Given Several Extant Averages,[1]
Which is Best for Your Business?

Dr. Kenneth F. Smith, PMP

A former participant of one of my Program/Project Monitoring & Evaluation (PM&E) workshops who monitors sales at multiple store outlets recently contacted me with this concern about outliers: "*I want to get the average daily sales per asset type. To get a more realistic average sales per asset type, I need to identify and exclude stores with outlier performance. May I know which approach I should take?*"

After replying, I thought this issue would be of sufficient interest to warrant a review of basics.

There are three 'averages' in general use for measuring and comparing performance by 'cohorts' -- *i.e. groups in which individual members share a common characteristic*. Since each average has a different focus*,* it is important to use the most appropriate one for your purpose, so as not to misrepresent the results to stakeholders; or deceive yourself – with unintended consequences!

The three averages, and the essential distinction between them is as follows:

1. **The MEAN** – *more precisely the Arithmetic Mean –* is probably the average most widely known, generally understood and used. The Mean is obtained by adding the values of all the data items in the group, then dividing that sum by the number of items. For example:

   Given **11 items** with the values **2 3 3 4 5 12 13 20 25 28 60** respectively, the sum is **175,** which divided by **11** results in an Arithmetic Mean of **15.91**

2. **The MEDIAN** is simply the value of the item at the midpoint of a range of data, ranked from low to high, *or high to low,* with no other consideration of their values.

   In that same range, **2 3 3 4 5 12 13 20 25 28 60,** the Median is **12.**
   [*Given an even number of items, the Median is the Mean of the two middlemost values*.]

3. **The MODE** is the most frequently recurring value (*if any*) in a data series.

   In the foregoing range, **2 3 3 5 12 13 20 25 28 60** the Mode is **3**.

So, between options **15.91, 12,** or **3**, which would be the most appropriate one to use as a realistic average to represent this group? Or, perhaps, '*None of the above!*'

Well, as William Shatner says in his TV show "The UNXPLAINED" on the History Channel, "*That's what we'll try and find out!*"

[1] How to cite this work: Smith, K. F. (2025). Given Several Extant Averages; Which is Best for Your Business? *PM World Journal*, Vol. XIV, Issue XII, December

To better appreciate the utility of each average, I'll use this example to take a closer look at each, in turn. Then, to address & assess the problem my inquiring former participant posed, I'll apply all three averages on a pertinent data set, to clarify the issue for your consideration and future use.

The Mean

While the Mean of **15.91** was the largest result -- *and it certainly is precise* -- that may also tempt you to use it as the most impressive of the three options. Furthermore, the formula is readily available & accessible -- in cell phones, calculators, and computers. However; if you intend to measure and compare performance levels within the group, establish standards, or set targets, note that in this example **15.91 is not an actual performance level** within the cohort. Consequently, although arithmetically correct & statistically factual, it would be disputed by many as an arbitrary value. Furthermore, despite being statistically within 2 standard deviations – i.e. 95% probability -- it can clearly be seen in Figure 1, that 15.91 is way beyond the reach of at least 5 members in the cohort. So if 15.91is used as a criterion, standard or target, it would be unreasonable for them.

FIGURE 1

STANDARD DEVIATION COMPUTATION TEMPLATE © 2025, 2020. Dr. Kenneth F. Smith, PMP

FIRST: Delete any data in the yellow cells beginning at cell B3
NEXT: Enter up to 450 new data items in the yellow cells beginning at cell B3 and view the results below

	ENTER Value
1	2
2	3
3	3
4	4
5	5
6	12
7	13
8	20
9	25
10	28
11	60
12	
13	
14	
15	
16	

Number of items	11
Range	58.00
Max #	60.00
Min #	2.00
Mean	15.91
SUM	175.00

PROBABILITY +/- 95 PERCENT

Three types of Standard Deviation			OUTLIER -3 SD	-2 SD	-1 SD	Mean	+1 SD	+2 SD	OUTLIER +3 SD
			Mean Exact; other Data Rounded						
A Sample sd	17.32	=	-36	-19	-1	15.91	33	51	68
Q&E ESD Range/6	9.67	=	-13	-3	6	15.91	26	35	45
The Population sd *[Most Accurate]*	16.52	=	-34	-17	-1	15.91	32	49	65

Moreover, while clustering a couple of times -- first in single digits and again in the teens & twenties -- the single data value **60** is unduly inflating the computed Mean and standard deviation size; precisely the type of outlier my former participant wanted to exclude.

In general, wide ranges in data sets often reveal not just poor performance at the lower extreme, but are also leading indicators of common factors inhibiting or fostering achievement at the higher levels. However, if quality control was the objective, results far from the Mean in either direction would be a red flag of defects in processing; warranting follow-up inquiry and ocular inspection. On the other hand, if the wide range was a first-time result from a census or sample survey, to establish a baseline for future comparisons, a wide range is a leading indicator the cohort is not as cohesive as earlier anticipated. So rather than employing the Mean as a universal standard or a common target for achievement, there may be extant factors justifying sub-dividing the group into smaller sets. Otherwise, the lower-level entities would never be able to catch up!

The Median

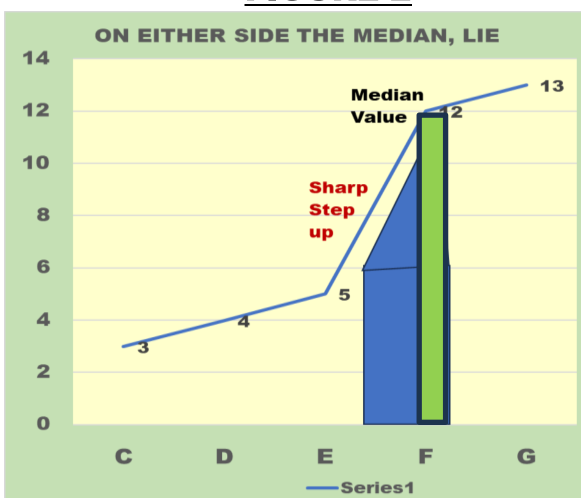
As the centermost value in the rank-ordered range, the Median of **12** is readily identifiable without the need for computation. It is also an actual value; and with half the values exceeding it, it would clearly counter any attempts to declare it as unattainable. Most importantly -- *to address my participant's concern* -- the Median is oblivious to outliers, so is unencumbered by their otherwise distorting effects; at either end.

However, despite the ease in identifying the Median without further computation, and it disregarding outliers, standing alone a Median has no facility to conduct further analysis -- *in terms of standard deviations* -- to determine statistical probability of other members of the cohort. So if such analysis is desired, the Median must be used in conjunction with the Mean.

Moreover, while the Median position in the range is oblivious to data values, it is nevertheless susceptible to another type of non-representative distortion: Significant Step Differentiation (SSD) before &/or after its location.

As a rapid review of Figure 2 illustrates for this example, there is a definite distinction between the values or trends on either side of the Median value, so caution should be observed utilizing it in purporting to represent the group.

FIGURE 2



Thus, although standing in the middle of a 'low-high' or 'high-low' range – *except in a perfectly symmetrical quantitative distribution situation* -- the Median value is not *ipso facto* the best representative of the entire group.

