

Fort Chipewyan Cancer Study Findings

Independent Peer Reviews

Reviewed by:

Professor Bruce Armstrong

Dr. John Dennis

Dr. Kenneth Cantor

Dr. Kim Barker

Dr. Martin Tobias

Dr. Malcolm King

**REVIEW OF RESEARCH REPORT ON CANCER INCIDENCE IN FORT
CHIPEWYAN, ALBERTA**

I have read this report.

I have no conflicts of interest in relation to any parties directly or indirectly associated with the report or the matters dealt with in it.

I consider investigation of the suspected cluster of cancers in the community of Fort Chipewyan to be thorough, well done and to cover all issues material to such an investigation and the interpretation of its results.

I agree that the observed, small increase in risk of cancer as a whole, and of some specific types of cancer, particularly cancers of blood and lymphatic system, could be due to chance and/or to increased detection. While a real increase in risk of cancer is also a possibility, I consider chance to be the most likely explanation. Given the community's concern I consider it wise, as the report suggests, to maintain surveillance on cancer incidence in Fort Chipewyan for another decade.

I do not agree that lack of establishment and follow-up of a cohort of Fort Chipewyan residents is a weakness of this investigation. I would not expect it to show a materially different pattern of cancer risk to that in the resident population of Fort Chipewyan except by chance. If, however, it were to show a clear gradient towards increasing risk of cancer with increasing duration of residence in Chipewyan, it could suggest that the possibly higher risk of cancer in Fort Chipewyan was due to some unusual environmental exposure in Chipewyan.

Regardless of whether or not there is truly an increased risk of cancer in residents of Fort Chipewyan, well done studies of personal exposure of Fort Chipewyan residents to potentially toxic chemicals originating in the oil sands developments, and comparison of the results with accepted standards for environmental exposure of communities, might, depending on the results, provide reassurance to community members or point to the need for stricter environmental controls on oil sands operations to the benefit of the community's health.

Bruce Armstrong

Independent Peer Review	Professor Bruce Armstrong
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Independent Peer Review	Dr. John Dennis
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Email message from Dr. John Dennis to Dr. Yiqun Chen

I attach my review of the report addressing cancer incidence in Fort Chip. I have come to know this community quite well. I think that the work and data contained in this report can go a long way to quantifying very real fear in the community. In my review I have tried to explain my concerns over the overall tone of the report, and offer suggestions on how this might be usefully improved. I offer my critique as constructive criticism and offer any further support I am able. This is very important work, and describes not only challenging epidemiology, but requires careful and balanced presentation of what is a very sensitive topic. It is in everyone's best interest (government, science, industry and most importantly the Fort Chip community) to get this right.

Please let me know if I can be of further help, or if I have not made my points in the attached review clearly.

Sincerely

John Dennis

Review of Alberta Cancer Board's draft Report
Cancer Incidence in Fort Chipewyan, Alberta (undated)

Submitted to
Yiqun Chen, BMed, MSc, PhD
Leader, Surveillance
Division of Population Health and Information, Alberta Cancer Board

Submitted by

Dr. John H Dennis, BSc, MSc, PhD, DipOccHyg
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Nov 3, 2008

At the request of Yiqun Chen I have reviewed a document sent to me on Oct 12, 2008 entitled 'Cancer Incidence in Fort Chipewyan, Alberta'. This report summarizes JHDs views on the report contents and offers some suggestions for clarification and improvement.

Summary

The report examines cancer incidence in Fort Chipewyan and compares these to adjacent communities as well as to the wider Alberta population. In general, the report describes a thorough study of the background to the issue and an analysis of the available evidence. As a consultant working for ACFN and having spoken with various community members I have acquired an appreciation for community concerns over environmental contamination and potential impacts on human health from exposure to pollutants. This study has the potential for addressing some of these concerns, and given current anxieties it is my opinion that it is important to ensure the overall tone of the report will help provide a clearer presentation of its findings. In reading this draft of the report, I repeatedly winced as I digested passages that seem to place too little emphasis on protecting the community, and too much emphasis on obtaining an unrealistic 'proof' (at the 95% CI) that there is a cancer increase. I do not believe that this is the intention of the authors, but do believe that this may be how the report is perceived as it is currently written and presented. I have attempted to point out some of the report passages that give rise to my concerns, and make suggestions of how this might be improved.

