

Symptomatology of a gas field

An independent health survey in the Tara rural residential estates and environs



Photo courtesy local resident

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EXECUTIVE SUMMARY

This report documents an investigation during February and March 2013 by a concerned General Practitioner, in relation to health complaints by people living in close proximity to coal seam gas development in SW Queensland.

Thirty -five households in the Tara residential estates and the Kogan/Montrose region were surveyed in person and telephone interviews were conducted with three families who had left the area. Information was collected on 113 people from the 38 households. Of these, 17 were children 5 years of age or less, 31 were children aged between 6 and 18, and 65 were adults aged between 19 and 82. 58% of residents surveyed reported that their health was definitely adversely affected by CSG, whilst a further 19% were uncertain. The pattern reported was outside the scope of what would be expected for a small rural community. In all age groups there were reported increases in cough, chest tightness, rashes, difficulty sleeping, joint pains, muscle pains and spasms, nausea and vomiting. Approximately one third of the people over 6 years of age were reported to have spontaneous nose bleeds, and almost three quarters were reported to have skin irritation. Over half of children were reported to have eye irritation.

A range of symptoms were reported which can sometimes be related to neurotoxicity (damage to the nervous system), including severe fatigue, weakness, headaches, numbness and paraesthesia (abnormal sensations such as pins and needles, burning or tingling). Approximately a third of the all the 48 children to age 18 (15/48) were reported to experience paraesthesia. Almost all the 31 children aged 6-18 were reported to suffer from headaches and for over half of these the headaches were severe. Of people aged 6 years and over, severe fatigue and difficulty concentrating was reported for over half. Parents of a number of young children reported twitching or unusual movements, and clumsiness or unsteadiness.

This unfunded study is limited in terms of what can be concluded and does not claim to be without methodological problems. However what it does do is highlight the basis for serious concerns of the residents and the need for the Queensland government to fund a comprehensive epidemiological investigation of the problem.

No baseline air or water monitoring or baseline health studies were done prior to the Queensland Government permitting the widespread development of the CSG industry in close proximity to family homes. No ongoing health study or surveillance and no ongoing testing to monitor chronic exposure levels is in place. This is clearly unacceptable.

The rural residential estates near Tara are the most densely settled area in Australia to have seen intensive CSG development. Since 2008, the people of these estates have informed successive Queensland Governments of their health problems. Their reports of ill health have been trivialised and ignored. The recent report released by the Queensland Government following their investigation into the health impacts near Tara was so inadequate and flawed that it has done little to alleviate concerns.

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The Queensland government undertook minimal non-systematic environmental sampling, and relied mainly on inadequate industry commissioned data. The investigation of patient symptoms was grossly underfunded and understaffed, with no medical staff actually visiting the site. Only 15 people were examined clinically. Positive findings of volatile chemicals were dismissed, despite the fact they are potentially capable of causing health impacts, especially over long periods of time.

The state government must take its responsibility for the health of these citizens seriously, and the federal government must develop federal legislation to protect public health from CSG impacts.

Recommendations are:

- 1) A fully funded comprehensive medical assessment of residents currently living in proximity to unconventional gas development should be carried out as a matter of urgency.
- 2) The planning and urgent implementation of fully funded, long term epidemiological studies is essential to track the health of people exposed to CSG over the next several decades. This must include workers in the industry as well as people who may already have left the area because of health concerns.
- 3) Health impact assessments must be an integral part of any and every unconventional gas development. No new permit should be issued without one, and health impact assessments should be carried out for every development already in place.
- 4) Comprehensive air and water monitoring (an open, ongoing and unlimited information loop) is essential. If we are looking at possible non beneficial human health impacts we need to look at all the gases and volatiles both natural and derived emitted via well drilling, gas and pipeline valves, leaking wellheads, flaring, and other processes involved in gas collection/purification/refining to export specifications. This monitoring is urgently required. It must be independent, unbiased, fully funded and available for public scrutiny preferably in real time and in electronic form.
- 5) Gas companies must be required to fully and openly disclose in a timely manner, all chemicals, and all quantities of chemicals, used or planned to be used for drilling, fracking, cleaning, dehydration, and other processes at every gas facility. All historical results they have of analyses of air, soil and water should be available for public scrutiny.
- 6) The federal government must develop legislation, a unified standard, to protect public health across Australia from the impacts of unconventional gas development and other extractive industries.
- 7) There must be open, fully informed, public debate on the future of the unconventional gas industry in Australia.

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ACKNOWLEDGEMENTS

I would like to thank the residents of the Tara estates and surrounding areas for their trust and cooperation in completion of this survey which was, for very private people, at times intrusive and distressing. I sincerely hope this study will help to inform the wider community and highlight the basis of your serious concerns.

ABSTRACT

The unconventional gas industry has been allowed rapid, unprecedented expansion in Queensland within recent years with little regard to the public health consequences. The people of the remote rural residential estates on the Western Downs near Tara in Queensland are suffering from the side-effects of the industry. Despite their pleas over the past few years to successive Queensland Governments, as illustrated in the recently released Queensland Government health report into the effects of CSG in the Tara region, their reports of ill health have been trivialised or ignored.

Conversely this study found a pattern of symptoms which is extremely concerning. In particular a high percentage of the residents surveyed had symptoms which could relate to neurotoxicity. These included tingling, paraesthesiaⁱ, numbness, headaches, difficulty concentrating and extreme fatigue. Of particular concern was the high percentage of symptomatic children, with paraesthesia being reported in approximately a third (15/48) of children to age 18, and headaches being reported in more than 70% (36/48). These symptoms deserve further investigation, something which has not been done adequately to date. If these symptoms are caused by living within a gas field, there are serious implications not only for this community but for many more across Australia. If the health implications of the unconventional gas industry continue to be ignored and the industry is allowed to develop along its current path, the potential exists for serious and widespread harm to human health across Australia.

ⁱ Paraesthesia refers to a burning or prickling sensation that is usually felt in the hands, arms, legs, or feet, but can also occur in other parts of the body.

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INTRODUCTION

I am a general practitioner who has been living and working in suburban Brisbane for the past 25 years. As little as 18 months ago, I was oblivious to the concept of unconventional gas extraction. Having been made aware of impacts of CSG and Shale gas developments overseas, I took an increasing interest in what was happening in rural Queensland, and I became increasingly concerned. I began following the story of the CSG industry in the Tara area and visited the region on several occasions as part of a community initiative called "Bridging the Divide".ⁱⁱ This put into sharp focus the problems being experienced by people living within Queensland's gas fields and led to me undertaking this study.

BACKGROUND

Within the past few years the unconventional gas industry, particularly coal seam gas (CSG) has been permitted to develop with remarkable rapidity across rural Queensland. Little or no consideration has been given to how this will affect public health. No baseline health studies were done prior to the Queensland Government permitting the widespread development of this controversial industry in close proximity to family homes. No ongoing health study or surveillance is in place. No baseline air or water monitoring was done and no ongoing testing to monitor chronic exposure levels has taken place.

As reported in The Courier Mail on February 11th 2013, the approvals for the coal seam gas developments were controversial and were pushed through despite the public servants responsible for drafting the environmental response stating clearly that serious harm would ensue.¹

The following is just one of 26 objections made by Simone Marsh, the public servant in charge of drafting the environmental response from the Queensland's Government Coordinator-General, to the process of approving the Santos GLNG project:

"It is clear the project's activities will lead to wide-spread, serious environmental harm and material environmental harm, as defined by the Environmental Protection Act, both during and following the removal, transportation and processing of coal seam gas,"¹

The Courier Mail also reported that the EIS assessment team responsible for vetting the safety of these multibillion dollar projects were given a physically impossible task.

DERM director (EIS assessment) Stuart Cameron, May 4, 2010 responded to a request for draft conditions to be submitted in three days:

ⁱⁱ Bridging the Divide is a city-country communication and support network involving health and social justice issues.

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*"I have consistently been advised by DIP (Department of Infrastructure and Planning) the QGC was down the track and that DIP had not even started writing their report. We have had no warning for this sudden request for immediate provision of QGC conditions or any notice of a meeting tomorrow. In addition we have the APLNG comment on their EIS due today for which we were given less than four weeks to deal with 10,000 pages. Once again I am faced with a physically impossible request along with the other 80 EIS projects that are starting to slip."*¹

People who owned their own home and land did not have protection in legislation or the right to prevent gas companies coming onto their property. Their only legal recourse was to negotiate compensation. Communities had no choice.

The circumstances surrounding the permitting of the coal seam gas developments have now been referred to the Crime and Misconduct Commission. The alleged inadequacies in the assessment process for CSG projects highlight the failure of state governments to put in place adequate protections for communities and the environment. No health impact assessment was undertaken for the CSG developments approved initially and no health impact assessment has been required for developments since.

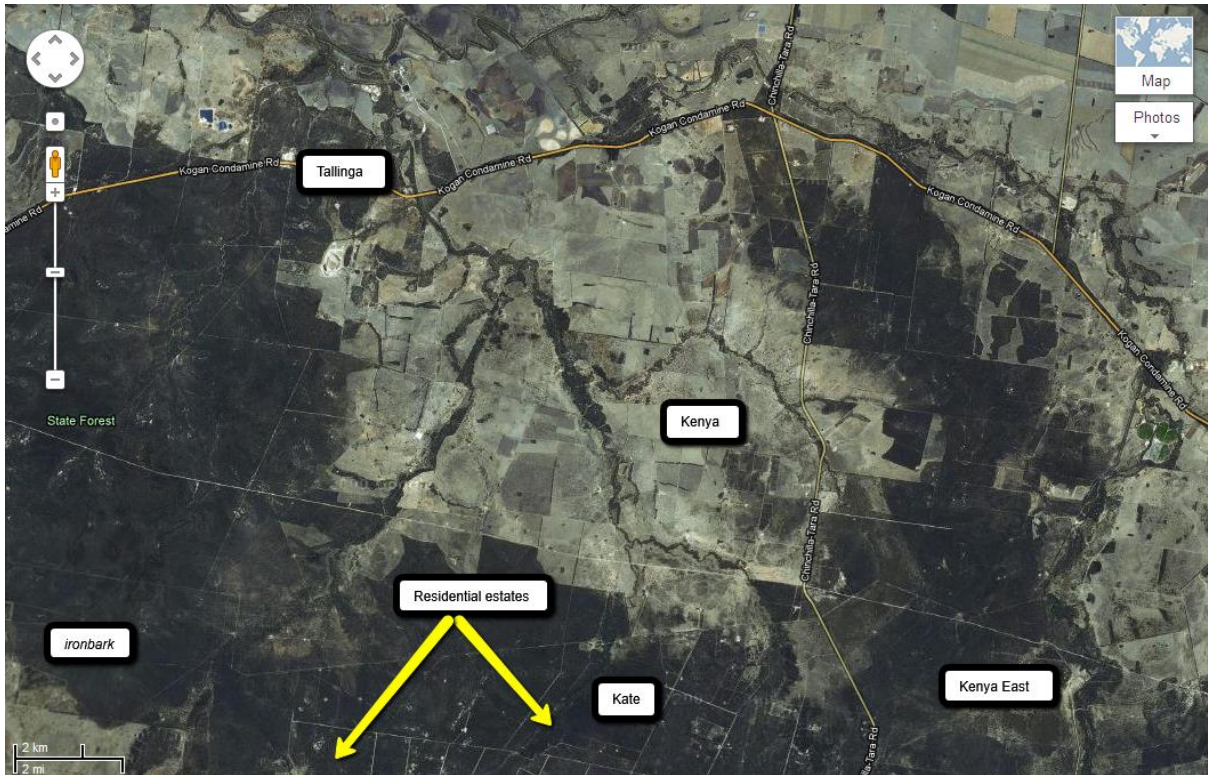
TARA CASE STUDY

The rural residential estates outside Tara in Queensland's Western Downs are surrounded by the infrastructure of the coal seam gas industry and unconventional gas development. Since 2008, the people of these estates have been trying to draw the attention of successive Queensland Governments to their health problems.

It is approximately 70km from Chinchilla in the north to Tara in the south along the Chinchilla-Tara road. Major gas fields and infrastructure are located in the region between Chinchilla and Tara. They are under the control of Queensland Gas Company (QGC), British Gas, Origin and others. The Tara rural residential estates are located in the same area with most of the estates lying south of the immense Kenya gas field with its evaporation ponds, dehydration plants, compressor stations and associated infrastructure.

The Talinga gas field is to the North West, Ironbark to the West and Kenya East to the east. While hundreds of gas wells surround the residences, the Codie, Kate and Jake fields are actually situated within the Tara estates.

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LAYOUT OF GAS FIELDS IN RELATION TO TARA RESIDENTIAL ESTATES
@Google 2013



GIANT KENYA HOLDING PONDS
@Google 2013

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TALINGA GASFIELD, COMPRESSOR AND INFRASTRUCTURE
(NORTH OF RESIDENTIAL ESTATES)
@Google 2013

These major projects are often described as “development”ⁱⁱⁱ but their introduction has not brought better quality of life or additional services to the local people. The residents live on rural blocks ranging in size typically from 30 to 250 acres. They are surrounded by the infrastructure of the gas industry. There are no shops, petrol stations, schools or other basic facilities. The nearest doctor is in Tara which is an approximately 70km round trip. Residents habitually travel to medical facilities in Chinchilla, Dalby and Toowoomba where the regional base hospital is located.

Beyond the estates towards Kogan and Montrose, there has also been rapid CSG development on large acreage agricultural blocks.

In June 2012 the Queensland Government finally committed to investigate the growing health complaints of residents. On 21st March 2013 Queensland Health issued a report titled ‘Coal seam gas in the Tara region: summary risk assessment of health complaints and environmental monitoring data report.’²

Between June 2012 and March 2013, no doctor employed by the Queensland Government visited the residential estates to speak to the residents. The township of Tara was the closest that the Queensland Government doctors got to the source of the

ⁱⁱⁱ People who express concerns about the unconventional gas industry are often referred to as ‘anti-development’.

health complaints. Considering they were investigating the health impacts of living in a gas development it is somewhat surprising that no on-site visits were made.

In the nine months available to them, the Queensland Government Departments failed to establish a comprehensive, systematic long term testing regime to monitor potential chronic exposure to air or water borne toxins. Instead they commissioned QGC, the gas company at the heart of the residents' health complaints, to undertake testing, creating a clear conflict of interest. Sampling, which occurred as one off events at nine residences, was entirely inadequate in scope and duration. Importantly, what is missing are analyses of the gases produced in the localities concerned by flaring, well leakages and pipeline venting.

There is evidence of irregularities in the documentation accompanying the test samples. On the chain of custody for one site the start time was documented as 09:37 and finish time 07:30. In that particular case, the family left home shortly after the QGC representatives arrived. When the family returned at lunchtime, the QGC representatives had gone taking all their equipment with them. Sampling which is documented as lasting 22 hours could only have lasted for approximately 1-3 hours.

Apart from a limited number of passive samplers, in the 9 months of the investigation, the only other air testing employed was random 30-60 second Summa canisters. These tests were undertaken by the resident themselves.

People who believed they were impacted by CSG were told to phone a 13 HEALTH number or report to their local GP or hospital to fill in a questionnaire. No dedicated medical team was formed to undertake health assessments. One doctor from the Darling Downs Public Health unit was given the task of collating the information from the 13 HEALTH numbers and local doctors. This was in addition to their normal work load. No referral system was set up to assist the local doctors.^{iv}

On 11th and 12th October 2012, Dr Keith Adam, held a clinic in Tara as part of the promised Queensland Government investigation. The clinic was poorly advertised. A second clinic was promised but never took place. Dr Adam is from Medibank Health Solutions, a private healthcare company and is retained as a consultant by two large coal companies.³

By February 2013 no health report had been published, yet both the industry and politicians had repeatedly stated that Queensland Health had investigated and no health problem had been found. In a letter printed in The Sydney Morning Herald (19th January 2013), Rick Wilkinson, Chief Operating Officer Eastern Region, Australian Petroleum Production & Exploration Association Ltd (APPEA) claimed that Queensland Health had *"reported no pattern of illness consistent with effects from natural gas extraction."*⁴

^{iv} Shortly after announcing the health investigation, the Queensland Government sacked 14,000 public servants including many from Queensland Health.

Given the events and circumstances outlined above, I reluctantly concluded that the Government had no real commitment to investigate public health complaints related to CSG development. As a general practitioner, I was concerned about the potential long-term damage being done to the health of the people living in the residential estates. I decided to carry out my own study to clarify whether or not the implication that only a “handful” of people perceived health impacts was true, and then to document these perceived health impacts.

This paper does not claim to be a comprehensive health assessment of the people living within the Queensland gas fields. It is a health survey based on the voluntary work of one person in conjunction with the residents. In the nine months of their investigation the Queensland Government had the opportunity, the time and the resources to do what is necessary: to set up a detailed research study including comprehensive history taking, full clinical examination, testing and long term follow up. That still remains to be done. A comprehensive study would effectively investigate exposure and symptoms. It could compare the symptoms of those living near gas wells with those not exposed, or it could investigate the individual exposures of those who complain of illness with those who appear well. It would, as an added benefit, pick up and provide opportunity to treat cases of unrelated illness which have fallen through the gaps in the health system.

This study has significant limitations as there will be bias in the way the study participants have been selected and also in the fact that they are being asked to recall past events without independent verification. It is the opinion of the author that a study of this type could not be blinded. Nevertheless it has succeeded in obtaining data on a greater number of people than the official government investigation has done and has confirmed the extensive clustering of serious health complaints in this region. In addition, the significance of neurotoxic symptoms being reported with such frequency, especially in children, remains an issue of great concern, and should be fully investigated.

METHOD

On nine days between 24th February and 16th March 2013, I surveyed the health of people within 35 households in the Tara residential estates and the Kogan/Montrose regions of the Western Downs in Queensland. In addition to that I conducted telephone interviews with families from three households who had left the area because they believed their health had been adversely affected by CSG. One family moved 80km away but remained within 4413 post code, one family moved to postcode 4305 and one family moved interstate to post code 3380.

These locations were chosen to survey as residents from these areas had previously contacted the Gasfields Community Support Group with health concerns they related to CSG exposure.

In the majority of cases I documented the residents' responses; in a few cases the respondents preferred to complete the paperwork themselves. Parents provided current health data on their children with input from older children and parents provided comparison data on their children's health prior to CSG.

The survey was in two parts. Part [1](#) documented the environmental details of each household including perceived impact on animals. Part [2](#) was an individual questionnaire regarding the health of each person within each household. The first page was age specific.

For children aged up to 5 years this involved answering affirmatively if the parent was concerned about any of 25 health issues. There was a question whether the parent believed the child's health had been adversely affected by CSG with the options on answers being "yes", "no" and "uncertain". There were free form questions on perceived health impacts and their experience seeking medical help.

As no baseline health studies had been carried out prior to coal seam gas development, in lieu of baseline studies, for people aged 6 to 82, the first page of their health questionnaire was designed to compare how their health was perceived to be in the past two years^v whilst living in a gas development with their health in the two year period before they were exposed to the CSG industry. For before and after CSG, there were 30 questions, the answers to which were "never", "occasionally", "often" or "constantly".

^v Or for a lesser period if they had moved to the area within that two year timeframe

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For the purpose of the questionnaire the definitions were as follows:

| Definition | Details of definition |
|-------------------|--|
| Never | Never. |
| Occasionally | That it has happened ever (within the 2 years ^v), a few times, sporadic. |
| Often | Recurring, regular, frequent. |
| Constantly | At least twice a week. |

TABLE 1 QUESTIONNAIRE DEFINITIONS

There was a question on diagnoses made prior to CSG development and conditions diagnosed since CSG development. One question related to whether the respondents believed their health had been adversely affected by CSG and there were open format questions on health impacts and medical care.

With the assistance of the Gasfields Community Support Group,⁵ I visited some of the families who had previously stated that their health was impacted. In order to minimise bias, I endeavoured to visit and survey the near neighbours of impacted families. Of the 40 families I approached, only two declined to participate. Locked gates with “For Sale” signs proved to be more of an obstacle to participation. Families were willing to respond with the assurance of anonymity. Although identifying data such as names and addresses was collected, only postcode and/or survey number would be used in the pooled results.

FINDINGS

NUMBER SURVEYED

In total the health of 113 people from 38 households was documented.

There were 17 children between the ages of 0 and 5, 31 children between the ages of 6 and 18 and 65 adults between the ages of 19 and 82. This included just two people aged over 70 years. There were 56 males and 57 females.

ENVIRONMENTAL DATA

53 people lived within postcode 4421, 40 people lived within postcode 4413, 15 people lived within postcode 4406 and 3 people now lived in 4305 with two people in 3380.

Of the thirty eight households canvassed, 3 families lived in second dwellings on the acreage blocks so the environmental data was collected for 35 blocks

Of the 35 blocks 12 families had owned them for less than 5 years, 10 families for 6-9 years, 8 families from 10 to 19 years and 5 families for between 20 and 40 years.

The smallest residential block was 30 acres. 16 families lived on blocks of 30 or 40 acres. 8 families lived on blocks of between 50 and 100 acres. 7 families lived on blocks

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of between 110 and 250 acres and 4 families outside the residential estates lived on blocks of between 640 and 8000 acres.

15 households used solar as their main source of power, while 15 had mains electricity and 5 used a generator as the primary source. 9 households had a generator as back up while 4 had solar as their secondary source of power.

24 households used gas for cooking while 11 used electric cookers or cooktops. 21 used a woodstove or wood heater.

3 households used bottled water for drinking and cooking. The rest used rainwater collected from the roof into tanks for drinking, cooking and washing dishes. 5 households used settled dam water treated with alum for washing clothes. 3 families habitually washed their clothes in town. 3 households used treated dam water for bathing, the rest used rainwater. Dam water and rainwater was used in various combinations for vegetable gardens and domestic animals and in one case for watering the lawn. Only one person swam in their dam. Four families used dam water to flush the toilet. Several families did not use their dam at all. Some believed it had been contaminated by run off from road spraying of CSG flow back.

There was a bore on three properties. None were currently used. One of these bores had sustained 145 head of cattle throughout Queensland's long drought. However, that bore is now flammable.

Flea and tick prevention was used by 13 households but otherwise pesticides and herbicides were used very sparingly around the home or garden; two households used pyrethrin ant sand; three occasionally used Roundup; one had treated for termites; one used Graslan in the paddocks. Several households were proudly organic.

Only one household had purchased new or refinished furniture or carpets.

For one family the nearest well was at a distance of 5km. For everyone else the infrastructure was much closer. One family had a major gas development site 20 metres from their property. For 6 families the nearest well was between 500 and 800 metres; for 6 families the nearest well at approximately one kilometre; for 5 families the nearest well was 1.5km; for 13 families the nearest well was 2-3km away; for 3 families the nearest gas well was approximately 4km away.

Many families were aware of multiple infrastructure including wells, compressors stations, pumping stations, vents, and open CSG waste disposal ponds in various directions from their homes which were operated by different companies including QGC, Origin and Linc Energy. Many families were unsure what infrastructure they were in proximity to. 18 families were aware of non-agricultural odours through their

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property.^{vi} The intensity, frequency and duration were variable and depended on wind direction. Most people noticed the problems were worse when the wind was coming from the north. 11 families were aware of unusual cracking of the soil on their property and 8 families had seen bubbling in puddles on their property after the rain while one man, though not ever noticing a problem on his own property, had watched bubbling in cracks in the bitumen road which was covered in 6 inches of water at the time.

HEALTH DATA

Note that a complete set of the data is available in Appendix B.

Of the 113 people surveyed 66 or 58% were certain their health was being impacted by CSG. (Figure 2)

26 people (23%) felt sure that their health had not been impacted and 21 people (19%) were uncertain.

Of the 113 people there were 95 individuals in the age 6-82 age cohort who answered the 'before' questionnaire with 96 individuals answering the 'after'. The reason for this was that one child had to all extents and purposes always lived in the gas field so had no prior health history. For this reason the data for before and after has been in each case documented in separate pie charts.

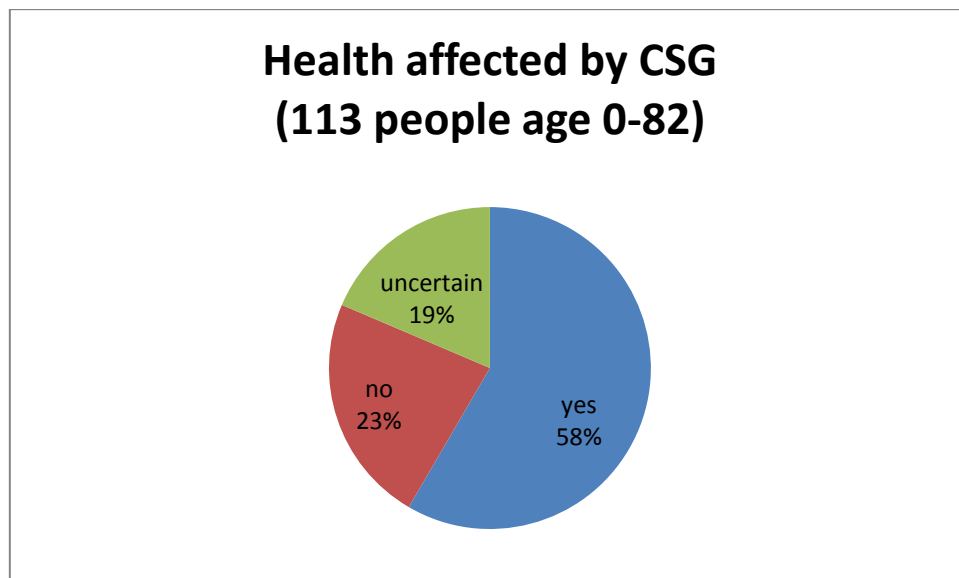


FIGURE 2 HEALTH AFFECTED BY CSG (113 PEOPLE AGE 0-82)

^{vi} In August 2011, Queensland Country Life reported Linc Energy offered to purchase air-conditioners for some of the surrounding farmers' houses so long as the landholders were willing to sign a confidentiality agreement and not tell anyone about the matter.

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Visual representation of the data in this format is striking and shows major changes in perception of wellbeing for large percentages of the people surveyed. Of particular concern is the type of symptoms experienced as they are not symptoms one would expect due to aging alone over a 2-5 year time frame.

Skin irritation was a good example of the change in symptoms with 17% reporting skin irritation before CSG and 72% complaining of skin irritation after CSG. (Figures 3 and 4) People reported symptoms of discomfort, sensitivity, itch and inflammation of their skin which, particularly in adults, was often in the absence of a visible rash.

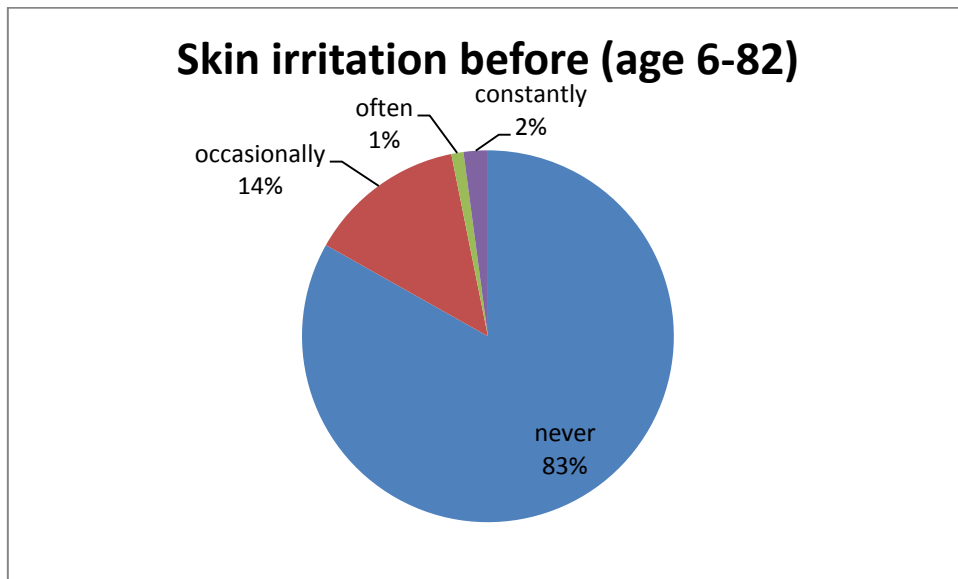


FIGURE 3 SKIN IRRITATION BEFORE CSG (AGE 6-82)

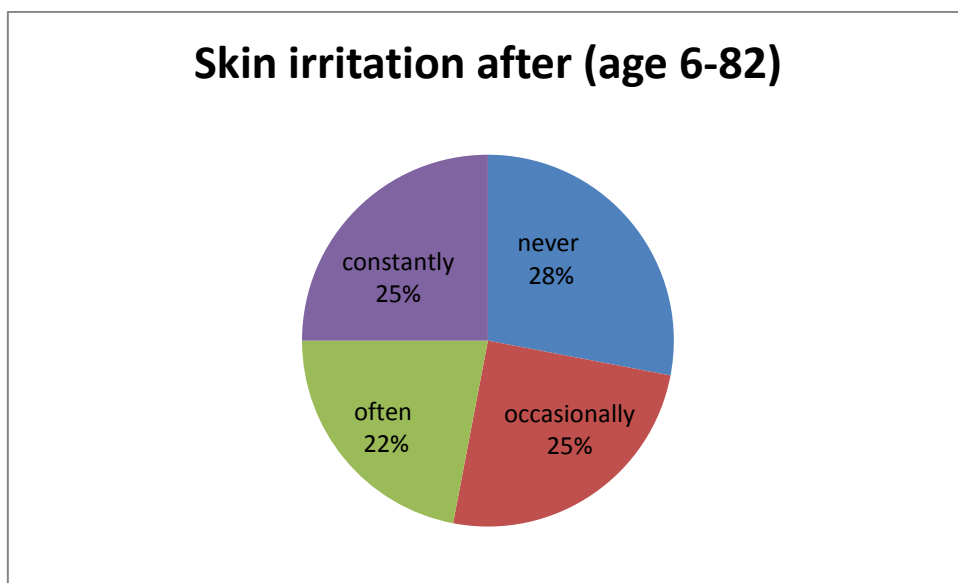


FIGURE 4 SKIN IRRITATION AFTER CSG (AGE 6-82)

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Eye irritation was reported with similar frequency, with 7% reporting symptoms before and 60% after. (Figures 5 and 6)

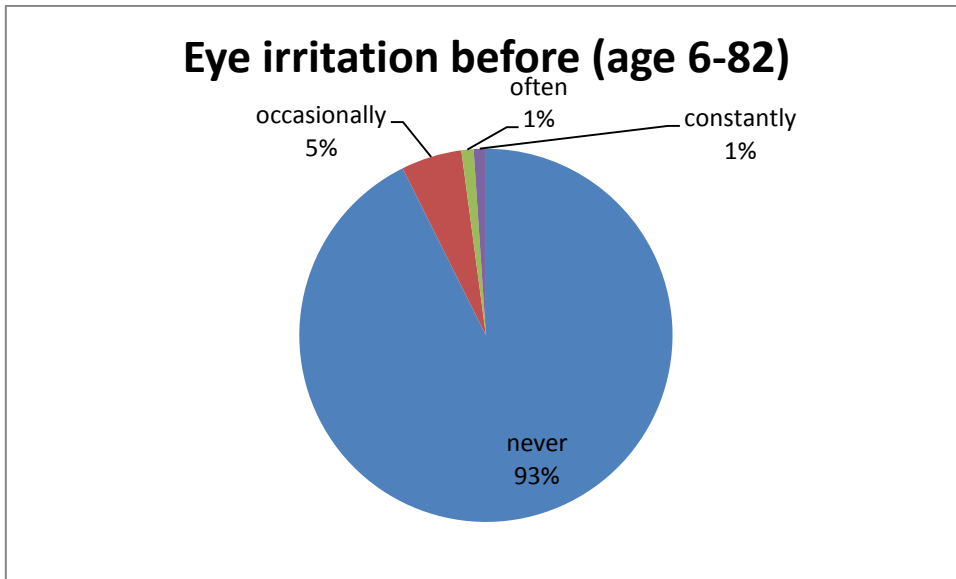


FIGURE 5 EYE IRRITATION BEFORE CSG (AGE 6-82)

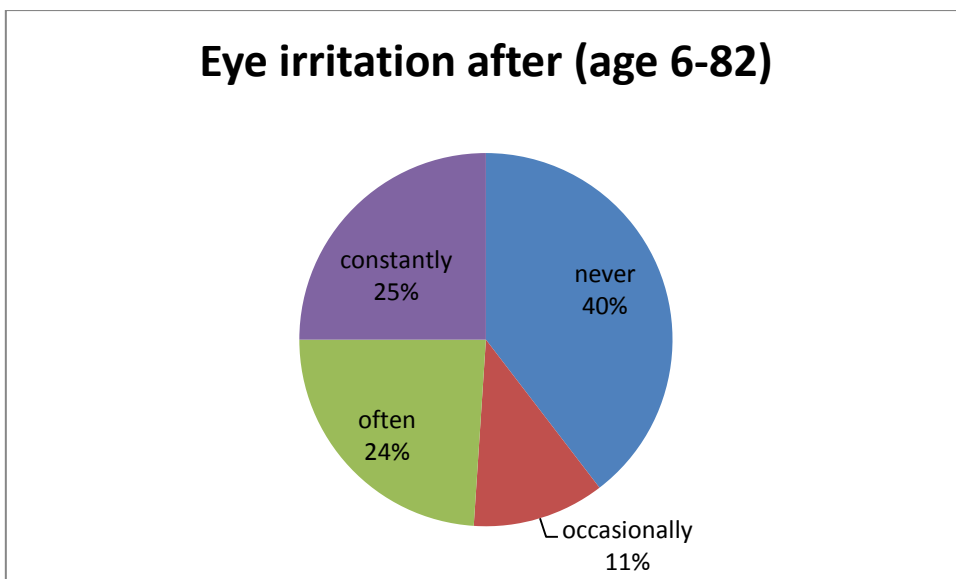


FIGURE 6 EYE IRRITATION AFTER CSG (AGE 6-82)

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Likewise 7% reported trouble with spontaneous nose bleeds before CSG while 32% had spontaneous nose bleeds after. (Figures 7 and 8)

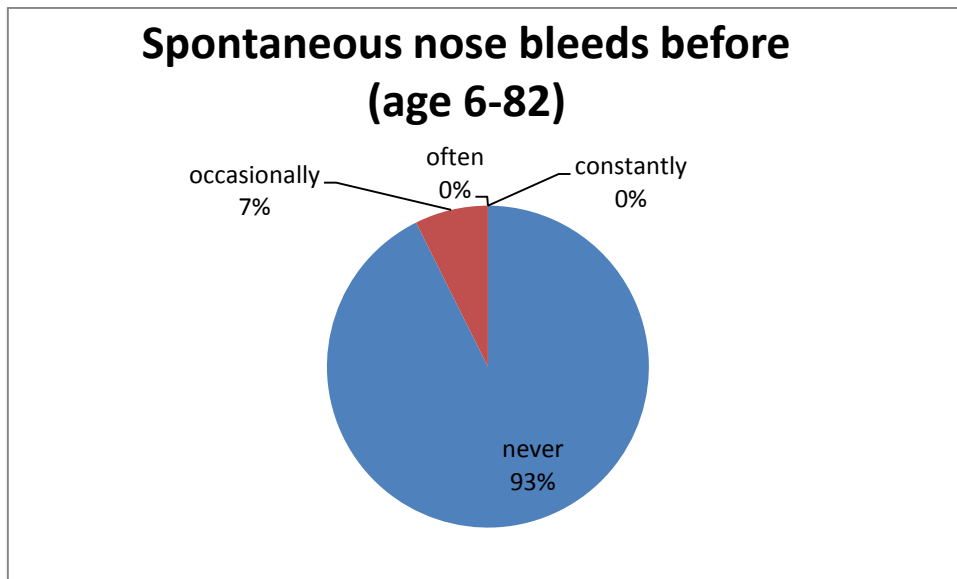


FIGURE 7 SPONTANEOUS NOSE BLEEDS BEFORE CSG (AGE 6-82)

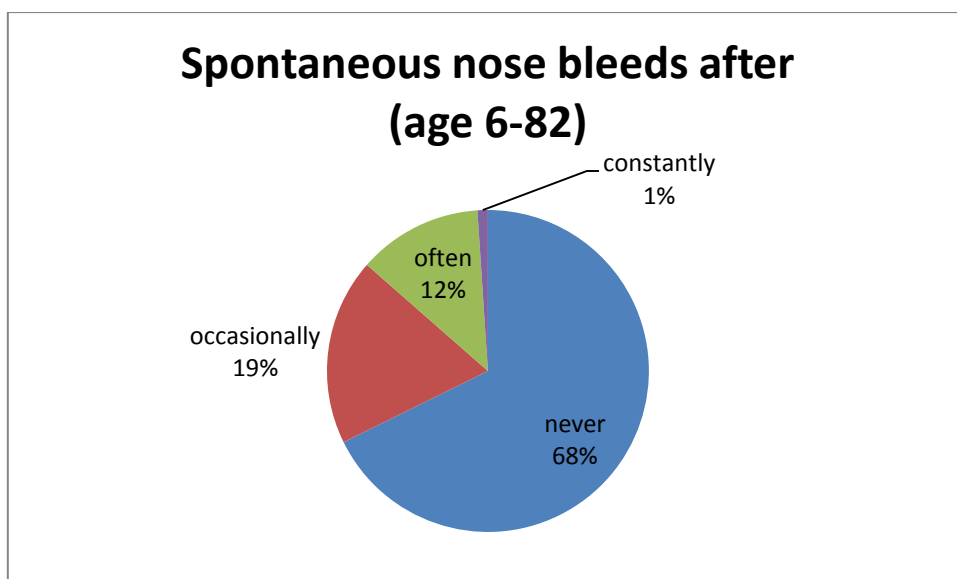


FIGURE 8 SPONTANEOUS NOSE BLEEDS AFTER CSG (AGE 6-82)

There was a marked increase in a range of symptoms which can be related to serious conditions such as neurotoxicity (damage to the nervous system), including weakness, severe fatigue, headaches, numbness and paraesthesia (abnormal sensations such as burning or tingling).