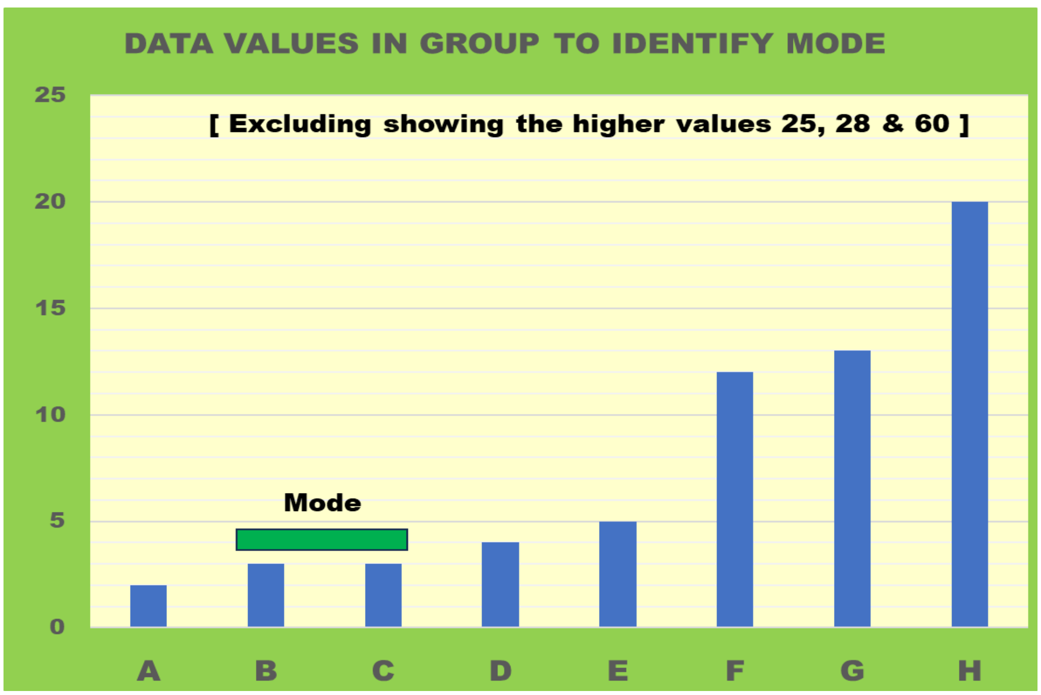
The Mode

On the other hand, the most frequently occurring value in the group would seem to be the most accurate value to represent the entire cohort.

But there are also a couple of flaws with this assumption, and approach.

Sometimes there are no duplicate, triplicate or more numerous 'like-values' in a sample, or even in a census; so in some situations there may be no Mode. Furthermore, even if there are any repetitions, they may be in the wrong place; as in this case example, as illustrated in Figure 3, below.

FIGURE 3

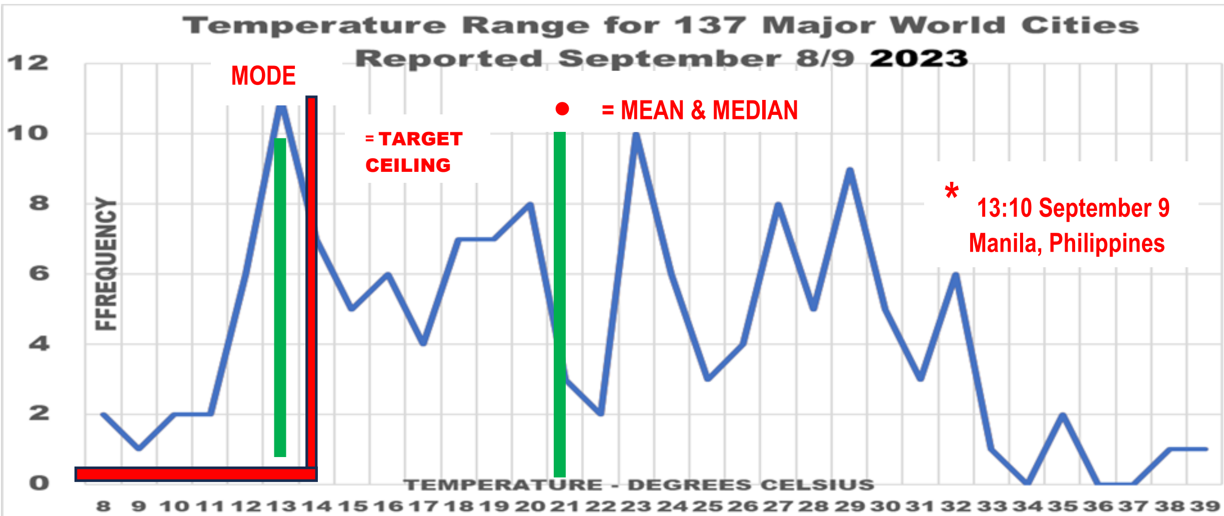


So, while – *generally* -- a Mode may be indicative of a desirable collective sub-cohort, its proximity to the Median's physical location in the range would need to be visually verified before utilizing it to represent the cohort – as well as determining possible reason(s) for any quantitative offsets from the general population of the entire group represented by the Mean.

In this case example, with a value of only **3**, the Mode is inordinately low; an anomaly indicating a probable common problem or circumstance either at a particular location, and/or in the process which generated it. In any event, this specific Mode is obviously unsuited as a valid representative of this cohort.

Parenthetically, cognizant of the foregoing factors I continue to wonder why the 'Climate Change' cohort[2] -- the UN with its Conferences of the Parties (COPs) -- seems to utilize the **Mode** as their reference indicator & target in its temperature abatement efforts; as it is an extremely low outlier & clearly unrepresentative of contemporary global temperatures almost anywhere any day or time.

FIGURE 4



NOTE: The Paris Accords objective was to *contain the 'Average' limit* ***below*** **14.33°C** [i.e. *a 1.5°C [2.7°F] increase over a* 12.83°C *[55°F] base*]. But in this case *only the* **11-city 13°C Mode *outlier*** – with twelve[3] other cities below – **is even close.** Using the Mode to represent the global Average in this instance would be either sophomoric stupidity -- or deliberate deception & blatant chicanery -- because the **113** other **cities (83%)** monitored that day and time **had already breached the ceiling barrier!**

Taking humidity into account, Manila's **33°C** *[91.4°F]* peak daytime temperature also had a *'Heat Index'* that day so it *felt like **38 º Celsius** – i.e. 100 º Fahrenheit!* Moreover, temperatures on the planet's surface at different altitudes range throughout day and night -- for instance*, the night-time **low** in Manila, was '**only' 25°C** [77°F];* so the **Mode** *for Manila* -- ***and half the planet*** -- would be their *cooler nighttime temperature***,** rather the day's peak temperature; so the mode itself might vary depending on the time. Still more variance: In many places temperatures also range *widely* throughout annual seasonal cycles. Also 70% of the planet is covered by oceans, whose temperatures are excluded here.

Although there is nothing 'normal' about the distribution, **the Mean & Median at +21°C [70°F] are unquestionably more realistic**; and almost all the city temperatures from this sample day and time are far from the UN **12.83°C** [55°F] base and target **+1.5°C** [2.7°F] UCL target ceiling!

