# ESTIMATED COST OF DELIVERING HEALTH CARE TO THE AFFECTED POPULATION OF THE CONCESSION AREA OF ECUADOR

Prepared by:

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**September 10, 2010**

**Report Title: Estimated Cost of Delivering Health Care to the Affected Population of the Concession Area of Ecuador**

I prepared this report at the request of plaintiffs' counsel.

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I am a medical doctor certified in both internal medicine and pulmonary medicine. I am a partner in a private medical practice (Chevy Chase Pulmonary Associates) in the Washington, DC area. I am Argentine by birth and a native Spanish speaker. Having participated in a number of medical missions to Ecuador, I have first-hand knowledge of the challenges in providing medical care to its rural population. My detailed curriculum vitae is appended to this report.

## ESTIMATED COST OF DELIVERING HEALTH CARE TO THE AFFECTED POPULATION OF THE CONCESSION AREA OF ECUADOR

The people of Sucumbios and Orellana have broad health care needs, which in many ways can be tied back to the long-standing environmental damages caused by Texaco's oil exploitation. To determine the cost of delivering health care to the population living in the affected area, it is first necessary to understand the nature of the existing health care infrastructure. Then, the elements of a proposed system must be defined. Based on the availability of this information, this report considers methods for developing a cost estimate for developing a health care system for these people.

### STATE OF EXISTING HEALTH CARE INFRASTRUCTURE

There is minimal existing health care infrastructure in the Concession area, and it is clearly inadequate for meeting the needs of the affected population. Information on the current health care resources was derived from public sources (Ministerio de Salud Publica del Ecuador 2002, 2008).

The distribution of resources in Ecuador is very unbalanced, with 20% of the population generating 60% of the wealth and consuming most of the goods and services. This discrepancy is even more profound in the affected provinces of Orellana and Sucumbios. In Orellana, 80% of the population lives below the poverty level and 30% lives below the extreme poverty level. In Sucumbios, the values are 68% and 20%, respectively. In these provinces, only 50% of the population has access to potable water distributed by public utilities.

Sucumbios and Orellana are consistently ranked lowest in Ecuador in terms of health expenditures per capita, receiving only 2.6% of the nation's expenditures. Few medical professionals serve these provinces, e.g., per 10,000 inhabitants, there are fewer than five physicians, two nurses and one dentist.

Hospital inpatient services are also minimal in these provinces. There are fewer than five hospital beds per 10,000 inhabitants. There are fewer than 0.02 private institutions offering inpatient services per 10,000 residents, reflecting the fact that almost all of the basic health care is provided at the expense of the government.

The Ministry of Health supervised public institutions in both provinces. In Sucumbios, there is one hospital (Hospital Marco Vinicio Iza), 33 clinics and one social security dispensary. The hospital in the province of Lago Agrio is considered a second-level facility with only 40 functioning beds (out of a 73 bed capacity), which provides gynecologic, pediatric, internal medical, trauma, surgical and psychiatric services. There are also basic radiological and imaging services. The 33 clinics that are distributed throughout the province have few observation beds, no hospitalization capacity and are staffed by one primary care doctor, one dentist, and one obstetrician/gynecologist. All staff are in their first year of clinical practice upon completion of University education as mandated by the Ministry of Health. There are basic laboratory services available in the clinics.

In the province of Orellana, there is one hospital (Hospital del Coca), three health centers and seven social security dispensaries. The hospital is second-level, with 30 beds and four basic specialties. The three health centers located in Shushifindi and Joya de las Sachas have a total of 19 beds and operate as rudimentary health centers with limited hospitalization capacity.

There are other indicators of the rudimentary condition of the existing health care system. For example, there are no trained laboratory and radiological technicians in Sucumbios and Orellana nor are there any computerized tomography scanners in the region. (Although the National Ministry of Health invited bids for purchase of CT scanners in 2008, none has been deployed to date in the region.) At the regional hospital in Lago Agrio, there is a mammography machine, but it has remained unused in recent years as there is no technician to operate the equipment (personal communication, Dr. Pablo Andres Buitron).

