Record Keeping for Cow-Calf Herds: An Excel Guide

A Guide for Beef Cattle Producers

While many cattle producers maintain some form of records, it is not always apparent how to make the best use of the information collected.

Review and analysis of herd records can identify problems within the herd, whether they develop gradually over time or require immediate attention.

This guide discusses the advantages of record keeping, what formats are available, and how to use data visualization to help identify herd problems.

What are some possible barriers to record keeping?

- Record fatigue: Record management can be overwhelming, and their value may not always be clear.
- The financial benefits of keeping records may not be obvious at first glance.
- Ignorance is bliss: If I'm unaware of a problem, then I won't have to worry about it in the first place.

Why keep records then?

Russian playwright Anton Chekov said: "Knowledge is of no value unless you put it into practice." Record keeping for record keeping's sake is, indeed, not worth much. Data must be transformed into information before it becomes useful to make decisions. You cannot manage what you cannot measure, so the first step is to produce data that can help you measure important processes within the herd.

Records can be useful to evaluate the effectiveness of any changes in management or to make sure the desired status quo is maintained.

- What are the pregnancy, calving, and weaning percentages? Are there any changes occurring over time? What is the distribution of calves being born across the calving season? See the chart below (Page 2).
- What is the body condition score (BCS) of cows at weaning? How does BCS influence pregnancy percentage?
- How does the percentage of the herd affected by a specific disease change over time, especially after implementation of management changes?
- What is the recovery rate from a disease before and after changing the treatment protocol?

Records can give you peace of mind that withdrawal times for drugs have been observed and help to investigate when sudden health problems occur. The Beef Quality Assurance program goes into detail on which records for drug treatments to keep and the reason for keeping them.

Below is an example of a calving distribution that we will recreate later. If the shape of the distribution shifts to the right, with more and more calves being born later, it should give cause for concern. Late calving can lead to higher feeding costs and often result in calves of lower weight. In addition, dams may not return to an appropriate body condition or be bred in time for the next breeding season.

Some questions to ask are:

- Who are the late-calving cows? Did they have a calf late in the season the year before?
  - It might be time to cull some of the latecomers. Late-calving cows may not breed back in time during the next breeding season, they may be at a lower BCS during breeding season, and their lower fertility may be passed on to their offspring.
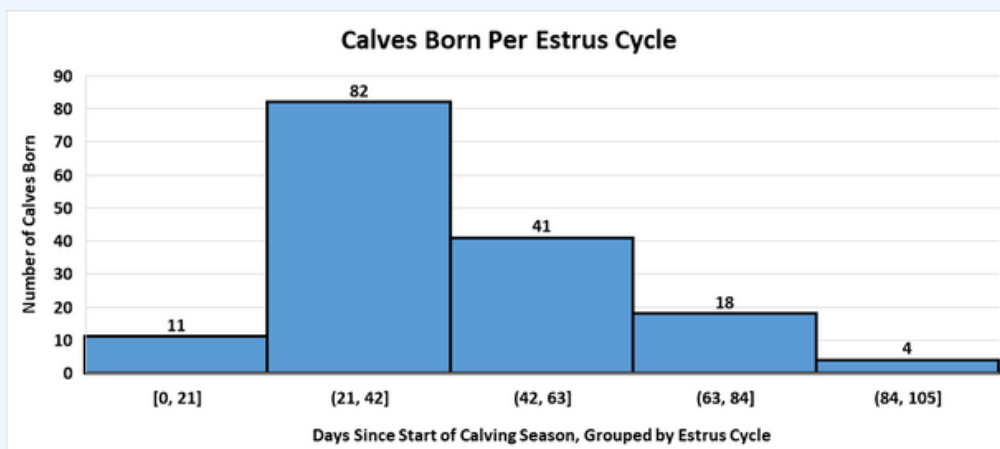
- Are cows in good body condition at the start of the breeding season?
  - If not, can you supplement feed at weaning so cows can improve their body condition by the start of the breeding season?
- Are you testing all bulls for Trichomoniasis (Trich) each year?
  - Trich can cause early pregnancies to be lost, with some cows getting pregnant again later in the season .

In this document, we will go over production, performance, and some disease records to monitor your cattle herd.

Table of Contents

Page

Microsoft Excel Basics

Data Entry

The following examples show how to use simple data to evaluate your herd efficiency. Before we delve into data visualization, we will review some basic techniques in Microsoft Excel.

☐ Data entry is simple. You start by creating headers—one in each column—for the data you want to record.

Columns:
Data type, e.g., cow or calf ID, date of birth, weight, dates of treatment, types of treatment, etc.

Rows:
Each row represents one animal or pair; one row here has data on the calf, the dam, the calf's sex, date of birth, etc.

|	Calf ID	Dam ID	Sex	DOB	BW	Color	Udder	Days since start of calving
1	Calf ID	Dam ID	Sex	DOB	BW	Color	Udder	Days since start of calving
2	9100	792	H	8/23/2019	70	BLK	good	0
3	9101	724	H	8/28/2019	78	BLK	good	5
4	1	751	B	8/30/2019	76	BLK	great	7
5	9102	735	H	9/2/2019	80	BLK	great	10
6	2	743	B	9/4/2019	77	BROC	great	12
7	9103	701	H	9/4/2019	76	BROC	good	12
8	9104	767	H	9/6/2019	72	BLK	great	14
9	3	757	B	9/8/2019	83	BLK	good	16
10	4	703	B	9/10/2019	80	BLK	okay	18
11	9105	713	H	9/11/2019	60	BLK	okay	19
12	5	3018	B	9/13/2019	70	BLK	great	21
13	6	603	B	9/14/2019	74	BLK	great	22
14	7	3042	B	9/15/2019	78	BLK	great	23
15	9108	527	H	9/15/2019	80	BLK	good	23
16	9109	3039	H	9/15/2019	81	BROC	great	23
17	9107	3123	H	9/15/2019	79	BLK	great	23
18	8	406	B	9/16/2019	73	BROC	great	24
19	9116	522	H	9/16/2019	80	BLK	great	24
20	9111	1131	H	9/16/2019	75	BLK	good	24
21	9106	1225	H	9/16/2019	72	BWF	great	24
22	9	523	B	9/17/2019	69	BLK	great	25
23	no tag	0024	H	9/17/2019	38	BLK		25

Adding Data Entry Validation

Excel enables the user to validate what is entered so that implausible entries can be avoided and to ensure data consistency, which is particularly important when multiple users enter and analyze data.

