

# An Epidemiologist Looks at Art

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## Introduction

**[Next slide]** About 10 years ago, in 2002, I embarked on a personal project to learn more about Western art from the time of the Renaissance to the present. The project frankly had nothing to do with epidemiology. It was intended more as a change of pace and a chance to explore an entirely different area of human life that I knew only a little about from casual visits to art museums and a couple of art history courses as a college student. I just thought that learning more about art would be a fun adventure and that I would enjoy seeing some beautiful things and learning more about the historical context in which they came to be made. Those expectations were fulfilled many times over, but in the process I also discovered what I thought were some interesting connections between art and epidemiology, some of them obvious and some a bit more subtle.

**[Next slide]** Anyhow, the project was planned to take six years. Why six years? Well, to provide some structure, I envisioned spending one calendar year studying the art of each century from the 15th century through the 20th. Some of the main art movements or styles of art that prevailed each century are shown on the right, although I would not have been able to fill them in when I started. The project did, in fact, follow exactly this schedule and was completed on time and under budget in 2007.

**[Next slide]** The main activities that the project involved are described here. One of many advantages of being at the University of Washington is that a lot of interesting stuff goes on north of Pacific Street, to which we have access. Through the courtesy of several faculty in Art History and one in Philosophy, I was allowed to sit in on six courses that covered different periods of art history, as shown here. (I would like to have attended more courses and may still have a chance to do so in retirement.)

**[Next slide]** Besides going to classes, I set aside some time to read about the history of art of the century that I was focusing on each year. I ended up amassing a collection of art history books as large or larger than my collection of epidemiology books. I won't claim to have read all of them from cover to cover, but one nice thing about art books is that there tend to be a lot of pictures.

**[Next slide]** Probably the most fun part of the project was taking an annual art trip to Europe. Each year I chose a few places in Europe where some of the best art of the century I was focusing on that year could be seen.

**[Next slide]** So in 2002, after a brief stop in London, I spent the entire month of April in northern Italy, particularly Florence and places nearby, looking at art of the Italian Renaissance.

- **[Next slide]** In 2003, I started in Rome and worked my way north through Urbino, Venice, Vienna, and several cities in Germany, and ended in Colmar, France.
- **[Next slide]** In 2004, focusing on the 17th century, the trip started in the Netherlands and proceeded south through Belgium and France to finish in Madrid.
- **[Next slide]** In 2005, a shorter trip included Naples, Florence again, and longer stops in Paris and London.
- **[Next slide]** In 2006, focusing on 19th century art, the entire time was spent in France.
- **[Next slide]** Finally, in 2007, the trip included London and nearby cities; Oslo, Norway; and St. Petersburg, Russia.

**[Next slide]** During those years, I also travelled frequently for professional reasons and managed to piggy-back on visits to lots of American art museums, including most of the major ones on the East Coast.

**[Next slide]** An unexpected opportunity came along early during the project. My friend and colleague Fred Rivara had recently become editor of the *Archives of Pediatrics & Adolescent Medicine*, one of the JAMA family of journals. JAMA has featured art works on its cover for many years, and it encouraged editors of other journals in its family to do likewise.

**[Next slide]** Fred invited me to try my hand as art cover commentator for his journal, which involved picking a work of art for the cover related to the lives of children, and then **[Next slide]** writing a brief commentary about it. I accepted his offer with some trepidation, having minimal experience in clinical pediatrics and no children of my own. (I did mention that I had been a child once myself, and Fred said that was close enough.) So I ended up writing 18 art cover commentaries, the last one about two years ago. I'll read you three of the most relevant ones later on.

The rest of today's talk will focus on 10 art works that I saw in my travels and that I think illustrate different kinds of connections between the worlds of art and of epidemiology.

## **1. Josse Lieferinxe: *St. Sebastian Intercedes for the Pest-Stricken***

**[Next slide]** The first connection is quite an obvious one. Artists can draw on the full range of human experience as subject matter for their work, including even epidemics. For many centuries, outbreaks of plague swept through Europe periodically, with an especially devastating epidemic in the mid-14th century. This painting by a lesser-known Netherlandish painter, Josse Lieferinxe, shows a scene from an Italian town in which an outbreak of the plague was in full swing.

**[Next slide]** In the foreground we can see a dead plague victim in a shroud being lowered into the ground, while a gravedigger on the left has himself just been struck down. Farther back, other dead bodies await burial, and more are on the way. Off to the side, clergy pray for the dead.

[Next slide] Meanwhile, up in the sky, St. Sebastian on the right is interceding with God to spare the stricken city. St. Sebastian was one of the patron saints of the sick. He had been a Roman soldier who supported Christianity when it was still banned. And as punishment, he was tied to a post and used by Roman archers for target practice, which explains all the arrows in his body. In the 15th century, a popular theory about the plague was that it was caused by fiery arrows sent down from heaven by an angry God. Despite being shot full of arrows, the original Sebastian survived with help from St. Irene, thus making him a model of hope for plague sufferers. Below them, an angel and a flying devil are engaged in an air battle over the future of humanity.