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- 54% reported mild headaches prior to CSG while 87% had mild headaches after; (Appendix B)
- 23% reported having ever had a severe headache before CSG, while 55% had severe headaches after (38 % often or constantly); (Appendix B)
- 13% reported suffering from severe fatigue before while 64% suffered from severe fatigue after; (Appendix B)
- 7% reported suffering from weakness before while 51% were symptomatic after. (Figures 9 and 10)
- Depression and anxiety, difficulty concentrating and insomnia showed similar reported increases. (Appendix B)

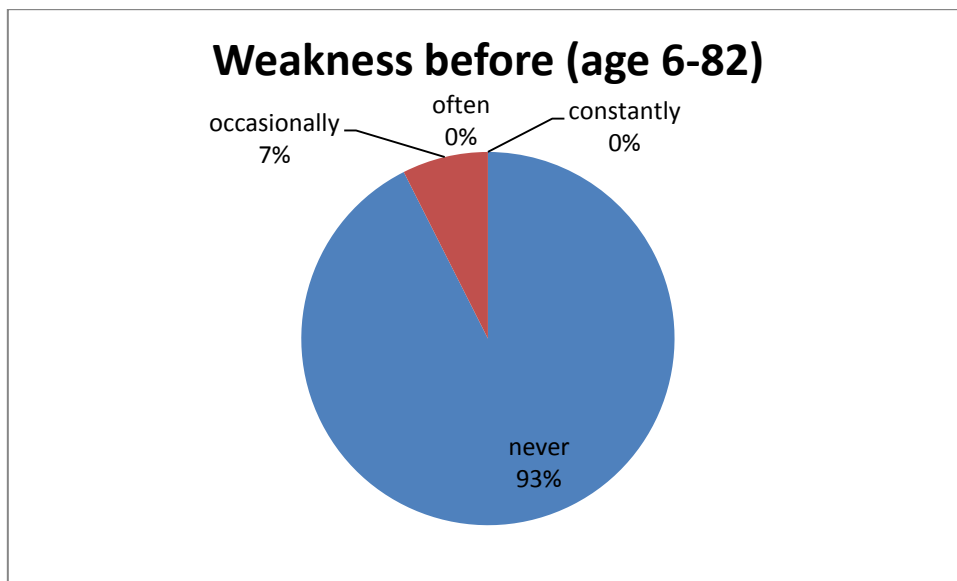


FIGURE 9 WEAKNESS BEFORE CSG (AGE 6-82)

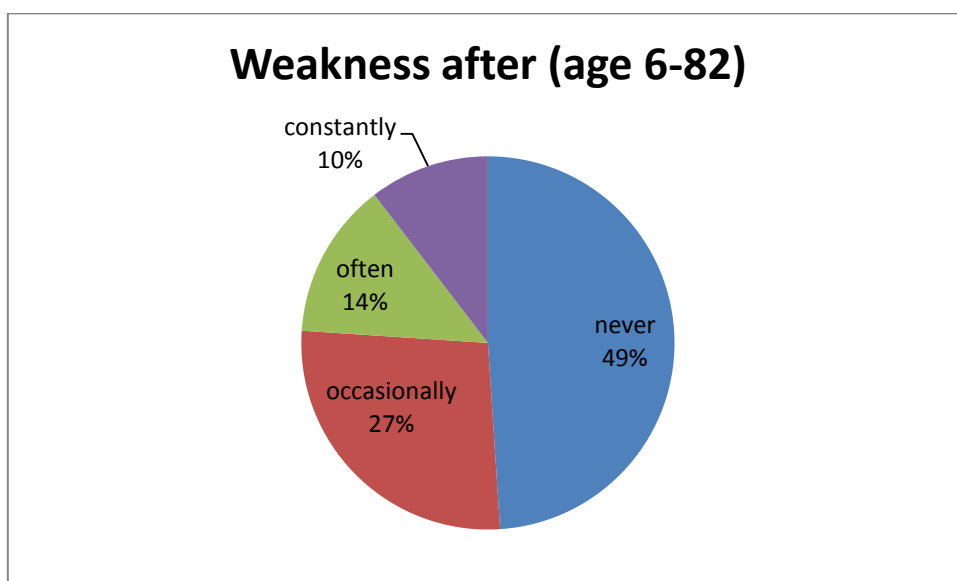


FIGURE 10 WEAKNESS AFTER CSG(AGE 6-82)

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Reported symptoms of tingling, numbness, and pins and needles increased from 8% prior to CSG to 42% after. (Figures [11](#) and [12](#))

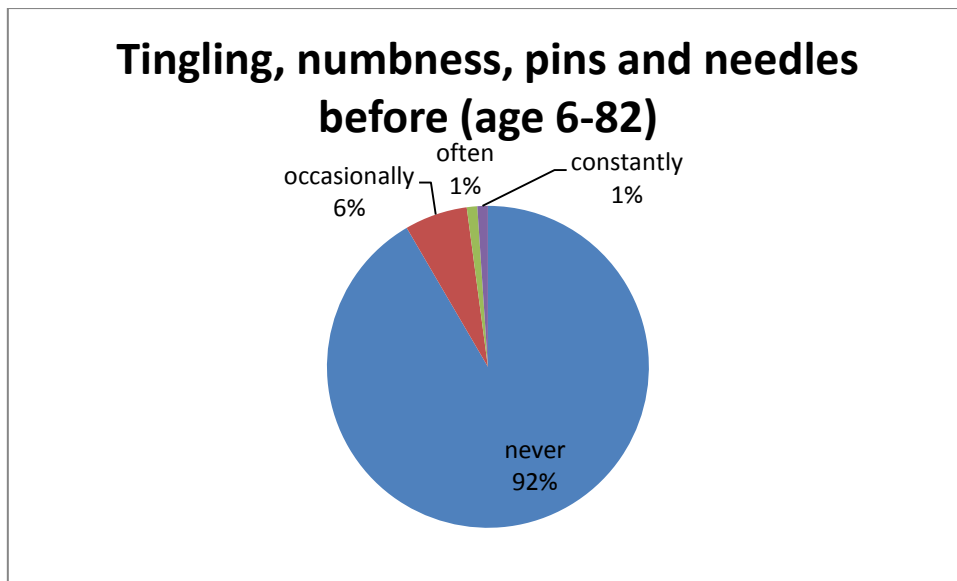


FIGURE 11 TINGLING, NUMBNESS, PINS AND NEEDLES BEFORE CSG (AGE 6-82)

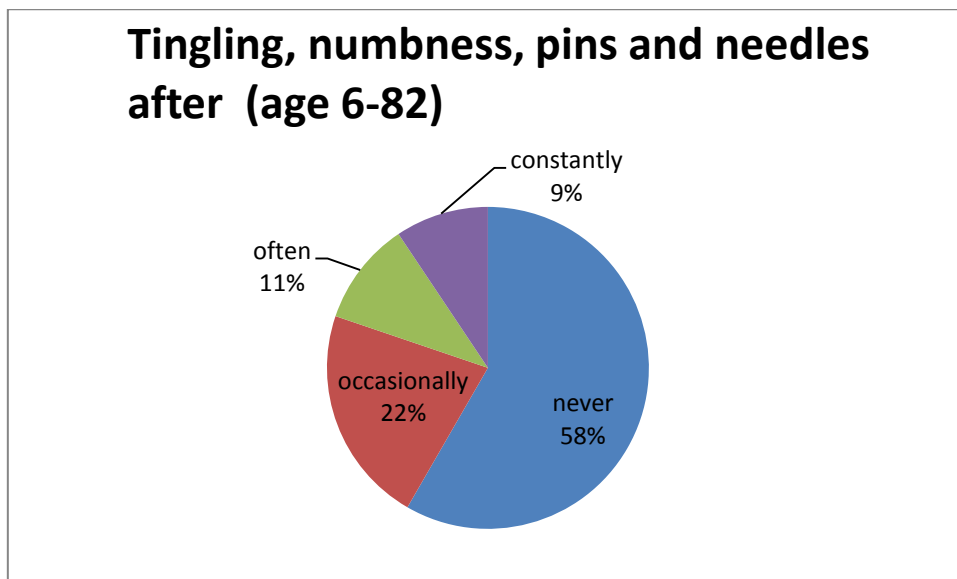


FIGURE 12 TINGLING, NUMBNESS, PINS AND NEEDLES AFTER CSG (AGE 6-82)

In order to determine if the symptoms were age related, the data was reanalysed for the age 6-18 age group. There were 31 children in this group (Appendix [B](#)). Since the results were similar for chest discomfort, chest tightness and difficulty breathing, only chest tightness was displayed in a pie chart. The results are striking.

After CSG

- 19 out of 31 children or 61% had spontaneous nose bleeds reported;

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- 28 out of 31 children had mild headaches, 23% constantly;
- 17 out of 31 children had severe headaches, 4 of them or 13% constantly;
- 24 out of 31 children had skin irritation- 15 (almost 50%) often or constantly throughout the past two years;
- 10 out 31 children age 6-18(over 30%)experienced paraesthesia
- 8 out of 31 (26%) had severe chest pain;
- It was reported that children had increased rates of cough, chest tightness, difficulty sleeping, nausea, rashes, difficulty concentrating and muscle pains and spasms.

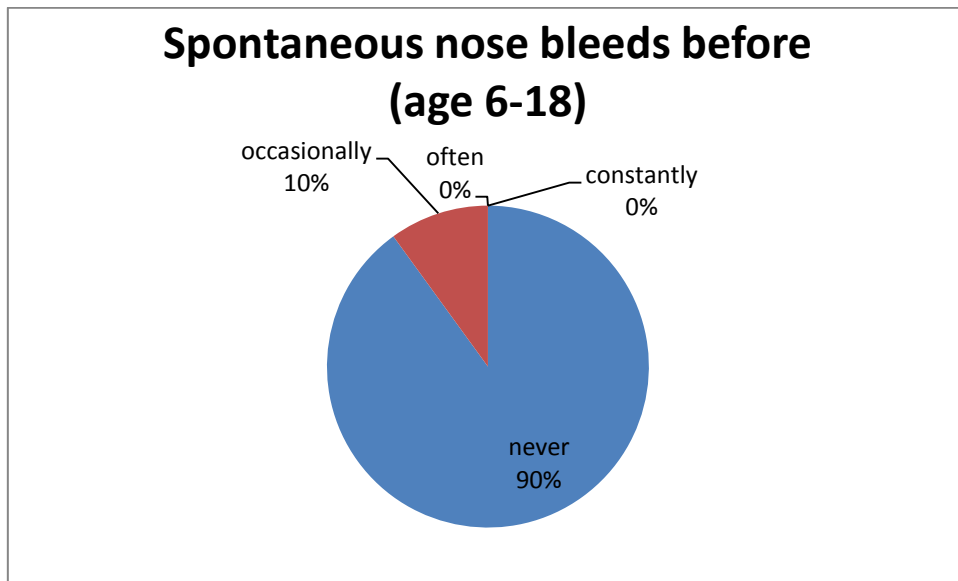


FIGURE 13 SPONTANEOUS NOSE BLEEDS BEFORE CSG (AGE 6-18)

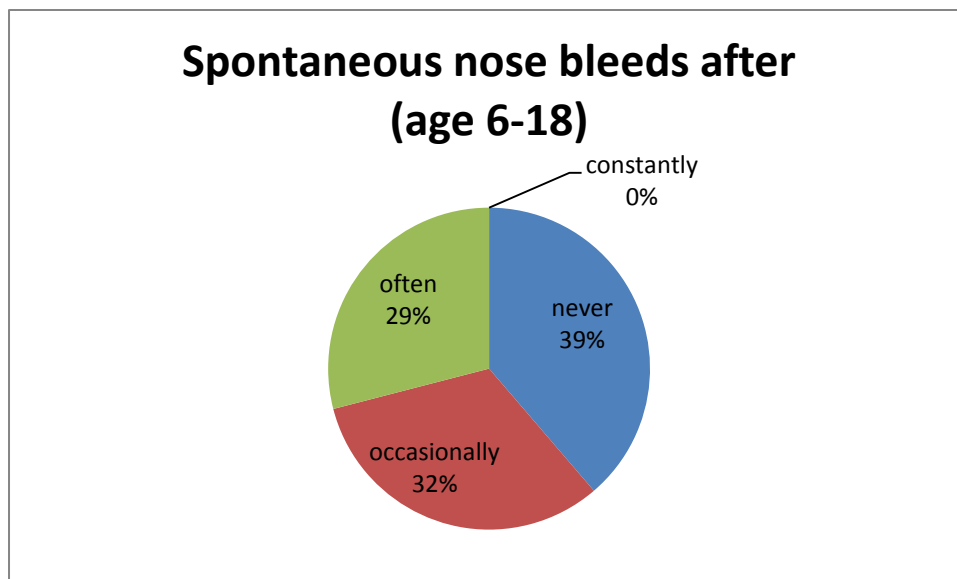


FIGURE 14 SPONTANEOUS NOSE BLEEDS AFTER CSG (AGE 6-18)

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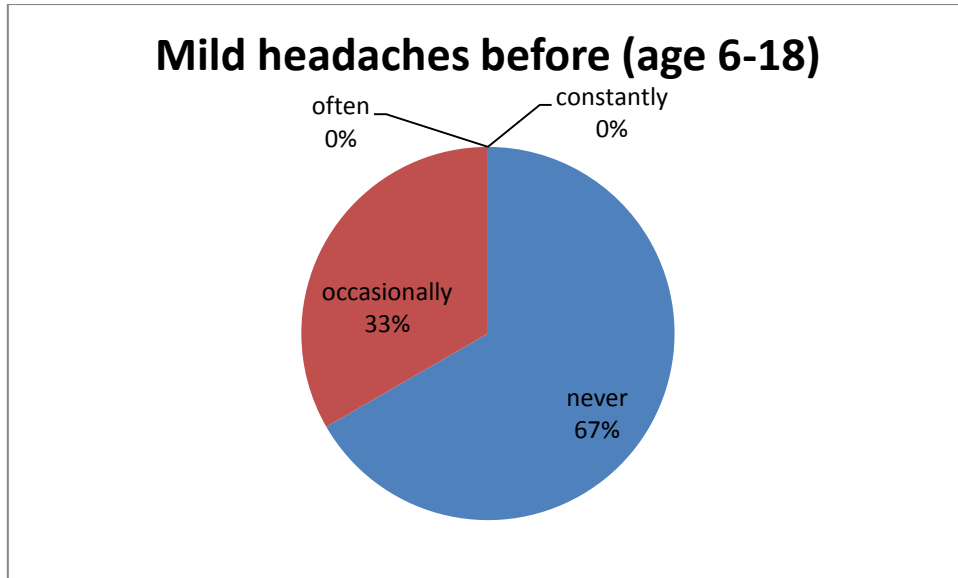


FIGURE 15 MILD HEADACHES BEFORE CSG (AGE 6-18)

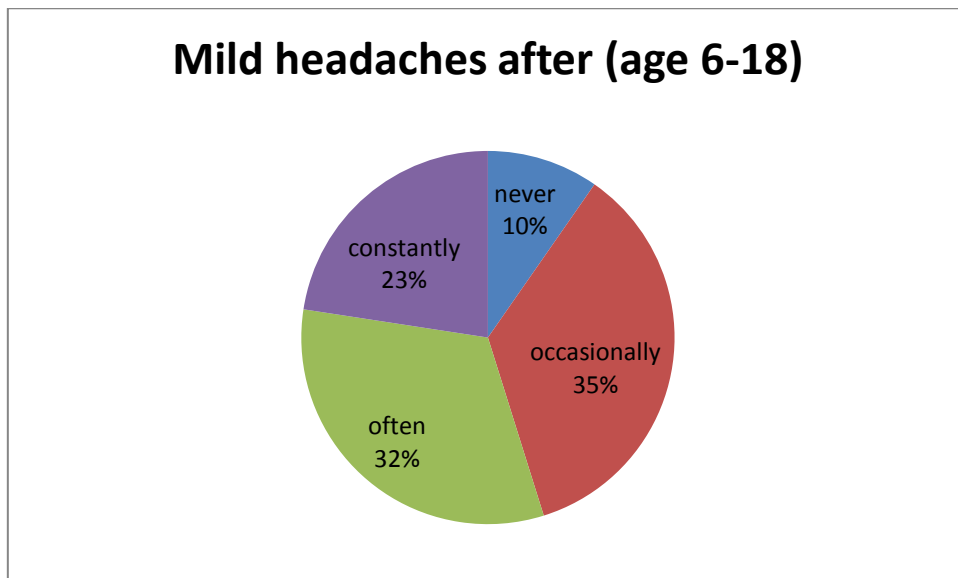


FIGURE 16 MILD HEADACHES AFTER CSG (AGE 6-18)

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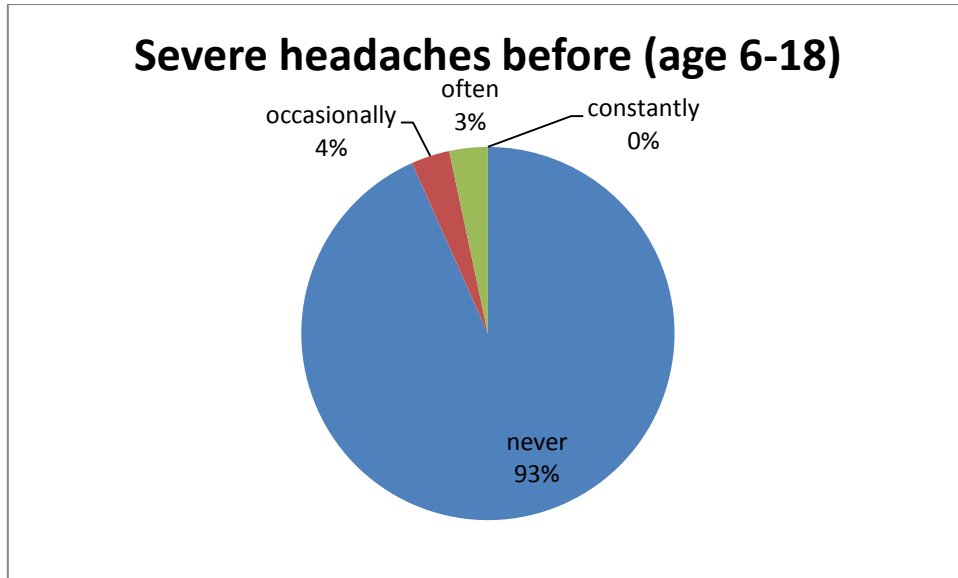


FIGURE 17 SEVERE HEADACHES BEFORE CSG (AGE 6-18)

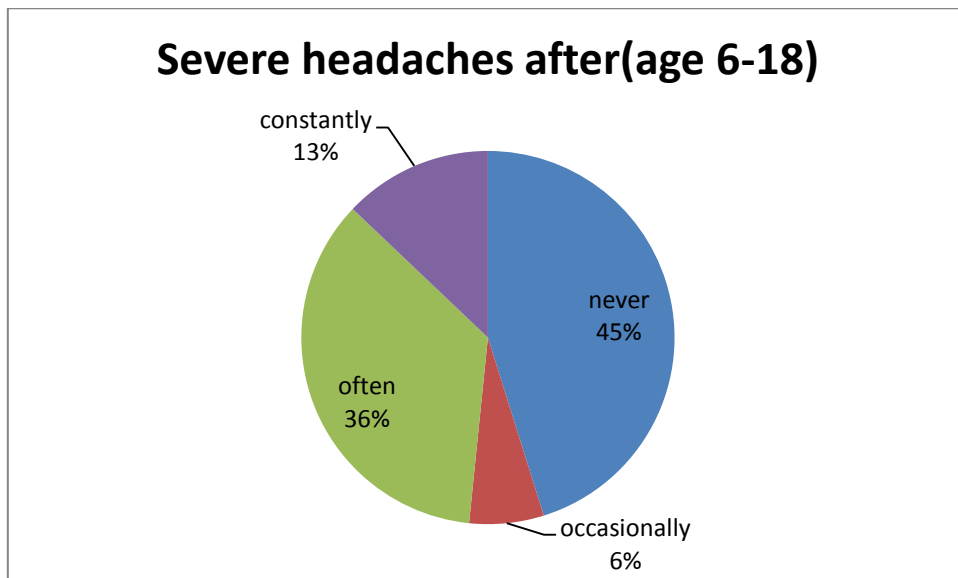


FIGURE 18 SEVERE HEADACHES AFTER CSG (AGE 6-18)

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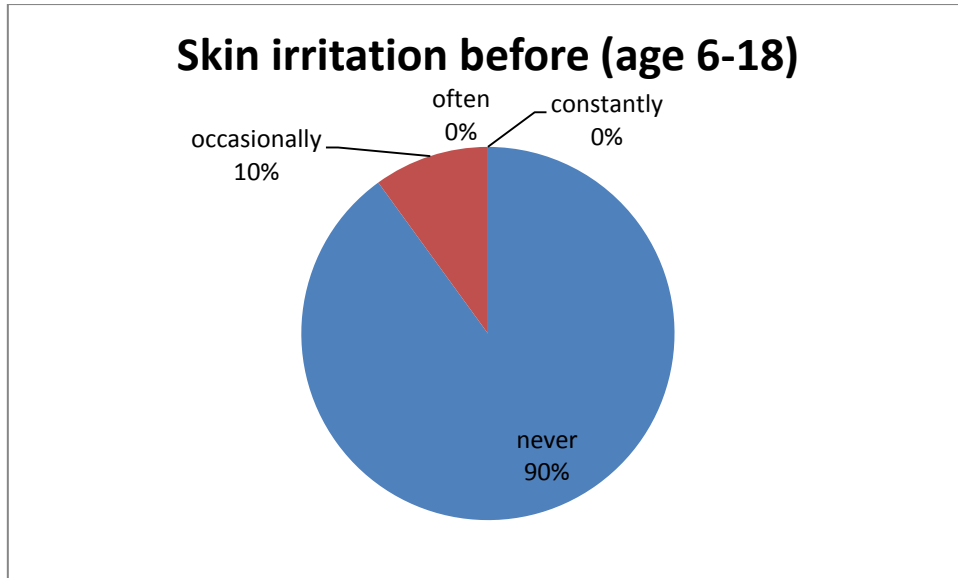


FIGURE 19 SKIN IRRITATION BEFORE CSG (AGE 6-18)

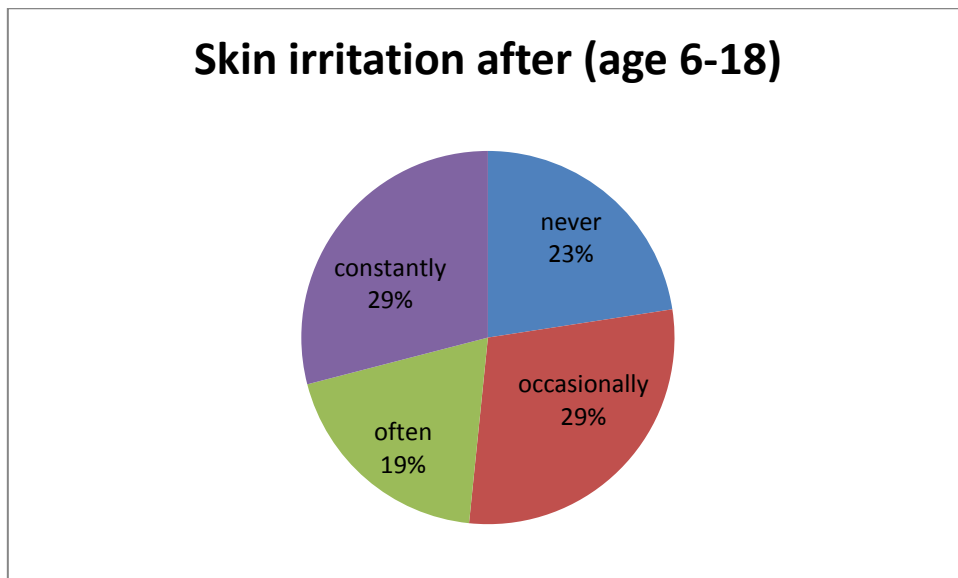


FIGURE 20 SKIN IRRITATION AFTER CSG (AGE 6-18)

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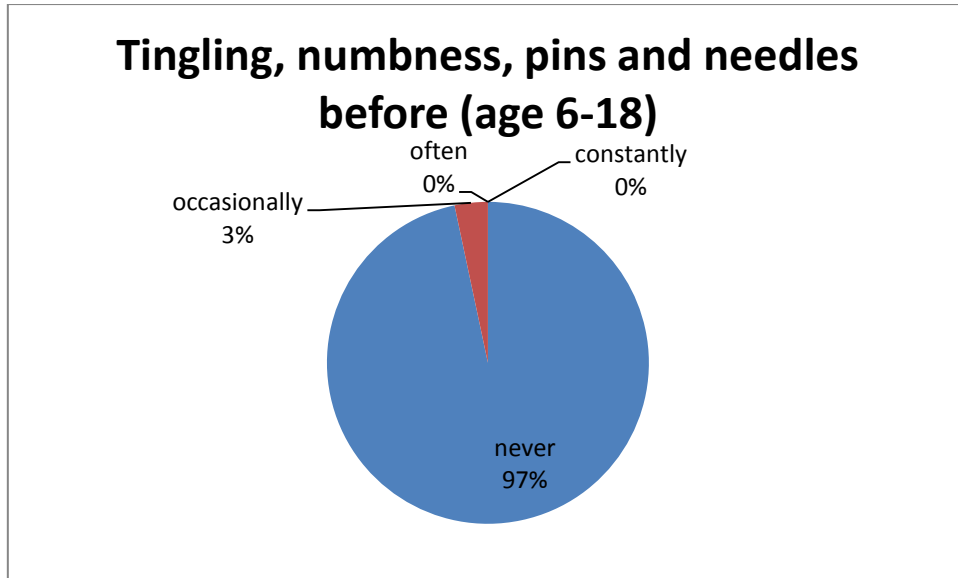


FIGURE 21 TINGLING, NUMBNESS, PINS AND NEEDLES BEFORE CSG (AGE 6-18)

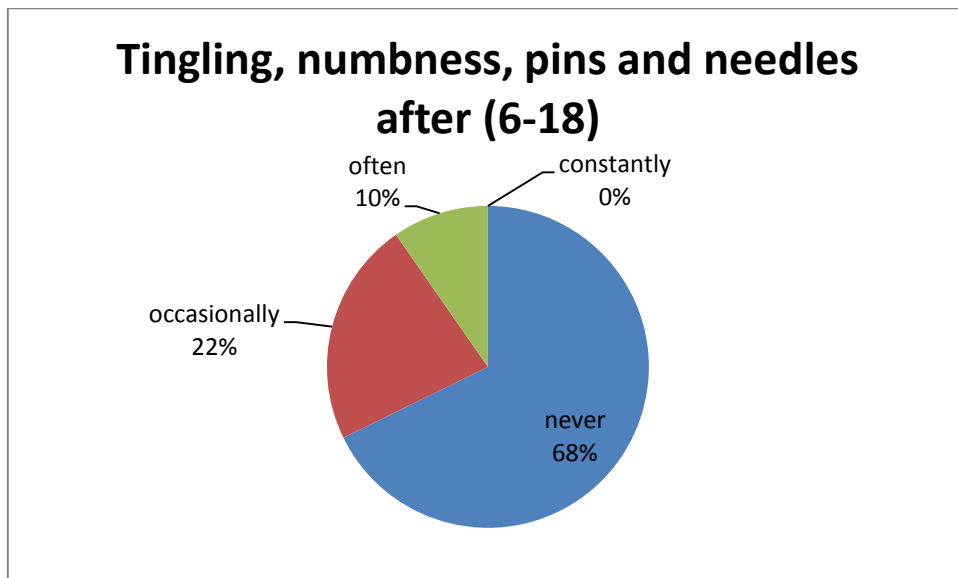


FIGURE 22 TINGLING, NUMBNESS, PINS AND NEEDLES AFTER CSG (AGE 6-18)

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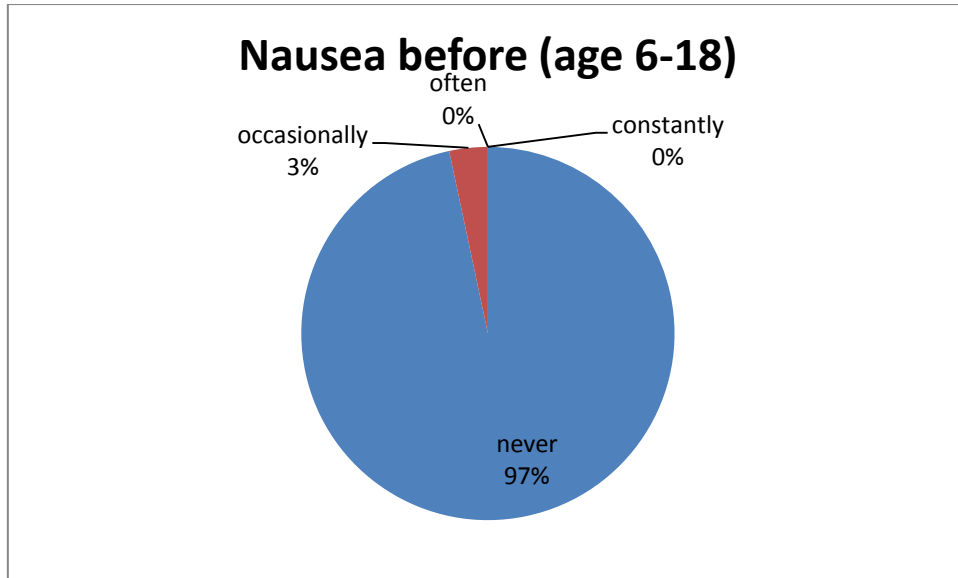


FIGURE 23 NAUSEA BEFORE CSG (AGE 6-18)

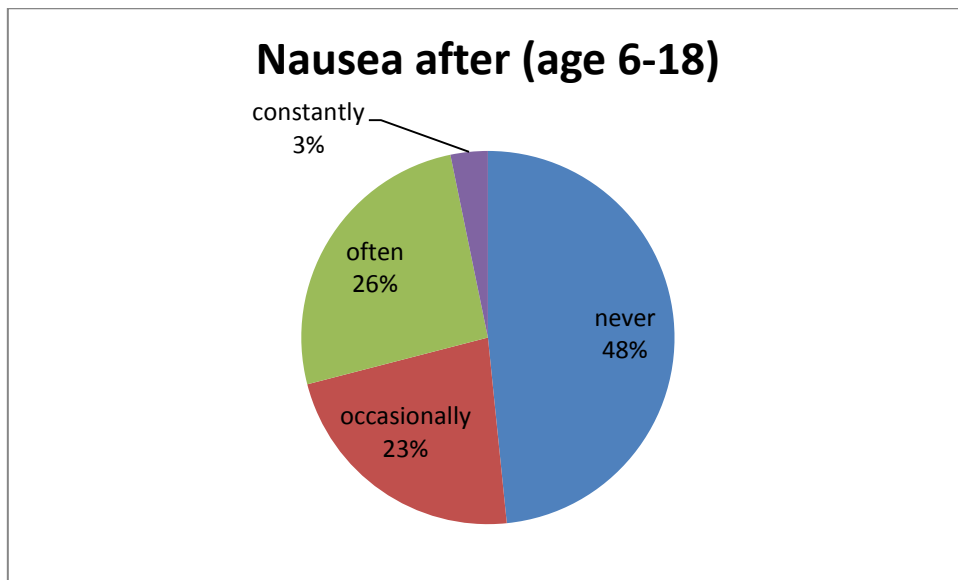


FIGURE 24 NAUSEA AFTER CSG (AGE 6-18)

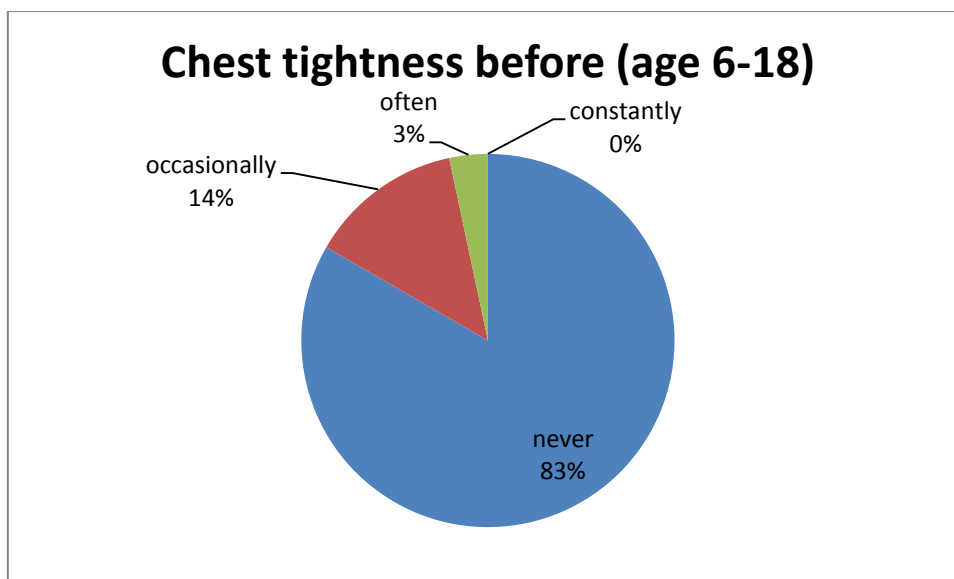


FIGURE 25 CHEST TIGHTNESS BEFORE CSG (AGE 6-18)

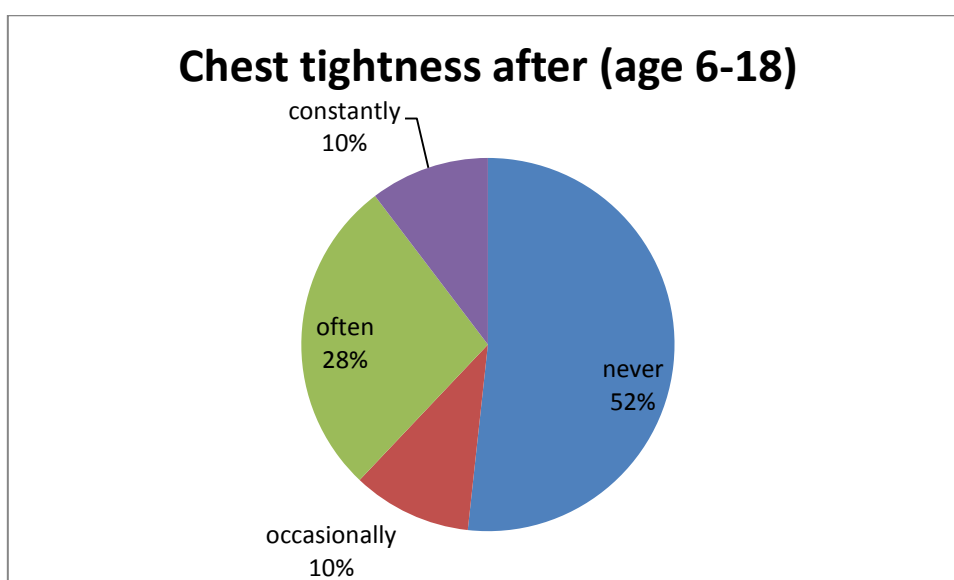


FIGURE 26 CHEST TIGHTNESS AFTER CSG (AGE 6-18)

PARENTAL CONCERNS

There were 17 children in the age group 0-5. Parental concerns for their children included rashes (11), eye irritation (11), and cough (5).

