By the Numbers

► by **Sally Northcutt,** *director of genetic research, American Angus Association*

Some things change, like EPDs

Expected progeny differences (EPDs) change. They are predictions of how future progeny are expected to perform. Expressed typically in units of measure for the trait, they allow us to quantify a measurable future progeny difference in calves from one sire compared to calves of another sire. The EPDs are not the true breeding values of the individuals, as we could never truly know those values unless we completely understood each animal at the DNA level.

Accuracy defined

In calculating EPDs, varying sources of information are combined (individual performance data from contemporary groups, pedigree and progeny data) to best predict the value of an animal as a parent. Since differing amounts of information may contribute to the individual's EPD, and therefore its precision, this prediction of genetic merit has an associated accuracy.

Accuracy is the measure of reliability associated with an EPD. In theory accuracies range from 0 to 1. In the American Angus Association National Cattle Evaluation (NCE), the accuracies for EPDs appear within the range of 0.05 to 0.99. The closer the value is to 1, the more reliable the prediction is.

Pedigree-estimated interim EPDs, for example, have an accuracy of 0.05; whereas, an interim EPD that utilizes an animal's own individual performance relative to its contemporaries would have an accuracy more within the range of 0.10 to 0.30. Both of these interims are low-accuracy predictions, and we would expect these EPDs to potentially change as more information becomes available. This may include the availability of the animal's own record for a trait (meeting NCE edits), progeny records, or changes in related animals' EPDs and pedigrees (for example, sire, dam, collateral relatives). The confidence in an EPD varies with the sources of performance information included in the prediction.

As the understanding and application of EPDs by commercial producers, seedstock breeders and industry leaders continues to grow with respect to Angus cattle, we are sometimes so captivated by the EPDs and the minute differences among animals that we forget these values are expected to change on animals with low-accuracy numbers.

That is not to say EPDs are unreliable or that individuals with low-accuracy EPDs are bad. On the contrary, the young animals in the breed are the new genetic material for future Angus generations. High-accuracy sires have a smaller range of change that is expected for their EPDs, as these sires have amassed large numbers of progeny influencing their EPDs. Examples of these animals would be the sires used extensively in artificial insemination (AI) throughout the breed.

Possible change

Table 1 can help you determine the relative risk associated with an EPD by considering the possible change (PC) value for each trait at various accuracy levels. Expressed as "±" units of the EPD, the possible change provides a measure of expected change or potential deviation

Table 1: Accuracy values and associated possible changes

	Production						Maternal				Carcass				
Accuracy	CED	BW	WW	YW	YH	SC	CEM	Milk	MW	MH	CW	Marb	RE	Fat	%RP
.05	7.8	2.49	11.0	16.2	.41	.70	9.3	9.2	38	.62	15.4	.25	.27	.034	.53
.10	7.2	2.36	10.4	15.3	.39	.66	8.8	8.7	36	.58	14.6	.23	.26	.032	.51
.15	6.7	2.23	9.9	14.5	.37	.62	8.3	8.2	34	.55	13.8	.22	.25	.030	.48
.20	6.2	2.10	9.3	13.6	.35	.59	7.8	7.8	32	.52	13.0	.21	.23	.028	.45
.25	5.8	1.97	8.7	12.8	.32	.55	7.3	7.3	30	.49	12.2	.19	.22	.027	.42
.30	5.4	1.84	8.1	11.9	.30	.51	6.8	6.8	28	.45	11.4	.18	.20	.025	.39
.35	5.1	1.71	7.5	11.1	.28	.48	6.3	6.3	26	.42	10.6	.17	.19	.023	.36
.40	4.7	1.58	7.0	10.2	.26	.44	5.8	5.8	24	.39	9.7	.16	.17	.021	.34
.45	4.3	1.44	6.4	9.4	.24	.40	5.4	5.3	22	.36	8.9	.14	.16	.020	.31
.50	3.9	1.31	5.8	8.5	.22	.37	4.9	4.9	20	.32	8.1	.13	.14	.018	.28
.55	3.5	1.18	5.2	7.7	.19	.33	4.4	4.4	18	.29	7.3	.12	.13	.016	.25
.60	3.2	1.05	4.6	6.8	.17	.29	3.9	3.9	16	.26	6.5	.10	.12	.014	.22
.65	2.7	.92	4.1	6.0	.15	.26	3.4	3.4	14	.23	5.7	.09	.10	.012	.20
.70	2.4	.79	3.5	5.1	.13	.22	2.9	2.9	12	.19	4.9	.08	.09	.011	.17
.75	2.0	.66	2.9	4.3	.11	.18	2.4	2.4	10	.16	4.1	.06	.07	.009	.14
.80	1.6	.53	2.3	3.4	.09	.15	2.0	1.9	8	.13	3.3	.05	.06	.007	.11
.85	1.2	.39	1.7	2.6	.06	.11	1.5	1.5	6	.10	2.4	.04	.04	.005	.08
.90	.8	.26	1.2	1.7	.04	.07	1.0	1.0	4	.06	1.6	.03	.03	.004	.06
.95	.4	.13	.6	.9	.02	.04	.5	.5	2	.03	.8	.01	.01	.002	.03

Source: American Angus Association Spring 2005 *Sire Evaluation Report.*

Table 2: Illustration of the concept of interpreting possible change values associated with different accuracy levels of WW EPDs

	Sire A	Sire B
WW EPD	+30 lb.	+30 lb.
WW ACC	0.25	0.85
Possible change	± 9 lb.	± 2 lb.
⅔ of time, final value falls between	+21 & +39 lb.	+28 & +32 lb.