There are insufficiencies at all levels of health care, including basic sanitary and preventive services, education and clinical services, equipment, and human resources. As acknowledged by the Ministry of Health officials there is inefficient organization, poor responsibility assignment and limited leadership with consequent duplicate functions and further reduction of the low coverage of services provided.

Furthermore, there is a central design of homogenous programs which disregard the rural context of two-thirds of the population impacted. The poorest segments of the population are forced to spend a larger proportion of their income on health care. Deforestation due to the oil exploration has impacted the ability of people in the Concession to obtain their traditional medical treatment.

## COMPONENTS OF PROPOSED HEALTH CARE PROGRAM

In general, there are three critical components that should be included in the health care program that will meet the basic needs of the affected population. These are provided below.

- Primary health care delivery
  - Inpatient hospital services
  - Outpatient services (clinics)
  - Laboratory services
  - Diagnostic imaging
  - Pharmaceuticals

- Preventive and rehabilitative services
  - Prevention of communicable diseases (e.g., tuberculosis, HIV)
  - Prevention of non-communicable diseases (e.g., cancer, heart disease)
  - Family health, including family planning, maternal, and child care
  - Supplemental feeding program to reduce childhood malnutrition

- Education and training
  - Health education to community and stakeholders
  - Medical education and training for paramedical workers and technicians.

## OPTIMAL METHODS FOR CALCULATING HEALTH CARE COSTS

Determining the costs for implementing a health care delivery program in a rural area of an underdeveloped country with little existing infrastructure and extensive needs is a complex task. While some details of the current health care system in the Concession area have been ascertained via review of publically available information, more surveys of the existing infrastructure would be necessary to provide complete cost estimates for a program. Extensive searching of reputable data sources (WHO, USAID, PAHO, World Bank) did not yield comprehensive estimates of costs for developing a health care system in this region. Moreover, the degree of complexity of the health care system to be established needs to be carefully considered as cost ranges can vary. It is difficult to predict overall costs when the entire range of diseases related to the environmental contamination has not yet been established or become manifest.

After much searching, it was concluded that the necessary data for calculating a comprehensive estimate are simply not available. Consequently, it was necessary to consider other methods for developing a cost estimate for providing health care for the people of the Concession area of Ecuador. One approach (discussed below) is to derive an estimate based on per capita health care spending for the country of Ecuador in 2008. Following this, a program with some similarities is discussed to provide some context for the cost estimate.

## COST ESTIMATE BASED ON PER CAPITA HEALTH CARE EXPENDITURE

One approach is to examine the current per capita health care spending in Ecuador, and use that as a basis for projecting costs over the next 30 years.

According to the most recent World Health Organization data, the total expenditure for health care by the Ecuadorean government in 2008 was $231 per person (WHO 2008, http://www.who.int/gho/countries/ecu/en/).[1] Thus, a simplistic method of deriving a total figure for health care costs involves multiplying this per capita value by the population at risk in the Concession area. The 2010 population estimate for the Concession area was based on the INEC-projected population data for Sucumbios and Orellana (n=178,517), giving an estimated cost of delivering health care in that year of more than $41 million.

[1] Note that there are a variety of estimates available for per capita health care costs for recent years in Ecuador. These estimates can fluctuate according to capital investments and other factors. For example, the WHO estimate for 2005 was $274 per capita. The most recent estimate from the World Bank (2008) was $200 per capita. After careful consideration, the $231 figure was selected as the best estimate.

The table below includes population projections from 2010-2019 for the five cantons in Sucumbios and Orellano where oil production facilities are located. These estimates were then used to calculate the estimated health care cost for the region for 10 years ($469 million).

| Year | Population at Risk | Nationwide Per Capita Health Care Expenditure (2008) | Annual Cost |
|---|---|---|---|
| 2010 | 178,517 | $231 | $41,237,427 |
| 2011 | 184,663 | $231 | $42,657,153 |
| 2012 | 189,968 | $231 | $43,882,608 |
| 2013 | 195,273 | $231 | $45,108,063 |
| 2014 | 200,578 | $231 | $46,333,518 |
| 2015 | 205,883 | $231 | $47,558,973 |
| 2016 | 211,188 | $231 | $48,784,428 |
| 2017 | 216,492 | $231 | $50,009,652 |
| 2018 | 221,797 | $231 | $51,235,107 |
| 2019 | 227,102 | $231 | $52,460,562 |
| **Total 10-year projected cost** | | | **$469,267,491** |

Reliable population estimates are not available for the years after 2019. However, multiplying the 10-year projected cost by 3 (i.e., not accounting for population growth from 2020-2039) leads to a very conservative estimate of $1,407,802,473.