Significant concerns reported in this age group were:

- twitching and unusual movements (6);
- poor colour/blueness of mouth or limbs (6);
- blood from the nose (9);
- headaches (8);
- tingling/numbness/ pins and needles (5).

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Of the 13 children who were walking, 5 were reported to have demonstrated unusual clumsiness or unsteadiness.

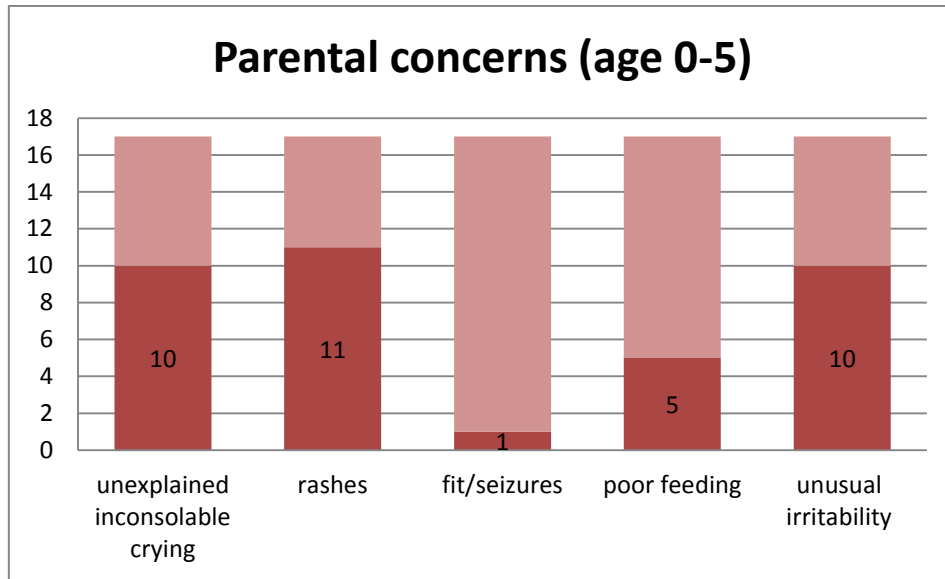


FIGURE 27 PARENTAL CONCERNS (AGE 0-5)

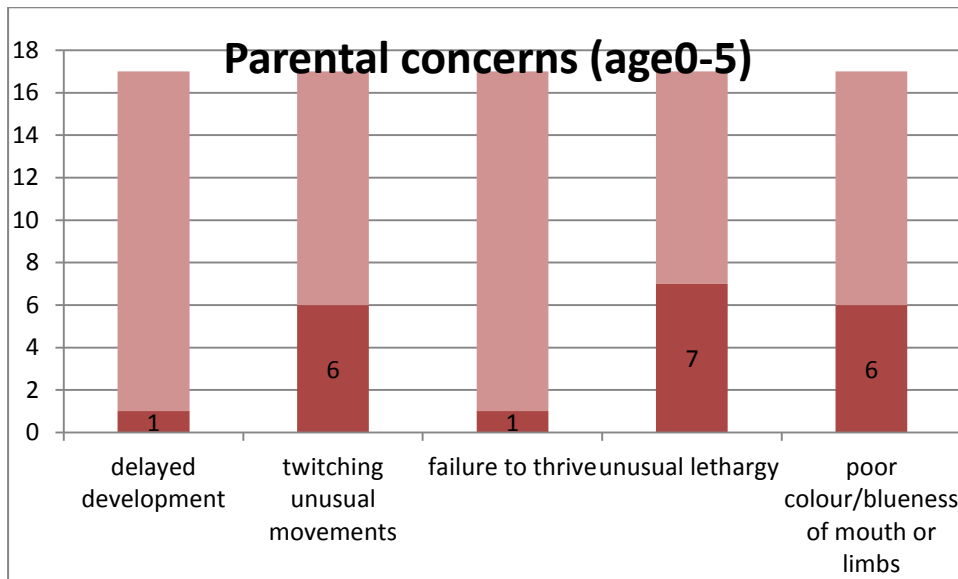


FIGURE 28 PARENTAL CONCERNS (AGE 0-5)

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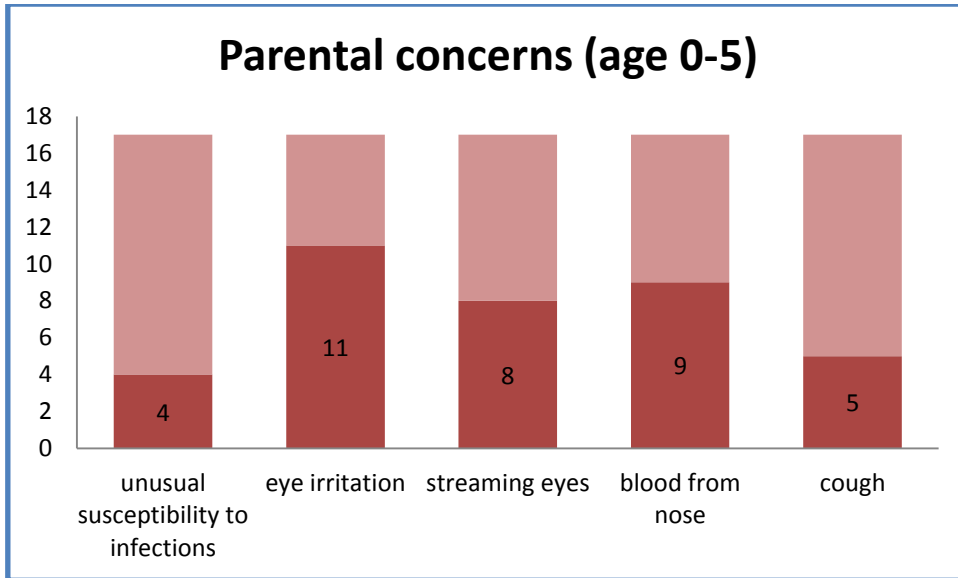


FIGURE 29 PARENTAL CONCERNS (AGE 0-5)

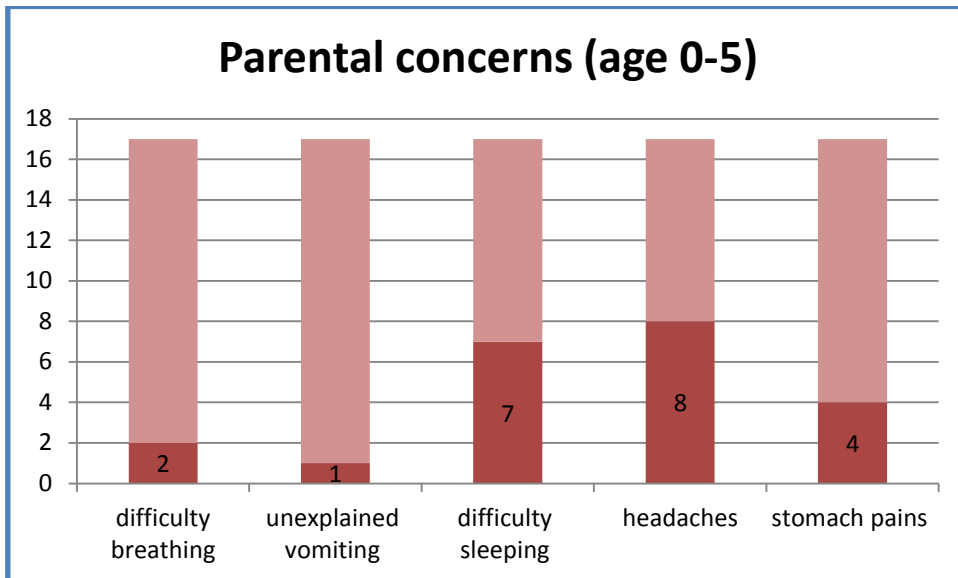


FIGURE 30 PARENTAL CONCERNS (AGE 0-5)

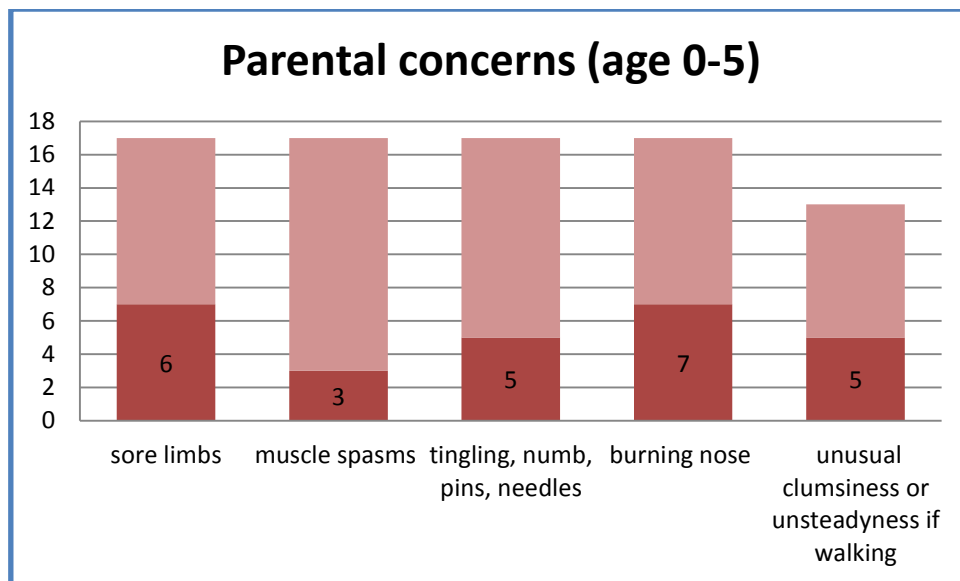


FIGURE 31 PARENTAL CONCERNS (AGE 0-5)

RESIDENTS' COMMENTS AND FEEDBACK

Residents' comments on health impacts were enlightening. Parents particularly noted their children coming in from playing outside with nose bleeds. Often they had linked increased frequency of these occurrences with wind direction and some had stopped their children playing outside at these times. Some adolescents had had daily nose bleeds for three months at a time. These rural children now deliberately avoided going outdoors when possible. Adults who had lived in the bush all their life now found their lives restricted to indoors.

Children were noted to be constantly rubbing their fingers. Children complained of ants in their hands and one infant reportedly screams and dips his fingers in water in the middle of the night. Children were reported to be waking at night in distress wanting their mums to rub their limbs. The only child who has been sent for evaluation by a paediatrician for this complaint was reportedly told she was attention seeking. Children were reported to be waking out of their sleep with headaches.

For adults and children alike, eye irritation and skin irritation, particularly when outside, were said to be constant background complaints, with severe exacerbations linked to odour events. So extreme was the discomfort for some people, they described that they felt they could rip their skin. Some said that after the odours came through, their skin felt like it had been washed by acid and their skin peeled in the shower.

Infants, children and adults alike suffered from headaches. Some had been so intense that they had been investigated with CT scans and lumbar puncture.

OTHER HEALTH AND WELL-BEING COMPLAINTS

Extreme fatigue, difficulty focusing and difficulty concentrating were new and debilitating symptoms for many residents. Symptoms were worse when odours came

through. Some people could identify distinct individual odours at different times, variously described as: "rotten eggs, sickly sweet, like pine tarsal, acetone, creosote, after burn from cigarette lighter." Many people noted the association between their symptoms, wind direction and the location of the CSG waste water/evaporation ponds. Some people commented on the link between road spraying and their symptoms.

Children and adults alike complained recurrently of a metallic taste which made them nauseous and anorexic. Undiagnosed cough, repeated diagnosis of 'flu', pneumonia, pleurisy and exacerbation of asthma were recurrent themes. Children were missing a lot of school. Sleep disturbance was endemic within the families surveyed. Many people related this directly to the noise associated with CSG activities: trucks moving, reversing, beeping, the noise and vibration from drilling, fracking and seismic testing. Some people were very clear that their sleep was disturbed by noise and vibration from the compressor station, at distances up to 15km away. Many other people's sleep was disturbed by the constant strain of living with, and dealing with, the impact of CSG on their daily lives. Many expressed helplessness and hopelessness in the face of their children's ill health and their inability to help and protect them. Some had the capacity to move away and did. Most found themselves trapped.

RESIDENTS' PERCEPTION OF HEALTH CARE

Residents who felt their health was not impacted in general had few comments on health care. A couple were happy with medical services in general. Several children were seen by paediatricians in Brisbane, and the families were happy with treatment there.

Residents who felt their health had been impacted had some disturbing comments on their experience of health care. Their experiences were based on presentations to different hospitals and medical practices in the local area including Chinchilla, Dalby, Tara and the Toowoomba base hospital. At one clinic a seriously ill, febrile infant was reportedly left unseen for 1½ hours while a stream of energy workers came and went. When eventually seen, this child was transferred as an emergency first to Toowoomba and then to Brisbane.

Residents reported being turned away from medical facilities without treatment with the triage nurse making the decision whether they would be seen by a doctor or not. People commented that after a one hour trip to see the doctor, and a four hour wait they were given a survey to fill in and turned away. For one family whose children presented with rashes and cough, the triage nurse made the unusual diagnosis of "flu" and turned them away without treatment.

A patient attended hospital with chest pains to be reportedly told by the nurse: "I'm not bringing the doctor in for this." At midnight, on the advice of the medical advisor on the 13 HEALTH line, a person with severe chest pain reportedly phoned triage at one of the larger hospitals and was told to take two panadol and go to bed.

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People had the definite perception that if they questioned whether their symptoms were related to CSG they were treated differently and were shunned. A referral to the mental health service ended months later, without ever being seen, with a phone dismissal of the possibility of depression and the statement they were just frustrated with CSG.

When actually seen by the doctors the frequent impression gained was that they did not want to know. Comments included : *“just fobbed off”, “disappointing”, “unsatisfactory”, “not being taken seriously by health authorities”, “no idea why coughing”, “recurrent rashes, told dermatitis/allergy, asked about the effect of gas, told ‘just old age’”, “undiagnosed”, “treated poorly, didn’t help with anything, waited a long time for them to tell him to go home”, “given eye drops”, “given steroids”, “made him feel like a hypochondriac”, “told allergic reaction”, “given antidepressants”, “told didn’t know what it was”, “no tests”, “told all in head- worrying about nothing”, “constant flu” “chest pains unexplained”, “referred months ago-no appointment”, “doctor laughed at her when she said she had a metallic taste in her mouth”, “no diagnosis or explanation”, “demoralised by lack of treatment by Queensland health” and “bunch of idiots.”*

A paediatrician in Toowoomba told the parents that we *“are not here to discuss the gas.”* One doctor, whilst empathetic, said they couldn't get involved as they worked for Queensland Health saying *“got to stay out of this.”*

WORKERS SURVEYED

Of the 113 people surveyed, 4 worked in the CSG industry. Two of these were involved in infrastructure construction and although both had ongoing skin irritation, neither believed their health was impacted. One person, after 4 months employment in a CSG facility, began to develop severe symptoms in their hands and feet. After biopsy they were eventually diagnosed with neuropathy (nerve damage) and can no longer work. The fourth worker also has a symptomatic neuropathy which has been, without tests, diagnosed as carpal tunnel. They also suffer from severe fatigue, headaches and nausea.

DISCUSSION

This small survey is not a comprehensive epidemiological study. However it does refute the assertion that *“just a handful of people are complaining that their health is affected by CSG.”* Furthermore, the character and frequency of specific health complaints, particularly relating to potential neurotoxicity in both children and adults are concerning.

Almost all the 31 children aged 6-18 were reported to suffer from headaches to some degree, but in 17 of these children the headaches were severe and for four children constant (i.e. occurring at least twice a week). Approximately a third of the all the 48 children to age 18 (15/48) were reported to experience paraesthesia. Regardless of any potential recall bias of their pre-existing health status these numbers and the significance of these symptoms stand out as a matter of serious concern. Add to that

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reports of spontaneous nose bleeds (31 out of 96 people age 6-82 (32%)) severe fatigue (61 out of 96 people (64%)), difficulty concentrating (59 out of 96 people (61%)), eye irritation 20 out of 31 children (64%) and skin irritation 69 out of 96 people (72%) and a pattern of ill health emerges which is undoubtedly abnormal in comparison to my suburban general practice. Parents of 6 of the 17 children, aged 5 and under, were concerned about twitching or unusual movements, and parents of 5 of the 13 children who were walking were concerned about their clumsiness or unsteadiness on their feet.

Considering that the rural residential estates near Tara is the most densely settled area in Australia to have seen intensive CSG development, the effect of any health impacts there should be taken seriously and investigated comprehensively.

LICENCES, HEALTH AND THE PRECAUTIONARY PRINCIPLE

Queensland continues to issue permits for rapid CSG expansion. Approximately 40,000 coal seam gas wells are planned across Queensland. In addition to that there are permits for shale gas and underground gasification. More than 80% of Queensland is under exploration licences. This could translate to a public health disaster.

The initial licences were issued in a cloud of controversy with compelling evidence that appropriate checks and balances to vet environmental safety were not undertaken. The consequences to public health were never part of the assessment at the time of issuing the initial licences. Health impacts are still not part of the assessment for the permits which have been issued since the initial licences. The precautionary principle was ignored: *"The precautionary principle asserts that the burden of proof for potentially harmful actions by industry or government rests on the assurance of safety and that when there are threats of serious damage, scientific uncertainty must be resolved in favor of prevention."* [6](#)

QUEENSLAND GOVERNMENT'S RESPONSE TO REPORTS OF ILL HEALTH

Shortly after the data for this report had been collected, the Queensland Government released the health report it had commissioned nine months earlier. Remarkably, the health minister Lawrence Springborg concluded that there was no evidence of health effects related to CSG.⁷

However the Queensland government report states:

"In summary the most that can be drawn from the DDPHU report is that it provides some limited clinical evidence that might associate an unknown proportion of some of the residents' symptoms to transient exposures to airborne contaminants arising from CSG activities."

As their report is based on minimal industry sampling and very limited clinical investigation this finding is important.

Following the publication of the Queensland Government's health report and Lawrence Springborg's assertion that CSG workers have had no health problems, a person

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previously employed on CSG drilling rigs in a different area of Queensland was so disgusted that they contacted the Gasfields Support Group to relate their story. That data is not included in the numbers for this study. This worker's ill health included nosebleeds, spasms of the hands and extreme difficulty breathing, making it impossible to continue work. Their comment was: *"They wiped their hands of me."*

CRITIQUE OF THE QLD GOVERNMENT REPORT

The Queensland Government report appears to be an exercise in minimisation and misrepresentation. The report is based on three sources of clinical data:

- calls to a 13 HEALTH number
- presentation to doctors and hospitals in Tara, Chinchilla, Dalby and Miles and
- two clinics attended by their expert in October 2012.

FAILURE OF ADEQUATE HEALTH SYMPTOM SURVEILLANCE AND DATA COLLECTION

The report states: *"A range of information available to the Department of Health up to January 2013 was used for the assessment."* The decision then, to exclude all presentations to doctors and hospitals from 13th November 2012 onwards from the data is perplexing. It is apparent however, that if the November/December time frame had been included it would have been difficult for the author of the government report to state:

"It is worthwhile noting that the formal symptom reporting has occurred almost exclusively during the winter months (July) when the use of wood heaters and open fires could be expected to peak."

Feedback from the residents indicates that the time frame November through December coincided with a major peak in reports of illness amongst the residents and multiple emergency presentations. It was directly as a result of that peak in severe symptoms that the urine of a three year old child was tested. Testing revealed extremely high levels of hippuric acid, the major metabolite of toluene, in his urine. As soon as she was aware of the result, the mother of this child immediately contacted her local Queensland Health doctor with the contents of this report.

Toluene metabolites found at high levels in a child in a non-occupational context is worrying, taking into account the short half-life i.e. toluene is quickly metabolised. This should have prompted investigation by the health department as a matter of urgency. Toluene is a known neurotoxin, an irritant and a suspected reproductive toxin that can be absorbed via inhalation.⁸ It is known to be associated with coal seam gas⁹ and has been found repeatedly in air samples in the residential estates.

No action was taken by the health department.

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MINIMISATION OF RESIDENTS' HEALTH CONCERNS

The Queensland Government report attempts to normalise the residents' health complaints by citing various studies:

"...54% of school children age for to 18 years were reported by themselves or their parents as currently having at least one of the following skin conditions, such as acne/pimples, eczema/ dermatitis, tinea/ringworm, and warts/papilloma."



RASH, ADOLESCENT
PHOTO COURTESY OF LOCAL RESIDENT

There can be no ambiguity; the children in this study were not complaining of pimples, warts, papillomas or fungal infections; they are complaining of rashes which improve or disappear when they are removed from the gas fields. The government's defined health expert reports he saw just one rash. He was unable to offer a diagnosis. One wonders why it was not referred for further investigation.



RASH ADULT AFTER ROAD SPRAYING
PHOTO COURTESY OF LOCAL RESIDENT



RASH CHILD
PHOTO COURTESY OF LOCAL RESIDENT

The image above left shows a rash which appeared on the leg of an adult visitor to the estate after road spraying. This was diagnosed as hives.

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The report cites 34% of residents living beside a chemical waste site at Kingston in 1990 as complaining of eye irritation as though this were an acceptable benchmark against which the complaints of the people of Tara can be measured.

REPORT BY CONTRACTED MEDICAL CONSULTANT

The Queensland Government report states that Dr Keith Adam was commissioned by the Department of Health to provide an independent expert opinion on the health complaints of residents in the Tara area with particular regard for the potential for the complaints to be linked to CSG activities.

The report states:

“Dr Adams commented that his review of peer-reviewed literature in regard to occupational exposure to CSG did not identify evidence of unique or substantial harm to employees in the industry. This is highly relevant as potential exposure among workers in the industry itself could be expected to be significantly higher than in a community setting among residents located up to many kilometres from CSG sites.”

There is not a single reference in Dr Adam’s report to any study, peer reviewed or otherwise, confirming lack of harm to CSG workers.

With reference to his role as the independent expert opinion on the potential for the health complaints to be linked to CSG activities, there are some specific comments made by Dr Adam which caused me particular concern. Firstly:

“Once a well has been drilled it becomes the only conduit for gas and water to reach the surface. The two products are separated below ground, with water being transferred to centralised collection and treatment points, and the gas being piped to processing facilities where it is dried compressed and fed into commercial pipelines.”

These comments go to the heart of the underlying question: namely, is there a pathway, or are there pathways by which mixtures of volatile organic compounds (VOCs), heavy metals, radioactive materials and other chemicals associated with unconventional gas extraction can find their way on to the skin, up the noses, into the lungs and the blood stream of people who are living in close association with gas development? After all, if there were no possible pathway there could be no associated illness.

Not only is the well, after having been drilled, not the only conduit for gas to reach the surface, the Queensland Government itself recognised this and has documented the frequency of methane leaking from CSG wells in this very area. Of the 58 gas wells tested at the Queensland Gas Company (QGC) Kenya gas fields of Lauren, Codie and Kate in 2010, 26 wells (or 45%) were already leaking.¹⁰

In addition, gas migration from CSG wells is currently being investigated by scientists at Southern Cross University.¹¹ This research is in the public domain and indicates that gas migration from CSG wells is indeed occurring.

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Of interest is their comment on one of the postulated mechanisms:

"We suspect that depressurisation (fracking, groundwater pumping) of the coal seams during gas extraction changes the soil structure (i.e., cracks, fissures) that enhance the release of greenhouse gases such as methane and carbon dioxide."

Regarding gas migration into water sources, there have been several reports in both the print and electronic media of gas bubbling up in the Condamine River. Currently the Queensland Government are carrying out an investigation¹² and stated in January 2013 following a preliminary report:

"While the results of this report don't provide definite evidence of the source or cause of the gas seeps, we are taking a long-term approach to find science-based answers to this phenomenon."

A further point of concern is Dr Adam's claim that the gas and water are separated below ground. This claim bears little scrutiny. It is the intrinsic fact that there is water in the gas and gas in the water that causes so many technical problems for the industry as discussed by Peter Lather writing in Gas Today, November 2011:¹³

"Challenges unique to CSG gathering systems include dealing with significant volumes of CSG water and its associated treatment. The presence of large volumes of water creates problems in the gathering system design, as there is water in the gas and gas in the water, even after the process of separation. In order to combat this low point, drains need to be designed to siphon the water out of the gas, and high-point vents need to be designed to extract the gas from the water.", "Working out where to install vents and low-point drains can be a bit of a dark art. For example, a good location to place one of these low-point drains is at the lowest point of a pipeline, which is often in the middle of a creek or stream ..."

The Queensland Government also disagrees with Dr Adam. The Queensland Government website states:¹⁴

"When CSG comes to the surface, water in the gas is separated".

It is the fact that the methane must be separated not only from water but from its associated toxins and be "cleaned" before being shipped to markets overseas that provide many of the pathways for exposure of the local residents to volatile organic and other compounds. These processes include dehydration, compression and pumping, deliberate venting and flaring of wells and venting from high and low point valves scattered throughout the estates. Evaporation of volatile organic compounds from the giant CSG waste water ponds along with road spraying of CSG waste water provide yet more pathways for exposure.

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PIPELINE VENT LOCATED INSIDE THE TARA RESIDENTIAL ESTATES
PHOTO COURTESY OF LOCAL RESIDENT

After confirming that benzene has in fact been found on testing in the residential estates, Dr Adam goes on to say:

“Benzene is not a normal constituent of coal seam gas, and so its source is uncertain.”

This statement is directly contradicted by the Queensland Government Department of Environment and Heritage Protection website:¹⁵ *“The BTEX^{vii} compounds are found naturally in crude oil, coal and gas deposits and therefore they can be naturally present at low concentrations in groundwater near these deposits.”*

In addition, The Sydney Morning Herald reported on August 28th 2011 that *“Benzene, toluene and xylene were discovered during routine tests of 14 bores used to monitor the company's [Arrow] coal seam gas (CSG) dams at the Tipton West and Daandine gas fields near Dalby.”*¹⁶ This was a year after Benzene had been outlawed as a fracking fluid in Queensland.

Dr Adam does note that the limits of detection by the analytical method used in the study were up to thirty-six times above the health standards they were being judged against. Incredibly he chooses to dismiss that as inconsequential stating that it does not invalidate the argument that 1,1,1,2-tetrachloromethane was not exceeded at the limit

^{vii} BTEX is an acronym that stands for benzene, toluene, ethylbenzene, and xylenes

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of detection. He says: *“Despite this criticism, the testing provides comfort that despite testing for a wide range of substances, the vast majority were not able to be detected.”*

It would seem small comfort when the limit of detection is 36 times above the safety level.



METHANE VENTING SIGN, KENYA GASFIELD, TARA REGION
PHOTO COURTESY OF LOCAL RESIDENT

Denial of a problem is rarely the best method of finding a solution to it.



PIPELINE VENT FLARE AND COMPRESSOR FLARE, TARA REGION
PHOTO COURTESY OF LOCAL RESIDENT

It is not the gas that is for the export market which poses a health hazard for the people of the residential estates. It is the mixture of chemicals which are rejected and contaminate the local atmosphere, the soil or water during the process of extraction,

cleaning and drying as well as those fugitive emissions which are inadvertently released which are of concern and warrant discussion. So too does the possible mobilisation of microbes in the coal seams.¹⁷

DEFICIENCIES IN THE ENVIRONMENTAL ASSESSMENT AND TESTING

The environmental air testing programme carried out by QGC, the gas company implicated in the health impacts, was extremely limited and inadequate in every aspect with only 13 air samples being collected. Despite this, many volatile organic compounds were detected. For 26 chemicals the detection level used was significantly higher than the health standard.

Although benzene, a known human carcinogen was detected at a level which demonstrably exceeded its reference criteria, its significance was dismissed. According to The World Health Organisation, because it is carcinogenic, no safe level of exposure to benzene can be recommended.¹⁸ The Ontario standard is 0.13 ppb while the Queensland air standard is 3 ppb, a level 23 times higher. Benzene was detected at Tara at 0.6 ppb. Four other samples reported benzene as <0.17ppb. Disturbingly the author of the Queensland Government report tried to dismiss the significance of this by saying that in suburban Springwood in Brisbane, air monitoring revealed the monthly maximum for benzene from Nov 2011 to October 2012 ranged from 0.9-1.3ppb. Far from this being an explanation or defence, it simply emphasises the poor level of air standards (in relation to world's best practice) which are acceptable to the Queensland government.

The airshed of urban Springwood is, by the Ontario standard, significantly contaminated and therefore associated with an increase in chronic health effects. Turning the airshed of a country area into one which is equally contaminated is not the appropriate solution.

The Queensland Government report recognises that *“the air monitoring programme had important limitations. The total limiting period was 9 days, the methodology resulted in limits of reporting for some analytes that were substantially higher than reference air quality criteria and the monitoring was not designed to identify short term peaks or troughs in air concentrations. It is considered a more strategic air quality monitoring programme could be implemented to provide more useful information....”*

An ad hoc limited odour sampling programme was initiated by the DEHP.

From a toxicological point of view odour does not necessarily correlate with an exposure of concern. However the summa canisters, of which a very limited number were available to the residents over this time period, were released in response to odour events. They detected a cocktail of toxic, irritant, volatile chemicals many of which individually or in combination were capable of causing irritation to the eyes, skin, nasal mucosa and respiratory tract along with systemic effects when absorbed. Carbon monoxide was not one of the chemicals tested following resident initiated sampling. Carbon monoxide is formed by incomplete combustion during flaring and is part of the

diesel emissions during drilling and fracking. It is slowly removed from the body, and episodic exposure causes neurotoxic symptoms particularly in children.

| Summa canister | Passive |
|--|--|
| acetone, acrolein, chloromethane, dichlorofluoromethane, ethanol, hexane, methylene chloride, methyl ethyl ketone, propene, toluene, vinyl acetate | alpha-pinene, benzene, benzothiazole, cyclohexane, ethyl acetate, ethylbenzene, 2-ethyl-1-hexanol, heptane, hexane, heptadecane, hexadecane, 2-methylbutane, methylcyclohexane, 3-methylhexane, 3 methylpentane, naphthalene, pentane, phenol, tetradecane, tetrachlorethylene, 1,2,4-trimethylbenzene, toluene, xylene. |

TABLE 2 CHEMICALS DETECTED DURING SAMPLING

Some phenols have been shown to have impacts on the endocrine system of living organisms.¹⁹ Endocrine disrupting chemicals can have impacts at very low levels.²⁰ Other chemicals used by the CSG industry are considered dangerous at concentrations near or below chemical detection limits. These include glutaraldehyde, brominated biocides (DBNPA, DBAN), propargyl alcohol, 2-butoxyethanol (2-BE) and heavy naphtha.²¹

Acrolein, an acute irritant to the eyes, nose, throat, lungs and skin, was reported at 0.5-0.6ppb in three samples. The Ontario 24 – hour criteria is 0.17ppb and the Texas annual criterion is 0.066 ppb. The report dismissed these findings saying it would be incorrect to attribute concern to these 30-60 second samples ‘*as the exposure period decreases eg from 24 hours (or even annual) to just a few minutes, an acceptable exposure level increases.*’ This logic is inexplicable since it presumes that the author knows how long the residents were exposed to acrolein. The exposure did not stop at the end of the 30-60 second grab sample. The report states that passive sampling over three weeks did not identify the presence of acrolein. Drilling, fracking, venting, flaring and road spraying occurred in varying locations and with varying frequency throughout the duration of the Queensland government investigation. One would expect certain chemicals to be associated with the timing of specific processes. The fact that one particular chemical was not detected in a particular 3 week period during the 9 months but was detected at high levels at other times, primarily by way of resident initiated tests, confirms the inadequacy of the testing programme.

For further information on acrolein, refer to the U.S. Department of Health And Human Services document ‘Toxicological profile for Acrolein’.²²

In summary the Queensland Government report appears to be at best a highly flawed inadequate investigation, unable to draw conclusions due to lack of appropriate data – at worst it could be interpreted as a cynical exercise to dismiss significant health concerns in the face of large financial profits.

EXPLORING THE EVIDENCE

The Queensland Health report did not undertake an extensive review of the evidence in relation to the health impacts of unconventional gas.

The underlying questions remain:

1. Are these health and well-being concerns legitimate?
2. Is there any independent supporting evidence to link these symptoms to unconventional gas exposure?

A search of the literature shows that there is a growing body of evidence documenting the adverse health impacts of unconventional gas development.

McKenzie et al (May 2012)²³

This study found that residents living $\leq \frac{1}{2}$ mile from wells are at greater risk for health effects from natural gas developments (both cancer and non-cancer) than residents living further away. Subchronic exposures to air pollutants during well completion activities presented the greatest potential for health effects.

Colburn et al (September 2011)²⁴

The technology to recover natural gas depends on undisclosed types and amounts of toxic chemicals..... More than 75% of the chemicals could affect the skin, eyes and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40% to 50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations. These results indicate that many chemicals used during the fracturing and drilling stages of gas operations may have long term health effects that are not immediately expressed.

It should be noted that many of the chemicals used for drilling and hydraulic fracturing in Australia have not been assessed for their impacts on human health and the environment. Of the 23 identified as commonly used 'fracking' chemicals, only 2 had been assessed by the national regulator, National Industrial Chemicals Notification and Assessment Scheme (NICNAS) and neither was for their use in CSG.²⁵

Shale gas roulette (October 2012)²⁶ A study undertaken in Pennsylvania

25 most prevalent symptoms: fatigue (62%), nasal irritation (61%), throat irritation (60%), sinus problems (58%), eyes burning (53%), shortness of breath (52%), joint pain (52%), feeling weak and tired (52%), severe headaches (51%), sleep disturbance (51%), lumbar pain (49%), forgetfulness (48%), muscle aches and pains (44%), difficulty breathing (41%), sleep disorders (41%), frequent irritation (39%), weakness (39%), frequent nausea (39%), skin irritation (38%), skin rashes (37%); depression

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(37%), memory problems (36%), severe anxiety (35%), tension (35%), and dizziness (34%)

“Contaminants that are associated with oil and gas development are present in air and water in areas where residents are experiencing health symptoms consistent with such exposures”, “Permitting widespread gas development without fully understanding impacts is risking public health”

Krzyzanowski (June 2012)²⁷

Northeast British Columbia has experienced increased rates of cancer and other illness due to contaminants and stressors associated with unconventional gas.