☐ To give only the choices "H" for heifer and "B" for bull when entering calf sex, first create a list of allowable entries on a separate sheet together with an explanation. It may be easy to figure out what the letters describing calf sex represent, but not all abbreviations are this intuitive, so it is good practice to include descriptions.

|	A	B	C
1	sex	description	
2	H	Heifer calf	
3	B	Bull calf	
4			
5			

☐ Go back to your data entry sheet and highlight the entire column by clicking on "C" above "Sex". In the **Data** tab, click on the **Data Validation** icon.
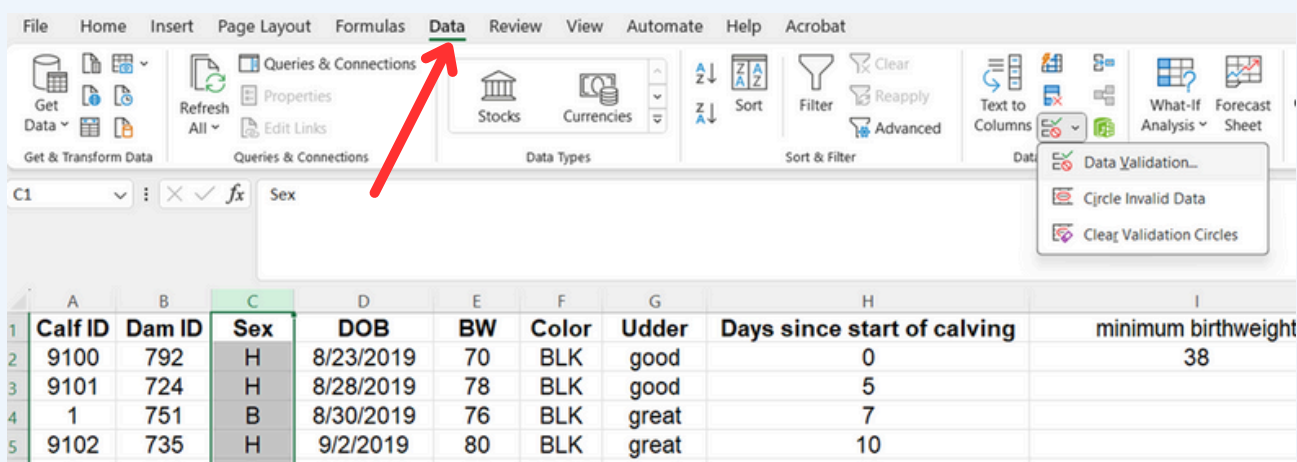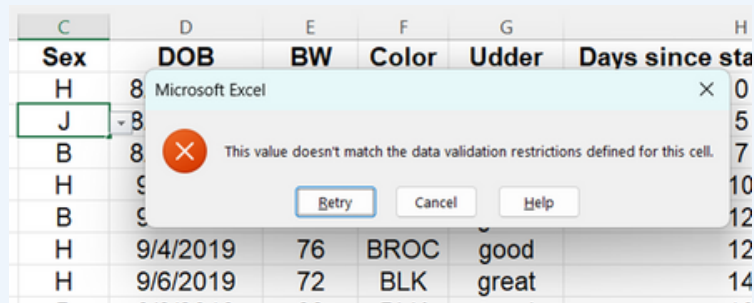
☐ In the dialog box, choose **List** from the **Allow** drop-down menu. Then click on the up arrow to select the list **Source**.
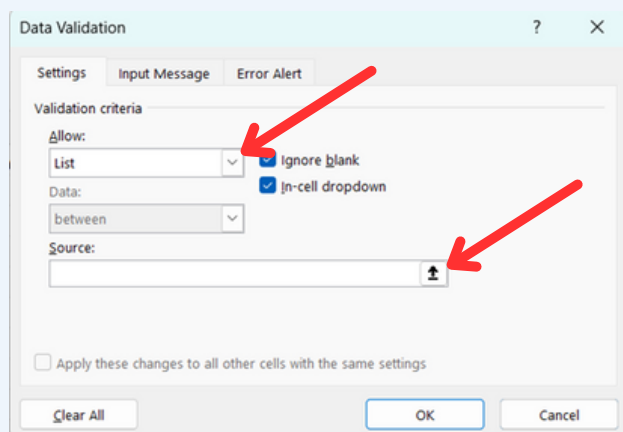
☐ Go to your list of allowable entries and highlight the cells with the allowable choices. Click on the down arrow and then "OK" in the **Data Validation** dialog box.
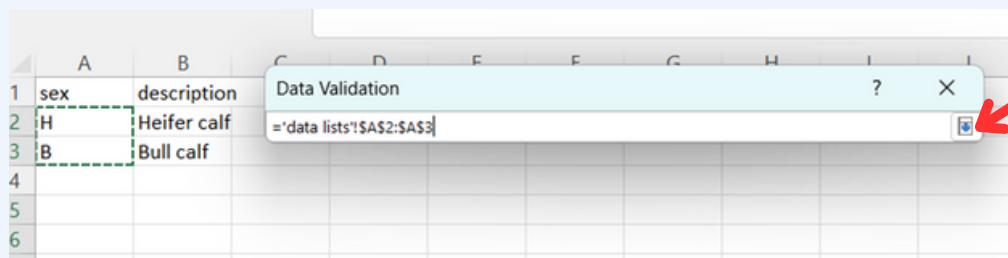
☐ It is now only possible to enter H or B into these cells. If you try to enter a different value, an error message will pop up.

