



## A JOURNEY INTO CANCER'S CAUSES

By Siobhan Wescott, MPH

### Alaska Natives Ask About Cancer

A lot of Alaska Natives are asking why do so many people have cancer? Is it due to pollution, radiation, or toxic chemicals in Alaska?

As an Athabascan and a long-time Alaskan, I have been curious about these questions, too. I am amazed at how much is known about cancer from experiences in the lower 48.

As a health educator, I want to share this knowledge with others. It is not a simple, easy journey to

learn the causes of cancer. To find out what goes wrong, and what we can do about it, we must understand some of the basics of how the body works.

A grant to the Alaska Native Health Board (ANHB) funded this booklet. I would like to thank the staff of ANHB for their help in putting this information together.

*Siobhan Wescott, MPH*

The following questions will be answered:

- *What goes wrong to cause cancer?*
- *What do genes do for us?*
- *What is the connection between cancer and age?*
- *How do we know what causes cancer?*
- *How does our diet effect cancer?*
- *Why can cancer grow unnoticed?*
- *Why does it matter where cancer starts?*

### What goes wrong to cause cancer?

When people speak of cancer, most often they talk about their fear that cancer is caused by pollution of one kind or another. The real situation is more like the Native view that all things are related. Environmental pollutants are only one of the many connections between cancer and our lives.

You may not have heard what cancer has to do with our body's inner workings. Those in the lower 48 who have closely looked at cancer found many surprising ways in which our bodies are involved in the battle against cancer.

To start, few people realize how mighty our body's defenses are

against cancer. Some parts of your defenses carefully correct the very problems that lead to cancer. Other parts attack early cancer as fiercely as mother bear protecting her cubs. All of these defenses fight cancer daily.

Why do our defenses know how to look for cancer? Cancer is an old enemy to our defenses because it starts from our body's most basic building blocks.

Our building blocks, called cells, follow a set of instructions, called genes. When genes are damaged, the

*(Continued on page 2)*



(Continued from page 1)

cells can grow out of control, and may become a dangerous cancer. So, cancer is our own cells growing out of control.

This is a good news, bad news situation. The bad news is that many, many things can damage genes, such as everyday wear and tear. The good news is that we have defenses that constantly fix any damaged areas. These defenses rarely let a mistake go unnoticed. If too many errors do occur, though, it can lead to cancer.

If errors do get past these cell-level defenses, our bodies provide another type of protection. These are roaming cells that search and destroy cancer long before it has a chance to threaten the person's life. These defenses are as fierce as a mother bear who senses a threat to her cubs.

How do genes get damaged in the first place? Most of the time, genes remain intact and undamaged. They are most vulnerable to errors when they have to be copied. Every time we need a new cell, the body makes a new copy of the genes.

You may feel like your body stays pretty much the same from day to day, but there is more to the story. Because certain cells wear out, we need to make millions of new ones every day. Specific areas are more likely to need new cells than others.

If you have ever wondered why cancer seems to start in the same few areas (lung, colon/rectum, breast, stomach), we have just found one reason. These areas must make many new cells, copying the genes, which can slowly gather the errors that lead to cancer.

So, is there anything we can do to prevent cancer (protect our genes from errors)? Yes, some of the connections between cancer and our lives can be changed to lower our risks of cancer.

We know what can be changed because of research from Harvard and other universities in the lower 48. The researchers at Harvard studied 289,700 people who *did not* have cancer. As the years went by, they could compare the lives of those who got cancer to those who did not.

These long-term studies showed that the two largest factors related to cancer were tobacco use and diet. Smoking and chewing tobacco account for 30% of *all* cancers in the United States. Diet is linked to 30% of all cancers (we'll talk about how diet affects cancer risk on page 8). The next largest factor is the errors that occur when the genes are copied to make a new cell.

Do environmental pollutants cause cancer? Research has found that industrial workers, such as those in certain chemical plants, had a slightly higher risk of developing cancer. The

(Continued on page 3)



A section of genes. Long chains of these hold the instructions for your cells and organs to work.

