I use the "Chandler rates"[1] to calculate the average mutation rate for FTDNA ySTR markers 1-37, and for the markers beyond that (FTDNA 38-67), , I use the rate estimates derived originally by Leo Little[2]. The rates for the additional 11 markers used to make up the panels used by SMGF, Ancestry, DNAHeritage, et al., I use the rates derived from the Sorenson Molecular Genealogy Foundation data, using a procedure similar to Chandler's.[3]

These are, I believe, the best currently published data, but most of these mutation rates are very much up in the air, and even the Chandler data for FTDNA markers 1-37, which is grounded on around 30,000 genetic transmissions, is subject to wide variance, as his error estimates indicate:

	Avg Mutation Rate	Error Range
FTDNA 12-marker panel:	.00187	±.00028
" 25- " " :	.00278	±.00042
" 37- " " :	.00492	±.00074
67- " " :	.00350	
Ancestry 30-marker panel:	.00273	
" 43-marker panel:	.00260	

Comparing Panels

Compared with the best Ancestry test (the 43+ marker test), and for the same price, the FTDNA 37+ marker panel has about a 57% better chance of detecting marker variances between haplotypes, and since the value of testing depends entirely on, and is proportional to, the expected mutation rate of the test panel, the recommended FTDNA test is a 57% better test for the same money.

I calculate this by using the Chandler estimate of .00492 for the mean mutation rate of FTDNA-37+, and for the non-overlapping markers of the Ancestry-30+ and- 43+ panels, I used the posted mutation rates in the incorporated chart in **this report** derived from the Sorenson database as of about 2004 (I had to extrapolate for just one of the markers, DYS635, for which I can find no data). Here are the calculations:

$$1 - (1-.00492)^{36} = .163 \quad \text{for FTDNA-37+}$$
$$\& \quad 1 - (1-.00260)^{42} = .104 \quad \text{for Ancestry-43+}$$

Thus, the FTDNA 37+ panel is (.163 -.104) / .104 = 56.7%
more likely to produce one or more mutations per generation than the Ancestry-43+ panel.

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[1] See John F. Chandler, in "**Estimating Per-Locus Mutation Rates**" *J Genet Geneal*, 2:27-33

[2] These rates are posted **here**, on a page subordinate to a **master link page** created originally by Leo Little, a genetic genealogy expert now deceased, although at present there appears to be no link from the master page to the one with the posted rates. No adequate explanation is provided for how these rates were derived, although the ones for markers 38-67 are said to have been "based on gene diversity comparisons for a set of R1b haplotypes with a star-shaped phylogram", and so-called markers 68-78 on calculations based on the SMGF genetic diversity data. I have myself derived some rough estimates using the latter method and in general both sets of rates look plausible in relation to such data, but I accept them here reluctantly and provisionally as probably "the best game in town". It is reassuring, at least, that the mean mutation rate for markers 38-67 (.00176) corresponds closely to the mean rate observed empirically in **Charles Kerchner's study** of differential mutation rates by haplotype (.0017 ± .0004).

[3] The SMGF rates were derived empirically from the SMGF ySTR haplotype database, in consideration of the genetic diversity for each marker, and validated by an analytical methodology comparable to Chandler's. The results were web-published **here**. These marker mutation rates are also posted on the Leo Little mutation rate page, numbered 68-78, but this section of the table is riddled with errors and should be ignored.

An even simpler calculation yields what might be called a mutational sensitivity index

.00492 x 37 = .1820
.00260 x 43 = .1118

and in this comparison, the FTDNA 37-marker test has 62.8% more mutational sensitivity than the best Ancestry test, while the 67-marker test, at 109.7% is more than twice as sensitive.

Here are some mutational sensitivity (and price) comparisons between various currently available tests:

	Average Mutation Rate	Price as of Feb10	Mutational Sensitivity Rate = (#markers x Avg Mut. Rate)
FTNDA-25	.00278	79	.0695
FTDNA-37	.00492	149	.1820
FTDNA-67	.00350	248[4]	.2345
Ancestry-30+	.00273	149	.0819
Ancestry-43+	.00260	179	.1118

Should I Upgrade from the Ancestry tests to FTDNA-37?

Yes, especially if you've only done the Ancestry-30+ test. If you can prove that you've tested at Ancestry, you can upgrade to FTDNA-37 for $119 by printing out and sending in this form along with the proof.

Should I Extend 37-Markers to 67?

By my calculations, the extension of FTDNA-37 to 67 markers yields only about a 29% boost in mutational sensitivity, at a cost 66% higher, and yields only about a 52% chance of producing one or more additional mutations over say 7 generations, and these estimates are consistent with the data I've seen. In general, I think it's better to spend the money testing additional people at37-markers than going for 67, at least initially; a 37-marker test can always be extended later to 67, for $99.

It may be worth extending a particular 37-marker haplotype when it matches closely and nearly equally to two other haplotypes which are themselves quite different; in this case the extension could serve as an arbiter between these two divergent haplotypes—provided both of them had been extended to 67 too. Of course, the more members of a patrilineage who have tested to 67 markers, the more valuable it would be to extend the remaining members, but for the first member contemplating the choice, it's sort of a Catch-22 situation.

[4] These and other prices are the regular ones available by ordering through an existing DNA project. FTDNA also occasionally has sales, in which, for example, the 37-marker panel goes for $119. Unfortunately, the company does such a poor job of posting these special prices that inquiries usually need to be made to determine the actual prices. I believe that that extension of 37-markers to 67 costs $99 presently.