CDFA Antimicrobial Use and Stewardship | www.cdfa.ca.gov/ahfss/aus
UC Agriculture and Natural Resources | https://ucanr.edu/site/newborn-beef-calf-health

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
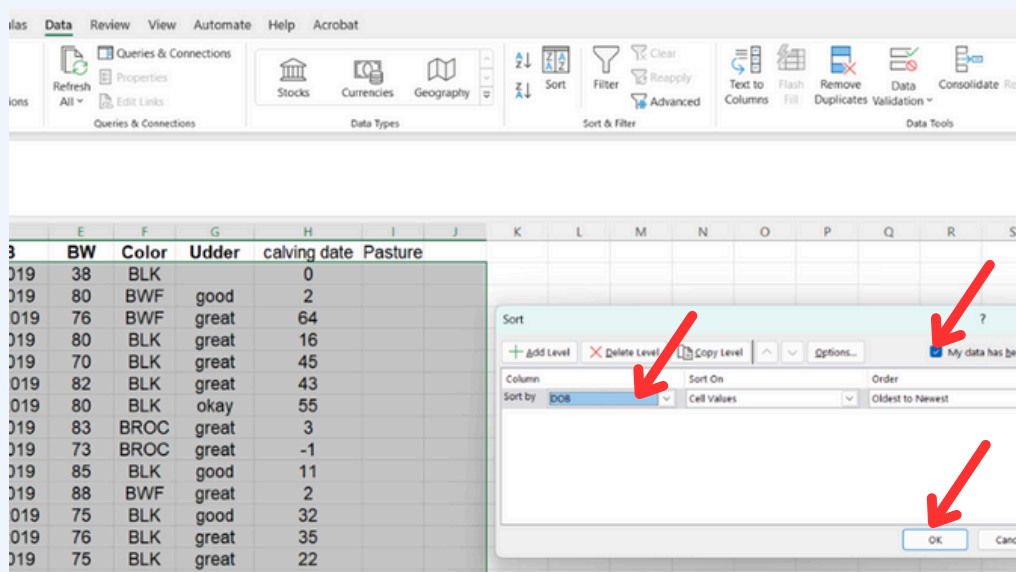
Sorting Data by a Column Heading

Sorting data can be useful to quickly find a specific entry, such as an ear tag number, a particular calving date, or to get an idea about the distribution of data by looking at it in order.

☐ Click on the little green triangle in the upper left corner to highlight the entire spreadsheet.

☐ Go to the **Data** tab, click on **Sort**. A dialog box will appear. Check the "**My data has headers**" box. Go to the "**Sort by**" dropdown menu and choose the column you want to sort by, e.g., DOB. Click "**OK**".

CDFA Antimicrobial Use and Stewardship | www.cdfa.ca.gov/ahfss/aus
UC Agriculture and Natural Resources | https://ucanr.edu/site/newborn-beef-calf-health

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

☐ The spreadsheet will now be sorted by date of birth (DOB).

	A	B	C	D	E	F	G
1	Calf ID	Dam ID	Sex	DOB	BW	Color	Udder
2	9100	792	H	8/23/2019	70	BLK	good
3	9101	724	H	8/28/2019	78	BLK	good
4	1	751	B	8/30/2019	76	BLK	great
5	9102	735	H	9/2/2019	80	BLK	great
6	2	743	B	9/4/2019	77	BROC	great
7	9103	701	H	9/4/2019	76	BROC	good
8	9104	767	H	9/6/2019	72	BLK	great
9	3	757	B	9/8/2019	83	BLK	good
10	4	703	B	9/10/2019	80	BLK	okay
11	9105	713	H	9/11/2019	60	BLK	okay
12	5	3018	B	9/13/2019	70	BLK	great
13	6	603	B	9/14/2019	74	BLK	great
14	7	3042	B	9/15/2019	78	BLK	great

Entering Formulas to Calculate the Mean, Median, Maximum, or Minimum

Excel will calculate various functions for you when you enter a formula into a cell. It is good practice to label what the formula is calculating so you can easily make sense of it when you come back later.

☐ Click into the desired cell where you want to show the results and type the "**=**" sign. This tells Excel that a formula will follow. To determine the minimum birthweight among all birthweights, type "**=MIN(E2:E157)**", or highlight the range of data you are interested in (here all birthweights in column E), close the parentheses, and hit Enter.

	: × ✓ *fx*	=MIN(E2:E157)						

B	C		D	E	F	G	H	I
Dam ID	Sex	MIN(number1, [number2], ...) DOB	BW	Color	Udder	Days since start of calving		minimum birthweight
792	H	8/23/2019	70	BLK	good	0		=MIN(E2:E157)
724	H	8/28/2019	78	BLK	good	5		
751	B	8/30/2019	76	BLK	great	7		
735	H	9/2/2019	80	BLK	great	10		
743	B	9/4/2019	77	BROC	great	12		

The **minimum birthweight** in this dataset is 38 lbs.

I
minimum birthweight
38

☐ The maximum birthweight can be determined with a similar formula: "**=MAX(E2:E157)**".

J
maximum birthweight
97

☐ To calculate the **average or mean** birthweight, enter the formula "**=average(E2:E157)**".

Mean Birthweight (lb)
=AVERAGE(E2:E157)

→

Mean Birthweight (lb)
77.2

☐ If you want fewer decimal places: click on the cell with the mean birthweight, then click on the icon shown here in the home tab until you reach the desired number of decimal places.
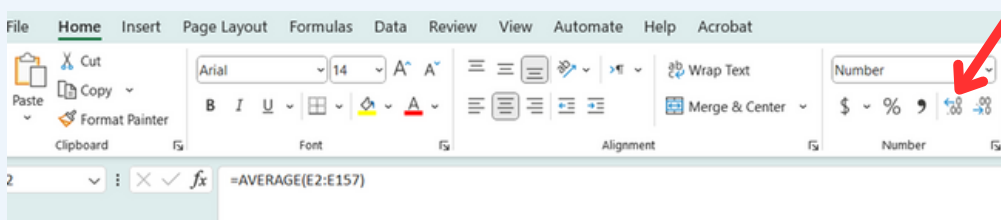
☐ The **median** is the middle value, where half of the data points are above, and half are below. The median may be very close to the mean; however, if there are outliers (e.g., very heavy or very light calves), the mean and the median can be quite different, especially if the herd is small. Here, they are almost identical.