## 2. Pablo Picasso: *Guernica*

[Next slide] As background for the next painting, let's first look at a slide from EPI 512. During a session about uses of descriptive epidemiology, one example we've used in recent years is a study conducted in Sudan by the non-profit group Doctors Without Borders. They carefully selected and surveyed samples of families in three refugee camps, to which residents of the war-torn Darfur region had fled to escape raids on their villages by violent militias. Besides finding a strikingly high mortality rate among family members before and during the period of flight, the study documented the human toll of the armed conflict simply by describing the demographic composition of the refugee population. In most normal population pyramids, about an equal number of males and females would be found in each age group. Here, especially in the Zalingei and Murnei camps, a "bite" has been taken out of the population pyramid among young adult males, reflecting the systematic kidnapping and killing of men of fighting age.

[Next slide] As the Doctors Without Borders researchers put it in their *Lancet* article about the study [1]:

In humanitarian emergencies, field epidemiology can, in addition to helping to orient and evaluate aid programmes, provide key scientific testimony about past events. Overwhelming epidemiological evidence on the consequences of armed conflicts, including that provided here, should be a tool to advocate respect for international humanitarian law.

[Next slide] Pablo Picasso's *Guernica* was painted in 1937 for much the same purpose. It portrays in art some of the consequences of the bombing earlier that year of Guernica, a town in northern Spain, by German war planes at the behest of Spanish Nationalist forces during the Spanish Civil War. The town was mostly populated by women and children, many of whom were killed in the indiscriminate bombing. The painting was first shown at an international exposition in Paris, where it called the world's attention to the human toll of the Spanish Civil War.

[Next slide] The painting *Guernica* now occupies much of a wall in the Reina Sofia Museum in Madrid, and continues to have its intended effect on many viewers. So a connection between epidemiology and art is that sometimes they have a common purpose: to bear witness to the human consequences of war. Epidemiologists do it with numbers; artists do it with pictures.

[Next slide] Just to show that Picasso's *Guernica* is not an isolated example, this is an earlier painting by another Spaniard, Francisco de Goya, entitled *May 3, 1808*. It shows a peasant on the outskirts of Madrid about to be executed by a firing squad of faceless soldiers in Napoleon's army, which had just invaded Spain. Note the pose of victim, reminiscent of a crucifixion.

### **3. Jan Steen: *The Young Ones Chirp as the Old Ones Sing* a.k.a. *The Artist's Family***

On a somewhat lighter note, the next painting is by Dutch artist Jan Steen and goes by two names, the first of which is a Dutch proverb. [Next slide] At first blush, the picture seems to show a multigenerational family having an extremely good time. But as one starts to look a bit more closely at what's going on, the real intent of the artist starts to become clear.

[Next slide] On the left, the matron of the family, who looks to be already in a fairly relaxed state, is having her drinking glass refilled by someone who looks a little young to be serving alcohol.

[Next slide] Meanwhile, on the right, a grinning father is introducing his young son to the pleasures of tobacco, giving the child a drag on his clay pipe. The father, incidentally, is the artist Jan Steen himself, who often appears in his own pictures in somewhat self-mocking roles.

[Next slide] Finally, in the middle, a grandmother is reading an old text. The original painting is large enough and detailed enough that we can see what she's reading, and it says:

As we sing, you'll have to chirp  
It's a law the whole world knows  
I lead, all follow suit  
From baby to centenarian... [2, p. 175]

OK, it probably sounds better in Dutch, if that's possible, but the gist of it is that children pick up habits from their parents—in this case their bad habits. Overall, the painting is a kind of morality tale, confronting parents with the likely hazards of their bad health habits, not just for themselves but for their children.

[Next slide] This rather chilling image of a skull smoking a cigarette is by none other than Vincent Van Gogh. The painting precedes by about 80 years the classic epidemiologic studies of Doll and Hill showing some of the adverse effects of smoking on health, including lung cancer and heart disease. But the message is pretty similar.

[Next slide] Still farther back in time, the central circular part of this painting by Hieronymus Bosch concerns the seven deadly sins.

[Next slide] One of them is shown here. We see a rather fat man lounging against a dinner table on which the remains of a large roast can be seen. The man's overweight son is leaning against him and reaching upward, apparently wanting a share of the large meaty bone the man is chewing on. At the left, more food is on the way. The sin being portrayed is... gluttony.

Historically, art has often served an educational purpose, not just a decorative one. Especially in times when a large share of the population was illiterate, pictures were a way to teach and to guide viewers toward good behavior, sometimes moral behavior but also sometimes health behavior.

[Next slide] It can cut both ways. This painting by Raphael is called *The Sistine Madonna*. The top part shows Mary with Jesus in her arms, flanked by two saints—a fairly common religious theme. But viewers over the centuries have especially enjoyed the two cute little angels at the bottom.

[Next slide] They look to be gazing idly at the scene above them while resting against a ledge at the bottom of the picture. But you may have heard the term *pentimento*, which refers to images on layers of paint underneath the visible one. They often show an earlier approach that the artist eventually abandoned.

