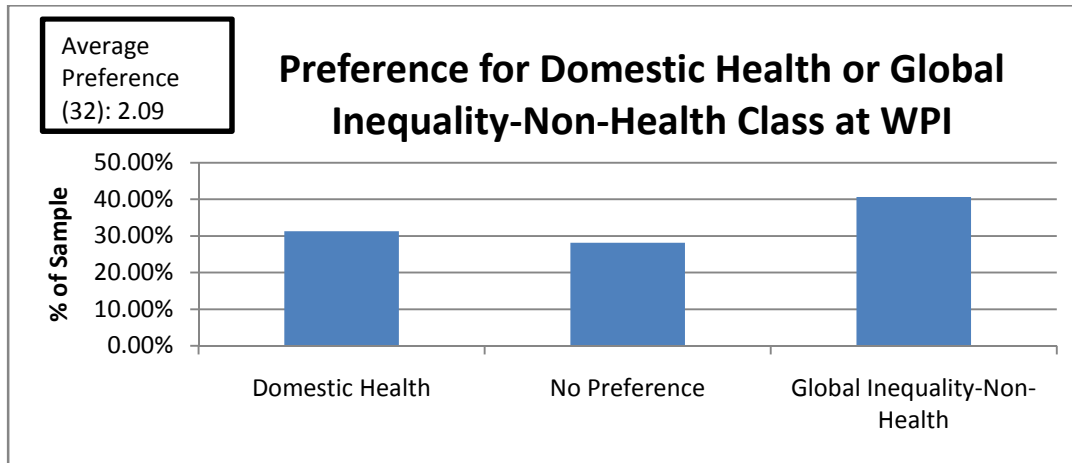


Figure 7 – Class preference when asked the question “If you were to take another social science class in Sociology, would you prefer to take a class focusing on Global inequality (non health-related topics) focusing on the situation in Africa, South America, and the South Pacific or a class focusing on the social problem of the USA and stressing domestic health related topics?”

Qualitative Data

Having read and coded about 40 of the response papers to the videos, I found some to be extremely thought provoking. Many students wrote about their shock and awe after watching “Place Matters”. “When I first viewed these...I was skeptical...” One student wrote, “However, after seeing the entire presentation I am a firm believer that inequality can heavily impact a persons’ health.” The video seemed to do an extremely good job at making its point and convincing you of their point. Another student wrote that “Place Matters” was a “shocking eye opener”. Even weaker papers were not poor because of apathy towards the video. One student whose response grade ranked in the bottom quartile wrote that “the correlation between poverty and health is not fair and needs to be fixed,” and that “[*Unnatural Causes*] will create a driving force that could someday make the United States a healthy nation.”

Some were outwardly against the message that videos tried to convey, though they managed to articulate themselves in a non-aggressive and interesting manner. One student writes, “I believe that

the documentary grossly over-presented the impact that these environment factors can have on the health of a population.” He goes on to relate an experience in his upper-middle class family to make the point that no one is safe from these disease risk factors, and stresses latent biological triggers over economic stressors. However, even in this case he admits that both are a factor. Note that the video still manages to get the viewer to think critically about healthcare in this country and to evaluate the movie’s credibility, even when it does not fit with personal experience. Those who connected the videos with personal experiences often wrote passionate calls for action.

The distribution of the responses was strongly towards agreement with and excitement about the issues illustrated in the video and/or the solution proposed. Six of the 35 papers went so far as to express shock or shame in regards to the information in the video, and openly endorsed the program suggested by the producers. Four of the papers could relate to the videos personally, because of family history or an active involvement in a related IQP. Six of the papers were opposed to the video, three being critical of the information itself or the effect it has and three had reservations about the proposed solutions.