The conclusion of the report (reflected in the executive summary) that the study confirmed a higher than expected number of cases for all cancers as well as individual cancers. It would be prudent to clearly include some cap on how big this increase may be rather than leaving it unaddressed in the executive summary and concluding statements.

In this reviewer's experience, there is real fear and anxiety within the Fort Chipewyan community that industrial pollution is contaminating the environment and impacting health. Fort Chipewyan is a remote and historically pristine community. This and community members strong links to the land may exaggerate perceptions of impacts of environmental contamination to human health. Objective presentation of this report without bias may help reduce anxiety and fears. The central messages being:

- a) Data demonstrates that there is an increase
- b) that this increase in cancer is finite
- c) further study is warranted to confirm level of risks, and cause and effect

Dr. Chen's response: Concur and will include actual numbers in the Summary.

Specific Comments at Issue

page	Issue	Recommendation
5	1 st paragraph. The statement that local residents believe(d) that the main source of ill health is from oil sands seem very sweeping. From this reviewers experience in talking to community members in Fort Chip, while it seems true most residents believe industry is the source of harmful contaminants, oil sands industry is not the only identified player. Some community members are cognisant that other industries including pulp mills, Uranium mining, etc are also important.	Soften and expand statement to allow for a range of views from community members. <i>Dr. Chen's response: Concur. Have made changes to text. Appendix 5 addresses this issue more fully.</i>
5	4 th paragraph. Includes a sentence that 'this increase was based on a small number of cases and could be due to chance or increased detection'. Sentence should also include the possibility that the increased risk is real.	Modify statement to allow explanation to include increased risk. <i>Dr. Chen's response: Have modified to include the possibility of increased risk being responsible for the increased cancer rate. There is, however, more evidence in the original report supporting the statement of chance or increased detection being responsible for the increased cancer rate.</i>
21	Last Para in discussion includes the	Delete sentence or expand to

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	<p>statement that ‘...; one cannot rule out the possibility that these increases were due to chance or increases in diagnosis’.</p> <p>While true for this is study, this is true for any epidemiological study - you can never completely rule out possibility (which is why we deal in probability). This sentence has little value.</p>	<p>make clear this is a truism of epidemiology in general.</p> <p><i>Dr. Chen’s response: Have adjusted text accordingly.</i></p>
22	<p>1st Para under Cholangiocarcinoma states that it is ‘difficult to eliminate the possibility that these two reported cases occurred within this short interval purely by chance.’ In fact, it is not only difficult, but impossible in epidemiology – again, why we deal in probability. This sentence seems to deny the messaged data which clearly states we have a high incidence of Cholangiocarcinoma, and that this high incidence, on the balance of probability, is real.</p>	<p>Either remove sentence, or expand to include the probability that the 2 cases represent a high incidence.</p> <p><i>Dr. Chen’s response: The author believes the evidence in this case points clearly to the probability that the two cases of cholangiocarcinoma would be attributed to chance.</i></p> <p><i>See cholangiocarcinoma under Discussion.</i></p>
24	<p>Last sentence of top paragraph ‘... the increase became insignificant once we factored in the high proportion of First Nation residences in the Fort Chipewyan population’. The level of significance is a very important missing point. I believe that this sentence refers to relatively high confidence of 95%.</p>	<p>Make clear the confidence level where the increase becomes ‘insignificant’. Recommend also including the level of confidence where the increase remains significant (e.g. 90%?).</p> <p><i>Dr. Chen’s response: The actual chance of observing two or more cases of cholangiocarcinoma in the community were provided in the last paragraph of the Discussion on cholangiocarcinoma.</i></p>
33	<p>Top paragraph uses the term ‘conservative’ in the use of high (95% vs 90%) confidence intervals. Use of this term in risk assessment will generally portray the opposite in that one adopts a conservative position to err on the side of safety.</p>	<p>Reconsider use of the term conservative as the current context ‘favours’ interpretation of higher risk to Fort Chip community health.</p> <p><i>Dr. Chen’s response: Adjusted wording for clarification.</i></p>