[Next slide] Recent work on this painting has revealed, somewhat disturbingly, that Raphael may have had other ideas about what these two cute little angels were doing to pass the time.

[Next slide] But fortunately for public health, he had second thoughts and left the final painting as we see it today.

## 4. Albrecht Dürer: *Proportions of an Infant*

One of the reasons why I as an epidemiologist wanted to learn more about art is that epidemiology seems squarely like a “left-brain” activity: we epidemiologists are coolly analytical, we base our decisions on hard data, we work with numbers all the time. In contrast, art seems like a quintessentially “right-brain” activity: creative, searching for aesthetically pleasing arrangements of forms and combinations of colors, all as part of a quest for beauty. But sometimes the classification is not so clear-cut.

[Next slide] Consider the next example, which focuses on drawings by the 16th century German artist Albrecht Dürer. One of my art cover commentaries concerned these drawings [3]. I'll read the commentary to you, and see if you don't see some epidemiologic thinking along the way. Keep in mind that this commentary appeared in a journal aimed at pediatricians.

[Next slide] Painters and pediatricians share a professional interest in the sizes and shapes of children's bodies. The drawings on this month's cover are from *Four Books*

of *Human Proportions* by German artist Albrecht Dürer [4]. In effect, they are Dürer's blueprints for an ideal child.

Dürer defined the child's overall height as one unit so that the image could be re-scaled easily to any size. Each number on the drawing indicates a body dimension as a fraction of that unit.

**[Next slide]** On the lateral view of the arm, for example, the width at the shoulder is  $1/10$  of the child's total height, while at the elbow it is  $1/16$ , and at the wrist,  $1/23$ .

**[Next slide]** Dürer's interest in "esthetic anthropometry" was kindled in about 1500 when the Italian artist Jacopo de' Barbari allowed Dürer a glimpse into his private sketchbook [5, p. 261]. Various human figures had been drawn according to numerical rules relating the sizes of different body parts to each other. Tantalized by the idea that such rules might exist, Dürer asked for the formulas, but de' Barbari considered them trade secrets and declined to share them. So Dürer began his own research to develop general rules for portraying beautiful human figures.

The project continued for 28 years until Dürer's death. He ran into several difficulties. At first he was guided by the idea that "... the perfection of form and beauty is contained in the sum of all men" [6, p. 250]. He reasoned that if Adam and Eve were perfect, having been created directly by God, then the ideal proportions could be recovered by averaging the characteristics of all of their descendants. In time, he took measurements on some 200 to 300 people [5, p. 266]. The results were not satisfying. Even if the theory had merit, most of Adam's and Eve's progeny were either dead or inaccessible, and those available for study were hardly a random sample of all humankind. It is also probably clearer to our modern minds that such statistical norms may not capture beauty any more than they define optimal health—if they did, the perfect child nowadays would be getting plumper every year as the prevalence of obesity increases.

**[Next slide]** Dürer also tried selecting the eyes of one person, the nose of another, the forehead of another, and so on to create a composite figure with only the most beautiful features. According to legend, the ancient Greek artist Zeuxis used this method to paint an image of Helen of Troy, combining the features of the five most beautiful women in his city [5, p. 178]. Yet Dürer came to recognize the inherent circularity of the method, depending as it does on the artist's subjective choice of which features to combine. **[Next slide]** In the end, he abandoned the goal of finding a single formula for an ideal human figure and instead set forth drawings for 26 different adult body types as a teaching aid for future artists. He left only the single set for an infant.

The *Four Books of Human Proportions* were popular among art students in the 16th century. **[Next slide]** But times and tastes had already begun to change, and eventually artists no longer felt bound by fixed rules or anthropometric data when drawing the human body. Some pursued their artistic aims by deliberately distorting nature—Bosch or Giacometti, for example—while others went still farther and rearranged body parts at will—think of Dalí or Picasso.

[Next slide] Dürer's graphic works still evoke wonder for their remarkable detail and representational accuracy. But after his long quest for a way to describe the ideal human figure, he concluded: "... what beauty is, I do not know" [7, p. 187].

[Next slide] When it comes to children, every mother knows.

## 5. Michelangelo: *Ceiling of the Sistine Chapel*

So if there is a quantitative side to art, is there an aesthetic side to epidemiology? Let's address that question indirectly by considering first one of the true shrines of art history, the Sistine Chapel. [Next slide] It is the chamber in the Vatican where, for many centuries, new Popes have been chosen. The chapel is fairly large, about 130 feet long by about 40 feet wide, and the ceiling is about 65 feet above the floor.

[Next slide] As is now the stuff of legend [8], Michelangelo was commissioned by Pope Julius III to paint the ceiling—about 5,000 square feet of surface area. Michelangelo complained vigorously that he was a sculptor, not a painter, but in the end he couldn't refuse the pope. The job took him over four years of painstaking and uncomfortable work, with some help from assistants.