Is it reasonable to use per capita health care costs as a basis for determining the cost of a health care delivery program? If anything, this number likely *underestimates* what the cost of health care in the Concession region would be. This is an average figure for the entire country, and as indicated above, the affected provinces have historically received only 2.6% of the total health care expenditure in Ecuador. For comparison, in 2001 (the most recent figures available), per capita health care spending in this region was only $75. It must be remembered that Ecuador has some of the lowest health care expenditures per capita in the Southern Hemisphere and therefore, these estimates of health care costs and expenses are relatively modest and provide only for a basic and urgently needed primary health system. To improve the infrastructure to an acceptable level (which would still be lower than other regions of the country) would require significant investments in physical infrastructure, technology and training of human capital.

Also to be considered is the impact of inflation. If the discount rate of the net present value of any court award is equal to the rate of inflation, this factor becomes irrelevant. However, the cost of health care is likely to rise at a faster rate than inflation, providing additional reason to consider this number an underestimate.

## COMPARABLE HEALTH CARE DELIVERY PROGRAMS

The previous section provided an estimate for the cost of delivering health care to the people of the Concession for 30 years of approximately $1.4 billion. As noted, the data necessary to make a comprehensive estimate are lacking; consequently, it is reasonable to consider whether there are any comparable programs to provide some context for this cost estimate.

A search did not identify any other entirely comparable health care delivery programs (i.e., where large numbers of residents were exposed over time to petroleum and its contaminants). However, there is at least one program that has some important commonalities: The World Trade Center (WTC) Screening, Monitoring, and Treatment Program.

**WTC Programs**

Implemented in 2001, this series of interrelated programs was designed to provide screening, monitoring, and treatment programs to rescue and recovery workers who were exposed to multiple chemicals at the WTC site in the weeks and months after 9/11. As of March 31, 2010, approximately 57,000 individuals were considered to be eligible for inclusion in the programs (NIOSH 2010). The program is administered through six clinical centers in the New York City area and there is also a national program for individuals who do not reside in the New York City area.

Experts who have attempted to develop a gross estimate of the total potential costs to treat 9/11 health issues note that it is impossible to do so with any precision or certainty. Funding for these programs has come from a number of sources and thus it is difficult to arrive at a single dollar value for them (NYC undated). However, one estimate for select federal and private funding for 2001-2010 puts the total at $535.3 million (NYC 2007). Projecting this over 30-years in a simplistic fashion (without inflation, etc.) leads to an estimate of $1.6 billion.

**Why the WTC Provides a Reasonable Comparison**

Most importantly, both of these disasters involved complex and ill-defined environmental exposures, with both physical and chemical components. Significantly, the exposures involved complex chemical mixtures, the health effects of which are wide-ranging and not entirely understood. Certain health effects have been associated with exposure to petroleum-based chemicals, including cancer and effects on the central nervous system, the immune system, lungs and other organs, skin, reproductive system, and fetal development (ATSDR 1999). However, as with the WTC disaster, the entire range of health effects caused by the Ecuadorean disaster remains unknown. Consequently, any health care program must involve understanding and defining the exposure-related health effects.

**How the WTC Differs from the Situation in Ecuador**

There are also important differences between the two situations. For the following factors, the reported costs for the WTC Programs likely underestimate the costs that would be incurred in Ecuador:

- The New York City area has a well-developed existing health care infrastructure, while the Concession area of Ecuador does not.
- There are fewer people in the WTC Monitoring and Treatment programs (approximately 57,000) than in the Concession area (approximately 178,000 in 2010).
- The WTC disaster did not involve long-term exposure to toxins.

