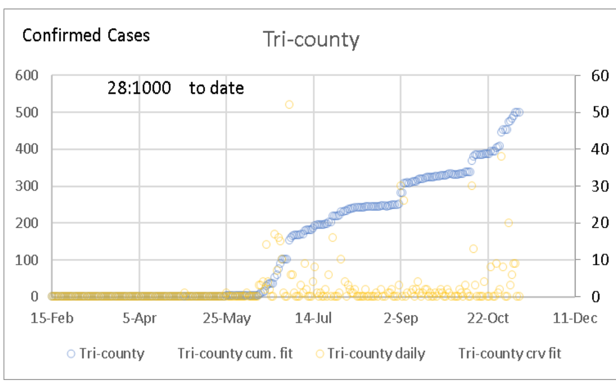
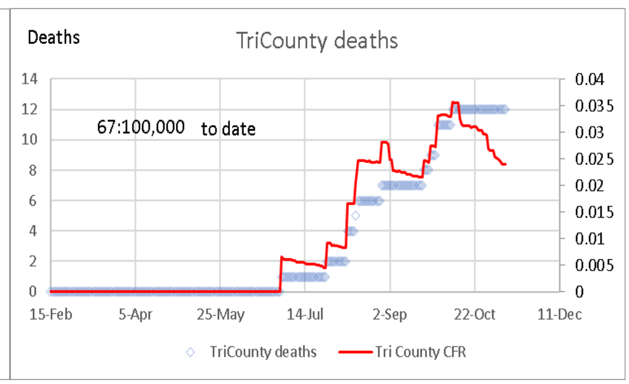
Tri-County (Brewster, Jeff Davis, and Presidio Counties) and the rest of the World, CV19

Please refer to accompanying two pdf files of graphs. The estimated number, and the related incidence relative to population, is based on maximums estimated from curve fits. They are subject to change of course, and should not be taken as precise projections, since there is no such thing. Another way to interpret them is as relative indices, that show a locale's progress relative to the others.[1]

US or Texas projections for confirmed cases scaled to Tri-County population:

max US daily	198,278	persons
equiv. max Tri-County	10.8	persons
max TX daily	8,620	persons
scaled to Tri-County	5.5	persons
max US cumulative	42,517,537	persons
equiv. max Tri-County	2319	persons
incidence	129:1000	
max TX cumulative	1,905,499	persons
scaled to Tri-County	1,225	persons
incidence	68:1000	
Tri-County (current)	28:1000	11/10/2020

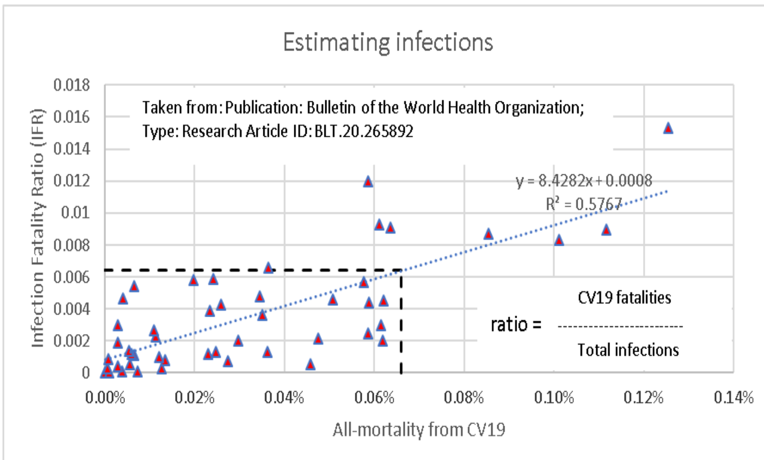




[1] Data all from publicly available Github site: https://github.com/CSSEGISandData/COVID-19

John Ioannidis, a highly respected epidemiologist now at Stanford, recently took a stab at estimating CV19 infection fatality rates; for example, infection fatality rate for deaths > 50:100,000 (e.g. USA) at 0.57%.[2] He is famous for his critique on research statistics released in 2005 which is available for free download on www.plosmedicine.org. I have taken a cross-plot of data he included in the paper cited below, to generate an estimate of the actual incidence of COVID19 in the Tri-County area.

