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**Knowledge, Attitudes, Beliefs and Behaviors Related to Health among the
Indigenous Peoples in Ecuador and the Potential Application of Telehealth**

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ABSTRACT:

There is much concern of health effects related to gas drilling in the provinces of Ecuador. Recent research has shown a possible correlation between oil drilling and a multitude of health problems (1). Cancer rates in particular may be elevated in populations exposed to the drilling pollutants; while intriguing, this research remains inconclusive in large part because of difficulties in diagnosing cancer among other health problems in rural populations, but also due to local people's perception of exposure. It has been determined that previous explorations between petroleum and cancer had not been approached directly in terms of taking indigenous peoples knowledge, attitude, behavior, and beliefs (KABB) into account, which is vital in shaping their identity and entity as a whole, particularly in the intersections of medical, ecological-environmental, and cultural-historical trajectories. Upon further investigation in the current literature and discussion with the local experts in the fields of anthropology and epidemiology, it is identified that the perception of illness and its implication in terms of KABB must be assessed and taken under consideration before the true prevalence of cancer in this region can be measured to its true extent. This research will therefore aim to lay the groundwork by conducting interviews utilizing surveys developed to assess the KABB of local people through healthcare providers and indigenous healers. Targeted interviewees will be from the following key figures of the local healthcare system: Physicians, nurses, promotores, shamans (Indigenous healers), Quito's epidemiologists, public health officials, oncologists. The KABB of the indigenous healers will be compared to those of western-trained healthcare providers and scientists. Targeted locales will be major cities such as Quito and rural areas in the Oriente. We will also enlist the help of students at Universidad Tecnológica Equinoccial (UTE), Equinoccial Technological University in Quito using Telehealth Video-Telephone-Conferencing (VTC) and Internet to share project progress, discuss issues, and to share information. The result will be valuable for future endeavor to further investigate the link between petroleum exploration and its carcinogenic effects on local population, as well as to establish the true prevalence of cancer due to petroleum exploration. This research also could help prevent a major health crisis, similar to the once-unknown deleterious effects of tobacco use along with its far-reaching medical-legal aftermath of unprecedented cases of litigations. It is hoped that this research will serve as a forerunner in qualitative research utilizing KABB model to explore area of complicated human-environment-diseases interactions; and thereby to shed light into the ambiguous relationship between cultural beliefs, petroleum exploration, and cancer in Ecuador. The study was aimed at laying the groundwork for future focused research to address critical health issues among the people affected. Results of the surveys showed that the concerns related to petroleum drilling and its effects on the environment and health is less tantamount in the urban areas compared to the rural communities near the drilling areas. Independent of the petroleum drilling activities, we found that the major health problems are related to poverty, malnutrition, unclean water, and a variety of potentially preventable infections. Solutions include improved education, prevention, better nutrition, sanitized water and local economic development. We

plan to apply Telehealth technologies to create a collaborative knowledge network and address these issues more efficiently.

INTRODUCTION:

The oil development in the Amazon region of Ecuador has led to significant environmental and health concerns. There is much concern of health effects related to gas drilling in the provinces of Ecuador. Research has shown that they are closely interconnected.

For many years residents of the oil-producing areas of the Ecuadorian Amazon have raised concerns over pollution related to oil development. Both peasants and indigenous people have reported that many local streams and rivers, once rich in fish, now support little or no aquatic life; further, cattle are reported to be dying from drinking from contaminated streams and rivers. These are typically the same waters that people use for drinking, cooking, and bathing (1). Residents have also reported that bathing in the river waters causes skin rashes, especially after heavy rains, which accelerate the flow of wastes from nearby pits into the streams (2). In 1993 a community health workers association in the Ecuadorian Amazon conducted a descriptive study in its communities. The study suggested that, compared to communities free from oil exploitation, communities in oil-producing areas had elevated morbidity rates, with a higher occurrence of abortion, dermatitis, skin mycosis, and malnutrition, as well as higher mortality rates (3).