[Next slide] The overall design of the ceiling is fairly complex but logical. One might expect that in that epicenter of Christendom, the ceiling would be based on the New Testament. But instead, the main narrative, which occupies the central panels (shown here in red), is based on the first book of the *Old* Testament, the book of Genesis. The more peripheral panels portray Old Testament prophets and sibyls (essentially female prophets) who foretold the coming of Christ, and some Old-Testament ancestors of Christ, plus some decorative panels at the four corners.

[Next slide] The nine central panels on which the Genesis story is told alternate between large and small in size.

[Next slide] Proceeding from one end of the chapel to the other, the panels follow the book of Genesis more or less in chronological order. The first few panels concern the creation: God separates light from dark; then creates the sun and moon and plants; then the earth and waters; then Adam, the first man; and then Eve, the first woman, from Adam's rib. The last three panels concern the story of Noah, who rescued all living creatures from a huge flood, or deluge, by loading them aboard an ark.

[Next slide] Let's focus on the four large panels. For whatever reason, Michelangelo decided to approach the task in *reverse* chronological order, painting the Deluge panel first and working back toward the early creation panels.

[Next slide] Here is the Deluge panel. On the left, a horde of people can be seen fleeing the rising flood waters. Some others have been stranded on an island in the background, and a few others in the middle have overloaded a small boat that is capsizing. On the right is Noah's ark. Overall, by my count, there are at least 48 human figures in this rather busy picture.

**[Next slide]** Here's how that end of the Sistine ceiling looks as viewed from the floor. The panel we were just looking at is in the middle. If it were on the wall of a museum, one could move in closer to see the details, but on the floor of the chapel, viewers don't have that option, helicopters being prohibited inside the Sistine Chapel. Looking at his first completed panel from the floor, Michelangelo must have seen that many of his carefully painted details were lost when viewed from 65 feet below. So on the subsequent large panels, one can see a gradual adaptation of his approach to composition and painting style.

**[Next slide]** Here is the next large panel, which simultaneously shows two scenes in the Garden of Eden. On the left, Eve is taking the forbidden fruit from the serpent. On the right, Adam and Eve are being banished from the Garden of Eden by an angel wielding a sword. Even though the population of the earth at that time was exactly 2, thanks to the use of continuous narrative, the painting has four human figures in it plus two non-human supporting figures, but it is still less busy than the Deluge panel.

**[Next slide]** The next large panel shows the famous Creation of Adam. God and Adam reach toward each other so that Adam can receive the spark of life. Note how the two hands stand out against a white background. A few loosely painted angels behind God are the only other figures.

**[Next slide]** The last large panel shows two images of God. On the right side He creates the sun with his right hand and the moon with his left. On the left side He creates plants below.

**[Next slide]** How Michelangelo adjusted his approach can be appreciated by comparing the first and last large panels. Although some of the shift was no doubt made possible by the subject matter, it still seems clear enough that Michelangelo simplified his compositions and used larger, broadly painted forms that could be perceived better from an obligatory viewing distance of 65 feet.

**[Next slide]** So what does all this have to do with epidemiology? Well, Michelangelo was not simply decorating the ceiling; he was telling a story in pictures. We epidemiologists also routinely rely on visual means of communication to tell a story—in our case, a scientific one. We create figures and graphs for our scientific papers, we present our work to other scientists in the form of slides and posters shown at meetings, and some of us use visual aids heavily in our teaching. On the left is the cover of a well-known book by Edward Tufte, aimed at scientists, entitled *The Visual Display of Quantitative Information* [9]. It offers advice about how to design graphics in such a way as to communicate a clear and compelling scientific message. **[Next slide]** John Snow's famous spot map of cholera cases in London clustering around the Broad Street pump appears in Tufte's book as an example of a well-designed figure.

**[Next slide]** As a grim reminder of the effects on viewers of ill-conceived graphics design, who among us has not endured presentations that feature slides like this one? It shows 8–10 fairly complicated figures on the left and 21 lines of small, dense, highly technical text on the right.

**[Next slide]** Or this one?

**[Next slide]** Or this one? My hat is off to anyone who can absorb the key content of these slides while simultaneously trying to listen to what the speaker has to say.



**[Next slide]** By coincidence, at about the time of my own two visits to the Sistine Chapel, I was thinking about making the conversion from teaching with transparencies and handouts to teaching with computer-projected slides. I had already become a fan of the LaTeX document preparation system and eventually chose a LaTeX add-on package called PowerDot to build slide presentations, rather than the ubiquitous PowerPoint, but the same design issues would have arisen either way. Taking a lesson from Michelangelo and trying to avoid some of the design horrors I had seen, I ended up creating my own slide style called Paintings, which is now distributed along with other user-contributed styles to anyone who uses the PowerDot package. Students who have taken EPI 512-513 in the last decade will have seen many slides created with the Paintings style.

**[Next slide]** The key features of the style are summarized here. It uses a simple and consistent slide design with a contrasting title bar at the top and a large white content area below.

**[Next slide]** The content area features black text on a white background for maximum contrast and visibility.

**[Next slide]** The font is a no-nonsense, familiar, sans-serif font, Helvetica.

**[Next slide]** And the basic font size is the one you see and, hopefully, can read without much difficulty.

**[Next slide]** Finally, all purely decorative add-ons are banished: no logos, no frilly borders, no watermarks, no continuously modulated shades of color in the background, no table of contents, not even a slide number. Basically, nothing competes with the actual content for the viewer's attention.