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77	<p>Figure 2. This is a very useful Figure, and graphically depicts the 95% CIs for all cancer cases in Fort Chip compared to comparison communities. It would be very helpful if similar graphs for ASIRs were compiled in an appendix for the individual cancers investigated. This would better present an overview of the individual cancers.</p>	<p>Compile and present figures for individual cancers.</p> <p><i>Dr. Chen's response: Because the number of cancer incident cases was small, confidence intervals would be too large to be shown for individual cancers for each of the small communities. The requested figures, however, have been provided to Dr. Dennis.</i></p>
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I have carefully read the report on cancer incidence in Fort Chipewyan, Alberta. I took two approaches in providing comments to you. First, I have attached the report, in Word format, with my comments entered using the Track Changes facility of Word. All of my comments may be found there. You will find several comments of an editorial as well as those of a more substantive nature embedded in the report. Since this is the primary way that I wish to convey my comments, I urge you to access the attachment. In addition, here I provide a brief summary of my most relevant comments, which follow. With minor exception, most of these comments may be found in the attached version, itself.

1. Overall comment: The report provides results of an excellent and comprehensive investigation into cancer incidence rates in Fort Chipewyan, Alberta over the past several years. Methods are appropriate for the task at hand, and findings are presented in an understandable and complete fashion. An innovative approach was taken in conducting a simulated distribution of several of the cancer sites of interest, and adds to the value of the overall report.
2. Regarding the overall report structure: It would be helpful to have more complete framing of the problem at the outset of the report, and what could (and could not) be expected from this effort. Some of this material now comes at the end, and I've made some notes there of materials that could be moved to the beginning of the report. In addition, some more detailed information about the origins of the concern for health in the community, especially the years of activity of the community physician originally involved – would be better moved up to the front of the report.

Dr. Chen's response: Concur. Have moved the information forward into the Summary, Introduction and Background.

3. Will there be an executive summary in a later version?

Dr. Chen's response: Yes.

4. When expressing the statistical probability that the observed level is higher than the expected, use the complement of the number presented in the original report (this occurred several times, as noted in the attached).

Dr. Chen's response: Clarified with the reviewer and made changes accordingly.

5. In the discussion of potential risk factors that could be related to the elevated cancer rates, I suggest that you add some discussion of the literature on oil shale toxicology, (and a limited amount of epidemiology), since many of the same types of exposure to toxic chemicals are involved.

Dr. Chen's response: The relevant literature on oil shale toxicology was searched and relevant information was added in the Discussion.

6. There is a technical error in the statement: "In Alberta itself, the incidence rate of cholangiocarcinoma has increased progressively over the past 30 years, which may be due to population aging," If rates were properly age-adjusted, as I assume they were, then population aging should have no effect on the age-adjusted rates.

Dr. Chen's response: The sentences were revised accordingly.

It was a great pleasure to read this well-conceived and documented report. I will be quite interested in seeing a copy of the final report, and in tracking the progress of this issue in Alberta. I hope my comments will be of use.

My best regards,

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Email from Dr Kim Barker to Dr Yiqun Chen

Please find attached my comments. Overall I would support the paper going forward with the caveat that my comments either get responded to by the author or that these suggestions get incorporated into the document.

Thanks

kim

I would like to preface my comments below by highlighting the importance of clear messaging these results to the community and the public at large. The document is full of data that could be misinterpreted to be significant when the wide confidence intervals and limitations are not fully understood. I am, although not at all involved; rather concerned about the importance of key communication method that comes from embarking on such a complex investigation and the potential interpretations of various stakeholders as to its intended intention and outcome. It would be of utmost importance to communicate the difference between identifying a sufficient causal factor to cancer versus a risk factor. Nevertheless, my comments below are based purely from an academic perspective.