Attendance was thin at the optional discussions. Hence, I was forced to qualitatively assess the quality of the other videos based on only a few reviews. Students who participated in the optional discussions were more engaged than in the first mandatory one. Clearly, this was a self-selected group. Those students spoke up more and seemed to give more thought to each of their points. Still, reaction papers to these videos only seemed to be on par in quality and strength of reaction to “Place Matters”. This indicates that the entire series is of high quality, though there doesn’t seem to be quite as much shock factor associated with some of the other videos. “The most striking point I found,” one student comments “was the differences in the way different governments handle [healthcare stressor] situations.” So, after a hard-hitting opening that gets everyone’s attention, the rest of them should be able to carry a weekly discussion day for an entire seven-week class.

Conclusion

In light of the data gathered in this project, it is clear that most WPI students are interested in traveling abroad for IQPs and MQPs, and some of those going overseas would like to study health issues. This sets the stage for some comparative studies. Most students claimed to have little to no preference in dealing with U.S. or international health issues. Among those staying in Worcester or going to Washington D.C., domestic themes might be easier to arrange, but opportunities like Aerovax suggest that international issues can also be addressed on campus. It is up to WPI to provide students with the opportunities in project centers that will allow them to complete projects with implications for US health policy. It might be prudent to focus this activity in certain project centers. The project possibilities are numerous in Europe, which has a better healthcare situation and can be used to evaluate successful healthcare policies for implementation in the US. However, Aerovax-style projects lead themselves to project centers in the third world, especially Namibia, so health projects could be based anywhere, from Thailand to Denmark.

In terms of sustaining student interest in such an initiative, the data supports my conclusion that students that participated in discussions of *Unnatural Causes* are more interested in health-related topics (and in completing health-related projects while at WPI) than they were before doing so; and 10% came out newly, and highly, motivated. Though extensive data could not be collected for each of the episodes of the series, from watching nearly all of them and leading discussion sessions regarding most of them, I believe it is safe to assume that most if not all of the episodes will have an effect in raising health consciousness in viewers. Even exposure to only one video, "Place Matters" would make a notable difference. This half-an-hour video could be contained as a one-day event in a class devoted to other things, or be a focus for an after school discussion, the kind that Student Pugwash USA supports and endorses.

Unfortunately, we won't know the real success that these videos have in increasing project interest until future prospective IQP participants have a chance to sign up for health-related projects, assuming there are enough offered in the future to fully accommodate them. This, of course, will take time and it would require a completely separate study to track.

Personally, I believe that a social science course that discusses issues of inequality relating to health, using *Unnatural Causes* in place of one text and as a sort of backbone, is a very good idea and one that will go over well with the WPI student body. Students prefer videos to readings, and these videos have a student impact comparable to the single best reading that was part of an introductory sociology course. Students that actively participated in the discussion sessions seemed very excited to be talking about issues that are relevant to them, partly because they are in a situation that allowed them to relate and empathize with those in bad situations who appeared in the videos. There was also a strong desire to set right what is wrong with this country. Housing and income policies are health policies too. Now they know that, and it has implications for both technology and policy, the core issues related with IQP projects.

There is a certain shock factor for people who didn't know the information pertained in the videos. While watching the video, many get an expression on their faces that indicate bewilderment, as if they are screaming "This is happening in my country?!" in their heads. There is an unusual opportunity for action-oriented education contained within these videos, and I feel strongly that someone should utilize it to its fullest.

Appendices

Appendix A – IQP Chronology

At the end of the school year in '07, I was approached by then-roommate Hilary Stinnett about an IQP project that she would be working on in the following academic year. As she described to me, it would involve working in on research in a biology laboratory. Although I didn't know much about the project's specifics, she seemed excited enough about the project that I quickly agreed to be her partner when asked. At the time, I was excited about the chance to do in-major research as part of a typically off-major project.

