

# ***Summary of Independent Health Evaluations of Area of Ecuador's Rainforest Where Chevron Operated from 1964 to 1990***

***By the Lago Agrio legal team***

## ***Exposures and cancer incidence near oil fields in the Amazon basin of Ecuador (2001)***

M. San Sebastián, B. Armstrong, J.A. Córdoba and C. Stephens, *Exposures and cancer incidence near oil fields in the Amazon basin of Ecuador*, *Occup. Environ. Med* 58:517-522 (2001)

- Study focuses on the high rates of cancer in the village of San Carlos, which the authors noted was surrounded by over 30 oil wells, most of them “just a few meters from the houses” and all of which “dispose of waste, without treatment, in the small rivers that cross the village.” The study found an elevated rate of cancer among males in the village. While the authors noted that the small population size made it “difficult to reject the possibility of chance,” they ultimately concluded that their risk estimation was conservative because of the likelihood of “cancer cases in San Carlos that were not diagnosed.” They further noted that only one of the cancer sufferers had been a smoker and that the population otherwise maintained a healthy lifestyle with few other occupational hazards.
- **Key findings:** the study found significantly elevated rates of cancers and cancer deaths among males, including cancers of the stomach, liver, pancreas, throat, skin, and blood.

## ***Gynecologic and breast malignancies in the Amazon basin of Ecuador, 1985-1998 (2001)***

A.K. Hurtig, M. San Sebastian, *Gynecologic and breast malignancies in the Amazon basin of Ecuador, 1985-1998*, *Int'l J. of Gynecol and Obstet* 76:199-201 (2002)

- Brief study reports on frequencies and incidence rates of gynecologic and breast malignancies the Ecuador's Amazon basin, in the provinces of Sucumbíos, Orellana, Napo, and Pastaza. Study consists of a comparison between the gynecologic and breast cancer rates recorded for Ecuador's Amazon basin with standardized worldwide cancer rates. Since no cancer registry is available in the Amazon, the study relied on the National Cancer Registry in Quito where suspected cancer victims in the Amazon are sent. All cancer cases diagnosed in Quito are registered in the Cancer Registry. However, the authors noted that the results may be conservative because, as a later study noted, Quito's distance from the Amazonian region meant that “it is likely that many cases of cancer never got referred to Quito from the study area” and were not logged in the National Cancer Registry.
- **Key findings:** the study measured annual incidence rate for 9 types of gynecologic and breast cancer and them to be a significant problem in Ecuador's Amazon basin. The

study also found that the late diagnosis of invasive cervical cancer to be a problem in the Amazon basin.

### ***Geographical differences in cancer incidence in the Amazon basin of Ecuador in relation to residence near oil fields (2002)***

A.K. Hurtig, M. San Sebastian, *Geographical differences in cancer incidence in the Amazon basin of Ecuador in relation to residence near oil fields*, Int'l J. of Epidemiology (2002)

- The study's goal was to determine if there was a difference in cancer rates between Amazonian populations living nearby to oil fields and populations located far from oil-producing areas. Study examined cancer cases in Sucumbíos, Orellana, Napo and Pastaza provinces from 1985-1998. Populations classified as living nearby to oil fields were defined as those living in a county where oil production had been ongoing for 20 years. Study found statistically significant higher rates of cancer for populations living nearby to oil fields. However, because the study relied on the National Cancer Registry for its data, cancer rates may be underestimated.
- **Key findings:** statistically significant higher rates of cancer found in people living in oil-producing areas compared to people living in similar regions of the Ecuadorian Amazon unaffected by oil operations, including cancers of the stomach, rectum (over 10 times higher), skin melanoma (over 10 times higher), soft tissue (over 15 times higher) and kidney in men, and for cancers of the cervix and lymph nodes in women, and higher rates of leukemia for male and female children under 10 years of age. Actual cancer rates likely higher because reliance on the National Cancer Registry probably resulted in conservative figures.

### ***Incidence of Childhood Leukemia and Oil Exploitation in the Amazon Basin of Ecuador (2004)***

A.K. Hurtig, M. San Sebastian, *Incidence of Childhood Leukemia and Oil Exploitation in the Amazon Basin of Ecuador*, Int'l J. of Occupational and Env'l Health (July/Sept 2004)

- This 2004 study followed-up on the findings in the 2002 "Geographical differences" study, also examining differences in cancer rates between Amazonian populations living in close proximity to oil fields and those living in areas without oil exploitation. This study examined the same areas as the 2002 study, utilized the same methodology for classifying populations in proximity to oil fields, and also relied on the National Cancer Registry for its data. However, this study focused specifically on childhood leukemia rates instead of overall cancer incidence in the general population. Also, this study encompassed the years 1985-2000, whereas the previous study only examined cases up until 1998. The study found statistically significant elevated rates of leukemia in children under 14.
- **Key findings:** study found statistically significant (*i.e.* less than 5% possibility that results could have occurred by chance) elevated risk of leukemia for children under age 14 (2.6 times higher) and under age 5 (3.5 times higher). Due to reliance on the National

Cancer Registry, this study's findings, like those of the 2002 study, are conservative and most likely underestimate the true risk of leukemia for those under 14.