In 1994 the Center for Economic and Social Rights released a study reporting skin problems (dermatosis) in the population in the Ecuadorian Amazon, apparently related to crude oil contamination of local rivers (4).

The “Manuel Amunárriz” Institute of Epidemiology and Community Health has been involved in a research process to assess the potential health impact of oil pollution in communities near oil fields. In the first of these studies, women living in communities near oil fields reported higher rates of various physical symptoms than did women in control areas. These symptoms included skin mycosis, tiredness, itchy nose, sore throat, headache, red eyes, ear pain, diarrhea, and gastritis. After adjustment for possible confounding factors, the symptoms significantly associated with exposure were those expected from known toxicological effects of oil (5). Another study found that the risk of spontaneous abortions was 2.5 times as high in women living in the proximity of oil fields (6).

Research done in 1998 found an excess of cancers among males in a village located in an oil producing area in the Oriente region (7). Another study, from 2000, examined the differences in cancer incidences over the period of 1985 to 1998 in the Amazon region of Ecuador. This study found a significantly higher overall incidence of cancer in both men and women in the divisions of provinces where oil exploitation had been going on for at least 20 years. Significantly elevated levels were observed for cancers of the stomach, rectum, skin melanoma, soft tissue, and kidney in men and for cancers of the cervix and lymph nodes in women. An increase in hematopoietic cancers was observed in children (8).

Tension continues to exist between economic development and environmental protection, health promotion and disease prevention. Peasants and indigenous people from the Amazon have presented their complaints to various administrations of the national Government of Ecuador. Through their own organizations and with support from national environmental groups, Oriente residents have demanded that the companies clean up the environmental pollution and compensate them for damages caused by oil-related contamination. The measures adopted so far by oil companies and the various administrations of the national Government have been described as “patches,” such as covering some waste pits, building some schools, and constructing roads, all without facing the root causes of the problem (9,10).

The public health concerns seen in Ecuador could be relevant throughout the world, wherever there is gas and oil drilling in the vicinity of local populations. As indicated in the recent studies, public health problems very likely do exist. However, the studies failed to demonstrate a link between oil and cancer because the epidemiological database does not include adequate information on human exposures. We hope to elucidate the KABB of the population at risk and to establish a link for further studies to prevent unnecessary health problems from the expansion of unregulated oil exploitation in Ecuador(11). This study will provide a pioneering first step in reaching this goal.

METHODS:

1. Written surveys with questionnaires and face-to-face-interviews were conducted in the various regions of Ecuador. The interviewees included physicians, nurses, promotores, shamans, epidemiologists, public health officials, and oncologists. Surveying and interviewing questionnaires (see appendix 1) were conducted in Spanish and later translated into English. The questions are composed of a combination of Likert-Scale type and open-ended ones. A total of 25 questions were utilized, they targeted areas such as demographics and training background; the subjects' knowledge, attitudes, and beliefs toward health, cancer; and the effects of petroleum drilling on socioeconomic and health issues.

2. Dr. Dale Alverson, our mentor, made a preliminary trip to the Equador on 7/05/25 to 7/15/05 for establishing contact with the local UTE counterparts: professors and students. From 6/11/06 to 7/01/06, we conducted our interviews and surveys in Quito, the capital of Ecuador, and the Oriente region of the remote rural areas. Upon our return, our subsequent communications were obtained through our counterparts via Telehealth, Video-Telephone-Conference, and Internet.

RESULTS:

A total of 26 interview-surveys were conducted, of which 24 of them were face-to-face with tape-recording device simultaneously, the remaining two were given to the interviewees and returned at a later time.

Demographically:

Physicians: 18 total

Nurses: 1

Promotores: 7

Epidemiologists: 2 out of 18 total

Oncologists: 3 out of 18 total

All other physicians were of general medicine background.