(Continued from page 2)

risks in industrial workers account for about 4% of all cancers in the US, and environmental pollution was linked to 2% of all cancers. Both of these are much less than the top two factors, tobacco use and diet.

Many people fear they have no defenses against the environmental pollutants that are now in our lives. Cancer, though, is due to a weakness in our own system of needing cells and genes, not a new disease. *The real story is our body's strong defenses against cancer.*

We know about preventing cancer by helping



Play-by-play of an immune defense cell destroying a cancer cell (arrow points to cancer cell).

your defenses. A traditional Native diet can provide important substances to boost the cell defenses. Exercise, even walking, also helps our defenses work better.

You can hurt your defenses by overloading them. Smoking floods the body with chemicals that can damage the genes, and makes the defenses work harder than they can handle. More errors than usual happen to the genes of smokers.

This booklet will answer some of your questions about cancer. Who is most at risk for cancer? How do your DNA and genes help you? And much more.

---

## Terms you may have heard, but were not sure what they meant

**Cells** – the basic building blocks of the body. Bones, skin, muscle, and vital organs all have different cells. Cancer is a group of cells that grow too quickly and no longer carry out their duties.

**Genes** – the set of instructions for your cells that help manage your day-to-day operations. Genes guide the development of all of our skin, muscle, bones, organs, etc.

**DNA** – the chemical pieces that make up the genes. Each person's set of DNA is unique.

**Cell defenses** – the part of the defenses that ensure when new cells are made, the genes are copied correctly. Errors that could lead to cancer almost never get past these cell defenses, so

it usually takes years from the first error to a cancer diagnosis.

**Immune defenses** – your body's defenses against anything that shouldn't be in the body, whether it be a bacteria or a cancer.

**Free radicals** – an unstable chemical. If a free radical reaches the genes, it can cause a lot of damage through a chain reaction. One source of free radicals is the sun, another is the process that cells use to convert food into energy.

**Anti-oxidants** – part of fruits and vegetables that prevent the damage from free radicals.



## What do genes and DNA do for us, anyway?

We start out with little in life: just one cell. As an adult we contain *trillions* of cells, making up our skin, bones, muscles, heart, lungs, kidneys, etc. How can this happen? After all, pregnant women never have to think about what organs or cells the baby needs.

We get to adulthood with all these organs and cells because the needed instructions are written in our genes. Every cell contains a copy of the genes.

Genes tell our bodies how to grow, and help keep our bodies working every day by guiding activity in cells.

If genes are a book of instructions, then the book is written in the language of DNA. Every per-



son has a completely unique DNA set (genes). The only exception is identical twins, who have identical DNA.

When we have children, our traits are passed on through our genes. Each parent contributes one half of the genes that make up the first cell of life.

Is cancer risk also passed through families by our genes? Some cancers can be hereditary, which means that certain genes in a family may increase your risk of cancer. However, most cancers are *not* thought to be hereditary. So if a relative has cancer, it does not mean that you will get cancer. Talk to your health care provider about your cancer risks.

---

## What is the connection between cancer and age?

The chart on page 5 shows how the risk of cancer rises as we age. The reasons that the risks are higher for elders involve our defenses against cancer.

First, as we age, many parts of our body slow down a bit. Our cancer defenses do not work as well as they used to, just like muscles cannot lift as much as they once could.

