



The digital step-up of healthcare: from reactive care to predictive & personalized medicine



Marco Manca, MD
President of SCImPULSE Foundation

Who am I?

What do I do?

How do I live?



A young Luciano Pavarotti interpreting Rodolfo (La Bohème) in the '60s

A New Interpretation of Information Rate

By J. L. KELLY, JR.

(Manuscript received March 21, 1956)

If the input symbols to a communication channel represent the outcomes of a chance event on which bets are available at odds consistent with their probabilities (i.e., "fair" odds), a gambler can use the knowledge given him by the received symbols to cause his money to grow exponentially. The maximum exponential rate of growth of the gambler's capital is equal to the rate of transmission of information over the channel. This result is generalized to include the case of arbitrary odds.

Thus we find a situation in which the transmission rate is significant even though no coding is contemplated. Previously this quantity was given significance only by a theorem of Shannon's which asserted that, with suitable encoding, binary digits could be transmitted over the channel at this rate with an arbitrarily small probability of error.

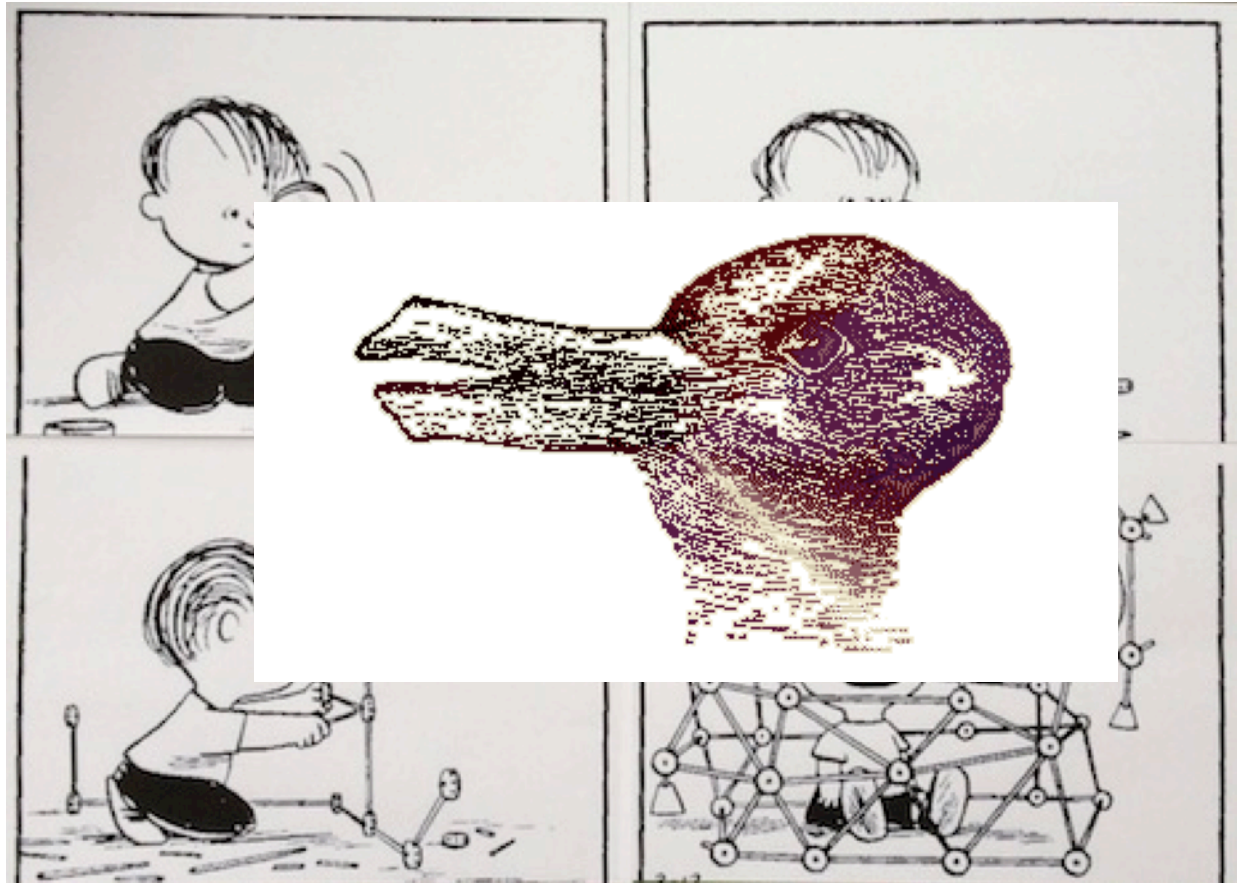
“Prediction is very difficult. Especially about the future.”