The idea is to use the following regression on his data, since from the known all-mortality values one could generate an estimated IFR. For example, all-mortality for Tri-County as of 25 Oct 2020 is 0.000660 deaths per capita (12 out of 18,000 people). That predicts an IFR of 0.64% ± 0.45% (based on two standard deviation of scatter in this plot):



The IFR is defined as:

$$IFR \equiv \frac{Fatality}{Infections}$$

Likewise, the CFR is defined as

$$CFR \equiv \frac{Fatality}{Cases}$$

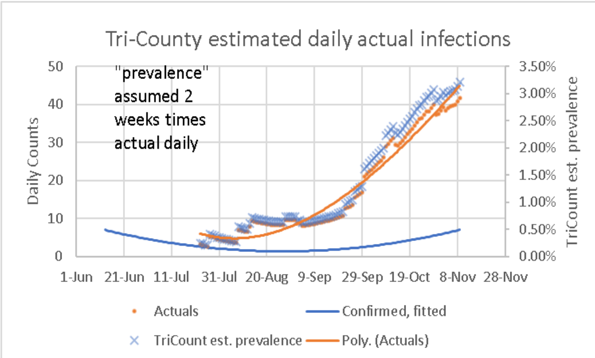
where *Cases* is the number of confirmed cases, known, always something less than the actual number of *Infections*, unknown. The ratio of *CFR*/*IFR* is the same as the ratio of *Infections* to *Cases*, *Fatality* cancels:

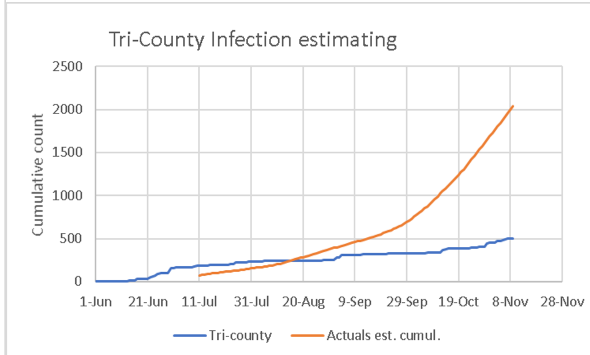
$$\frac{CFR}{IFR} = \frac{\frac{Fatality}{Cases}}{\frac{Fatality}{Infections}} = \frac{Infections}{Cases}$$

If you take the known average *daily* case incidence and apply the curve fit, it results in an estimate for actual number of infections. In this case, it's estimated at around five times the case incidence.

[2] https://www.who.int/bulletin/online_first/BLT.20.265892.pdf (Notice Tri-County All-Mortality is 66:100,000)

This is very speculative, but an example of what things have to be done to find what the actual infection rate is, approximately. Cumulative is summed off the daily data:

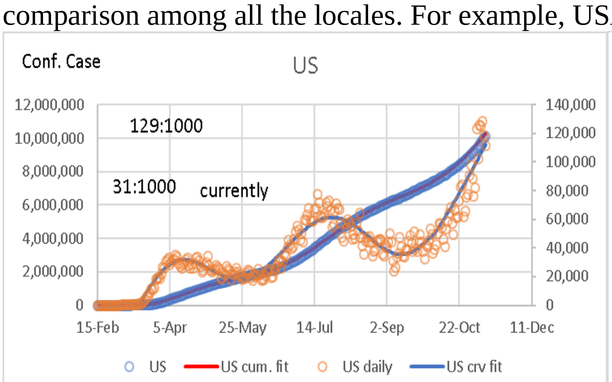


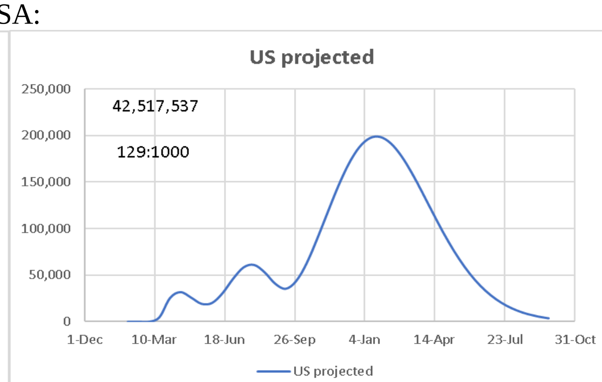


This is just an estimate, obviously, and the original source lists a whole bunch of caveats that go with it. Certainly our small population size carries more uncertainty with it, too. But as you can see, having some idea of what the actual infection incidence is, when it can't be directly measured, has a whole lot of uses. For example this could form the basis of estimating actual prevalence.[3] Read discussion in "*Details on R_o you may or may not be interested in*" document on this site on the effect of the actual prevalence on false positives for CV19 testing, for example. There is a contingency table demonstration of false positives on "*Experimental Page*," too.

