



Intelligence and Medicine: Parallel Cognitive Traps

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As society becomes more complex and interrelated, cognitive errors become ever more costly. These errors transcend our entire society, affecting analytic processes in medicine, intelligence, law enforcement, and the business community.

Studies have concluded that problems with the delivery of health services, for example, are due to flaws in how physicians process data. Studies have demonstrated that 80 percent of cases of misdiagnoses causing serious harm to the patient can be explained by a cascade of cognitive errors: as many as 15 percent of routine diagnoses are incorrect, and autopsies show a 10 to 15 percent error rate on diagnosisⁱ

Some experts assert that intelligence professionals suffer from similar error rates. Exercises conducted by Pherson Associates with Intelligence Community analysts suggest that they may be right. Pherson Associates has been teaching the Analysis of Competing Hypotheses methodology to intelligence and law enforcement officers since 2003. As part of this exercise, students work in groups of three to code and enter data onto a spreadsheet. More than 3,000 students have participated in this exercise and, invariably, they report that they disagree with their partners on how to load the data in about 25 to 35 percent of the cells in the matrix. The conflicts usually are traced to two students interpreting the data differently, bringing different experiences to the table, or simply not considering in a key fact that their colleague points out to them. The conflicts usually are resolved with the initial view being accepted half the time and the contrary view the other half of the time. This pattern has been consistent for several years, suggesting that if a student were to load the data himself without a colleague to challenge his (or her) assumptions, about 15 percent of the data in the spreadsheet would be loaded incorrectly.

Although reliance on structured thinking presumably can reduce such error rates, few college students are exposed to these more structured thinking tools. At least one study concluded that college students generally lack reasoning skills and have trouble recognizing the assumptions that must be made to solve problems. It also established that students found it difficult to discover implications of any essay or to identify an author's assumptions.ⁱⁱ

A careful review of medical and intelligence literature would suggest that both professions are equally affected by a failure to:

- Check Key Assumptions
- Generate Multiple Hypotheses
- Assess the Diagnosticity of Competing Hypotheses
- Seek Disconfirming Evidence
- Assess the Potential for Deception

The following paper provides examples of how these two professions are subject to many of the same cognitive traps.

Checking Key Assumptions

Intelligence Examples

In 1998, many were caught by surprise when the Indian government conducted a nuclear test. Some faulted the Intelligence Community, noting that India's new Bharatiya Janata Party (BJP)-led government had run on a campaign platform to conduct a nuclear test. A post-mortem found that two key assumptions had not received critical scrutiny. First, there was an assumption that India would not conduct a nuclear test because it would anger the United States and subject itself to economic sanctions. Second, some assumed that because the BJP had talked about testing in public, such statements were mere campaign rhetoric.ⁱⁱⁱ Another classic example of not challenging key assumptions occurred when senior intelligence analysts determined that the USSR would not put missiles in Cuba because Khrushchev would not dare antagonize the United.

Medical Example

A forest ranger in the apparent pink of health came in complaining of chest pain. Breathing intensified the pain. The pain stayed in the center of his chest and did not radiate. He had never smoked and had no family history of a heart attack, stroke, or diabetes. His job was stress free, and he had the pulse and blood pressure normal for an athletic person. His EKG, chest x-ray, and blood work were normal. The doctor concluded that he had over-exerted himself. The doctor acknowledged that his key assumption was based on the subject's healthy appearance. The forest ranger experienced an acute heart attack the next day. Several reasons were given for why the doctors missed the impending heart attack: unstable angina doesn't show up on an EKG half of the time; the enzyme test was negative because the damage to the heart had not yet happened; and the X-ray didn't show fluid buildup because the heart had not yet failed to pump.^{iv} In this case, the lack of definitive evidence and the assumption the patient was healthy based on his appearance prevented the doctor from anticipating a serious medical problem.