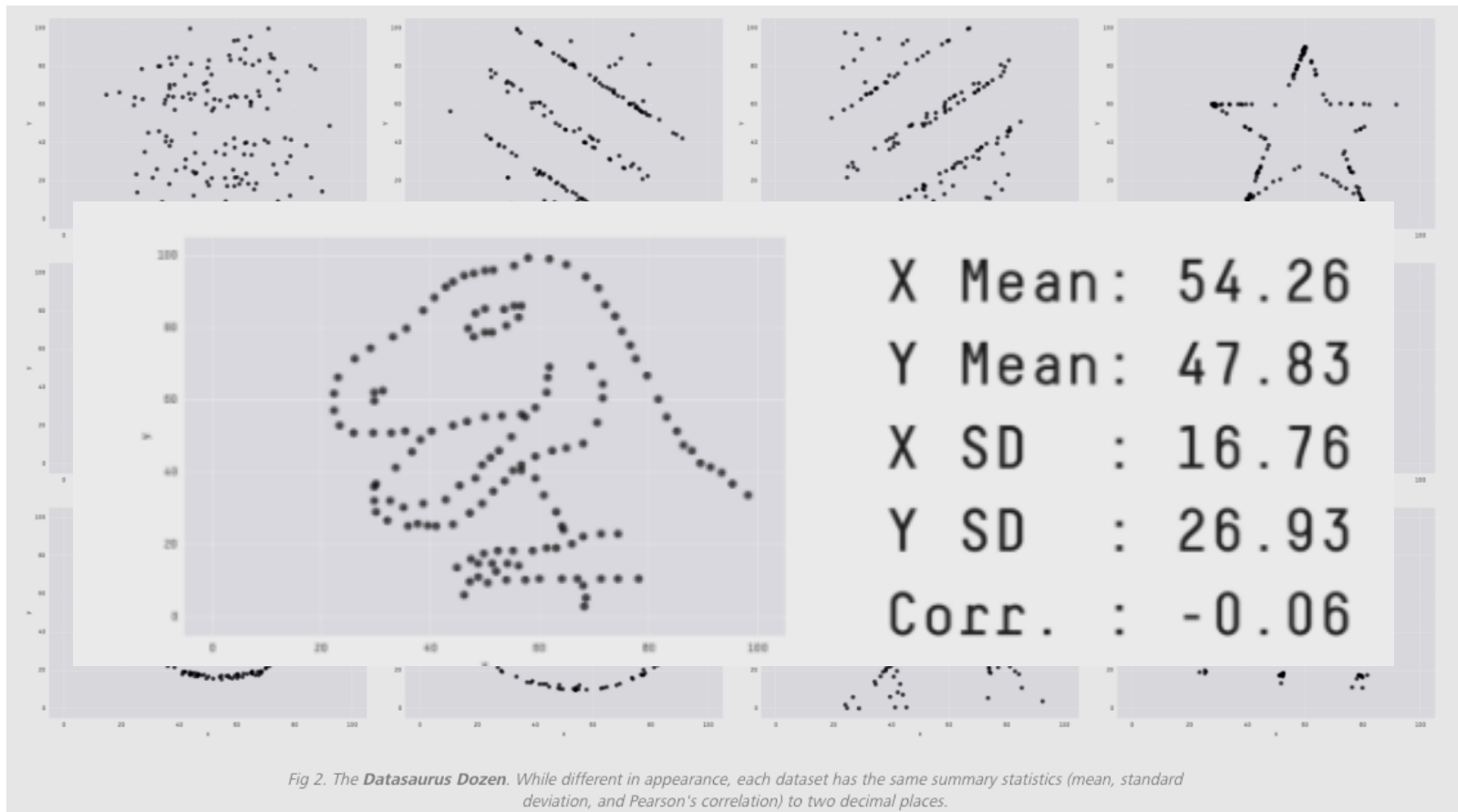
Niels Bohr (1885-1962)
Danish physicist



Grayscale low-def rendering of
"Capturing the Hagia Sophia"
CC-BY 2.0, by Rajeev Rajagopalan

Seemingly "objective" data is really just the result of a long "chain of human decisions"