Basis of Comparison

For each curve fit, the end is extended with a gamma distribution as a rough estimate of where the last wave ends. This becomes the basis of a number per thousand or hundred thousand, in an attempt at comparison among all the locales. For example, USA:



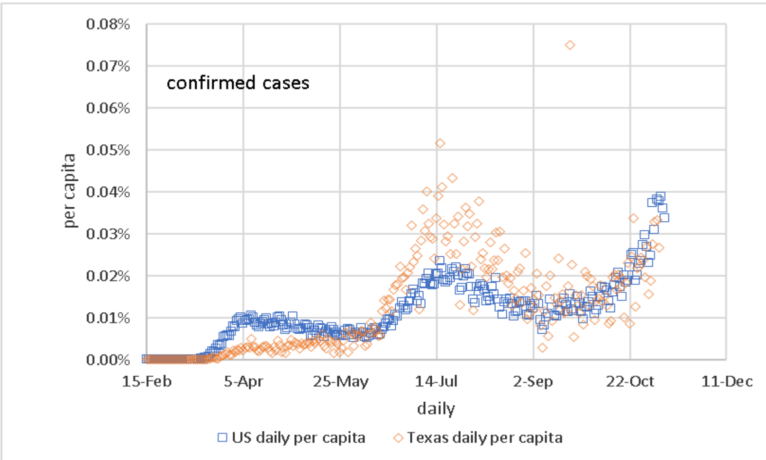


The 129:1000 represents the total area under the curve in the right graph, the total number of projected counts divided by the locale's population.

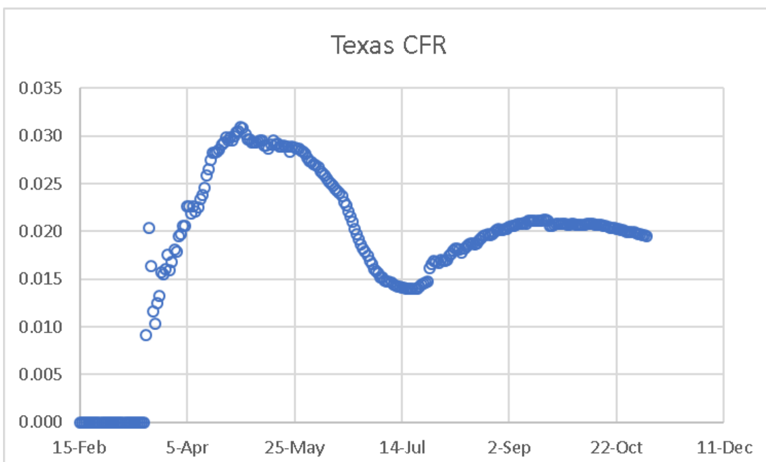
[3] Defined by National Institute of Health as the number of people with a certain characteristic divided by the total. It's usually done by sampling. As a crude estimate for example, you might say prevalence of people with CV19 is the actual number of infections at any given instance, times the average duration of an infection.

Comments

If Texas and the USA confirmed cases are plotted as daily data concurrently, on a per capita basis, here is what you see, along with the apparent *third* wave in US confirmed cases:



Mortality seems to have stabilized. This is an example of the confirmed case fatality ratio (CFR):



What's to be done? Your mom taught you to cover your mouth when you coughed as a act of consideration for others so you wouldn't spread germs. That is all wearing a typical cloth mask does, except more effectively, since this virus is stronger than the usual germs. What is so hard to understand about that? Certainly fits within the realm of being courteous to others, to say the least.