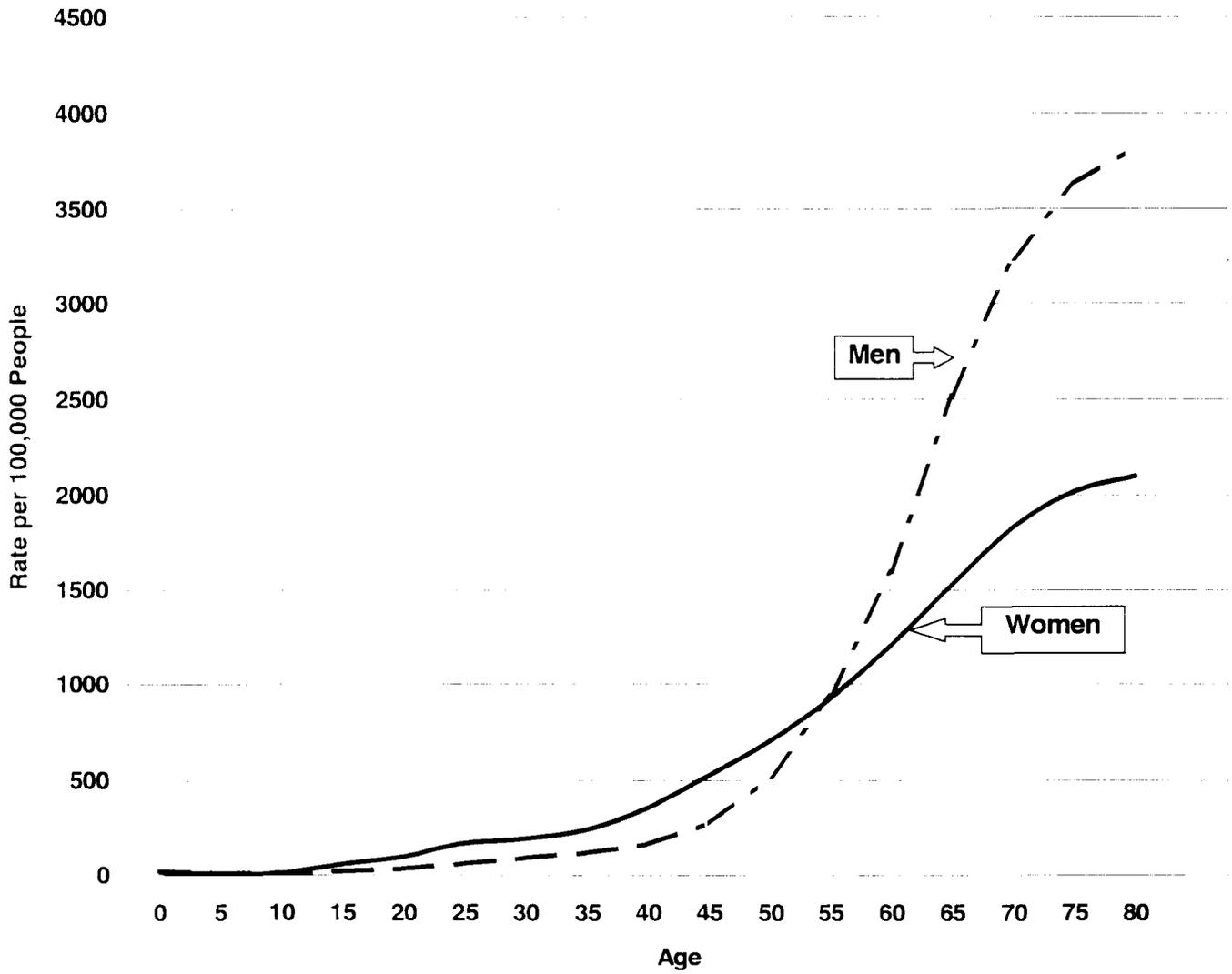
Second, very few errors that might lead to cancer get missed by our body's defenses. If an error does slip by, chances are it will be years before another error occurs.

Thus, most cancers require lots of time to develop. The research estimates that years or decades are needed.

In Alaska Natives, 3 out of every 4 cases of cancer occur in someone over the age of 50. While elders do most often get cancer, one quarter of cancers happen to people under age 50. This is a similar pattern to the lower 48.

If you have questions about understanding the chart on page 5, bring this booklet to your next visit with your health care provider.