So why is the style called Paintings? **[Next slide]** Well, I did allow one artistic flourish: namely, the color scheme or palette. There are about 10–12 variants of the Paintings style, each of which uses colors drawn from one of my favorite paintings. The slide you're viewing uses the Skater palette, based on colors that appear in the American artist Gilbert Stuart's novel portrait of a British client, William Grant, skating on a frozen pond. The text on the slide is not actually pure black; it is the color of William Grant's hat. The background is not actually pure white; it is the color of Mr. Grant's collar. The title bar is the color of the ice on which he is skating, and the second-level bullet points are the color of his right cheek.

**[Next slide]** Another variant is based on Vermeer's *Girl with a Pearl Earring*.

**[Next slide]** And another is based on Rembrandt's painting of a group quality-control officials, or syndics, at a cloth-making guild in 17th century Amsterdam.

So if you have seen a slide presentation by me in the last eight or nine years, you have been subliminally exposed to a few of the color combinations seen in some of my own favorite art—whether you knew it or not. And if you like the slide design, thank Michelangelo. (If you don't like it, blame Michelangelo.)

## 6. Giorgio Vasari: *Cancelleria*

[Next slide] Leading up to our 6th painting, this is a picture of Brunelleschi's Dome on the main cathedral in Florence, Italy. Brunelleschi's Dome is to Florence what the Space Needle is to Seattle—both iconic structures closely linked with their respective cities.

[Next slide] The inside of Brunelleschi's Dome is covered with murals painted by the 16th century artist Giorgio Vasari and his workshop. Unless you're an art history buff, Vasari's name is likely to be unfamiliar, even though he was a busy and commercially successful artist in his time.

[Next slide] Another major commission for Vasari was decorating the interior of a building called the Cancelleria in Rome, which contained offices of papal officials. On the right is one chamber among several that he and his assistants painted.

[Next slide] Here is a closer look at one of the walls in the Cancelleria.

[Next slide] And here is an even closer detail of one of them. If you're like me, you soon begin to understand why you may never have heard of Giorgio Vasari. He prided himself on having learned how to depict human forms in various poses, and he became sufficiently facile with painting them that he no longer needed real-life models to study as he worked. He could turn out large quantities of art by re-using essentially stock images of bodies in various combinations and poses, delegating some of this routine work to assistants. Vasari was a contemporary of Michelangelo, and as fellow artists, they were acquainted. Vasari once boasted that he and his assistants had been able to fill a long corridor in the Cancelleria with paintings in just 100 days. Michelangelo's famous reply was: "As can be plainly seen" [10, p. 715].

[Next slide] Although it's very difficult to define exactly what makes some art good and some not so good, a good artist certainly has to have more than just well-honed technical skills. There also has to be the flexibility and openness to learning how to adapt those skills to new subject matter, and to expand one's repertoire of skills as new projects require. And a good artist needs somehow to be able to interject his or her own new ideas and ways of looking at the world to make a lasting contribution. These attributes may still not be enough, but when one of them is missing, you notice it.

So where's the connection to epidemiology? I would argue that if you replace "artist" with "epidemiologist" in the title, the slide content still applies pretty well. One cannot be a good epidemiologist without learning the tools of the trade. But by the same token, one cannot distill all the standard epidemiologic methods into a simple cookbook that can be applied formulaically to any future study, regardless of the subject matter. Real progress is often made when we encounter a new research topic or context to which our standard techniques don't quite apply, and we need to adapt those methods or develop new ones in response to special features of the subject matter. And epidemiology, like art, needs to be refreshed and to grow through new ideas and new ways of looking at the world.

## 7. Piero della Francesca: *Brera Altarpiece*

[Next slide] Picture #7 is by Piero della Francesca and became one of my own favorite paintings. For me, it showed how knowing something about the story behind a work of art can make a big difference in how one views it and appreciates it.

[Next slide] This painting was the subject of another art cover commentary [11], which I will read. The connection may be a little closer to biostatistics than to epidemiology, but I hope you'll enjoy the story anyway.

[Next slide] Once upon a time in the town of Urbino, Italy, there lived a man named Federico da Montefeltro, the Duke of Urbino. By profession, he was a *condottiere*—a soldier for hire, who led recruits from his home town into battle on behalf of well-to-do clients, including the city of Florence and the pope, who in those days had his own army. Federico was a clever strategist and an effective leader, and he usually won his battles. Over the years, he and his men were much in demand and well compensated for their efforts, and little Urbino became a prosperous center of culture and the arts.