Another good thing to do is avoid enclosed areas with low or no ventilation where there are lots of people. This would include most restaurants and bars, and probably schools, too. Or step up the air changes in such places. For example, Alpine has done some nice work on granting special use rules so restaurants can serve food outside on tables on the sidewalk. But unfortunately, we gripe about the government telling us what to do, or criticize it for not doing anything, not sure which is more irritating. For better or for worse, Germany is now taking action on fresh air in buildings.[4]

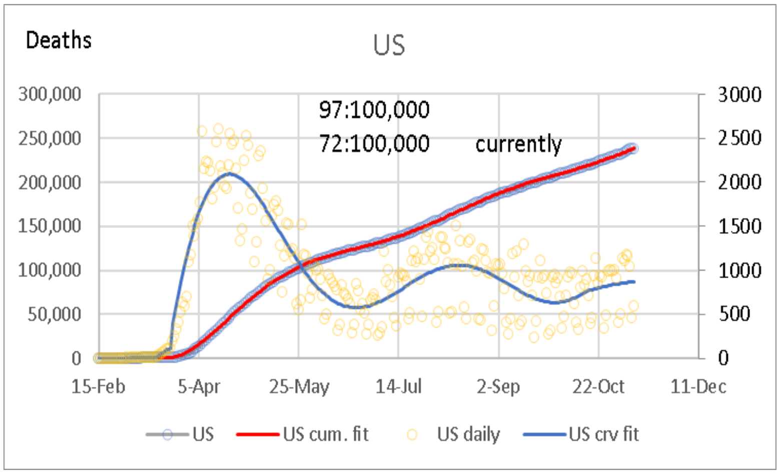
[4] https://www.bbc.co.uk/news/world-europe-54599593

COVID-19 deaths

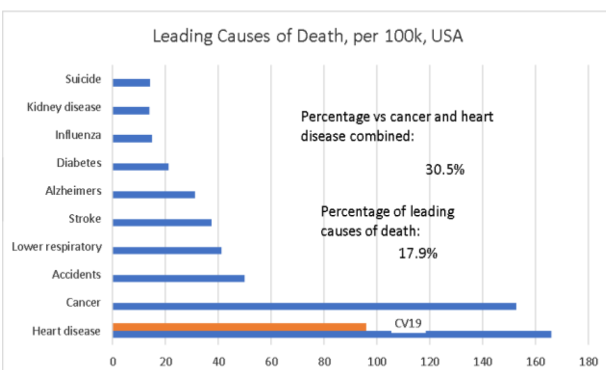
The USA CV-19 death statistics are based on 7th order curve fit, combined with a last gamma distribution curve fit of US deaths that generates a cumulative maximum for the two combined (minus their overlap). See “Experimental Page” for a look at ratios of the curve fits, rather than the data itself:

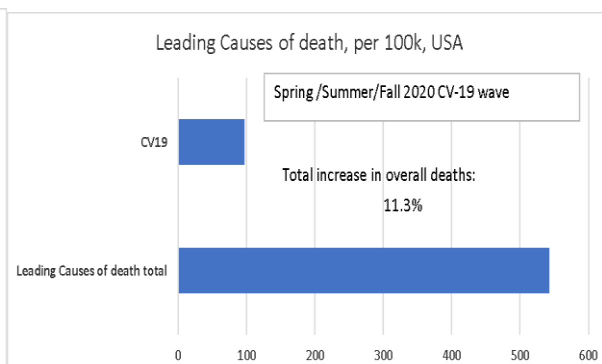
A point of comparison:

Around 1920, the population of the US was 105 million. It is estimated that 500,000 people in the US died from the Spanish Flu epidemic in those years. This is a death rate of around 480 per 100k. Most deaths occurred during the Fall of 1918.



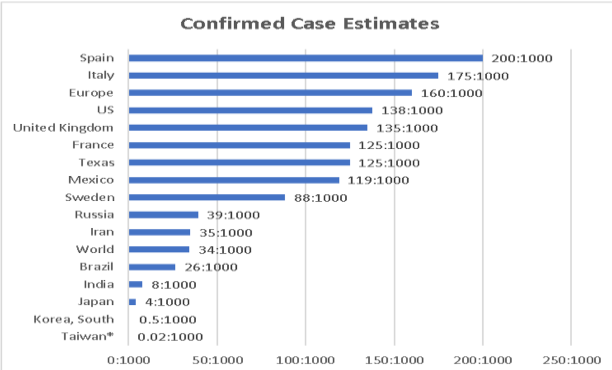
A few months ago the Wall Street Journal published data on annual causes of death which is plotted with the USA CV-19 death statistics. The possible death value is plotted as deaths per 100,000 with WSJ data of annual averages of leading causes:

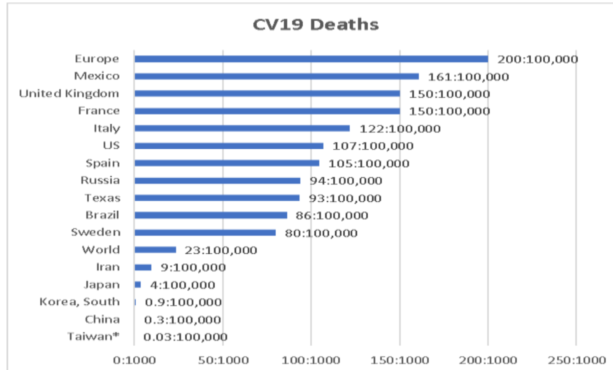




It’s right up there with the major killers, although it’s known many who died from CV-19 already had these potentially fatal issues. It’s not clear where dying from old age fits here, either. (It’s strange how nobody dies of old age anymore—it’s always some other cause.) It’s interesting to read off the mortality table the IRS uses that the expected age of death is 77.3 yrs (median is 80.3). The probability of dying within age bin 77 to 78 is 0.026, and the 77 to 78 age bin proportion of population is 2.7%, so fraction dying is 15:100,000. Similarly, the probability of dying in each year age, from 77 on up, is 62%, with population proportion 29.9%, so fraction dying in that group is 257:100,000. Total deaths are around 860:100,000 every year, so old people are a significant chunk of that, not surprisingly. See table towards end of this document.*

What follows are some comparative tabulations of these estimates:





It's also worth reminding yourself of basic arithmetic—a confirmed case incidence of 125:1000 is big on this ranking, but still is only 12.5% of the population! Most of those are now recovered.

Recently, a lot of discussion has centered around excess deaths. The CDC has taken a stab at this, while recognizing the difficulties of getting accurate death certificate information (e.g. did this person die *from* CV-19, or die while *having* CV-19, etc.). They took weighted data from the previous three years and averaged it. I found the difference between the three year avg observed and for 2020, up to the most current week, and annualized it. It’s interesting to speculate that if 10% of the population is to have confirmed cases this year, but there is a five to seven multiple for actual cases, the US would have more than 50% infected in the year, and possibly reach herd immunity. But, a problen with herd immunity is the immunities may not last very long. Here are the results:

USA Excess Deaths (from CDC data): [5]

Annualized on 42 weeks			
	All Cause	All Cause, excl. CV19	CV19
3 yr average before 2020	854:100,000	854:100,000	-
2020	976:100,000	895:100,000	-
Diff.	121:100,000	40:100,000	81:100,000

3 yr average
859:100,000

33% of total excess is non-CV19

(See graph on *“Experimental Page.”*)

Trends in Confirmed Case Estimates

The confirmed case estimates are based on the maximum value parameter of a curve fit for a *completed* epidemic wave. A way to look at this is this estimate is what it *would* be, if the data followed a gamma (or other distribution). Historically that’s what they tend to do, but you can see plenty of examples here where the data suddenly diverges (e.g. US, World, Texas, etc.). Still, it’s a useful way to characterize it.

[5] https://data.cdc.gov/NCHS/Excess-Deaths-Associated-with-COVID-19/xkkf-xrst/data

Masks

There's a lot of hullaballoo about masks, but it's useful to remember that the "95" rated masks, like the N95 or KN95, are rated for the most difficult particle size to trap. Above this size, it's relatively easy to make a material that will act like a seive and trap particles and still be breathable. Below this size, it's interesting that the effectiveness of the mask relies on the random kinetic motion of molecules to shove the particles *into* the material. That's how small viruses are! The viruses are on the order of 100 nanometers; the critical size most difficult to trap because it falls between the two filtration modes is about 300 nanometers. So the viruses are best trapped by kinetic motion of molecules. The N95 is rated to trap 95% of particles of 300 nanometer size, which is where the "95" designation comes from. Since this size is the hardest to trap, this implies efficacy is better than 95% for particles bigger or smaller than this critical size.[6]

However, how much virus travels in an aerosol (that is, suspended in the air by itself)? It turns out a large portion of them ride on relatively large water droplets that people cough, sneeze, or otherwise expel. The fraction traveling the one way or the other way is not well understood. An N95 is "tight" enough that it offers resistance to air flow, so if it is not fitted properly, the air you breathe will bypass the filter and it will do no good. It also will get saturated sooner or later with various particles, which increases flow resistance and increases the tendency for bypass, too. So, it must be fitted properly and changed regularly.