For other factors, the estimate derived from the WTC Programs may overestimate the costs that would be incurred in Ecuador:

- Costs of medical care are lower in Ecuador than in New York.

In summary, there is no directly comparable program against which to assess the estimated cost of $1.4 billion to deliver health care to the Concession area for 30 years. However, the WTC program, which shares some important similarities, provides some context for evaluating the cost estimate.

## CONCLUSION

The detailed data needed to develop a comprehensive estimate of the cost of delivering health care to the people of the Concession area of Ecuador are not available. As a result, an alternate methodology of developing a cost estimate was pursued based on recent per capita health care expenditures in Ecuador. This simple approach generated an estimate of approximately $1.4 billion to provide basic health care to the affected population for the next 30 years. While no truly comparable programs were identified, one program with some important commonalities (the WTC Monitoring and Treatment Program) yields a cost estimate that provides some helpful context for this $1.4 billion figure.

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Guide to Producing National Health Accounts with Special Applications for Low-Income and Middle-Income Countries. The World Bank Group. The World Health Organization. USAID. 2003.

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MINISTERIO DE SALUD PÚBLICA DEL ECUADOR LICITACION PUBLICA NACIONAL. 2008. ADQUISICION DE 18 EQUIPOS DE TOMOGRAFIA DETALLADO EN: 9 DE 8 CORTES Y 9 DE 16 CORTES JUNIO – 2008. No. MSP/000/0003/2008

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***Curriculum Vitae***
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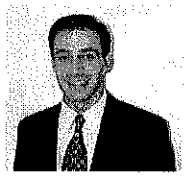

**Personal Information:**

| | | | |
|---|---|---|---|
| **Citizenships:** | Argentine, Italian, USA | | |
| **Specialty:** | **Internal Medicine** - | **Board Certified 1993.** | **Recertified 2003 – exp 2013** |
| **Subspecialties:** | **Pulmonary Medicine** - | **Board Certified 1998.** | **Recertified 2008 – exp 2018** |
| | **Critical Care Medicine** - | **Board Certified 1999.** | **Recertified 2005 -- exp 2019** |
| | **Hospice and Palliative Medicine – Board Certified 2006.** | | |

**Current Position:**

**Private Practice – Partner – Chevy Chase Pulmonary Associates– July 2000 -Present**
**Pulmonary Section - Chief – Sibley Memorial Hospital, Washington, DC – Jan 2005 -Present**

**Consultant:**

**Completion of Independent Medical Examinations as requested by County Agencies**
**Support of Peace Corps providing Pulmonary – Critical Care Medicine Consultations.**

**Last Position:**

**Assistant Professor of Medicine: Pulmonary and Critical Care Division, Medical College of Virginia (MCV) 1998-2000**
**Assistant Professor of Emergency Medicine: Department of Emergency Medicine, MCV**
**Emergency Department Experience: > 12.000 hrs. 1996 - 2000**

**Credentials:**

| | | |
|---|---|---|
| Advanced Cardiac Life Support (ACLS) | | 1991 - Current |
| Pediatric Advanced Life Support (PALS) | | 1994 - Current |
| Federal Licensure Examination (FLEX) | # 660310007 | Dec 1992 |
| Educational Commission for Foreign Medical Graduates | # 431-609-7 | 1990 |
| National Board of Internal Medicine-Critical Care Medicine | # 147918 | 1999 - Current |
| National Board of Internal Medicine-Pulmonary Medicine | # 147918 | 1998 - Current |
| National Board of Internal Medicine (NBIM) | # 147918 | 1993 - Current |
| Medical License Commonwealth of Virginia | # 49618 | 1993 |
| Medical License District of Columbia | # 21536 | 1995 |
| Medical License State of Maryland | # 56065 | 2000 |
| Relevance Reviewer – American Board of Internal Medicine | | 1999 - Present |
| Critical Care Medicine – Pulmonary Medicine | | 1999 – Present |
| ACP DC Chapter Organizing Committee member | | 2004 – Present |
| Fellow, American College of Chest Physicians | | 2000 - Present |
| Fellow, American College of Physicians | | 2007 - Present |