TEDX (November 2012)²⁸

Weekly air sampling for one year revealed that the number of non-methane hydrocarbons (NMHCs) and their concentrations were highest during the initial drilling phase. Methylene chloride, a toxic solvent not reported in products used in drilling or hydraulic fracturing, was detected 73% of the time; several times in high concentrations. Many of the NMHCs had multiple health effects, including 30 that affect the endocrine system, which is susceptible to chemical impacts at low concentrations, far less than government safety standards. Selected polycyclic aromatic hydrocarbons (PAHs) were at concentrations greater than those at which prenatally exposed children in urban studies had²⁹ lower development and IQ scores.

NIOSH (May 2012)³⁰

The American occupational health and safety organisation has highlighted the serious risks of cancer and chronic lung disease from silica (which is used in fracking and which the industry regularly innocuously refers to as “sand” There are risks of inhalation at every stage through quarrying, road transportation, and for workers on the well sites as well as residents nearby). Following on from their research they issued Silica sand Hazard Alert in April 2012.

American Academy of Pediatrics (December 2012)³¹

This document lists 12 chemicals used in fracking or found in the brine drawn out of the well which are of particular concern to the authors. They state *“most physicians will recognize that these are highly toxic substances”*

Below is an extract regarding 4 of the 12 chemicals.

ACETIC ANHYDRIDE- Severe irritation of eyes, upper respiratory mucous membranes and skin to very low concentrations. Permanent corneal scarring. Explosion related injuries

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ETHYLENE GLYCOL- acute: neurotoxicity, cardiopulmonary effects, renal. Low dose effects, eyes, nose and throat.

TOLUENE- Noncancer acute effects: Neurotoxic, fatigue, drowsiness, headaches, nausea, unconsciousness. Noncancer chronic effects: CNS depression, ataxia, tremors, cerebral atrophy, impaired speech, hearing and vision, Inflammation and degeneration of nasal epithelium, pulmonary lesions. Maternal reproductive: increased spontaneous abortions. Developmental: neurotoxicant, attention deficit, cranio-facial and limb anomalies.

BENZENE- IARC Group 1 Carcinogen: Leukemia (acute myelogenous). Noncancer acute effects: Neurological: drowsiness, headaches, unconsciousness, convulsions. Skin, eyes and upper respiratory tract Irritation GI: Nausea, vomiting. Noncancer chronic effects: Blood dyscrasias, aplastic anemia, excessive bleeding, leukopenia Immunosuppression. Developmental: low birth weight, delayed bone formation.....

CONCLUSION

The unconventional gas industry has been allowed rapid, unfettered expansion in Queensland within recent years without taking into account the consequences to public health.

Experts in human health have been excluded from all decision making regarding CSG and other types of unconventional gas development in Australia despite this controversial industry being permitted and imposed in close proximity to human habitation. Studies documenting the serious health consequences have been already published overseas. It is essential that medical specialists relating to all aspects of human health, (paediatricians, oncologists, endocrinologists, neurologists, toxicologists, obstetricians and others) are urgently involved in decision making relating to the unconventional gas industry.

The population of the rural residential estates on the Western Downs near Tara is among the most densely settled cohort in Australia to have, so far, lived in close proximity to intensive unconventional gas development. Without any formal system in place to monitor the effect on human health of this industrial process, they have in effect become the sentinel population, the human equivalent of the canary in the coal mine.

This study shows a pattern of reported symptoms that is very concerning. In particular, a high percentage of the residents surveyed had symptoms of which could relate to neurotoxicity, including tingling, paraesthesia, numbness, headaches, difficulty concentrating and extreme fatigue. Of particular concern was the high percentage of symptomatic children, with paraesthesia being reported for almost a third of surveyed children to age 18, and headaches being reported for more than 70%. This is not a pattern of reported illness which is expected and should prompt an urgent and comprehensive response.

There are serious questions to be answered by the previous Queensland Government in relation to their due diligence in the process of permitting these gas developments. I believe there are also serious questions to be answered by the current Queensland Government in regard to their due diligence in investigating the harm that was reported to them by residents of the residential estates.

It is vitally important that the politicians of Australia, both state and federal, understand that they have a duty of care to the citizens of this nation. If the health implications of the unconventional gas industry continue to be ignored and the industry is allowed to develop along its current path, the potential exists for serious and widespread harm to human health across Australia.

RECOMMENDATIONS

1) A fully funded comprehensive medical assessment of residents currently living in proximity to unconventional gas development should be carried out as a matter of urgency. The residents of the rural residential estates and surrounding neighbourhoods on the Western Downs are an obvious first priority, but it should not be forgotten that throughout rural Queensland there are even more remote locations where isolated families have been living in close proximity to gas development.

2) Considering the toxins that residents could potentially have been exposed to, fully funded, long term epidemiological studies are necessary to track the health of people exposed to unconventional gas over the next several decades. These studies should be set up as a matter of urgency. It is important to include people who may already have left the area because of health concerns. The census of 9th august 2011 could provide data on residency at that point in time. The long term health of workers in the industry requires long term surveillance also. In this case baseline health studies are already available in the form of pre-employment medicals. For their own future reference, I would advise all workers to acquire a copy of their pre-employment medical under freedom of information.

The cause of human health impacts may not be simple, that is a single chemical culprit, but be the cumulative impact over time of several related or unrelated chemicals. It is the interactions of a mixture of chemicals both outside and inside the body which warrant investigation. If one compound prevents the breakdown or excretion of other compounds from the body then unforeseen toxicity can result. If solvents are part of the mix, then the blood brain barrier may be compromised, with serious and unpredictable consequences.^{viii}

3) Health impact assessments must be an integral part of any and every unconventional gas development. No new permit should be issued without one, and health impact assessments should be carried out for every development already in place.

^{viii} Dr John Polglase private email/Dr David Brown PSE

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4) Comprehensive air and water monitoring (an open, ongoing and unlimited information loop) is essential. If we are looking at possible non beneficial human health impacts we need to look at all the gases and volatiles both natural and derived emitted via well drilling, gas and pipeline valves, leaking wellheads, flaring, and other processes involved in gas collection/purification/refining to export specifications. This monitoring is urgently required. It must be independent, unbiased, fully funded and available for public scrutiny preferably in real time and in electronic form.

5) Gas companies must be required to fully and openly disclose in a timely manner, all chemicals, and all quantities of chemicals, used or planned to be used for drilling, fracking, cleaning, dehydration, and other processes at every gas facility. All historical results they have of analyses of air, soil and water should be available for public scrutiny.

6) The federal government must develop legislation to protect public health in general but from the impacts of unconventional as development in particular. Public health legislation occurs at state level and it is important to have a unified standard and approach to public health across Australia.

7) Thought must be seriously given to what the future for the unconventional gas industry should be in Australia. Politicians must engage in public debate. Consideration of the health impacts of unconventional gas development should be added to the national debate on its future.

The questions which require answers are:

a) Is it simply enough to provide buffers around residential developments? If so how far should the buffer extend? It should be noted that New South Wales's proposed 2km buffer from a residential development of 1000 people or more would not have protected a single resident of the Tara estates.

b) If it is confirmed that the health of the residents of the Tara estates is impacted, should they be rehoused? If so where and at cost to whom?

c) What would the effect of loss or contamination of agricultural land and possible insecurity of food supply have on the future health of the population?

d) What would the effect of degrading or depleting the aquifers of the Great Artesian Basin and possible insecurity of fresh water supply have on the health of Australia?

e) If methane emissions accelerate global warming what impact will that have on our health?

If these questions are still unanswered should the activities of an industry which was imposed upon communities in Queensland in such controversial circumstances remain unchecked? Or is this the asbestos equivalent of the 21st century and no matter how unpalatable and how unprofitable, difficult decisions need to be made.

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APPENDIX A – QUESTIONNAIRES

Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Part 1- Environmental details of each household

CSG HEALTH QUESTIONNAIRE

Name

Survey number

Date

Address

Occupants

| | Name | age | Relationship |
|--|------|-----|--------------|
| | | | |
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| | | | |

How long have you lived on the property?

House structure

| | | | | |
|--------|---------------|--------|-------------|-------|
| Single | Double storey | wooden | Brick/ slab | other |
|--------|---------------|--------|-------------|-------|

Size of property

Power source

| | | | |
|-------------------|-------|-----------|-------|
| Mains electricity | Solar | Generator | Other |
|-------------------|-------|-----------|-------|

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Name survey no

Water supply

| | Drinkin g | cookin g | Washin g dishes | Washin g clothes | Bathin g | Vegetabl e garden | Domesti c animals | othe r |
|--------------------|--------------|-------------|-----------------------|------------------------|-------------|----------------------|-------------------------|-----------|
| Town | | | | | | | | |
| Trucked | | | | | | | | |
| Bottled | | | | | | | | |
| Rainwater tanks | | | | | | | | |
| Dam | | | | | | | | |
| Bore | | | | | | | | |
| River/cree k | | | | | | | | |
| other | | | | | | | | |

Water storage, type of tanks

How is water treated before use?

Home environment

| | | | |
|-----------------|--------------|-------------------------------|------------|
| Air conditioner | Air purifier | Central heating(gas) (oil) | Gas stove |
| Electric stove | Fireplace | Wood stove | humidifier |

Have you recently acquired new furniture, carpet or refinished furniture?

Yes, no

Are pesticides or herbicides (bug or weed killers; flea and tick sprays, collars powders or shampoos) used in your home or garden, or on pets?

Yes, no

To your knowledge, when did CSG activity start?

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| Closest infrastructure | distance /quantity | Direction |
|------------------------|--------------------|-----------|
| Wells | | |
| Ponds | | |
| High point valves | | |
| Low point valves | | |
| Compressor stations | | |
| Dehydration plants | | |
| Pipelines | | |
| other | | |

Name

Survey no

Usual wind directions

Relative to your home, which companies have gas infrastructure and in which direction?

On or near your property are you aware of the following And if so since when?

| Odours | Unusual cracking of soil | Bubbling in puddles | Bubbling of river/creek |
|--------|--------------------------|---------------------|-------------------------|
| | | | |

Do you have domestic animals/birds on the property?

| Cattle | sheep | goats | Pigs | chickens | ducks | Dogs | cats | Pet birds | other |
|--------|-------|-------|------|----------|-------|------|------|-----------|-------|
| | | | | | | | | | |

Have you noticed any unusual illness amongst the livestock?

Birds – loss of feathers, unexpected death

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Dogs- rashes, change in temperament/ apparent pain / unexpected death/

Have you noticed any change in health or numbers of native animals, birds or frogs?

If so what and since when?

Part 2- Individual questionnaire for each person within each household

Past history questionnaire

Name

survey no

Health prior to CSG development

| DIAGNOSIS | Yes | No |
|----------------------------|-----|----|
| asthma | | |
| allergies | | |
| eczema | | |
| COPD | | |
| Heart attack | | |
| stroke | | |
| Peripheral neuropathy | | |
| Carpal tunnel | | |
| Diabetes | | |
| Epilepsy | | |
| Other neurological problem | | |
| Skin cancer | | |
| Other cancer | | |
| Congenital heart disease | | |
| | | |

Conditions diagnosed since CSG development

Name

Survey

no

Do you believe your health has been adversely affected by CSG?

yes no

uncertain

If yes, explain how you feel your health is impacted. Describe symptoms. Relate specific incidents / frequency and duration of exposures / frequency and duration of symptoms/ time frame of symptoms related to weather events and known specific gas

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field activities. Describe odours- if there are different odours do you notice any difference in symptoms?

If medical attention sought: where, from whom and how frequently?

What was the outcome?

If medical attention not sought, reasons why not

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Child age 6-adult questionnaire

Name.

Survey number

Age

male female

smoker non-smoker

date

| | In the two years prior to CSG development how often did you suffer from; | | | | Since CSG development(in the past 1-2 years) how often have you suffered from; | | | |
|---|--|------------------|-------|----------------|--|------------------|-------|----------------|
| | Never | Occasionall y | often | Constantl y | Never | Occasionall y | often | Constantl y |
| Eye | | | | | | | | |
| Streaming eyes | | | | | | | | |
| Nasal burning | | | | | | | | |
| Blood from nose on wiping | | | | | | | | |
| Spontaneous nose bleeds | | | | | | | | |
| Mild headaches | | | | | | | | |
| Severe headaches | | | | | | | | |
| Cough | | | | | | | | |
| Chest discomfort | | | | | | | | |
| Chest tightness | | | | | | | | |
| Difficulty breathing | | | | | | | | |
| Severe chest pain | | | | | | | | |
| Irregular heartbeat | | | | | | | | |
| Skin irritation | | | | | | | | |
| Rashes | | | | | | | | |
| dizziness | | | | | | | | |
| Severe fatigue | | | | | | | | |
| Difficulty concentrating | | | | | | | | |
| Difficulty sleeping | | | | | | | | |
| Depression/ anxiety | | | | | | | | |
| weakness | | | | | | | | |
| forgetfulness | | | | | | | | |
| nausea | | | | | | | | |
| vomiting | | | | | | | | |
| Stomach pains | | | | | | | | |
| Muscle pains/ spasms | | | | | | | | |
| Tingling /numbness hands / feet/ head | | | | | | | | |

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| | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|
| seizures | | | | | | | | |
| Collapse | | | | | | | | |
| Sore joints | | | | | | | | |

Never:- never. Occasionally :- has happened ever (in the time frame), few times, sporadic. Often:- recurring, regular, frequent. Constantly :- at least twice per week.

Age 0-5 questionnaire

Infants / Children

Name survey number

Age male female date

History by mother / father /

Have you noticed or been concerned by any of the following:

| | | | |
|---------------------------------|---|--|--------------------------------------|
| Unexplained inconsolable crying | Rashes | Fits /seizures | Poor feeding |
| Unusual irritability | Delayed development | Twitching /unusual movements | Failure to thrive |
| Unusual lethargy | Poor colour /blueness around mouth or limbs | If walking, unusual clumsiness unsteadiness or falls | Unusual susceptibility to infections |
| Eye irritation | Streaming eyes | Blood from nose | |
| Cough | Difficulty breathing | Unexplained vomiting | Difficulty sleeping |
| | | | |
| Headaches | Stomach pains | Sore limbs | Muscle spasms |
| Tingling hands feet head | Burning nose | | |

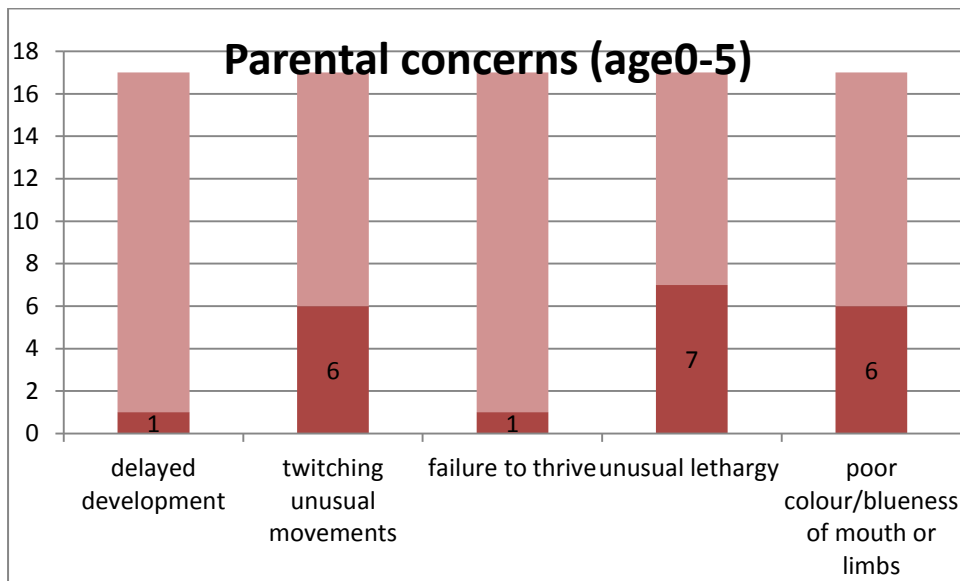
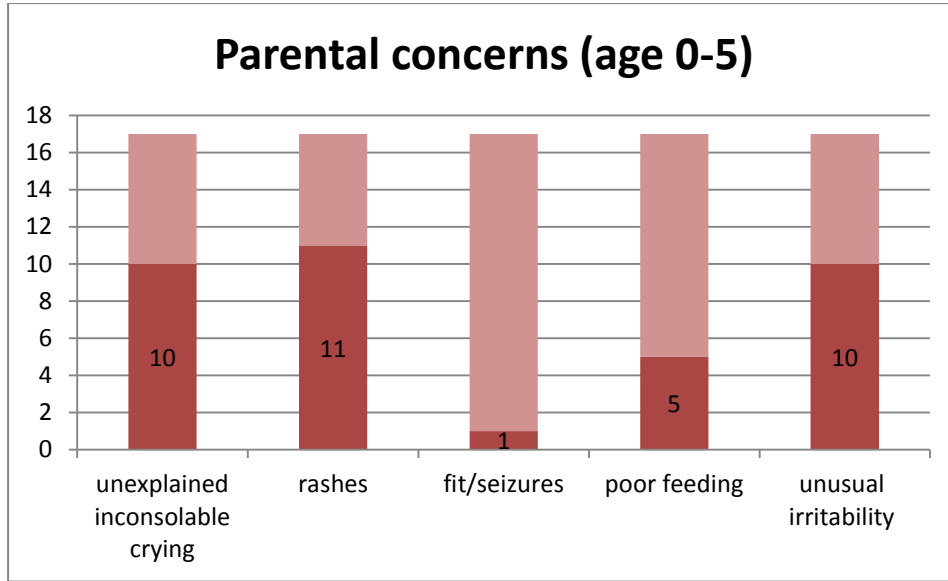
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APPENDIX B – DATA CHARTS

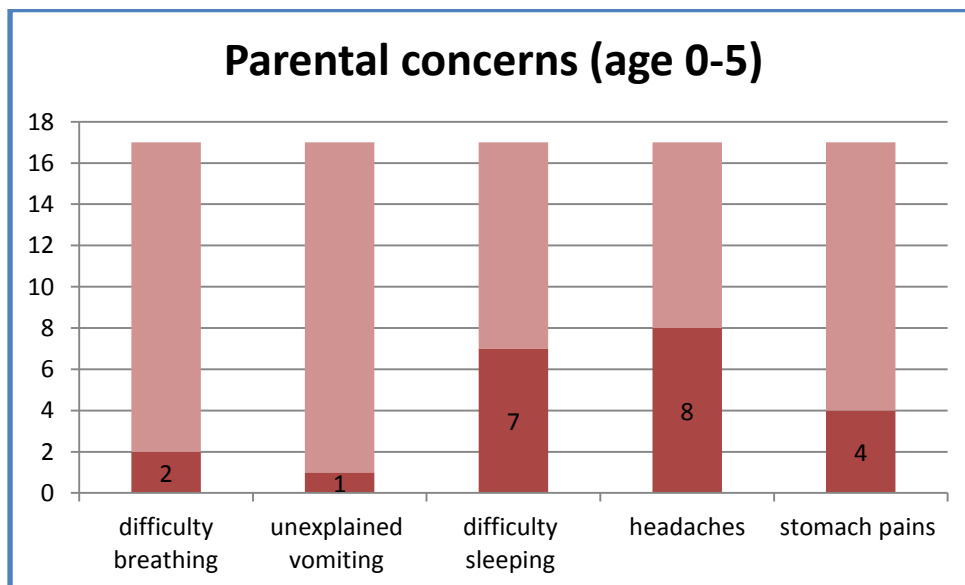
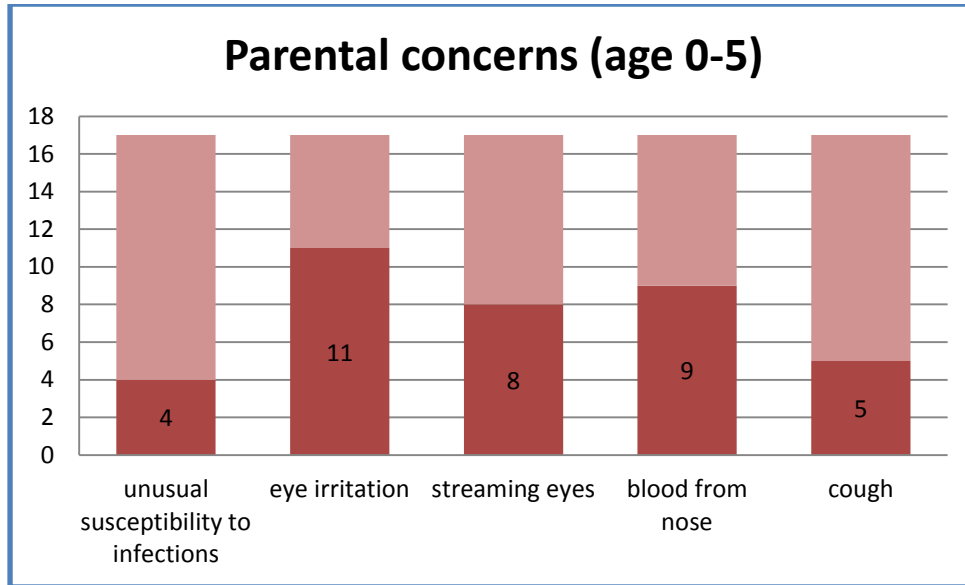
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Parental Concerns age 0-5

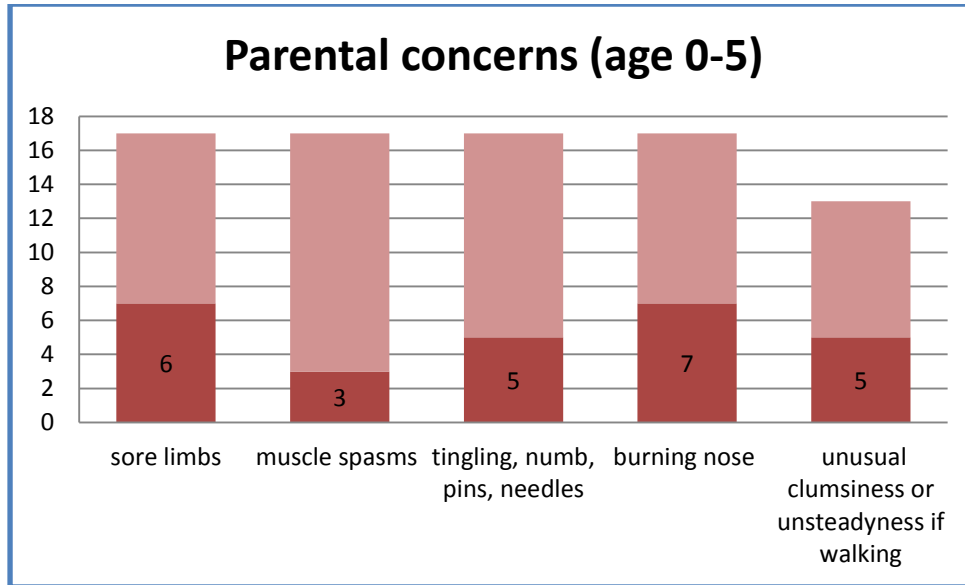
Bar Charts



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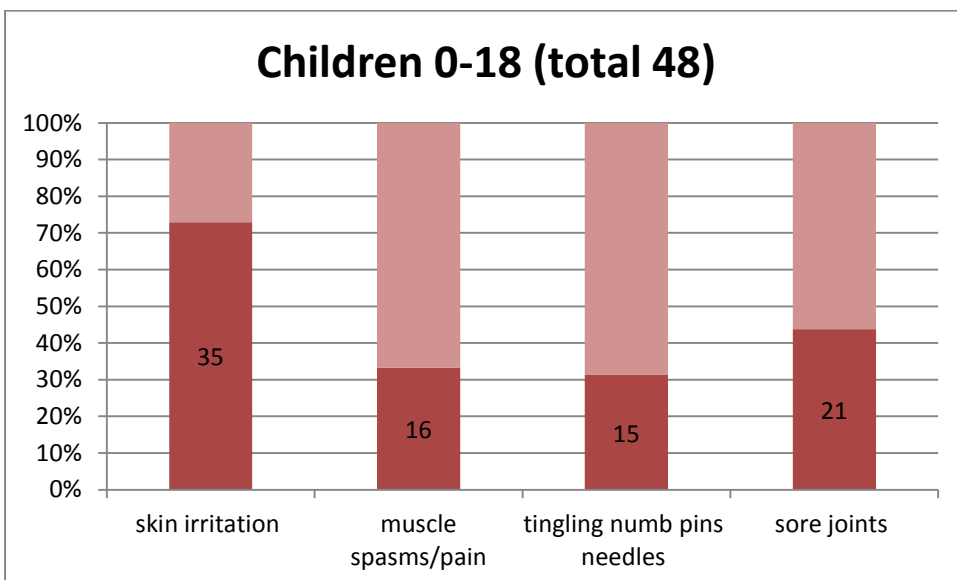
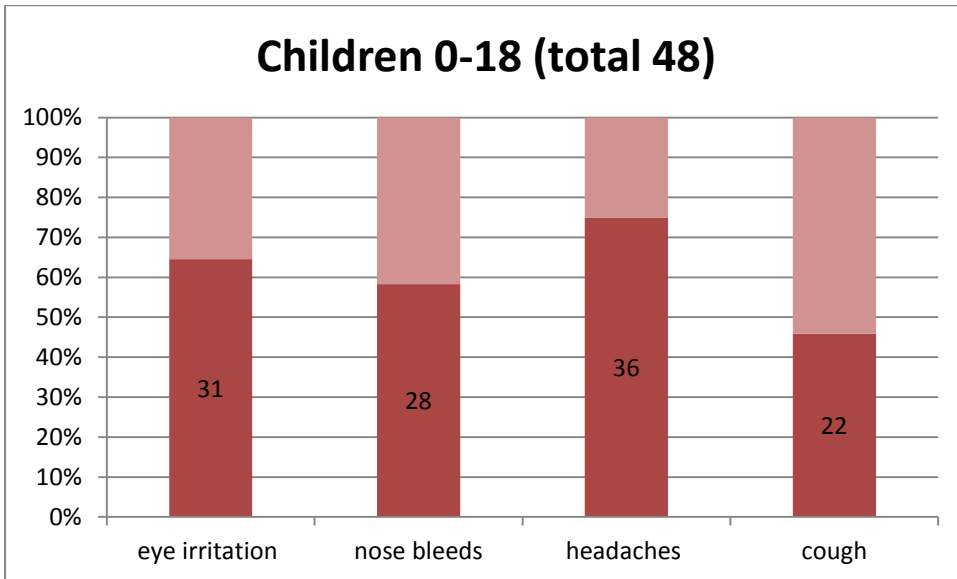


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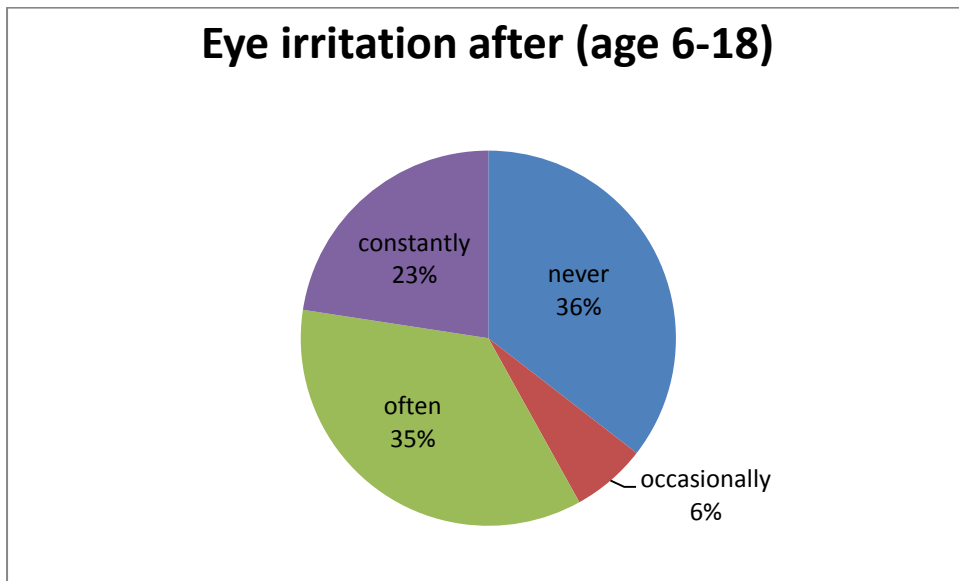
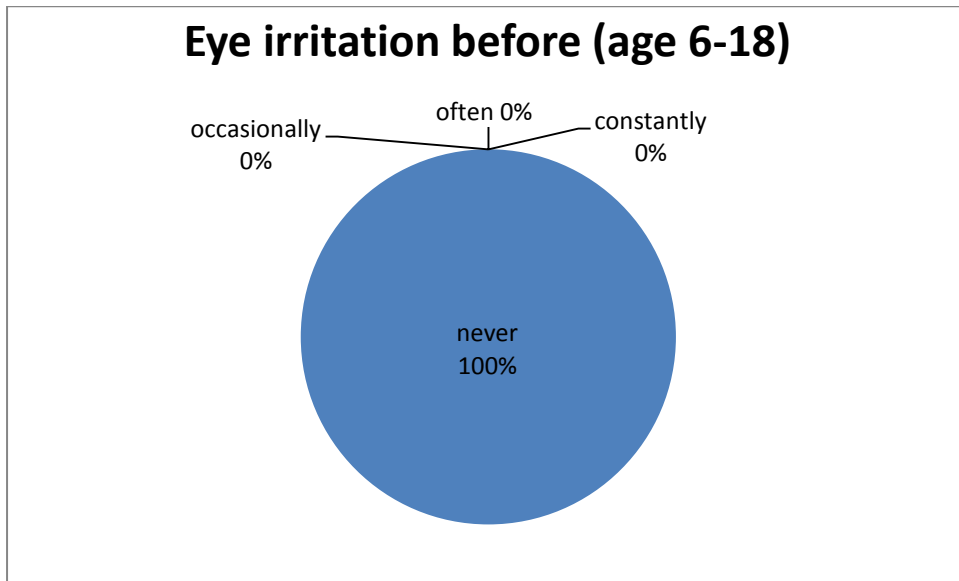
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Children age 0-18, Percentage symptomatic - Bar Charts



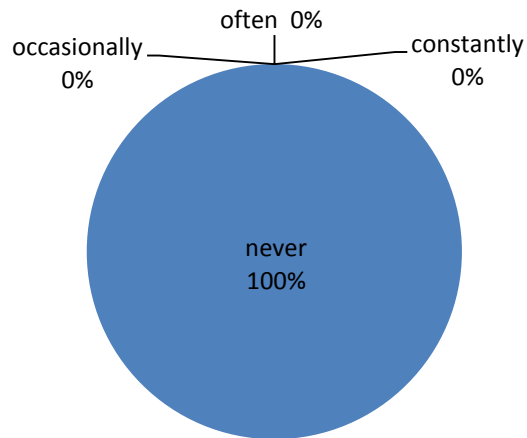
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Age 6-18 Symptoms reported before and after Coal Seam Gas exposure - Pie Charts

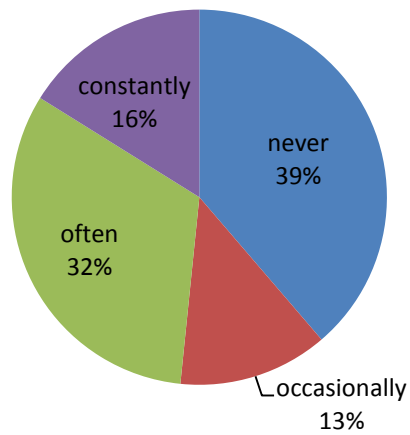


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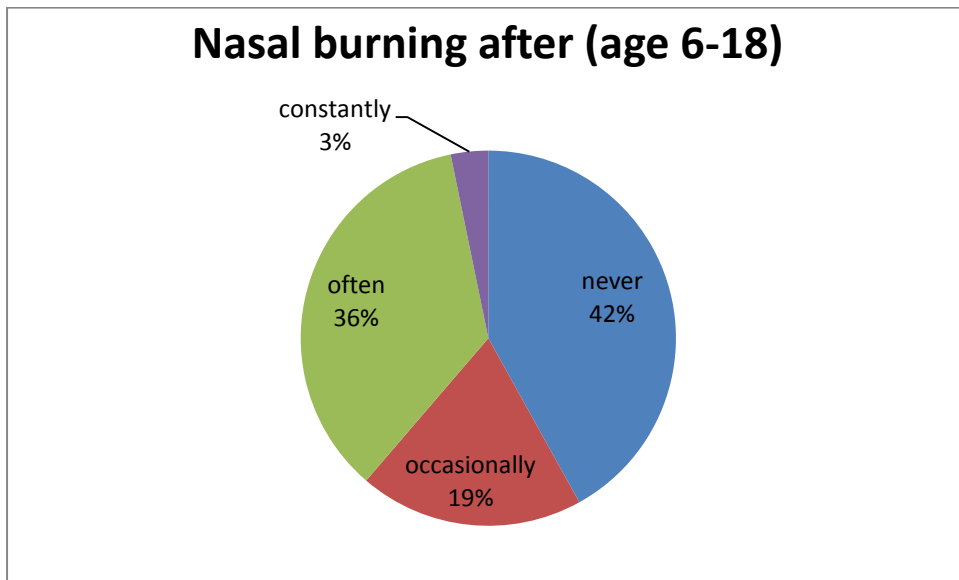
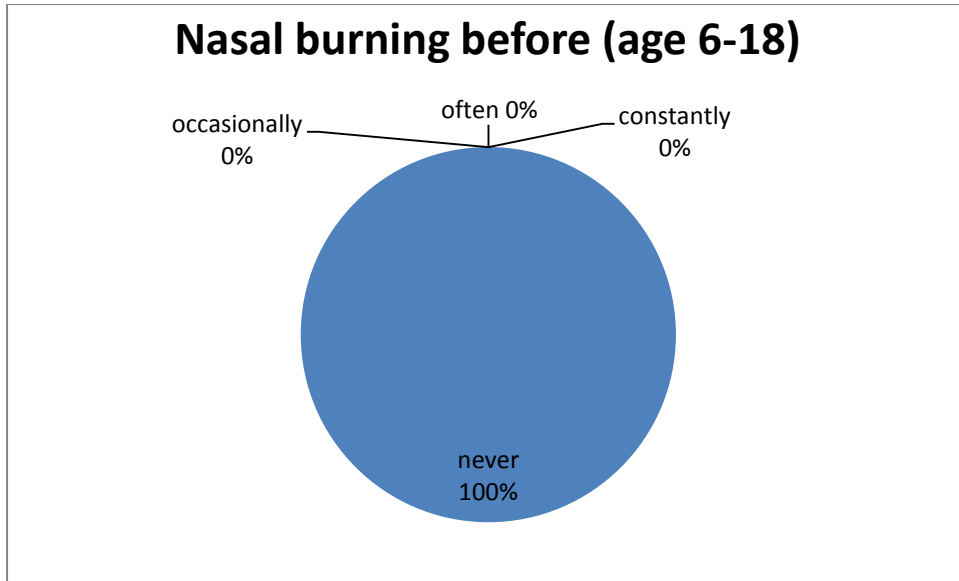
Streaming eyes before (age 6-18)



Streaming eyes after (age 6-18)

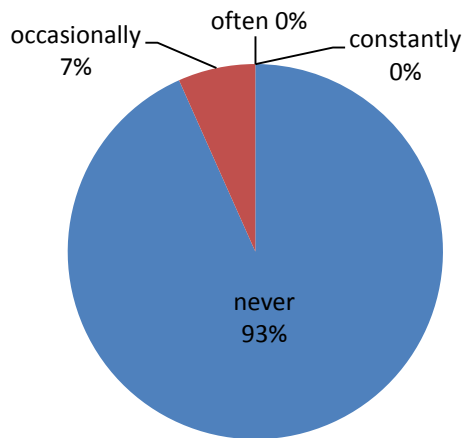


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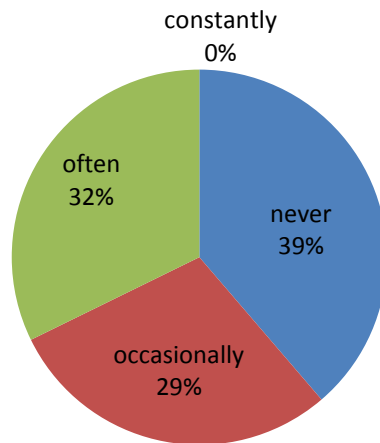