L
median birthweight
78

☐ To calculate how many days have passed in the calving season until a specific calf was born, sort the data by date of birth (DOB) to have the date when the first calf was born in cell **D2**. Then, in a new column, enter the formula "**=D2-D2**" under the heading "**Days since start of calving**".

For the first calf, this will be 0 days (no days have passed during the calving season when the first calf was born). Grab the lower right corner of cell **H2** and drag it down. This will automatically calculate the difference between the DOB for each calf and the value in **D2**. Without the "**$**" signs, Excel will subtract **D3** from **D3**, **D4** from **D4**, etc., resulting in all 0s.

=D2-D2

	D	E	F	G	H
	DOB	BW	Color	Udder	Days since start of calving
	8/23/2019	70	BLK	good	0
	8/28/2019	78	BLK	good	5
	8/30/2019	76	BLK	great	7
	9/2/2019	80	BLK	great	10
	9/4/2019	77	BROC	great	12
	9/4/2019	76	BROC	good	12
	9/6/2019	72	BLK	great	
	9/8/2019	83	BLK	good	
	9/10/2019	80	BLK	okay	
	9/11/2019	60	BLK	okay	
	9/13/2019	70	BLK	great	
	9/14/2019	74	BLK	great	
	9/15/2019	78	BLK	great	
	9/15/2019	80	BLK	good	

Visualizing Data

Bar Charts to Compare Categories

It is simple to create graphs in Excel that will let you better understand your data. We start with a bar chart comparing the birth weight of bull and heifer calves.

☐ Start by sorting the data by calf sex. Create a table next to the data that looks like this:

	bulls	heifers
birthweight		

☐ Under "bulls," enter the formula for calculating the average and the range of data that covers bull calves' birthweights (as shown on page 5). Do the same for heifer calves. You should get these results:

	bulls	heifers
birthweight	78.0	76.1

☐ Highlight this table by holding down the left mouse key and sweeping over all cells. Then click on **Insert**, the **bar chart icon**, and **More Column Charts** at the bottom of the drop-down menu to get this dialogue box. Choose the colored columns and press **OK**.

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
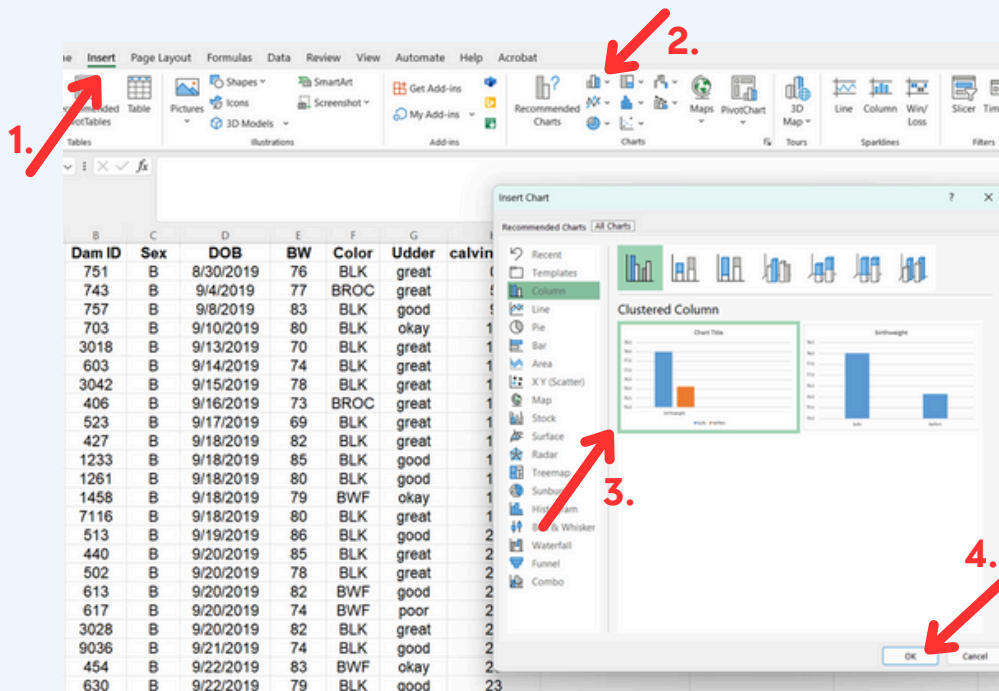
☐ It looks like there is a big difference between bull and heifer calves, although in reality there is a difference of less than two pounds. Excel chooses the lower cutoff for us, but we can change it to make it more realistic. We can change the scale of the vertical axis by right-clicking on the axis, then choosing **Format axis**... to bring up this dialogue box. Change the **Bounds Minimum** to **50**.


☐ Finally, we can add some error bars to see how variable the data is:

First, we calculate the **standard deviation** of our data with the following formula. Remember, the standard deviation tells you how dispersed the data is relative to the mean. So, if most of the data points are clustered close to the mean, the standard deviation is low, and vice versa.