## Cancer Risk by Age



## How can we find out what causes cancer?

You have probably heard of many things that may lead to cancer, such as environmental pollutants, store-bought foods, living longer, smoking, genetics, etc. You will find people who firmly believe that one cause is more to blame than any other. *But how do you know which ones caused cancer in the people you know?*

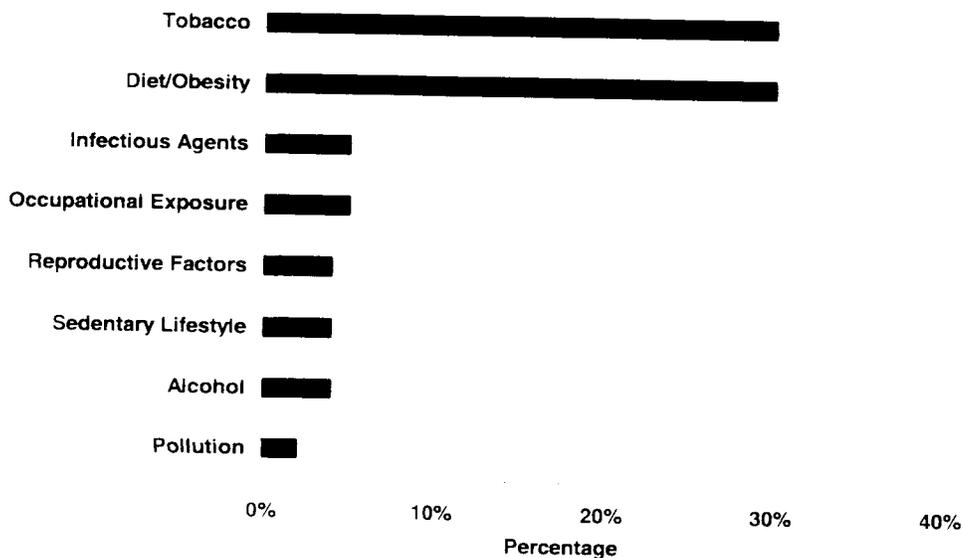
Harvard and other universities put their efforts into long term studies to answer this very question. These researchers learned about the lives of 289,700 people without cancer. As the years went by, the researchers could look back and see what the differences were between people who got cancer and those who did not. They were able to assign a percentage of all cancers brought on by each risk factor.

The factors that are most frequently associated with developing cancer are shown on the chart below. As you can see, the majority of cancer risk comes from tobacco use and diet. This is why you have probably heard about lowering your risk of cancer by quitting smoking or eating certain foods.

Other research from the lower 48 suggests that about another 25% of cancer happens because of the need to make new cells (our basic building blocks). This is due to everyday wear and tear on our genes, not from a defective gene the person inherited.

Pollution levels as a risk factor are very low on the list, which is a surprise to many.

### Causes of Cancer Deaths in the United States



## What are the risk factors for cancer?

The long-term studies from Harvard compared the major differences in the lives of people who got cancer to those who did not get cancer. The result is the following list of risk factors, which can help sort out what you can do to reduce your risk of cancer.

Keep in mind that rarely is one factor the sole reason for a cancer case, so talk to your providers about what would be best for you to focus on.

**Tobacco** – largest single factor that increases risk of cancer, with a total of 30% of all cancers attributed to smoking or chewing tobacco.

**Diet/Obesity** – rather than what environmental pollutants are in food, researchers found that what types of food you eat affect your risk of developing cancer. Diet is another 30% of the cancer risk. See page 8 for a more in-depth look at the connection between cancer and diet.

**Infectious agents** – for Alaska Natives, one example of cancer from an infectious agent is Hepatitis B, which can lead to liver cancer. There is now a vaccine for Hepatitis B which can provide protection. (People who are Hepa-

titis B carriers should have a blood test every six months to screen for liver cancer.)

**Occupational exposure** – these include high risk occupations which are not common in Alaska. Examples include uranium miners, asbestos factory workers, certain chemical plant workers, etc.

**Reproductive factors** – this category refers mostly to women's risk factors. Risk of breast cancer, for example, goes up if a woman does not have children before age 30. Sexually transmitted diseases also increase the risks of cancer.

**Sedentary lifestyle** – Not moving around much during the day can increase the risk of cancer. Your body's own defenses work better when you exercise during the day. Even walking around or climbing a flight of stairs can help.