Dr. Chen's response: The objective of the study, as well as the limitations of the study, have been stated up front in the report.

INTRODUCTION

1. Is the problem or goal of the study clearly stated?

Yes there is no doubt that the problem is clearly described and the goals stated. Again, I would caution that any communications that comes from this study highlight that the goal of this study was not to determine a causality relationship but rather an increased incidence of cancer.

2. Is the pertinent literature succinctly reviewed and cited?

Yes, my only comment might be that some of the literature reviewed in the discussion be introduced earlier in the paper so that some readers with questions have them answered earlier. Furthermore, it is a well known fact that First Nations cancer rates for common

cancers are lower whereas their risk of rare and unusual cancers is higher than non-First Nations Canadian born people. This literature should also be cited.

Dr. Chen's response: Information on the frequency of physician visits to the community, the uranium mining activities in the Athabasca Basin, and Fort Chipewyan residents' health status was introduced earlier in the report. A page has been added to the Discussion of the report citing evidence from studies on cancer incidence in the US and Canadian native populations.

3. Is the research question or hypothesis clearly stated?

Yes, the hypothesis is clearly stated although readers might find it difficult to determine in some aspects of the paper whether the writer is trying to link causality or simply highlight increased numbers of certain types of cancer.

Dr. Chen's response: The report has been reviewed to ensure that no causal link was implied when risk factors were made known.

METHODS

4. Will the design of the study answer the research questions?

The design of this study, while in keeping with the standards for cluster cancer case studies according to CDC, does not meet the needs of evaluation this population given its high mobility. To suggest that a First Nations community member would be present at the time of diagnosis in the community and not elsewhere either in the province of Alberta or Canada is short sighted to the realities of First Nations mobility patterns. Furthermore, given the mobility in combination with cancers known to have a long latency, means that the methodology can not be restricted to only those residing in the community at the time of diagnosis. This is particularly true for a rare cancer where reviewing the charts of all patients with histories of cholangiocarcinomas in Alberta is not unreasonable to determine whether or not they had resided at any point in the community in question.

Dr. Chen's response: This limitation of the study design has been clearly stated. Further study to overcome this shortcoming has been proposed. Furthermore, the residence history of the 18 suspected cancer cases reported by Dr. O'Connor were reviewed. All Albertans of First Nations status who lived in Fort Chipewyan at any time

between 1983 and 2006 and were diagnosed with cancer during the study period were also identified. The outcomes of the review were added to the report under the potential limitations.

5. Are the methods described clearly enough that other researchers could duplicate the study

Yes, the methodology chosen is indeed a standard method for evaluation cancer clusters; however it is not a method recommended for populations known to have high migratory rates.

Dr. Chen's response: The author recommends this concern be addressed in the proposed next step.

6. Was the reliability and validity of the research instrument assessed?

Yes, the tools or methods used to evaluate the data are internationally recognized as appropriate research instruments for assessing the problem. The complexities come with the changes in the diagnostic criteria and lack of other contributory factors that may also contribute to the number of cancer seen. For example, the use of tobacco, alcohol, other health conditions and potential exposure to the uranium mines.

I do think that the population size was not highlighted as a major issue significantly enough in the document. – large random variations in cancer incidence are known to occur in small populations where one additional case or fewer case can dramatically affect the rate outcome.

Dr. Chen's response: The point has been added to the Summary. It has been also been addressed in the Methods section (at the end of the Methods of analysis) and in the Discussion section (Evaluation of the degree of an increase).

7. Are there sources of bias in the sampling method or design of the study?

The initial source of bias of course, was the original physician that alerted the authorities about his concern. His bias would have severe impacts on this study that would otherwise unlikely have occurred. Other sources of bias include

1. It is necessary to demonstrate that there is no other likely explanations for the association. Other social factors such as smoking and use of alcohol are not clearly listed, nor are the possible infection with Hepatitis C noted and in the cases of leukemia's and lymphomas, employment in the uranium mine. Furthermore age is a known risk

factor which needs to be further assessed for its degree of confounding and effect modification on the results.