**Training:**

Medical College of Virginia, Richmond, Virginia
**Fellowship, Pulmonary Medicine** **7/1996 – 7/1998**

National Institutes of Health, Bethesda, Maryland
**Fellowship, Critical Care Medicine** **7/1994 – 7/1996**

Medical College of Virginia, Richmond, Virginia
**Chief Medical Resident, Medicine Department** **7/1993 – 7/1994**

Medical College of Virginia
**Residency, Internal Medicine** **7/1991 – 7/1993**

Medical College of Virginia
**Internship, Internal Medicine** **7/1990 – 7/1991**

**Education:**

**Doctor of Medicine, National University of Cordoba** **3/1984 – 12/1989**

**Honors and Awards:**

**Externship in Pathology** - Medical College of Virginia **1988**

**Gold Medal** - Summae Cum Laude - Class Rank # 1 – Medical School **1990**

**Keynote Speaker** – Medical School Graduation Ceremony 04/27/1990 **1990**

***Winner of the Syntex/MEDICINE Award for Excellence in Clinical Practice*** **1992**
*Medicine 1992;Vol 71(1)*

**Medicine Chief Resident** - Medical College of Virginia **1993-1994**

Sibley Memorial Hospital – **Honorary Chair** for contributions to SMH **2006**

**Hispanic Health Leadership Award granted by the**
**National Hispanic Medical Association – March 24th, 2007** **2007**

**President, Pan American Medical Society** **2006-2008**
**Board Member** **2002- Present**
(Non-profit organization dedicated to organizing good-faith medical and surgical missions in Central and South America).

**President** – Sibley Memorial Hospital Medical Association – **2009 - 2010**

**Medical Executive Committee – Member At Large –** **2010 - Present**

Affiliations:

**Medical College of Virginia - VCU - Admissions Committee Member** **1993-1994**

**Fellow, American College of Physicians** **2006**

**Fellow, American College of Chest Physicians** **2001**

**Member, Society of Critical Care Medicine** **1999**

**President, Pan American Medical Society** **2006-2008**

Board Member – Pan American Medical Society **2004- Present**
(Non-profit organization dedicated to organizing good-faith medical and surgical missions in Central and South America).

**Medical Volunteer – Mobile Medical Clinics of Greater Washington, DC. 2007- Present.**
Non-Profit organization dedicated to providing free medical care to the underserved communities of Greater Washington, DC.

**Medical Volunteer** – Mission work in Latin American communities. Dominican Republic – Ecuador – Peru – Argentina.

**Board Member – Operation Canasta** **2007 - Present**
(Non-Profit secular organization dedicated to providing assistance to Argentina's hinterland's schools and orphanages).

**Member –** Latino Asthma Initiative. **2009 – Present**
(Organization dedicated to educating the Hispanic community on asthma and respiratory illnesses and decreasing their health impact).

**Member, National Hispanic Medical Association** **2007 - Present**
(Organization dedicated to advancing access to healthcare for the Hispanic communities of the USA).

**Organizer – Pulmonary Journal Club – Washington, DC** **2000- Present**
(Monthly meetings dedicated to continuous update and medical education – Joint effort with practicing pulmonologists in the greater Washington area).

**President, Sibley Medical Association** **2009-2010**
(Organization dedicated to promoting professionalism, excellence and camaraderie among practicing physicians at Sibley Hospital).

**Medical Committees Member:** Sibley Memorial Hospital

| | |
|---|---|
| **Pharmacy and Therapeutics Committee** | **2000 - Present** |
| **Utilization Review Committee** | **2000 - 2004** |
| **ICU Committee** | **2000 - Present** |
| **Invasive Procedures Committee** | **2005 - 2008** |
| **Emergency Department Committee** | **2002 - Present** |
| **Medical Executive Committee – Member At Large** | **2010 - Present** |