**Alcohol** – you might think that alcohol would be a bigger factor than only 4% of risk. People who drink too much may not be eating well or taking care of themselves, which will increase their overall risk of cancer.

**Pollution** – although people think of environmental pollution as the biggest cause of cancer, it is only the major risk in 2% of all cancers.

## What does our diet have to do with cancer?

You may be surprised that 30% of the risk of cancer is associated with diet. The long-term studies that showed this connection are from the lower 48, so applying the results to Alaska requires some explanation.

The largest difference is that Alaskans have many more foods rich in cancer-fighting agents available than do people in the lower 48. In the typical American diet, fruits and vegetables are the main sources of cancer-fighting agents in their diet.

*In Alaska, many traditional foods are very high in cancer fighting agents. Salmon and other fish, sea mammals, berries, meat from game animals, and many other traditional foods contain agents that help fight cancer.*

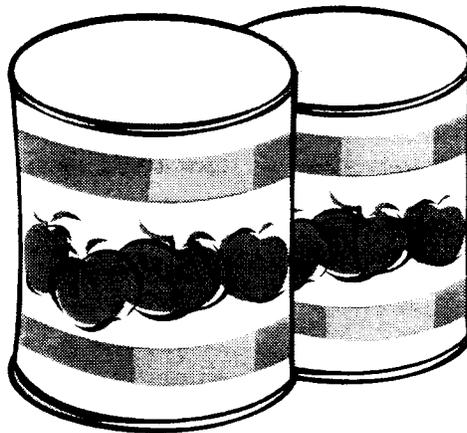
What if you cannot get traditional foods? The healthiest choice from the store may be canned or frozen, rather than fresh, fruits and vegetables.

Besides being expensive, fresh fruits and vegetables may not be as healthy as canned or frozen choices. The reason for this involves saving the vitamin and mineral content.

When you pick a fruit or vegetable, the vitamin content starts to decline. The farther the

piece of fruit or vegetable has to travel until you eat it, the more vitamins are lost.

If the fruit or vegetable is canned or frozen right away, the loss of the vitamins stops. The loss of the vitamins only starts up again when you open the can or the bag. To choose the healthiest canned or frozen foods, watch out for any added fat or salt. These may make the food taste better, but they also make the food less healthy.



Can you just take a vitamin pill and not worry about what you eat? Basically, no. Eating a healthy, varied diet provides your body with many cancer-fighting substances besides vitamins. Vitamin pills provide only part of the health benefits, and can cause problems if

they are not taken correctly.

If you take too many of certain vitamins, you may actually cause health problems. Also, many vitamins should be taken with food to be fully effective.

After looking at all of the factors, the best advice is to eat as healthy as you can. Talk to your provider or a dietitian about which foods you should choose.

## Why can cancer grow unnoticed?

Why can people feel fine, go in for a medical visit, and suddenly find out they have cancer? Why are there no symptoms of some cancers? Why can't health care providers find the cancer earlier?

*The answer is that early cancer does not call attention to itself since it is an unhealthy growth of our own cells (our tiny building blocks).*

This type of growth only happens when our set of instructions, called the genes, become damaged in very specific areas. Because of our strong safeguards, these errors do not occur all at once. For enough errors to lead to cancer, years or decades are needed.

Meanwhile, the person will probably feel fine. Since it is our own cells, there may be no symptoms at all, especially very early on in the cancer.

If a cancer does cause symptoms, it may be very hard to tell them from everyday problems. For instance, stomach problems *can* be a sign of can-

cer. But almost anything can upset your stomach, like a big meal or stress.

Cancer may seem like a fast-acting disease because by the time someone feels sick enough to know something is wrong, the cancer can be progressing very quickly. That cancer probably grew quietly for years before the person felt sick.



*Cancer needs time to grow, and the person may not have any symptoms.*

There are medical tests to look for certain types of cancers. These tests, called screenings, include Pap Smears, mammograms, sigmoidoscopy (try saying that one!), etc. Screenings are recommended even if the person feels fine.

Currently, only a few cancer screenings can find cancer *very* early when treatment is the most effective. Some people ask why bother at all? The

sooner you detect cancer, the better chance of survival you have, and regular screenings can help.

