

## How Pancreatic Cancer Arises, Based on Complexity Theory

Nat Pernick, M.D.

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### Introduction

This is the third paper in a series discussing the top 20 causes of US cancer death and how they arise based on complexity theory (see also [How Lung Cancer Arises \[Pernick 2018\]](#), [How Colon Cancer Arises \[Pernick 2020a\]](#)). We first discuss the population attributable fraction of pancreatic cancer risk factors and their mechanism of action, then integrate these mechanisms into our theory about how cancer arises in general ([Pernick 2017](#)) and in the pancreas, and finally suggest curative treatment approaches for pancreatic cancer. This essay focuses on pancreatic adenocarcinoma, the histologic type of over 90% of all pancreatic cancer cases.

### Pancreatic cancer epidemiology

Pancreatic cancer is the third leading cause of US cancer death after lung and colorectal cancer, with a projected 47,050 deaths in 2020 (men 24,640, women 22,410, [Cancer Facts & Figures 2020](#)). It is projected to become the second leading cause of US cancer death by 2030 ([Rahib 2014](#)) as pancreatic cancer deaths increase due to excess weight and type 2 diabetes ([Gordon-Dseagu 2018](#)) and as colorectal cancer deaths continue to decrease ([Cancer Facts & Figures 2020](#)). Americans have a 1.6% lifetime risk of this disease based on 2015-17 data ([SEER](#), accessed 17Jan21).

Pancreas cancer has a 5 year relative survival rate of only 9% ([Cancer Facts & Figures 2020](#)), with minimal improvements since the mid-1970s, unlike other cancers ([Siegel 2018](#)). Most patients (53%) are diagnosed at an advanced stage and have a 5 year survival of only 3%. For the 10% of patients with locally confined pancreatic cancer, the 5 year survival is still only 37% ([Cancer Facts & Figures 2020](#)).

### Attributable risk factors for pancreatic cancer

Table 1 lists the risk factors for pancreatic cancer, which are discussed below in declining order of population attributable fraction ([World Health Organization - Metrics: Population Attributable Fraction \(PAF\)](#), accessed 17Jan21), assessed using conservative figures.

#### Table 1 - Population attributable fraction of pancreatic cancer risk factors

Random chronic stress / bad luck - 25-35%  
Non O blood group - 17%  
Excess weight - 15%  
Cigarette smoking (tobacco) - 15%  
Type 2 diabetes - 9%  
Excessive alcohol use - 5%  
Diet - 5%  
Family history / germline - 2%  
Chronic pancreatitis - 1%

Controversial: aspirin, *Helicobacter pylori* infection, smokeless tobacco

Protective: allergies (atopy) - 3-7%

References in text

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Note: This paper is in preparation, with an estimated completion date in March 2021. This PDF will be replaced with the full paper when available.