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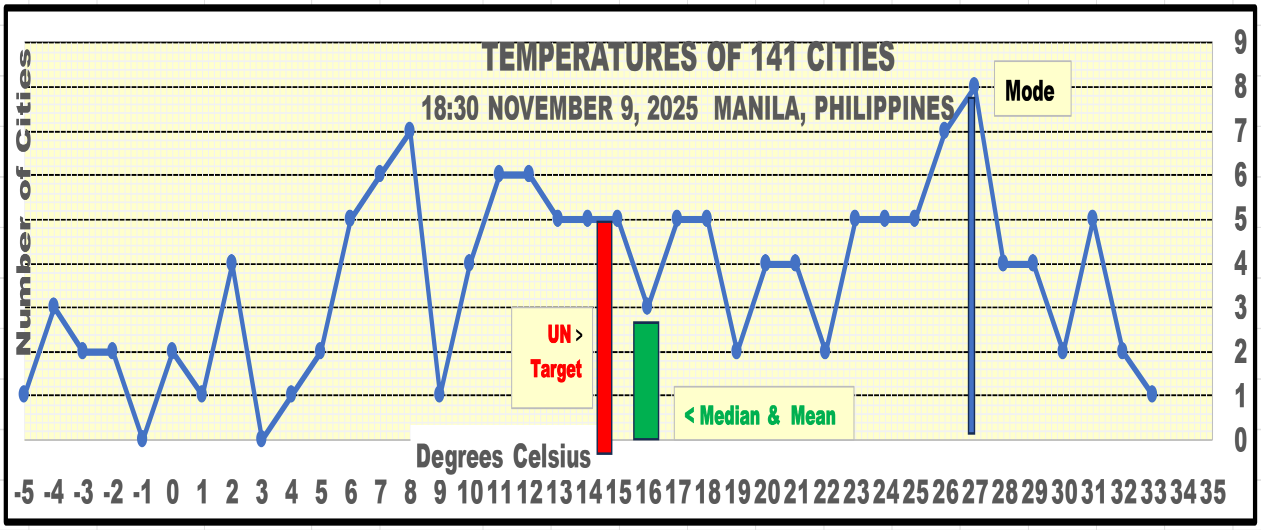
[2] The United Nations Framework Convention on Climate Change (UNFCCC) is a multilateral treaty adopted in 1992 to combat *"dangerous human interference with the climate system"*.
[3] Note; there were 5 cities at 12°C that I inadvertently missed in earlier counts.

Two years later, with the onset of winter at high latitudes, the picture has changed considerably:

FIGURE 5



The temperature distribution is still 'not normal' but the lower end of the range declined dramatically by 10 degrees -- from +8ºC to -5ºC. Although the Arithmetic Mean & Median temperatures are still very closely related, they also dropped 5 degrees -- from 21ºC to 16ºC & 16.23ºC, respectively. However, the Mode shifted significantly, from the previous low of 13ºC to a much higher temperature of 27ºC. Further statistical analysis[4] reveals a strong negative correlation of -0.76 between Temperature and Latitude, with low temperatures predominantly from cities in the higher northern hemisphere; the Median in South America and Modal temperatures all below Latitude 32 º. [For more detail, see the ADDENDUM.]

To me, the very concept of *an average global temperature* seems to be merely massaging massive amounts of data for meaningless composite 'averages' of any type. Only the individual unaggregated temperature ranges at site-specific locations -- *on a case-by-case basis* -- would seem to be meaningful. Consequently, I wonder what is the basis the UN, C3S and others actually use to establish targets for climate control, then track and measure official annual world '**average**' temperatures! ***[Is it possible the pre-industrial 'average,' and subsequent comparisons vs. climate targets are only based on a few pre-selected city samples in northern latitudes?]***

But I digress. [5]

[4] Pearson Correlation

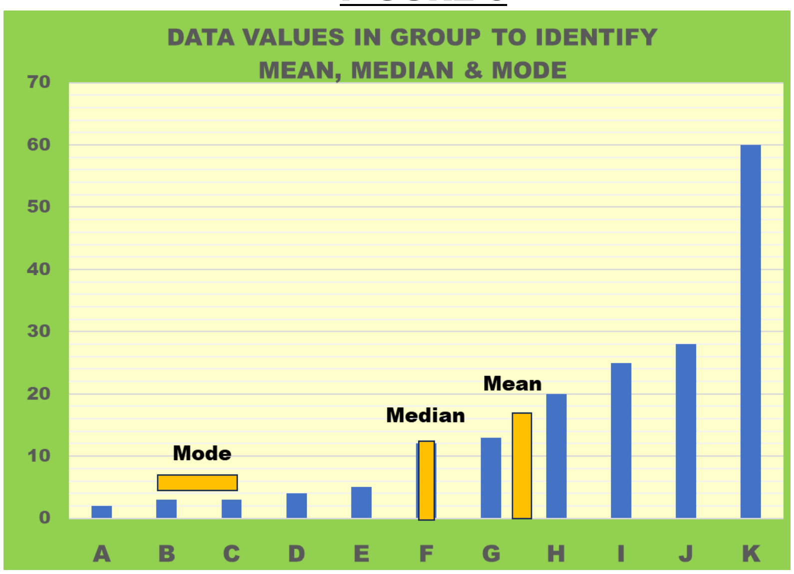
[5] For more details on this and related climate issues, see: Smith, K. F. (2025). Global Warming & Climate Change: Current Concerns, & Considerations for Project Planners, commentary, *PM World Journal*, Vol. XIV, Issue I, January. https://pmworldlibrary.net/wp-content/uploads/2025/01/pmwj148-Jan2025-Smith-global-warming-and-climate-change-2.pdf

Summary

In an 'Ideal' symmetrical world situation, all three of these averages – Mean, Median & Mode -- would coincide. However, such a situation hardly ever happens in the real world.

Nevertheless, whether you are merely initiating a baseline survey of a scenario; measuring performance achievement by individuals *vs* a pre-established target level, or establishing a quality control criterion to monitor a cohort unit's variance from a standard (*hence the need for the 'standard deviation' metric*), **the proximity of the Mode and Mean to the Median is the best guide for determining the most suitable average for your purpose(s).**

FIGURE 6



With respect to the standard deviation, remember: the smaller the range, the smaller the standard deviation, and – conversely -- the greater the precision. In any event, management tolerance for variation in a particular scenario -- *which necessitates use of the Arithmetic Mean to measure results due to its capability to analyze findings in terms of a standard deviation* -- should be pre-determined. But such statistical finesse can be dispensed with in many situations.

Given the foregoing concerns with each average, and the desirability of bringing the Arithmetic Mean closer to the range Median, I concocted the following systematic process to dispense with distorting outliers; and created a more realistic quantitative indicator: **the 'Adjusted Mean'**. My quick & easy approach to calculate an Adjusted Mean that dispenses with outliers is to initially create a six-segment range of the data -- *a la* the PERT process -- and the normal distribution curve. Then truncate the values in the first & last segments, and finally recalculate the Adjusted Mean using the remaining four segments. The process is described, and depicted in detail in the Figures on the following pages; first illustrating with the foregoing hypothetical example, then again with some relevant data.