[Next slide] “It is a truth universally acknowledged that a single man in possession of a good fortune must be in want of a wife” [12]. Federico’s true love was Battista Sforza, his beautiful young bride from a prominent family in Milan. Theirs proved to be a happy marriage, with Battista managing the affairs of state capably when Federico was away at war. She knew full well that her responsibility was to produce a male heir, and she got right to work. Their first child was a daughter. So was their second. And their third, fourth, fifth, sixth, seventh, and eighth. After eight daughters in a row, the increasingly desperate Federico and Battista prayed to Saint Guido Ubaldo, patron saint of the nearby town of Gubbio, for divine intercession. Battista was said to have offered up her own life in return for the birth of a son. Early the next year she did bear a son, whom the happy parents named Guidobaldo. Six months later, Battista was dead at the age of 26, leaving behind nine children and their grieving father [13].

[Next slide] Soon afterward, Federico commissioned *Madonna and Child with Saints* from Piero della Francesca for the altar of a small church in his beloved Urbino. Federico himself kneels before the Virgin Mary and the infant Jesus, who are flanked by six saints and four angels in a scene of timeless stillness. The ostrich egg suspended over Mary’s head symbolizes new life. By one reading, the painting is a traditional portrayal of a donor affirming his devotion to Mary and Jesus.

[Next slide] But Federico also had deep personal reasons for celebrating the birth of a baby boy, and the sleeping infant before whom he kneels with hands raised in thanks can also be viewed as representing his own long-awaited son, Guidobaldo.

[Next slide] Yet another interpretation is suggested by noting that the painting’s otherwise near-perfect symmetry is disturbed by an empty space in the left foreground, opposite Federico. Had Battista survived, she would almost certainly

have been shown there in front of her own name saint, John the Baptist. Like an empty chair at the banquet table, the open space in Piero's painting honors someone not seen—the departed wife and mother, Battista.

Guidobaldo led a pampered boyhood, tutored by a doting father. When Federico's luck finally ran out and he died in battle, the 10-year-old Guidobaldo succeeded him as Duke of Urbino. He grew up to continue the family's prowess in military affairs and patronage of the arts. During Guidobaldo's lifetime, the great Renaissance painter Raphael was born and raised in Urbino, receiving his first serious exposure to fine art in the ducal palace collection. Like his father before him, Guidobaldo married well, but the union produced no children. When he died of gout at age 36, the Montefeltro line and the golden era of Urbino came to an end.

## 8. Francisco de Goya: *Carlos IV*

[Next slide] Painting #8 relates to a story about epidemiology that I learned about through art. In late 2004, the Seattle Art Museum organized an exhibition called "Spain in the Age of Exploration, 1492–1819" with support from the Spanish government, in part to commemorate the early voyages of Spanish explorers to Puget Sound.

[Next slide] One of the paintings on display was a portrait of King Carlos IV of Spain. [Next slide] And the exhibition catalogue included the intriguing comment shown here.

In 1803, concerned with the serious health problem posed by deadly smallpox epidemics, King [Carlos] IV organized and financed the first large-scale international public health operation. Known as the Royal Philanthropic Vaccine Expedition, it was the most fruitful of all the Enlightenment expeditions characteristic of the late eighteenth century. . . [14]

Clearly, I had to learn more. Thanks to some wonderful historical research by Michael Smith at Oklahoma State University [15], the story of the Royal Philanthropic Vaccine Expedition is known in considerable detail and led to another art cover commentary [16].

[Next slide] I had wanted to feature on the cover a painting like this one of a Mexican boy by Diego Rivera, but we were unable to obtain reproduction rights, so a photograph of a Mexican boy by American photographer Paul Strand was used instead.

[Next slide] In the early 1930s, American photographer Paul Strand spent several summers in Mexico, gathering images of men and women who worked the rough land and of their children. [Next slide] He found the young boy on this month's cover in the south central Mexican town of Uruapan. Yet the boy who posed for Strand's photographic portrait might never have lived at all had it not been for a bold

humanitarian mission a century earlier in which 22 children about his age had played a vital role.

Besides superior arms and military tactics, the Spanish *conquistadores* and their followers brought to the New World a host of infectious diseases that decimated the native population. For the next three centuries, smallpox epidemics recurred in the Spanish colonies about every 15–20 years, often wiping out half the population of affected areas.

**[Next slide]** Finally, in 1798, British physician Edward Jenner showed that vaccination with cowpox virus could confer immunity to smallpox. Immunization against smallpox soon spread through Europe. Unfortunately, native cowpox could not be found in the Americas, and attempts to transport the virus *in vitro* across the Atlantic without refrigeration failed repeatedly.

**[Next slide]** In 1803, King Carlos IV of Spain commissioned the Royal Philanthropic Vaccination Expedition to combat the scourge of smallpox in the Spanish colonies.

**[Next slide]** The most important passengers aboard the expedition vessel *Maria Pita* were 22 non-immune boys, ages 3 to 9 years, from a foundling home in Santiago de Compostela. **[Next slide]** Two of the boys were vaccinated just before departure.

**[Next slide]** Then, when vesicles at their inoculation sites matured 9–10 days later at sea, lymph from those vesicles was used to vaccinate another two boys, beginning a new cycle. Thus, these boys formed a chain of children transporting live cowpox virus across the Atlantic, with a new link added every 9–10 days.