Dr. Chen's response: The study discussed the Texas Shooter phenomenon. This study was designed to determine incidence and could not have reliably drawn conclusions on causality.

Age is an important risk factor for cancer. Both the age standardized rate and age specific rate were calculated. Also, adjustments for age were made when comparing the observed number of cases with the expected number.

2. The lack of inclusion of the other cases of cholangiocarcinoma in Alberta to determine if any of them had spent time in For Chip. For a rare cancer such as cholangiocarcinoma this should not seem to be an ominous task. It is a well known fact that a latent disease such as cancer, in a population as mobile as that of First Nations, is difficult to assess based on location of time of diagnosis. Are the other 20 First Nations in the Alberta Cancer Registry that were diagnosed with Cholangiocarcinomas born in Fort Chip? Worked in Fort Chip?

Dr. Chen's response: None of the six cases of cholangiocarcinoma reported by Dr. O'Connor were excluded from the study because they were living elsewhere at the time of diagnosis. This information has been added to the report. Further tracking of resident history is recommended as a next step.

3. I wonder if the determination and effort made to diagnose possible-unreported cancer cases among For Chip residents was extended to the other comparable communities too? Otherwise it would seem likely that you will find more through this extensive search.

Dr. Chen's response: This has been addressed in the first point in the Discussion, Strengths of the current study.

8. Are the outcome measures appropriate?

Yes, all patient outcomes measures are appropriate.

9. Were all the important outcomes considered?

Yes all the important outcomes were considered.

RESULTS

10. Is there an adequate response rate

According to the design of this study there was indeed an adequate response rate as all cases were accounted for. However, all potential cases were not accounted for given the limitation of the methodology – specifically limiting the location of diagnosis's as being the sole inclusive factor rather than taking into account the mobility of this population and the possibility of their diagnosis being made at a location that they had not spent a great deal of time.

Dr. Chen's response: This has been discussed in detail in the report. To clarify, cases were excluded if they were living outside of the community at the time of diagnosis. Residents of the community were included even if they were diagnosed outside of the community.

11. Are all the patients accounted for?

According to the methodology yes, however there are a number of potential patients that are not accounted for given the methodology that excludes diagnosis outside of the community.

Dr. Chen's response: This has been discussed in detail in the report. Again, residents of Fort Chipewyan who were diagnosed elsewhere, for example at a hospital in Fort McMurray, were included.

12. Are the results clearly presented?

Yes, all tables are clearly related and described. There is however one unclear variable and that is that an adjustment was made to account for the number of First Nations in the community – how would the results have looked if the adjustment was not made?

Dr. Chen's response: The results with and without adjustment for First Nation status are in the Discussion section of the report.

13. Do the results respond to the research questionnaire?

The results do respond to the research question.

DISCUSSION

14. Are the striking results of the study summarized in the first paragraph?

Yes the results are summarized in the first paragraph.

15. Are the interpretation and conclusions justified by the results?

I think that it is not appropriate to talk about the potential risk factor of the environment in the discussion when other risk factors for cancer were not identified as part of the methodology. I think that to suggest that there is a higher rate of cancer in Fort Chip given the limitations is debatable given the wide confidence intervals.

Dr. Chen's response: Study limitations are included in the report.

16. Are there other interpretations and conclusions that should be considered

One other conclusion that should be considered is the lack of accountability on the initial physician's part in reporting the cases to Alberta Cancer Board before contacting the CBC. This is significant and no doubt a case control study on FN living in Fort Chip vs FN not living in Fort Chip would demonstrate that the lack of trust in the medical system has been significantly jeopardized by this.

17. Are the limitation to the study and its results explained?

Yes the author does explain the limitations but I feel that the author ignored their own limitations in citing that there is an increased risk of cancer in this community.

Dr. Chen's response: The study acknowledges its limitations. To be clear, however, the study finds an increased incidence rate of cancer, not an increased risk. Identifying risk was beyond the scope of this study.