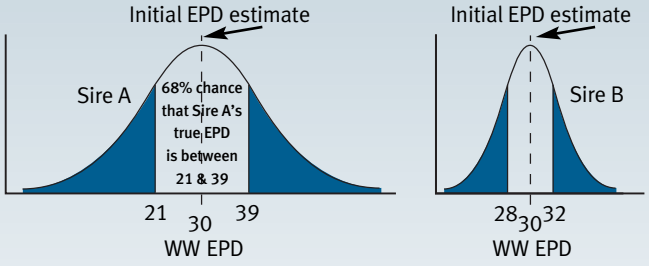
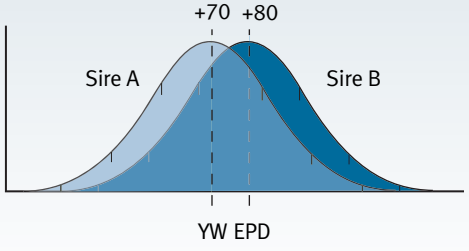


Table 3: Illustration of the concept of how to interpret possible change values associated with different accuracy levels of YW EPDs

	Sire A	Sire B
YW EPD	+70 lb.	+80 lb.
YW ACC	0.25	0.25
Possible change	± 13 lb.	± 13 lb.
⅔ of time, final value falls between	+57 and +83 lb.	+67 and +93 lb.



between the EPD and the "true" progeny difference (which we never know). This confidence range depends on the standard error of prediction for the EPD. By knowing the possible change value for a given accuracy, you can establish a confidence range in which two-thirds of the time the animal should have a true progeny difference within that window of possible change. One can expect that during the remaining one-third of the time, the animal's true EPD is outside this confidence range. Table 1 also appears at *www.angus.org/sireeval/accuracy.htm* and is reported in the Association's printed *Sire Evaluation Report.*

Ultrasound			
IMF	RE	Fat	%RP
.17	.31	.022	.37
.16	.30	.021	.35
.15	.28	.019	.33
.14	.26	.018	.31
.13	.25	.017	.29
.12	.23	.016	.27
.12	.21	.015	.25
.11	.20	.014	.23
.10	.18	.013	.21
.09	.17	.011	.20
.08	.15	.010	.18
.07	.13	.009	.16
.06	.12	.008	.14
.05	.10	.007	.12
.04	.08	.006	.10
.04	.07	.005	.08
.03	.05	.003	.06
.02	.03	.002	.04
.01	.02	.001	.02

Use of possible change values

The basic relationship to remember is that as accuracy increases, possible change decreases. Two sires with differing weaning weight (WW) EPD accuracies illustrate this concept in Table 2.

For sire A, two-thirds of the time his "true" progeny difference will fall between +21 pounds (lb.) and +39 lb. For the remaining one-third of the time, his true value will be outside the ±9-lb. range. (Here's another way to think of it: There's a 68% chance that sire A's true WW EPD value would fall between +21 lb. and +39 lb., and a 32% chance it would fall below +21 lb. or above +39 lb.)

In contrast, the possible change is much smaller for the higher-accuracy sire, sire B, with only a 4-lb. range (+28 to +32) in the confidence band.

Do not confuse progeny variation with accuracy. The progeny of sire A will vary no more in performance, on the average, than calves from high-accuracy parents. Also, an EPD has an equal chance of moving in a "better" or "worse" direction. It's good to keep this point in mind when evaluating possible change values.

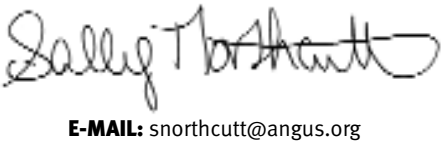
Differences in young bulls are sometimes unnecessarily scrutinized over a few pounds. For example, if two young bulls have relatively small differences in their yearling weight (YW) EPDs, then that difference is less significant because of the accuracy levels for their EPDs (approximately 0.05 to 0.30) and their associated possible change. They would have overlap in the confidence bands in which their true EPDs lie (see Table 3).

Possible change tables are updated when different genetic parameters are used in the NCE. Otherwise, the values for each trait will appear as presented in the table. The tables are specific to the breed because the variance components used in NCE are breed-tailored as well.

Accuracy in practice

Keep in mind that accuracy is a risk-management tool. Each breeder determines his or her comfort level with accuracies for particular traits in a breeding program. For example, more emphasis may be placed on accuracy when selecting heifer bulls within a desirable calving ease EPD range.

Regardless of the accuracy, EPDs are the most powerful tool to predict the genetic merit of an animal. Even on young bulls, EPDs are the most objective measure to determine future progeny performance differences. EPDs are a guide to selecting which bulls to use; accuracy values provide a risk-management aid to assist in how extensively these animals are used. Accuracies provide a snapshot of how much we know about an animal's true genetic merit based on the information contributing to the EPD.



E-MAIL: snorthcutt@angus.org

Editor's Note: *"By the Numbers" is a column authored by Association performance programs staff to share insights with Angus members about data collection and interpretation, NCE, genetic selection, and relevant technology and industry issues. If you have questions or would like to suggest a topic for a future column, you may contact Sally Northcutt, director of genetic research, or Bill Bowman, director of performance programs, at (816) 383-5100.*