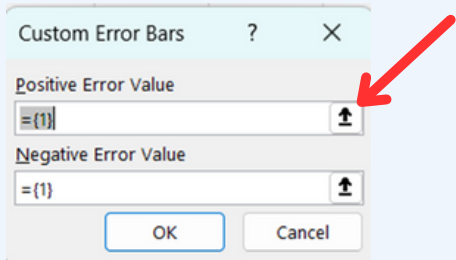|	bulls	heifers
birthweight	78.0	76.1
standard deviation	=STDEV.P(E2:E87)	

☐ Repeat for heifers. Click anywhere on your chart, then click on the **green "+" sign**, check "**Error Bars**", and "**More Options...**".
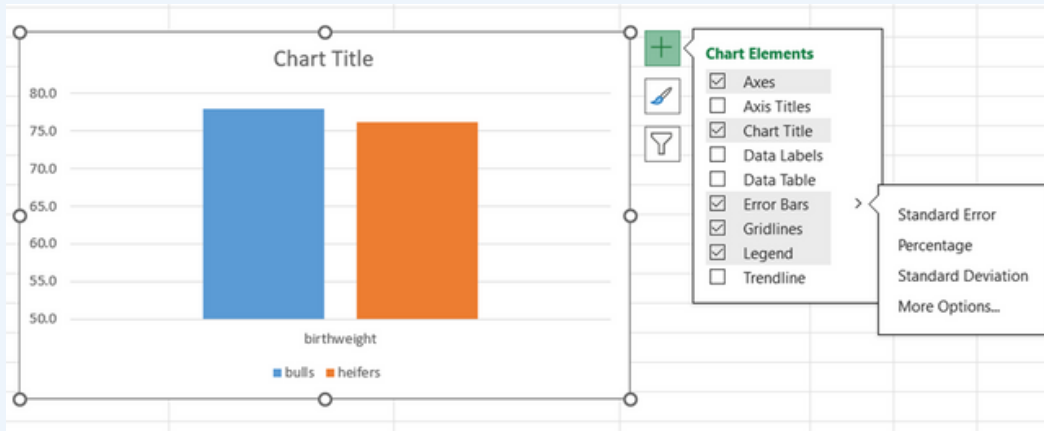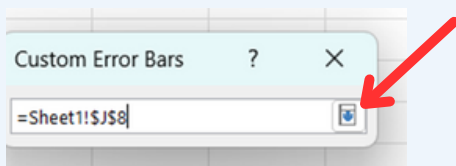

☐ In the dialogue box, choose "**bulls**". In **Format Error Bars** go to the data icon and select "**Custom**" and "**Specify Value**".
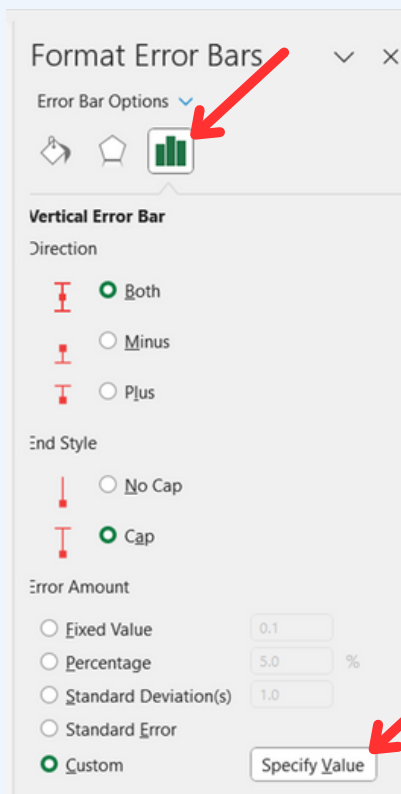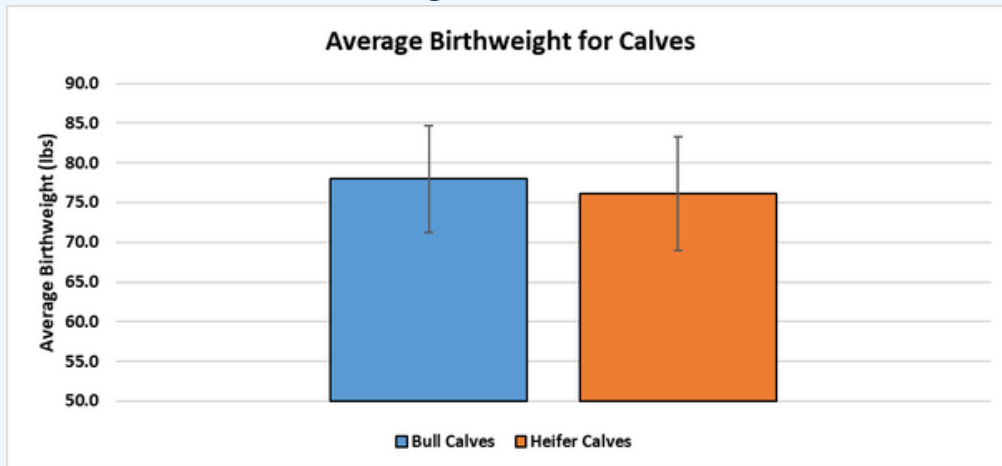
☐ Click on the up arrow to specify the value for the positive error bar, which is the standard deviation we just calculated.


☐ Click on the value for the standard deviation for bulls in our table and then click the down arrow and "**OK**."

☐ Repeat for the Negative Error Value, and then do the same for heifers. Here is the finished chart after adding a title:

The error bars show where 68% of the data fall above and below the average, i.e., within 1 standard deviation from the mean, to show how wide the range of the majority of weights is.
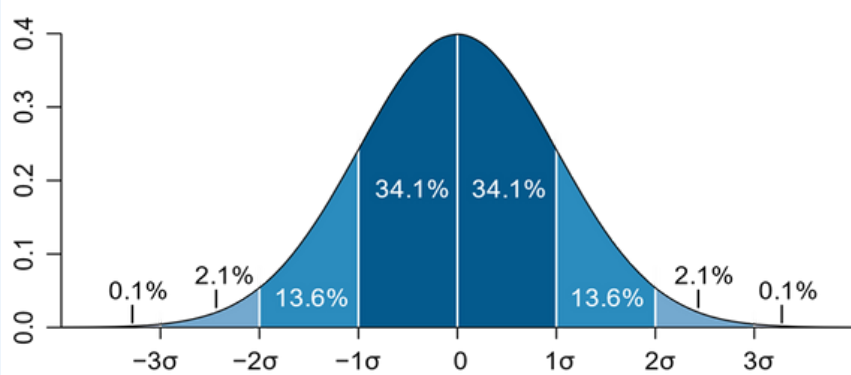
From: **M. W. Toews** - based (in concept) on figure by Jeremy Kemp, on 2005-02-09

Histograms to Evaluate the Spread of Data

Now, from the "calving date" column, we'll create the histogram of the number of calves born in each 21-day cycle since the start of the calving season.