After I met with the advisor John Wilkes at the end of D-Term, I was confused about the inner-workings of the Aerovax project, but at least had some basic information to work with. As I understood it, we would be the "bio-experts" in testing the feasibility and effectiveness of a new device that was being developed. This device was a medical tool that was to be used in the third world to mass immunize otherwise unreachable target populations. I did not know anything about the device specifically; only that it was written about in a relatively respected college journal and won a contest at MIT. I hadn't met with the device's designer, Jose Gomez-Marquez, but I signed onto the project anyway.

The following fall, Hilary and I were called to a group meeting with Jose Gomez-Marquez, Professor Wilkes, and three other students. I arrived to the meeting a little late because of a small scheduling conflict and upon my arrival was greeted with blank stares in the small Social Science conference room. Apparently Jose hadn't been informed of my participation in the project, because not only did he not know who I was when I told him my name, he had still thought that Hilary was working on her portion of the project alone. A quick interjection by Wilkes about the reason for my addition to the team quelled the confusion.

Jose caught me up on the events of the meeting prior to my arrival. Mostly this meeting seemed to be for introductions and an official explanation of the device. There were to be two groups: one had four members and was to work on the engineering and development of the product, and the other was Hilary and I. It was fully explained that because this was an IQP and not a MQP the research aspect of the project was to be a secondary objective. Wilkes wanted, as the main purpose of the project, for us to explore the cultural aspect of the implementation of Aerovax in the third world. We were to study and research the implications of attempting to apply the device to several cultures. Additionally, Wilkes wanted to explore the dynamics of R & D team interactions (which was one of the reasons that I was brought on in the first place.)

This meeting was also the first time that I had the device explained to me in detail, including sketches and official documentation. I scratched some notes onto the notebook I had brought with me, but still didn't fully understand the inner workings of the device at the time. It wasn't until I read the material that Jose directed us to that I actually understood it completely. The final action of the meeting was for Wilkes to hand out MBTI personality tests to all of the IQP participants. They were used in order to better analyze the relationships and interactions between members of the groups. I had already taken the MBTI once before as part of a previous relationship-building exercise, so I quickly completed the test and handed it in. I proved to be an INTP and Hilary an ESTJ, in MBTI terminology; we had very different personality types but were potentially complementary. I later discovered that Jose was also an INTP.

The next few weeks went smoothly. We had our first private meeting with Jose where we discussed our group's specific goals and what we should do first. He assigned to us some background reading specific to testing the device. His personal interests were quite noticeably less about the cultural aspect than they were about the actually testing. Included in the background material were some explanatory articles about BOP, or bottom-of-the-pyramid, economics. This field focuses on how

the poorest people of the world interact with consumer markets, and how to develop and deliver products with these people in mind.¹

One specific article that he asked me to retrieve explained the methods that one group used to test a device that was very similar to ours. The methods of this report used live virus to attempt to infect cells that had been immunized with their device. This procedure didn't seem at the time like a thing that would be difficult to duplicate with our device. Jose informed us that the other IQP team's goal was to develop an integral part of the device: the canister that contained that would contain the powdered vaccine. Without it, we would not be able to conduct any testing of the device fully. We expected to have it in our hands by the time we were ready to conduct the experiments.

It had been decided relatively early that Hilary would be in charge of most of the reading and writing and that I would be in charge of communication between various parties and obtaining what we needed to complete the experiments. This split was acceptable to me because I dislike reading outside my personal favorite genres. My first action on behalf of the team was to try to secure a lab where we could run the experiments. I spoke with Mike Buckholt, the manager of the introductory biology laboratory classes and obtained permission to use the lab whenever it was available. Considering the relative ease I had in obtaining this, I was optimistic about obtaining the other necessary permissions and equipment.