The cloth and surgical masks everyone wears don't offer much protection to the wearer; it's safest to consider the protection none and act accordingly. However, they do significantly impede spraying of water droplets and individual viruses in aerosols, which is their real value in protecting others *from* you, and I think that is not to be discounted, in spite of the inconvenience.

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*This is an approximation of deaths by age out of 100k, normalized to an average 860:100,000 each year:

Age range	Probability of dying in age range (IRS tables)	Fraction of US population	Fraction dying
0 - 5	0.01474	6.62%	11:100,000
5 - 10	0.00079	6.38%	2:100,000
10 - 15	0.00099	6.37%	2:100,000
15 - 20	0.00334	6.48%	7:100,000
20 - 25	0.00462	6.86%	10:100,000
25 - 30	0.00452	7.14%	10:100,000
30 - 35	0.00551	6.77%	11:100,000
35 - 40	0.0078	6.46%	15:100,000
40 - 45	0.01151	6.11%	22:100,000
45 - 50	0.01677	6.34%	33:100,000
50 - 55	0.0238	6.48%	48:100,000
55 - 60	0.03616	6.65%	74:100,000
60 - 65	0.05371	6.07%	100:100,000
65 - 70	0.0743	5.05%	115:100,000
70 - 75	0.10233	3.87%	121:100,000
75 - 80	0.13742	2.67%	112:100,000
80 - 85	0.16348	1.77%	89:100,000
85 - 90	0.15999	1.11%	55:100,000
90 - 95	0.11601	0.56%	21:100,000
95 - 100	0.05394	0.18%	3:100,000
100+	0.00827	0.03%	0:100,000
Total	1	100.00%	860:100,000

[6] Millimeter is a thousandth of a meter (mm), micrometer (or micron, or μm) is a millionth of a meter, and a nanometer is a billionth of a meter (nm). So, a nanometer is one thousandth of a micron. A human hair is measured in the micron range, for example, say from 20 μm to 200 μm; 300 nm is 0.3 μm.

Explanation of statistic used for comparative purposes:

Often the generation of confirmed cases or deaths tend to be in a gamma distribution, which is a slightly skewed bell-shaped curve. Other times a triangular distribution better describes what's happening. A least squares procedure is used to get the closest fit to the data. Generally, the data is provided in a *cumulative* format, so the number increases each day, until the wave is over, at which point it is at its maximum and no longer changes. This can be converted to a daily format just by finding the difference between each pair of successive days. In mathematical terms, the daily format is the time derivative of the cumulative format. In any case, the area under the daily curve is identical to the last, largest and unchanging value in the cumulative format. This is the value that is used here as a comparative statistic, on a per capita basis, for a completed curve. Each locale's "wave" has a different beginning, develops at a different rate, so comparison of values on a particular date among any given datasets doesn't tell you anything, but nonetheless that is how most of this data is usually presented to the public.

Cases are described here as incidents per thousandths; deaths are described as incidents per hundred thousandths. In this way, one can get a better feel for the relative performance of locales, as long as the current population figure is available. It's also a way to gauge one's own personal risk. Keep in mind this statistic can and will change over time, not as a direct result of increasing cases or deaths, but because of the possible change in shape of the distribution. In some cases, particularly with the US, the distribution was changed from a gamma to a triangular because it fit better (at least the first section), which also changed the comparative statistic. It should be thought a qualitative measure, since it's impossible to put error bounds on it, at least in its earlier stages before the inflection point.

R_o

Basic Reproduction Rate (said as R-sub-0, or just R-0). R_o is a measure of transmissibility: $R_o < 1$, disease disappears; $R_o = 1$, it's endemic; $R_o > 1$, epidemic. R_o is mentioned a lot during this epidemic, along with flattening of curves, with not a lot of understanding or relevance. More discussion in the "*Details on R_o you may or may not be interested in.doc*" found elsewhere on this site.