☐ Sort the data by **calving date.** Highlight the data in the calving date column with your cursor. Go to **Insert**, **Charts**, and then choose the **Histogram** icon:
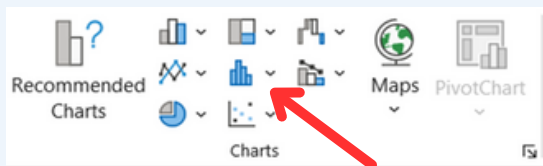

☐ Excel will choose the number of bins (columns) for us, but that may not be what we want. Here, it chose a 13-day interval, but we want a 21-day interval.
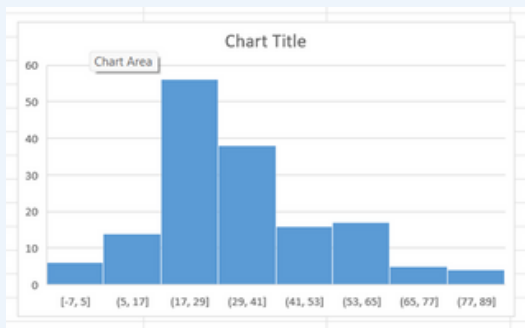
☐ To change to a 21-day interval, right-click on the numbers on the horizontal x-axis and select "**Format Axis...**" Click on **bin width** then change the number in the box to **21**.
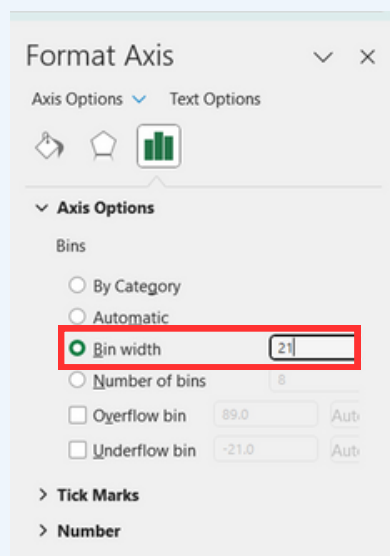

☐ To display the actual number of calves born in each 21-day cycle: click on the "**+**" sign, and check "**Data Labels**".
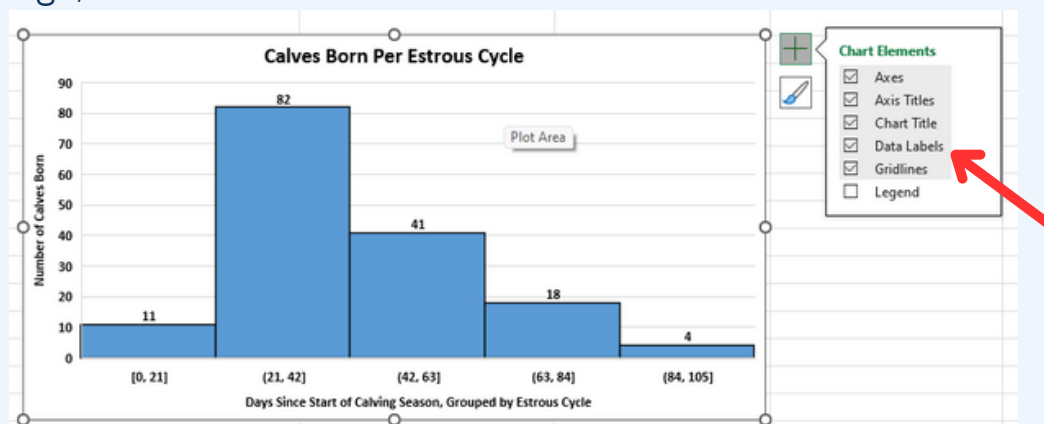
Note for above graph: The shape of the brackets indicates whether the number is included or not, e.g. the first bracket "[" includes both 0 and 21; the second bracket "(" includes everything above 21, but not 21 itself, up until and including 42, etc.

The data shows that a few calves were born in the first 21-day interval – these may have been premature. The rest of the distribution is what we'd like to see: most are born in the first cycle, with fewer and fewer born later. It is good to compare these charts between years to see if the trend is stable or slipping towards later calvings in the season.

☐ We can then calculate the % of calves born per cycle by dividing the number in each bin by the total number of calves. To prepare this table, the formula is "**= number of calves/total calves**". For the first cycle, that would be "**=11/156**". To change the proportion to %, click on the "**%**" icon within **Number** on the **Home** tab.
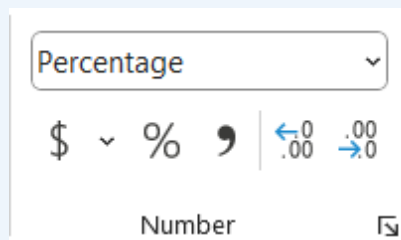
☐ For the cumulative % born, add all born up to this point, e.g., in the 42-63 period with the formula "**=sum(highlight the three cells with 7%, 53% and 26%)**", and hit Enter.

cycle	% of calves born	cumulative % born
0 - 21	7%	7%
22-42	53%	60%
42-63	26%	86%
64-84	12%	97%
85-105	3%	100%