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Blood nose on wiping before (6-18)

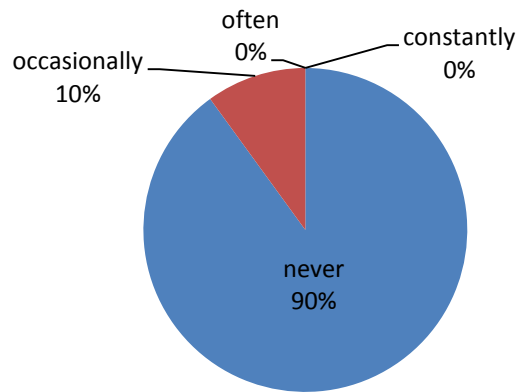


Blood nose on wiping after (age 6-18)

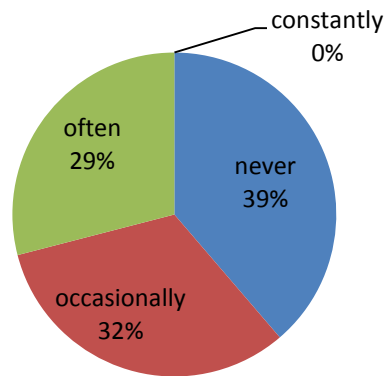


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Spontaneous nose bleeds before (age 6-18)

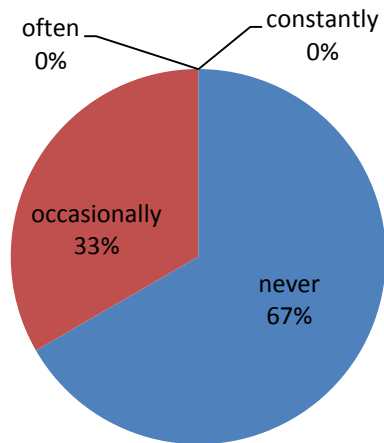


Spontaneous nose bleeds after (age 6-18)

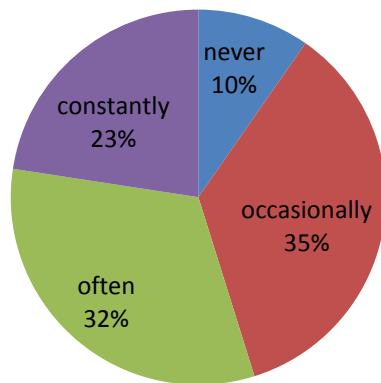


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

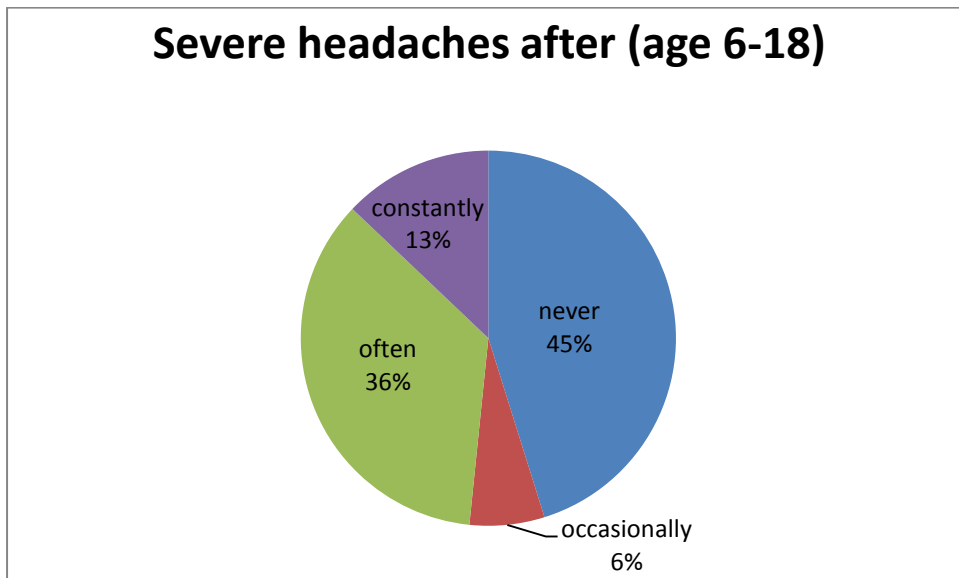
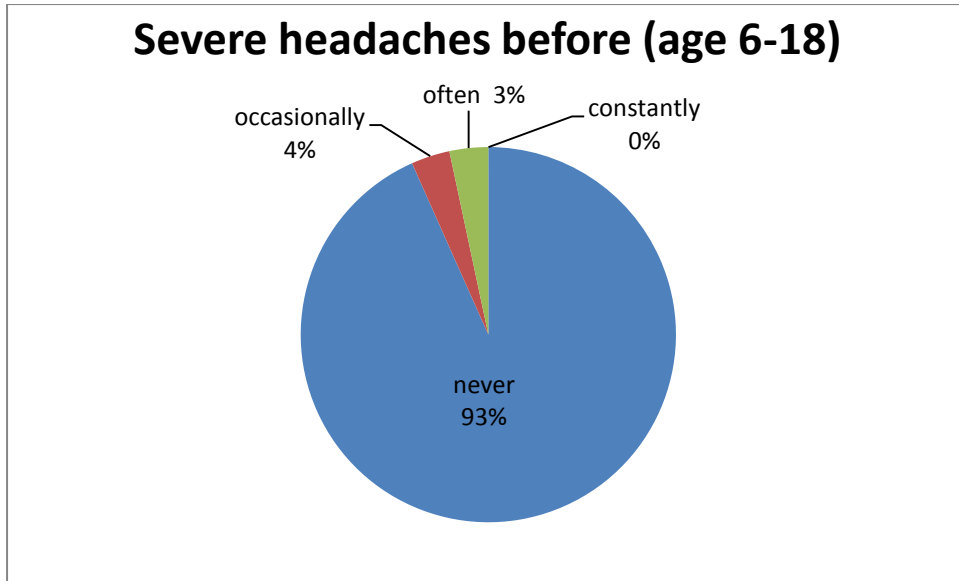
Mild headaches before (age 6-18)



Mild headaches after (age 6-18)

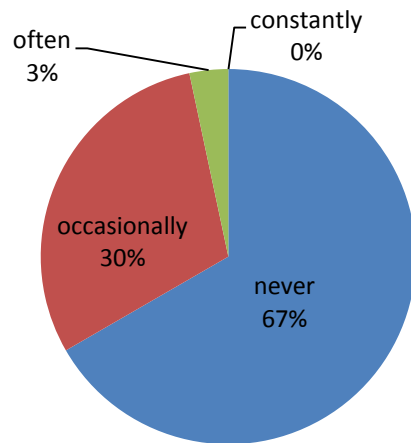


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

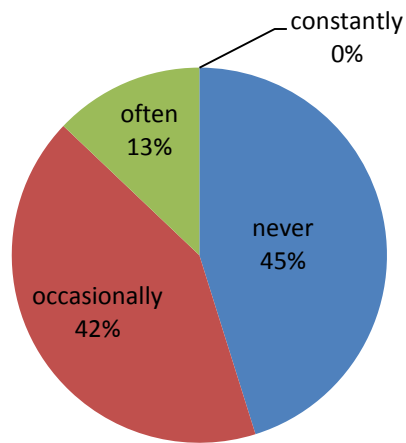


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

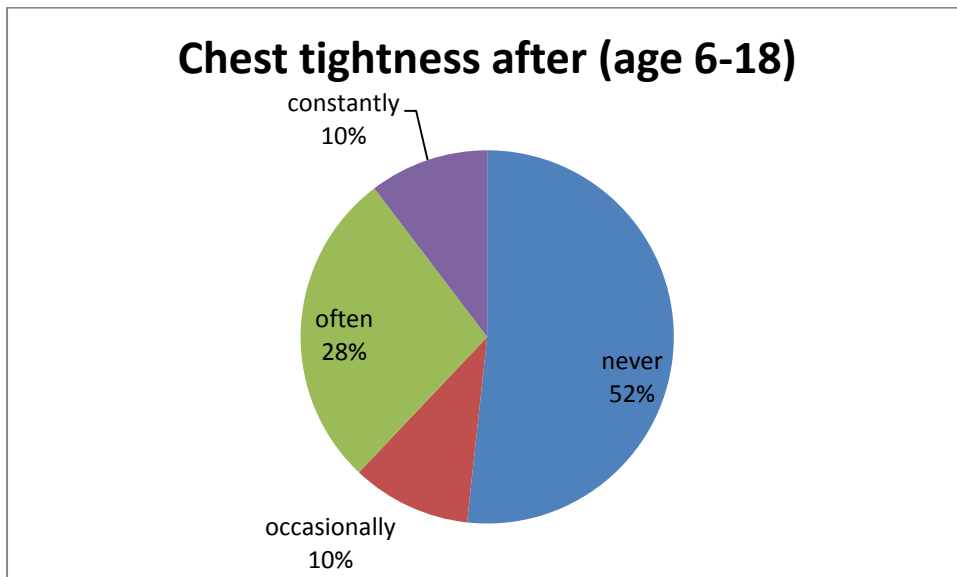
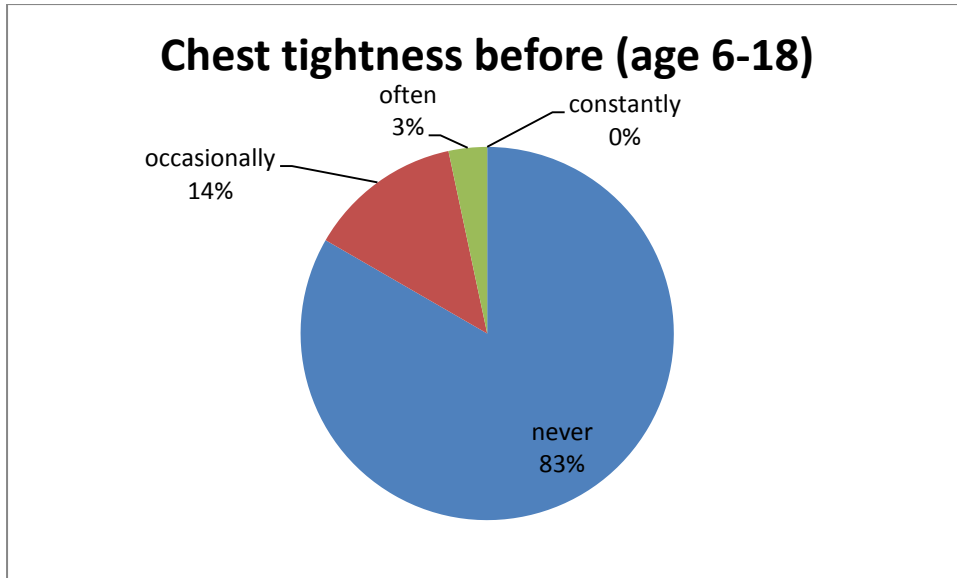
Cough before (age 6-18)



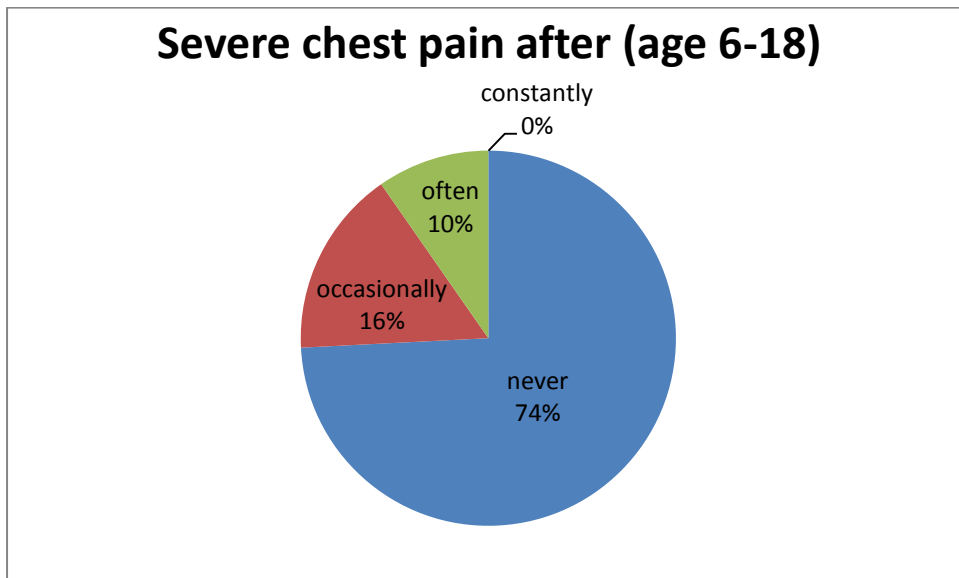
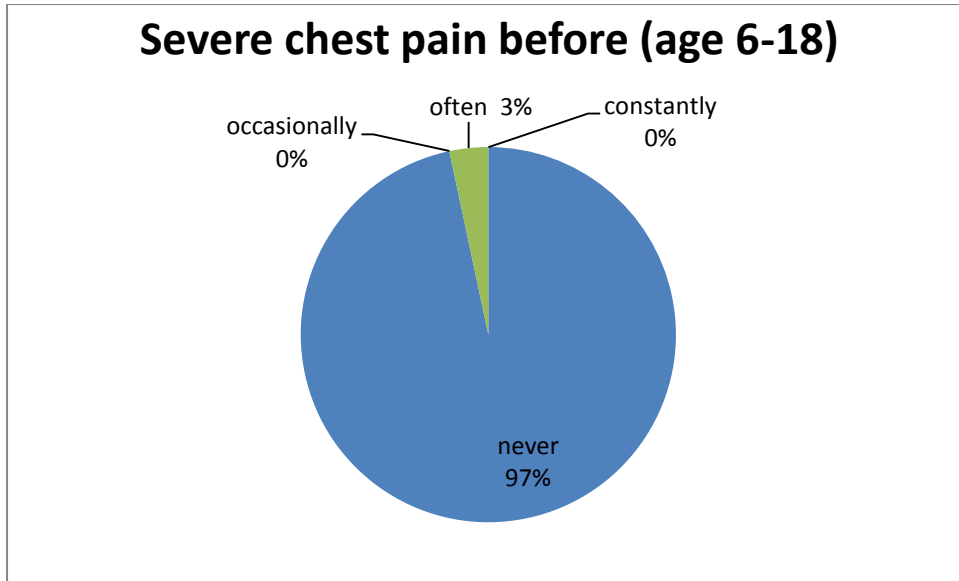
Cough after (age 6-18)



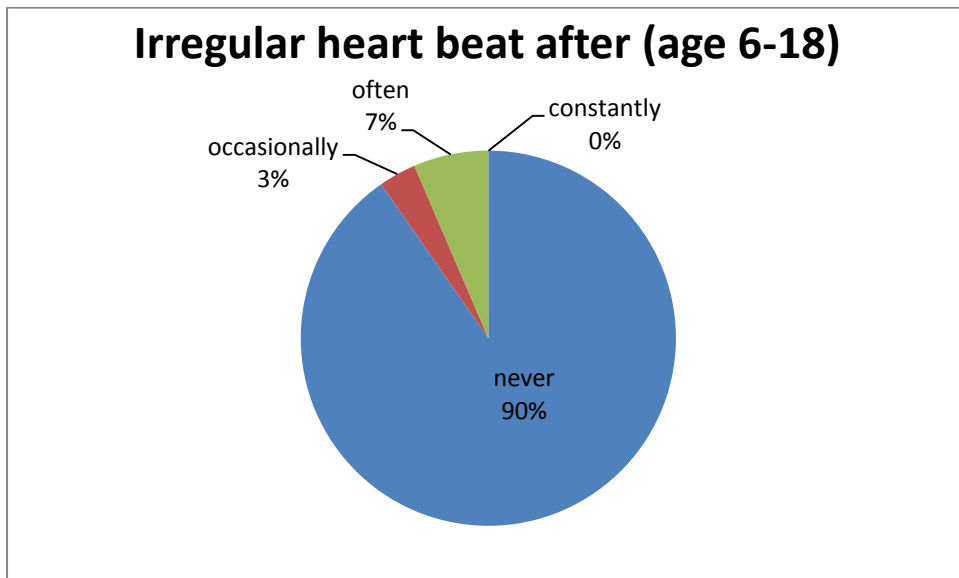
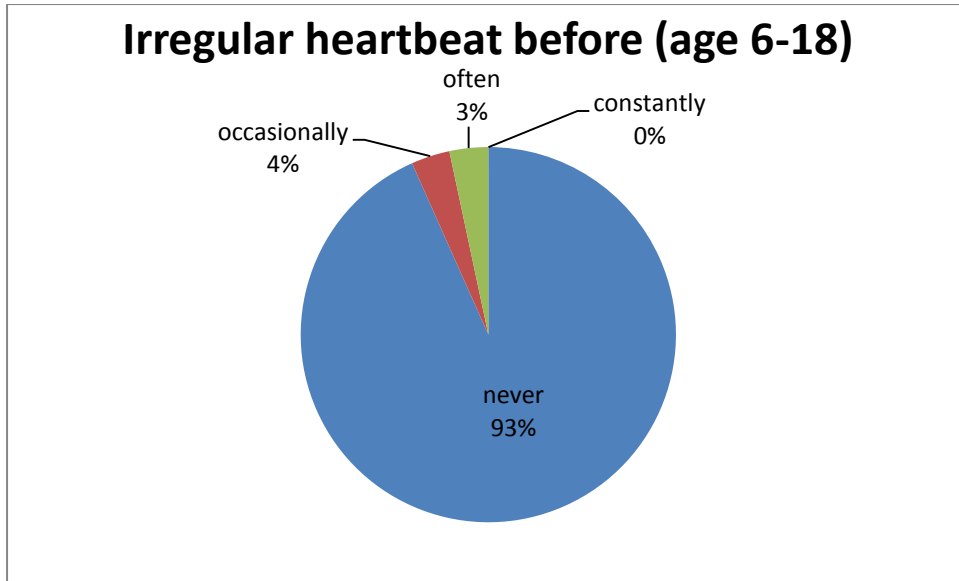
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



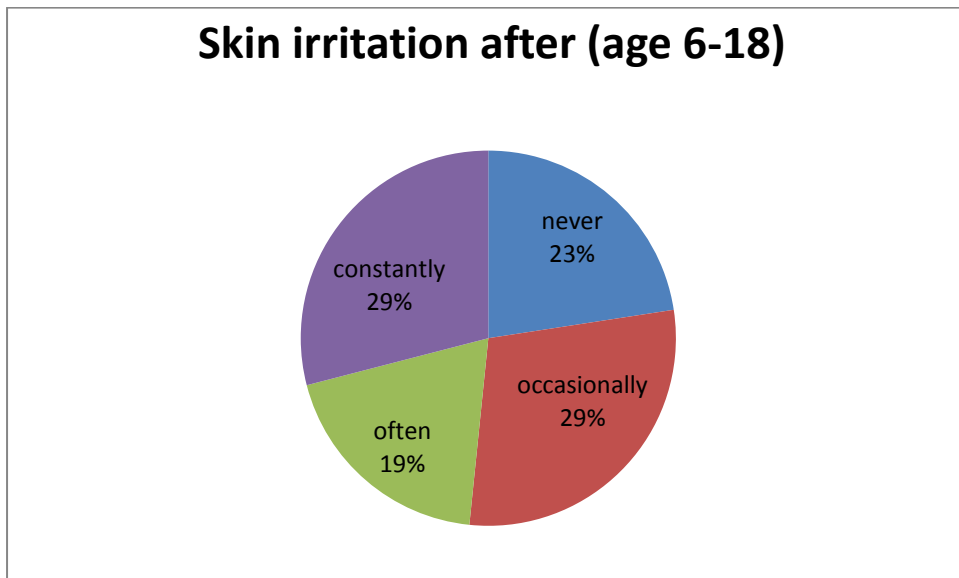
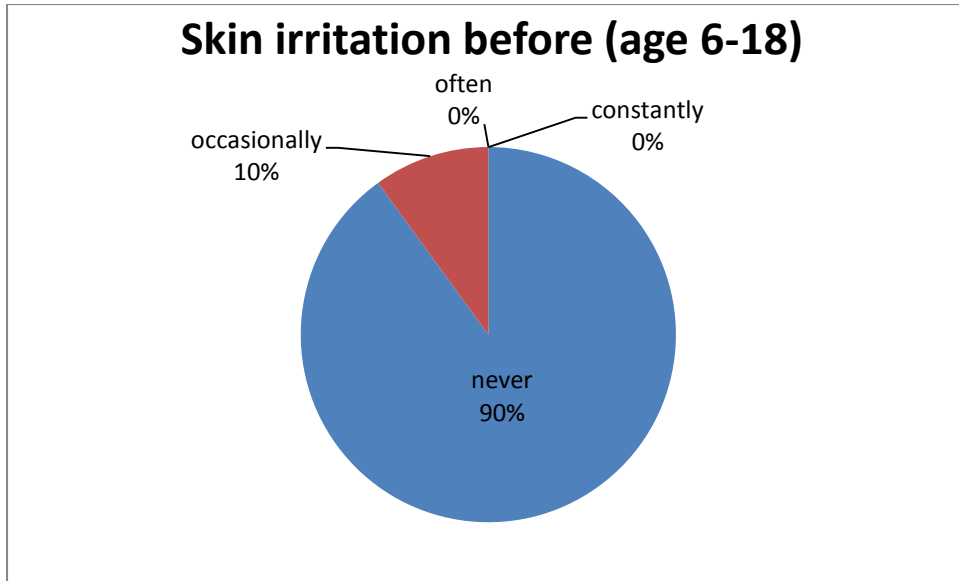
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



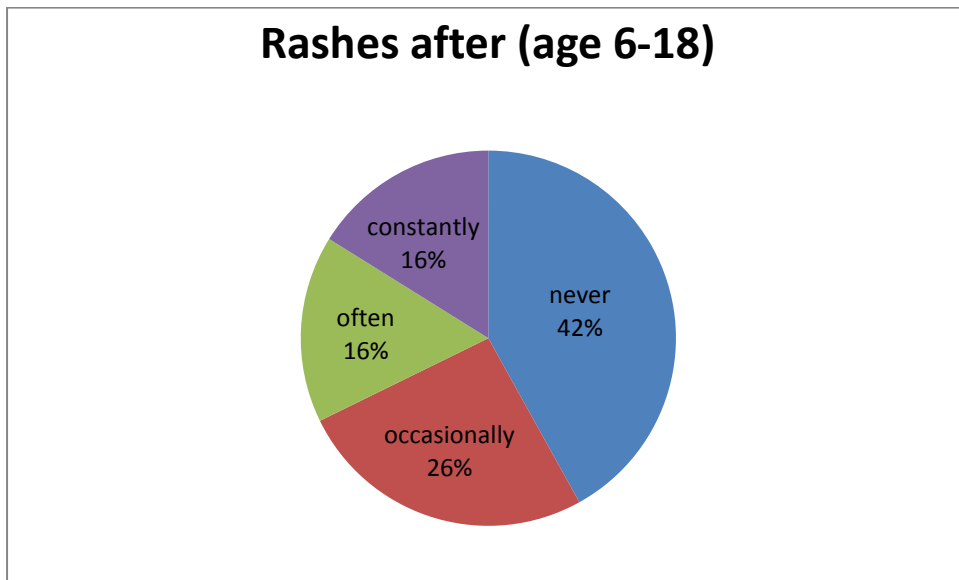
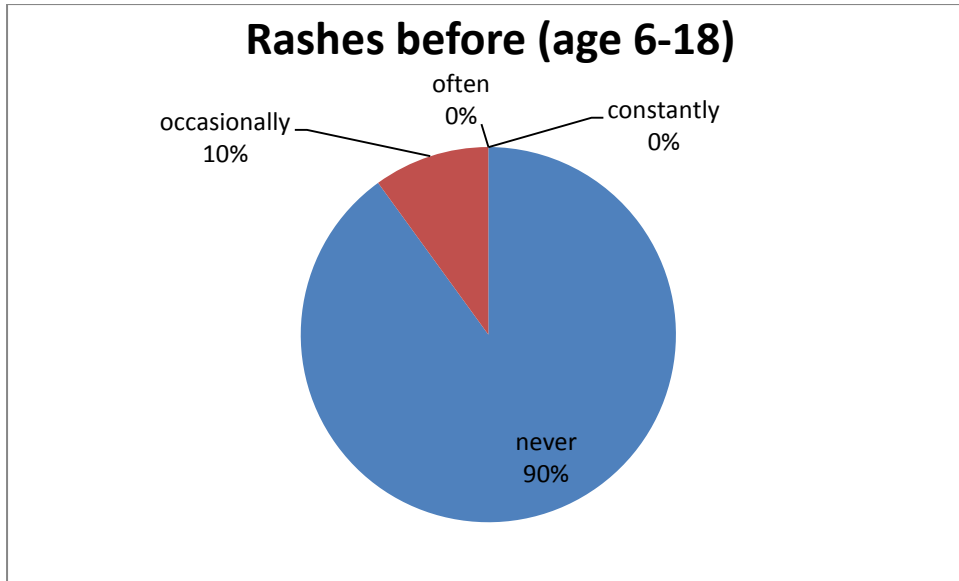
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



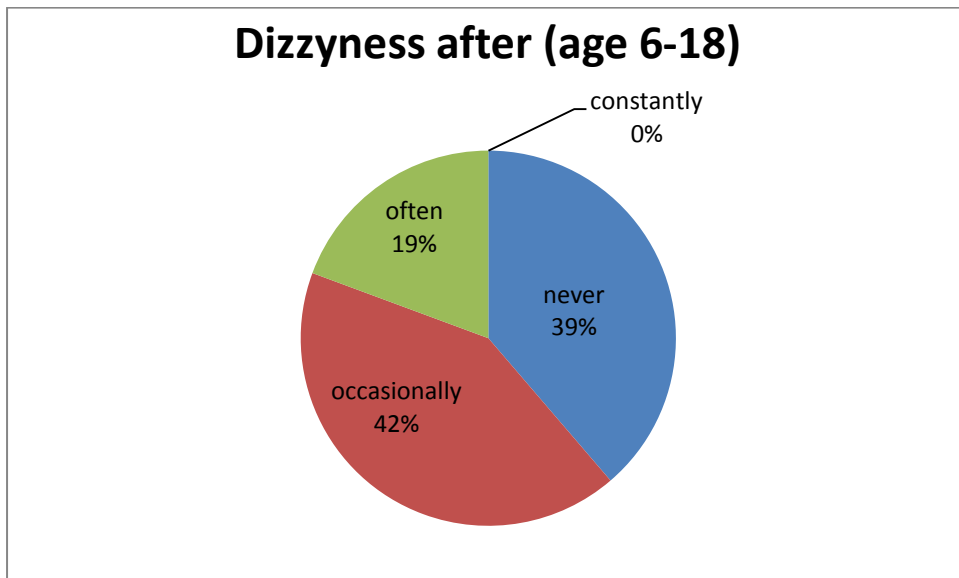
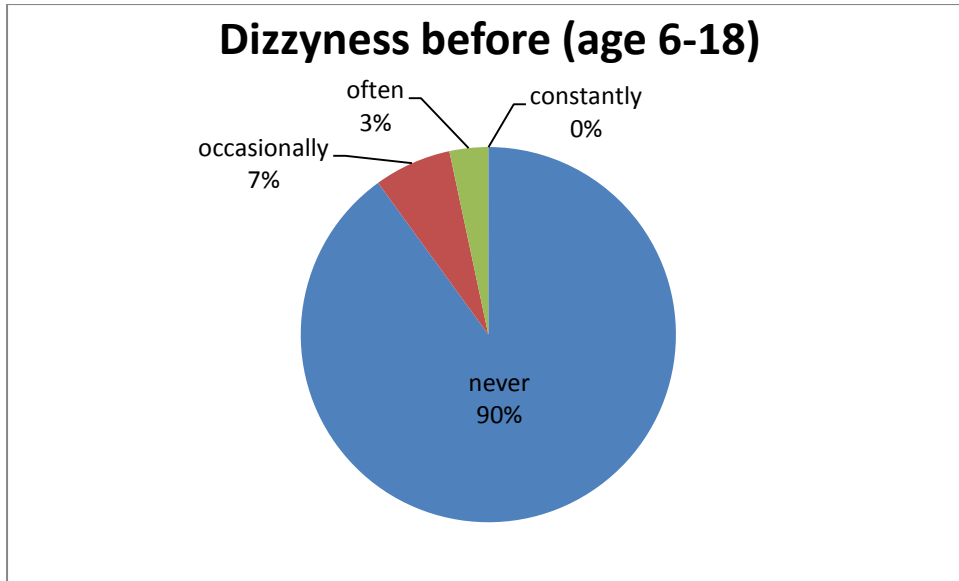
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



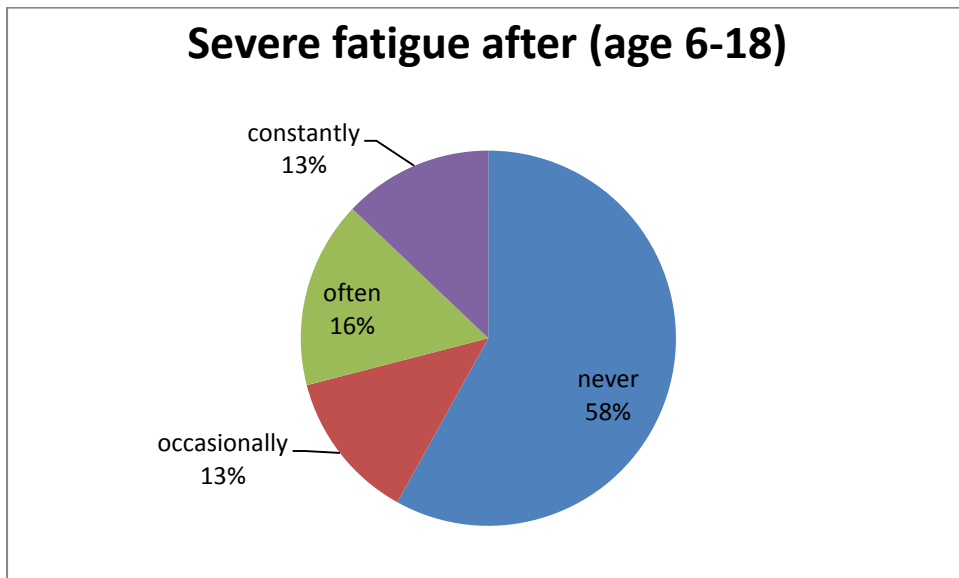
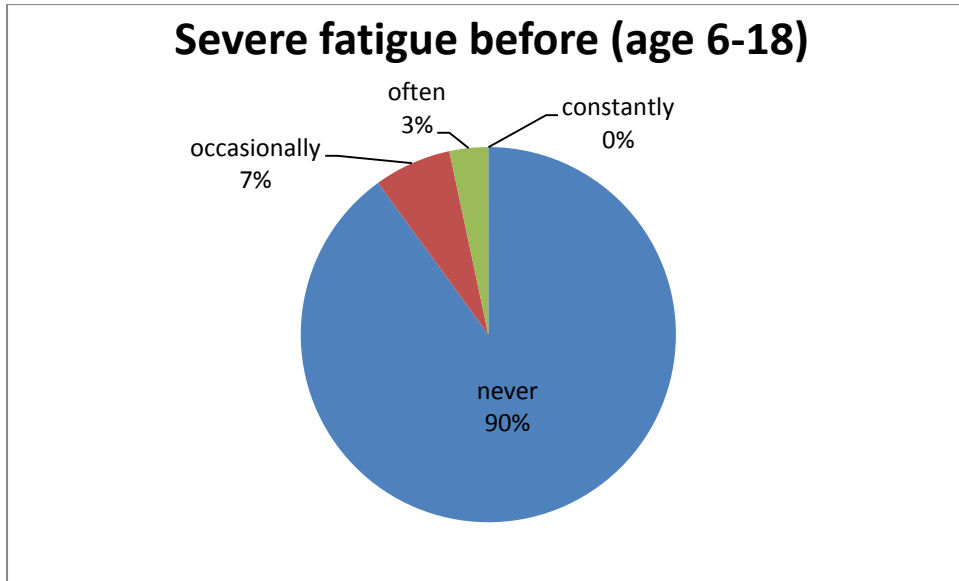
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

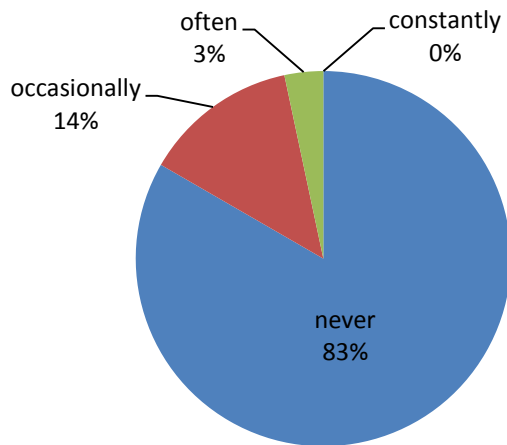


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

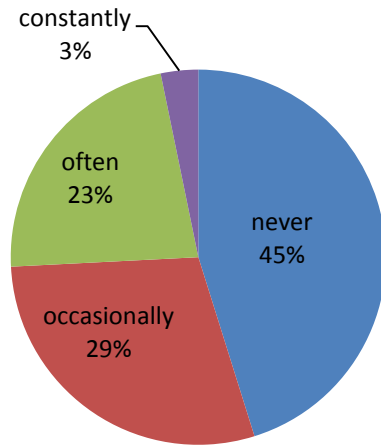


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Difficulty concentrating before (6-18)

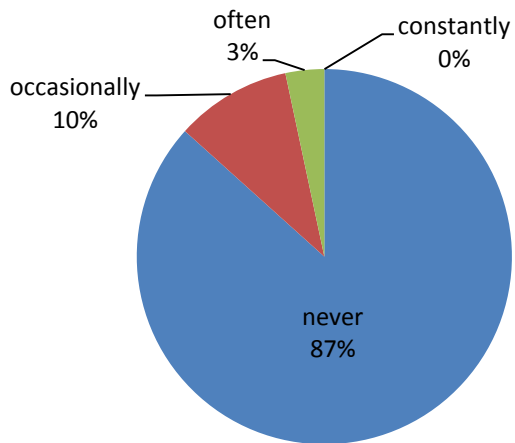


Difficulty concentrating after (6-18)