SMITH'S SIX-SEGMENT STEP PROCESS

Illustrative Example

1. Given 11 values in a group Range
2. Rank order their values from Low to High
3. Divide the number 11 by 6 = 1.83
4. If a decimal results, round up – in this case to 2
5. Identify the six 2-size segments: 2 3 | 3 4 | 5 12 | 13 20 | 25 28 | 60 xx |
   Segments: **1 2 3 4 5 6**
6. Discard the Lowest and Highest segments **1** & **6**
7. Calculate the Arithmetic Mean of the values in segments **2, 3, 4** & **5.**

FIGURE 7

STANDARD DEVIATION COMPUTATION TEMPLATE © 2025, 2020. Dr. Kenneth F. Smith, PMP

FIRST: Delete any data in the yellow cells beginning at cell B3
NEXT: Enter up to 450 new data items in the yellow cells beginning at cell B3 and view the results below

	ENTER Value
1	
2	
3	3
4	4
5	5
6	12
7	13
8	20
9	25
10	28
11	
12	
13	
14	
15	
16	
17	
18	

Number of items	8
Range	25.00
Max #	28.00
Min #	3.00
Mean	13.75
SUM	110.00

PROBABILITY +/- 95 PERCENT

Three types of Standard Deviation			OUTLIER	Mean Exact; other Data Rounded					OUTLIER
			-3 SD	-2 SD	-1 SD	Mean	+1 SD	+2 SD	+3 SD
A Sample sd	9.71	=	-15	-6	4	13.75	23	33	43
Q&E ESD Range/6	4.17	=	1	5	10	13.75	18	22	26
The Population sd *[Most Accurate]*	9.08	=	-13	-4	5	13.75	23	32	41

The segmented Median is **12.5** i.e. (12+13)/2
While calculating only segments 2 through 5 results in an Adjusted Mean of **13.75**
Whereas the Arithmetic Mean of the 11 data range with a **12** Median was **15.91**
– calculated on my Standard Deviation computation template shown in Figure 1 –

Eliminating the Outliers has thus moved the Mean closer to the Median by **2.66**
i.e. from 3.91 to 1.25 thereby providing a **more representative 'average'.**

Now, A Specific Case

1. Given 77 stores in a particular asset range
2. Rank Order their values from Low to High
3. Divide the number 77 by 6 = 12.8
4. If a decimal results, round up -- in this case to 13
5. Identify the six 13-size segments with different colors to facilitate recognition
6. Calculate the Adjusted Mean of segments 2 through 5

NOTE: Instead of showing the standard deviation template as depicted in Figure 7 above, this time I'll focus on the Asset Group's data in the segmented columns:

FIGURE 8

Discard

Column:	C	D	E
	65,789	STORE 75	
	66,285	STORE 76	
SEGMENT	66,662	STORE 77	
	67,005	STORE 74	
1	68,472	STORE 73	
	68,763	STORE 72	
	70,595	STORE 70	
	71,360	STORE 71	
	72,281	STORE 69	
	75,928	STORE 66	
	76,680	STORE 68	
	78,090	STORE 67	
	83,445	STORE 64	COUNT
	84,497	STORE 65	1
	86,552	STORE 63	2
	87,035	STORE 62	3
SEGMENT	87,782	STORE 59	4
	87,827	STORE 61	5
2	88,944	STORE 60	6
	95,393	STORE 57	7
	95,540	STORE 58	8
	97,291	STORE 56	9
	97,459	STORE 38	10
	98,635	STORE 53	11
	99,321	STORE 52	12
	99,443	STORE 55	13

	99,874	STORE 54	14	
	102,374	STORE 51	15	
	103,669	STORE 47	16	
SEGMENT	103,802	STORE 49	17	
	103,855	STORE 48	18	
3	104,223	STORE 50	19	
	109,143	STORE 46	20	
	109,919	STORE 45	21	
	110,508	STORE 40	22	
	111,160	STORE 42	23	
	112,156	STORE 43	24	
	112,168	STORE 39	25	
	112,363	STORE 44	26	
	113,900	STORE 37	27	
	114,169	STORE 41	28	
	114,561	STORE 36	29	
	114,783	STORE 35	30	
SEGMENT	115,494	STORE 34	31	
	115,624	STORE 29	32	
4	117,143	STORE 31	33	
	117,841	STORE 32	34	
	118,305	STORE 30	35	
	120,021	STORE 33	36	
	145,666	STORE 27	37	
	148,210	STORE 28	38	
	150,241	STORE 26	39	
	150,501	STORE 25	40	
	153,896	STORE 24	41	
	165,632	STORE 23	42	
	167,938	STORE 10	43	
SEGMENT	169,330	STORE 21	44	
	169,813	STORE 22	45	
5	172,665	STORE 20	46	
	175,939	STORE 19	47	
	176,761	STORE 18	48	
	181,323	STORE 17	49	
	188,252	STORE 15	50	
	188,310	STORE 12	51	
	188,394	STORE 16	52	HIGH

`

		188,464	**STORE 13**	
		190,511	**STORE 14**	
		191,728	**STORE 11**	
		203,991	**STORE 9**	
	SEGMENT	**210,159**	**STORE 8**	
		217,621	**STORE 7**	
Discard	**6**	**238,062**	**STORE 6**	
		245,138	**STORE 5**	
		264,319	**STORE 4**	
		265,182	**STORE 3**	
		269,133	**STORE 2**	
		289,990	**STORE 1**	
Ignore				

The original Median was **112,363** i.e. the 39th Item in the range
After segmentation the Median is a now **113,131.5**
i.e. the mean of items 26 & 27 (112,363 + 113,900)/2 in the truncated range

Calculating the segments 2 through 5 [i.e. @sum(c14:c65)/52 in the template]
Results in an Adjusted Mean of **127,771**

Whereas the Arithmetic Mean of the 77 data range was **131,965**
– calculated separately on my Standard Deviation computation template shown in Figure 5 –

Eliminating the Outliers has thus moved the Mean closer to the Median by 4,962,5,
i.e. from 19,602 to 14,639.5 **thereby providing a more representative average.**

By contrast, using the PERT formula: (a + 4ML + b)/6
with a = 65,789 ML = Median = 112,363 & b = 289,990
the Mean was **134,205**

<u>Conclusion</u>:

The Quick & Easy approach of truncating segments 1 & 6
produces an even more realistic result than the time-honored PERT formula!

In any event. despite whatever accomplishment is reported, the fact – *all too often overlooked* – is that when you utilize the Mean &/or the Median, ***at least half of the items tabulated and measured in the population database are/were <u>below the average</u>!*** The result is even more distorted if the distribution is not 'normal' -- *with a few excessively large outliers, &/or the mode(s) off-center compared to the general run of the remainder of the population* -- and you do not make the aforementioned truncating adjustment.

To overcome this issue with central tendency analysis and also highlight the undesirable effect of outliers, I turned to **proportional** assessment; adding a new indicator with a different perspective. **"SALTS"** is the **"At Least" Number** or **Percentage** of samples Equal or Exceeding a target.[6] This perspective provides a much more valid percentage than the traditional methodology.

For example, a hypothetical data set – *below* -- where a predetermined **target** 'average' is **20** '*somethings,*' and the results from a **sample of 30** are arrayed from Low to High as follows:

0, 5, 6, 11, 12, 15, 17, 17, 18, 18, 18, 18, 18, 19, 19, 19, 19, 20, 20, 20, 21, 22, 23, 25, 26, 28, 30, 33, 60, 65

Tabulated below as:

0
5
6
11
12
15
17, 17
18, 18, 18, 18, 18 **Mode**
19, 19, 19, 19 **]Median[**
20, 20, 20 **[Target]**
21 [**MEAN**]
22
23
25
26
28
30
33
60
65

The Arithmetic Mean is 642/30 = **21**, *PROCLAIMING SUCCESS*

While the lesser utilized Median is 19, and the Mode is even less at 18.
BOTH of which INDICATE A SHORTFALL!