Unfortunately, my lack of knowledge about biosafety regulations would have me continuously falling flat on my face after this promising start. My first unfortunate encounter was with Dave Adams, the head of the biosafety committee at WPI. I inquired of him about where I might find the materials I needed to conduct the experiment, including where to find live attenuated virus that would be required

¹ I recently discovered that Jose was determined to develop Aerovax as a self-financing entrepreneurial venture, though looking for grants and contracts from WHO and UNICEF. I am unsure of how the population to be served is expected to pay for the research and development costs required for the projects. I hope that they might be able to cover the costs of services once the device and distribution systems were in place.

to mimic the experiment in the article as planned. He explained to me that an experiment of this magnitude was, in his opinion, fit only for an MQP with a dedicated biology advisor. He also explained the live measles virus was a biohazard level 2 material and that WPI could not obtain any of it nor did they have the facilities required even to store it let alone experiment with it.

After a few exchanges, he finally instructed me to consult the professors at UMASS Medical, because they had the necessary facilities and might be of assistance. This option was not useful, however, because with no connections at UMass we would find only dead ends there. After consulting Jose regarding this issue, we came up with an alternate experiment that involved only the vaccine and not the virus itself. He would try to secure the virus and a lab at another location, most likely in Boston.

A couple of weeks after this occurrence we took our first trek to Boston to meet with one of Jose's contacts named Anton. He had a device that we needed in order to measure the device's performance. Another contact at a laboratory near Worcester owned a laser that could accurately measure the output of the device, but was unavailable at the time.

By this time, most of A term had passed and we had still not secured all of the materials required for testing, namely the vaccine. The engineering team still had not finished the critical component of the device we needed. Optimism was low at this point about completing the testing and so a "Plan B" was created for the IQP: drop the testing altogether and emphasize the work that was to be done on the cultural side of things. This plan was discussed and planned by Hilary, Wilkes and I without Jose's direct input. Wilkes assigned us each additional reading to complete if it was definite that the experiment could not be completed. I was never excited about the library project, however, and was determined to save the original project as best I could.

At the beginning of B term, the project proposal was due. Hilary completed the background while I did the materials, methods, and timeline sections. Before writing these sections, I had discussed the

experiment again with Jose. Having not obtained the vaccine and with the virus out of the question, I was to write up three separate procedures for the experiment. The first was the optimal procedure, assuming we had all the materials we needed to carry out the original ideas including the virus and the vaccine. The second was the modified experiment assuming we didn't have the virus but at least had the vaccine. The third was a procedure that didn't require the vaccine or the virus. This procedure would be carried out just to measure the basic output of the device. Still, Jose considered this worthwhile and I was able to maintain the hope of working in the laboratory.

It was determined by Hilary and Professor Wilkes that if the correct materials could not be obtained by a predetermined date, plan B would be carried out and the project would transform entirely into a literature review about BOP (Bottom of the Pyramid, see Appendix C) economics, third world cultures, and the implementation of Aerovax. We hoped that even if all else failed, we would still be able to conduct the simplest of the three experiments. I was skeptical however, of the usefulness that results of this third experiment would have on the finalization of the device, but continued regardless because of Jose's optimism regarding its usefulness.

The second wall was hit after a discussion with Jill Rulfs, a biology faculty member. Though it would be possible to obtain the vaccine, she told me, it would take weeks for a credible biology professor to obtain the approval required by the government, let alone a student, an engineer, or a social science professor. After that talk, I knew that neither of the more elaborate procedures would be able to be conducted.

By the time that everything regarding the materials was said and done, it was obvious that we didn't have enough time to conduct any of the experiments and plan B was carried out. Because I was busy trying to save the experiments, however, I didn't have much of a chance to read material regarding cultures. Hilary took it upon herself to organize the final paper, so I consulted her for what I should

write. I ended up using winter break to actually write the pieces that were assigned to me, which proved difficult due to constant travelling. The increased distance from both Hilary and Wilkes made the task even more difficult, as communication was sparse and inefficient.