<https://www.autodeskresearch.com/publications/samestats>

“The *who* and *why* will let us discover the
how and *what*”

Agent Maxwell Smart



Knowledge from data

RESEARCH ARTICLE | SOCIAL SCIENCES | 



Observing many researchers using the same data and hypothesis reveals a hidden universe of uncertainty

Nate Breznau , Eike Mark Rinke , Alexander Wuttke ,  +162, and Tomasz Żółtak  [Authors Info & Affiliations](#)

Edited by Douglas Massey, Princeton University, Princeton, NJ; received March 6, 2022; accepted August 22, 2022

October 28, 2022 | 119 (44) e2203150119 | <https://doi.org/10.1073/pnas.2203150119>

161 researchers in 73 research teams

Widely diverging numerical findings and substantive conclusions despite identical start conditions

More than 95% of the total variance in numerical results remains unexplained even after qualitative coding of all identifiable decisions in each team's workflow

These results call for greater epistemic humility and clarity in reporting scientific findings.

Thumb rules? ...dumb rules

Journal of
Evaluation in Clinical Practice
International Journal of Public Health Policy and Health Services Research

Personal View

Unpacking the process of interpretation in evidence-based decision making



Eivind Engebretsen PhD Professor, Nina
Köpke Vøllestad PhD Professor, Astrid
Klopstad Wahl PhD Professor, Hilde
Stendal Robinson PhD Researcher
and Kristin Heggen PhD Professor

Article first published online: 7 APR 2015

DOI: 10.1111/jep.12362

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Issue



Journal of Evaluation in
Clinical Practice

Early View (Online Version of
Record published before
inclusion in an issue)

EBM is a good catchphrase but how do we combine (1) clinical experience and expertise; (2) scientific evidence; and (3) patient values and preferences, to provide high-quality services?

Data = known unknown

Culture = heuristic structures

Diagnosis/prognosis = judgement of competing interpretation

Choice of course of action = transition from the domain of facts to the domain of values, **from what we know to what we should do**



IMPLEMENTATION SCIENCE

IMPACT
FACTOR
3.47

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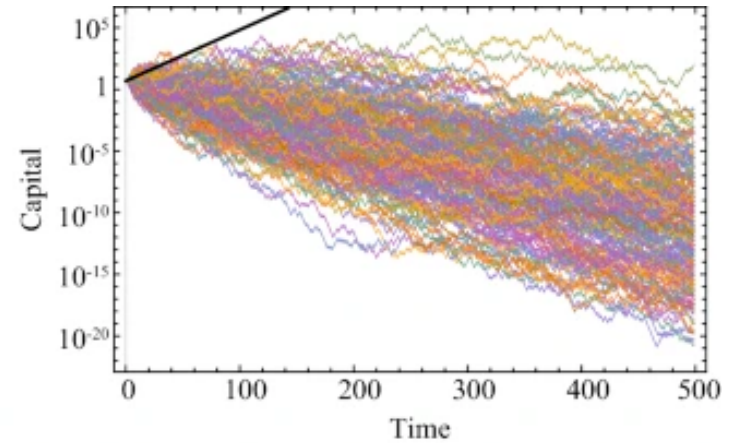
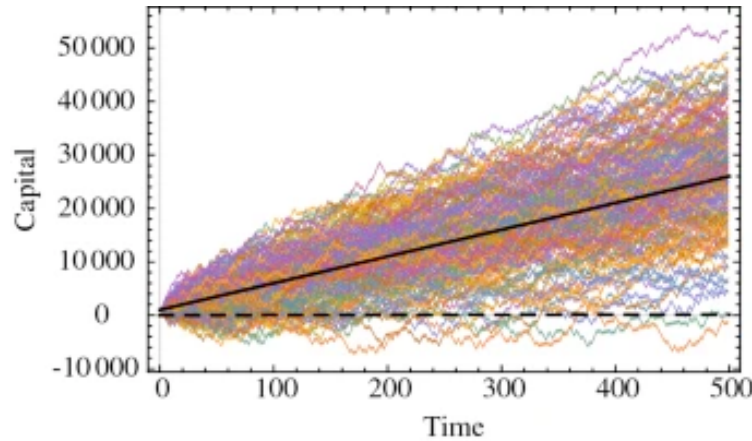
My Implementation Science

Systematic review

10 years of mindlines: a systematic review and commentary

Sietse Wieringa^{1*} and Trisha Greenhalgh²

Ergodicity and position



The left panel illustrates the capital of 200 individuals partaking in an additive scenario for 500 repetitions. The right panel illustrates the capital of 200 individuals participating in the multiplicative scenario for 500 repetitions. In both figures, the black line depicts the expected outcome of the bet. While the expected value provides a reasonable proxy for the evolution of the individuals' capital in the ergodic (additive) setting, it is clear that this is not the case in the non-ergodic (multiplicative) setting.