To find out about screenings, talk to your health care providers.

## Why does it matter where cancer starts?

People often think of cancer as one disease that happens to start in different areas of the body. In the medical view, though, noting where the cancer started is critical for several reasons.

Where the cancer starts has a great effect on how hard it is to find the cancer. Lung cancer, the most common cancer in Alaska Natives, is very hard to find. Cervical cancer, on the other hand, is fairly easy to find with the Pap Smear screening. The earlier the cancer is detected, the more effective treatment can be.

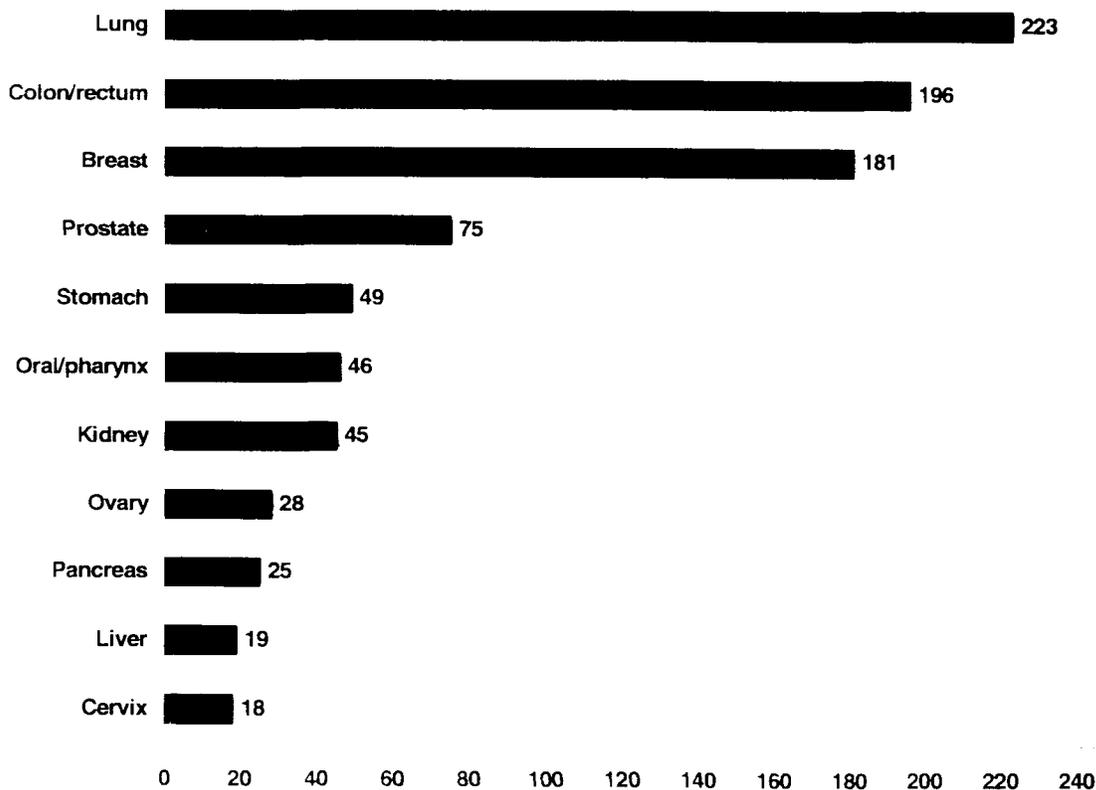
The chart below lists the number of each type of cancer that has occurred in Alaska Natives. Health care providers can make the best treatment plan when they know what area of the body the cancer started in.

When people in a village see many cancer cases, they often worry that something around them is causing all the cancer. *Each type of cancer has a separate set of probable causes, and environmental pollutants are low on the list of risk factors.*

Sometimes it feels like cancer is higher here than anywhere else. The overall rate of cancer in Alaska Natives is about the same as the rate for the U.S. The top three cancers in Alaska Natives are the same for the U.S. population.