SALTS computes the number of instances **Equal or Exceeding the Target** as **13,**
so **only 43% --** i.e. **13/30** – attained the Targeted percentage.

The value, utility and facility of the SALTS template is illustrated with another hypothetical example in Figure 9.

[6] [SALTS was previously published by PMWJ: Smith, K.F. (2023). A Better Indicator for Targeting & Measuring Performance "*ON THE AVERAGE*", *PM World Journal*, Vol. XII, Issue VIII, August. S*ince then, I have upgraded the template, as illustrated in this article*.]

FIGURE 9

"SMITH'S '*AT LEAST*' *TWO-STEP*" (SALTS) APPROACH
For TARGETING & STANDARD-SETTING, and ASSESSING RESULTS
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1. ENTER YOUR TARGETTING DATA IN THE YELLOW CELLS BELOW

Target Audience/Responders:	Stores	
Type & Units of Production:	$1,000's	
TARGET/STANDARD		
TOTAL PROGRAM QUANTITY	900	$1,000's
RESPONDER AVERAGE	25	$1,000's
SALTS Perspective: AT LEAST	70	% Percent of Stores
ATTAIN *AT LEAST*	25	$1,000's

RESULTS			
PROGRAM QUANTITY	888	$1,000's	*SHORTFALL*
RESPONDER AVERAGE	30	$1,000's	*APPARENT SUCCESS*
PROGRAM PERCENTAGE	99%	$1,000's	*SHORTFALL*

BUT be wary of individual Responders who may distort the Mode or Percentage
While simple average results are tallied and calculated with this template, SALTS' PRIME VALUE is when INDIVIDUAL RESULTS are as Important as the OVERALL Program Average or Percentage

SALTS RESULTS			
At Least	43.3	% Percent of Stores	SHORTFALL
Attained at Least	25	$1,000's	

2. DELETE ANY EXISTING DATA BELOW, THEN SCROLL TO ENTER THE DATA COLLECTED IN THE YELLOW CELLS BELOW for up to 2,000 respondents, and the results will be displayed above.

13	Number of respondents Equal to or greater than Target
30	Number of respondents
888	TOTAL PRODUCTION

	RESPONDENT ID	RESULT	Result = or > Target
1	ken	60	1
2	etc	61	1
3	etc	55	1
4		40	1
5		80	1
6		15	
7		17	
8		17	
9		18	
10		18	
11		20	
12		40	1
13		18	
14		19	
15		19	
16		19	
17		19	
18		20	
19		20	
20		20	
21		21	
22		22	
23		23	
24		25	1
25		26	1
26		28	1
27		30	1
28		33	1
29		45	1
30		40	1

In this manner, SALTS presents a more valid status than the traditional Mean.

Furthermore, subsequent 'trial & error' manipulation of Results data in conjunction with the Target also enables the analyst to quickly identify the Median *without having to rank-order the data – i.e.* **$22,000** *as shown in Figure 10* – and/or various other performance value and percentage combinations to help establish a more meaningful target for the future.

FIGURE 10

"SMITH'S '*AT LEAST*' *TWO-STEP*" (SALTS) APPROACH
For TARGETING & STANDARD-SETTING, and ASSESSING RESULTS
© 2025 Dr. Kenneth F. Smith, PMP

1. ENTER YOUR TARGETTING DATA IN THE YELLOW CELLS BELOW

Target Audience/Responders:	Stores		
Type & Units of Production:	$1,000's		
TARGET/STANDARD			
TOTAL PROGRAM QUANTITY	900	$1,000's	
RESPONDER AVERAGE	30	$1,000's	
SALTS Perspective: AT LEAST	50	% Percent of	Stores
ATTAIN *AT LEAST*	22	$1,000's	

RESULTS			
PROGRAM QUANTITY	888	$1,000's	*SHORTFALL*
RESPONDER AVERAGE	30	$1,000's	*APPARENT SUCCESS*
PROGRAM PERCENTAGE	99%	$1,000's	*SHORTFALL*

BUT be wary of individual Responders who may distort the Mode or Percentage

While simple average results are tallied and calculated with this template, SALTS' PRIME VALUE is when INDIVIDUAL RESULTS are as Important as the OVERALL Program Average or Percentage

SALTS RESULTS				
At Least	50.0	% Percent of	Stores	SUCCESS
Attained at Least	22	$1,000's		

2. DELETE ANY EXISTING DATA BELOW, THEN SCROLL TO ENTER THE DATA COLLECTED IN THE YELLOW CELLS BELOW for up to 2,000 respondents, and the results will be displayed above.				15	Number of respondents Equal to or greater than Target
				30	Number of respondents
	RESPONDENT ID	RESULT	Result = or > Target	888	TOTAL PRODUCTION
1	ken	60	1		

Thus, while the Mean, Median and Mode each have a role in central tendency performance analysis, I contend the SALTS Percentage is a much more meaningful indicator of group accomplishment than any of the traditional averages.

In conclusion, for more meaningful performance measurement my prescription is threefold:

1) use an **Adjusted Mean** for a more realistic average by offsetting the outlier effect,
2) in conjunction with a dose of **SALTS** to derive a more valid percentage;
3) and '**Ground truthing**' to address the cause of anomalous Modal offsets, for future iterations

But I'll leave it for you to decide which of these tools is most useful for your business.

Final Thoughts

Averages are everywhere, but they're often misleading.
By understanding their limitations and using better alternatives
like medians, percentiles, and segmentation,
we can make smarter, data-driven decisions.

Advait Dharmadhikari

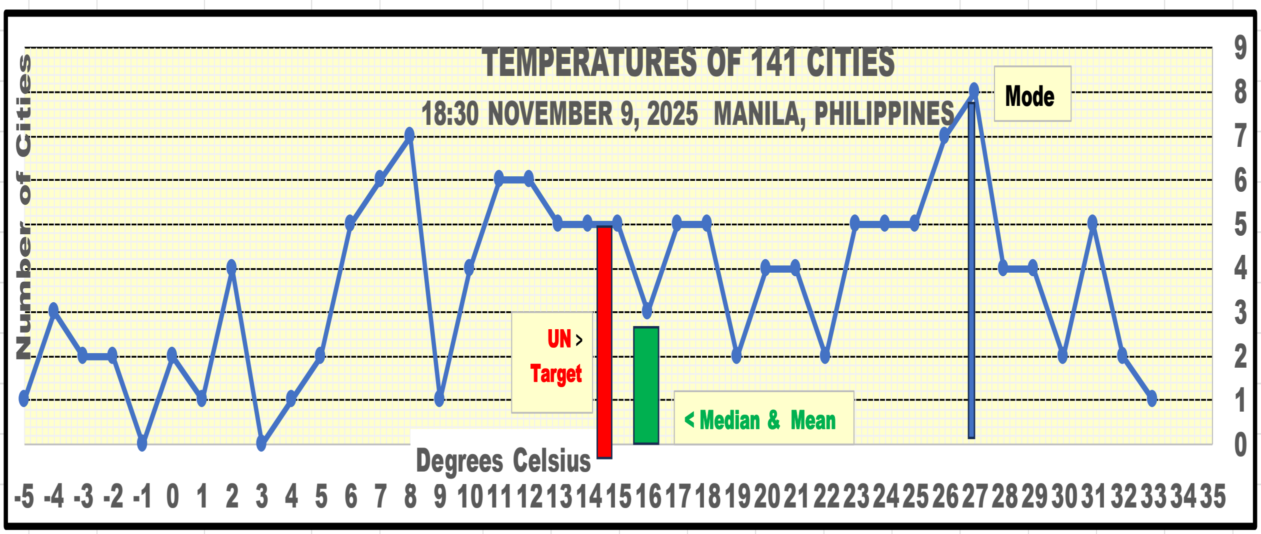
ADDENDUM
RE: GLOBAL TEMPERATURE COMPUTATION CONCERN