At the time of the project's required completion deadline, my piece of the IQP was deemed by Hilary to be of insufficient caliber to include into the portion of the report that she had written. She requested the project be split in two, with her submitting her portion of the report and me submitting mine. This left me in an awkward situation, however, because I hadn't read much or written many of the core pieces that would be necessary to submit a formal IQP paper. So instead, I decided to continue to work on the IQP into the next term, and take on a new project that was relevant to Aerovax and would keep me away from the Library. Aerovax the R & D project would not benefit directly from this project, but Aerovax the company, which requires teams of researchers and technical workers, would benefit enormously.

Appendix B – Aerovax Evaluation

There are several reasons why the IQP didn't go off as originally intended. First and foremost, I believe that there was a lack of communication on all sides of the project. Hilary and my meetings with Jose or Wilkes were rare, maybe one every other week, which prevented vital communication during the periods in which obstacles were reached. Hilary and I communicated less than we should have, which prevented confirmation and resolution of even minor issues that one member of the group may have been experiencing. Lack of communication also hindered our (or at least my) ability to make and follow schedules because there were no quality control checks being run regularly.

A second reason for the project's failure was the enormity of the work that Hilary and I had given ourselves, and the arrogance that we had in thinking we could pull it all off without a snag on a two-term schedule. When obstacles were hit, we attempted to side step and pass them, only to find out that someone of our limited experience and status could never hope to overcome obstacles of the size that we faced. Information of these insurmountable obstacles only reached Jose well after they already severely hindered our schedule. Had Hilary or I known about the biosafety regulations regarding measles virus and vaccine, or the difficulty of accurately performing the experiments asked of us, we would have been able to say from the start that the project as designed was futile and changes would have to be made. However, as I was going through the process of learning this on my own, Hilary grew impatient as time passed as she had little to do until the reading list was finalized and the "Plan B" was confirmed. In the end, by the time I read one book (by Anne Fadiman) she had read many, and decided to drop my contribution rather than edit my writing to fit into a paper that was largely her own.

Appendix C – Aerovax Literature Review Piece

This appendix contains some of the original material that was to be added to the parts of the IQP project that Hilary had written for submission.

Western medicine has long held the notion that experimentation, observation, and discovery is the driving force for successful medicine. The only way to cure a patient, Western doctors believe, is to know their exact physiological and psychological ailments and to treat them accordingly. This method of treatment can greatly conflict with cultures that believe strongly in alternative forms of healing. Concepts of shamanism, spiritualism, and naturopathy seem to completely confound and aggravate Western medicine to the extent of arrogance.

Author Anne Fadiman details an example of the conflict between two cultures in the book [The Spirit Catches You and You Fall Down](#), an exploration into the life of a Hmong refugee family and their interactions with American doctors during the treatment their epileptic child (5). This family is the Lees, who had fled from Laos in the late 70's to escape persecution after the Vietnam War. Their journey finally led them to Merced, California, where many Hmong ended up during the early 80's. The Lee's spoke no English (and couldn't even read numbers), and knew nothing of Western culture past the horror stories they had heard about American doctors eating brains and selling human meat.

Their fourteenth child Lia Lee was the first to be born on American soil at the Merced County Medical Center (MCMC). This was a truly foreign experience for the mother as she was used to giving birth by herself in her hut standing up and instead was barraged by a battery of nurses and doctors as she delivered. It would be only the first of a plethora of visits to MCMC the family would have to undertake, however, because soon after her birth Lia contracted a severe form of epilepsy.

A shamanistic culture, the Hmong believe that many illnesses and diseases are caused by evil spirits known as *Dabs*. These spirits have the ability to steal souls from people, especially infants and

children who are incapable of guarding them. Lia's parents attributed her epilepsy to her fragile spirit being frightened from her body after their house door was slammed hard by her sister one day. They say that her spirit was then stolen by a *dab* that whisked it away and left her body empty. Her mother and father also believe that her ability to enter 'trances' (i.e.: epileptic fits) makes her somewhat special because it is a prerequisite to becoming a high-status shaman in their culture.