☐ To calculate the length of the calving season, subtract the first day of calving from the last day of calving:

length of calving season, days	=D157-D2

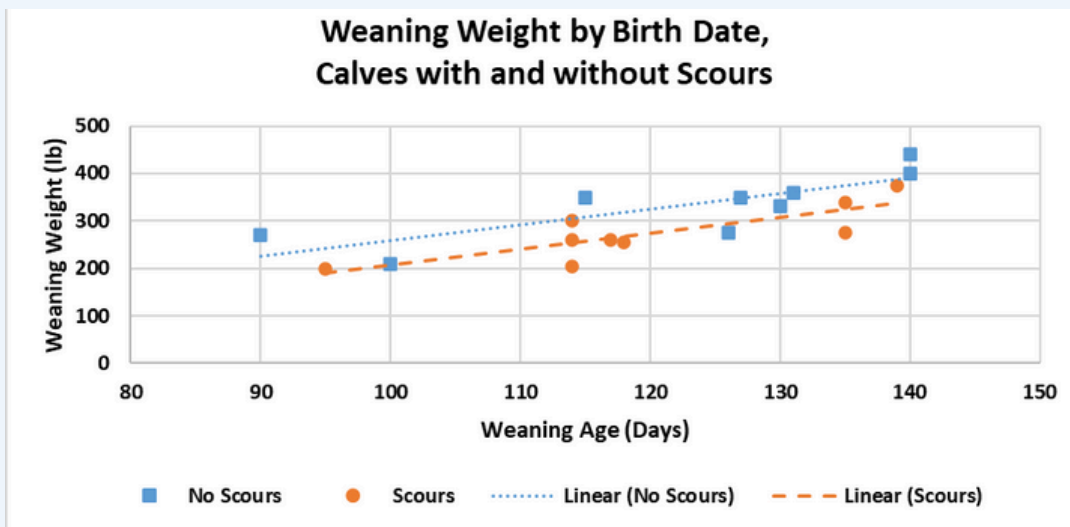| length of calving season, days	91

☐ For Excel to be able to do calculations with dates, the data must be formatted as dates in the drop-down menu in the **Number** section in the **Home** tab.
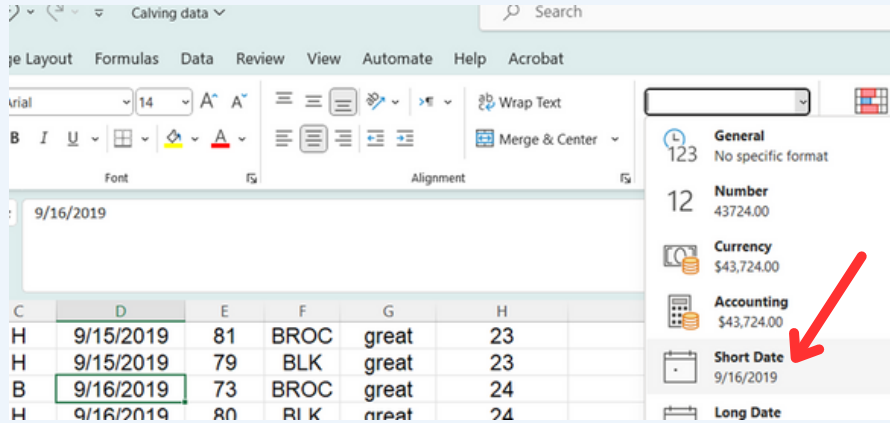
## Other Examples of Data Visualization

Scatter plot of weaning weight by birth date

☐ A uniform calf crop is desirable. Weaning weight is not only determined by age and sex but also by health status of the calf as it grows and by how much milk the calf's dam was making. How much certain diseases can affect calves can be visualized by plotting weight versus age for two groups: those affected and those unaffected by a disease, using the **X Y (Scatter) chart** type.
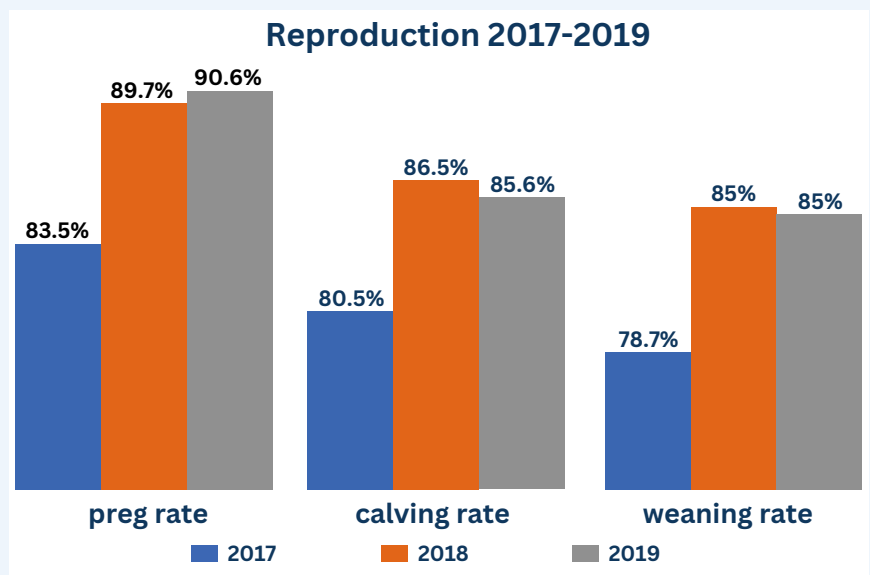

CDFA Antimicrobial Use and Stewardship | www.cdfa.ca.gov/ahfss/aus
UC Agriculture and Natural Resources | https://ucanr.edu/site/newborn-beef-calf-health