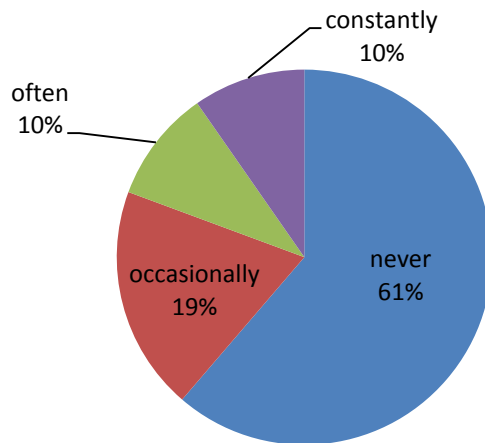


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

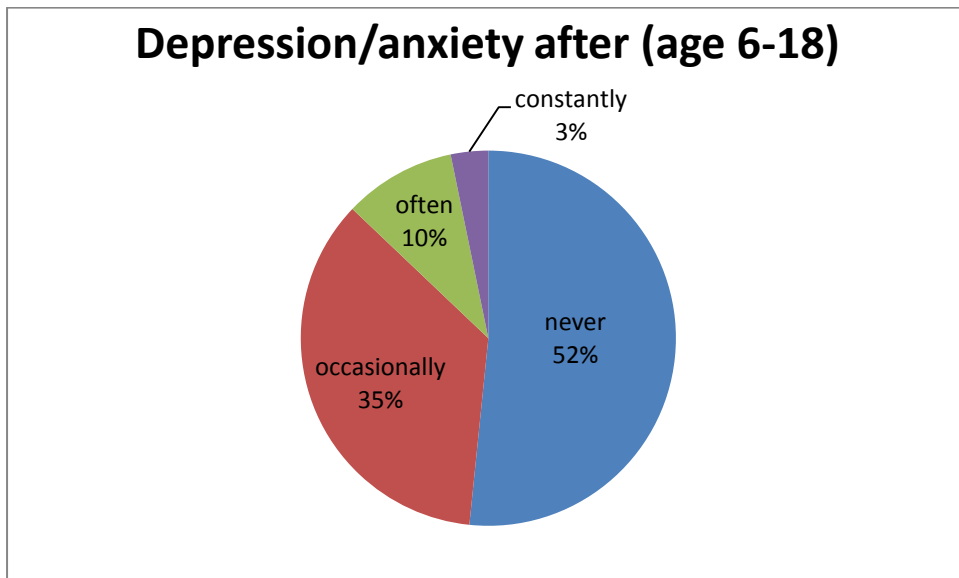
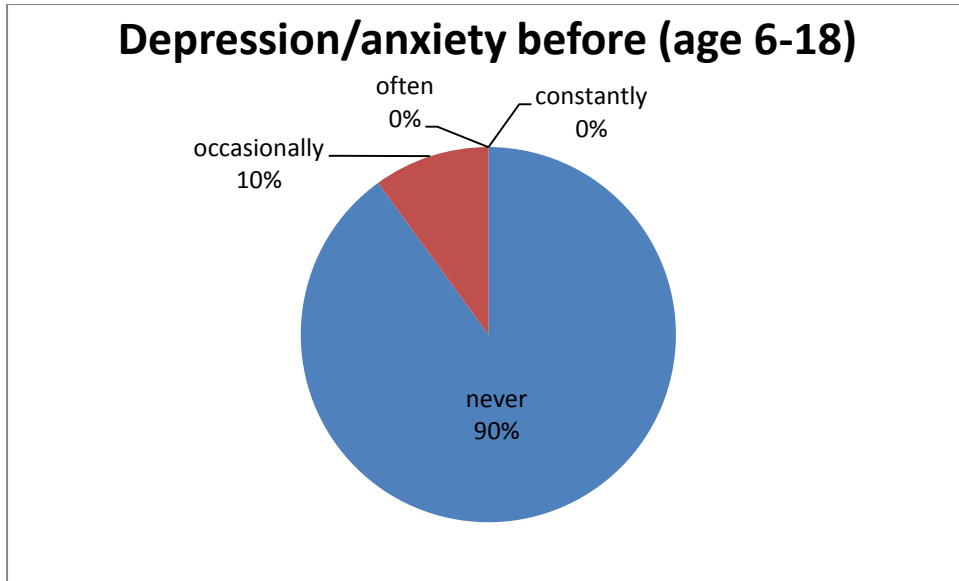
Difficulty sleeping before (age 6-18)



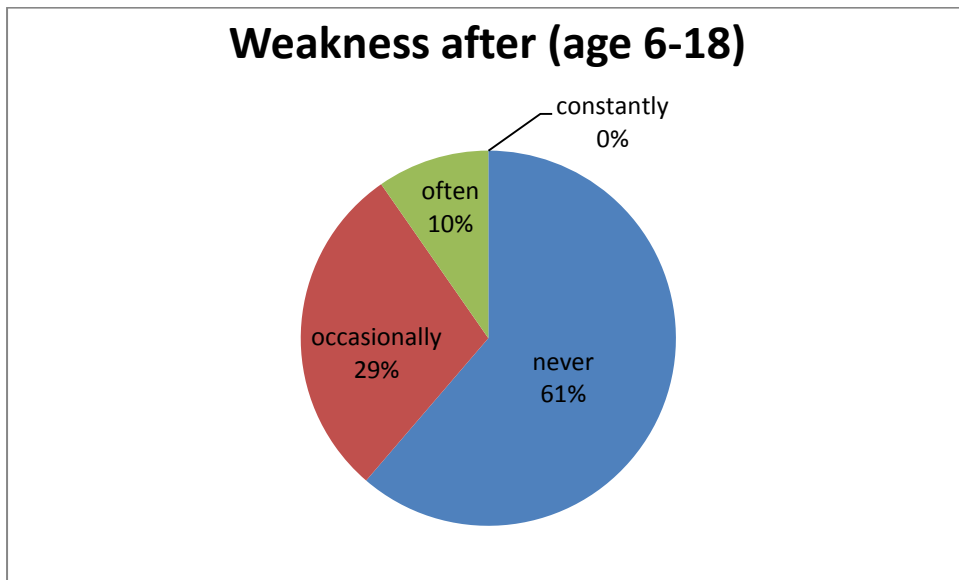
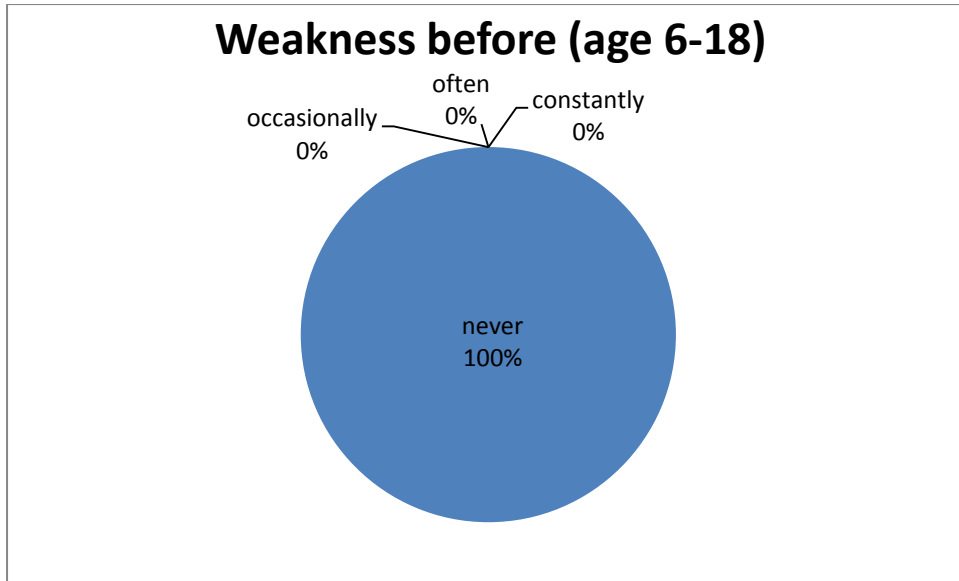
Difficulty sleeping after (age 6-18)



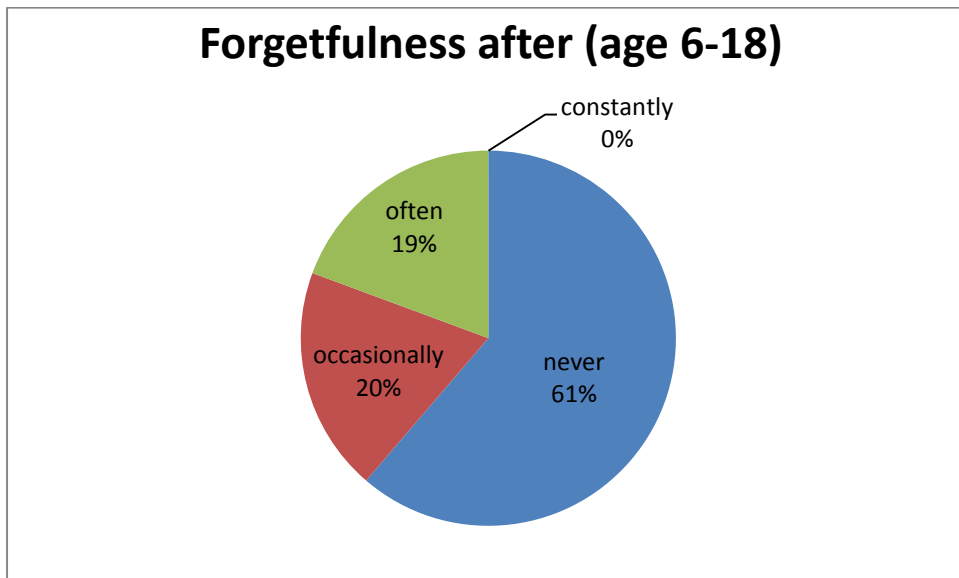
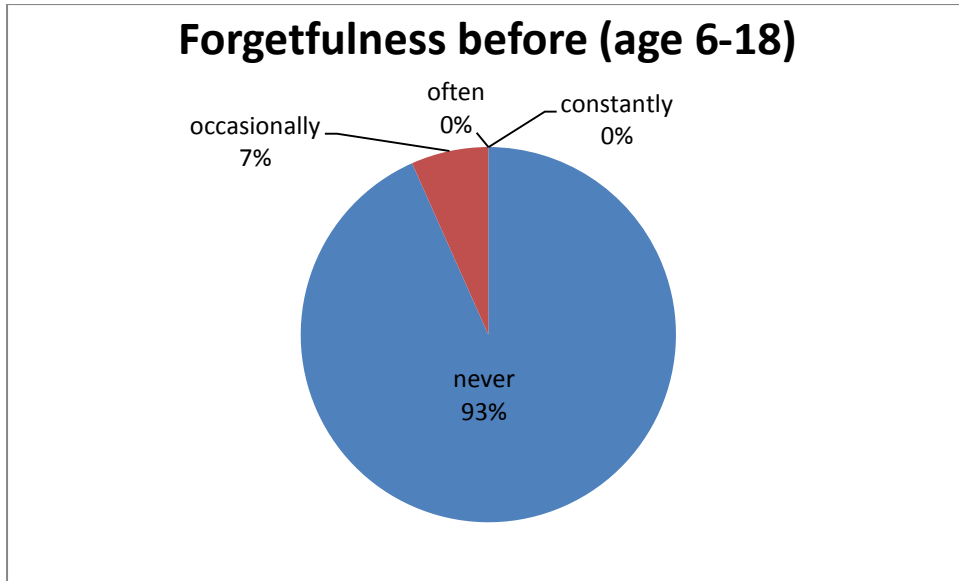
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



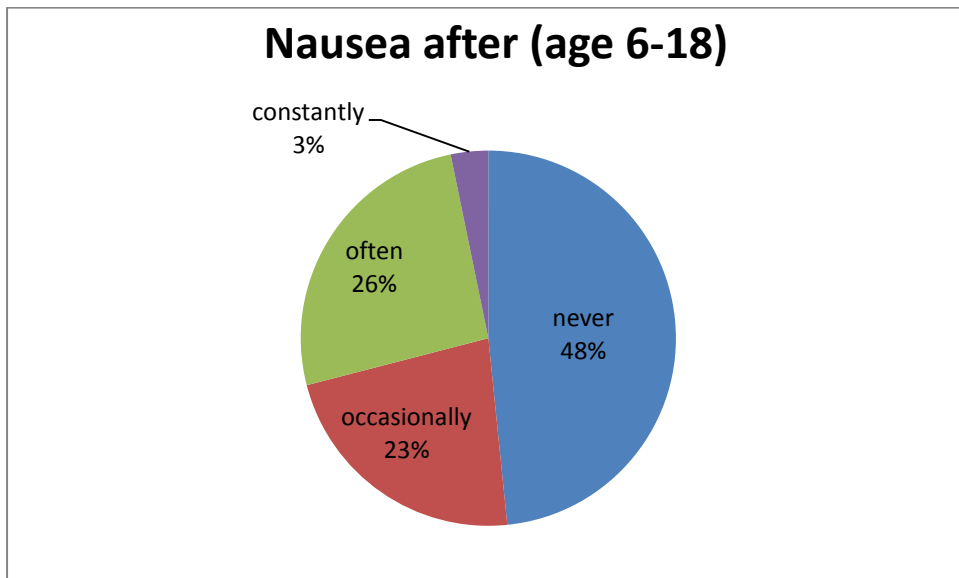
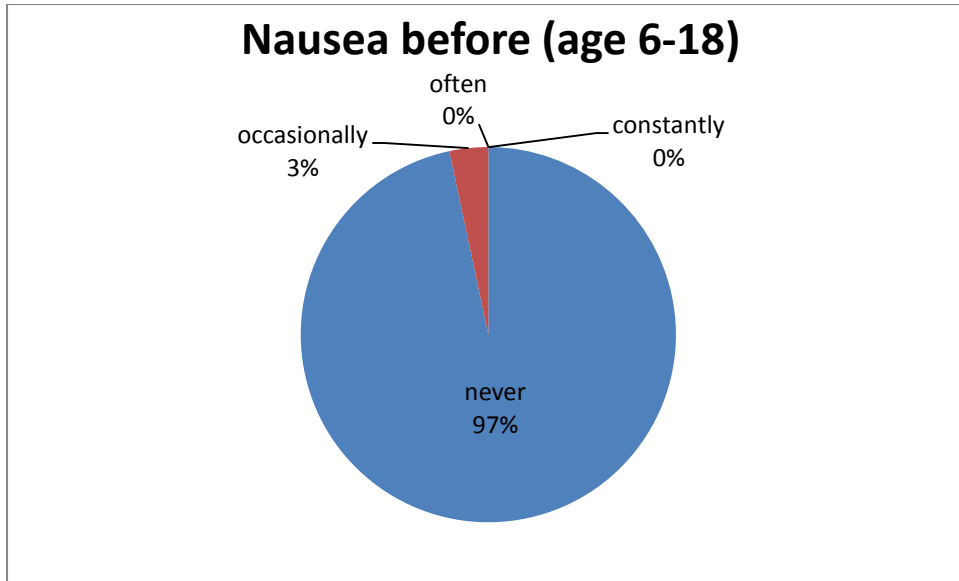
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



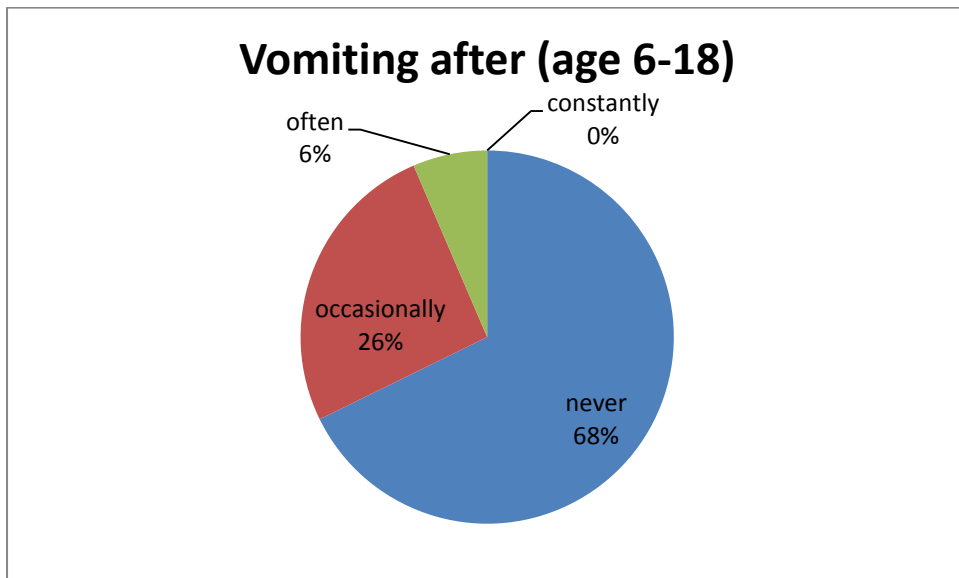
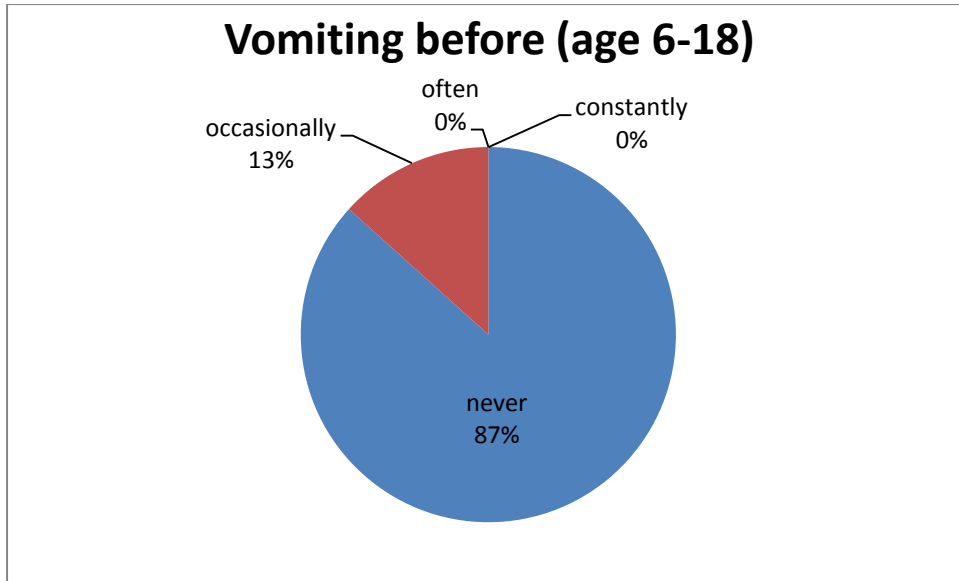
Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs



Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

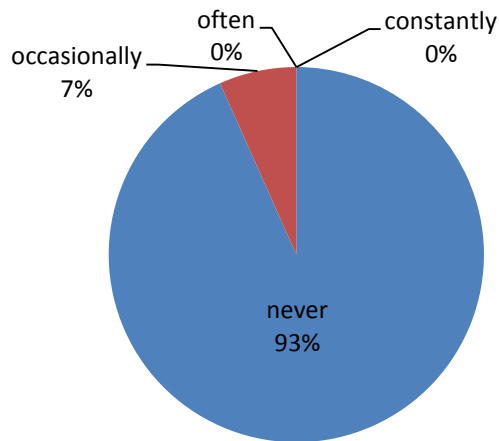


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

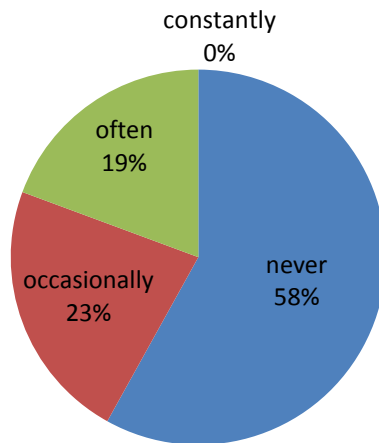


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

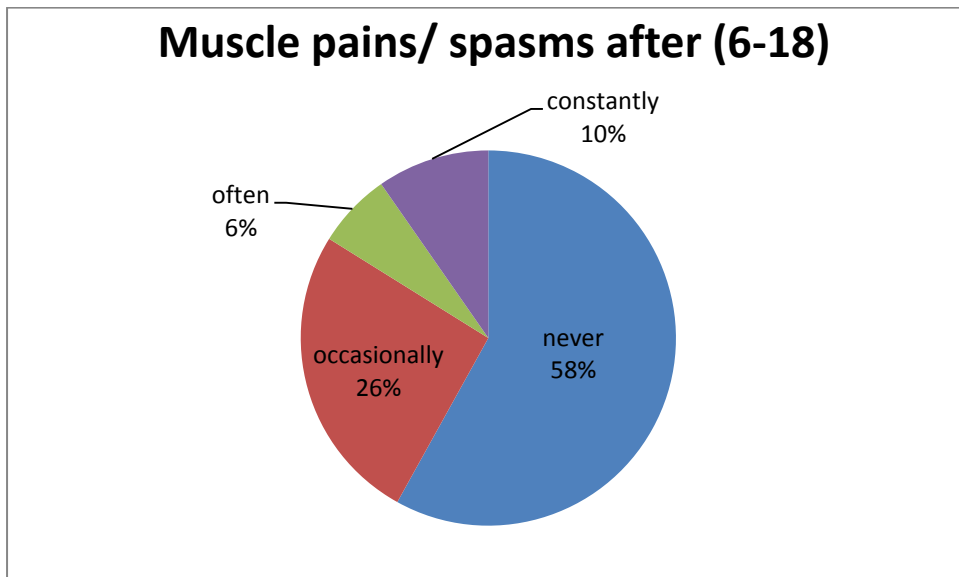
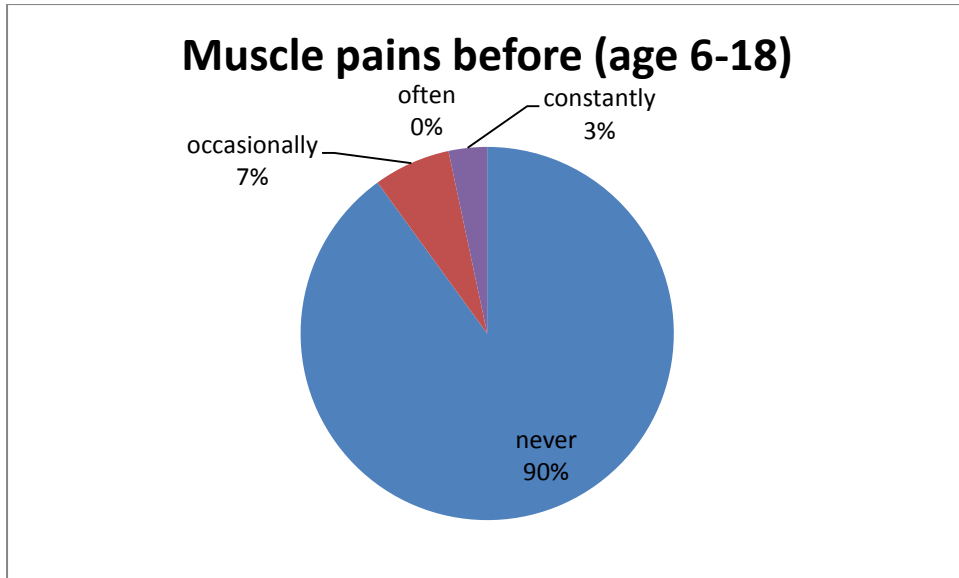
Stomach pains before (age 6-18)



Stomach pains after (age 6-18)

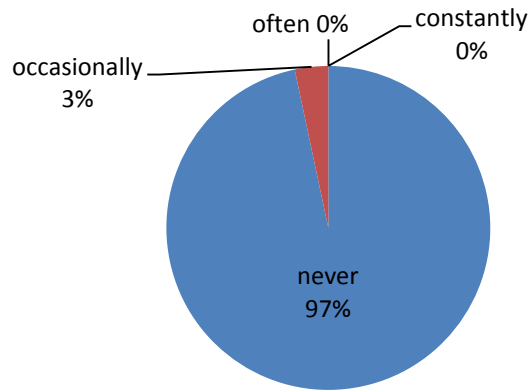


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

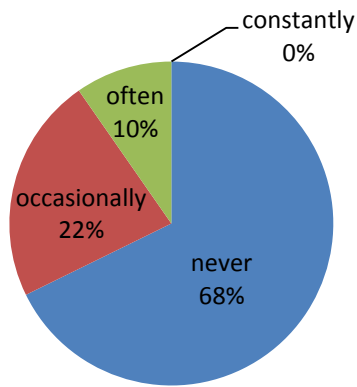


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

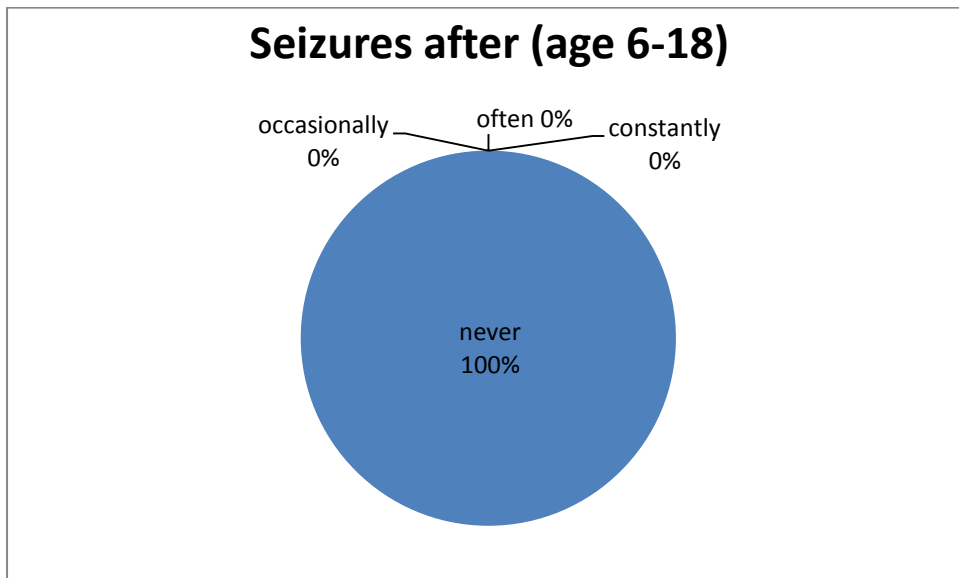
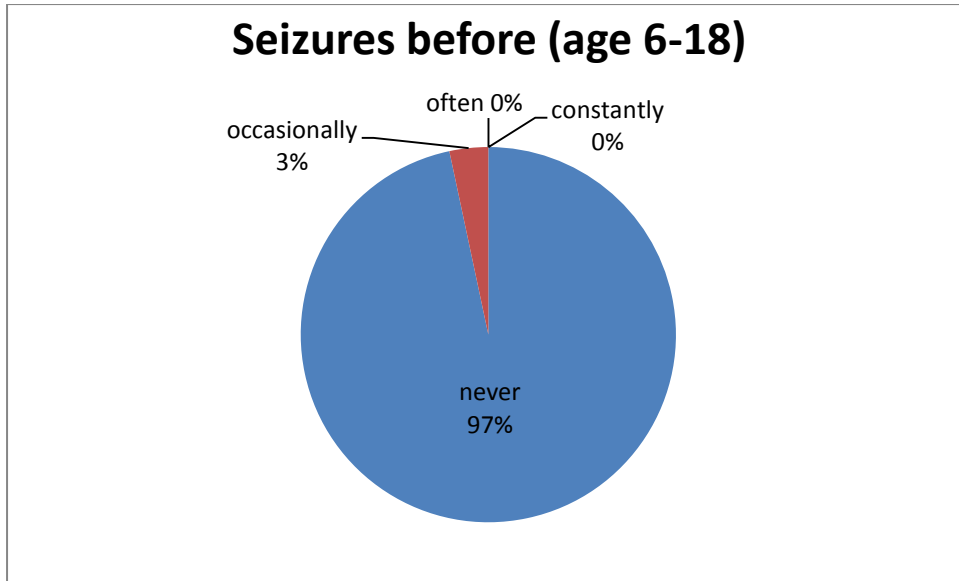
Tingling numbness pins and needles before (age 6-18)



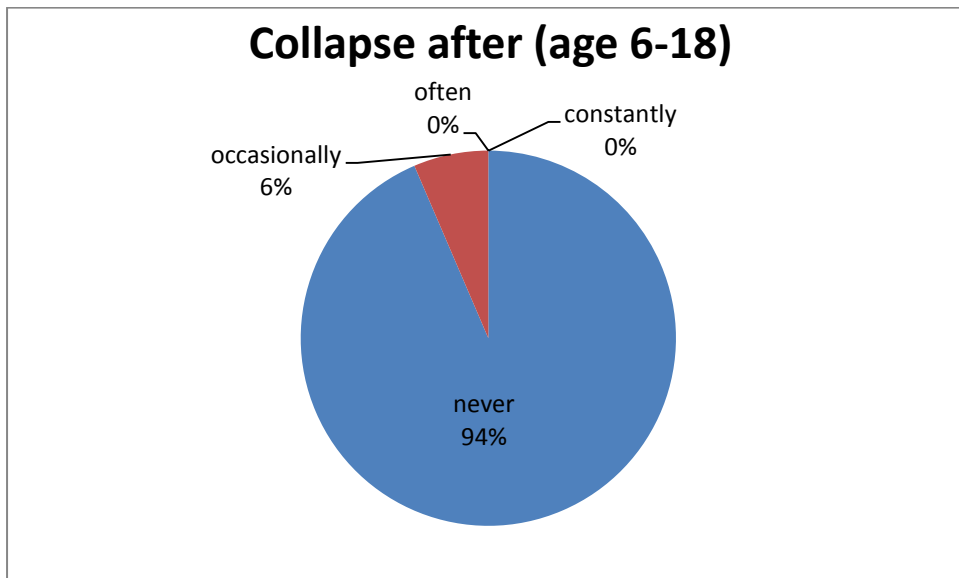
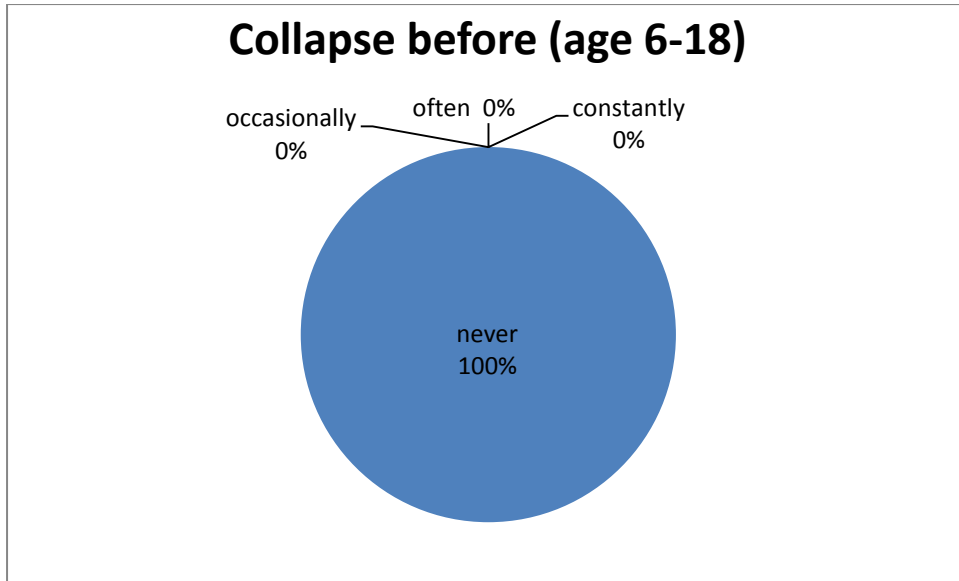
Tingling numbness pins and needles after (age 6-18)



Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

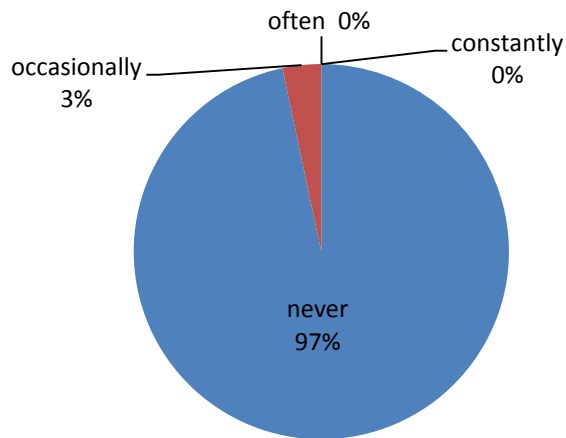


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

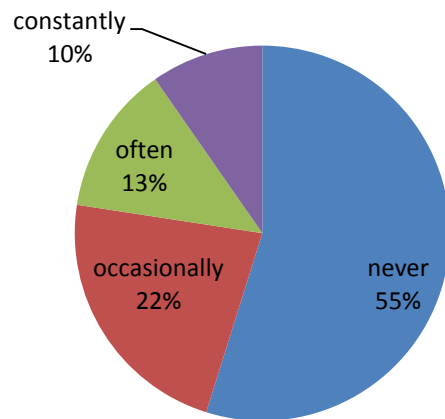


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Sore joints before (age 6-18)

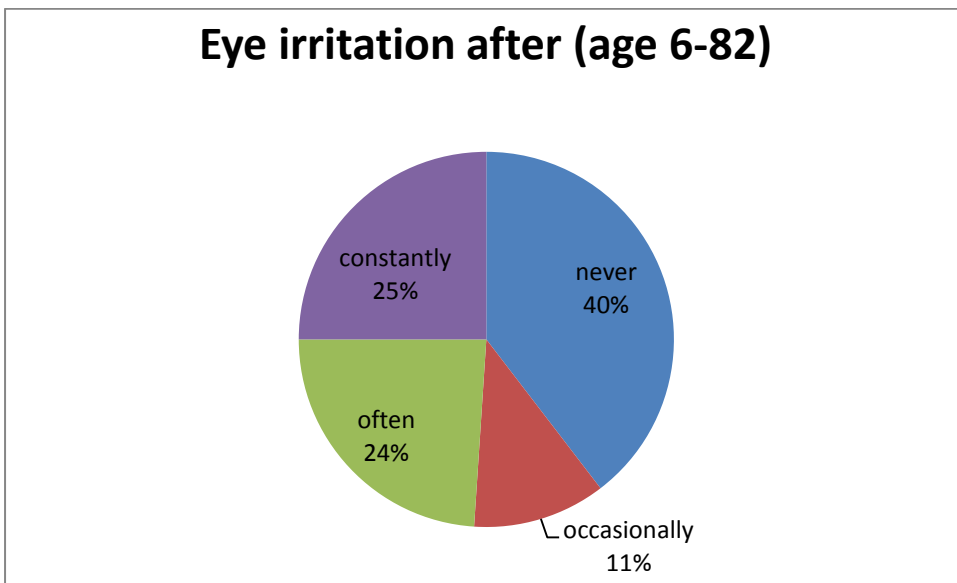
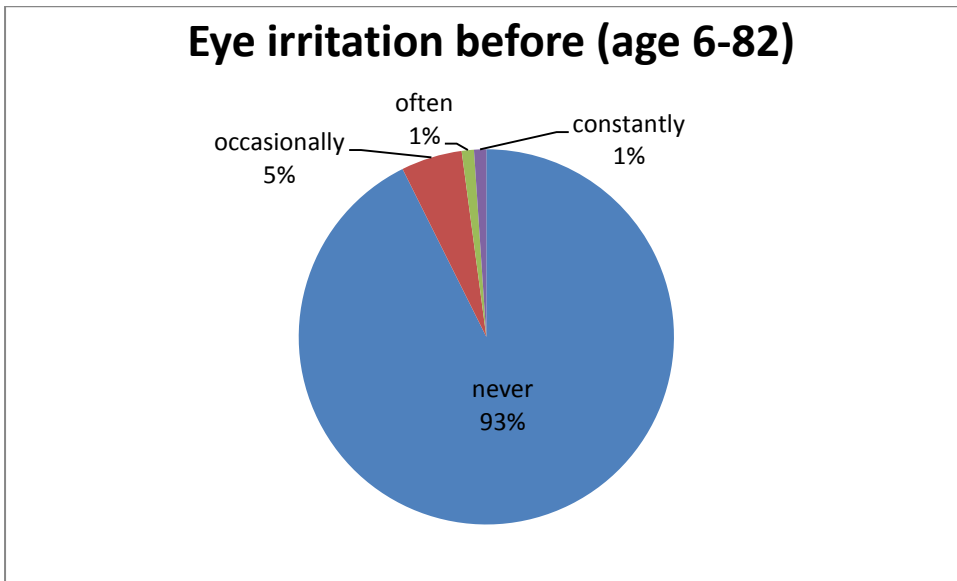


Sore joints after (age 6-18)