The KABB results we surveyed western-trained physician and compare the responses with rural areas in the Oriente (Nuevo Roca Fuerte, Zumbahua, Chiru Isla, San Vicente)

Questions pertaining to Knowledge/training: (Questions 1 to 7)

All of MD's went through 6 to 8 years of medical school plus residency training, most indigenous healers learn by apprenticeship, from 1-2 years of basic first-aide and traditional training to 10 to 20 years of experience on the field. There was one indigenous healer who had a few years of medical training in a formal university.

Questions pertaining to beliefs toward health problems in general: (Questions 8 to 13 and 24)

In Quito, the following were mentioned: HTN, DM, CHF, Dyslipidymia, lack of nutrition, lack of exercise, tobacco and alcohol use, TB, parasites, respiratory infections, sexually transmitted diseases, increased stress, lack of funding and resources, uterine ,breast, stomach, testicular, lung, and prostate cancers.

In Oriente areas, the following were mentioned:

Lack of water sanitation, malaria, snake bites, resistant TB, malnutrition, trauma, parasites, dengue fever, diarrhea, fever, mycosis, leshmaniasis, alcoholism, cardiac and respiratory diseases, pregnancy complications, congenital birth defects, multiparity, UTI, menorrhagia, dermatitis, anemia, lung and cervical cancer, depression, lack of education and preventive healthcare.

Questions pertaining to Beliefs /attitude toward cancer: (Questions 14 to 18)

Responses range from of no concern of cancer in Quito and those rural areas not being explored, to being a major concern and endemic in areas near the drilling sites. In areas mainly served by indigenous healers, the concept of cancer was not very clear to them, as reflected in responses obtained. As for reporting of cancer to a national registry, the responses were not very congruent or consistent.

Questions pertaining to attitude toward petroleum drilling: (Questions 22 to 24)

Most responses from Quito and rural areas reflected concerns with environment and economic developments, the health issues were less of an issue by comparison. The attitudes toward the petroleum companies ranged from welcoming the economic development to outright indignant feeling of being exploited.

When asked about the leadership of the community, the responses range equally from politicians, ministry of public health, clergy, and indigenous healers, none of the western-trained physicians considered themselves as ones who hold leadership. The responses also reflected a strong mistrust of the public officials and politicians. Corruption of these officials was of a major concern of the people.

DISCUSSION:

1. Obstacles to achieving overall objectives.
2. Common themes found in all locations when determining the KABB of Ecuadorean people toward health and petroleum drilling.
3. Possible solutions and potential for telehealth intervention.
4. What we have learned from this experience as medical students.

1. Obstacles to achieving overall objectives:

To compare KABB in metropolitan area versus the rural areas as well as the western-trained healthcare providers vs traditional healers proved to be an enormous task, the sample size was small and not all eight groups of indigenous tribes were surveyed (Provinces of Sucumbios, Orellana, Napo, Pastaza, Morona Santiago, and Zamora-Chinchiipe.) due to time constraints and the vast amount of territories occupied by these tribes. However, although not all of the Oriente regions were surveyed, the population of 500,000 total as estimated by the Ecuadorian government, only represented 4.5% of the total population of Ecuador. Due to small sample size, the link between cancers and petroleum drilling is not representative and can not be determined at this time.

2. Common themes found:

- Lack of nutrition, sanitation, education, and resources.
- Infections and preventable diseases.
- Mistrust of government and business leadership.

3. Possible solutions and possible applications of telehealth.

-Lack of nutrition- This problem was mentioned as a health problem consistently by providers of all levels in the various geographic locations. There are two models we've found for providing sustainable, economic sources of protein and nutrition in

impoverished rural areas. One is planting of beans, which may or may not be a problem with rainforest soil, but it is an inexpensive and easy way of providing protein. The other is fishery which is currently being used in Africa by the US Peace Corps and the World Health Organization with some success. Recent publications of *The Plant Journal* (12) in which the Rutgers University reported a development of a new corn that is rich in protein can also be utilized. In New Mexico, we can also utilize our expertise on agriculture, and our current connection with UTE, it would be possible to use telehealth to further research this issue and educate providers on instillation of one of these or similar programs.