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Pinkeye cases in the spring

☐ Plotting when cases of a disease occur can give information on when to best introduce control measures, such as fly tags or vaccination. For example, a bar chart illustrating the number of pinkeye cases every two weeks during the spring, with the highest cases recorded at the end of May, suggests that applying ear tags and vaccines by the end of April could be the most effective strategy.
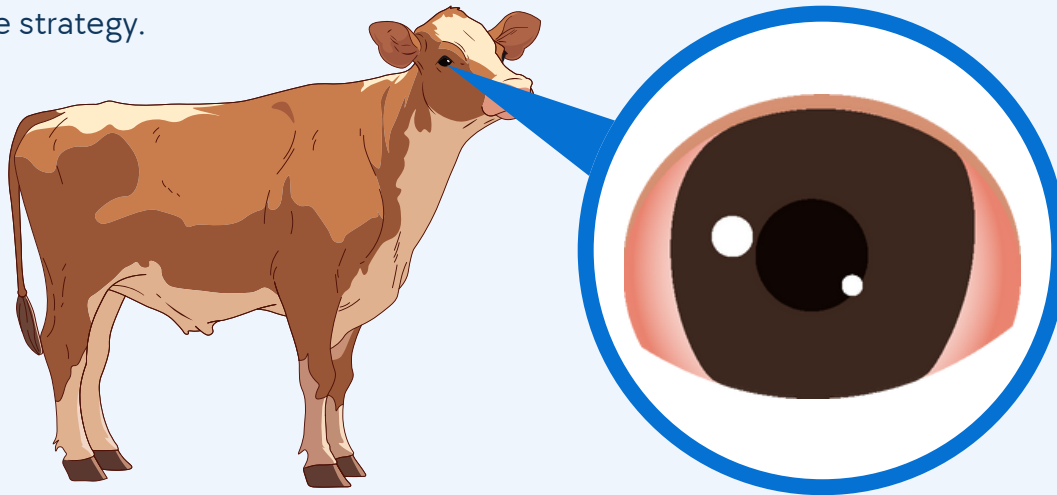
Reproductive records over time

☐ Here is a comparison of multiple years of reproduction records in **bar chart** format. Although all reproductive rates have increased between 2017 and 2019, the calving rate is lower in 2019 than in 2018, indicating that there may be an issue with reproductive loss between pregnancy check and calving, or that stillbirths are on the rise (stillbirths shouldn't be counted as calvings, as they did not result in a live calf). A rise in stillbirths may be due to dystocia (difficulty giving birth) or insufficient monitoring during calving.

Reproduction 2017-2019

	preg rate	calving rate	weaning rate
2017	83.5%	80.5%	78.7%
2018	89.7%	86.5%	85%
2019	90.6%	85.6%	85%

Pregnancy status by BCS

☐ Here is another bar chart that compares the pregnancy status and BCS of cows. The chart demonstrates that several cattle are either too fat (BCS of 7 or 8) or too thin (BCS of 3 and 4). Investigation of fat cattle might reveal that they lost a calf or weren't pregnant in the previous year but were kept around. The number of open cows among those with a BCS below 5 is higher than in the other categories and should trigger some effort to improve BCS before the breeding season.
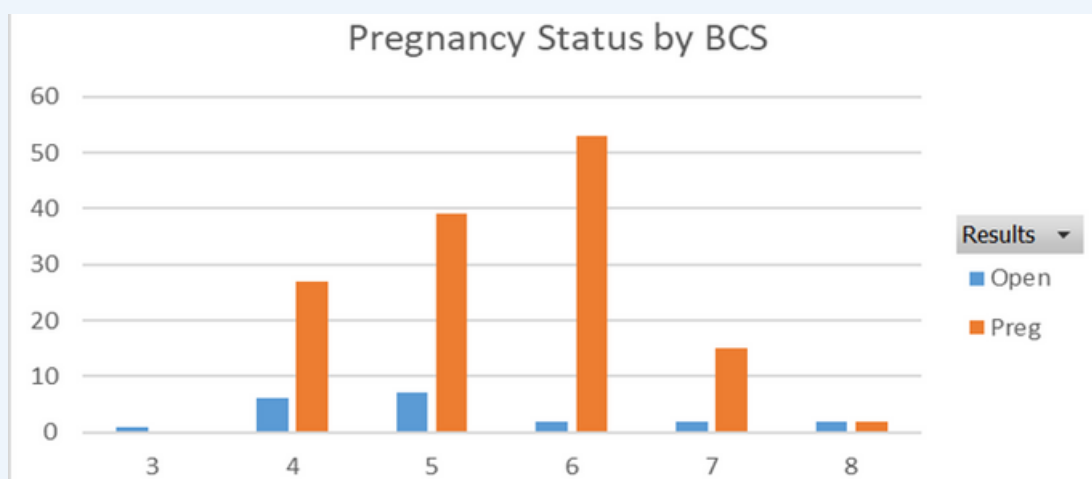
Conclusion

☐ Records are important to avoid drug residues and keep an inventory. However, records can provide you with information on the health and reproductive success of your herd when you summarize or visualize data. These summaries can also be great talking points for discussions with your vet about changes to your herd health program.

Additional Resources

When it comes to data visualization, the sky is the limit. You do not have to memorize how to create these charts. There are a lot of short videos on YouTube that take just a few minutes to explain how to create various charts, so don't feel constrained by what is shown in this short guide.

- Microsoft offers online video training, e.g. how to create a chart from start to finish: https://tinyurl.com/MicrosoftChartTraining

  Microsoft Training

- Coursera is an online learning platform that offers hundreds of courses just on Excel, from beginning to expert. Coursera courses can be taken for credit for a fee or can be audited (aka taken for free) for your own learning objectives: https://tinyurl.com/CourseraMicrosoft

  Coursera

- There is an hour-long workshop recorded on record keeping for beef cattle available from the California Beef Council webpage. *California BQA Refresher: Are Your Records Cutting It? (November 2020)*: https://tinyurl.com/BeefCouncilWorkshop

  CA Beef Council

CDFA Antimicrobial Use and Stewardship | www.cdfa.ca.gov/ahfss/aus

UC Agriculture and Natural Resources | https://ucanr.edu/site/newborn-beef-calf-health

This document was made in collaboration with the following organizations:

cdfa — CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

AUS — ANTIMICROBIAL USE AND STEWARDSHIP

UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources

UCDAVIS VETERINARY MEDICINE