The chart on page 11 will help you identify factors which affect your risk for several types of cancer. Be sure to talk with your health care provider about what you can do to reduce your risk of cancer.

**Number of Cancers by Type (Alaska Natives, 1992-96)**



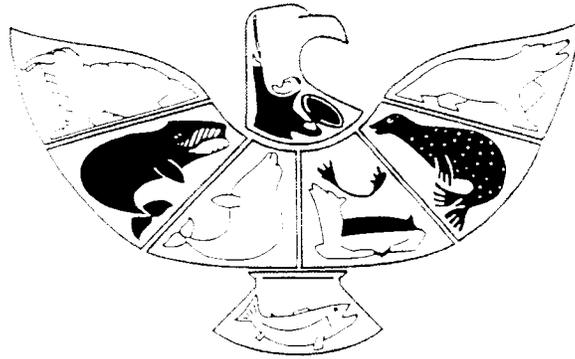
**Factors that *lower*  
your risk of cancer**

**Factors that *RAISE*  
your risk of cancer**

Type of cancer	Vegetables	Fruits	Physical Activity	Alcohol	Salt	Obesity	Tobacco Use
Lung	↓↓↓	↓↓↓	↓	↑			↑↑↑
Colon/rectum	↓↓↓		↓↓↓	↑↑		↑	↑
Breast	↓↓	↓↓	↓	↑↑		↑↑	
Prostate	↓						
Stomach	↓↓↓	↓↓↓			↑↑		
Oral/pharynx	↓↓↓	↓↓↓		↑			↑↑↑
Kidney	↓					↑↑	↑
Ovary	↓	↓					
Pancreas	↓↓	↓↓					↑↑↑
Liver	↓			↑↑↑			
Cervix	↓	↓					↑↑↑
Bladder	↓↓	↓↓					↑↑↑
Esophagus	↓↓↓	↓↓↓		↑↑↑			↑↑↑
Larynx	↓↓	↓↓		↑↑↑			↑↑↑
Thyroid	↓	↓					
Uterus	↓	↓				↑↑↑	
Gallbladder						↑	
Nasopharynx					↑↑↑		↑↑

↓↓↓ greatly lowers your risk of cancer  
 ↓↓ somewhat lowers your risk of cancer  
 ↓ might lower your risk of cancer

↑↑↑ highly raises your risks of cancer  
 ↑↑ somewhat raises your risk of cancer  
 ↑ might raise your risk of cancer



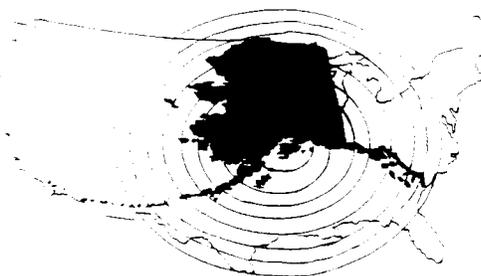
## Alaska Native Health Board

*For further information about cancer in Alaska Natives, please contact:*

- Alaska Native Health Board, Epidemiology Center (907) 562-6006, [www.anhb.org](http://www.anhb.org).  
The staff of the Epicenter can provide specific information about cancer in Alaska Natives.

*For other good sources of information about cancer, contact:*

- American Cancer Society 1-800-227-2345, [www.cancer.org](http://www.cancer.org) 1057 Fireweed Lane, Suite 204 Anchorage, AK 99503, local number: (907) 277-8696. The American Cancer Society is a nationwide, community-based voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives, and diminishing suffering from cancer through research, education, advocacy, and service.
- Cancer Information Service 1-800-4-CANCER (1-800-422-6237), Pacific Northwest web site: [www.fhcrc.org/cipr/pnwcis](http://www.fhcrc.org/cipr/pnwcis). CIS provides current, accurate cancer information for patients, their families, the general public and health professionals.



## Epidemiology Center

This booklet was funded in part by a grant from the Alaska Cancer Registry, Section of Epidemiology, Division of Public Health, Alaska Department of Health and Social Services. This booklet was printed in September, 1999.