-Lack of sanitation- Again sanitation, especially water sanitation was noted as a problem consistently and there are also options for further research/intervention/application of telehealth in this area as well. Cal Berkely has started research installing UV filters to household water barrels. These filters cost as little as 5\$. According to Presentation at the Convention of the Illinois Chapter of Sister City International Hanover Park, Illinois on Friday, April 23, 2004 there are a number of technologies that can be employed to produce and distribute clean and safe drinking water, and to collect, treat and dispose of sanitary waste in urban centers. In treating surface water, for example, the technology can range from something as simple as slow sand filters, which require relatively large land area, , and very little chemicals, to exotic treatment processes that might include membrane filtration, ozonization, UV ray disinfection, etc. In the sanitation sector, the technology can range from a simple Ventilated Pit Latrine, to elaborate treatment works that include various pre-treatment processes, biological filters, sludge treatment facilities, etc. Again with our current connections in Ecuador future research and eventual intervention with the aide of telehealth would be possible.

-Infections- We believe with improvements in nutrition and sanitation, there would be a reduction in infections as well, but telehealth could be used on instituting further education and communication on better diagnosis and tx of infections. This may be more difficult as a lot of this would require more funds for antibiotics and staffs for manning the clinics. Improvements in sanitation and nutrition would undeniably help here as well.

-Mistrust: This was a reoccurring issue on the surveys and is at the root of the problem in many ways we believe. The government and the petroleum companies are felt to be responsible for many of the health problems in the area. There is room for much ecological and medical research into these areas. It is also important to note here that such a widespread mistrust is a problem and could lead to unrest and therefore needs to be addressed. I think we could talk about how the situation in Ecuador and many developing nations is similar to our regions in the US with the Native Americans 50-100 years ago. There are a lot of opportunities for research with our native people on their attitudes and beliefs toward our state and national leadership, even with better nutrition and sanitation as compared with Ecuador. More research could also be done on specific reasons the people in rural and urban settings in Ecuador have little trust in their leaders.

-Education: While we did not interview enough promotores to say for certain, it should be noted that 2/8 promotores had either no understanding of cancer or a wrong understanding of it. One promotore admitted to not knowing what cancer was, and one other believed that cancer of the heart was very common in his community. This indicated a possible area of future research, as well as a possible application of telehealth. A larger study on the education, and knowledge of promotores in the rural regions of Ecuador could shed more light on their understanding of basic medical knowledge and interventions. Telehealth could be used in both the application of future studies as well as in the education of health care providers in rural settings in Ecuador.

-Corporate-Social responsibility: Several responses to surveys mentioned a negative impact on health, environment and the economy in Ecuador by the petroleum companies. Once again secondary to small sample size it is impossible to make real conclusions on this topic, but it should be noted as well that Ecuador is home to many indigenous cultures, with their unique foods, customs, medicine etc. As these are replaced by western culture it is impossible to predict the consequences on the health of Ecuador's indigenous people. The implications however are concerning. Here in the southwest region of America we have seen the effect a sudden cultural change can have on indigenous people, as we are still dealing with the problems of diabetes, poverty, alcoholism, as well as limited access to health, education, and employment that have afflicted our own native populations. The cost both in morbidity, mortality, and economically has been high. According to the CDC the average health care cost for a person with diabetes in 1997 was \$10,071. The CDC also estimates that American Indians are 2.8 times more likely to develop diabetes than a Caucasian American. (13)(14) The Navajo tribe alone is estimated to have 1/4 million people and so the cost of diabetes alone in this population is substantial. In Ecuador, the indigenous people are facing a similar cultural change and the health ramifications may be equally costly. Further study into changes in diet, lifestyle, and beliefs, as well as poverty rates and health problems of these peoples is important. Telehealth could be used in cooperative research between investigators in the U.S. and Ecuador as well as in the proper training for prevention and treatment of health problems.