***Estimate of the Number and Costs of Excess Cancer Deaths Associated with Residence in the Oil-Producing Areas of the Sucumbíos and Orellana Provinces in Ecuador (2010)***

*Estimate of the Number and Costs of Excess Cancer Deaths Associated with Residence in the Oil-Producing Areas of the Sucumbíos and Orellana Provinces in Ecuador*, Sept. 12, 2010, in the Lago Agrio trial record at 1967:206,576-206,597; Dr. Daniel Rourke, Addendum Report, Sept. 15, 2010.

- This study, conducted by Dr. Daniel Rourke, a leading statistician formerly with RAND Corp., was presented during the Lago Agrio Trial and was not published in a peer-reviewed journal. Dr. Rourke used the elevated risk data published in the 2002 *International Journal of Epidemiology* article to calculate how many residents of parts of former Texaco concession area and a small surrounding area, could contract cancer linked to oil contamination.
- **Key findings:** Dr. Rourke calculated that as many as 9,000 local residents could contract cancer linked to the oil contamination starting in the 1960s in the Texaco concession and surrounding area.

***Outcomes of Pregnancy among Women Living in the Proximity of Oil Fields in the Amazon Basin of Ecuador (Oct-Dec 2002)***

M. San Sebastián, B. Armstrong, J.A. Córdoba and C. Stephens, *Outcomes of Pregnancy among Women Living in the Proximity of Oil Fields in the Amazon Basin of Ecuador*, Int'l J. of Occupational & Environmental Health (Oct-Dec. 2002)

- Study conducted on communities in the Orellana and Sachas cantons of Orellana province and Shushufindi canton of Sucumbíos province that were adjacent to rivers and streams where high levels of petroleum contamination could be specifically measured. The study focused on pregnancy outcomes and was carried out by interviewing 650 women in 23 different communities, nine of which were located on streams that, lab tests showed, were severely contaminated with petroleum (up to 300 times over international norms). The study controlled for smoking, alcohol, medication use, and other potentially confounding factors such as socioeconomic conditions and occupation streams. The study found a link between women's exposure to contaminated streams and elevated risks of miscarriage and spontaneous abortion.
- **Key findings:** study found a highly statistically significant (less than 1% possibility of results obtained by chance) elevated risk of miscarriage or spontaneous abortion (2.5 times higher) for women exposed to the contaminated streams.

***Oil exploitation in the Amazon basin of Ecuador: a public health emergency (2004)***

M. San Sebastian, A.K. Hurtig, *Oil exploitation in the Amazon basin of Ecuador: a public health emergency*, Rev Panam Salud Publica/Pan Am J. Public Health 15(3) (2004)

- This is not a scientific study but rather an article detailing the history of oil exploitation in Ecuador's Amazon basin and documenting the effect that exploitation has had on the environment and the health of those living in the region. The article also examines steps (or the lack of) that the Ecuadorian government has taken to confront the problems caused by oil drilling in the Amazon basin. Finally, the authors offer their opinion about what steps should be taken to remedy the situation.
- **Key findings:** the article references the peer-reviewed cancer studies summarized earlier in this memo but does not offer any new data related to cancer.

### **REBUTTAL TO THE KELSH STUDY**

M.A. Kelsh, L. Morimoto & E. Lau, *Cancer mortality and oil production in the Amazon Region of Ecuador, 1990-2005*, Int Arch of Occup and Environ Health (2008)

One peer-reviewed study, conducted by Michael Kelsh and published in 2008, attempted to refute previous studies' findings and found no elevated risk of cancer for those living in oil-producing regions of Ecuador's Amazon. The study's independence and impartiality were immediately questioned due to Chevron's funding of the study, Kelsh's long-term employment by Chevron as a consultant, and links between Chevron's Board and Exponent, Inc., Kelsh's employer at the time of the study. Critics noted multiple methodological problems with the study that may have led to its findings downplaying the risk of cancer for Amazonian communities. Methodological flaws included the study's decision to investigate cancer mortality rates rather than cancer rates themselves. Also, a significant number of deaths in the Amazon region Kelsh studied were never recorded because of the area's isolation; which may have lowered the cancer rates found by the study. The study's reliance on death certificates as a data source presented a further problem. Ecuadorean death certificates indicated a statistically significant elevation in liver cancer in oil-producing areas of the Amazon. Kelsh asserted that liver cancer was probably misdiagnosed to a great extent, thus resulting in erroneous entries on death certificates and the recording of an artificially high number of cancer deaths. However, Kelsh offered no proof to buttress his claim. Further, the study chose to compare cancer rates in Amazonian communities to cancer rates in Ecuador's capital, Quito, rather than with other rural Ecuadorian communities. Kelsh did not explain this choice or note its potential effect on the study's findings. Finally, epidemiologists who have examined the study have suggested that it contains methodological flaws and possibly even intentional corruption of the underlying data.