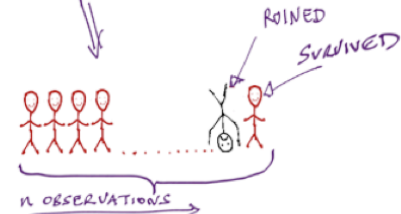
Vanhooyweghen A., et al. The influence of ergodicity on risk affinity of timed and non-timed respondents. Sci Rep 12, 3744 (2022). <https://doi.org/10.1038/s41598-022-07613-6>

Ergodicity and position



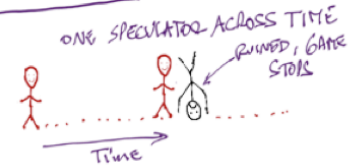
ENSEMBLE PROBABILITY

THE RUIN OF ONE DOES NOT
AFFECT THE RUIN OF OTHERS

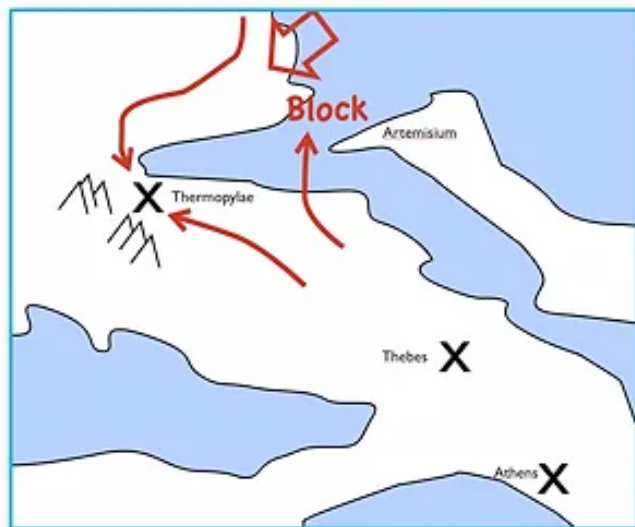


APPROXIMATELY ONE IN n FACE RUIN

TIME PROBABILITY



You can read more about ergodicity economics by Ole Peters here <https://ergodicityeconomics.com/publications/>



Strengths

- A well trained Spartan army
- A high level of motivation not to become a Persian slave
- Most of the Persian army are mercenaries and slaves

Weaknesses

- The rest of the Greeks aren't well trained
- The Ephors might stop the Spartans turning up
- A truck load of Persians ARE turning up