Lia was taken to the medical center countless times during her young life. The doctors prescribed her drug regimens that would be confusing even for a knowledgeable American family let alone an illiterate one who believed that the drugs might have been causing the illnesses as much as healing them. The Lee's methods of healing included, among many other things, herbal treatments, shamans, and an ancient coin-rubbing technique said to absorb disease from the body. The family believed that they were being treated unfairly because the Americans thought they were stupid immigrants.

Eventually Lia's condition worsened until she had an immense grand mal seizure that left her catatonic. Doctor's blamed the Lee's "parental neglect" on the overall cause of the eventual catastrophe. Lia's parents hadn't treated Lia with the correct medicines at the correct times as were prescribed. They believed strongly that the medicine itself was bad for their child's health, and that it was the doctors' fault that Lia had her final massive seizure.

This book dictates what can happen when a patient doesn't trust the medical system they are in, when it looks threatening or menacing, or when the patient believes the medical system may actually be causing problems more than helping them. Because of the lack of communication due to the cultural and language barriers, no clear explanations about the reason for the drugs and medical procedures could be given and no adequate feedback could be received from the patient about their frustrations of the doctors' practices.

Subtleties can have a large impact on the relationship between two parties, and it's important to start on the right foot. Fadiman explains towards the end of her book that people often make the wrong decisions when meeting with others who are culturally different. People often tend to "go overboard" in trying to prevent doing anything taboo that they come off as arrogant or instead make many mistakes. Fadiman stresses that it's important to realize that those from other cultures expect people to make mistakes because they don't come from the same place. It is better to be kind and respectful and ask if something is acceptable when in doubt. Fadiman also suggests the use of a cultural guide who knows acceptable cultural policy and who can be referred to when needed.

Fadiman also illustrates the disasters of trying to force viewpoints and beliefs into another, even seemingly logical and/or practical ones. Medicine is no different in this case; many cultures' view of disease and medicine is far different from traditional Western beliefs. Fadiman also recognizes people's natural ability to rationalize and accept new viewpoints, however, as long as they are introduced in a respectful and culturally acceptable manner. New technology has a much higher chance of being accepted into a community as long as care is taken to ensure that it is not implemented with force and that it isn't glaringly taboo.

The world is becoming more and more of a global community, interconnected by free trade, communication, and political ties. As the world continues to grow, new technologies must be implemented to care for all people, rich and poor alike. One article entitled The Next 4 Billion, which was written by the International Finance Corporation and the World Resources Institute, details some of what must be done to support the BOP (Base of Pyramid) communities as world growth continues (6). Chapter 2 is a section entitled "The Health Market," in which the article talks about BOP market as a whole as it related to health, including where it is, who is a part of it, and what they need/want. The article focuses on the poorer areas in Latin America, Eastern Europe, Africa, and Asia but applies to communities all over the world.

According to the article, new business models are being implemented in low-income environments such as Kenya, which have improved success rates over older models. These models provide vital medical infrastructure within communities as well as providing jobs to members of these communities. Cultures that have previously shied away from Western medicine are beginning to accept it, and in many cases prospering from it. Part of being a part a growing global interdependence is a growing awareness of the need for proper healthcare, and even cultures with viewpoints far different from those of conventional Western medicine are beginning to accept medicine that can save their lives.

Appendix D – Aerovax Background Piece

This appendix contains some of the original material that was to be added to the parts of the IQP project that Hilary had written for submission.

A very hardy and remote Asian culture that traditionally resided in the hills and mountains of China and Laos are called the Hmong (5). They were regarded by surrounding nations as stubborn and arrogant. They referred to the lowlands as “the land of the leeches,” because anyone descending there would invariably get sick. A solitary culture, they took to themselves and refused any foreign identity, even though they had no country borders of their own. Many times the Chinese tried to force their integration into Chinese society, and each time they failed due to the sheer determination of the Hmong even though they were greatly outnumbered. Rather than have their identity be lost, they would die or flee from their homes and resettle elsewhere.