**Publications:**

1- Medical Complications of Cocaine: Possible relationship to low plasma cholinesterase enzyme. Om A; Ellahham S; Picone C; Ornato JP. Am Heart J 1993 Apr;125(4):1114-8. http://www.ncbi.nlm.nih.gov/pubmed/8465736
2- One of the Many Faces of Systemic Mastocytosis: Hemodynamic collapse. Abstract presentation - Clinical Vignettes. American College of Physicians Meeting-1994.
3- Non-Resolving Pneumonia. Picone, C. Chest 1998; 114:923-926. http://chestjournal.chestpubs.org/content/114/3/923.full.pdf
4- Recurrent acute respiratory distress syndrome from use of salicylate containing over-the-counter preparations. Picone, C. Chest 1998; 114:408-S. http://chestjournal.chestpubs.org/content/114/6.toc.pdf
5- Acute Pneumonitis after In-Vitro Fertilization with IM Progesterone. Picone C. JResp Dis 2008; 29:170-71. http://jrd.consultantlive.com/display/article/1145425/1404737
6- Opening Debate on End-of-Life Medical Care. Progress Notes. Suburban Hospital 2010 https://www.suburbanhospital.org/documents/SumrPrgsNotes.pdf
7- Palliative Care and Opening Debate on End-of-Life Medical Care. Sibley MD March 2010 http://www.sibley.org/assets/1/workflow_staging/Publications/404.PDF

**Teaching Appointments:**

| | |
|---|---|
| Assistant Instructor - Human Anatomy<br>National University of Cordoba | 1985 - 1986 |
| *Staff Appointment - Human Physiology*<br>National University of Cordoba | 1986 - 1989 |
| Assistant Instructor - Biological Chemistry<br>National University of Cordoba | 1987 - 1988 |
| Assistant Instructor - Pharmacology<br>National University of Cordoba | 1988 - 1989 |
| *Instructor of Clinical Medicine*<br>Medical College of Virginia | 1993 - 1994<br>1996 - 1998 |
| *Clinical Instructor - Emergency Medicine*<br>Medical College of Virginia | 1997 - 2001 |
| *Assistant Professor - Pulmonary and Critical Care Division*<br>Medical College of Virginia | 1998 - 2000 |

**Lectures/Presentations:**

**Tobacco Cessation.** Several Presentations to colleagues, local schools and community
**Maximizing your Lung Power.** Presentations to Senior community members
**Lung Cancer: Prevention and Early Detection.** Presentations at Sibley Memorial Hospital
**Pulmonary Arterial Hypertension.** Grand Rounds presentations at local hospitals
**Pulmonary Arterial Hypertension: Update.** Guest Speaker at the National Congress of Cardiology, July 2009. Argentina.
**Mechanical Ventilation: Invasive and Non-Invasive ventilation Update.** Grand Rounds at local hospitals
**Towards a Healthy Life**: Several Presentations to local and international schools. Community effort dedicated to engaging children and adolescents in healthy life habits with emphasis on exercise, nutrition, avoidance of tobacco and drug use and promotion of community engagement.
**Oxygen: Cosmological history of an essential element for life.** Several Grand Rounds presentations at local hospitals.

**Palliative Medicine: The Last Breath. End of Life and Palliation of Respiratory Symptoms.** Several Presentation to the Hospice Network of Maryland, Capital Hospice and local hospitals.
**Pulmonary Complications of Rheumatologic Disease.** Grand Rounds presentations.
**Eosinophilic Lung Diseases:** Grand Rounds presentations.
**Pulmonary Vasculitides:** Grand Rounds presentations.
**Asthma: State of the Art.** Grand Rounds presentations and guest speaker at the Peace Corps, DC.
**Pulmonary and Critical Care Medicine – Literature Update** – National University of Cordoba 2010
**Pulmonary Arterial Hypertension** – International guest speaker – National University of Cordoba July 2010.

**Major Current Professional Interests**

1- Pulmonary Arterial Hypertension. Pathophysiology and Treatment.
2- Bioethics and End-of-Life Decision Making.
3- Parenchymal Lung Diseases.

**Language:**

Spanish-Italian

**Overseas experience:**

Extensive travel in Europe, Middle East, Central & South America.

**Miscellaneous interests:**

Literature, Chess, Squash, Astronomy.