For those of you concerned about Climate Change, there is obviously a significant difference between the Paris Accords objective to *contain the 'Average' limit* ***below*** **14.33°C** [i.e. *a 1.5°C [2.7°F] increase over a 12.83°C [55°F] base*] and the data reported & summarized in Figure 4 that shows the global Mean & Median temperature for 'high noon' in Manila on September 9 2023 was already **21°C [70°F].** Moreover, applying the Adjusted Mean to the 137 range city base, with 137/12 = 22.83, or 6 Segments of 23 cities each; the entire sub-group of cities below the UN Control Target -- including the Mode -- plus a couple of cities beyond, are excluded as Outliers!

Although the Arithmetic Mean & Median temperatures dropped 5 degrees -- from 21°C to 16°C & 16.23°C, respectively, the Mode shifted significantly, from the previous low of 13°C to 27°C. Further statistical analysis[7] reveals a strong negative correlation of -0.76 between Temperature and Latitude, with low temperatures predominantly from cities in the higher northern hemisphere; the Median in South America and Modal temperatures all below Latitude 32 °.

The recent data – *shown in figure 5 and repeated here for convenience* – throws even more cold water on the concept of using an average of any type to measure temperature, let alone attempting to control it. **The only 'central tendency' in the world's climate variation is from the poles to the tropics during seasonal changes, not by human activity in dispersed cities!**

FIGURE 5[8]



[7] Pearson Correlation

[8] The data for this graph was obtained by Googling **World Temperatures — Weather Around The World**, then subsequently summarized and analyzed as shown in the Appendix,

I attempted to elicit an authoritative response from the World Research Climate Programme (WRCP) how they compute global temperatures and determine targets; but was snubbed. While I put little stock in AI -- *based on previous experiences* -- I also solicited its 'opinion', and this time received a comprehensive & enlightening answer; citing NASA. Key excerpts were as follows:

> "Many major population centers developed in temperate or subtropical zones that naturally have warmer climates (e.g., Manila has an annual average temperature of 29.5°C). Sampling a limited number of cities likely excludes many vast, cold regions of the world.
>
> The calculation you performed gives you a good idea of the average temperature in those specific cities, but it's not a representation of the entire planet's climate. The **global average temperature**, calculated by organizations like NOAA and NASA using thousands of data points from land stations (rural and urban, with corrections for urban bias), ships, buoys, and satellites, consistently places the Earth's long-term average temperature around **14°C to 15°C (57°F to 59°F)**.
>
> The 1.5°C (or 2.7°F) figure in the Paris Agreement is not an absolute temperature, but rather the **maximum allowable *increase* (warming anomaly)** above the pre-industrial average. Therefore, when scientists and policymakers talk about the "1.5°C limit," they mean preventing the *additional* warming from crossing that threshold on a sustained, long-term global average. The daily, local temperatures you observe are part of weather patterns and natural variability that fluctuate around this long-term global average trend."

Furthermore,

> "Climate scientists focus on how temperature has changed over time. For each individual station, they calculate how the temperature has strayed from what is considered normal; these are known as anomalies. Normal, according to NASA GISS scientists, is the temperature average from the 30-year period 1951—1980. Every location is measured against that 20th century baseline. . . . The temperature *change* between two nearby locations is remarkably consistent, said Nathan Lenssen, a climate scientist at the Colorado School of Mines and the National Center for Atmospheric Research. "When it's 2 degrees warmer than normal in Denver, it's going to be 2 degrees warmer than normal at the top of Bear Peak." That the average temperature change is similar in Baltimore and Philadelphia or in Austin and Fort Worth can be attributed to long, consistent weather patterns, meaning the temperature anomalies of weather stations within an 800-mile distance are highly correlated. This is because large-scale weather systems stretch to this distance. These correlations were first demonstrated in a 1987 paper published in the *Journal of Geophysical Review* by James Hansen and Sergei Lebedeff. And it has been well documented since, Schmidt said. . . .
>
> Scientists must account for the varied spacing of temperature stations. There are fewer weather stations in the Sahara Desert and Antarctica, for example, than in other parts of the world. . . . but the fact that temperature anomalies stay consistent over distances means scientists can fill the gaps by making estimates for the areas surrounding individual weather stations. These estimates are weighted in the analysis: the closer a point on a map is to a station, the more weight it gets. "That allows us to get coverage of nearly the entire Earth's surface, except with maybe some exceptions, like right on the ice sheets of Antarctica," Lenssen said. Scientists at NASA GISS also correct for hotter than normal temperatures that could skew the results. For example, the asphalt and concrete of major roads, uncovered parking lots, and buildings absorb more heat than green spaces. As a result, temperatures in cities are typically higher than those in rural areas. Plus, additional heat is generated from a city's cars, trucks, factories, and air conditioning units. Research shows that the impact of these urban heat islands has a miniscule effect on global temperature — about 100th of a degree. Picture the size of a city compared to the size of the Pacific Ocean.

> Even the biggest cities aren't big enough to make a difference on a global scale. Still, to ensure that these urban data don't make the average artificially high, scientists remove temperature measurements captured in cities or at airports before calculating averages."

The bottom line: AI confirmed UN average world temperature computations **do** include 70% of the world's surface covered by oceans; plus plains, vast mountain ranges & uninhabitable polar regions. AI also clarified that rather than a fixed upper limit 15°C (59°F) target as I had believed heretofore, climatologists derived an arbitrary undulating **+1.5°C (2.7°F) containment target <u>for each location</u>** – *i.e. an imaginary impermeable 'anomalous' membrane blanketing the earth* that they are now fearful will be severely breached *somewhere* in the near future.

In a last-ditch attempt for further confirmation & clarification of this extraordinary approach to concoct an apparently-meaningful indicator for measuring climate in familiar terms, during a webinar with several academic experts on international economics, Brazil–U.S. trade, energy, agricultural policy, global governance, and climate finance I posed my issues; then followed up with them in several emails. The collective responses I received were

> "I pay attention to the numbers, but I'm not in a professional position to dispute the UN Inter-governmental Panel, but clearly most climate scientists are saying the same thing, the planet is hotter now than at any time in modern history. . . . While activists, fundraisers and some policymakers are fixated on the numbers, project developers are not really in the game; rather, they are focused on fossil fuel displacement, and herein lies the rub; prices versus profits. . . . Probably 99.9% of attendees take for granted the overall global warming. . . . Ken, your work – *referencing my involvement with reforestation projects in Nepal, the Philippines & Uganda* -- is valuable but misplaced with respect to the political and institutional dynamics of COP30. . . . Where does that leave you? Well, you have to make the connection between your science and the unfolding climate action (or not) underway."