18. Is the objective of his study reached?

Yes the objective of this study was reached.

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19. Were specific directives for new research initiatives proposed?

I would agree that the proposed next steps are appropriate.

I would like to congratulate the investigators on an excellent cancer cluster investigation and a clearly written report that should be well accepted by the affected community and the Alberta government alike.

The methodology used follows best practice guidelines for cancer cluster investigations and is in fact a textbook example of how such investigations should be done.

Two aspects related to the methodology stand out. First is the use of simulation. This innovative approach seems superior to conventional statistical methods and is much more readily interpretable by non-statisticians – so making the findings more meaningful to and acceptable by the affected community.

Second is the interesting spin off: according to the authors, work undertaken for this cancer cluster investigation has provided the first definitive evidence for the lower risk for many cancers exhibited by First Nations people (despite their typically lower socioeconomic position). This is an epidemiologic finding of great potential significance. I am not aware of any other indigenous population in a colonial society who show lower cancer incidence rates overall and for most cancer types than the settler population (adjusting for age and SEP).

The results are insightfully interpreted and clearly explained. The authors point out the limitations inherent in all cluster investigations, most notably the Texan sharpshooter fallacy. So the problem is false positives (specificity) rather than false negatives (sensitivity). Had a thorough cluster investigation such as this one, with active case ascertainment and multiple comparators, failed to find any hint of elevated risk in the index community, it is unlikely that any further investigation would be appropriate. However that was not the case.

Instead, the author's conclusion, that the results justify progression to the next step, is absolutely sound. In terms of managing risk perceptions, the message to communicate to the community (and to the government agencies) is simply that a possible exposure cannot be excluded and escalation to the next step is justified. The community should be very reassured by this. However, it is important to emphasise that such escalation is not evidence that an environmental exposure exists (or existed in the past) – indeed that remains the least likely explanation. Perhaps one could go a little further and point out more definitively that the absence of measurable excess cancer risk in women and children makes an environmental (non-occupational) exposure unlikely in the extreme (the elevated female lung cancer risk notwithstanding). If anything at all, the results suggest that some males who lived in the community at the time their cancer was diagnosed, may have been occupationally exposed in the (often distant) past.

So the next step seems to be a more in depth investigation of geographically-based cohorts, much as described by the authors on page 35 of the report (top paragraph). The need for such a 'surveillance system', as opposed to the initial one-off cluster investigation, will need to be clearly explained both to the community (who will have

to engage with the study) and the government agencies (who will have to fund it). Yet there is arguably no alternative, given that the initial cluster investigation was not able to conclusively rule out the possibility of a present or past (most probably occupational) exposure. The only addition I would make to the proposed cohort study design is to include detailed occupational histories for all participants.

Should the 'cancer surveillance system' confirm the existence of elevated cancer risk (overall or restricted to certain cancer types) among past or present Fort Chipewyan residents, and demonstrate that such excess risk is concentrated among certain categories of workers (or men who were workers in certain industries / geographic locations within the relevant time window for exposure), then an in depth occupational (ie industry or workplace based) investigation will of course be required.

I trust these comments are useful and once again congratulate the investigators on a superb cluster investigation. I would encourage them to publish their work in due course in journal article form, if this is acceptable to the Fort Chipewyan community, so that others can also benefit from their experience – including communities and health professionals beyond Canada.

Thank you for the opportunity to peer review this most inspiring report.

Martin Tobias
Public Health Physician
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10 October 2008

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Fort Chipewyan (Fort Chip) is a community of about 1200 people, many of them Aboriginal, in the far northeast of Alberta, downriver from the tar sands at Fort McKay. A report in 2006 indicated greatly elevated rates of biliary tract cancers in this community; concerns were raised about the validity of this report, and if valid, what was the source of this relatively rare form of cancer. The present report, from the Alberta Cancer Board and Alberta Health and Wellness, is a response to the concerns raised in the initial 2006 report.