4. What we have learned from this experience as medical students:

1. Health problems are becoming globally important in terms of their rippling or butterfly effects which transmit via various conduits with or without our control as we interact, that no nation can be totally exempt from either the beneficial or deleterious contributions from all of us.
2. In helping other less-fortunate nations to reach the standards of care measured by most developed countries, we in turn, help ourselves and the future generations to have better health, environment, and possibly world peace. We have learned so much from the local medical personnel and indigenous healers' view of healthcare and the way of life, it certainly broadened our horizon and truly transformed us.
3. Telehealth and telemedicine will play a significant role in implementing

networking of all resources to enhance a global community and therefore, the equal access and distribution of healthcare worldwide.

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June 11, 2006

Appendix A

Survey Questionnaires

We are privileged to be here and thank you for allowing us to take part in your community activities. We are a group of medical students from the University of New Mexico, Albuquerque, NM, USA. We are conducting a survey to enable us to better understand the cultural perspective of the Ecuadorean people in your region on health, environment, and economy. Your response is voluntary and the data we obtain from you will be kept confidential. The reporting of the data will be anonymous and when applicable, be linked only to the region in general but not to any individuals. Thank you.

Nos sentimos muy privilegiados por estar aquí. Gracias por permitirnos tomar parte en las actividades de su comunidad. Nosotros somos un grupo de estudiantes de medicina de la Universidad de Nuevo México, Albuquerque, NM, EEUU. Estamos haciendo una encuesta para poder entender mejor la perspectiva cultural de las personas ecuatorianas en su región sobre la salud, el ambiente, y la economía. Su respuesta es voluntaria y los datos que obtenemos de usted se mantendrán confidencial. La cobertura de los datos será anónima y cuándo aplicable, ser ligado solamente a la región en general pero no a ningún individuo. Gracias.

Date and signature of consent for interview:

Fecha y la firma del consentimiento para la entrevista:

Location of interview:

La ubicación de entrevista:

- Quito,
- Nuevo Roca Fuerte
- Zumbagua
- Other:

I would like to ask you some personal questions in order to understand better the health concerns of people in this area and your work.

Con su permiso, me gustaría hacerle una serie de preguntas personales para poder entender las preocupaciones de la gente acerca la salud en esta área y para también aprender más de su trabajo.

June 11, 2006

- What motivated you to pursue this career path?
¿Qué le motivó para seguir esta carrera?

5. What are your responsibilities in the community?
¿ Cuáles son sus responsabilidades en la comunidad?

6. How many communities do you serve?
¿Cuántas comunidades sirve usted?
__1, __2 to 3, __3 to 5, __>5

Which ones are they?:
¿Cuáles son?:

June 11, 2006

7. How many patients do you see per week?
¿Cuántas personas atiende por semana?
__10, __11-20, __21-30, __>30

8. Who do people go to first for their general health concerns?
¿Con quién van las personas primero cuando tienen preocupaciones de su salud?

9. Besides you, who else do people see for their health problems?
¿Además de usted, con quien mas va la gente cuando tienen problemas de salud?

10. How do you treat the health problems?
¿Cómo cura las enfermedades de salud?

June 11, 2006

11. How would you compare your treatment with other healers; a doctor's / shaman's / promotore's treatment?

¿Como compararía su tratamiento con otros curadores; doctores/ shaman/ promotores?

12. What, in your opinion, are the most serious health problems in the community?

¿En su opinión, cuales son los problemas de salud más serios en su comunidad?

13. What do you think causes these health problems?

¿Qué piensa usted que causa estos problemas de salud?

June 11, 2006

14. What is the situation with cancer in your community?

¿Cuál es la situación del cáncer en su comunidad?