There were risks with this plan. A vaccinated boy could scratch at the itchy inoculation site, destroying the vesicles. Accidental contact between a vaccinated boy and a susceptible boy could result in premature transmission. To guard against these possibilities, three male nurses accompanied the boys and kept them under close watch day and night. Still, to be safe, two boys were vaccinated at each cycle in case something went wrong with one of them.

**[Next slide]** The *Maria Pita* left Spain on November 30, 1803. She made intermediate stops in Tenerife **[Next slide]** and Puerto Rico before arriving at last **[Next slide]** in Venezuela **[Next slide]** on March 20, 1804, just as the last boy's vesicles were ripe with virus. Twenty-eight Venezuelan children were vaccinated immediately. When they developed the desired immune reaction, the mission's main goal was achieved. Before departing, the expedition organized and trained a local vaccination board to perpetuate the vaccine and arrange for its orderly dissemination. Eventually expedition staff vaccinated tens of thousands of people and set up vaccination boards in several cities in Central and northern South America.

**[Next slide]** The 22 Spanish boys disembarked at Veracruz, Mexico, and then proceeded inland to Mexico City. King Carlos IV had promised that the royal treasury would cover their maintenance and education until they were old enough to support themselves. At first they were housed at a public hospital, then at a new boarding school. (Their teachers complained about the difficulty of breaking their use of profanity, which they had picked up from the sailors.)

[Next slide] By 1808, two of the boys had died and four were still at the boarding school, but the other 16 had all been placed in private homes, including one with a physician. And so they became Mexicans.

[Next slide] The names of all but one of these intercontinental vaccine couriers were recorded and are shown here.

## 9. Matthias Grünewald: *The Isenheim Altarpiece*

My art history project exposed me to many beautiful works of art with interesting stories behind them. And at times I found myself engaging in a little counterfactual thinking about what my life might have been like if I had pursued art history as a career instead of epidemiology. But seeing and learning about the story behind painting #9 got me grounded again and made me proud to be an epidemiologist.

[Next slide] The painting is Grünewald's *Isenheim Altarpiece*, now in Colmar, France. It took a special trip across Germany to get there and to see this one painting. The entire work has several folding panels, so it could be displayed in several forms, including this way. In the center is a crucifixion scene, and the side panels show two saints: Sebastian and Anthony. At the bottom is a predella showing interment of the dead Christ.

[Next slide] One sees a lot of crucifixion images in art of this time, but the *Isenheim Altarpiece* is distinctive. For comparison, look at this crucifixion painted by Raphael. Christ is shown in dignified repose against a bright blue sky with a pleasant landscape in the background. Christ is flanked by two graceful angels.

[Next slide] In contrast, Christ in the Grünewald painting is a ghastly figure, emaciated, bleeding, suffering a horrible death. The sky in the background is almost black, the landscape barren. Mary, mother of Christ, is below the cross, wailing over the grim fate of her son.

[Next slide] The original venue for this painting was the chapel in a monastery dedicated to St. Anthony. The monastery also ran a hospital for patients with a serious and often fatal illness known as St. Anthony's Fire. Another panel of the altarpiece shows the Temptation of St. Anthony, when he was taunted and tortured by demons when he was living as a hermit in the desert.

[Next slide] The forlorn figure at the lower left of that panel is believed to be a man suffering from St. Anthony's Fire.

[Next slide] The disease was horrible. People became crazy—paranoid and demented; they developed painful skin sores that made them feel as though their body was on fire; fingers, hands, and feet would turn black from gangrene and fall off; and most victims either died of complications or were driven to suicide to escape the incurable pain. Outbreaks of St. Anthony's Fire had occurred in Europe throughout recorded history.

**[Next slide]** The altarpiece was commissioned as an attempt to provide comfort and hope through art in the face of incurable illness. Although the patients' suffering was great, the painting sought to remind them that the suffering of Christ and of St. Anthony was greater still. And this panel of Christ's resurrection sought to provide hope that the suffering would end and that the afterlife would be better.

**[Next slide]** In the year 1670, about 160 years after this painting was created, a French physician named Thuillier began to notice some patterns in the occurrence of St. Anthony's Fire [17, 18]. Over the years, he had seen hundreds of cases. **[Next slide]** He noticed that unlike other epidemic diseases, such as plague, the illness did not seem to be spread from person to person. Caregivers were often unaffected even after long exposure to a victim, while people who lived in isolation were sometimes stricken. **[Next slide]** He noted that the disease was more common among peasants than among the wealthy. **[Next slide]** Unlike plague, which occurred mainly in cities, where population density was high, St. Anthony's Fire mainly occurred in rural areas. **[Next slide]** On reviewing his records, he also found that he had seen more cases in years of bad weather, when crop yields were low and diets were poor.

**[Next slide]** All of these things made him wonder whether something in rural peasants' diet might be involved. A staple of their diet was rye bread, which he often saw on the table when visiting the houses of patients. One day while walking through rye fields, he recalled that the blue-black cockspurs from a plant disease that sometimes infected rye had been used by the old alchemists to make potent medicinal potions. The idea came to him that eating too much of these cockspurs in contaminated rye could be the problem, because it fit with all the patterns he had seen.