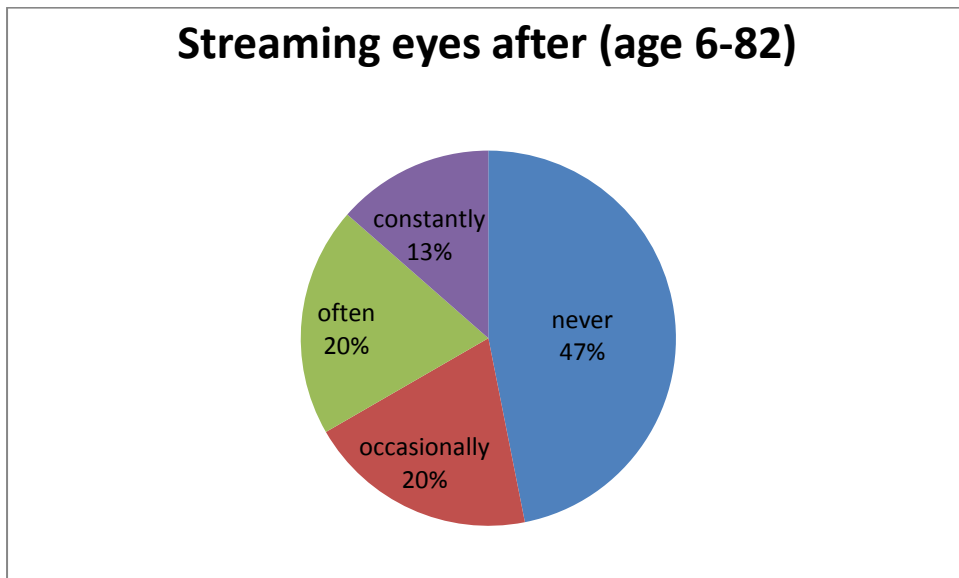
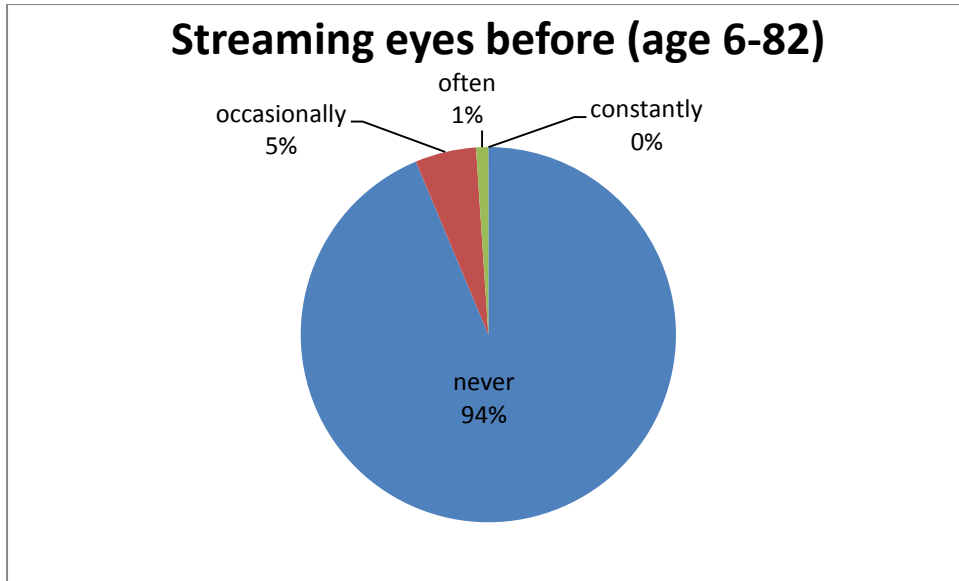


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Age 6-82 Symptoms reported before and after Coal Seam Gas development - Pie Charts

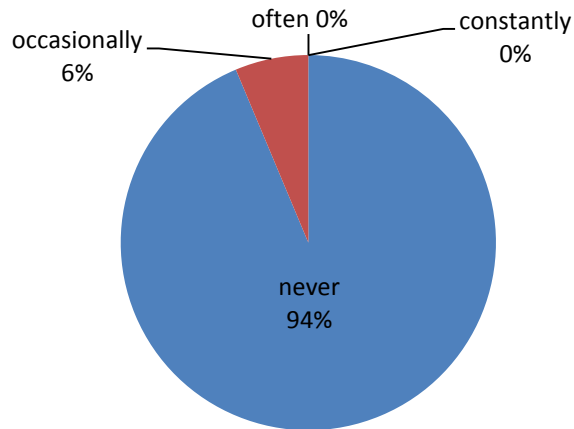


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

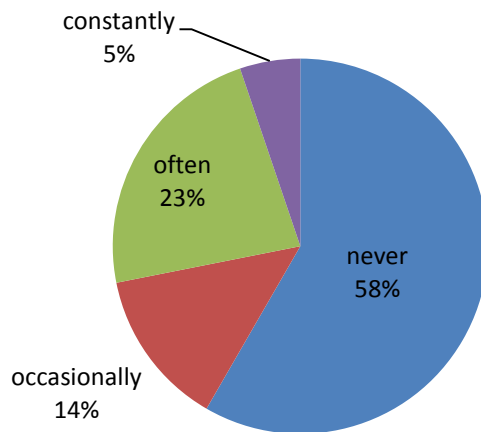


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Nasal burning before (age 6-82)

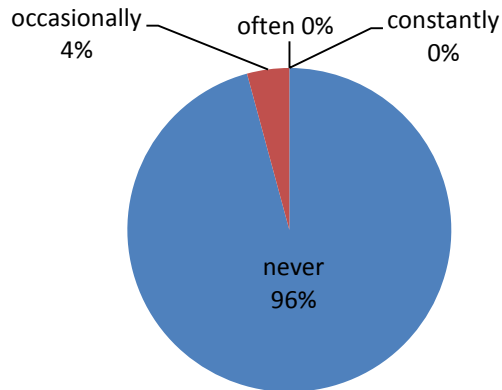


Nasal burning after (age 6-82)

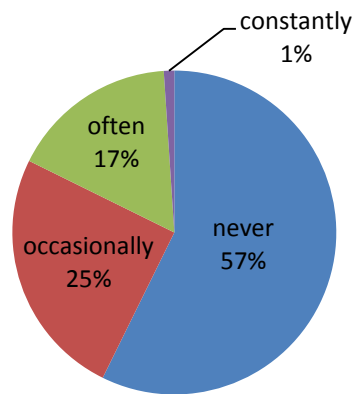


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Blood nose on wiping before (age 6-82)

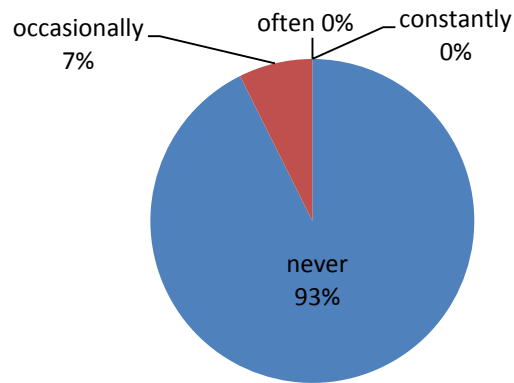


Blood nose on wiping after (age 6-82)

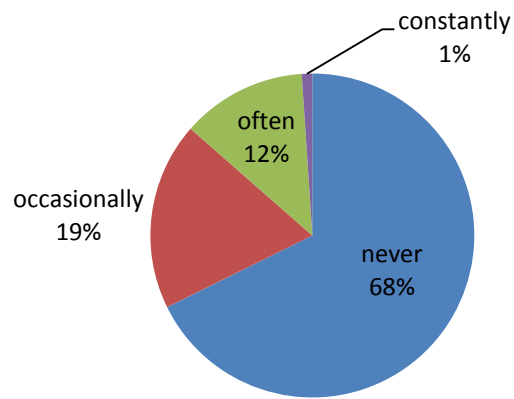


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Spontaneous nose bleeds before (age 6-82)

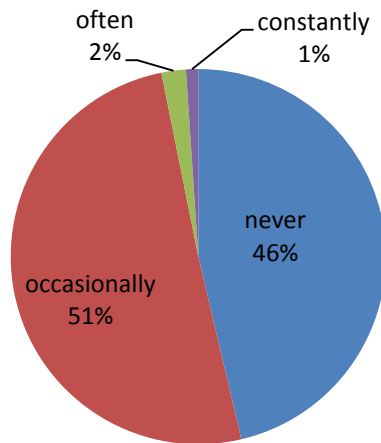


Spontaneous nose bleeds after age (6-82)

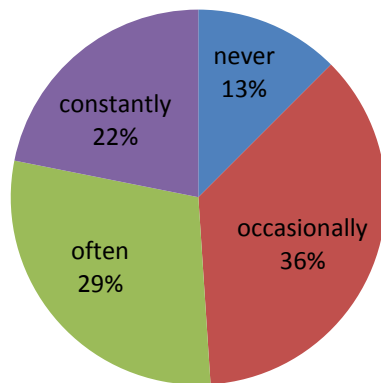


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Mild headaches before (age 6-82)

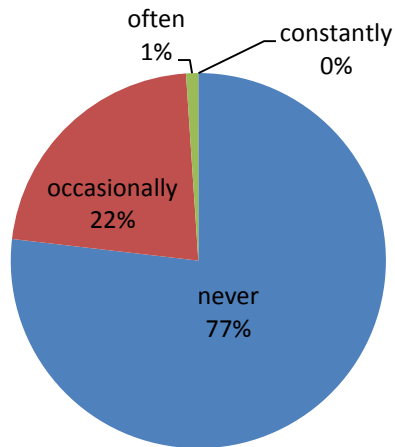


Mild headaches after (age 6-82)

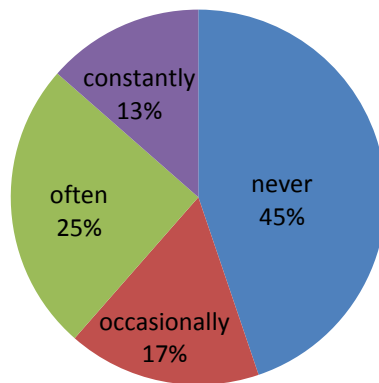


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Severe headaches before (age 6-82)

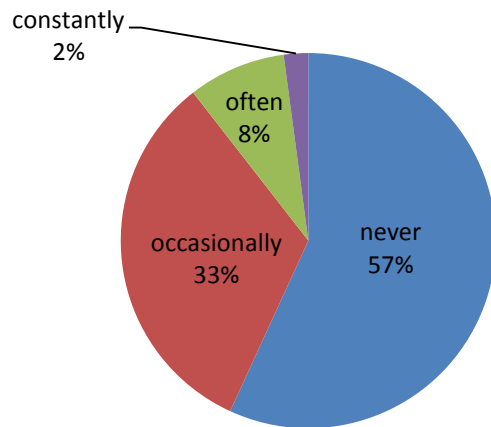


Severe headaches after (age 6-82)

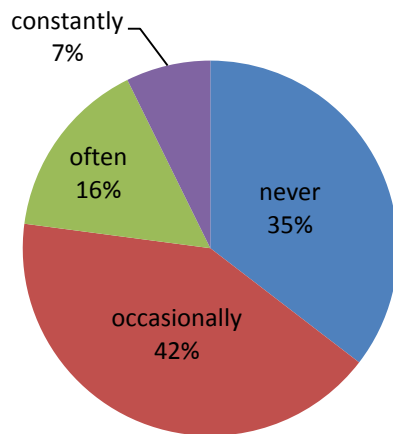


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

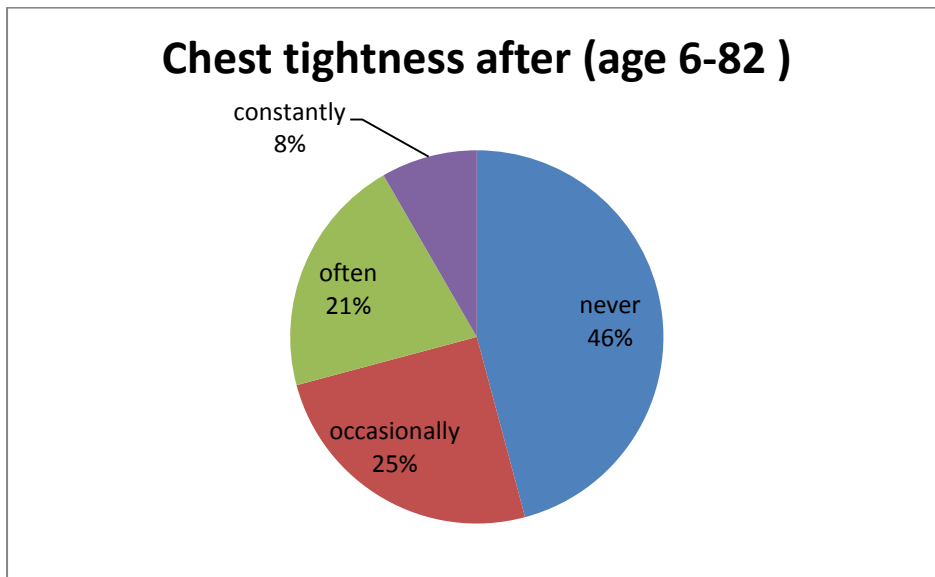
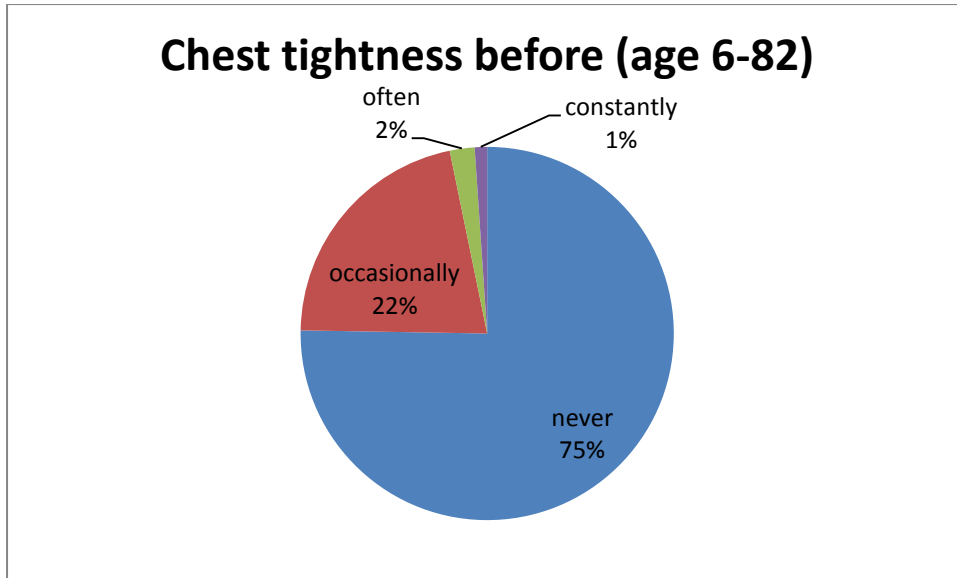
Cough before (age 6-82)



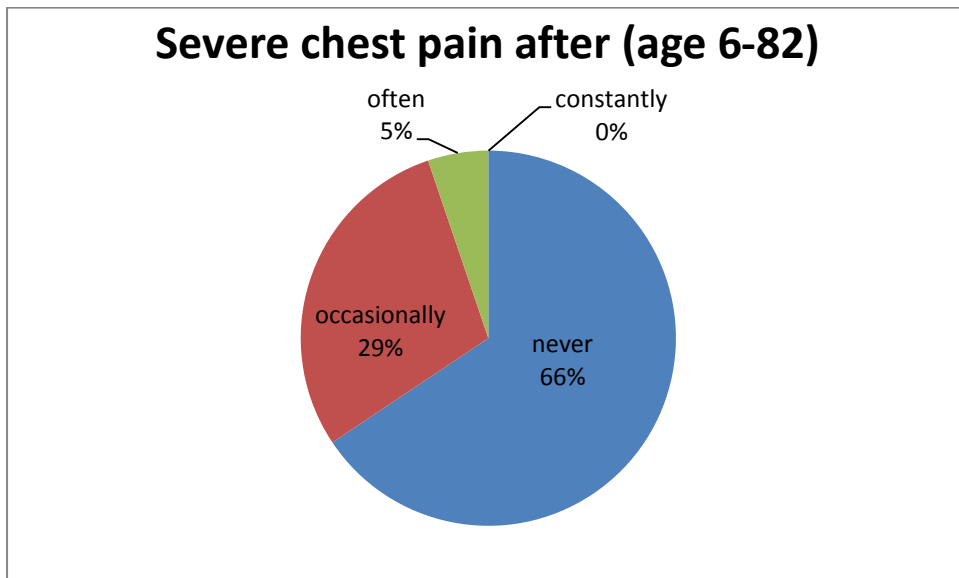
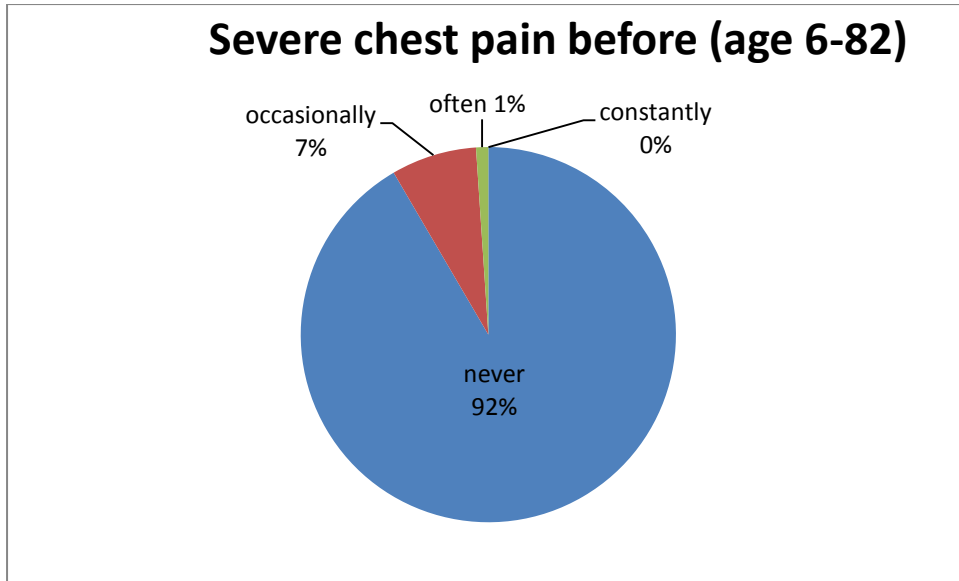
Cough after (age 6-82)



Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

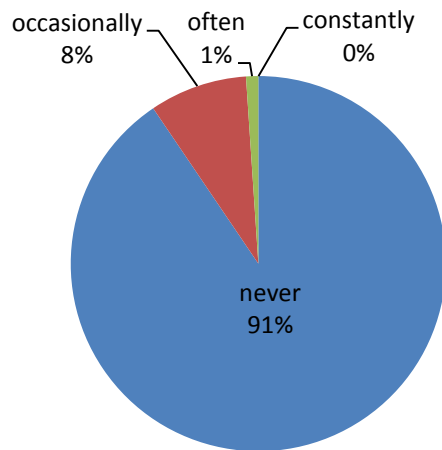


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

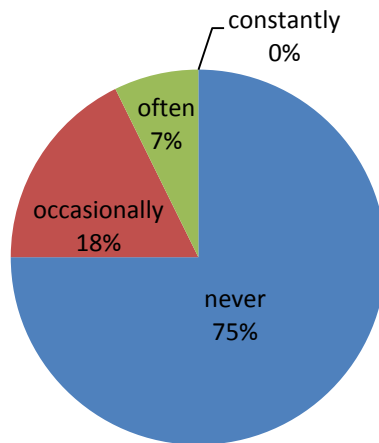


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Irregular heart beat before (age 6-82)

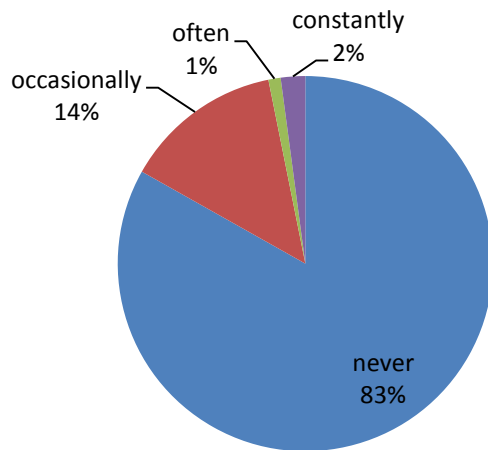


Irregular heart beat after (age 6-82)

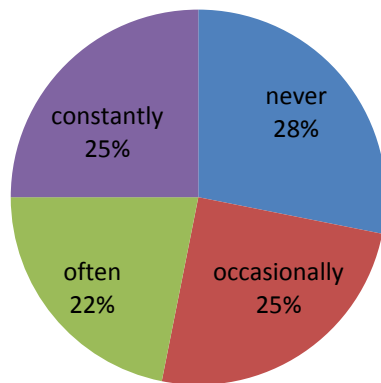


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

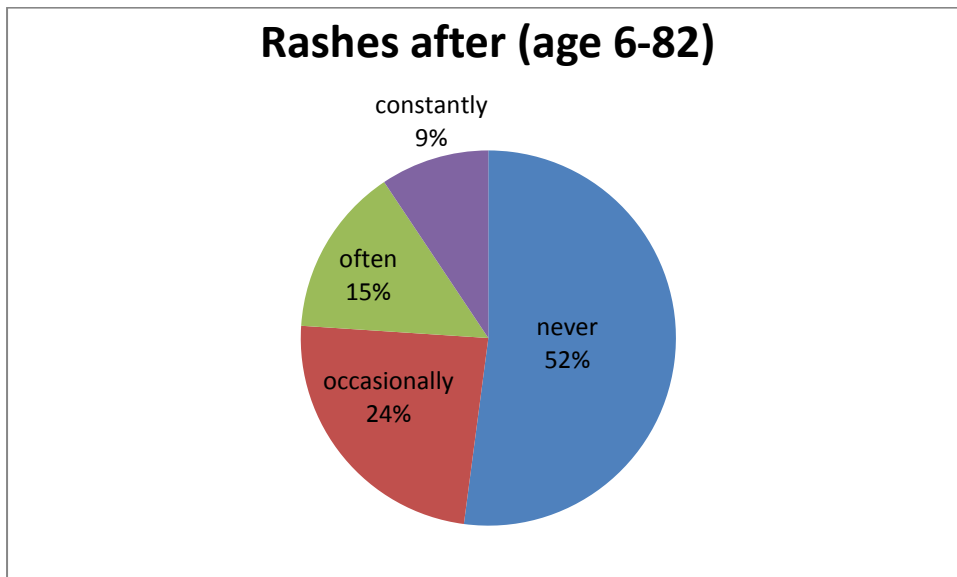
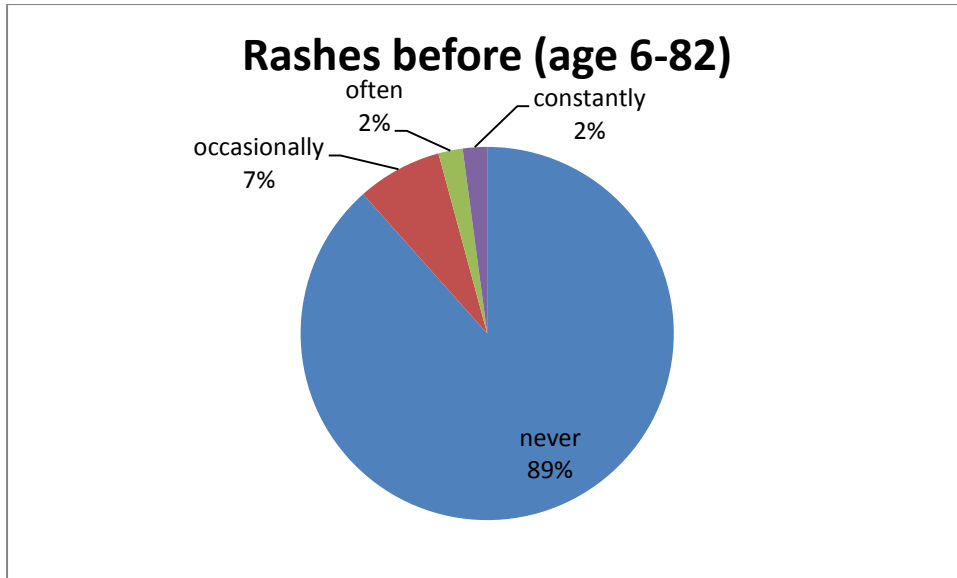
Skin irritation before (age 6-82)



Skin irritation after (age 6-82)

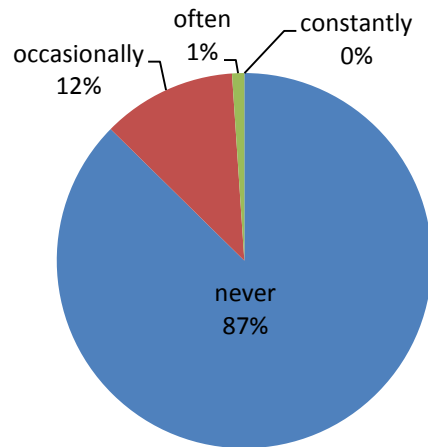


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

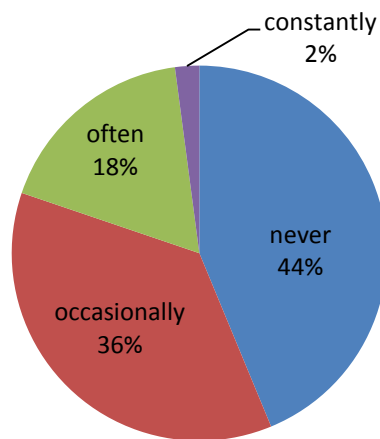


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Dizziness before (age 6-82)

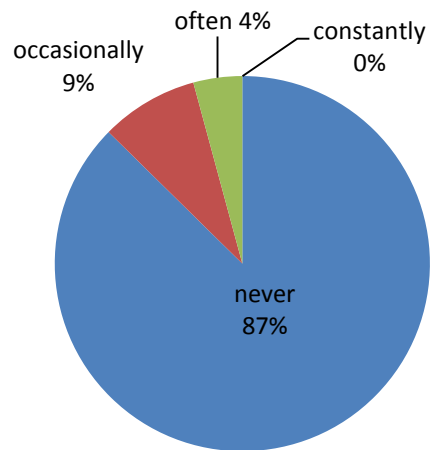


Dizziness after (age 6-82)

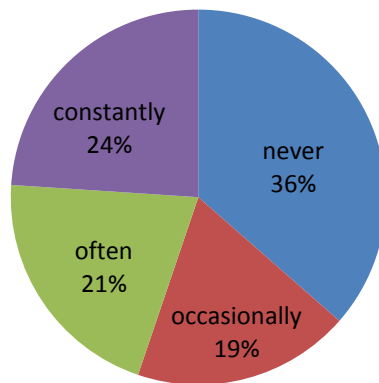


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Severe fatigue before (age 6-82)

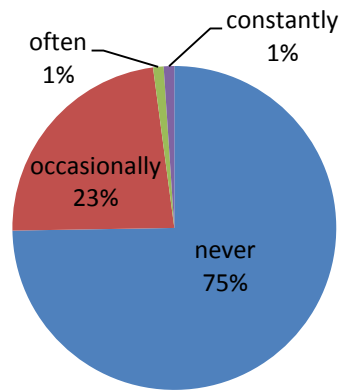


Severe fatigue after (age 6-82)

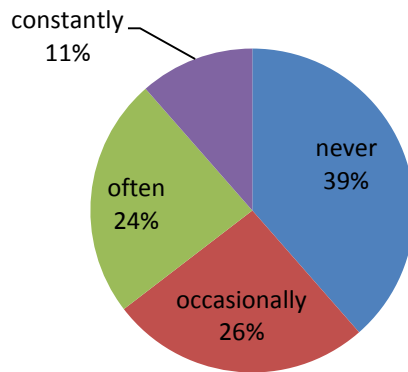


Symptomatology of a gas field - An independent health survey in the Tara rural residential estates and environs

Difficulty concentrating before (age 6-82)

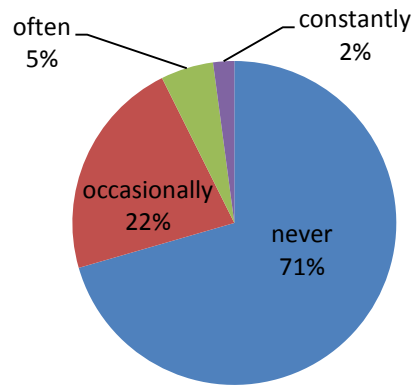


Difficulty concentrating after (age 6-82)

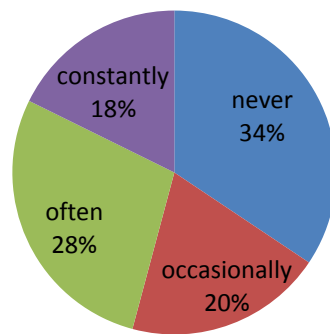


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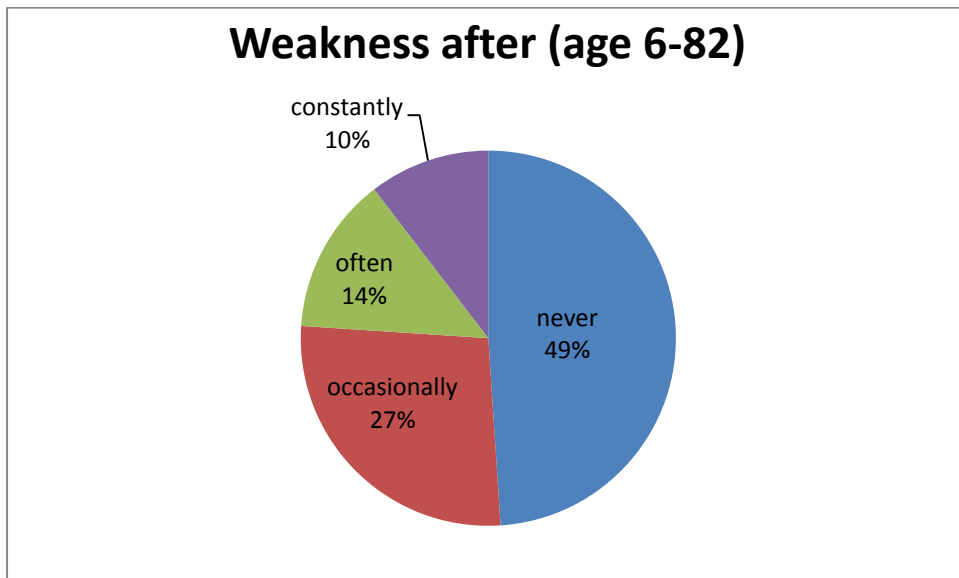
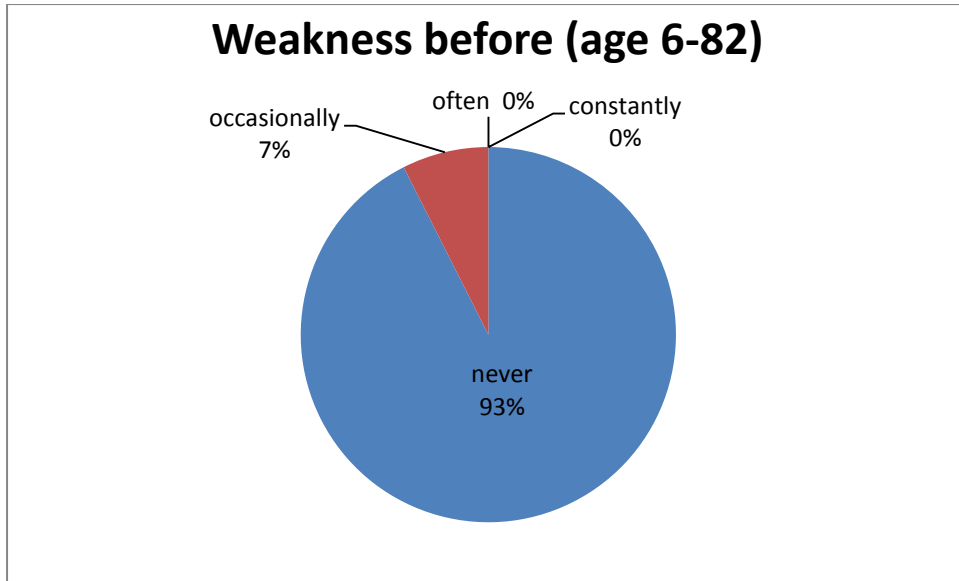
Difficulty sleeping before (age 6-82)



Difficulty sleeping after (age 6-82)

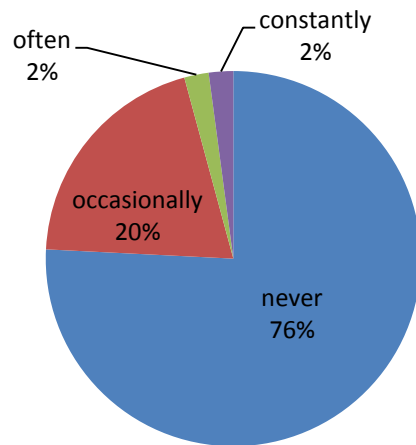


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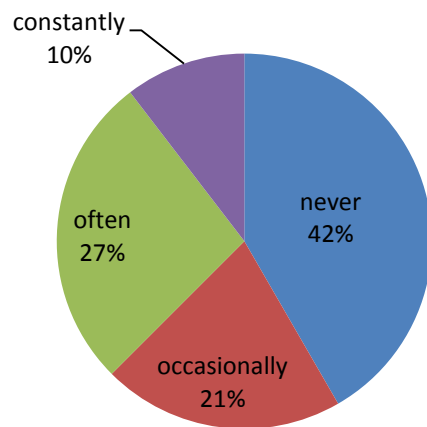


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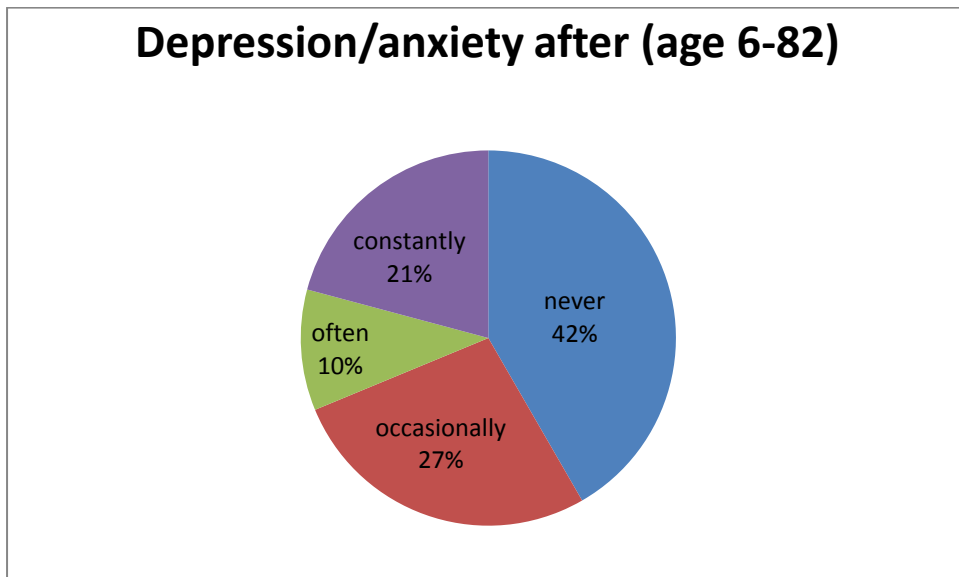
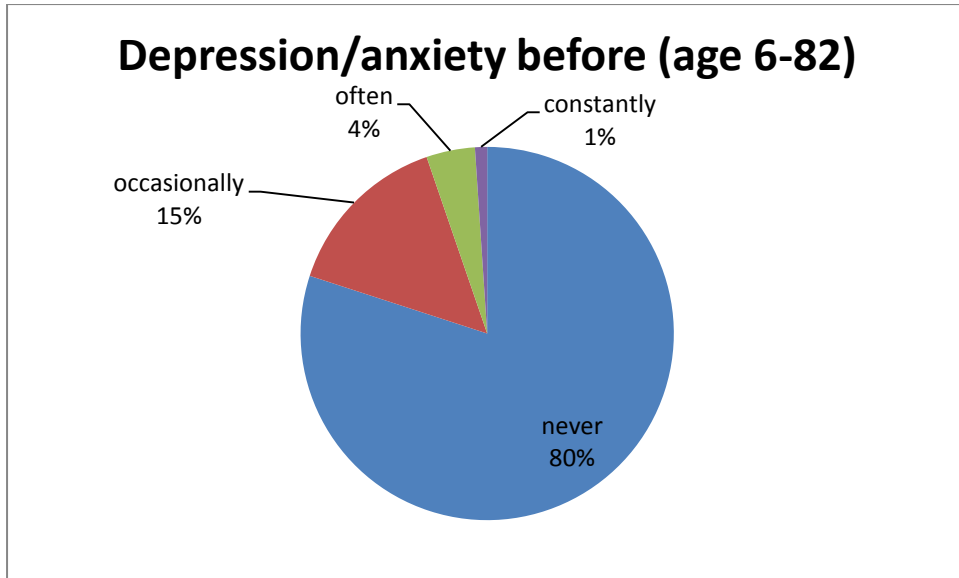
Forgetfulness before (age 6-82)