Generating Multiple Hypotheses

Intelligence Example

In the 1970s and 1980s most intelligence analysts believed that change in the USSR, if any, would be marginal. Any new leader would not break sharply with the past because all former Soviet leaders had built their careers within the Communist Party and hence had a vested interest in sustaining the system. A scenario involving the disintegration of the Soviet

Union was deemed not worth discussing and relegated by most to the realm of the fantastic. One senior intelligence official, in fact, pronounced that the demise of the Soviet Union would not happen in our lifetime or in our children's lifetime. When new trends were identified in Eastern Europe and the Soviet Union, most analysts interpreted them in the context of the single model to which they adhered—hence forecasting an almost inevitable conservative backlash—rather than considering a broader context that might have implied fundamental reform. The generation of multiple hypotheses and a more careful look for underlying drivers of change could have produced a much richer understanding of the rapidly evolving situation in the USSR and its policy implications for the United States.^v

Medical Example

One woman had a problem eating food and keeping it down. After eating, she frequently vomited. A series of doctors concluded that she had irritable bowel syndrome, bulimia, or psychiatric disorders. After lab results showed her overall health failing, she was placed on a diet to insure she still had adequate calories, but her stomach problems became worse. After many years, a new doctor asked open ended questions that refocused attention more on the onset of her problems and set aside previous diagnoses. By listening carefully to her story, the new doctor considered the possibility she was not absorbing the calories. He probed for new hypotheses and ordered further tests that showed she had celiac disease. Her eating of carbohydrates was literally making her sick. Being a rare disease, few doctors ever consider that possibility.^{vi}

Assessing the Diagnosticity of Competing Hypotheses

Intelligence Example

Prior to the onset of the second Iraq war, almost all Intelligence Community analysts operated from the mindset that Iraq must have Weapons of Mass Destruction (WMD). The only open question for them (and most policymakers) was how many weapons of mass destruction Iraq had in its possession and how close the country was to weaponization. Pieces of evidence that revealed information about WMD capabilities were evaluated as highly reliable, whereas evidence that might have questioned the existence of WMD was ignored. When the requirement was received to draft a National Intelligence Estimate (NIE) on Iraq's WMD capability, a key alternative hypothesis—"Does Iraq even have WMD?"—was not addressed. As a result, the null hypothesis was not considered, diagnostic evidence that suggested Iraq had no weapons of mass destruction was ignored, and evidence that Iraq had such weapons was not subjected to sufficient scrutiny.^{vii}

Medical Example

A sailor from the merchant marine came in with fatigue and a swelling belly. An intern noticed alcohol on his breath, and the patient said he enjoyed a glass of rum every evening. His legs, feet, and abdomen were swollen; he was unshaven and dressed in old clothes. The intern decided that the man was suffering from cirrhosis of the liver. He was unsympathetic to patients whom he felt did not take care of themselves and told the man to sleep it off while giving him some mild diuretics. The overseeing doctor asked the intern to provide alternative hypotheses. After additional tests, it was determined that the sailor has Wilson's disease that causes the body to lose its ability to shed copper. The sailor was not an alcoholic and really did have only one small glass of rum a day.^{viii}

Seeking Disconfirming Evidence

Intelligence Example

A formal search for disconfirming indicators before the attack on Pearl Harbor might have made policymakers more alert to clues that something was up. Pearl Harbor was not a last-minute event. Rather, there were several events days prior to the attack that suggested an attack was imminent. On November 27, a US General noted that the Japanese in the Pacific were analyzing, at a high pace, US ship signals to pinpoint the American fleet. Two days later, the same person noted that the Japanese fleet seemed to be retransmitting old messages. On the night of November 30 the Japanese fleet suddenly changed its naval codes—much sooner than their normal pattern. On the morning of December 3 reports were received that the Japanese were burning documents and their codes both in Hawaii and Washington D.C.^{ix} None of these signals were recognized and processed in time to alert Pearl Harbor of an impending attack.