So be it. These findings reaffirm my earlier assertion UN numbers do not represent reality. My 'science' says fabricating temperatures – *both meanings intended* -- by Rube Goldberg-ish machinations, then deriving global 'averages' from that wide range of obscure data is meaningless; let alone comparing each average against a precise but undulating 1.5°C (2.7°F) global target. Temperatures & related weather issues are site-specific, and population concerns are indifferent to conditions elsewhere. Despite current global warming trends, comprehensive attempts at climate control are irresponsible, if not futile, without a reasonable rationale for local judgement and appropriate follow-through to address specific situations. The Philippines, for example – not merely 1.5°C, but ***<u>at least 15°C (27°F) hotter</u>*** than the UN annual average and global target -- is perennially beset by earthquakes & typhoons. But -- *as recently revealed to all and sundry* – its pernicious ecological & economic catastrophes are exacerbated by the temperament of amoral men; ***not tropical temperatures,*** while outlier areas in temperate zones remain unperturbed by the Philippines' plight. Nevertheless, they suffer health problems due to ***cold air*** trapping fumes from factory smoke, city traffic & agricultural trash burn-off! In either case, ***warming*** is not the cause.

Instead, in the spirit of Reinhold Niebuhr's "*God grant me the Serenity to accept the things I cannot change; Courage to change the things I can; and Wisdom to know the difference*" IMO, politicians, government officials, activists and the private sector should cease generic climate-deflection and instead concentrate on rectifying self-inflicted man-made environmental mis-adventures in their own jurisdictions; which – 10 years after the Paris Agreement – have been undeniably underwhelming. They should also aggressively undertake local adaptation projects to protect their communities from the vagaries perceivably precipitated by Mother Nature's wrath.

COP1 was held in Berlin during 1995. Given the dismal results since then – *reminiscent of Adam Smith's critical economic self-interest pronouncements in an earlier era* -- and taking cognizance of Martin Weitzman's 21st Century 'Dismal Theorem' with respect to the climate, perhaps after COP30 in Belem, in journalistic terms it is now time to 'write "-30-"' on climate control. xxx

APPENDIX:

FIGURE 1

TEMPERATURES OF 141 CITIES				
18:30 NOVEMBER 9, 2025 MANILA, PHILIPPINES				
TEMPERATURE				
Celsius	Fahren-heit	LATITUDE		CITY
-5	23	39.74	N	Denver
-4	25	61.22	N	Anchorage
-4	25	49.86	N	Winnipeg
-4	25	44.98	N	Minneapolis
-3	27	64.73	N	Anadyr
-3	27	45.42	N	Ottawa
-2	28	51.04	N	Calgary
-2	28	45.5	N	Montreal
0	32	53.55	N	Edmonton
0	32	43.65	N	Toronto
1	34	42.33	N	Detroit
2	36	53.9	N	Minsk
2	36	44.65	N	Halifax
2	36	41.88	N	Chicago
2	36	40.76	N	Salt Lake City
4	39	50.08	N	Prague
5	41	59.91	N	Oslo
5	41	16.49	S	La Paz
6	43	52.52	N	Berlin
6	43	59.33	N	Stockholm
6	43	55.76	N	Moscow
6	43	55.23	N	Warsaw
6	43	45.82	N	Zagreb
7	45	64.14	N	Reykjavik
7	45	60.17	N	Helsinki
7	45	50.45	N	Kyiv
7	45	50.11	N	Frankfurt
7	45	47.6	N	Seattle
7	45	47.38	N	Zurich
8	46	59.44	N	Tallinn
8	46	55.68	N	Copenhagen
8	46	49.28	N	Vancouver
8	46	48.86	N	Paris
8	46	48.21	N	Vienna
8	46	40.42	N	Madrid
8	46	39.77	N	Indianapolis
9	48	51.51	N	London
10	50	47.5	N	Budapest
10	50	44.81	N	Belgrade
10	50	39.95	N	Philadelphia
10	50	38.9	N	Washington DC
11	52	53.35	N	Dublin
11	52	50.85	N	Brussels
11	52	47.56	N	St John's
11	52	42.7	N	Sofia
11	52	42.36	N	Boston
11	52	4.71	N	Bogota
12	54	43.24	N	Almaty

12	54	38.72	N	Lisbon
12	54	37.81	S	Melbourne
12	54	34.91	S	Montevideo
12	54	33.44	S	Santiago
12	54	19.43	N	Mexico City
13	55	52.37	N	Amsterdam
13	55	40.71	N	New York
13	55	39.9	N	Beijing
13	55	35.68	N	Tokyo
13	55	32.78	N	Dallas
14	57	44.43	N	Bucharest
14	57	41.9	N	Rome
14	57	41.39	N	Barcelona
14	57	37.57	N	Seoul
14	57	34.93	S	Adelaide
15	59	41.3	N	Tashkent
15	59	37.78	N	San Francisco
15	59	35.28	S	Canberra
15	59	34.6	S	Buenos Aires
15	59	23.56	S	Sao Paulo
16	61	33.76	N	Atlanta
16	61	26.12	S	Johannesburg
16	61	25.26	S	Asuncion
17	63	39.93	N	Ankara
17	63	34.06	N	Los Angeles
17	63	33.87	S	Sydney
17	63	14.64	N	Guatemala City
17	63	12.05	S	Lima
18	64	36.84	S	Auckland
18	64	36.17	N	Las Vegas
18	64	33.57	N	Casablanca
18	64	33.45	N	Phoenix
18	64	31.23	N	Shanghai
19	66	41.01	N	Istanbul
19	66	36.45	N	Algiers
20	68	17.83	S	Harare
20	68	15.8	S	Brasilia
20	68	14.06	N	Tegucigalpa
20	68	9.02	N	Addis Ababa
21	70	35.72	N	Tehran
21	70	29.76	N	Houston
21	70	23.13	N	Havana
21	70	1.29	S	Nairobi
22	72	29.95	N	New Orleans
22	72	22.91	S	Rio de Janeiro
23	73	37.98	N	Athens
23	73	27.71	N	Kathmandu
23	73	27.47	S	Brisbane

23	73	21.31	N	Honolulu
23	73	18.46	N	Santo Domingo
24	75	12.12	N	Managua
24	75	25.79	N	Miami
24	75	25.04	N	Nassau
24	75	25.03	N	Taipei
24	75	18.13	S	Suva
25	77	33.7	N	Islamabad
25	77	31.95	N	Amman
25	77	21.03	N	Hanoi
25	77	18.92	S	Antananarivo
25	77	13.7	N	San Salvador
26	79	33.92	S	Cape Town
26	79	33.89	N	Beirut
26	79	18.42	N	San Juan
26	79	16.84	N	Yangon
26	79	14.6	N	Manila
26	79	10.48	N	Caracas
26	79	33.32	N	Baghdad
27	81	31.78	N	Jerusalem
27	81	31.52	N	Lahore
27	81	30.04	N	Cairo
27	81	28.61	N	New Delhi
27	81	18.02	N	Kingston Jamaica
27	81	5.56	N	Accra
27	81	4.3	S	Kinshasa
27	81	1.87	N	KiritImati
28	82	29.38	N	Kuwait City
28	82	24.71	N	Riyadh
28	82	12.96	N	Bengaluru
28	82	6.61	N	Lagos
29	84	31.95	S	Perth
29	84	22.57	N	Kolkata
29	84	22.32	N	Hong Kong
29	84	12.46	S	Darwin
30	86	24.86	N	Karachi
30	86	23.8	N	Dhaka
31	88	25.29	N	Doha
31	88	25.21	N	Dubai
31	88	18.96	N	Mumbai
31	88	6.82	S	Dar es Salaam
31	88	6.2	S	Jakarta
32	90	13.76	N	Bangkok
32	90	1.35	N	Singapore
33	91	3.13	N	Kuala Lumpur