Not a concern, Somewhat a concern, Definitely a concern, Endemic
*No es una preocupación, algo de preocupación, definitivamente una preocupación,
 endémico*

15. What are people's perceptions of cancer in your community?

¿Cuáles son la opiniones de la gente sobre el cáncer en su comunidad?

16. How often do you treat cancer?

¿Que tan seguido cura a personas con cáncer?

Almost never, Rarely, Occasionally, Frequently
 casi nunca, raramente, de vez en cuando, con frecuencia

June 11, 2006

17. What is your first hand experience with patients who have cancer?
¿Cuál es su experiencia directa con pacientes de cáncer?

- How have you felt dealing with this type of patients?
¿Cómo se ha sentido lidiando con ese tipo de pacientes?

- What kind of treatment do you provide for them?
¿Qué tipo de tratamiento les da a los pacientes con cáncer?

18. Are you required to report cancer cases, infectious diseases, etc. to a national database?

¿Están ustedes obligados a reportar los casos de cáncer, enfermedades contagiosas, etc. a una base de datos nacional?

Yes, No

June 11, 2006

19. Have you sent your patients to the doctors in the city? (or other health providers)

¿Ha mandado a sus pacientes a los médicos de la ciudad? (o a otros proveedores de salud

Yes, No
 Sí, No

- If that is the case, under what circumstances?
¿Si ése es el caso, bajo qué circunstancias?

20. Does location/transportation ever make this impossible?

¿La ubicación / transporte hace esto imposible?

21. What kind of transportation if any is available?

¿Qué clase de transporte está disponible?

22. **A.** In your opinion has the drilling for petroleum affected your community financially?

¿ En su opinión, las compañías involucradas en la perforación de petróleo han afectado su comunidad financieramente?

___ Very Little, ___ Mildly (a little), ___ Moderately (some), ___ Severely
___ *Muy poco*, ___ *Ligeramente* ___ *Moderadamente*, ___ *Severamente*
(*un poquito*) (algo)

- If so, how?
- *¿ si eso es el caso, cómo?*

B. In your opinion has the drilling for petroleum affected your community's environment?

¿ En su opinión, las compañías involucradas en la perforación de petróleo han afectado el ambiente de su comunidad?

___ Very Little, ___ Mildly (a little), ___ Moderately (some), ___ Severely
___ *Muy poco*, ___ *Ligeramente* ___ *Moderadamente*, ___ *Severamente*
(*un poquito*) (algo)

- If so, how?
- *¿ si eso es el caso, cómo?*

C. In your opinion has the drilling for petroleum affected your community's health?

¿ En su opinión, las compañías involucradas en la perforación de petróleo han afectado la salud de su comunidad?

__Very Little, __Mildly (a little), __ Moderately (some), __ Severely
__Muy poco, __Ligeramente __ Moderadamente, __ Severamente
(un poquito) (algo)

- If so, how?
- ¿ si eso es el caso, cómo?

23. Based on financial/environment/health concerns, what is your attitude towards the companies involved in petroleum drilling in your community?

¿Basado en las preocupaciones de finanzas/ del ambiente/ y de la salud, cual es su actitud hacia las compañías petroleras en su comunidad?

__Indifferent, __Somewhat concerned, __Very concerned, __Indignant
and outraged.
__Indiferente , __Algo preocupado, __Muy preocupado, __Indignado
y ultrajó.

- Why do you feel that way?
- ¿ Por qué se siente usted de esa manera?

June 11, 2006

24. Who, in your opinion, serves as the leader or one who makes changes for the people of your community?

¿Quién, en su opinión, sirve como el líder o uno que hace los cambios para las personas de su comunidad?

Politicians, Religious authorities, Individual healer, Myself,
 Políticos, las autoridades religiosas, curador Individual, yo mismo,

Others, Please specify:

Otros, por favor de especificar:

25. Is there anything we did not cover in the interview?

¿Hay otras cosas que no cubrimos en esta entrevista?