The present report – Cancer Incidence in Fort Chipewyan, Alberta - makes several important points. First, the overall cancer rate in Fort Chip is higher than expected, based on provincial averages, and with adjustment for age, gender, and Aboriginality (FN status – p. 32). The rates for specific cancers, namely biliary tract and leukemias are also elevated. The rates are dependent on small numbers of cases, and therefore could be influenced by chance. Because of the publicity since 2000 and/or the extra diligence of the physician concerned, there's the possibility that more cases of cancer were found than would have been found otherwise. Finally, and importantly, there's the acknowledgement that the extra cancers could be real, and therefore the contributing factors, including possible environmental factors should be investigated.

The rates are not as elevated as initially reported, in part due to re-designation of the residency of some of the patients included in the initial report (p. 15). This is not entirely clear, but presumably some of the cancer cases were diagnosed while people were resident in communities other than Fort Chip. It would have been useful to have some further description of these re-designated cases. Were they long-time residents of Fort Chip whose cancers were diagnosed elsewhere? Or were they truly mis-designated? The concern is that the numbers of Fort Chip "associated" cancers may well be higher than what is indicated in this report. This needs to be sorted out, and presumably will be, if the resident cohort study mentioned in the recommendations is carried out (p. 35).

Dr. Chen's response: The cohort study would address possible mis-designation. It's important, however, to note that of the six suspected cases of cholangiocarcinoma reported by Dr. O'Connor, none were excluded because they were diagnosed outside of Fort Chipewyan. This information was added to the report.

It is comforting to know that there were no cases of cancer in children in Fort Chip during the study period (p. 27). This supports the argument that there isn't a major environmental source of the cancer, although it doesn't prove it. It is also interesting to note that overall cancer rates among First Nations people in Alberta are lower than in the non-First Nations population (p. 31).

In Fort Chip, the rate of cholangiocarcinoma, a fairly uncommon cancer, was elevated. The colon cancer rate was somewhat elevated (not significant). These latter two might suggest some ingestible carcinogen, or possibly this is a by-product of alcohol

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consumption; this should be investigated further. There were gender differences in the cancer profiles – more biliary tract cancer in men, more lung cancer in women. Why the latter? One might suspect a differentially higher rate of smoking among First Nations females, which was confirmed nationally in a younger population in the 2002-03 First Nations Regional Health Survey.

Although the adjusted cancer rate in Fort Chip is higher than the provincial average, what is more disturbing to this reviewer is the fact that ASIRs (age-standardized incidence rates) are significantly *lower* than the provincial average in Fort McMurray and the overall Northern Lights Region (p. 18). In the comparator communities (Fort Vermillion and Conklin-Chard-Janvier, communities with higher percentages of Aboriginal residents, and presumably more people *from* there or having grown up there) rates are even lower on average than in Fort McMurray. . This needs to be investigated in greater detail. Figure 2 (p. 77) makes it appear that the northeast part of Alberta is a relatively healthy place, cancer-wise, except for Fort Chip. One might expect Fort McMurray to be different – more mobile people, younger, certainly higher employment, higher income. Many residents have not lived there for a long time. These demographic and socioeconomic factors, and perhaps others such as smoking rates, might well influence the cancer rate profile. More data on cancer rates in appropriate comparator communities is needed.

It is suggested (p. 26) that another 5-10 years of monitoring might be necessary to “substantiate the suggestion that there are increased cancer rates in the area”. While this type of long-term monitoring should be carried out, this is nevertheless a long time to wait before further action is taken to deal with what could turn out to be a significant public health problem.

Overall, the report is well written, and the study appears to have been rigorously carried out. However, this reviewer is not a cancer expert.

Specific comment:

p. 27, paragraph 1. The report suggests that the high incidence of cancer in Fort Chip is due to the high proportion of residents over 55 years of age. Since the cancer rates are age-standardized, does this point to some inadequacy in the age-standardization method?

Dr. Chen’s response: The sentence “This may have contributed to higher cancer rates in Fort Chipewyan than in the comparison communities.” was deleted.