Though their ideologies are radically different from those of many other Asian cultures, some general concepts can be drawn from their customs. The Hmong are a shamanistic culture; they believe that each person contains within themselves one or more spirits that are part of them. Human spirits are fragile and can be easily snatched away by demons known as *Dabs*. These demons are what the Hmong believe are responsible for a myriad of illnesses, from nausea to Parkinson’s disease. In order to retrieve a lost or stolen spirit a *Txiv Neeb*, or shaman, is called upon who can traverse the spirit world and locate it.

Often to assist in locating a spirit, or as payment to a *Dab* for a stolen spirit, an animal is sacrificed. This practice is common among the Hmong, and is sometimes used in celebration or to appease angry *Dabs*. Most parts sacrificed animals are utilized; It is cooked and eaten in a feast that involves many Hmong. The family unit within the Hmong is very large, with most people in a person’s tribe being considered part of the extended family. Additionally, it is very taboo for a family to marry within their tribe.

Medicines consist mainly of herbs that have been picked from forests near the village. There are a few dozen staple herbs prepared in a multitude of ways that are prescribed to cure almost any common disorder. Other methods are called for when a disease is severe or persistent. One such procedure is a technique called coin rubbing where a heated coin covered in oil is rubbed vigorously over the patient's body to remove impurities and toxins from within them.

The Hmong do not view the Western medical community highly. Above all else, they do not appreciate Western doctors because they view them as intrusive and rude. *Txiv Neebs* are always right even if their healing doesn't work, they never touch their patients, and they never ask inappropriate questions. Western doctors, on the other hand, often ask patients to remove all their clothing, ask embarrassing questions, and are at fault when the medicine they prescribe fails. They also don't respect customary Hmong practices, such as consulting the man in the family about important decisions.

The reason for this mistrust has been, in the past, due to the inability for Western doctors to consider or consult the beliefs of their patients before attempting to heal them with Western medicine. These methods include confusing regiments of drugs that may seem to do as much harm as heal to a drugless society and extremely invasive surgeries that remove all personal privacy from the patient. Considering that most Hmong are completely illiterate and don't understand the reasoning or the purpose of medical procedures, it is difficult for them to agree with the procedures. The Hmong can, however, appreciate antibiotics and other fast-acting drugs, because their effect is apparent and their usefulness obvious. They aren't afraid of needles because their culture makes use of acupuncture and other dermatological treatments.

Implementing Aerovax into a society such as this would require care in marketing the device. No part of the product is inherently taboo, but it will be met with skepticism until it's approved by the greater community. This will be particularly difficult with vaccination tool, because vaccinations are a

preventative medicine rather than a fast-acting cure. A special effort would need to be made in putting the device into a context that fits into their culture. Perhaps it could be said that breathing the device will safeguard spirits against certain *Dabs* that are known to cause whatever illness the vaccination prevents. A solution might be to hire a cultural guide to help introduce the device in a culturally acceptable way.

Another issue in integrating Aerovax into the Hmong would be training the people to use the device. Hmong language is oral; there is no formal written form and most conventional Hmong can't read numbers and symbols. Alternate usage methods such as sounds and pictures would have to be added to the device in order to allow the community to use it. Otherwise, a doctor would have to be hired to stay with it and administer it, which could be met with little success. A cultural guide would act as a translator when training people to use the device, and could help them to understand it better. This might improve usage rates.

As the world grows, people must also change the technologies used to improve it. Bottom of the Pyramid economics focuses on the implementing technologies to the poorest people of the world, who also make up the largest portion of the world's population. These people need food and medicine as well, and new business models are being implemented which improve the success rate of companies marketing to them (6). Their locations, market shares, spending habits, and needs are all now being closely monitored in order to better develop technologies for them. For Aerovax, these business models should be watched and interpreted for implementation of the device.

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