Medical Example

Sometimes doctors tend to look for conditions that exist rather than conditions that are missing. A controlled study of more than 100 radiologists in reading 60 chest x-rays found radiologists disagreed among themselves 20 percent of the time when asked if the x-ray was normal. When a radiologist is asked to reread the films on a different day, he or she usually disagrees with himself or herself 5 to 10 percent of the time. In one study to assess whether doctors would detect something not on the film (in intelligence parlance this would be acknowledging the absence of evidence), a film was provided with a missing clavicle. Sixty percent of the doctors failed to detect the missing clavicle. When the doctors were told that the x-ray was part of an annual physical to screen for serious diseases, 58 percent failed to notice the missing clavicle. When told the x-ray was taken to look for cancer, however, 83 percent mentioned the missing bone.^x

Assessing the Potential for Deception

Intelligence Example

President Bush, and President Reagan who preceded him, were concerned about reports that Libya was developing a Chemical Weapons (CW) capability at Rabta. Libyan officials contended, however, that the plant was merely producing pharmaceuticals. As officials were considering air strikes in March 1990 against the suspect CW facility at Rabta, new intelligence arrived indicating that the plant had been destroyed in a fire. US officials initially judged that the plant had sustained substantial damage and would be out of commission for at least a year. After weeks of analysis that considered the possibility of deception, analysts decided that the fire at Rabta was a hoax. Reports of bringing tires to the plant and setting them on fire to create a large amount of smoke and other evidence to simulate an accident eventually persuaded analysts that they had witnessed deception.^{xi}

Medical Example

Not all deception is done for sinister purposes. A 74-year old black woman from Mississippi was admitted to the hospital with poorly controlled hypertension and angina. Several medicines had been prescribed for her with different dosages she was having trouble following the directions and her condition continued to deteriorate. Doctors who were involved in her case were increasingly frustrated that she was not following the regimen laid out for her, and she was determined to be non-compliant. It took some time before one of the doctors realized that she was non-compliant because she could not read.^{xii}

ⁱ Groopman, Jerome, MD, *How Doctors Think*, Boston, Houghton Mifflin Company, (2007). Most of the medical examples come from this source, although the internet is replete with examples including 285,000 hits on “medical misdiagnosis.” This is a difficult field to research objectively because many doctors are reluctant to discuss their mistakes, citing possible exposure to lawsuits and the efforts by many attorneys to score malpractice awards by second guessing doctors.

ⁱⁱ L. Dee Fink, *Creating Significant Learning Experiences: An Integrated Approach to Design College Courses*, San Francisco, John Wiley & Sons, (2003). The author cites several other studies on the lack of progress of college students in analytic thinking. Anecdotal information indicates these deficiencies persist.

ⁱⁱⁱ The postmortem by Admiral Jeremiah of the intelligence failure on the 1998 Indian nuclear test was never publicly released. However, this information can be gleaned from the press conference Adm. Jeremiah gave on 6/4/1998. Also, see Jack Davis in Sherman Kent School of Intelligence Analysis, Occasional Papers, “Improving CIA Analytic Performance: Strategic Warning,” Sherman Kent Center, Volume 1, Number 1, (September 2002),

^{iv} Groopman, *op. cit.*

^v The CIA record on predicting the fall of the Soviet Union is a hotly debated topic. As with many disputes, the truth is complicated and probably lies somewhere between the two extremes. For a version from the CIA perspective, see Doug MacEachin, “CIA Assessments of the Soviet Union: The Record versus the Charges”, Center for the Study of Intelligence. (Posted on the CIA’s website, March 19, 2007).

^{vi} Groopman, *op. cit.*

^{vii} “Report of the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction: Report to the President of the United States,” (March 31, 2005).

^{viii} Groopman, op. cit.

^{ix} Prange, Gordon W., *At Dawn We Slept: The Untold Story of Pearl Harbor*, New York, McGraw Hill Book Company (1981). The examples cited here are just a few of the many that could be extracted from this book or others on the subject.

^x Groopman, op. cit.

^{xi} There is a body of fragmentary unclassified information on the Rabta deception. For one example, see Michael Gordon “U.S. Says Evidence Points to Hoax in Fire at Libyan Chemical Plant” *New York Times*, (June 19, 1990).

^{xii} Groopman, op. cit.