Opportunities

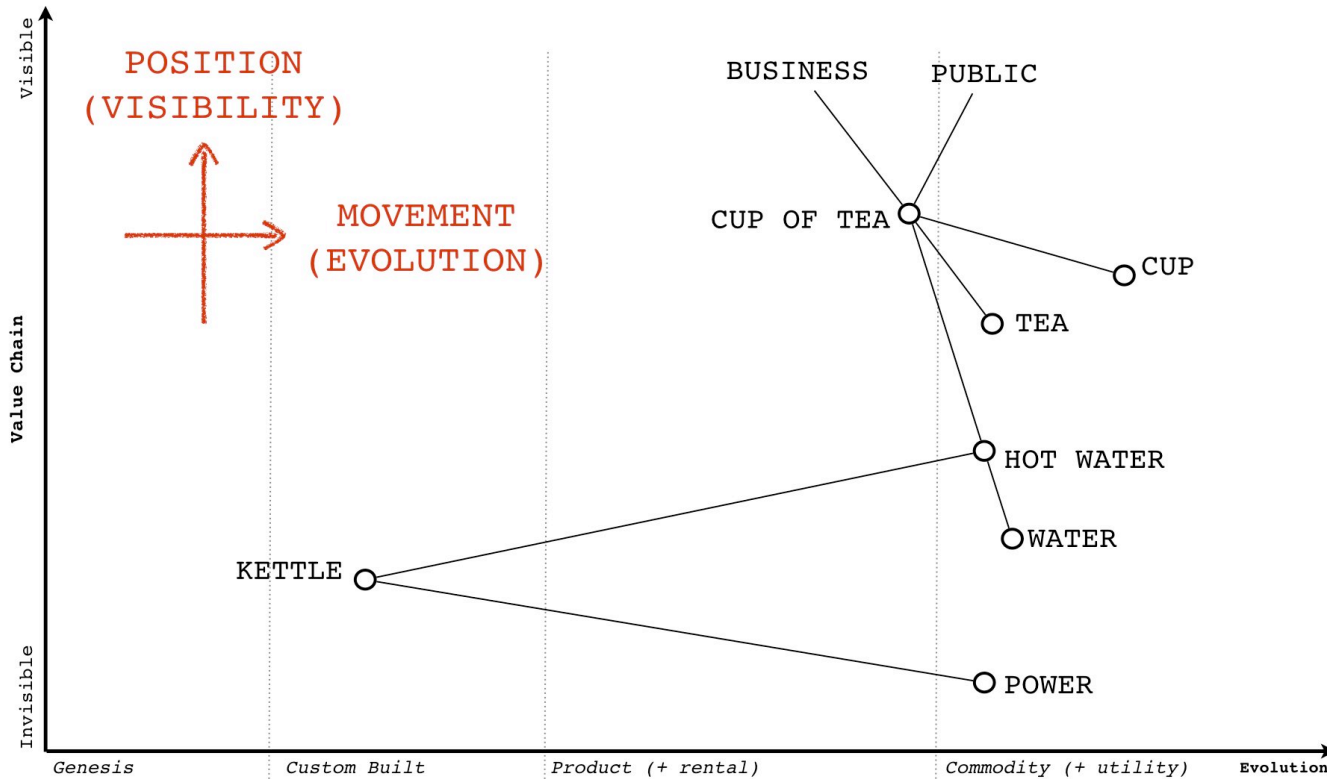
- Get rid of the Persians
- Get rid of the Spartans
- Become a Legend

Threats

- Persians get rid of us
- The Oracle says a really dodgy film might be produced over 2,000 years later

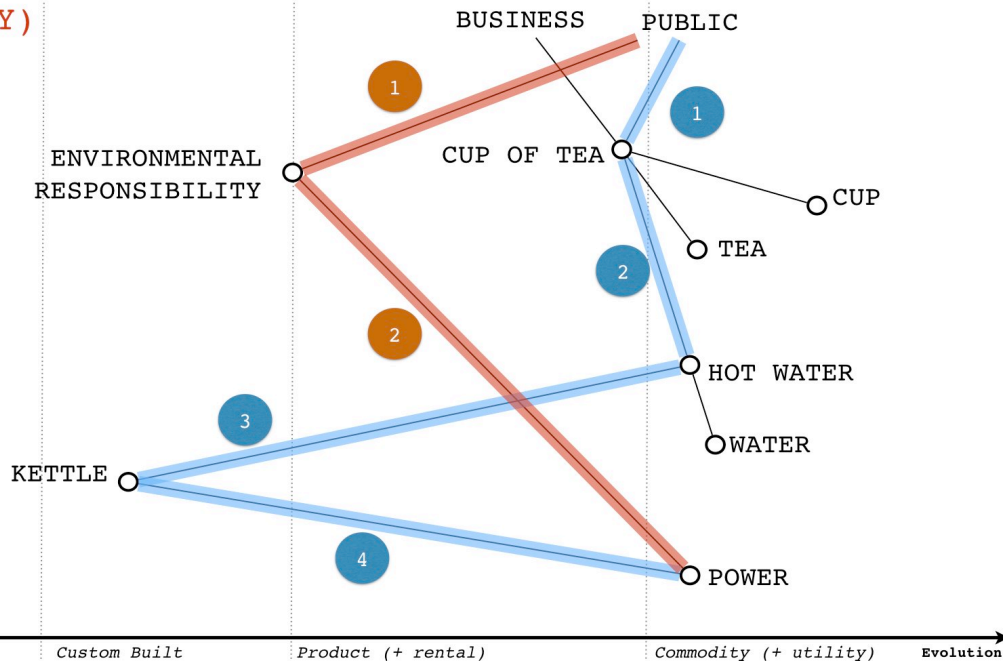


Credits: Simon Wardley - you can read more here <https://medium.com/wardleymaps>



Credits: Simon Wardley - you can read more here <https://medium.com/wardleymaps>

POSITION
(VISIBILITY)



Credits: Simon Wardley - you can read more here <https://medium.com/wardleymaps>



The purpose of collecting and reporting data was to comply, not to learn. Compliance was systemic and learning was optional and ad hoc

Source: <https://www.centreforpublicimpact.org/insights/public-sector-porkies-10-years-of-lying-up-the-hierarchy>

OPINION

Participation-washing could be the next dangerous fad in machine learning

Many people already participate in the field's work without recognition or pay.