FIGURE 2

PEARSON CORRELATION ANALYSIS

To Assess the CAUSE-EFFECT Relationship between Two Sets of DATA

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1. **Enter the Titles of each set of data in YELLOW Cells C9 and D9 below.**
2. **Then enter the two sets of data (i.e. up to 200 pairs) to be analyzed in Cells C10 through C109, and D10 through D209, in the two columns below.**
3. **The Correlation Coefficient will appear in Cell F9, with an explanation below.**

	CAUSE	EFFECT
	Independent Variable	*Dependent Variable*
	Y	X
	latitude	*Temperature Celsius*
1	39.74	-5
2	61.22	-4
3	49.86	-4
4	44.98	-4
5	64.73	-3
6	45.42	-3
7	51.04	-2
8	45.5	-2
9	53.55	0
10	43.65	0
11	42.33	1
12	53.9	2
13	44.65	2
14	41.88	2
15	40.76	2
16	50.08	4
17	59.91	5
18	16.49	5
19	52.52	6
20	59.33	6
21	55.76	6
22	55.23	6
23	45.82	6
24	64.14	7
25	60.17	7
26	50.45	7
27	50.11	7
28	47.6	7
29	47.38	7
30	59.44	8
31	55.68	8
32	49.28	8
33	48.86	8
34	48.21	8
35	40.42	8
36	39.77	8
37	51.51	9

The Correlation Coefficient is

=CORREL(C9:C209,D9:D209)

-0.76

Strong Negative Correlation

NOTE: Correlation Analysis <u>does not conclusively prove anything</u>; it merely infers whether or not there may be a cause-effect relationship greater than chance or coincidence. Also be sure that you do not confuse the

38	**47.5**	**10**
39	**44.81**	**10**
40	**39.95**	**10**
41	**38.9**	**10**
42	**53.35**	**11**
43	**50.85**	**11**
44	**47.56**	**11**
45	**42.7**	**11**
46	**42.36**	**11**
47	**4.71**	**11**
48	**43.24**	**12**
49	**38.72**	**12**
50	**37.81**	**12**
51	**34.91**	**12**
52	**33.44**	**12**
53	**19.43**	**12**
54	**52.37**	**13**
55	**40.71**	**13**
56	**39.9**	**13**
57	**35.68**	**13**
58	**32.78**	**13**
59	**44.43**	**14**
60	**41.9**	**14**
61	**41.39**	**14**
62	**37.57**	**14**
63	**34.93**	**14**
64	**41.3**	**15**
65	**37.78**	**15**
66	**35.28**	**15**
67	**34.6**	**15**
68	**23.56**	**15**
69	**33.76**	**16**
70	**26.12**	**16**
71	**25.26**	**16**
72	**39.93**	**17**
73	**34.06**	**17**
74	**33.87**	**17**
75	**14.64**	**17**
76	**12.05**	**17**
77	**36.84**	**18**
78	**36.17**	**18**
79	**33.57**	**18**
80	**33.45**	**18**
81	**31.23**	**18**
82	**41.01**	**19**
83	**36.45**	**19**
84	**17.83**	**20**
85	**15.8**	**20**
86	**14.06**	**20**

87	**9.02**	**20**
88	**35.72**	**21**
89	**29.76**	**21**
90	**23.13**	**21**
91	**1.29**	**21**
92	**29.95**	**22**
93	**22.91**	**22**
94	**37.98**	**23**
95	**27.71**	**23**
96	**27.47**	**23**
97	**21.31**	**23**
98	**18.46**	**23**
99	**12.12**	**24**
100	**25.79**	**24**
101	**25.04**	**24**
102	**25.03**	**24**
103	**18.13**	**24**
104	**33.7**	**25**
105	**31.95**	**25**
106	**21.03**	**25**
107	**18.92**	**25**
108	**13.7**	**25**
109	**33.92**	**26**
110	**33.89**	**26**
111	**18.42**	**26**
112	**16.84**	**26**
113	**14.6**	**26**
114	**10.48**	**26**
115	**33.32**	**26**
116	**31.78**	**27**
117	**31.52**	**27**
118	**30.04**	**27**
119	**28.61**	**27**
120	**18.02**	**27**
121	**5.56**	**27**
122	**4.3**	**27**
123	**1.87**	**27**
124	**29.38**	**28**
125	**24.71**	**28**
126	**12.96**	**28**
127	**6.61**	**28**
128	**31.95**	**29**
129	**22.57**	**29**
130	**22.32**	**29**
131	**12.46**	**29**
132	**24.86**	**30**
133	**23.8**	**30**
134	**25.29**	**31**
135	**25.21**	**31**
136	**18.96**	**31**

137	**6.82**	**31**
138	**6.2**	**31**
139	**13.76**	**32**
140	**1.35**	**32**
141	**3.13**	**33**
142		

xxx

About the Author

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Initially a US Civil Service Management Intern, then a management analyst & systems specialist with the US Defense Department, Ken subsequently had a career as a senior foreign service officer -- management & evaluation specialist, project manager, and in-house facilitator/trainer -- with the US Agency for International Development (USAID). Ken assisted host country governments in many countries to plan, monitor and evaluate projects in various technical sectors; working 'hands-on' with their officers as well as other USAID personnel, contractors and NGOs. Intermittently, he was also a team leader &/or team member to conduct project, program & and country-level portfolio analyses and evaluations.

Concurrently, Ken had an active dual career as Air Force ready-reservist in Asia (Japan, Korea, Vietnam, Indonesia, Philippines) as well as the Washington D.C. area; was Chairman of a Congressional Services Academy Advisory Board (SAAB); and had additional duties as an Air Force Academy Liaison Officer. He retired as a 'bird' colonel.

After retirement from USAID, Ken was a project management consultant for ADB, the World Bank, UNDP and USAID.

He earned his DPA (Doctor of Public Administration) from the George Mason University (GMU) in Virginia, his MS from Massachusetts Institute of Technology (MIT Systems Analysis

Fellow, Center for Advanced Engineering Study), and BA & MA degrees in Government & International Relations from the University of Connecticut (UCONN). A long-time member of the Project Management Institute (PMI) and IPMA-USA, Ken is a Certified Project Management Professional (PMP®) and a member of the PMI®-Honolulu and Philippines Chapters.

Ken has two KENBOOKS: 1. Project Management PRAXIS which includes many innovative project management tools & techniques; and describes a "Toolkit" of related templates, and 2. MUSINGS on Project Management -- a compilation of contemporary concerns in project planning, monitoring & evaluation, with some tools & techniques suggested for their solution. Either or both books are available from Amazon, and their related templates are available directly from him at kenfsmith@aol.com on proof of purchase.

To view other works by Ken Smith, visit his author showcase in the PM World Library at https://pmworldlibrary.net/authors/dr-kenneth-smith/