**[Next slide]** Dr. Thuillier was thinking like an epidemiologist, noting how the disease varied by person, place, and time. And he turned out to be right. The modern name for St. Anthony's fire is ergotism. **[Next slide]** It is now known to be caused by ingesting the pods, or sclerotia, of a fungus that grows on rye. **[Next slide]** The toxins in these sclerotia include ergot alkaloids, which are such potent vasoconstrictors that they can entirely cut off the blood supply to fingers, hands, and feet and cause gangrene. Other toxins include the constituents of LSD, which make people crazy. **[Next slide]** The sclerotia fall to the ground and break open the following spring, releasing millions of spores that are spread by wind and especially by fog droplets in bad weather.

**[Next slide]** So why is Dr. Thuillier not as famous as John Snow even though he was effectively using epidemiologic methods almost two centuries earlier? Probably it's because no easy intervention was available to Thuillier that was as simple as Snow's arranging to have the handle of the Broad Street pump removed, thus forcing local Londoners to get water from other, uncontaminated sources. Thuillier tried in vain to warn peasants about why he thought that eating rye bread made from contaminated grain was dangerous, but he made no headway. The peasants had always eaten rye bread, could see no reason to doubt age-old eating habits, had no ready substitute, and saw the problem abating by itself anyway. So Thuillier's public health efforts failed—another instance of research having no impact on public policy, I suppose. Two more centuries went by until the life cycle and the toxicology of the ergot fungus were worked out well enough to provide overwhelming proof that Thuillier had been right. The disease is now easily

prevented just by careful separation of grain from fungal sclerotia, and by turning over the soil deeply enough to bury the sclerotia where they cannot germinate.

But in the end, the story is a moral victory for epidemiology. Art can do good by offering comfort and hope to people with an incurable disease. But sometimes epidemiology can do even more good by figuring out how to prevent them from developing that disease in the first place.

## 10. Andrea del Verrocchio: *Baptism of Christ*

**[Next slide]** To introduce our last painting, here is Giorgio Vasari again, about whose artistic contributions I made some unflattering remarks earlier. Despite his shortcomings as a painter, he is a revered figure in art history, not because of what he painted but because of what he wrote.

**[Next slide]** On the right is the frontispiece from a book that Vasari published in the mid-16th century, entitled *Lives of the Most Eminent Painters, Sculptors, and Architects* or, more briefly, *Lives of the Artists* [19]. He wrote what is arguably the first serious book of art history. As a contemporary of Michelangelo and other artists and an art insider himself, Vasari was well-connected. He could interview people and view art works that few others could access. His book provides key biographical and historical information about Italian Renaissance artists and their work. Not all of what he wrote has turned out to be strictly true, but often it is true in spirit if not in detail.

**[Next slide]** One chapter in Vasari's book is a biography of the artist Andrea del Verrocchio, and it includes this anecdote:

So shortly afterwards, [Verrocchio] did another panel picture. . . showing the Baptism of Christ by St. John. In this work he was assisted by the young Leonardo da Vinci, who was then his pupil. The angel which Leonardo painted was so superior to the rest of the work that Andrea resolved he would never take up a brush again, seeing that the young Leonardo had shown himself to be a far better craftsman [19, p. 236]

Two angels appear in the lower left corner of the painting. **[Next slide]** One of them is by Leonardo da Vinci. Which one do you think it is? (It's the one on the left.)

**[Next slide]** I picked this example because it's about something that one sees throughout the history of art, namely a kind of chain formed by relationships between teachers and students. Fra Angelico taught and mentored Fra Filippo Lippi, who then taught and mentored Botticelli, who then taught and mentored Filippino Lippi, the son of Filippo Lippi. And one can often see evidence in their work of how skills and styles were passed on from teacher to student.

I couldn't help thinking that the same kind of thing happens in our field (and probably others). As one example, Brian MacMahon at Harvard taught and advised Noel Weiss, who taught and advised me when I was a student, and I've taught and advised UW students of my own.



And in that vein, the time has come for me, like Verrocchio, to lay down my brushes, so to speak, but with the full expectation that my junior colleagues and students will go on to outdo my own accomplishments and extend the chain of intellectual inheritance with students of their own.

## Summary

**[Next slide]** So in summary, here are a few of the connections that I have tried to describe between art and epidemiology:

- Artists can and do portray life and death during epidemics
- **[Next slide]** Art and epidemiology can have a shared purpose of bearing witness to the human toll of war, each in its own way
- **[Next slide]** Art and epidemiology sometimes also have a shared goal of guiding people's behavior, including health behavior
- **[Next slide]** Artists and epidemiologists share an interest in the design of visual communications
- **[Next slide]** At some level, the elements of good craftsmanship are not so very different between the two fields
- **[Next slide]** And lastly, intellectual inheritance operates strongly in both fields. We are always learning from, and building on, the accomplishments of our predecessors and teachers.

**[Next slide]** Art history projects like mine eventually come to a close—I ran out of centuries. And careers eventually come to a close. And in any case, today's talk has come to a close.

**[Next slide]** Thank you for coming and for your attention.

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