By Mona Sloane

August 25, 2020

Machine learning extends the tech industry's broader priorities, which center on scale and extraction.

The AI community is finally waking up to the fact that machine learning can cause disproportionate harm to already oppressed and disadvantaged groups.



Self-driving cars prove to be labour-intensive for humans

Primary vs secondary uses & human costs

SCIENTIFIC ARTICLES

The Impact of Electronic Medical Record Implementation on Labor Cost and Productivity at an Outpatient Orthopaedic Clinic

 Scot S. MD¹; [AMIA Annu Symp Proc.](#) 2018; 2018: 1137–1146.

PMCID: PMC6371290

[Author](#) Published online 2018 Dec 5.

PMID: [30815156](#)

The Jou

doi: 10.2

Nurses' Time Allocation and Multitasking of Nursing Activities: A Time Motion Study

[EN](#) [Po-Yin Yen](#), PhD, RN, ^{1, 2} [Marjorie Kellye](#), MS, RN, ³ [Marcelo Lopetegui](#), MS, MD, ⁴ [Abhijoy Saha](#), MS, ⁵ [Jacqueline Loversidge](#), PhD, RN, ³ [Esther M. Chipps](#), PhD, RN, ^{3, 6} [Lynn Gallagher-Ford](#), PhD, RN, FAAN, ³ and [Jacalyn Buck](#), PhD, RN ^{3, 6}

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Brian G. Arndt, John W. Beasley, Michelle D. Watkinson, Jonathan L. Temte, Wen-Jan Tuan, Christine A. Sinsky and Valerie J. Gilchrist
The Annals of Family Medicine September 2017, 15 (5) 419–426; DOI: <https://doi.org/10.1370/afm.2121>

Up to 6hours/day on EMR

Also nurses spend more time on charting in the EMR than on any other task!!!

Primum non nocere

> [J Am Med Inform Assoc.](#) 2019 Feb 1;26(2):106-114. doi: 10.1093/jamia/ocy145.

Physician stress and burnout information technology

> [Ann Intern Med.](#) 2019 Jun 4;170(11):784-790. doi: 10.7326/M18-1422. Epub 2019 May 28.

[Rebekah L Gardner](#) ^{1 2}, [Emily Cooper](#) ²,
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Affiliations + expand

PMID: 30517663 PMCID: [PMC7647171](#)

Estimating the Attributable Cost of Physician Burnout in the United States

[Shasha Han](#) ¹, [Tait D Shanafelt](#) ², [Christine A Sinsky](#) ³, [Karim M Awad](#) ⁴, [Liselotte N Dyrbye](#) ⁵,
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PMID: 31132791 DOI: [10.7326/M18-1422](#)

70% reported EN

[Res Nurs Health](#) 2010 Aug; 33(4): 288-298.

Published in final edited form as:

[Res Nurs Health.](#) 2010 Aug; 33(4): 288-298.

PMID: 20645421

NIHMSID: NIHMS215130

PMID: [20645421](#)

Why does burnout matter? Because burnout begets more burnout, as well as rising costs, and worsening care. Under conservative estimates, the reduced clinical hours and physician turnover due to burnout costs us \$4.6 billion a year. Quality of care worsens when nurses report symptoms of burnout, independent of the practice environment

HUMANS AND TECHNOLOGY

We used to get excited about technology. What happened?

Innovation that truly serves us all is in scarce supply. That's a problem.

By Shannon Vallor

October 21, 2022

"Danger is not only that today's technology fails to be directed to our most urgent civilizational needs. It's that technologists' apparent loss of interest in humane innovation is depleting our collective faith in our own powers of invention"

Acknowledgements



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Head of Finance/Treasurer



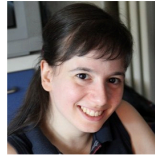
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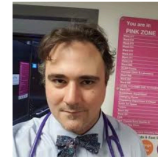
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