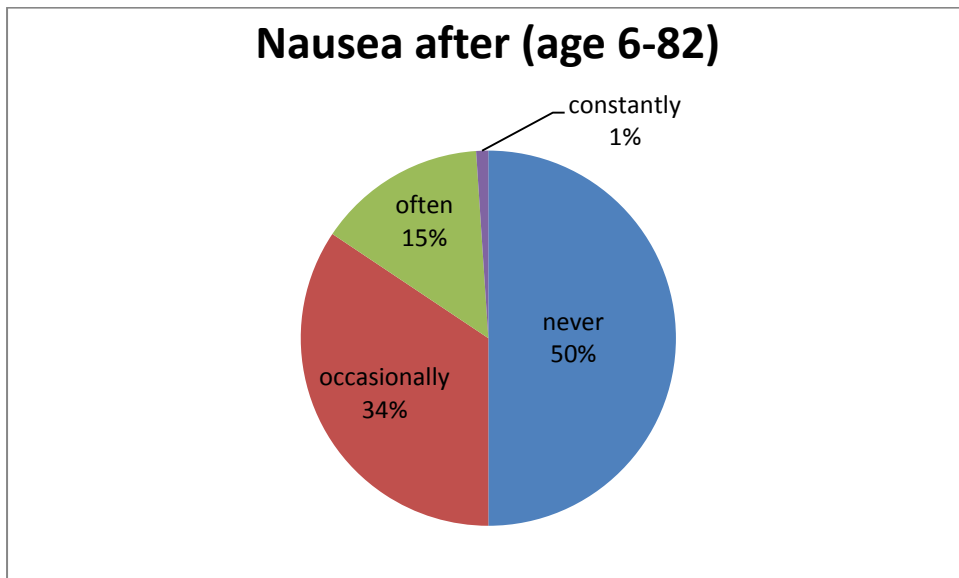
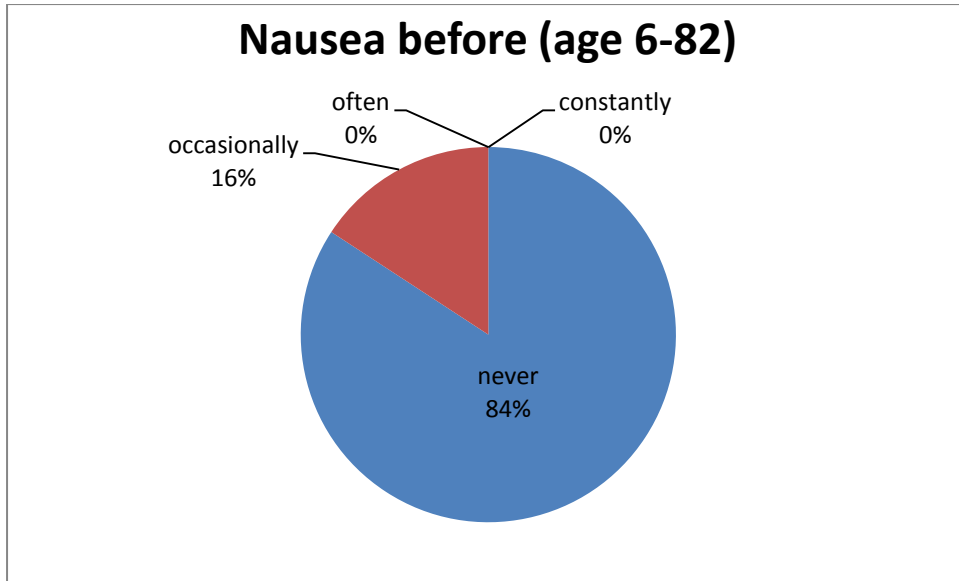
Forgetfulness after (age 6-82)



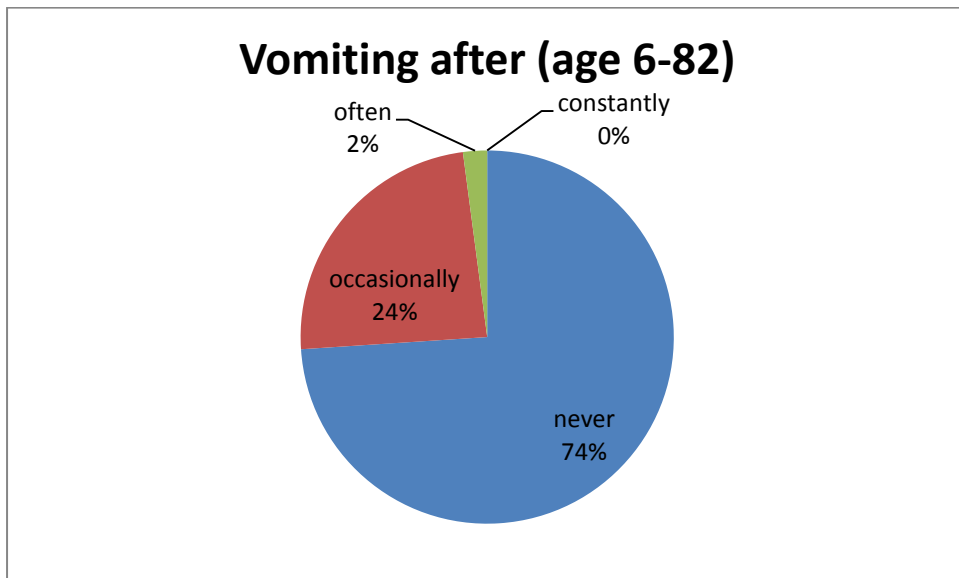
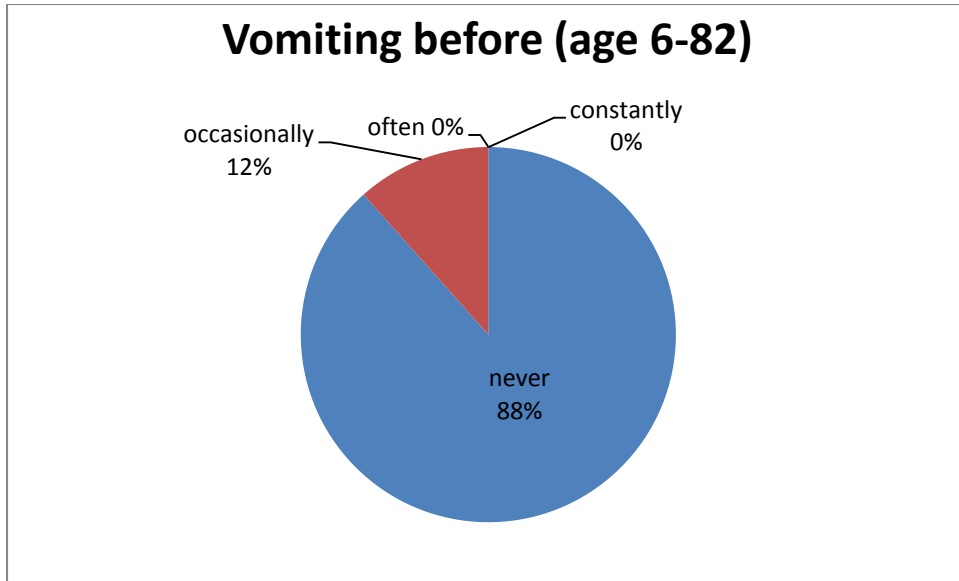
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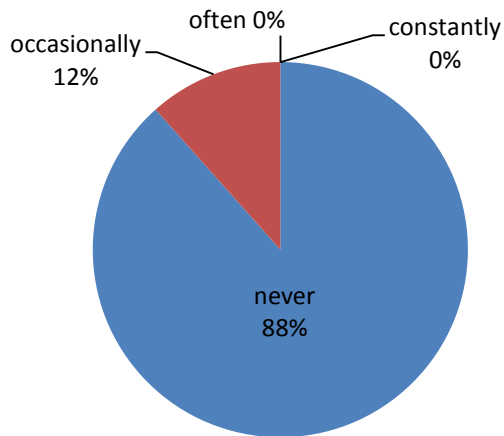


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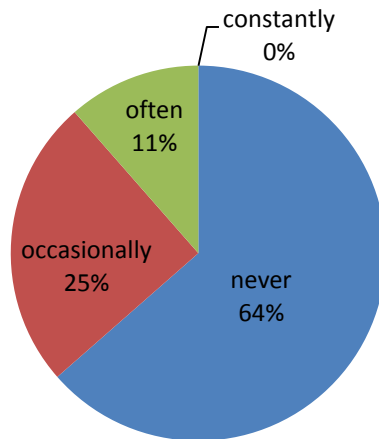


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Stomach pains before (age 6-82)

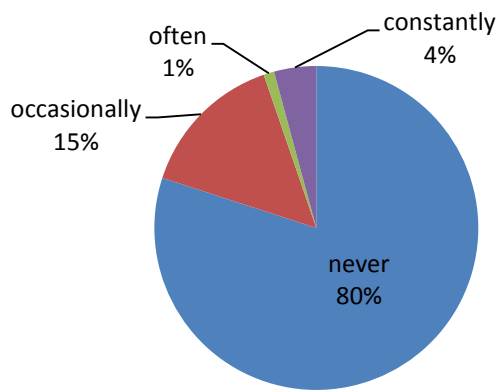


Stomach pains after (age 6-82)

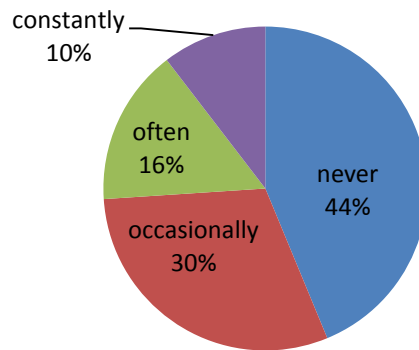


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Muscle pains/spasms before (age 6-82)

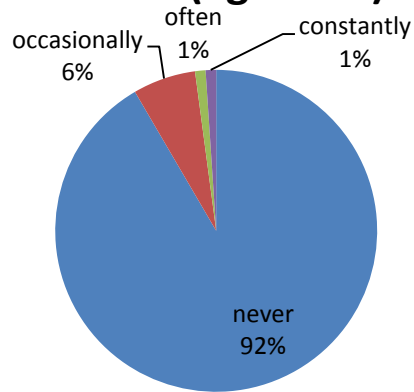


Muscle pains/spasms after (age 6-82)

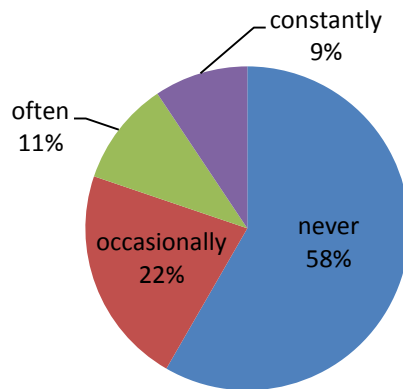


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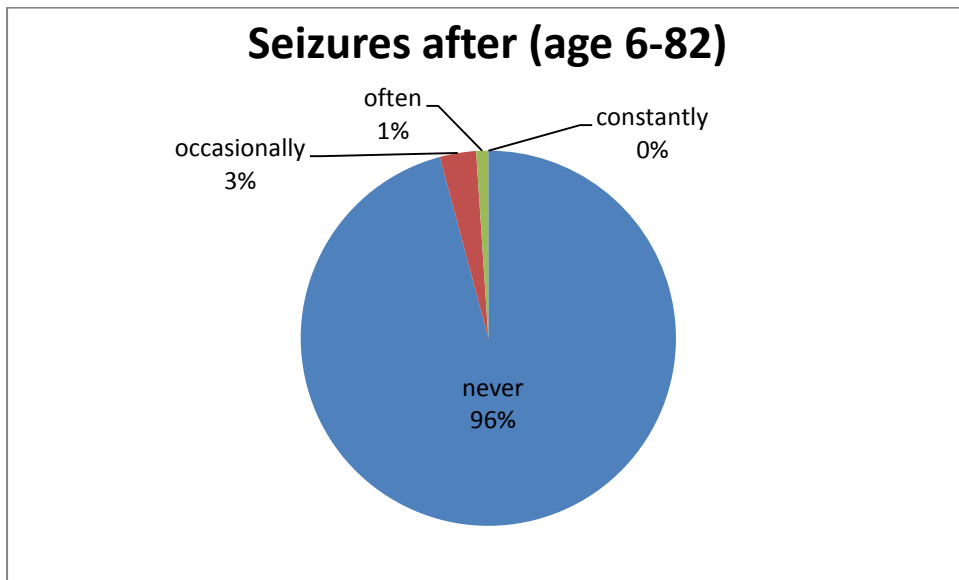
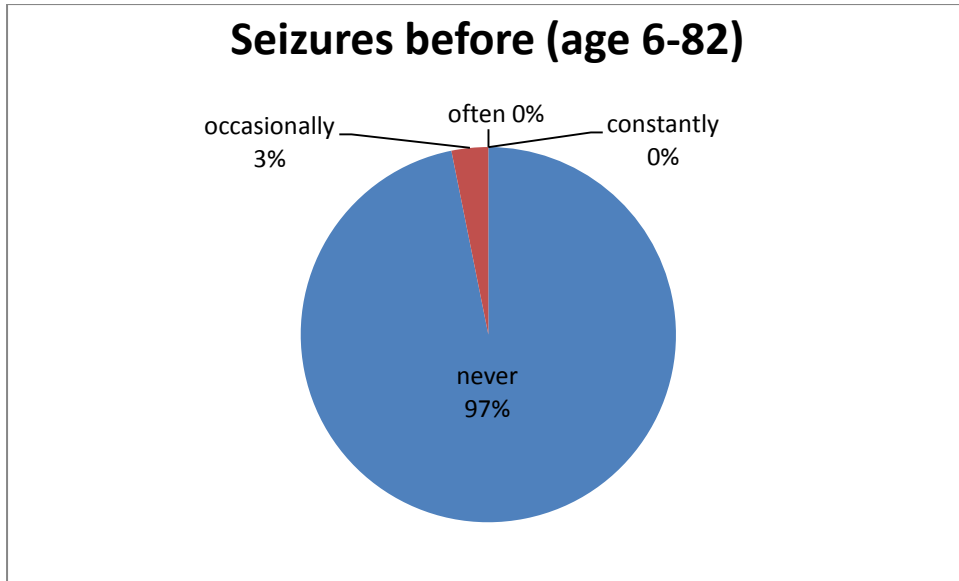
Tingling, numbness, pins and needles before (age 6-82)



Tingling, numbness, pins and needles- after (age 6-82)

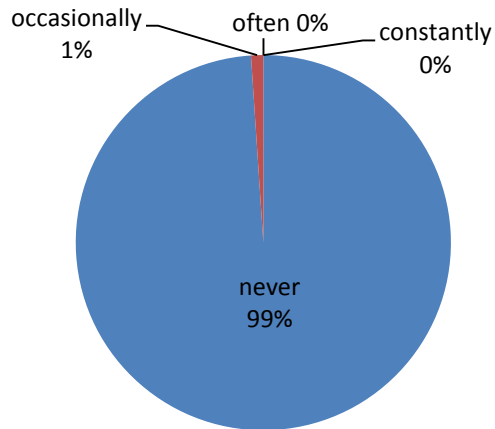


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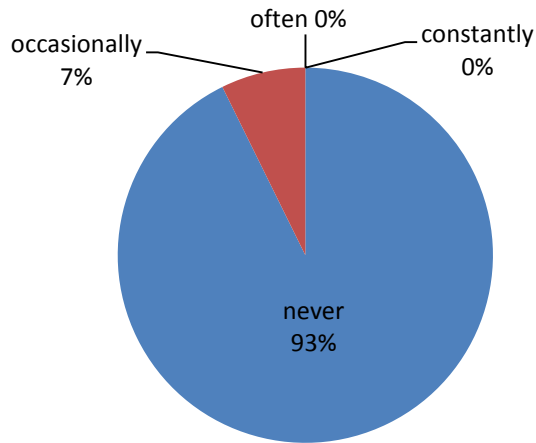


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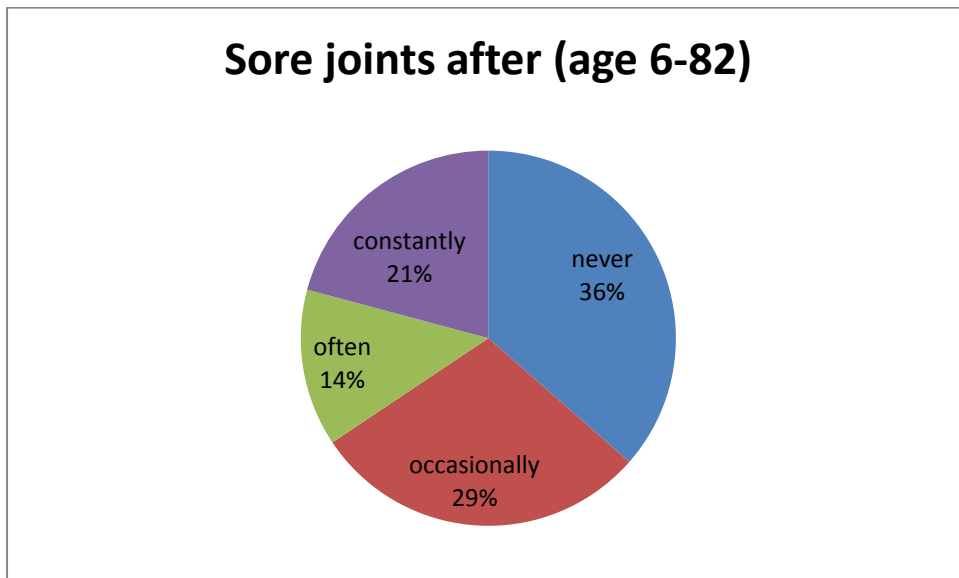
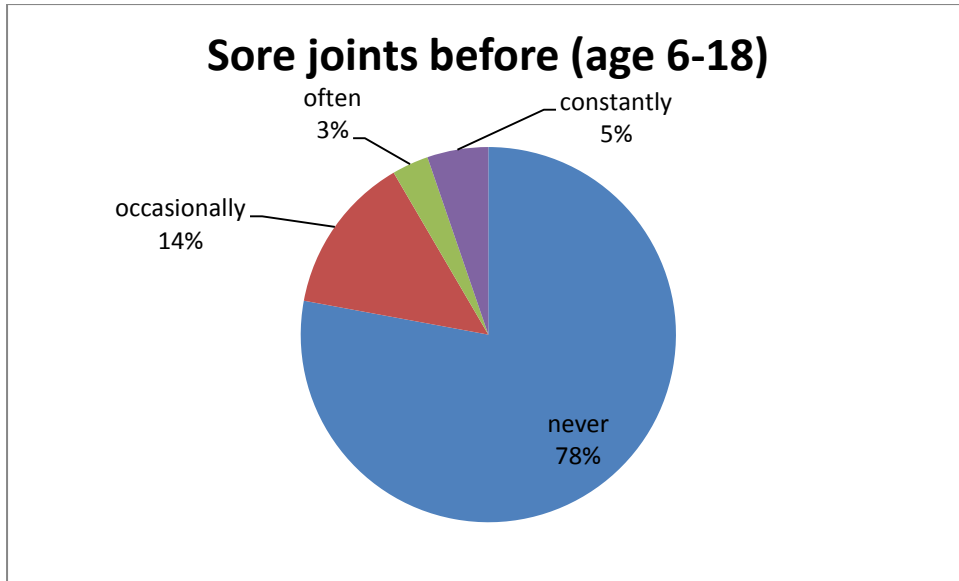
Collapse before (age 6-82)



Collapse after (age 6-82)

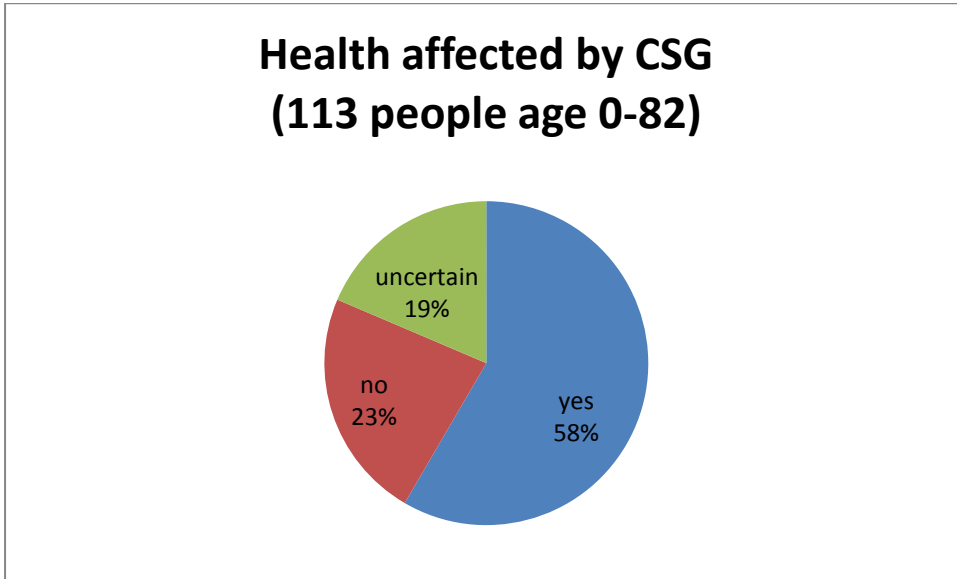


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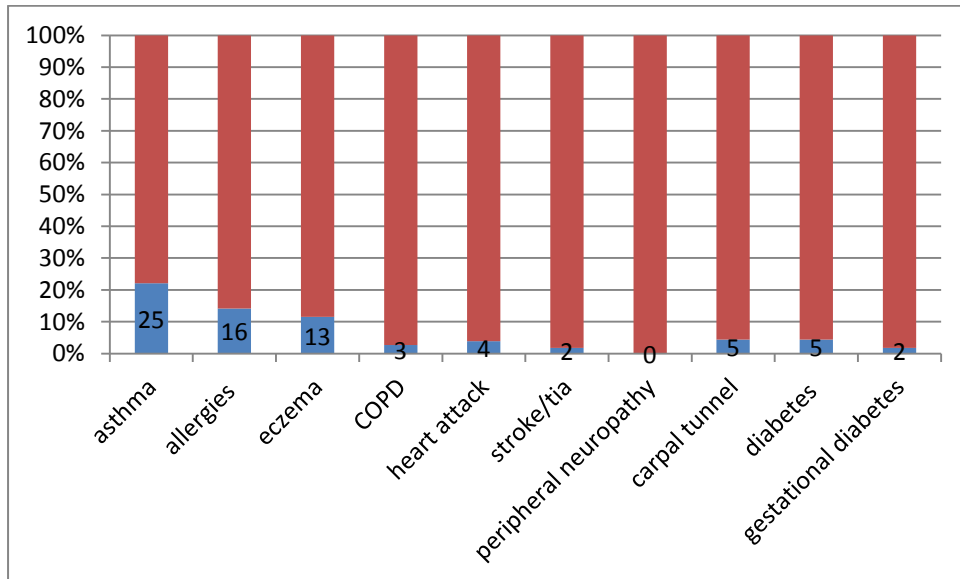
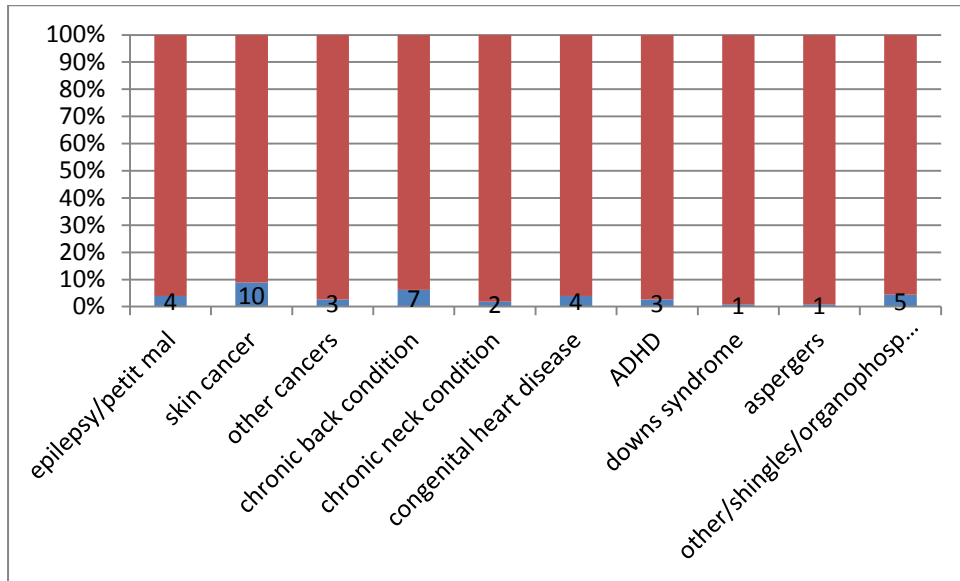
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Percentage Total Affected age 0-82 - Pie Chart



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Diagnoses prior to CSG age 0-82



Diagnoses after CSG

Unexplained marker for ovarian cancer

Asthma

Attention seeking

Chronic cough (undiagnosed)

Depression/anxiety

Asthma

Hypertension

Petit mal

Anxiety/reflux /asthma/ chest infection

Scabies (unresponsive to treatment)

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COPD/ thyroid lump/helicobacter/ diverticulosis/ dermatitis

Low/normal calcium

Constant "flu"

Eczema

Cerebral haemorrhage/secondary hydrocephalus

Anxiety/depression

Pneumonia 6 times since Oct 2012/ abnormal PSA

Skin cancers/ heart issues

Pulmonary emboli post cholecystectomy/ sleep apnoea

Suicidal

Prolapsed disc

Depression/anxiety

Allergies(told environmental)

Pleurisy ?viral

Hashimotos/gastritis/diverticulosis /hypertension

COPD/ Barrett's oesophagus

Arthritis

Ectropian

Skin cancer

Recurrent chest infections/hypertension

Carpal tunnel

Peripheral neuropathy/ renal impairment

Ross River

Depression/anxiety

APPENDIX C – PERCEIVED IMPACTS ON ANIMALS/ BIRDS

Feathers falling off birds and chickens. Skin irritation in dogs, bald patches.

No frogs for 3 years until 2012/2013 season.

Frogs back after the rains.

Horse keeps getting sores on its legs. Less birds- redwings. Used to be heaps. Not here for years.

At one points budgies and chickens died. Turkeys died. No sign of disease. Well one day – dead the next. Parent budgies and babies all dead inside breeding box in the morning. Birds dead outside. 3 chickens died at point of lay. 20 week old turkeys died.

Didn't notice less birds. Goannas disappeared in the last few months-kept finding dead goannas. Cane toads were brought in with the pipes. Puts fresh water and food out for the birds.

Haven't noticed anything

Dog died 10 months after arriving in Tara-heart attack, gums white. Died overnight. Healthy cat- age 8 years, suddenly sick. Persian cat, developed kidney problems, died.

Haven't noticed any problems

More cane toads. Less small birds- no redcaps, robins, wrens. Plants aren't flowering as used to.

Haven't noticed anything

Haven't noticed anything

Increased road kill- emus, echidnas, goannas, snakes, blue tongue lizards, kangaroos, wallabies

No unusual illness

Within a 6 month period dog lost fur, couldn't walk properly, stopped eating and two placid family dogs (raised from pups) -overnight became vicious, had to be put down.

Native animals disappeared especially frogs. Some back in last few weeks in the rains.

Haven't noticed anything

Dogs vomiting after being near surface water

No unusual illness. puts out fresh water for wildlife

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Used to be a lot of wallabies, none recently- very scarce. Birds ok mainly king parrot, rosella, redwing, galah, less snakes, frogs ok

Haven't noticed anything

Rarely see native animals. Previously lots of emus, kangaroos, parrots, galahs

More roos- moved away from traffic nearer wells.

Lots of frogs

Dog bites skin until he has no fur. Other dog that doesn't go outside is ok. Used to be a lot of parrots, red parrots, king parrots, now don't see them

Dogs- rashes after swimming in the dam. No birds, kangaroos or wallabies will drink from the dam now- they used to. Puts out rainwater for the wild animals.

Unexpected death of two kangaroos hand raised from birth. Gives kangaroos and wildlife tank water.

Ample wildlife

Used to be lots of birds and kangaroos- not now. Less green and red/black frogs.

Haven't noticed anything

Nothing unexpected

Dogs rashes, birds loss of feathers.

Hasn't seen a snake in the past seven years. No goannas- previously plentiful. Uses to be lots of birds, now infrequently. Has lots of native trees, no birds even when they are in flower.

Hasn't noticed anything

Cane toads came in with the pipeline, large influx of large adult cane toads. (? Came in with machinery and pipes) rarely see snakes now. Less kangaroos- ?because of road kill

Puppies lost their fur. Loss of frogs for 18 months during drilling. Coming back – finding dead frogs now.

-
- ¹ Public servants tasked with approving massive CSG projects were blindsided by demands to approve two in two weeks <http://www.couriermail.com.au/news/public-servants-tasked-with-approving-to-massive-csg-projects-were-blindsided-by-demands-to-approve-two-in-two-weeks/story-e6freon6-1226574952587>
- ² Coal seam gas in the Tara region: summary risk assessment of health complaints and environmental monitoring data report www.health.qld.gov.au/publications/csg/documents/report.pdf
- ³ Curriculum Vitae Dr Keith Adam <http://education.qld.gov.au/asbestos/pdfs/keith-adam-cv.pdf>
- ⁴ Letter, Rick Wilkinson, Sydney Morning Herald <http://www.smh.com.au/national/letters/churches-fail-to-put-reasoned-argument-20130118-2cz9s.html>
- ⁵ Gasfields Community Support Group <http://westerndowns.group-action.com/2012/04/27/gasfield-community-support-group-3/>
- ⁶ Bernard M Goldstein MD 'The Precautionary Principle Also Applies to Public Health Actions' <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1446778/>
- ⁷ ABC News No link found between CSG and health complaints <http://www.abc.net.au/news/2013-03-21/no-link-found-between-csg-and-health-complaints/4586344>
- ⁸ Toluene <http://www.epa.gov/ttnatw01/hlthef/toluene.html>
- ⁹ Queensland Government, Dept of Environment and Heritage Protection, BTEX Chemicals <http://www.ehp.qld.gov.au/management/non-mining/btex-chemicals.html>
- ¹⁰ QGC – Tara leaking GSQ wells investigation report 1 June 2010 http://mines.industry.qld.gov.au/assets/petroleum-pdf/tara_leaking_well_investigation_report.pdf
- ¹¹ Submission on National Greenhouse and Energy Reporting (Measurement) Determination 2012 - Fugitive Emissions from Coal Seam Gas http://www.scu.edu.au/coastal-biogeochemistry/download.php?doc_id=12515&site_id=258&file_ext=.pdf
- ¹² Condamine River Gas Seep Investigation Report <http://www.industry.qld.gov.au/lng/condamine-river-gas-seep.html>
- ¹³ Gas Today, Challenges in CSG gathering system design http://gastoday.com.au/news/challenges_in_csg_gathering_system_design/064554/
- ¹⁴ About coal seam gas <http://www.ehp.qld.gov.au/management/coal-seam-gas/index.html>
- ¹⁵ Queensland Government, Department of Environment and Heritage Protection <http://www.ehp.qld.gov.au/management/non-mining/btex-chemicals.html>
- ¹⁶ Sydney Morning Herald - Carcinogens found in CSG project <http://news.smh.com.au/breaking-news-national/carcinogens-found-in-csg-project-20110828-1jg77.html>
- ¹⁷ Researchers Find Surprises When Analyzing DNA From Fracking Site <http://www.redorbit.com/news/science/1112743155/fracking-well-microbes-bacteria-water-120612/>
- ¹⁸ WHO Air Quality Guidelines for Europe http://www.euro.who.int/_data/assets/pdf_file/0017/123056/AQG2ndEd_5_2benzene.pdf
- ¹⁹ p-Nonyl-Phenol: An Estrogenic Xenobiotic Released from "Modified" Polystyrene <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1519400/pdf/envhper00388-0165.pdf>
- ²⁰ Diamanti-Kandarakis et al. Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement *Endocrine Reviews* June 1, 2009 vol. 30 no. 4 293-342 <http://edrv.endojournals.org/content/30/4/293.full>
- ²¹ Chemical and Biological Risk Assessment for Natural Gas Extraction in New York. Ronald E. Bishop, Ph.D., CHO, Chemistry & Biochemistry Department, State University of New York, College at Oneonta, Sustainable Otsego March 28, 2011 www.sustainableotsego.org/Risk%20Assessment%20Natural%20Gas%20Extraction-1.htm
- ²² Toxicological profile for Acrolein <http://www.atsdr.cdc.gov/toxprofiles/tp124.pdf>
- ²³ Human health risk assessment of air emissions from development of unconventional natural gas resources May 2012 <http://www.ncbi.nlm.nih.gov/pubmed/22444058>
- ²⁴ Natural Gas Operations from a Public Health Perspective Sept 2011 <http://www.endocrinedisruption.com/chemicals.journalarticle.php>
- ²⁵ Lloyd-Smith, M. & Senjen, R., Hydraulic Fracturing in Coal Seam Gas Mining: The Risks to Our Health, Communities, Environment and Climate, National Toxics Network, September 2011 <http://ntn.org.au/wp/wp-content/uploads/2012/04/NTN-CSG-Report-Sep-2011.pdf>

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²⁶ Gas Patch Roulette

http://www.earthworksaction.org/library/detail/gas_patch_roulette_full_report#.UWBLDntwbIU

²⁷ Environmental pathways of potential impacts to human health from oil and gas development in northeast British Columbia, Canada <http://www.nrcresearchpress.com/doi/abs/10.1139/a2012-005#.UWBMJ3twbIU>

²⁸ An Exploratory Study of Air Quality near Natural Gas Operations

http://cogcc.state.co.us/RR_HF2012/setbacks/CommentDocs/Public/TEDX_Setbacks_Comments.pdf

²⁹ Update on Hydrofracking <http://aapdistrictii.org/update-on-hydrofracking/>

³⁰ Worker Exposure to Crystalline Silica During Hydraulic Fracturing <http://blogs.cdc.gov/niosh-science-blog/2012/05/silica-fracking/>

³¹ Update on Hydrofracking <http://aapdistrictii.org/update-on-hydrofracking/>